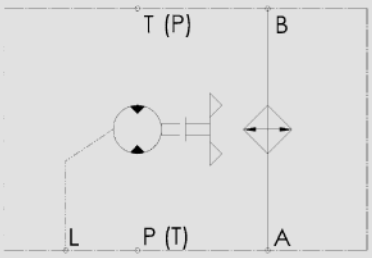
Air Cooler Mobile
OK-ELH 2-7
with hydraulic motor

Symbol



General

The OK-ELH air cooler series is designed specifically for mobile hydraulic applications where high performance and efficiency are required and physical size is minimized to allow easy installation.

Product Features

These coolers use a combination of high performance cooling elements and hydraulic motors to give long trouble free operation in arduous mobile hydraulic applications.

- Compact, efficient, high performance
- Cooling range 4 - 55 kW
- Hydraulic Motors from 6.3 to 22 cm³/r

Application Field

For transmission cooling and hydraulic systems in all mobile machines and vehicles, such as

- Mobile cranes
- Concrete mixers and pump trucks
- Road paving machines
- Construction machines (excavators, wheel loaders)
- Agricultural machines
- Municipal machines

Operation Data

Fluids	● Oils (mineral oils, synthetic oils, high viscosity oils, biological oils, phosphate ester) ● Water-glycol (cooling fluids)
Viscosity	2,000 mm²/s (standard)
Temperature range	● Minimum / maximum ambient temperature: -20 °C bis +40 °C (standard) ● Minimum / maximum temperature of the medium: +20 °C to +130 °C Please contact the technical sales department in the event of deviating temperatures. **Notice!** Fan at max. speed (max. volume of air) must be avoided when operating a cooler at which the temperature difference between the medium inlet at the cooler and the ambient temperature can be greater than 50 °C. Quick changes in the temperature of the cooling element material can lead to a significant reduction in service life or to direct damage of the cooling element due to thermal shock. Please contact the technical sales department to receive information about controlled fan drives.
Pressure resistance of the cooling element	● Dynamic operating pressure: 16 bar ● Static operating pressure: 21 bar
Fan	Axial fan in suction version (standard) Axial fan in pushing version on request (note: approx. 10 % less cooling capacity)
Motor*	● Hydraulic motor reversible with drain port ● max. outlet side pressure: 120 bar ● max. drain pressure: 2 bar ● max. peak pressure: 6.3/14 cm³/U = 300 bar, 22 cm³/U = 200 bar ● Operating fluid: Mineral oil to DIN 51524/25 DIN 51511 Fluid viscosity range: 10 - 600 mm²/s (recommended 30 - 45 mm²/s) Fluid temperature range: up to 90 °C Filtration : ISO/DIS 4406, Code 19/16, $\beta_{25} > 75$
Noise levels	See technical data The noise levels are only reference values as the acoustic properties of a room, connections and reflection have an effect on the noise level.
Accessories	● Integrated pressure bypass valve (IBP) or integrated thermal pressure bypass valve (IBT) (cannot be retrofitted, also see options) ● Thermostats ● Air filter grid or air filter mat ● Vibration damper

* The motor oil flow Q can be calculated at nominal motor oil operating pressure as follows:

$$Q = \frac{V_g \times n}{10^3 \times \eta_{vol}} \text{ [l/min]}$$

V_g = motor displacement [cm³/U]
n = fan speed [rpm]
η_{vol} = volumetric efficiency = 90 % at motor oil operating pressure of 150 bar

(Calculation also in simulation software “KULI” possible)

Options

Integrated pressure bypass valve (IBP) / Integrated thermal pressure bypass valve (IBT)
The bypass channel is integrated in the cooling element. If a particular pressure is exceeded, the IBP opens the bypass channel, thereby protecting the cooling element from too high a pressure. Furthermore, the IBT only opens the cooling element path once a particular temperature has been reached.

ATEX
The OK-ELH is also available for operation in gas and dust explosive areas.

Corrosion protection CPL
The CPL version (corrosion protection level) is for aggressive ambient conditions, such as industrial atmospheres, high humidity or high salt content, which place great demands on the corrosion resistance and robustness of the materials used.

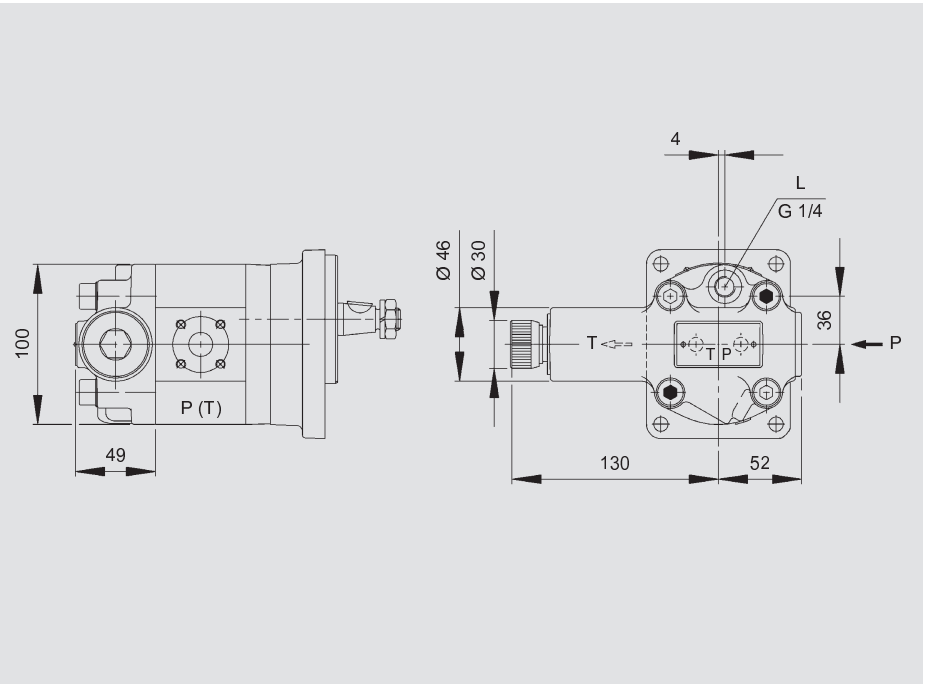
Thermal bypass Hydraulic motor / variable speed
The thermo valve is a pre-controlled pressure valve with temperature-dependent pressure control and is mounted on the hydraulic motor in place of the existing cover plate.

The pressure setting of the valve automatically changes dependent on the temperature and thus controls the motor speed. In addition to the actual temperature-controlled pressure setting, a mechanical maximum pressure control and a recharging valve are fitted as a non-return valve.

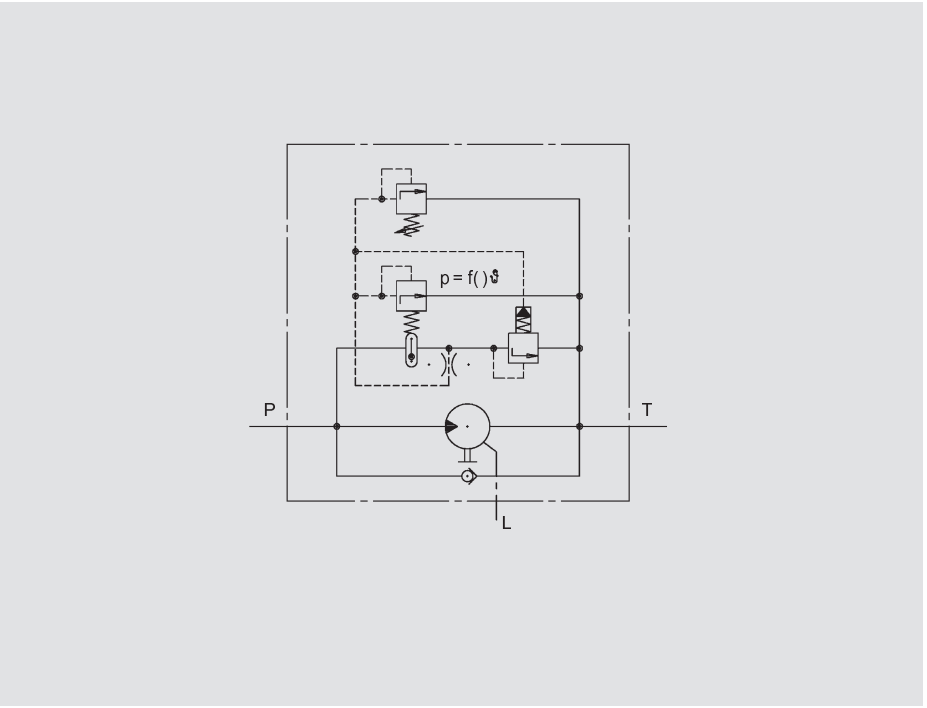
The switching temperature values can be set from 40 to 70 °C and the pressure can be controlled up to 100 °C: please contact our sales for the dimensioning of the thermo-bypass.

All the standard hydraulic motors can be used with the thermo-bypass. The minimum oil pressure at which the thermo control starts to work is 8 bar, i. e. a maximum residual power consumption corresponding to 8 bars is to be foreseen also in by-pass phase.

