HYDAC INTERNATIONAL

Oil/Air Cooler Units

Standard series OK-P type

COMPLETE OIL / AIR COOLER WITH AXIAL FAN FOR INDUSTRIAL APPLICATIONS.

Application

These high performance coolers with axial fans are suitable for hydraulic cooling applications.

Typical applications include: industrial power units, lubrication systems (i.e. gearboxes) and hydraulic presses.

OK-P Product Features

5 Sizes, 12 models

16 Bar Dynamic Pressure Rating

OK-P coolers use high efficiency axial fans and strong cooling elements to achieve maximum performance.

These units have been designed for standard applications where maximum performance is needed at the best price.

There are two or three fan speeds available for each model so that you can choose the best combination of performance and noise level to suit the application.

The P-Series is a full industrial quality cooler designed to meet the demands of most applications, at the best price performance level available today by using the latest technology in design.

Both 50 Hz and 60Hz models are available.

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:

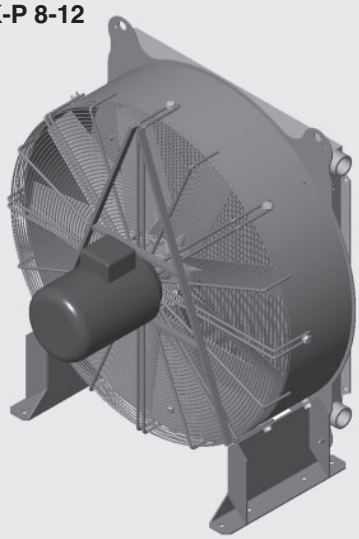
- Environmentally friendly: exchange between air and oil not possible
- For commissioning only electrical energy is required
- Low operating costs, no additional cooling circuit necessary for the cooling medium, i.e. air

CONSTRUCTION FOR OK-P 8-12

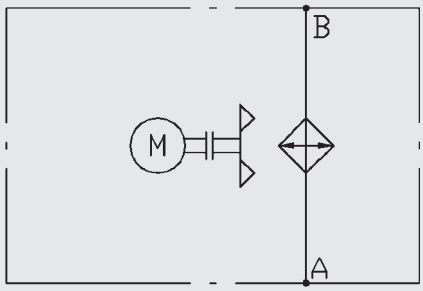
Oil/air cooler units consists of the (1) heat exchanger, (2) metal housing , (3) feet, (4) axial fan, (5) protection grid, (6) motor.

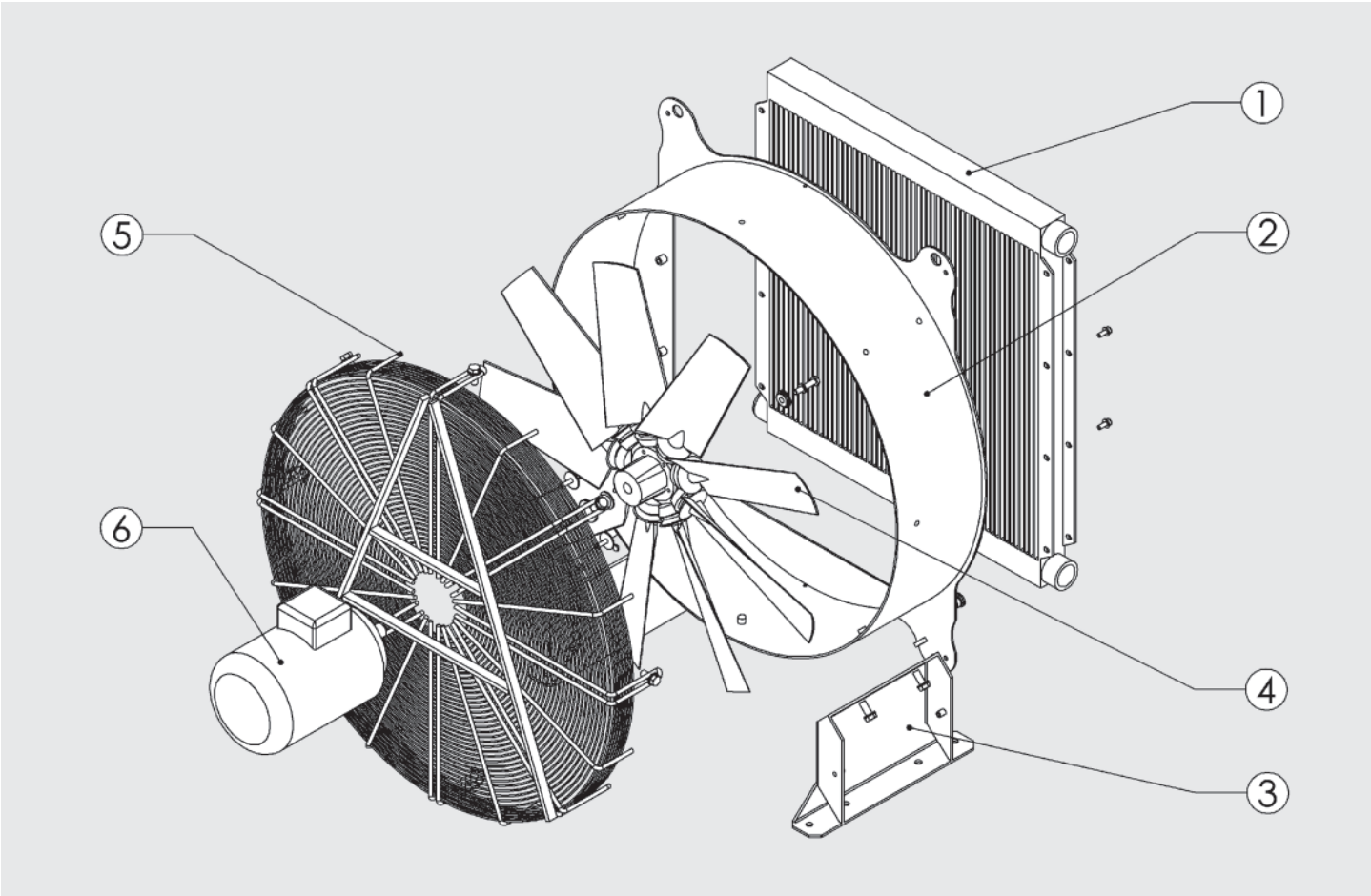
The oil connections are external.

