

**MOBILE OIL / AIR COOLERS
NEW COMPACT DESIGN
WITH DC ELECTRIC FANS
AND HIGH COOLING
PERFORMANCE**

Application

These coolers are designed specifically for mobile hydraulic applications where high performance and efficiency are required and physical size must be minimised to allow easy installation. Typical applications include mobile cranes, concrete mixers and pump trucks, road paving machines & transmission cooling.

OK-ELD Product Features

These coolers use a combination of high performance cooling elements and high capacity, long life DC electric powered fans to give long trouble free operation in arduous mobile hydraulic applications. The compact design allows the coolers to fit most equipment and provide the highest cooling performance in heat dissipation whilst minimising space required.

- Cooling range 2-34 kW
- DC motors in 12 Volt & 24 Volt with motor lifetimes up to 16,000 hours
- Hydraulic pressure 16 bar dynamic

Oil/Air Cooler Units

Mobile series with DC motor
OK-ELD Type



Test procedure certified following EN 1048

OIL/AIR COOLER

DESCRIPTION

GENERAL

In hydraulic systems energy is transformed and transmitted. During this transformation and transmission losses occur, i.e. mechanical and hydraulic energy is converted into heat. It is the function of the cooler to dissipate this heat.

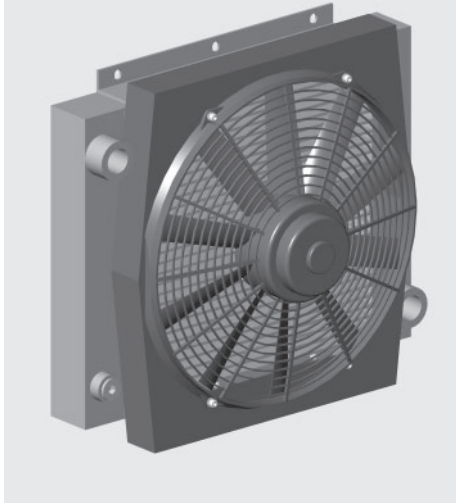
ADVANTAGES OF THE OIL/AIR COOLERS:

- Environmentally friendly.
No exchange between water and oil possible
- For commissioning only electrical energy is required
- Low operating costs, no additional cooling circuit necessary for the cooling medium, i.e. air

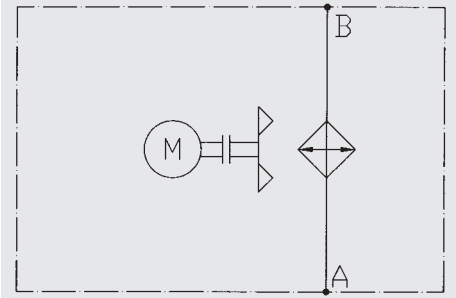
CONSTRUCTION

Oil/air cooler units consist of the (1) heat exchanger, (2) housing (3) axial motor fan.
The oil connections are on the rear side.