Dimension

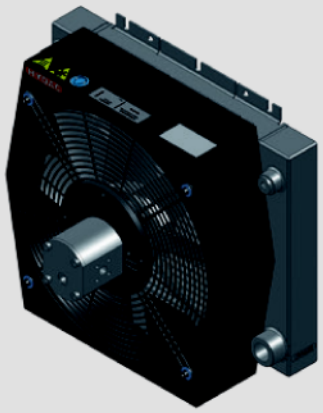


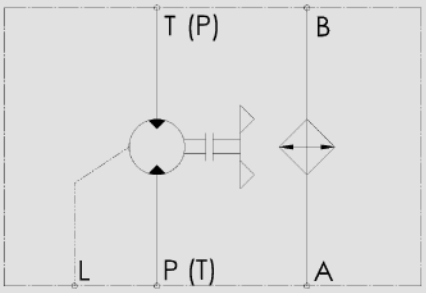
Symbol Thermal bypass



Design

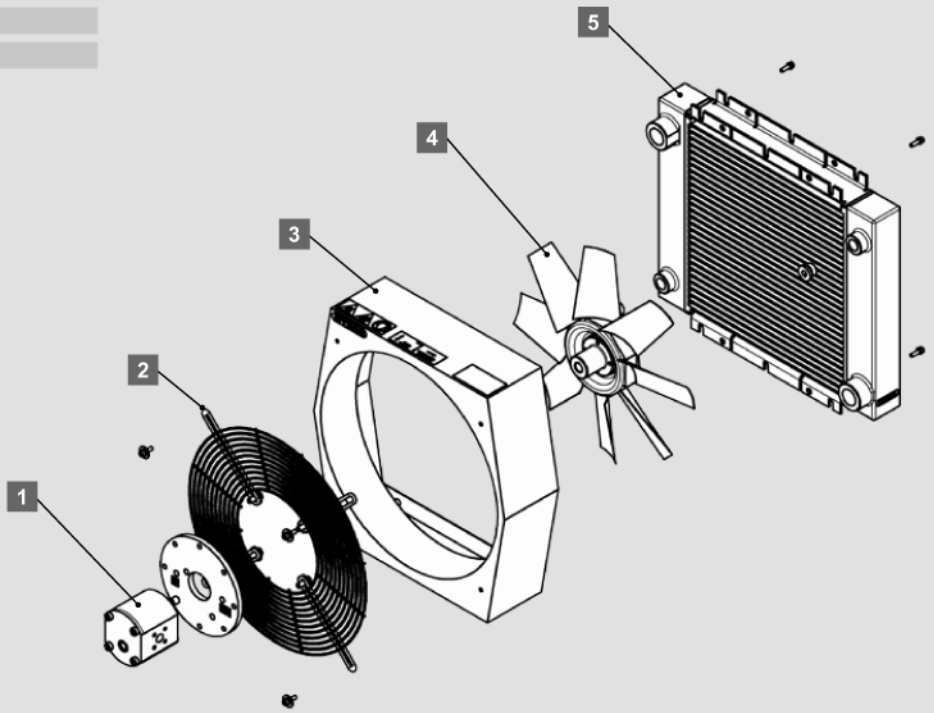
OK-ELH 2-4





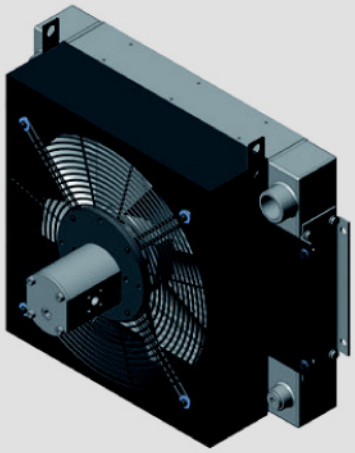
Air cooler with

1. Hydraulic motor
2. Finger grid
3. Fan housing
4. Axial fan
5. Heat exchanger

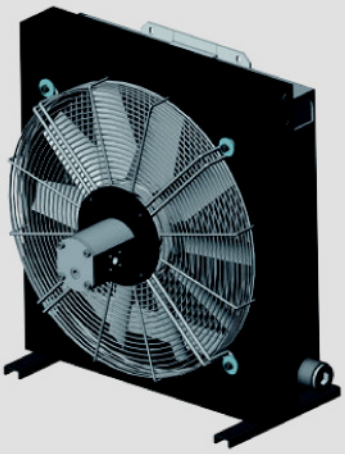


Design

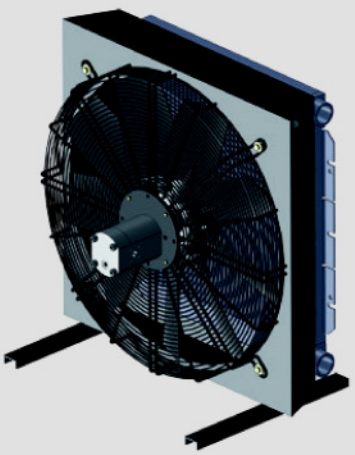
OK-ELH 5

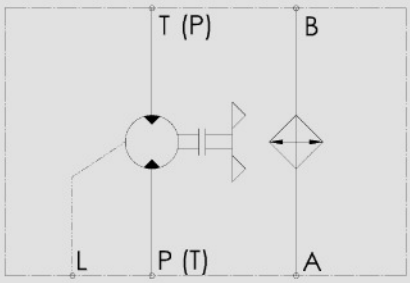


OK-ELH 6

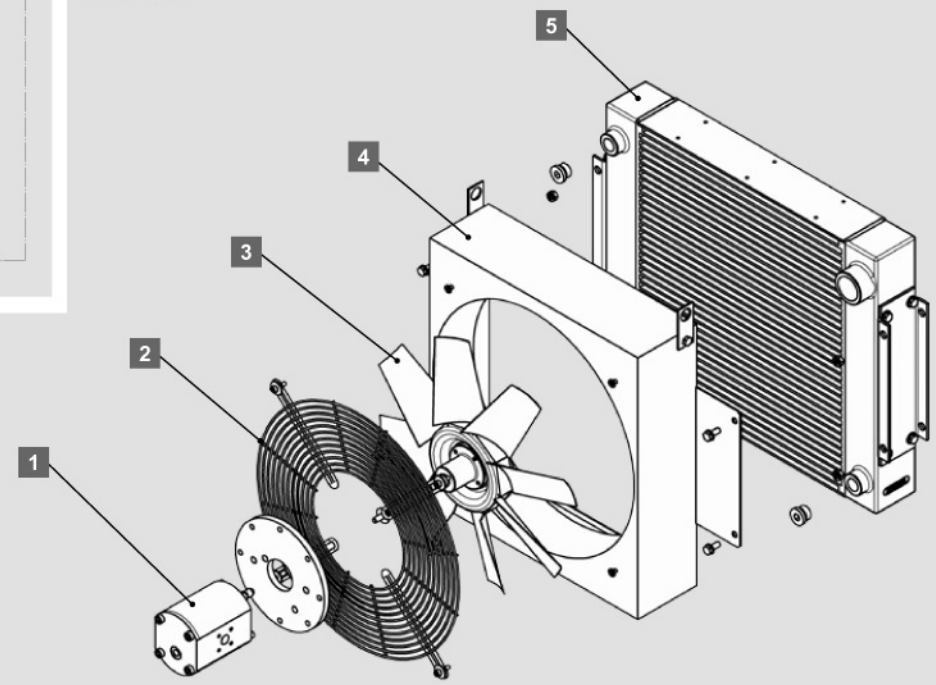


OK-ELH 7





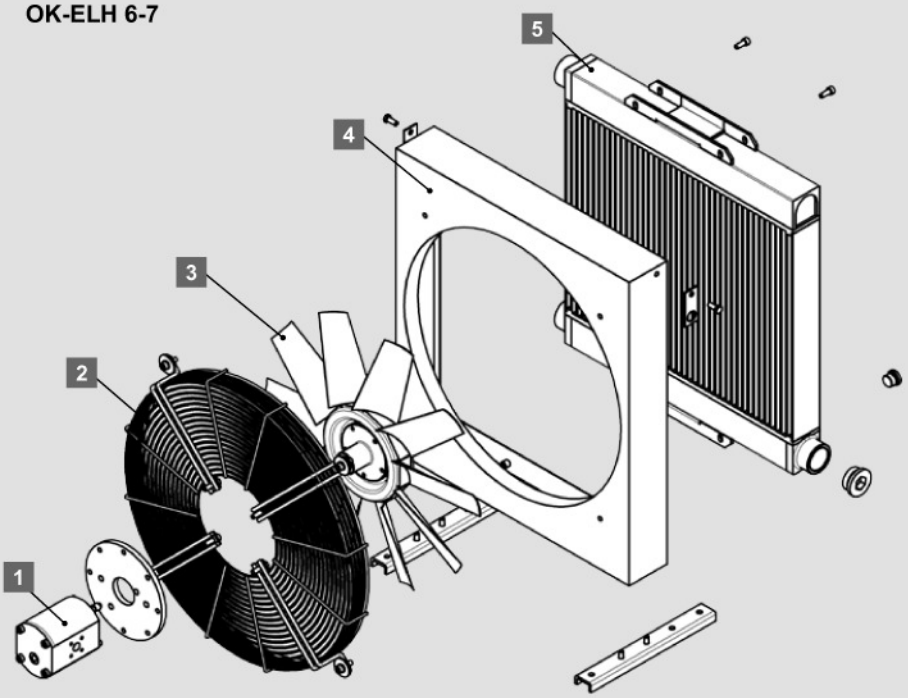
OK-ELH 5



Air cooler with

1	Hydraulic motor
2	Finger grid
3	Axial fan
4	Fan housing
5	Heat exchanger

OK-ELH 6-7



Air cooler with

1	Hydraulic motor
2	Finger grid
3	Axial fan
4	Fan housing
5	Heat exchanger

Technical Data

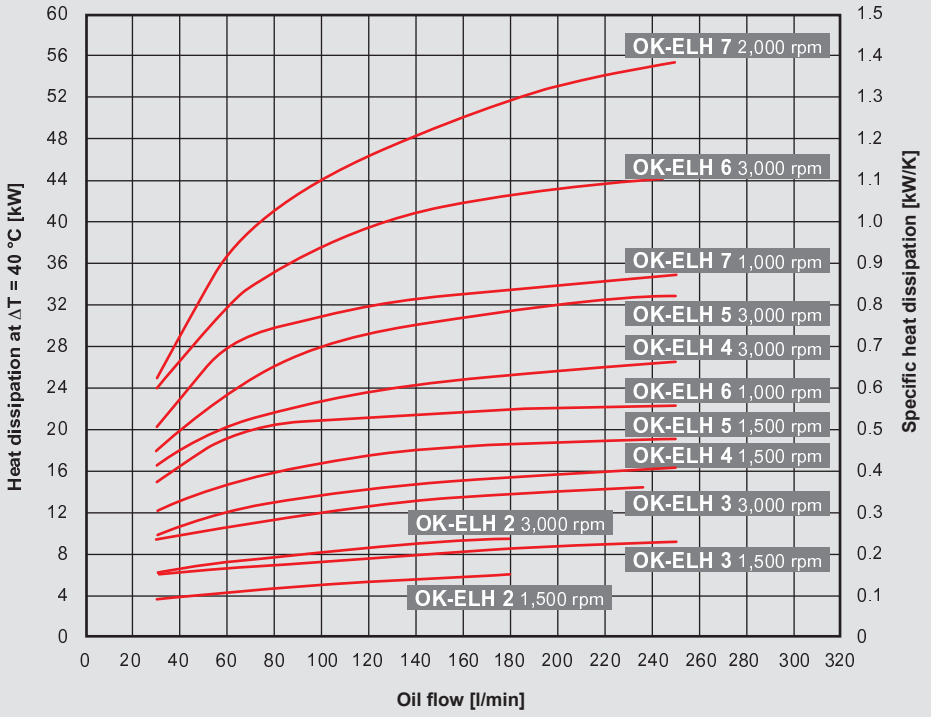
OK-ELH 2-7

Type of cooler	P/N	Motor displacement [cm3/r]	Operating speed range [rpm]	Fluid flow [l/min] [1]	Air flow [m³/h] [1]	Continuous motor operating pressure [bar]	Required pressure for max. speed [bar] [2]	Motor oil flow at 1,500 rpm [l/min]	Noise level at 1,000 rpm [dB(A)] (at 1 m distance)	Volume [l] [3]	Weight [kg] [4]
OK-ELH 2	3118399	6.3	1,500 - 3,000	180	420	250	20	10.5	69	2.0	11
OK-ELH 2	3118400	14.0	1,500 - 3,000	180	420	250	20	23.0	69	2.0	11
OK-ELH 3	3103131	6.3	1,500 - 3,000	250	740	250	20	10.5	69	2.2	13
OK-ELH 3	3103134	14.0	1,500 - 3,000	250	740	250	20	23.0	69	2.2	13
OK-ELH 3	3103523	22.0	1,500 - 3,000	250	740	150	20	36.6	69	2.2	13
OK-ELH 4	3106813	6.3	1,500 - 3,000	250	1,500	250	50	10.5	70	3.0	18
OK-ELH 4	3106816	14.0	1,500 - 3,000	250	1,500	250	30	23.0	70	3.0	18
OK-ELH 4	3106817	22.0	1,500 - 3,000	250	1,500	150	20	36.6	70	3.0	18
OK-ELH 5	3098892	6.3	1,500 - 3,000	250	1,700	250	70	10.5	70	5.2	24
OK-ELH 5	3103135	14.0	1,500 - 3,000	250	1,700	250	30	23.0	70	5.2	24