OK-P 8-12



OK-P 8-12





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 60 °C over 16 minutes.
The tank contains 400 l.

Heat to be dissipated:

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

$$P_V = \frac{40 \times 1.88 \times 0.915 \times 400}{16 \times 60} = 28.7 \ [kW]$$

Cooler selection:

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

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

$$P_{01} = \frac{28.7}{60 - 30} = 0.96 \quad [kW/°C]$$

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

$P_{01} \times 1.1 = 1.06$ kW/°C.

The power loss 1.06 kW/°C must be dissipated by an oil cooler.

Suggestion:

–Cooler OK-P 9L,
P_{01} = 1.12 kW/°C at 180 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	N° of poles[-]/size[-]	Motor capacity [kW] at 50Hz	Noise level [dB(A)] (at 1m distance) at 50Hz	Max. operating pressure [bar]	Max. oil temperature [°C]	Max. Viscosity [mm²/s]	Weight [kg]	Motor voltages available (see par.3)
OK-P8L	6/90	1.1	75	16	130	2000	78	A
OK-P8S	4/100	3.0	87	16	130	2000	83	B or C
OK-P9LL	8/90	0.55	70	16	130	2000	84	A
OK-P9L	6/90	1.1	77	16	130	2000	84	A
OK-P9S	4/100	3.0	89	16	130	2000	89	B or C
OK-P10LL	8/100	1.1	73	16	130	2000	103	A
OK-P10L	6/100	1.5	78	16	130	2000	103	B or C
OK-P10S	4/112	5.5	90	16	130	2000	110	B or C
OK-P11LL	8/100	1.1	77	16	130	2000	126	A
OK-P11L	6/112	2.2	83	16	130	2000	132	B or C
OK-P12LL	8/132	3.0	83	16	130	2000	205	B or C
OK-P12L	6/132	5.5	90	16	130	2000	215	B or C

– For direction of fan rotation, see arrow on cooler housing.
– Electric vent drive: axial drive with forward flow through cooler element (sucking).
– Cooling fluid: mineral oil to DIN 51524; for other fluids, please contact our sales/ technical department
– Three-phase motors IP55, conforming to CE norm
– The noise levels are only a guide as acoustic properties vary and depend on the characteristics of the room, connections, viscosity and resonance.
– Fan protection grid to EN 294

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.

