Air Cooler Industry
AC-LN 8-14 MI
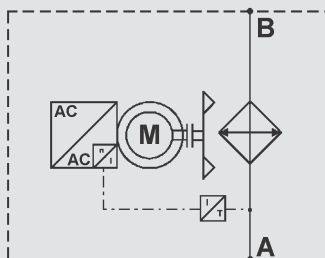## with integrated frequency inverter

Symbol

General

The AC-LN MI air cooler series can be used in all areas where either oil or water-glycol has to be cooled with air.

The integrated frequency inverter controls the fan speed depending on the fluid temperature. This way fluid temperature keep a constant level with less energy consumption and less noise.

The wide range of accessories and optional versions mean that the coolers can be adapted flexibly to various applications.

Application Field

Systems with high cooling requirements in return line and off line, such as:

- Hydraulic systems
- Lubrication systems
- Gears
- Motors
- Generators
- Converters
- Machine tools

Operation Data

Fluids	Oils (mineral oils, synthetic oils, high viscosity oils, biological oils, phosphate ester) Water-glycol (cooling fluid) HFC pressure fluids
Viscosity	AC-LN: 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.
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)
Motoinverter	Three-phase motor Protection class IP55 Insulation class F With integrated frequency inverter Nominal power: 2.2 kW at 400 V Max. current absorption: 10 A
ErP	The fan unit of the AC-LN MI corresponds to the minimum efficiency levels specified in the Ecodesign directive or ErP directive (Energy-related Products) 2009/125/EC.
Noise levels	See technical data AC-LN MI. The average noise level could be lower than the values indicated in the table. 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) Air filter grid or air filter mat Vibration damper

Product Features

AC-LN MI coolers use high efficiency axial fans driven by a frequency inverter. This guarantees immediate adjustment to required cooling performance under changing load conditions.

- **Variable speed**
  The inverter controls the fan speed in order to have a constant temperature.
- **Plug and Play**
  Simple installation thanks to the integrated frequency inverter and temperature probe.
- **Lower operating cost**
  The electric power is required only when cooling power is needed allowing lower power consumption.
- **Lower average noise level**
  When less power is required the cooler generates less noise.
- **PT1000 Temperature probe with probe holder**
  Accurate and reliable temperature measurement, no need to drain the cooling system when probe replacement is needed.
- **Fail-Safe operation**
  Operation at maximum speed in case of Probe failure detection (open or short circuit).
- **Own safety**
  If during operation the electronic overheats, fan speed drops automatically.
- **Software interface**
  A user friendly interface is available to check and modify all the parameters directly on site (see also Technical Data).

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.
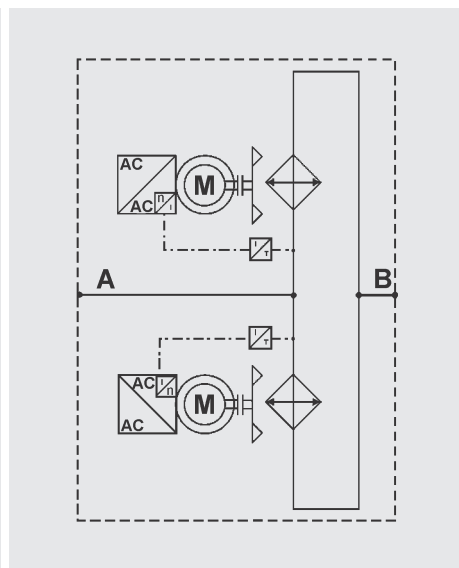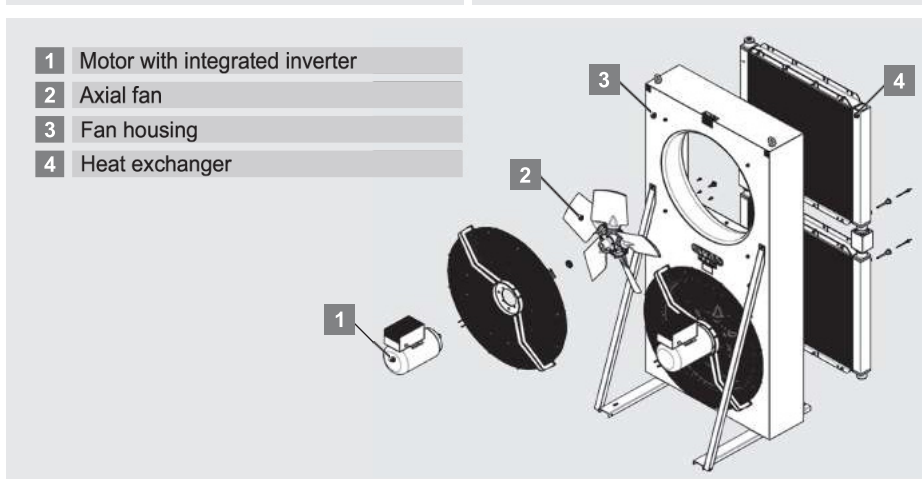
Design