OK-ELH 5	3107149	22.0	1,500 - 3,000	250	1,700	150	20	36.6	70	5.2	24
OK-ELH 6	3128565	6.3	1,000 - 3,000	250	3,300	250	150	10.5	72	4.6	43
OK-ELH 6	3128566	14.0	1,000 - 3,000	250	3,300	250	70	23.0	72	4.6	43
OK-ELH 6	3128567	22.0	1,000 - 3,000	250	3,300	150	50	36.6	72	4.6	43
OK-ELH 7	3189345	14.0	1,000 - 2,000	250	7,800	250	220	23.0	77	5.2	50
OK-ELH 7	3189359	22.0	1,000 - 2,000	250	7,800	150	140	36.6	77	5.2	50

[1] Max. flow rate at 1,500 1/min
[2] at 34 mm²/s
[4] Fluid in cooling element
[3] Unfilled

Cooling Capacity and Pressure Difference Δp

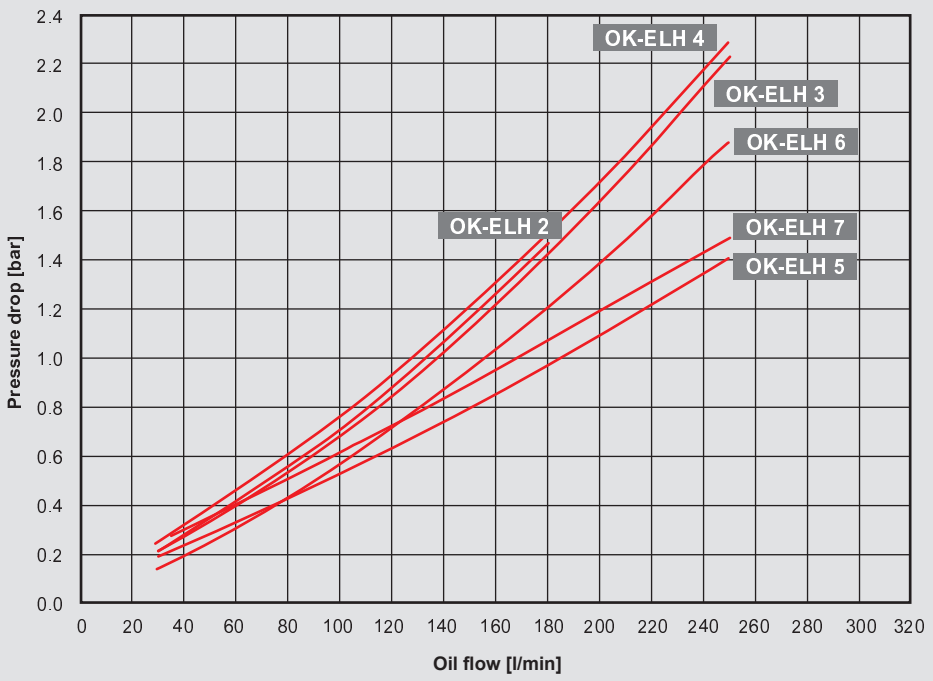
OK-ELH 2-7



Tolerance: ± 5 %

Cooling capacity:
Dependent on the oil flow rate and the temperature difference ΔT between oil inlet and air inlet.

Note:
The values are measured at ΔT = 40 °C. For smaller ΔT values, the values can change. You can also use our cooler calculation software for designing. Please contact our technical sales department.



measured at 30 mm²/s
Tolerance: ± 5 %

Pressure difference Δp

For other viscosities, the pressure loss must be multiplied by the conversion factor K:

Viscosity (mm²/s)	10	15	22	30	46	68	100	150
Factor K	0.35	0.5	0.75	1.0	1.4	1.9	2.5	3.5

Model Type

OK-ELH - 2 - 1.0 - H6.3TB - 1 - S - AITF60

Cooler type
OK-ELH = Oil-Air cooler

Size
2-7 = Size

Revision

Motor displacement
H6.3 = 6.3 cm^3/r
H14 = 14 cm^3/r
H22 = 22 cm^3/r
H..TB = hydraulic motor with thermal bypass

Color

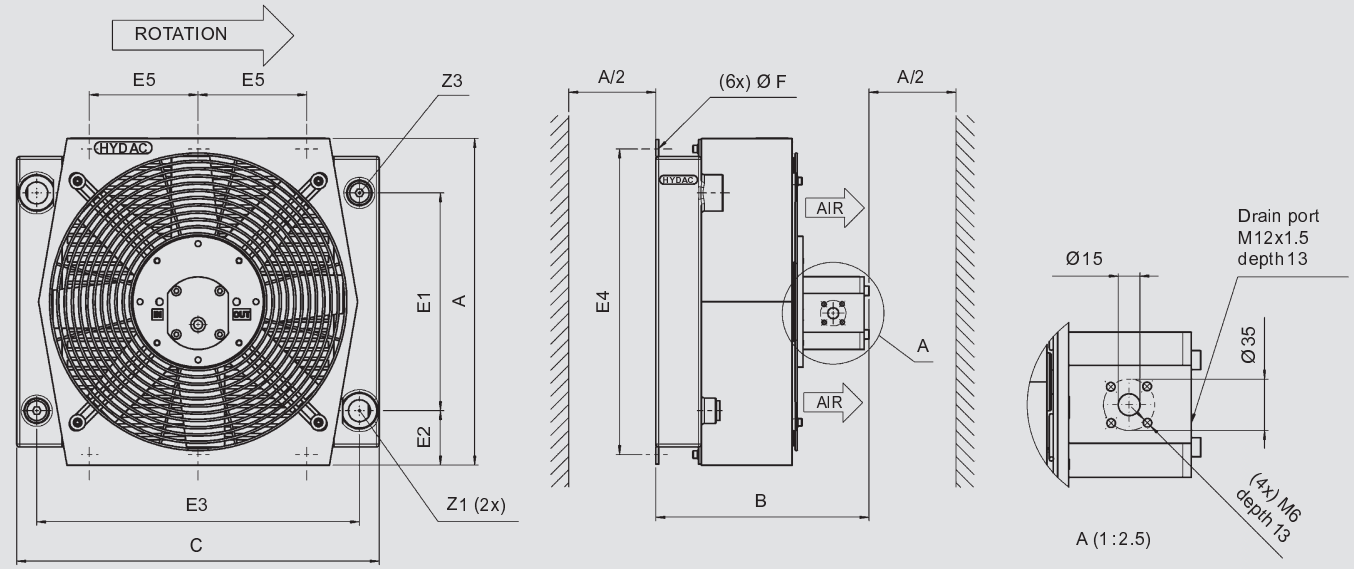
1 = RAL 9005 (standard)
Other colors on request.

Air flow direction
S = Suction (standard)
D = Blowing (on request)

Accessories
IBP = Heat exchanger with integrated bypass valve
IBT = Heat exchanger with integrated thermo-bypass valve
AITF = Thermostat (fixed)
FU = Feet
For all possible accessories, like vibration absorber, air filter grid or air filter mat please refer to brochure Accessories for air coolers.