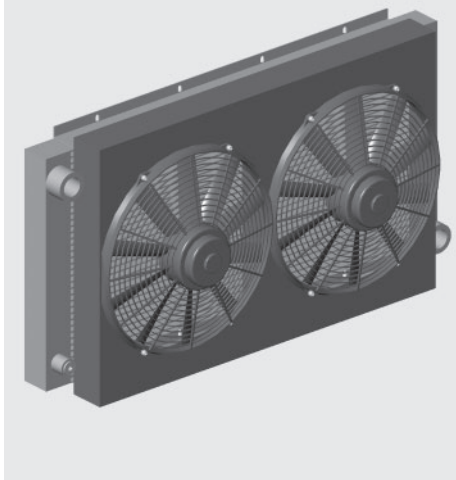
ELD 0-4.5



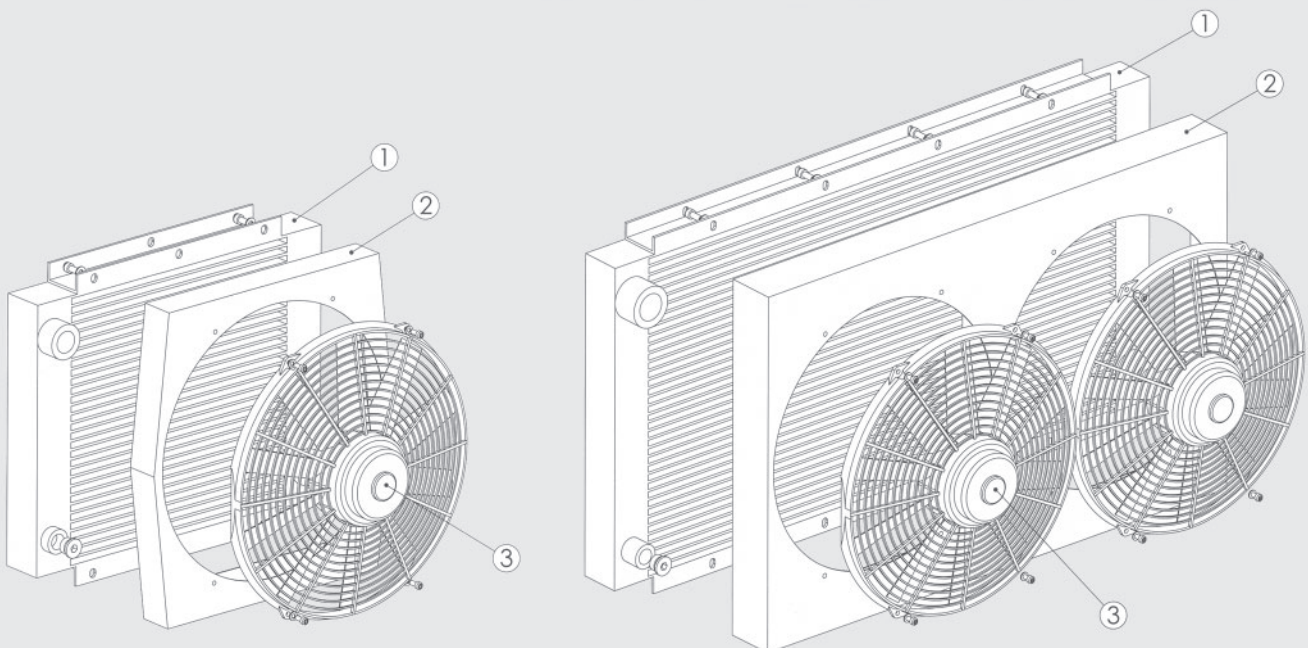
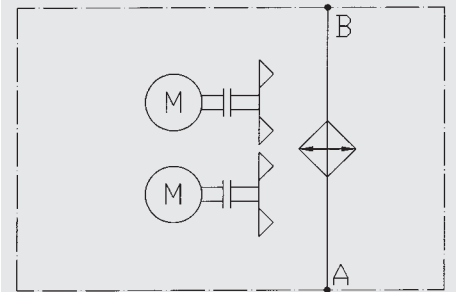
ELD 0-4.5



ELD 5-6



ELD 5-6



COOLER SELECTION

Designation:

P_v = Power loss [kW]

P_{01} = Specific cooling capacity [kW/°C]

V = Tank contents [l]

ρ_{oil} = Density of the oil [kg/l]
for mineral oil: 0.915 kg/l

C_{oil} = Specific heat capacity [kJ/kgk]
for mineral oil 1.88 kJ/kgk

ΔT = Temperature increase in the system [°C]

t = Operating time [min]

T_1 = Desired oil temperature [°C]

T_3 = Ambient temperature [°C]

Example 1:

Measurement of the power loss on existing units and machinery. For this method the temperature increase of the oil is measured over a certain period. The power loss can be calculated from the temperature increase.

Parameters:

The oil temperature increases from 20 °C to 45 °C over 15 minutes.

The tank contains 100 l.