AC-LN 8-9-10-11 MI
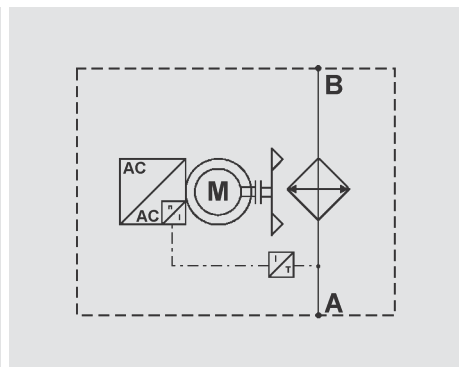
1	Motor with integrated inverter
2	Axial fan
3	Fan housing
4	Heat exchanger
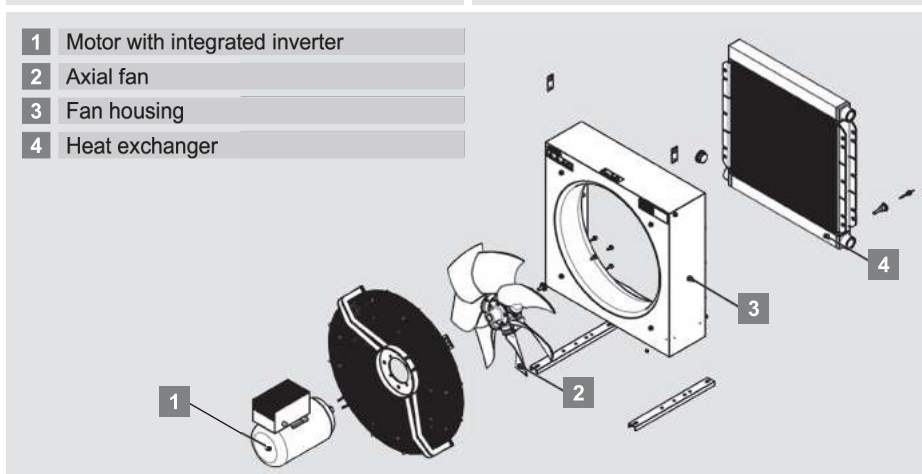
AC-LN 12-14 MI

1	Motor with integrated inverter
2	Axial fan
3	Fan housing
4	Heat exchanger

Technical Data

AC-LN MI

Type of cooler	P/N	Fluid [-][1]	Fluid flow [l/min][2]	Air flow [m³/h]	Fan motor[3]; Poles / size / flange	Noise level (at 1m distance, max. speed)) [dB(A)][4]	Volumen [l][5]	Weight [kg][5]
AC-LN8 MI	3876113	F	350	10,400	4/100/B14	83	6	72
AC-LN9 MI	3881548	F	350	12,400	4/100/B14	82	11	100
AC-LN10 MI	3881719	F	540	16,500	4/100/B14	84	14	129
AC-LN11 MI	3881975	F	540	18,300	6/112/B14	75	18	170
AC-LN12 MI	3882527	F	840	33,000	4/100/B14	87	28	290
AC-LN14 MI	3882659	F	840	36,600	6/112/B14	78	35	320

[1] Medium: F = mineral oil or water-glycol, M = mineral oil
[2] Max. flow rate
[3] AC-LN 12-14 MI: each motor
[4] The average noise level could be lower than the values indicated.
[5] Fluid in cooling element
[6] Unfilled

Frequency inverter data

|	
Motor Type	3 phase single winding with 3 phase frequency inverter on board
Pole Nr.	4 or 6
Power Supply	3 phases 350 – 520 Vac 47 – 64 Hz
Nominal Power	2.2 kW @ 400 V
Max. current absorption	10 A
Protection Rating	IP55
Insulation Class	F
Service	S1
Mounting	IMB14
Frame size	100 (4 Pole), 112 (6 Pole)

Temperature control

The fan frequency will be controlled by the measured fluid temperature according to the following diagram.