Dimensions

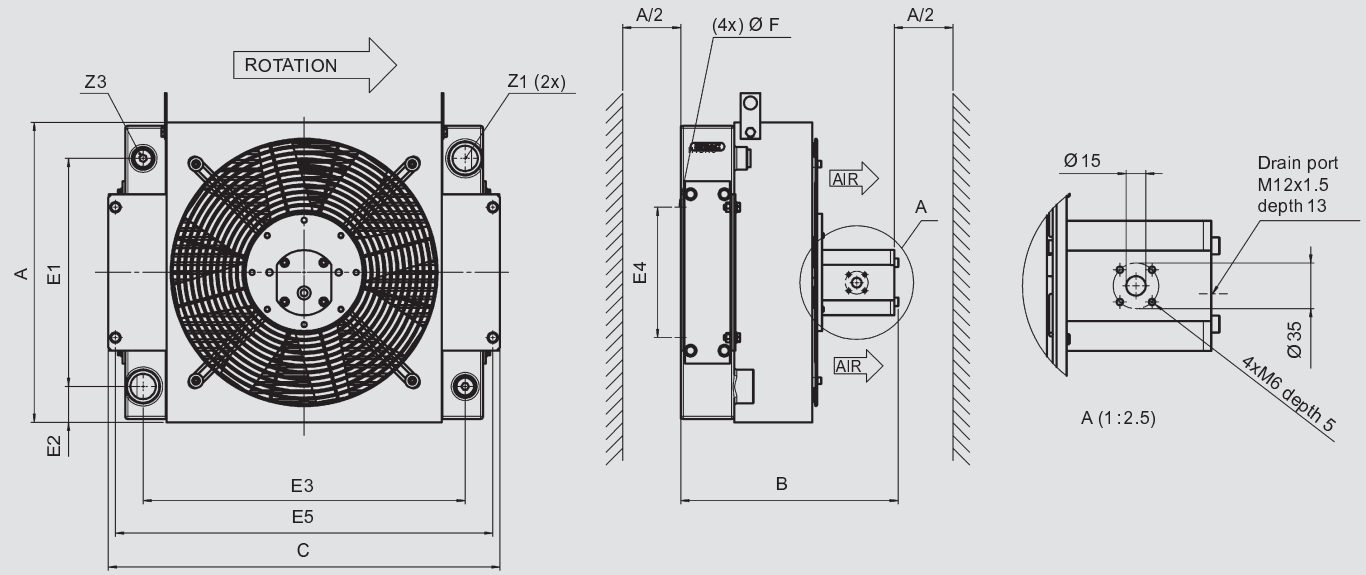
OK-ELH 2-4



[mm]	A ±5	B ±10 6.3 cc	B ±10 14 cc	B ±10 22 cc	C ±5	E1 ±5	E2 ±5	E3 ±5	E4 ±2	E5 ±2	F ø/slot	Z1	Z3
OK-ELH 2	313	270	283	283	384	199	57	324	288	80	14x10	G1"	M22x1.5
OK-ELH 3	356	279	292	292	420	230	63	370	329	100	14x10	G1"	M22x1.5 [1]
OK-ELH 4	450	294	306	306	500	300	80	445	421	150	19x10	G1"	M22x1.5 [2]

[1] OK-ELH 3 and OK-ELH 4 have two connections M22x1.5.

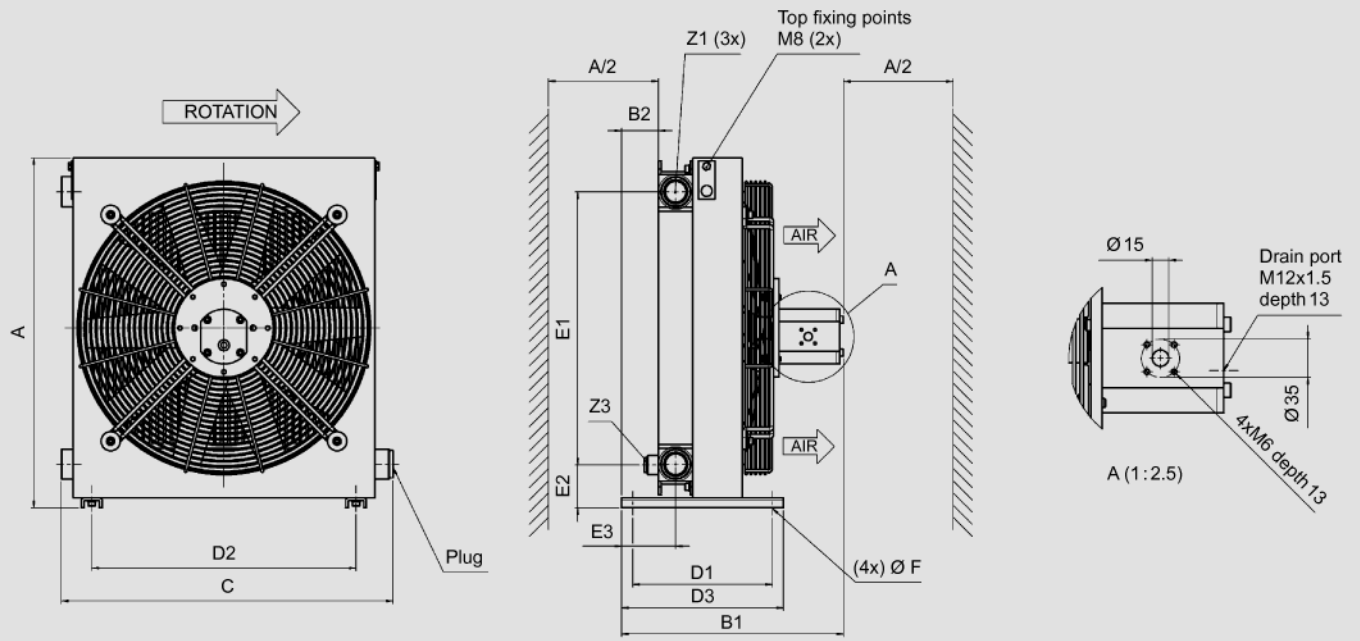
OK-ELH 5



[mm]	A ±5	B ±10 6.3 cc	B ±10 14 cc	B ±10 22 cc	C ±5	E1 ±5	E2 ±5	E3 ±5	E4 ±5	E5 ±5	F ø/slot	Z1	Z3
OK-ELH 5	460	311	323	338	602	350	55	495	200 [2]	580 [2]	12	G1-1/4"	M22x1.5 [2]

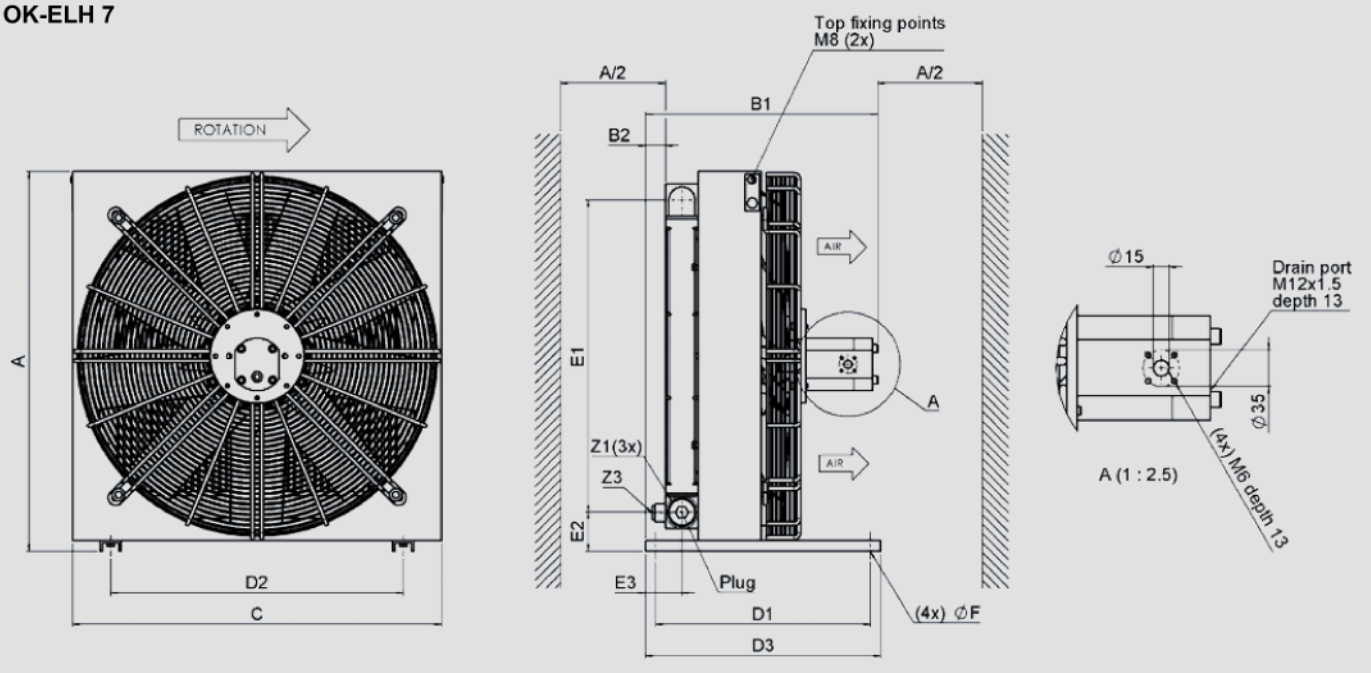
[1] The cooling element has two connections M22x1.5.
[2] OK-ELH 5 has the front fixing holes in the lateral sides.

OK-ELH 6



[mm]	A ±5	B1 ±10 6.3 cc	B1 ±10 14 cc	B1 ±10 22 cc	B2 ±5	C ±5	D1 ±2	D2 ±2	D3 ±2	E1 ±5	E2 ±5	E3 ±5	F ø/slot	Z1	Z3
OK-ELH 6	638	378	391	405	67	598	255	482	295	497	80	98	9	G1-1/4"	M22x1.5

OK-ELH 7



[mm]	A ±5	B1 ±10 6.3 cc	B1 ±10 14 cc	B1 ±10 22 cc	B2 ±5	C ±5	D1 ±2	D2 ±2	D3 ±2	E1 ±5	E2 ±5	E3 ±5	F ø/slot	Z1	Z3
OK-ELH 7	726	–	444	459	42	706	410	560	450	597	75	73	9x20	G1-1/4"	M22x1.5

Note:

We recommend maintaining a minimum distance to ensure an unimpeded air inlet and air outlet.
This is half the height of the cooling element (A/2).
Anything below the minimum distance can influence the cooling capacity and the noise emissions.

