

**HYDAC**

**INTERNATIONAL**

Pump-Transfer  
Cooler Filtration Unit  
UF-1 / UKF-1



## Pump-transfer cooler filtration unit UF-1 / UKF-1

### 1. DESCRIPTION

#### 1.1 GENERAL

The UKF unit is a compact, easy-to-install unit for off-line filtration cooling circuits. Installation is simply a matter of hydraulic inline mounting to and from the tank and connecting the voltage supply.

#### 1.2 FEATURES

Off-line unit consisting of:

- low-noise feed pump
- filter
- oil-water plate heat exchanger

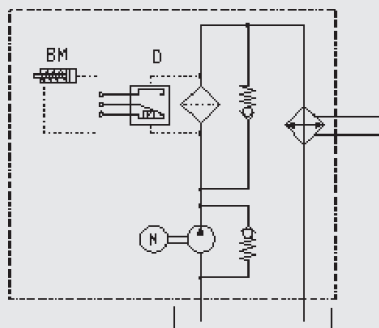
#### 1.3 APPLICATIONS

- plastic injection moulding machines
- transmission systems
- presses
- machining centres

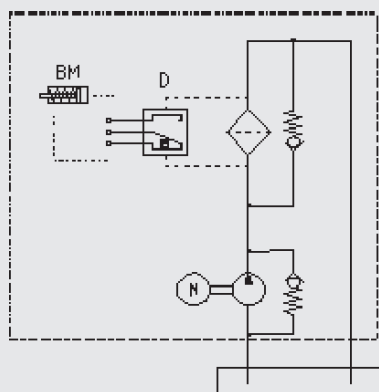
#### 1.4 SYMBOLS

(shown with visual and electrical differential pressure indicator)

UKF



UF



## 2. TECHNICAL SPECIFICATIONS

### 2.1 OPERATING PRESSURE

Oil side: max. 6 bar  
Water side: max. 27 bar (static)

### 2.2 SUCTION PRESSURE ACROSS THE SUCTION CONNECTION

max. : - 0.4 bar

### 2.3 OPERATING FLUID

Oil side:  
Mineral oil to DIN 51524 part 1 and part 2  
Permissible contamination ≤ NAS 12

### 2.4 TEMPERATURE OF OPERATING FLUID

Oil side : + 10 °C to + 80 °C  
Water side : + 5 °C to + 60 °C

### 2.5 MAX. VISCOSITY

See graph on page 5

### 2.6 AMBIENT TEMPERATURE

+ 10 °C to + 40 °C

### 2.7 MOUNTING POSITION

Optional

### 2.8 REVOLUTIONS

1500 rpm.

### 2.9 DIRECTION OF ROTATION

Clockwise -  
see direction of arrow

### 2.10 DRIVE

Three-phase electric motor  
Insulation class : F  
Safety type: IP 55

### 2.11 VOLUMETRIC EFFICIENCY

> 90 % when  $v = 40 \text{ mm}^2/\text{s}$

### 2.12 NOISE LEVELS

< 64 dB(A) at 1500 rpm  
Test medium: ISO-VG 46 at 40 °C  
The noise levels are only a guide as the acoustic properties of a room, connections, viscosity and reflections have an effect on the noise level.

### 2.13 WEIGHT (DRY UNIT)

(Basic unit + heat exchanger)

Basic unit: 12 kg

Heat exchanger:

410 - 10 3 kg

410 - 20 4 kg

415 - 10 4.5 kg

415 - 20 7 kg

### 2.14 OPERATING DATA FOR HEAT EXCHANGER

- Medium (water side)
  - Water glycol (coolant)
  - HFC operating fluid
  - Water
  - Oils

#### ● Contamination:

The quantity of particles in suspension should be less than 10 mg/l, particle size < 0.6 mm (spherical).

Thread-like particles cause a rapid rise in the pressure drops.

#### ● Corrosion:

The following critical values refer to a pH value of 7

- Free chlorine:  
 $\text{CL}_2 < 0.5 \text{ ppm}$

- Chloride ions:  
 $\text{CL} < 700 \text{ ppm}$  at 20 °C  
 $< 200 \text{ ppm}$  at 50 °C

- Other critical values:

- pH 7 - 10
- Sulphate  $\text{SO}_4^{2-} < 100 \text{ ppm}$
- $[\text{HCO}_3^-] / [\text{SO}_4^{2-}] > 1$
- Ammonia,  $\text{NH}_3 < 10 \text{ ppm}$
- Free CO < 10 ppm

The following ions are not corrosive under normal conditions:

Phosphate, nitrate, nitrite, iron, manganese, sodium and potassium.