Note

The inverter parameters are set according to the customer requirements before cooler dispatch. For on site parameters modification a free software interface is available at the HYDAC homepage www.hydac.com.

The needed programming cable has to be ordered separately (HYDAC P/N: 3880225).
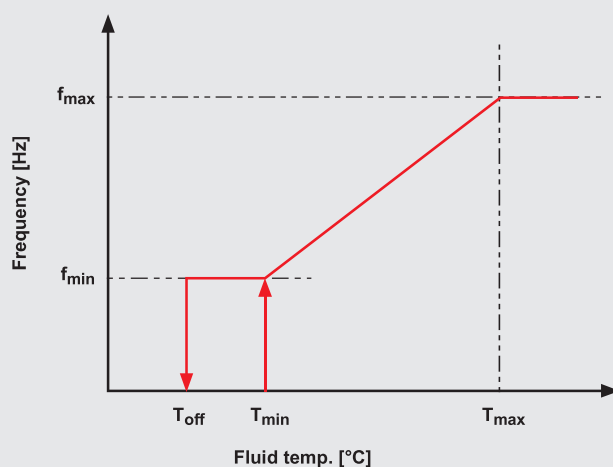
T_{min}	Temperature at which the inverter starts the fan [°C]
T_{max}	Temperature at which the inverter turns the fan to max. speed [°C]
T_{off}	Temperature at which the inverter stops the fan [°C]
f_{min}	Min. speed (starting speed)
f_{max}	Max. speed

PT1000 Temperature Probe

The platinum resistance PT1000 temperature probe offers reliable and accurate temperature measurement. At the AC-LN MI the probe is installed directly in the cooling element with a probe holder.
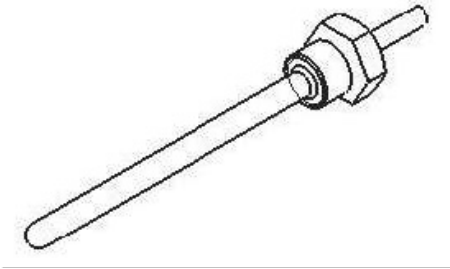
Probe failure detection:
In case of short or open circuit the fan will rotate continuously with maximum speed.
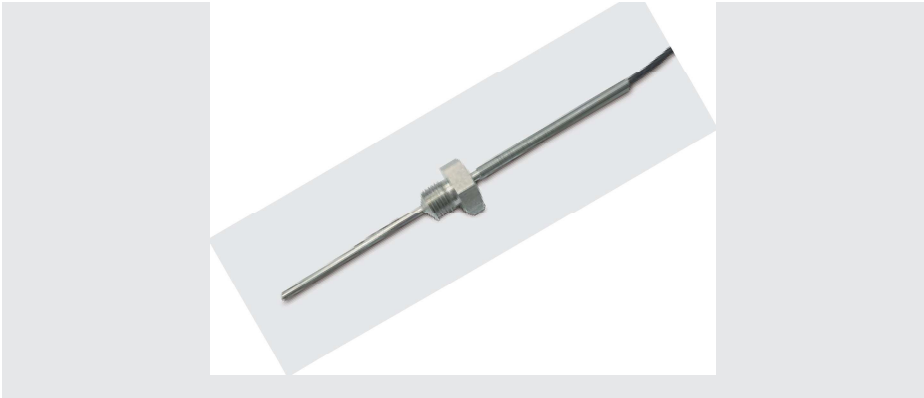
Working range	-20 °C … +130 °C
Resistance at 0 °C	1,000 Ohm
Measure accuracy	<1 %

Temperature probe with probe holder

Cooling Capacity and Pressure Difference Δp

Mineral oil

AC-LN MI

Heat dissipation [kW] at $\Delta T = 40\ °C$ / Specific heat dissipation [kW/K] vs Oil flow [l/min]