Heat to be dissipated:

$$P_v = \frac{\Delta T \times c_{oil} \times \rho_{oil} \times V}{t \times 60} \quad [\text{kW}]$$

$$P_v = \frac{25 \times 1.88 \times 0.915 \times 100}{15 \times 60} = 4.78 \quad [\text{kW}]$$

Cooler selection:

– Desired oil temperature: 60 °C
– Ambient temperature air: 30 °C

$$P_{01} = \frac{P_v}{T_1 - T_3} \quad [\text{kW/°C}]$$

$$P_{01} = \frac{4.78}{60 - 30} = 0.159 \quad [\text{kW/°C}]$$

A 10% safety margin is recommended to allow for element contamination, and therefore the specific power is:

$$P_{01} \times 1.1 = 0.175 \text{ kW/°C.}$$

The power loss 0.175 kW/°C must be dissipated by an oil cooler.

Suggestion:

–Cooler OK-ELD2,
 $P_{01} = 0.190 \text{ kW/°C at } 40 \text{ l/min}$

Example 2:

The power loss can also be estimated: With unrestricted flow approx. 15 to 20% of the drive power. With restricted flow up to 30% of the drive power.

1. TECHNICAL DETAILS

1.1 TABLE OF TECHNICAL SPECIFICATIONS

Type of cooler	Voltage [V]	Oil flow at 1.5 bar pressure drop [l/min]	Current draw at nominal voltage [A]	Motor capacity [kW]	Recommended fuse (indicative only) [A]	Fan diameter [mm]	Protection class IP [-]	Noise level [dB(A)] (at 1m distance)	Max. operating pressure [bar]	Max. oil temperature [°C]	Max. viscosity [mm²/s]	Weight [kg]
ELD0	12	30	3.0	0.05	5	140	67	68	16	130	2000	2.7
ELD0	24	30	1.6	0.05	5	140	67	68	16	130	2000	2.7
ELD1	12	90	8.0	0.10	15	190	67	73	16	130	2000	4.0
ELD1	24	90	3.2	0.10	7.5	190	67	73	16	130	2000	4.0
ELD2	12	170	9.4	0.14	20	255	67	74	16	130	2000	9.4
ELD2	24	170	5.2	0.14	15	255	67	74	16	130	2000	9.4
ELD3	12	180	17.5	0.23	25	305	67	79	16	130	2000	11
ELD3	24	180	8	0.23	20	305	67	79	16	130	2000	11
ELD4	12	180	22.5	0.30	30	385	67	76	16	130	2000	15.9
ELD4	24	180	10.5	0.30	20	385	67	76	16	130	2000	15.9
ELD4.5	12	280	22.5	0.30	30	385	67	76	16	130	2000	22
ELD4.5	24	280	10.5	0.30	20	385	67	76	16	130	2000	22
ELD5	12	170	35	0.46	2x25	305	67	80	16	130	2000	30.3
ELD5	24	170	16	0.46	2x20	305	67	80	16	130	2000	30.3
ELD6	12	140	45	0.60	2x30	385	67	77	16	130	2000	36.6
ELD6	24	140	21	0.60	2x20	385	67	77	16	130	2000	36.6

- DC axial motor type: maximum speed should be protected with a suitable external fuse
- Mounting position: all positions possible but for applications requiring vertical motor axis it is recommended to mount the cooler with motor downloads (see arrows on the motor)
- For direction of rotation: see arrow on cooler housing
- Cooling fluid mineral oil to DIN 51524
For other fluids, please contact our sales/technical department
- The noise levels are only a guide as acoustic properties vary and depend on the characteristics of the room, connections, viscosity and resonance.
- Options: see accessory catalogue

Warning!

When operating a cooler in situations where the difference in temperature between ambient air and inlet oil exceed 50 Deg. Celsius, care must be taken to avoid cycling of the fan at full speed/air flow as this can cause rapid change in material temperature of element and may result in significant reduction in lifetime or direct damage to the element through thermal stress.

Please contact your Hydac Branch or distributor for speed control solutions.