#### ● Heat exchanger connections

Female thread

(max. torque rating: 385 Nm).

The pipes must be connected so that the connections are stress-free.

Linear expansion and vibrations from the pipes to the heat exchanger must be avoided.

### 3. MODEL CODE

(also order example)

**UKF-1 / 1.0 / P / 3.5 / 0.37 / 410-10 / MF160 / 10 / BM**

#### Type

UKF : pump + heat exchanger + filter  
 UF : pump + filter

#### Model

1.0 : UF  
       UKF: heat exchanger   410  
 2.0 :       heat exchanger   415

#### Seals

P : Perbunan

#### Pump flow rate: cm<sup>3</sup>/rev.

cm<sup>3</sup>/rev. 1500 rpm  
 3.5   5 l/min  
 7     10 l/min  
 10    15 l/min

#### Motor

0.37 KW - 1500 1/min

#### Wide voltage range motor

All voltages and frequencies between  
 380/420V - 50Hz and  
 440/480V - 60Hz possible

#### Heat exchanger

UKF : 410 - 10  
       410 - 20  
       415 - 10  
       415 - 20

UF : -

#### Filter

MF 160  
 MF 180  
 N5 DM002

#### Filtration rating

Contamination retention at Δp: 2 bar

	MF180	MF160	N5DM002
2 : 2 μm absolute	-	-	150 g
3 : 3 μm absolute	103 g	54 g	-
5 : 5 μm absolute	106 g	56 g	-
10 : 10 μm absolute	94 g	50 g	-
20 : 20 μm absolute	119 g	63 g	-

For further details on filter elements, see brochure:

Mobile Spin-On Filters  
 brochure no.: E 7.301../..

#### Differential pressure clogging indicator 2 bar

BM : VM 2 BM.1 (visual; manual reset)  
 D : VM 2D.0/-L24 (electrical/visual)

For further details, see brochure:

Clogging Indicators for Filters  
 brochure no.: E 7.050../..

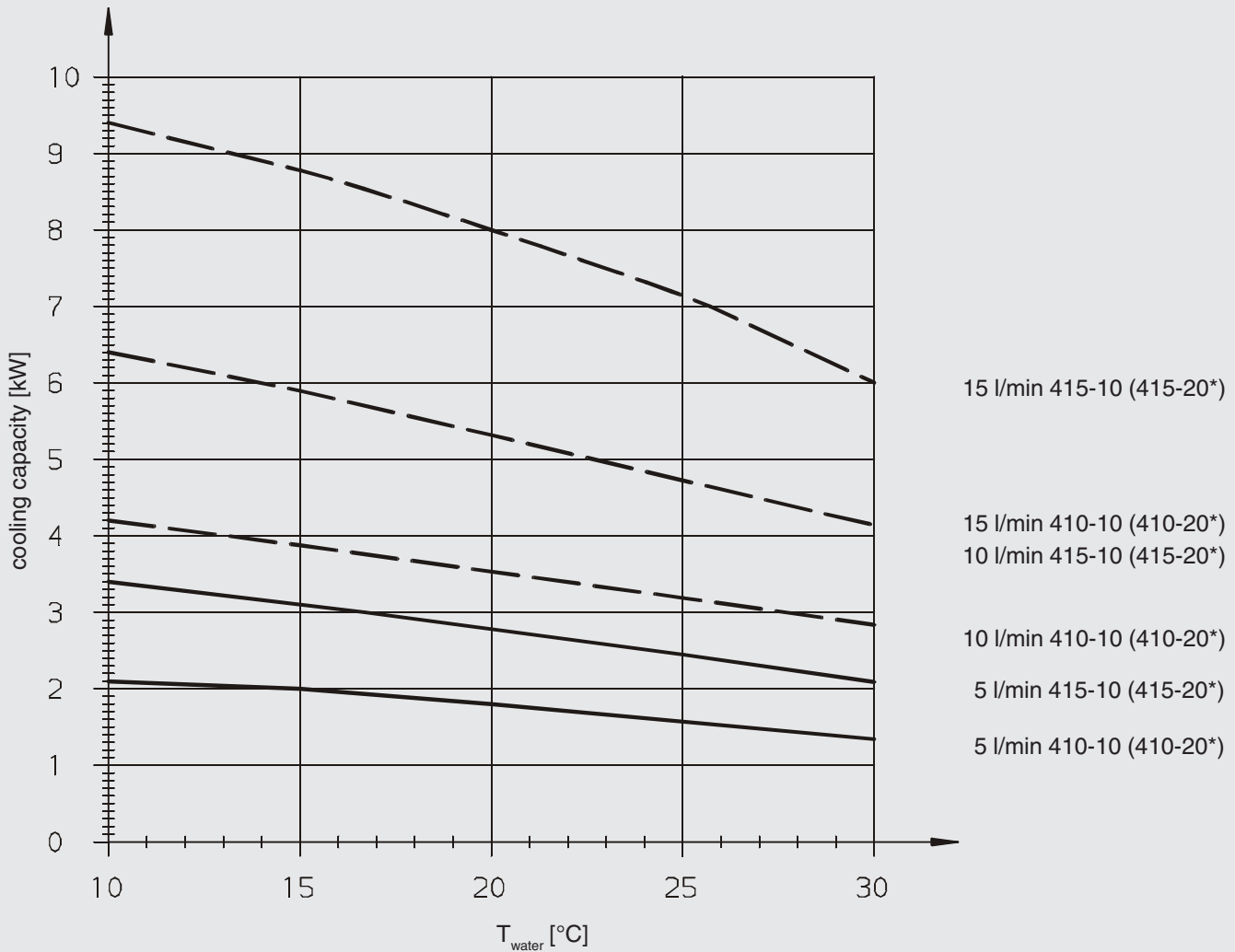
#### 4. DETERMINING THE COOLING CAPACITY OF UKF