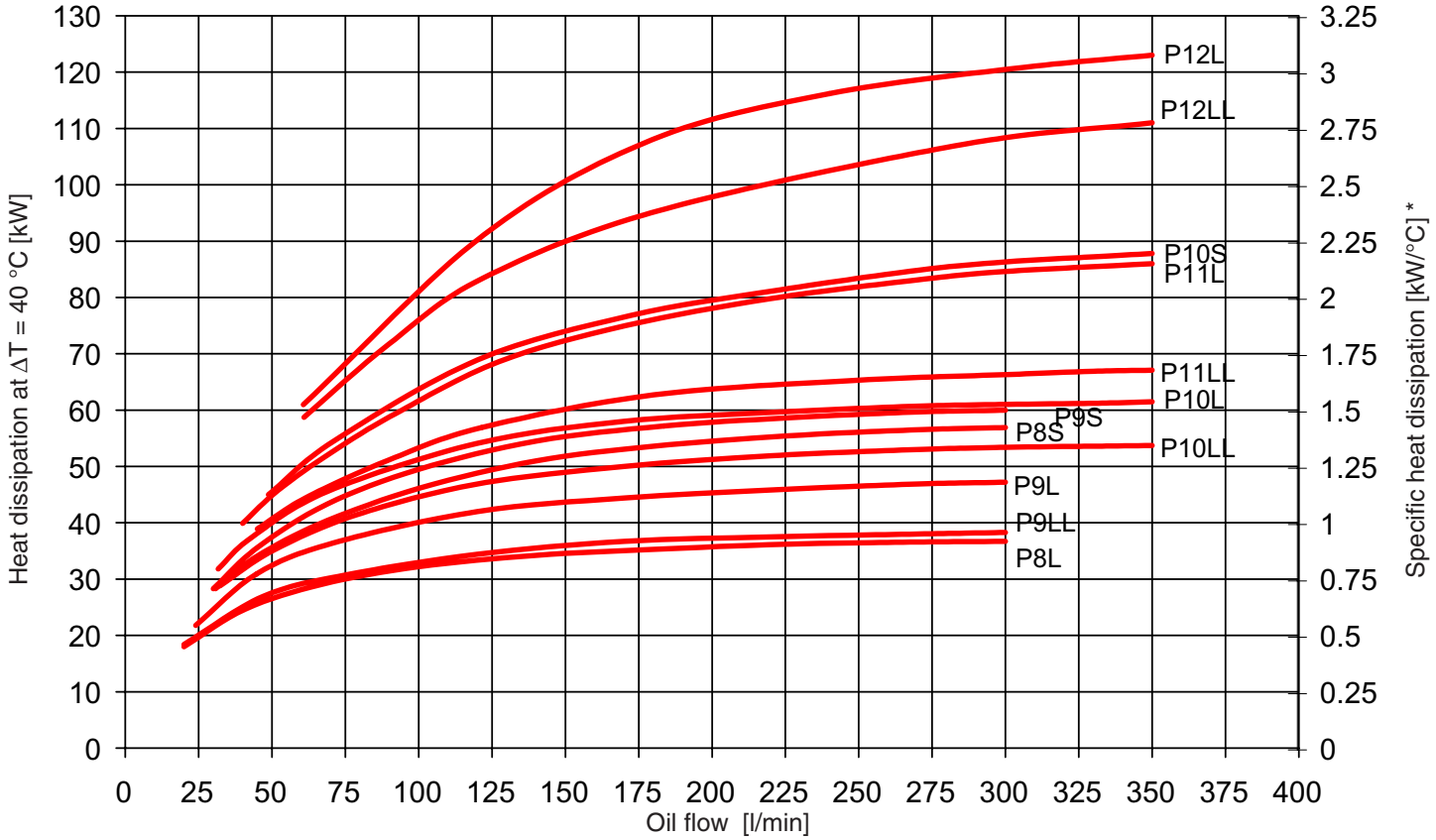
1.2. PERFORMANCES

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.