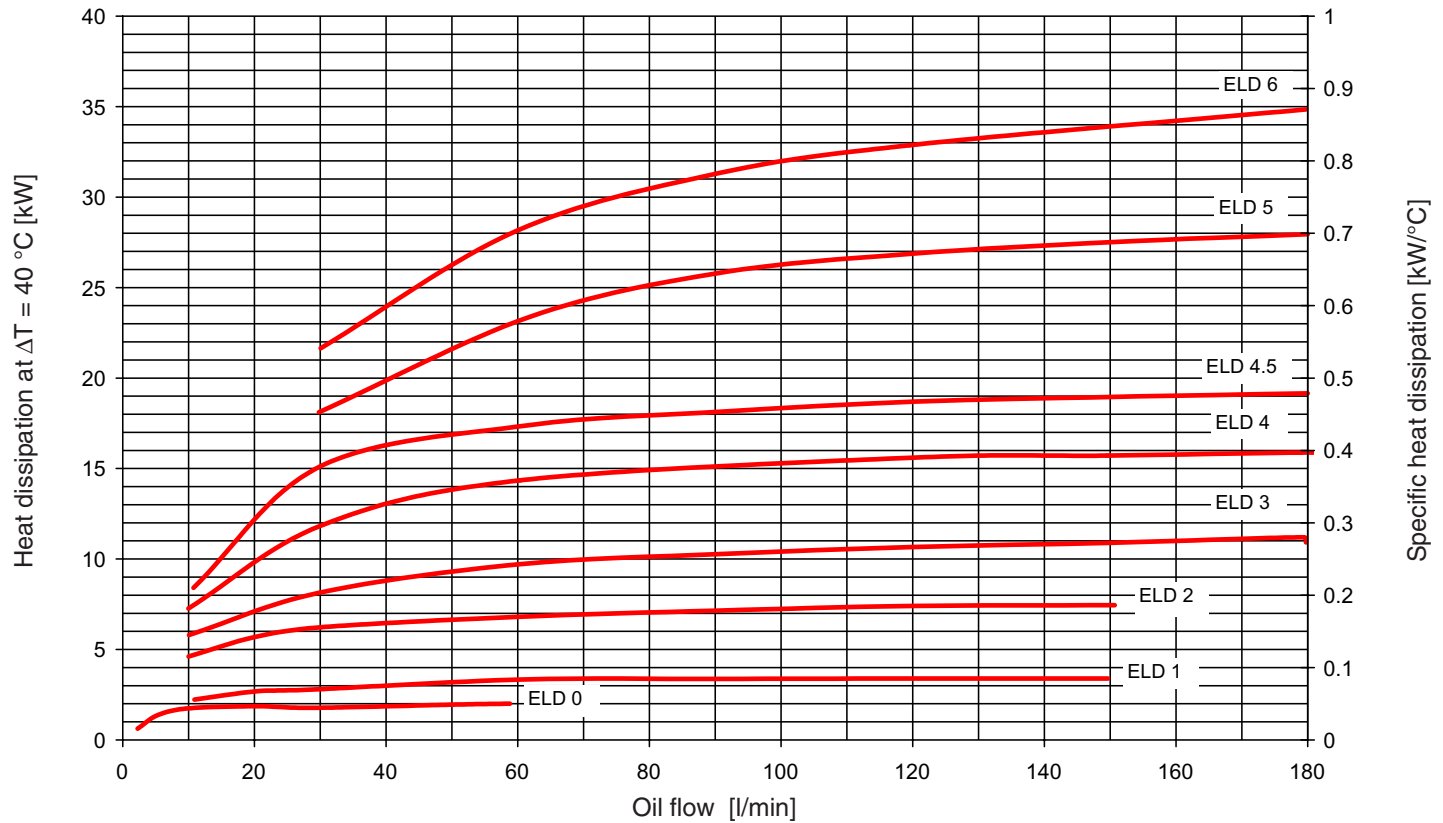
1.2 HYDRAULIC DETAILS

1.2.1 Cooling capacity

depending on oil flow and the temperature differential ΔT between the oil inlet and air inlet

For calculations with low ΔT values (i.e. below 10 °C), please contact our technical support staff.