Curves labelled: 14MI, 12MI, 11MI, 10MI, 9MI, 8MI
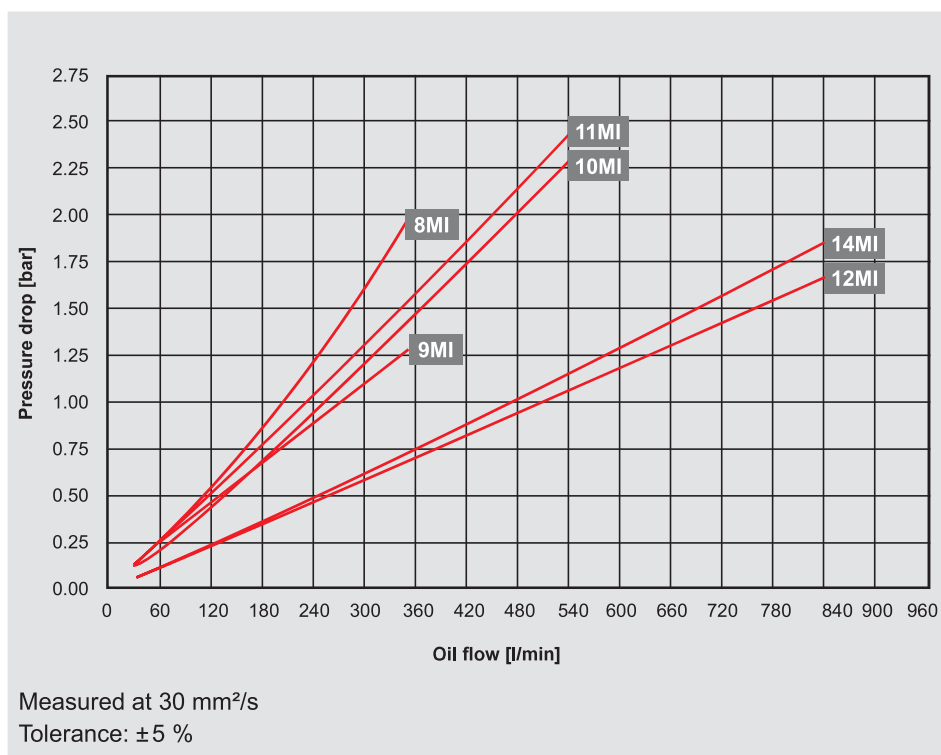
Tolerance: ±5 % — Max. Power -- Min Power
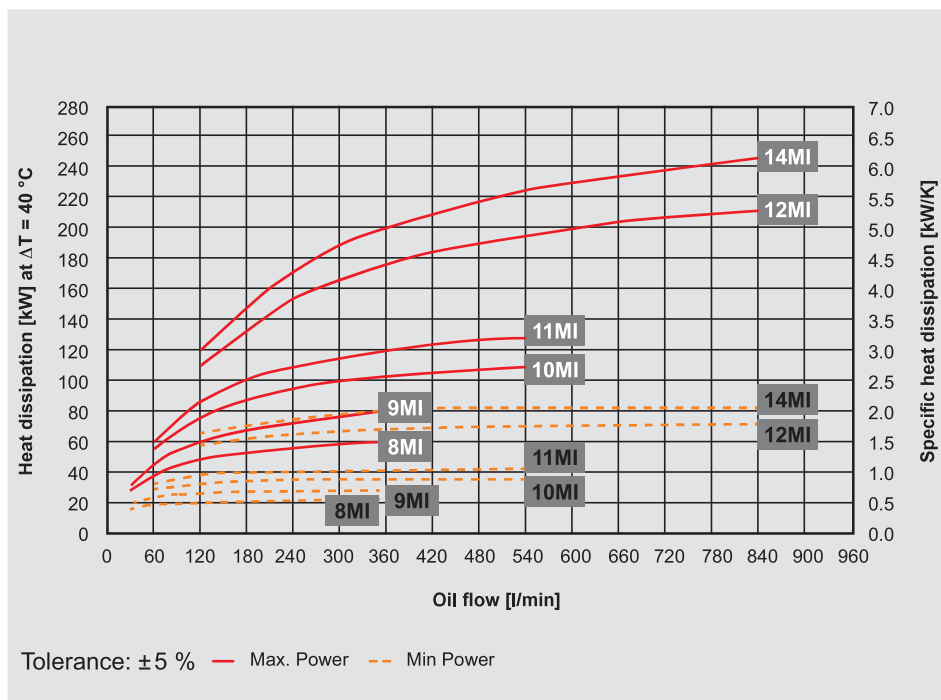
Cooling capacity:
Dependent on the oil flow rate and the temperature difference ΔT between oil inlet and air inlet.