Note

The information in this brochure relates to the operating conditions.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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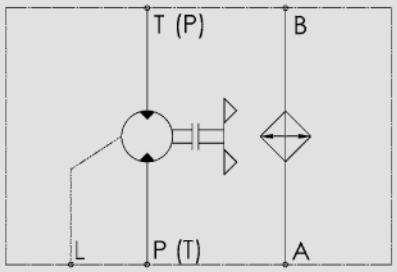
Air Cooler Mobile
AC-LNH 8-14
with hydraulic motor

Symbol



General

The AC-LNH air cooler series is designed specifically for mobile hydraulic systems where high performance and efficiency are required and physical size must be minimized to allow easy installation.

Product Features

AC-LNH coolers use a combination of high performance, pressure-resistant cooling elements and hydraulic drive motors in order to ensure long, trouble-free operation of hydraulic systems in the mobile sector.

- Compact, efficient, high performance
- Cooling range 20 – 290 kW
- Hydraulic motors from 6.3 to 22 cm³/rev

Application Field

Gearbox cooling and hydraulic systems in all mobile machines and vehicles, such as

- Mobile cranes
- Concrete mixers and pump trucks
- Road paving machines
- Construction machines (excavators, wheel loaders)
- Agricultural machines
- Municipal machines

Operation data

Fluids	● Oils (mineral oils, synthetic oils, high viscosity oils, biological oils, phosphate ester) ● Water glycol (cooling fluid)
Viscosity	2,000 mm²/s (standard)
Temperature range	● Minimum / maximum ambient temperature: -20 °C to +40 °C (standard) ● Maximum temperature of the medium: +130 °C Please contact the technical sales department in the event of deviating temperatures. **Notice!** Fan switching frequency at max. fan speed (max. volume of air) must be avoided when operating a cooler at which the temperature difference between the medium inlet at the cooler and the ambient temperature can be greater than +50 °C. Quick changes in the temperature of the cooling element material can lead to a significant reduction in service life or to direct damage of the cooling element due to thermal shock. Please contact the technical sales department to receive information about controlled fan drives.
Pressure resistance of the cooling element	● Dynamic operating pressure: 16 bar ● Static operating pressure: 21 bar
Fan	Axial fan in suction version (standard) Axial fan in blowing version on request (note: approx. 10 % less cooling capacity)
Motor*	● Hydraulic motor Reversible direction of rotation ● max. outlet side pressure: 150 bar ● max. drain pressure: 5 bar ● max. operating pressure: 6.3 / 14 cm³/rev = 300 bar, 22 cm³/rev = 240 bar ● Operating fluid: Mineral oil to DIN 51524/25; DIN51511 Viscosity range: 12 – 750 mm²/s (recommended 12 – 100 mm²/s) Temperature range: up to +80 °C Filtration: ISO/DIS 4406, Class 19/17/14, $\beta_{10} \geq 200$ bar, Class 21/19/16, $\beta_{25} < 140$ bar
Noise levels	See Technical Data. The noise levels are only reference values as the acoustic properties of a room, connections and reflection have an effect on the noise level.
Accessories	● Integrated pressure bypass valve (IBP) or integrated thermal pressure bypass valve (IBT) (cannot be retrofitted, also see Options) ● Thermostats ● Air filter grid or air filter mat ● Vibration damper

* Calculation of the required oil volume:

$$Q = \frac{V_g \times n}{10^3 \times \eta_{vol}} \text{ [l/min]}$$

V_g = motor displacement [cm³/rev]
n = fan speed [rpm]
η_{vol} = volumetric efficiency = 90 % at operating pressure of 150 bar

(Calculation also possible in simulation software KULI)

Options

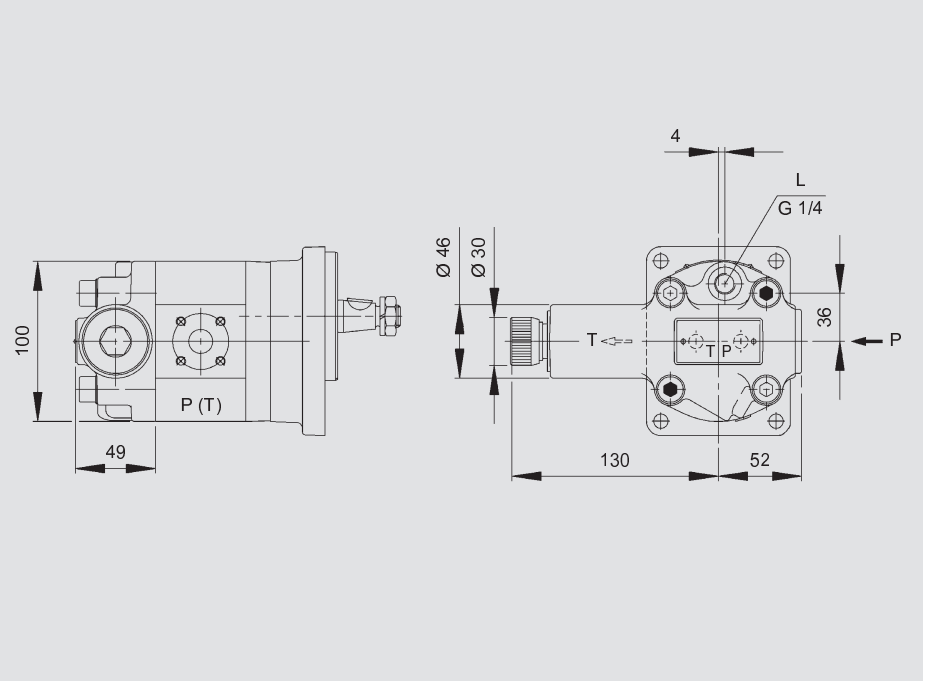
Integrated pressure bypass valve (IBP) / Integrated thermal pressure bypass valve (IBT)
The bypass channel is integrated in the cooling element. If a particular pressure is exceeded, the IBP opens the bypass channel, thereby protecting the cooling element from too high a pressure. Furthermore, the IBT only opens the cooling element path once a particular temperature has been reached.

ATEX
The AC-LNH is also available for operation in gas and dust explosive areas.

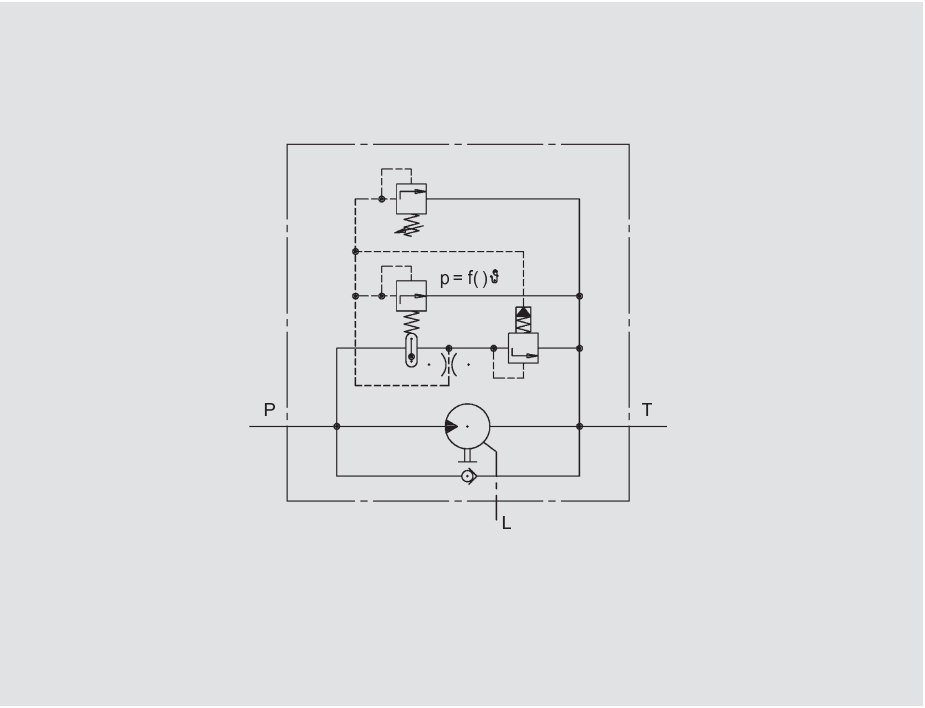
Corrosion protection CPL
The CPL version (Corrosion Protection Level) is suitable for aggressive ambient conditions, such as industrial atmospheres, high humidity or high salt content, which place great demands on the corrosion resistance and robustness of the materials used.

Thermal bypass hydraulic motor / variable speed
The thermal valve is a pilot-operated pressure relief valve with temperature-dependent pressure control and is mounted on the hydraulic motor instead of the provided end cap. The pressure setting of the valve automatically changes depending on the temperature and thus controls the motor speed.
In addition to the actual temperature-controlled pressure setting, maximum pressure relief and a recharging valve are fitted as a bypass check valve. The setting temperature values can be from +40 °C to +70 °C and the pressure can be controlled up to +100 °C. Please contact us for the designing of the thermal valve. All hydraulic motors can be equipped with thermal bypass. The minimum oil pressure at which the valve starts to work is 8 bar, i.e. this must be taken into consideration for the rest of the operating pressure range of the motor.