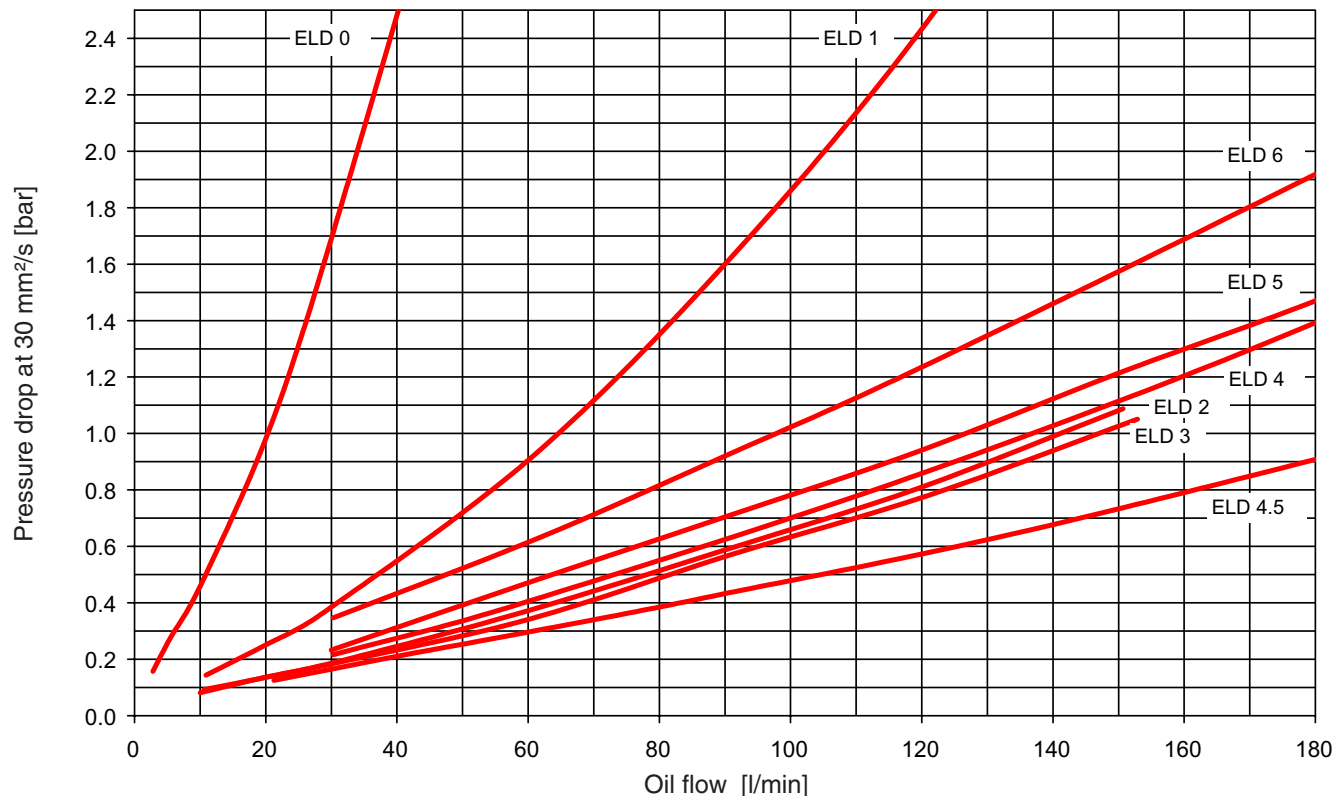
Tolerance: $\pm 5\%$



* Values measured at $\Delta T = 40\text{ °C}$, may vary at lower ΔT values

1.2.2 Pressure differential Δp measured at 30 mm²/s using mineral oil

Tolerance: $\pm 5\%$



For other viscosities the result must be multiplied by K

Viscosity (mm ² /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

2. MODEL TYPE

(also order example)

OK-ELD1H / 3.1 / 12V / 1 / S / AITF60

Type of cooler

OK-ELD = Oil/air cooler

Size / motor speed

0-6 = See hydraulic details 1.2

H = 3000 min⁻¹

Type code and modification number

For the latest version of each cooler, please see the table in our internet site.