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

Pressure difference Δp

Pressure drop [bar] vs Oil flow [l/min]

Curves labelled: 11MI, 10MI, 8MI, 9MI, 14MI, 12MI
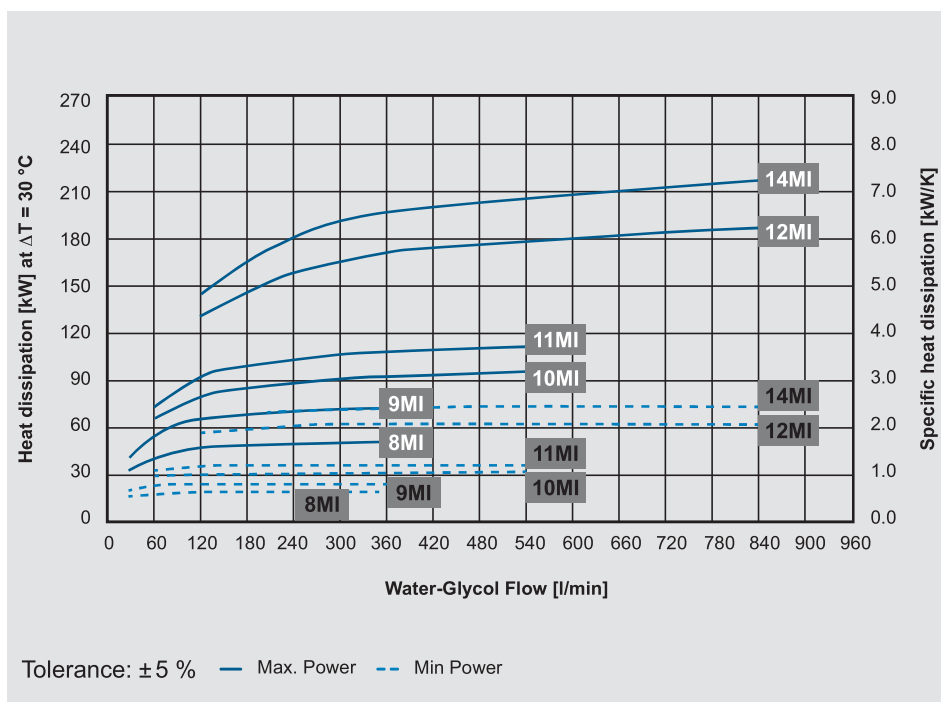
Measured at 30 mm²/s
Tolerance: ±5 %

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	1.4	1.9	2.5	3.5

Cooling Capacity and Pressure Difference Δp

Water-glycol (60/40)