Thermal bypass dimensions

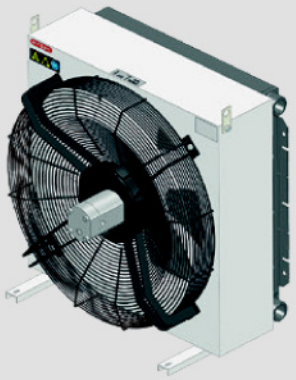


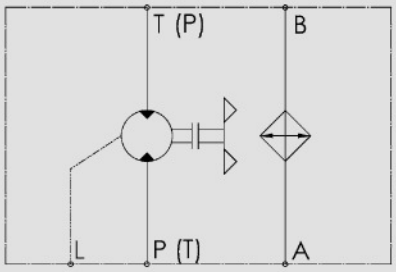
Thermal bypass symbol



Design

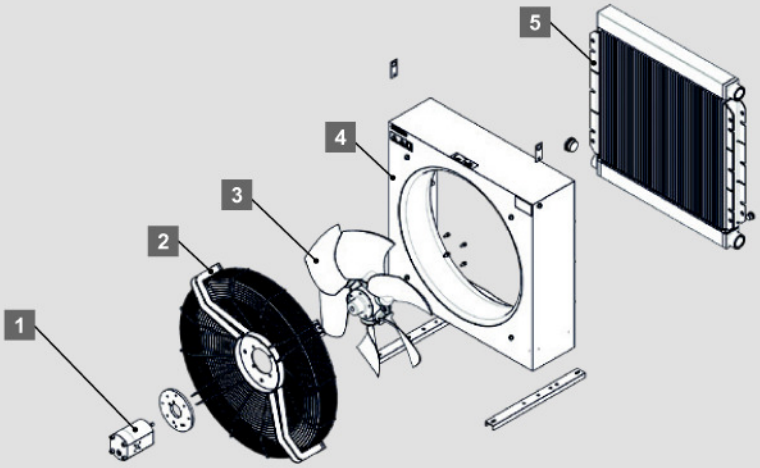
AC-LNH 8-9



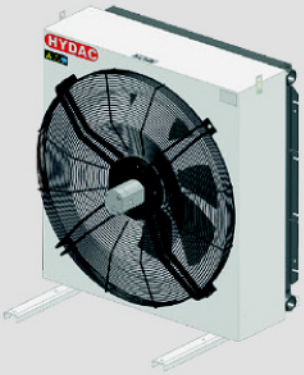


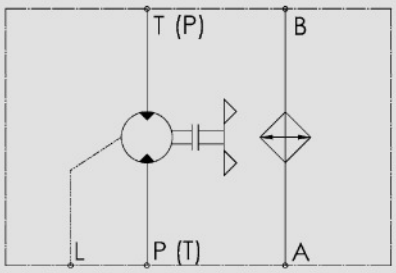
Air cooler with

1. Hydraulic motor
2. Finger guard
3. Axial fan
4. Fan housing
5. Heat exchanger



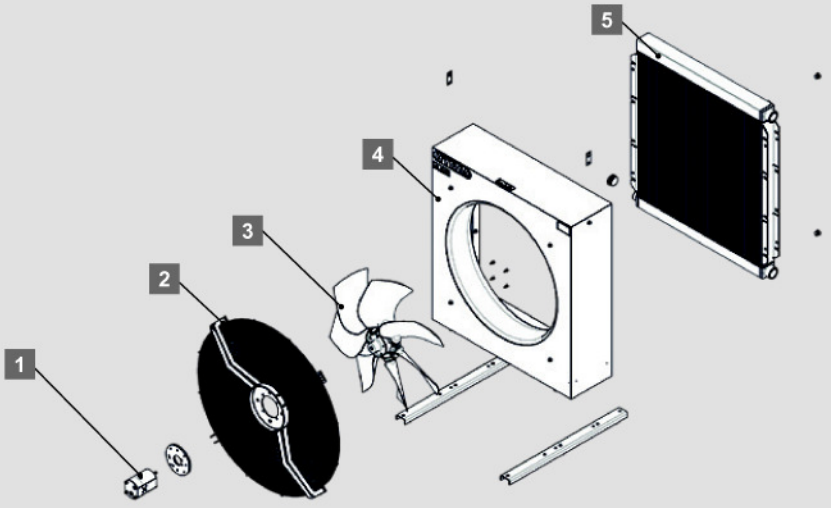
AC-LNH 10-11





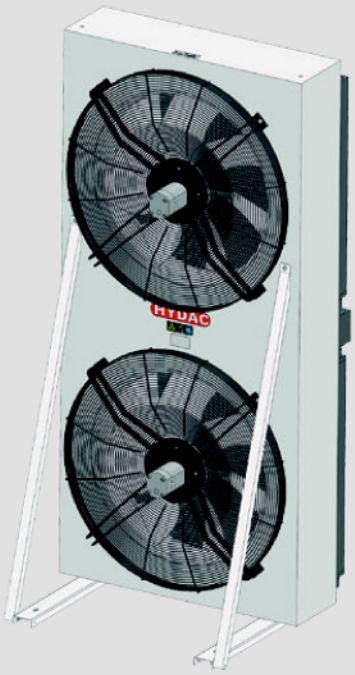
Air cooler with

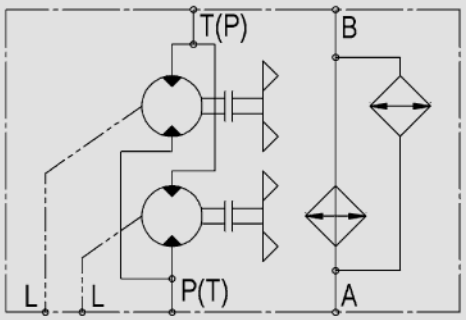
1. Hydraulic motor
2. Finger guard
3. Axial fan
4. Fan housing
5. Heat exchanger



Design

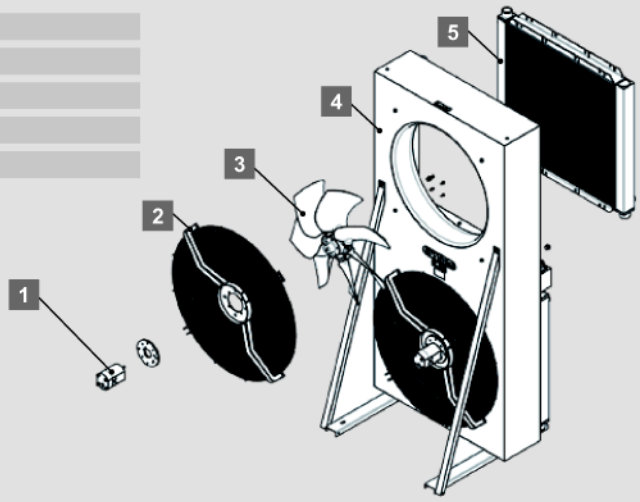
AC-LNH 12-14





Air cooler with

1. Hydraulic motor
2. Finger guard
3. Axial fan
4. Fan housing
5. Heat exchanger



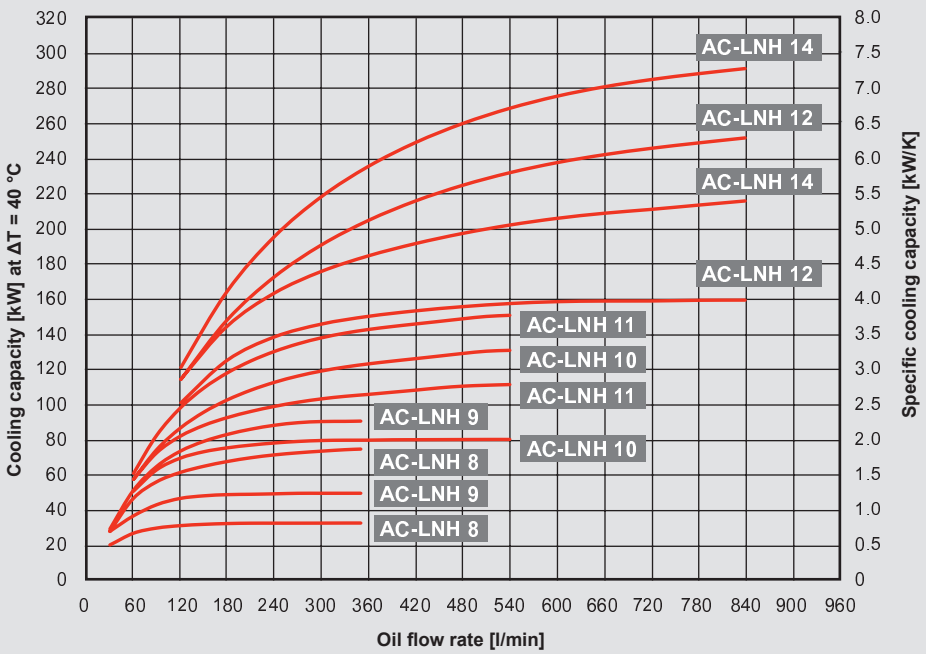
Technical Data

Type of cooler	P/N	Motor displacement [cm³/rev]	Operating speed range [rpm]	Fluid flow rate [l/min] [1]	Air flow rate [m³/h] [1]	Continuous motor operating pressure [bar]	Required pressure for max. speed [bar] [2]	Required motor oil flow at 1,500 rpm [l/min]	Noise level (at 1 m distance) [dB(A)]	Volume [l] [3]	Weight [kg] [4]
AC-LNH8	3903313	6.3	1,000 – 2,800	350	7,900	250	270	10.5	69	6	64
	3904781	14.0	1,000 – 2,800	350	7,900	250	120	23.0	69	6	64
	3904783	22.0	1,000 – 2,800	350	7,900	150	80	36.6	69	6	64
AC-LNH9	3903356	14.0	1,000 – 2,200	350	11,500	250	120	23.0	71	11	90
	3904830	22.0	1,000 – 2,200	350	11,500	150	80	36.6	71	11	90
AC-LNH10	3903358	14.0	1,000 – 1,800	540	18,600	250	210	23.0	77	14	120
	3904831	22.0	1,000 – 1,800	540	18,600	150	140	36.6	77	14	120
AC-LNH11	3903359	14.0	1,000 – 1,500	540	24,500	250	270	23.0	81	18	143
	3904832	22.0	1,000 – 1,500	540	24,500	150	180	36.6	81	18	143
AC-LNH12	3975153	14.0	1,000 – 1,800	840	18,600	250	210	23.0	77	28	270
	3975154	22.0	1,000 – 1,800	840	18,600	150	140	36.6	77	28	270
AC-LNH14	3975235	14.0	1,000 – 1,500	840	24,500	250	270	23.0	81	35	265
	3975236	22.0	1,000 – 1,500	840	24,500	150	180	36.6	81	35	265