Electrical motor fan voltage

12V = 12 Volts DC

24V = 24 Volts DC

Paint

1 = RAL 9005 (Standard)

Other paint on request and clearly written

Air flow direction

S = Suction (Standard)

Accessories (for more information see brochure accessories)

AITF = Thermostat (fixed)

GP = Vibration Absorber

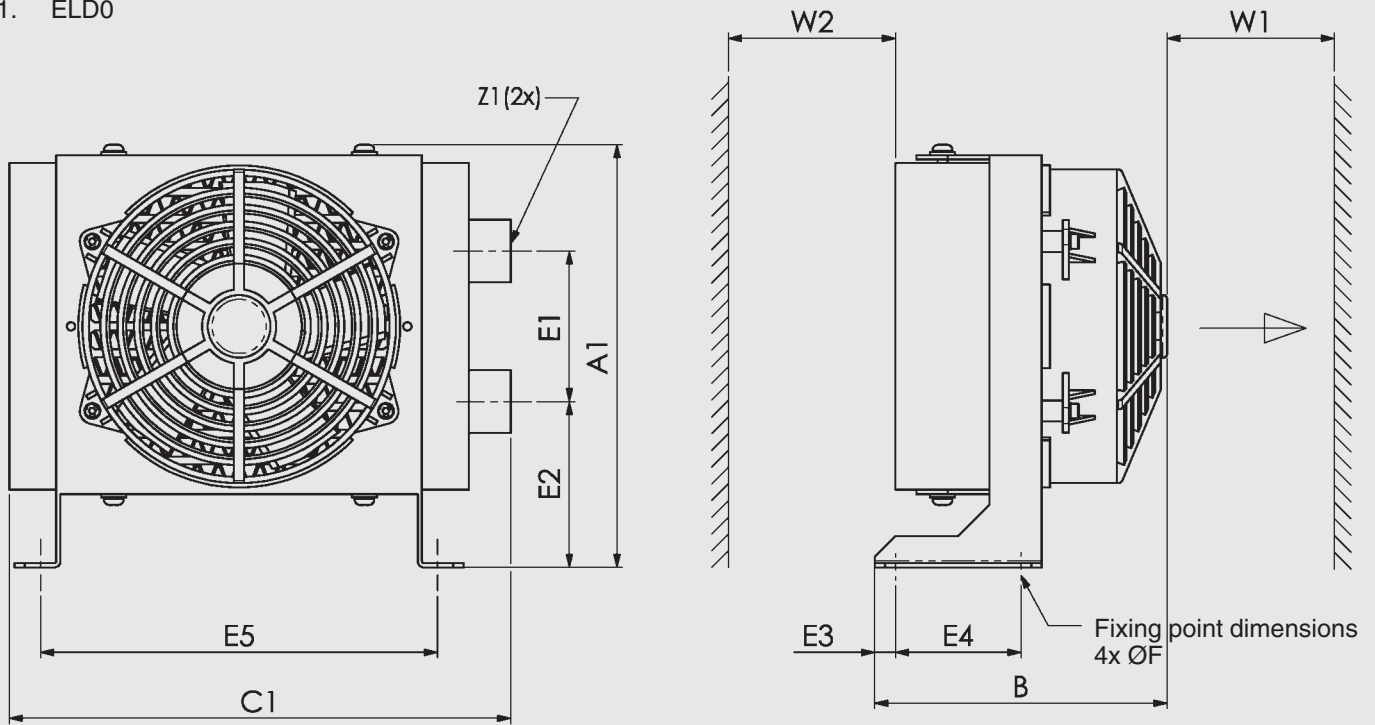
FU = Feet for alternative mounting arrangement

IBP = Heat exchanger with integrated bypass valve (not available for ELD0 and ELD1)