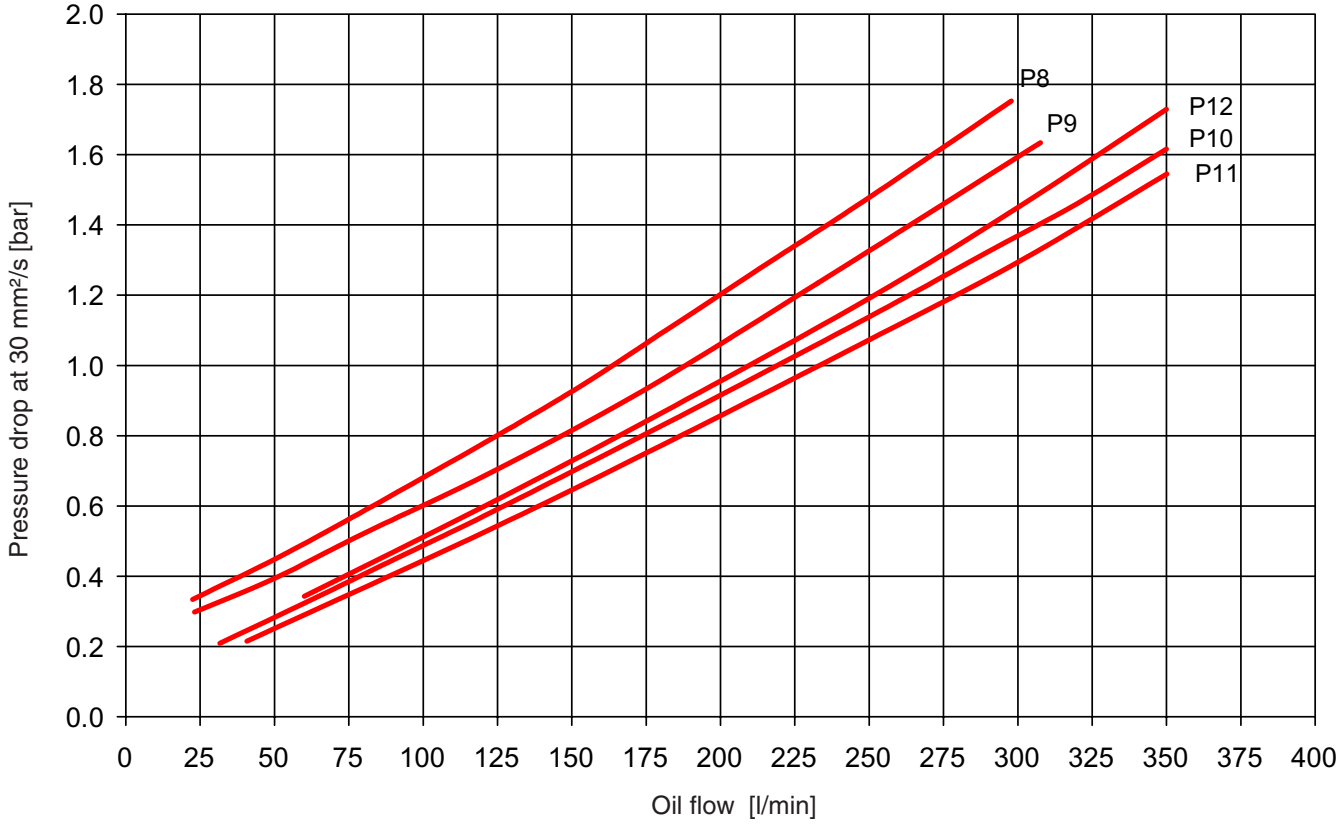
Tolerance: ± 5%



*: Values measured at ΔT = 40 °C, may vary at lower ΔT values

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

Tolerance: ± 5%



For other viscosities the result must be multiplied by 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

2. MODEL TYPE

(also order example)

OK-P 10L / 1.0 / M / A / 1 / IBP

Type of cooler

Size / motor speed

LL = 8 poles (750 rpm)
L = 6 poles (1000 rpm)
S = 4 poles (1500 rpm)

Type code and modification number

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

Fluids

M = Mineral oil to DIN 51524
Other fluids on request

Motor voltage

A = Standard voltages and frequencies for three-phase motor at 50 Hz / 60 Hz
50Hz : 380-420 V (Y) / 220-240 V (Δ)
60Hz : 440-480 V (Y) / 254-277 V (Δ)
Except for OK-P 12 and OK-P10S, for which the standard voltages are:
50Hz : 660-720V (Y) / 380-420V (Δ)
60Hz : 760-830V (Y) / 440-480V (Δ)

B = Standard voltages and frequencies for three-phase motor at 50 Hz
50Hz : 380-420 V (Y) / 220-240 V (Δ)
Except for OK-P 12, for which the standard voltages are:
50Hz : 660-720V (Y) / 380-420V (Δ)

C = Standard voltages and frequencies for three-phase motor at 60 Hz
60Hz : 440-480 V (Y) / 254-277 V (Δ)
Except for OK-P 12, for which the standard voltages are:
60Hz : 760-830V (Y) / 440-480V (Δ)