AC-LN MI

Chart: Heat dissipation [kW] at ΔT = 30 °C (left axis, 0–270) and Specific heat dissipation [kW/K] (right axis, 0.0–9.0) vs. Water-Glycol Flow [l/min] (0–960). Curves labelled 14MI, 12MI, 11MI, 10MI, 9MI, 8MI.
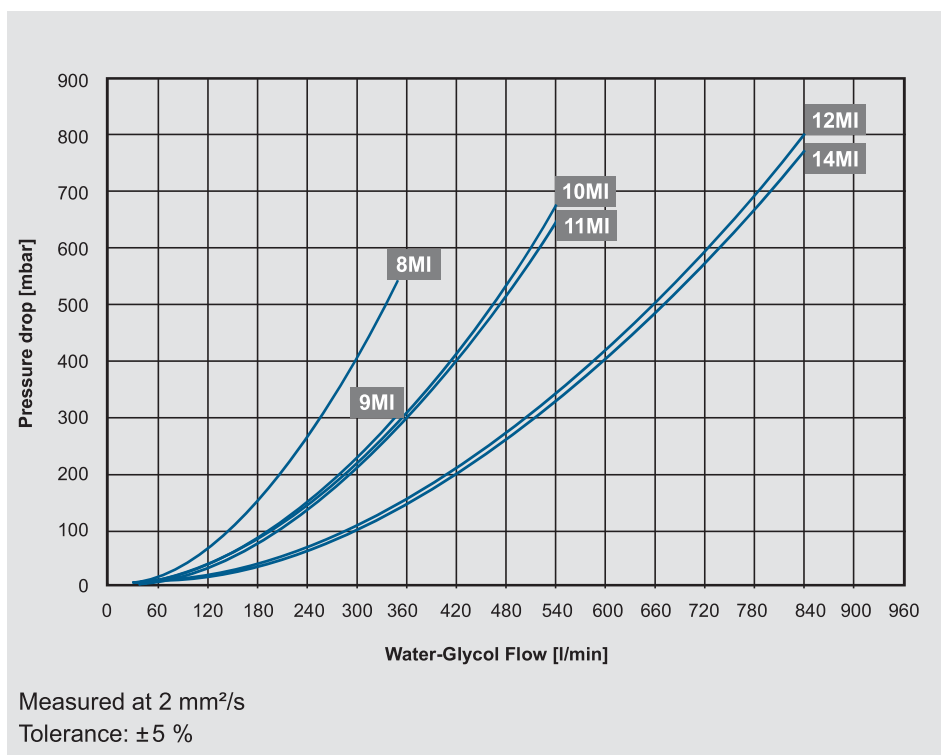
Tolerance: ±5 % — Max. Power -- Min Power

Cooling capacity:
Dependant 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. You can also use our cooler calculation software for designing. Please contact our technical sales department.

Pressure difference Δp

Chart: Pressure drop [mbar] (0–900) vs. Water-Glycol Flow [l/min] (0–960). Curves labelled 12MI, 14MI, 10MI, 11MI, 8MI, 9MI.

Measured at 2 mm²/s
Tolerance: ±5 %

Model Type

Cooler type
AC-LN   =   Air cooler (mineral oil or water glycol mix)

Size – Motor speed min. / max.
8MI   =   400 / 1,800 min^{-1}
9MI   =   400 / 1,800 min^{-1}
10MI   =   400 / 1,500 min^{-1}
11MI   =   600 / 1,200 min^{-1}
12MI   =   400 / 1,500 min^{-1}
14MI   =   600 / 1,200 min^{-1}

Revision

Fluids
F   =   Mineral oil or water glycol mix

Motor voltage
Supply
voltage   =   350 – 520 V

Color
1   =   RAL 9002 (standard)
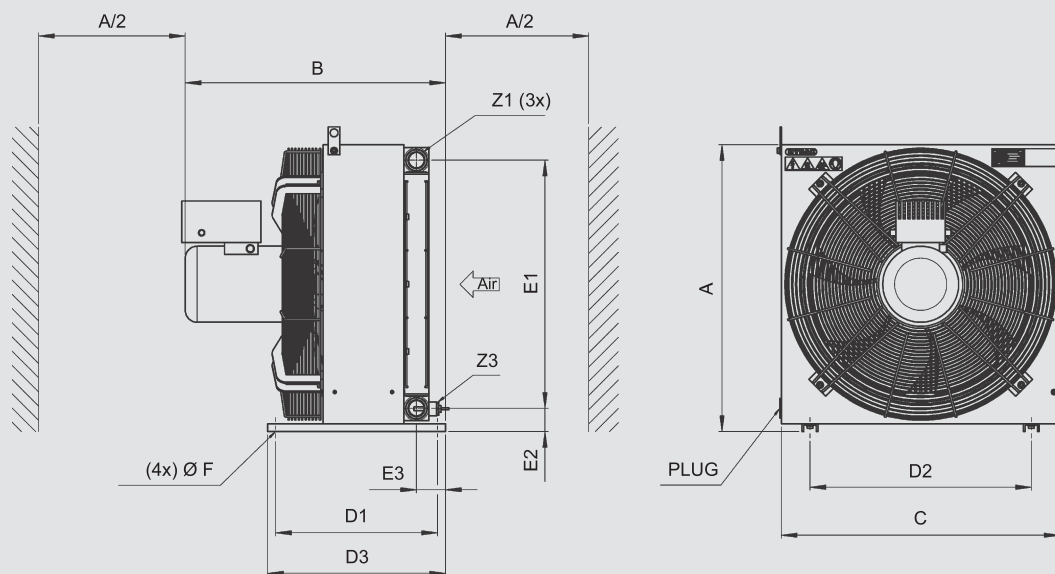Other colors on request.