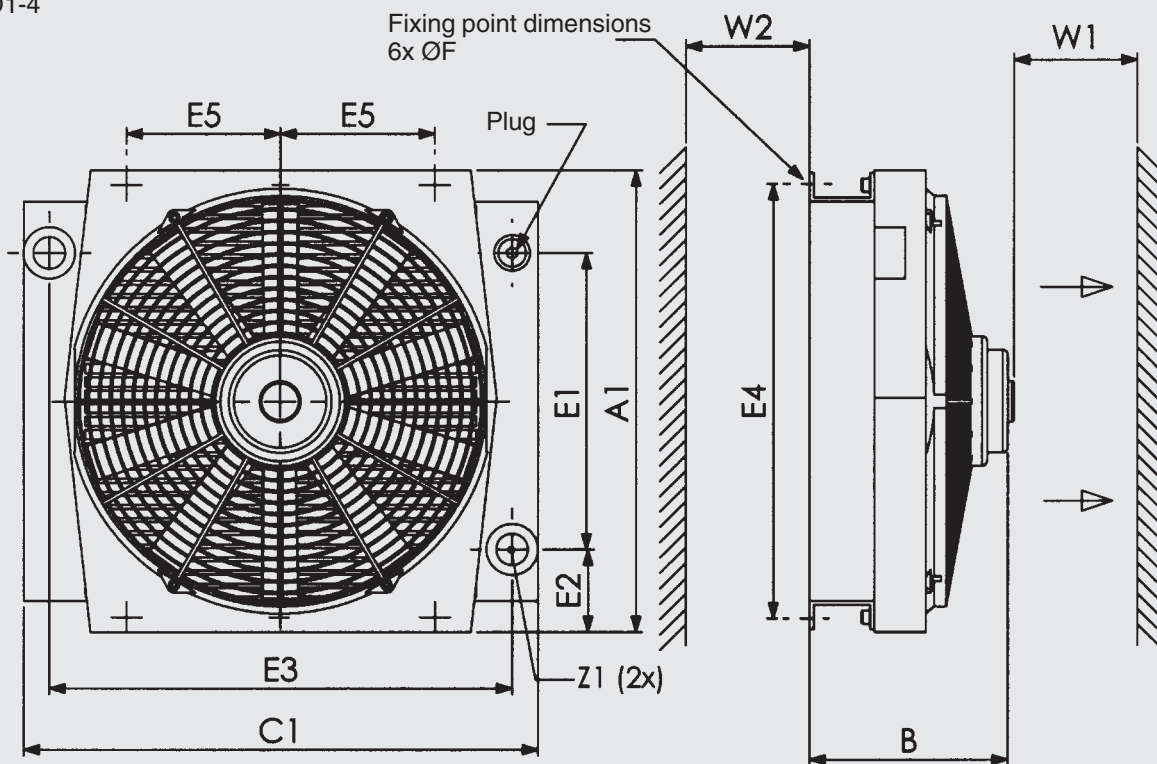
IBT = Heat exchanger with integrated thermo-bypass valve (not available for ELD0 and ELD1)