S = Other special voltages and frequencies on request and clearly written

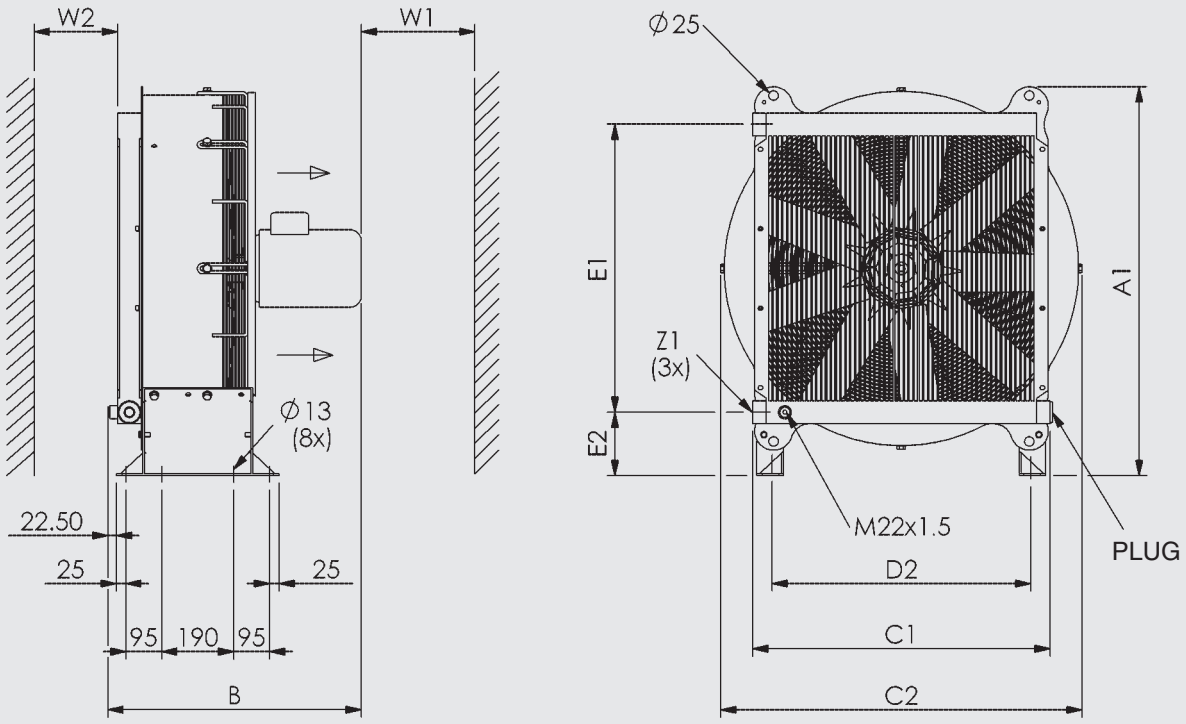
Paint

1 = RAL 9005
No other paint available

Accessories

AITF48 = Thermostat (fixed)
IBP = Heat exchanger with integrated bypass valve
IBT = Heat exchanger with integrated thermo-bypass valve
HF = Horizontal fixing

3. DIMENSIONS



	A1 ±10	B ±20	C2 ±10	C1 ±10	E1 ±5	E2 ±5	Z1	D2 ±5	W1 min.*	W2 min.*
OK-P8L	880	670	760	602	600	178	G1 ¼"	549	1900	700
OK-P8S	880	680	760	602	600	178	G1 ¼"	549	1900	700
OK-P9LL	944	670	841	695	630	192	G1 ¼"	606	2100	800
OK-P9L	944	670	841	695	630	192	G1 ¼"	606	2100	800
OK-P9S	944	680	841	695	630	192	G1 ¼"	606	2100	800
OK-P10LL	1027	680	955	786	760	167	G1 ½"	686	2500	900
OK-P10L	1027	680	955	786	760	167	G1 ½"	686	2500	900
OK-P10S	1027	695	955	786	760	167	G1 ½"	686	2500	900
OK-P11LL	1196	695	1155	910	910	163	G1 ½"	828	2800	900
OK-P11L	1196	695	1155	910	910	163	G1 ½"	828	2800	900
OK-P12LL	1349	798	1335	1016	1060	151	G1 ½"	955	3000	1000
OK-P12L	1349	798	1335	1016	1060	151	G1 ½"	955	3000	1000

*: for smaller distances please contact our technical office

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 recognised international test standard is the best solution. For air/liquid coolers this is EN 1048.

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.

NOTES