Accessories
IBP   =   Heat exchanger with integrated bypass valve
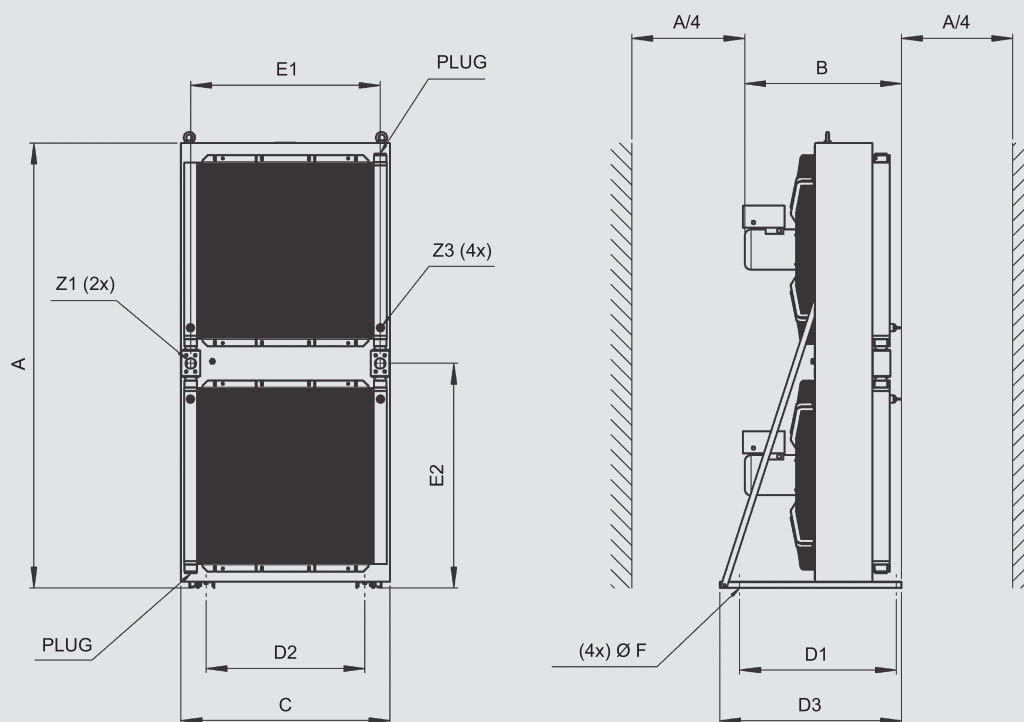IBT   =   Heat exchanger with integrated thermo-bypass valve
For all possible accessories, like vibration absorber, air filter grid or
air filter mat please refer to brochure "Accessories for air coolers"

Dimensions

AC-LN 8-9-10-11 MI

AC-LN 12-14 MI

[mm]	A ±10	B ±25	C ±10	D1 ±2	D2 ±2	D3 ±2	E1 ±5	E2 ±5	E3 ±5	F Ø Loch	Z1	Z3
AC-LN8 MI	725	659	705	410	560	450	627	58.0	74	9x20	G 1-1/4"	M22x1,5
AC-LN9 MI	880	813	790	750	700	790	757	76.5	148	12	G 1-1/2"	M22x1,5
AC-LN10 MI	1,030	799	930	750	700	790	907	76.5	147	12	G 1-1/2"	M22x1,5
AC-LN11 MI	1,180	813	1,050	750	700	790	1,057	76.5	147	12	G 1-1/2"	M22x1,5
AC-LN12 MI	2,130	751	1,000	750	760	870	907	1,075.0	-	13x30	SAE 2"	M22x1,5
AC-LN14 MI	2,297	764	1,140	750	900	870	1,057	1,166.0	-	13x30	SAE 2"	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 influence the cooling capacity and the noise emissions.