3. DIMENSIONS

3.1. ELD0

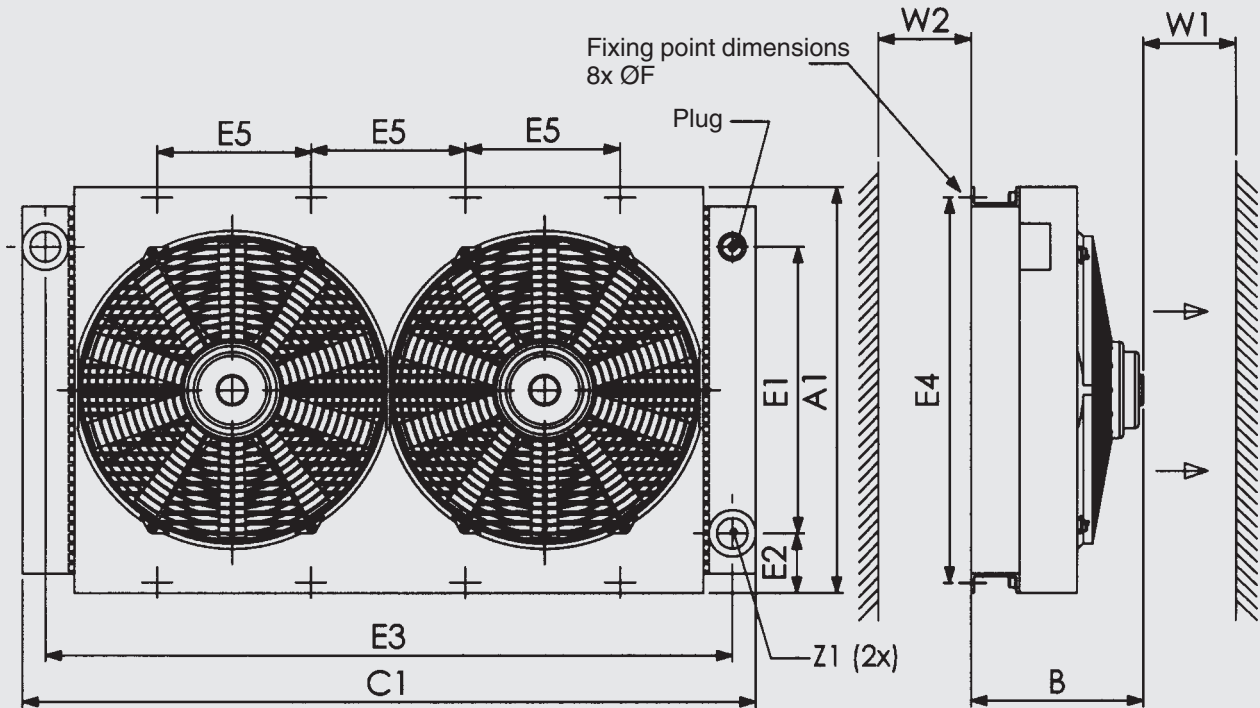


3.2. ELD1-4



	A1 ±5	B ±10	C1 ±5	E1 ±5	E2 ±5	E3 ±5	E4 ±2	E5 ±2	F	W1 min	W2 min	Z1	Plug
ELD0	202	140	240	72	79	10	60	190	6.5	100	80	G1/2"	-
ELD1	245	120	300	125	60	250	225	90*	9	200	100	M22X1.5	M22X1.5
ELD2	315	210	385	199	58	324	288	80	14X10	250	150	G1"	M22X1.5
ELD3	356	210	420	230	62.5	370	329	100	14X10	300	180	G1"	M22X1.5
ELD4	450	208	500	289	80	450	421	150	16X9	400	200	G1"	M22X1.5
ELD4.5	454	218	602	350	52	490	200*	580*	12	400	200	G1 1/4"	M22X1.5

* OK-ELD1 and OK-ELD4.5 have only the four external fixing points



	A1	B	C1	E1	E2	E3	E4	E5	F	W1	W2	Z1	Plug
	±5	±10	±8	±5	±5	±5	±2	±2		min	min		
ELD5	480	235	810	321	77	750	450	170	16X9	400	200	G1 1/4"	M22X1.5
ELD6	532	233	950	373	77	890	503	200	18X9	500	250	G1 1/4"	M22X1.5

4. CERTIFICATION FOLLOWING EN 1048

Hydac SA design and manufacture high quality coolers that are tested and certified to give reliable and repeatable high performance. To ensure the performance is accurate, testing in compliance with a recognized international test standard is the best solution. For air/liquid coolers this is EN1048.

Hydac SA test procedure complies with the requirements of EN 1048 and both the procedure and test equipment are independently inspected and certified by TÜV SÜDDEUTSCHLAND.

The cooler performance details in this brochure have been tested following EN 1048.



5. NOTE

The information in this brochure relates to the operating conditions and applications described. For applications or operating conditions not described, please contact the relevant technical department. Subject to technical modifications.