[1] Max. flow rate at fan speed of 1,500 rpm
[2] At viscosity 34 mm²/s
[3] Fluid in cooling element, AC-LNH 12-14: depending on cooling element
[4] Unfilled

Cooling Capacity and Pressure Difference Δp

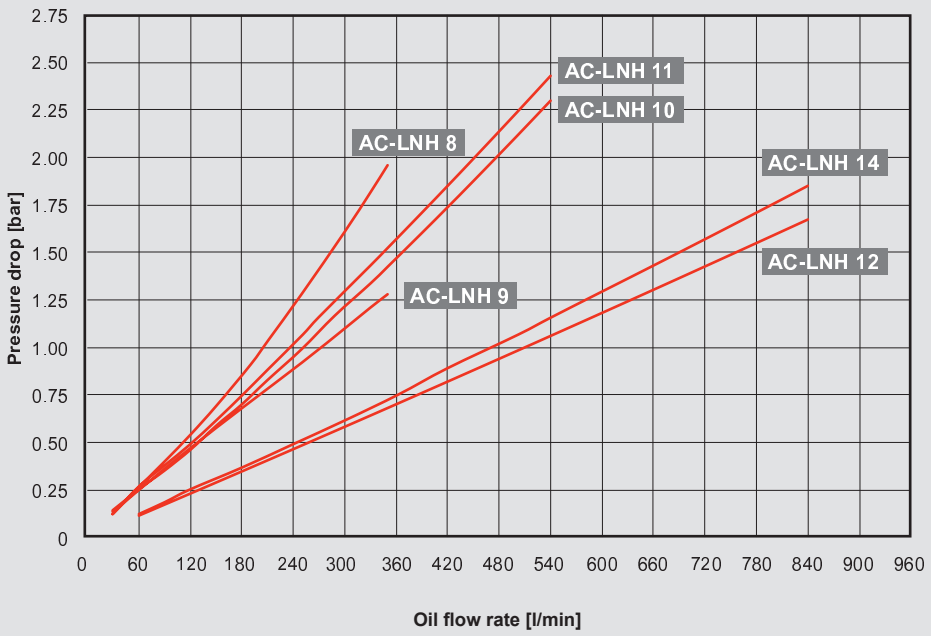
Mineral oil



Tolerance: ± 5 %

Cooling capacity:
Dependent on the oil flow rate and the temperature difference ΔT between oil inlet and air inlet.

Note:
The values are measured at ΔT = +40 °C. For smaller ΔT values, the values can change.
You can also use our cooler calculation software for designing. Please contact our technical sales department.



Measured at 30 mm²/s
Tolerance: ± 5 %

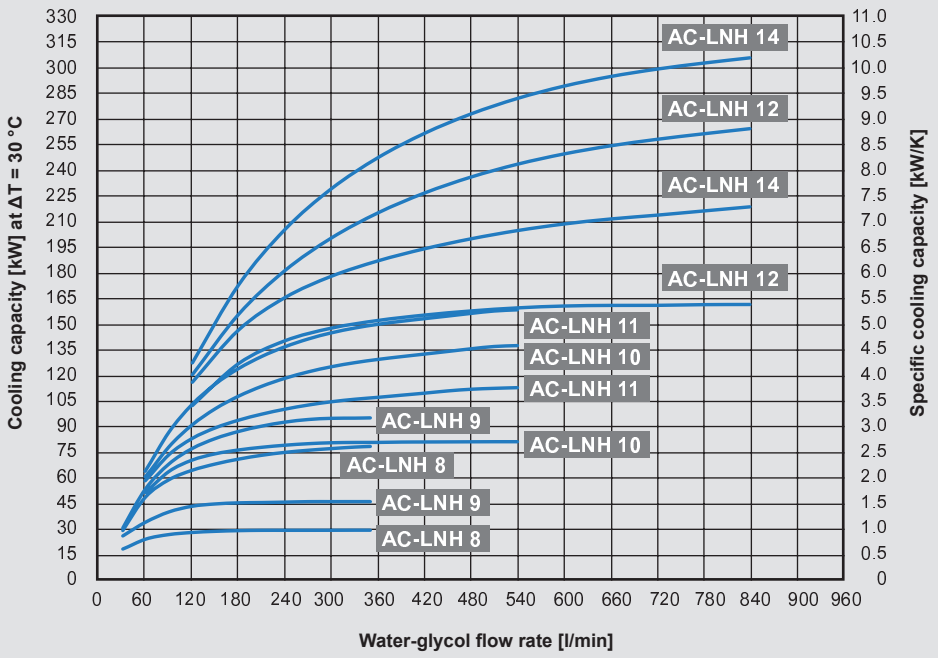
Pressure difference Δp

For other viscosities, the pressure drop must be multiplied by the conversion factor K:

Viscosity (mm²/s)	10	15	22	30	46	68	100	150
Factor K	0.35	0.5	0.75	1.0	1.4	1.9	2.5	3.5

Cooling Capacity and Pressure Difference Δp

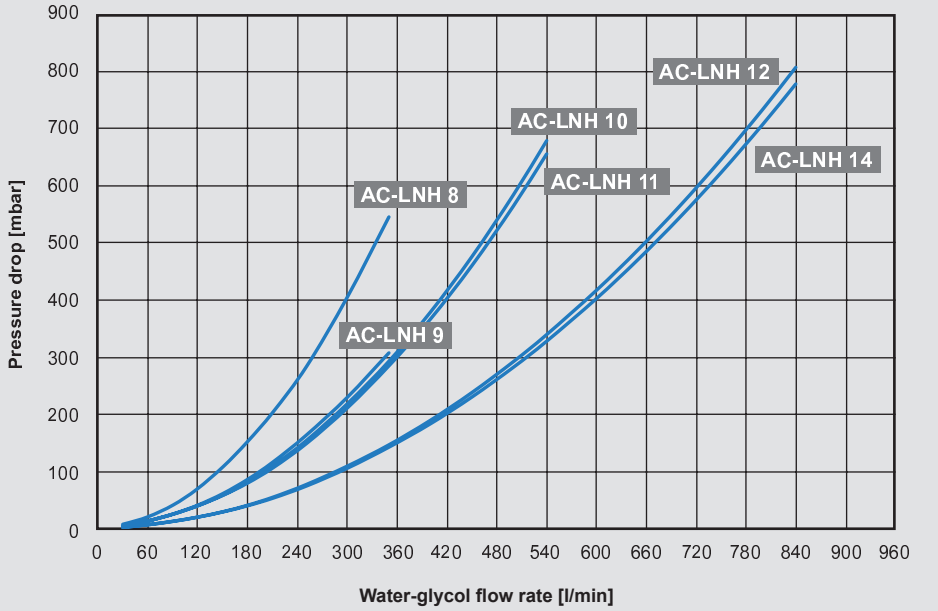
Water glycol (60/40)



Tolerance: ±5 %

Cooling capacity:
Dependent on the water-glycol flow rate and the temperature difference ΔT between w/g inlet and air inlet.

Note:
The values are measured at ΔT = +30 °C. For smaller ΔT values, the values can change. Please contact the technical sales department for designs with a temperature difference ΔT under +10 °C.



Measured at 2 mm²/s
Tolerance: ±5 %

Pressure difference Δp

Model Code

AC-LNH 8 - 1.0 - H6.3TB - 1 - S - AITF60

Cooler type
AC-LNH = Air cooler (oil/water-glycol mix)

Size
8 – 14 = Size

Revision

Motor voltage
H6.3 = 6.3 cm^3/r
H14 = 14 cm^3/r
H22 = 22 cm^3/r
H..TB = Hydraulic motor with thermal bypass

Colour

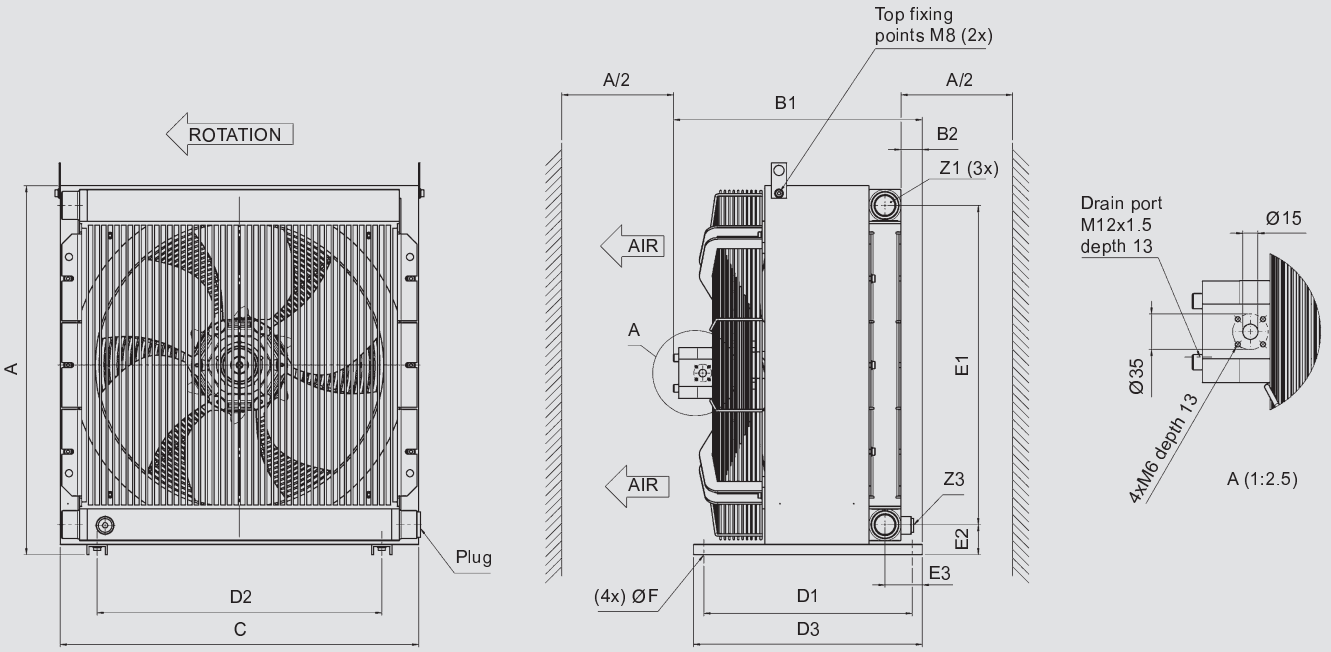
1 = RAL 9002 (standard)
Other colours on request.

Air flow direction
S = Suction (standard)
D = Blowing (on request)

Accessories
IBP = Heat exchanger with integrated pressure bypass valve (cannot be retrofitted)
IBT = Heat exchanger with integrated thermal pressure bypass valve (cannot be retrofitted)
AITF = Thermostat (fixed)
For other accessories, e.g. rubber buffer as vibration absorber, air filter grid or air filter mat, please see Air Cooler Accessories brochure.

Dimensions

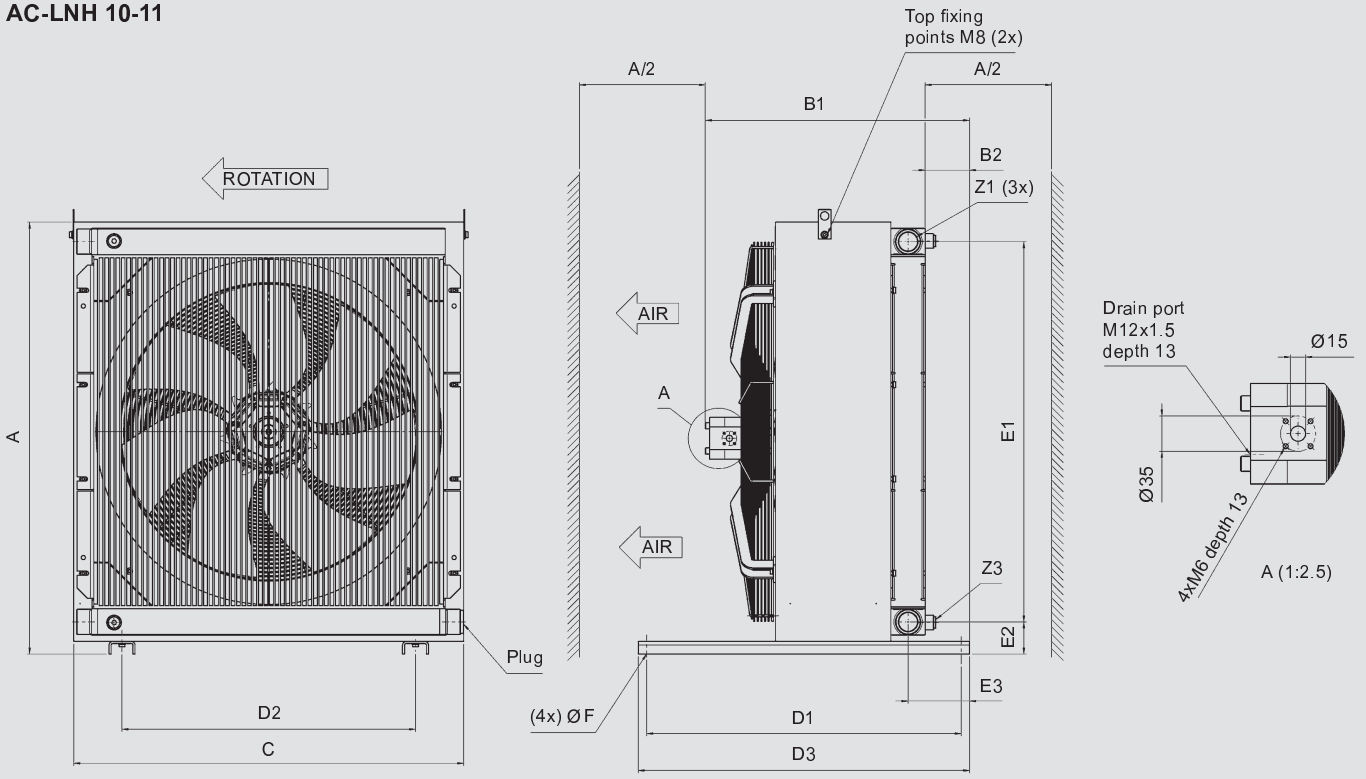
AC-LNH 8-9



[mm]	A ±5	B1 ±10 6.3 cc	B1 ±10 14 cc	B1 ±10 22 cc	B2 ±5	C ±5	D1 ±5	D2 ±5	D3 ±5	E1 ±5	E2 ±5	E3 ±5	F Ø/hole	Z1	Z3
AC-LNH8	725	471	485	495	42	705	410	560	450	627	59	74	9x20	G1 1/4"	M22x1.5
AC-LNH9	880	-	639	649	107	790	750	700	790	757	77	148	Ø12	G1 1/2"	M22x1.5

Dimensions

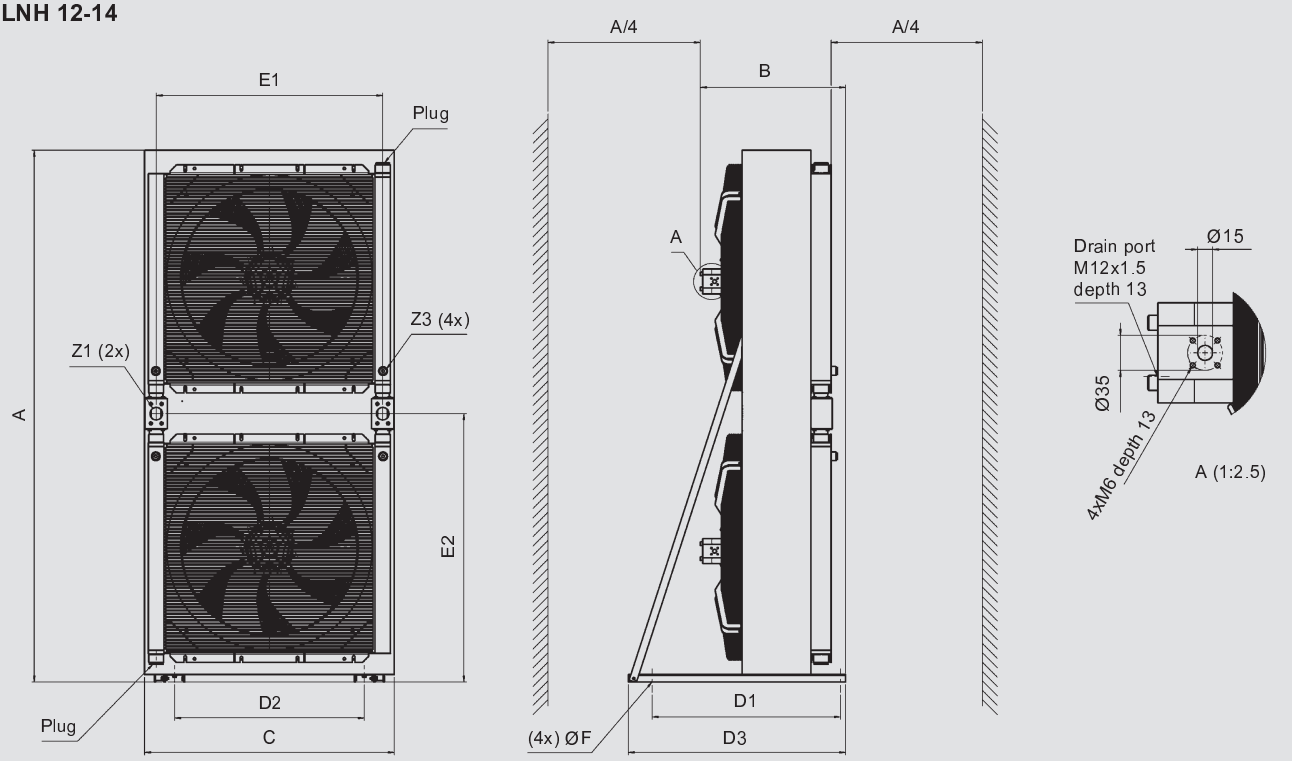
AC-LNH 10-11



[mm]	A ±5	B1 ±10 14 cc	B1 ±10 22 cc	B2 ±5	C ±5	D1 ±5	D2 ±5	D3 ±5	E1 ±5	E2 ±5	E3 ±5	F Ø / hole	Z1	Z3
AC-LNH10	1,030	626	636	106	930	750	700	790	907	77	147	Ø12	G1 1/2"	M22x1.5
AC-LNH11	1,180	626	636	106	1,050	750	700	790	1,057	77	147	Ø12	G1 1/2"	M22x1.5

Dimensions

AC-LNH 12-14



[mm]	A ±5	B ±10 14 cc	B ±10 22 cc	C ±5	D1 ±2	D2 ±2	D3 ±2	E1 ±5	E2 ±5	F Ø/hole	Z1	Z3
AC-LNH12	2,130	577	587	1,000	750	760	870	907	1,075	13x30	SAE G2"	M22x1.5
AC-LNH14	2,297	577	587	1,140	750	900	870	1,057	1,166	13x30	SAE G2"	M22x1.5

Note:

We recommend maintaining a minimum distance to ensure an unimpeded air inlet and air outlet. For sizes 8-11 this is half the height of the cooling element (A/2); for sizes 12-14 it is a quarter of the element height (A/4). Anything below the minimum distance can affect cooling capacity and noise emissions.

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.

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