Parameters:

$$T_{\text{Oil}} = 55^{\circ}\text{C}$$

Oil ISO VG 46

$$\frac{Q_{\text{Oil}}}{Q_{\text{H}_2\text{O}}} = 1$$



\* see point 5. Calculation criteria for the heat exchanger and flow rates

A calculation program is available for making an accurate calculation.

The following details are required:

- Tank temperature required with UKF
- Required cooling capacity
- Water inlet temperature and max. water quantity.

The cooling capacity is also dependent on the viscosity. At a lower viscosity the cooling capacity increases, at a higher viscosity it decreases.

#### Calculation of the oil and water outlet temperature

Temperature loss: oil

$$\Delta T \approx 36 \times \frac{P}{Q_{\text{Oil}}}$$

Temperature increase: water

$$\Delta T \approx 14.4 \times \frac{P}{Q_{\text{water}}}$$

P = cooling capacity [kW]

Q<sub>oil</sub> = flow rate [l/min]

Q<sub>water</sub> = flow rate [l/min]

## 5. CALCULATION CRITERIA FOR THE HEAT EXCHANGER AND FLOW RATES

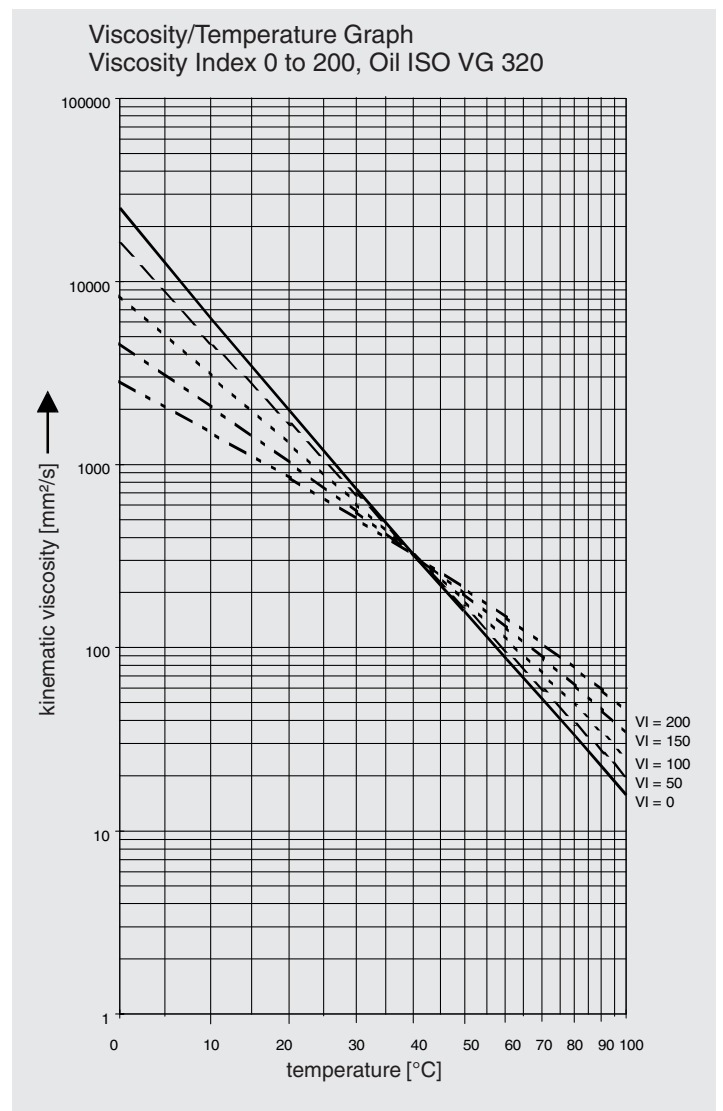
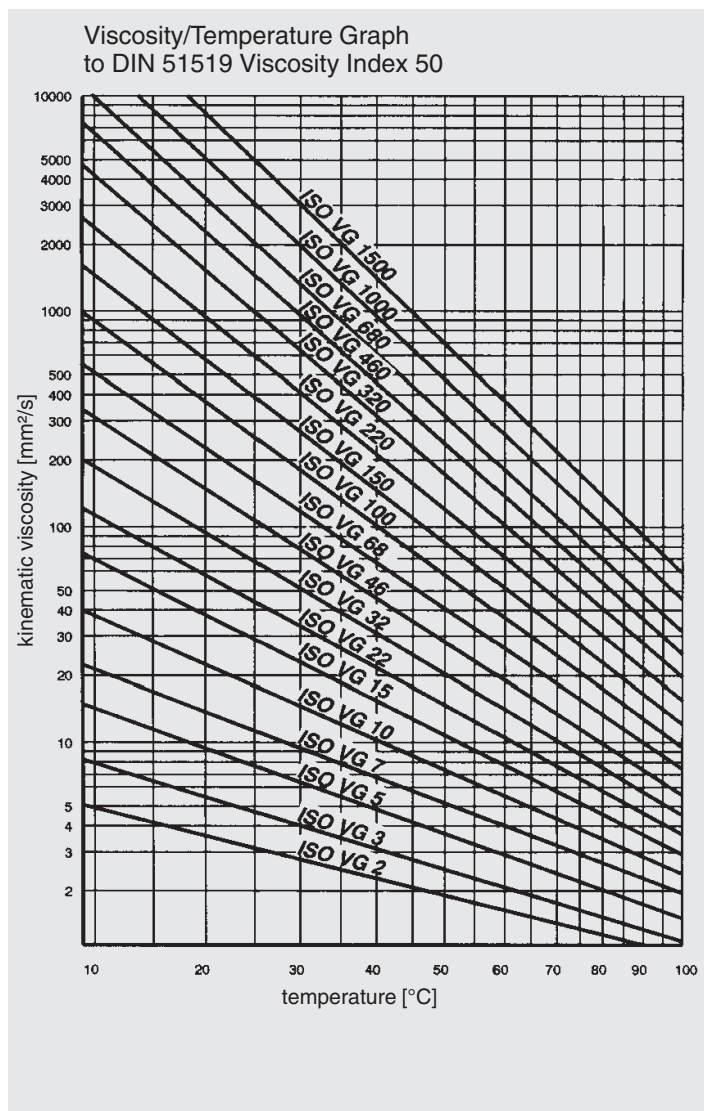
- Highest recommended viscosity at the point of operation ([cSt];[mm<sup>2</sup>/s])
- Temperature of operating fluid (oil)  
+ 10 °C to + 80 °C
- Short-term operation at higher viscosities is permissible ("cold start")

Heat exchanger	Flow rate		
	5 [l/min]	10 [l/min]	15 [l/min]
CP 410-10	300	200	150
CP 410-20	400	300	300
CP 415-10	200	100	100
CP 415-20	300	200	150

The viscosity index (VI) indicates how much the viscosity of the oil changes with temperature.

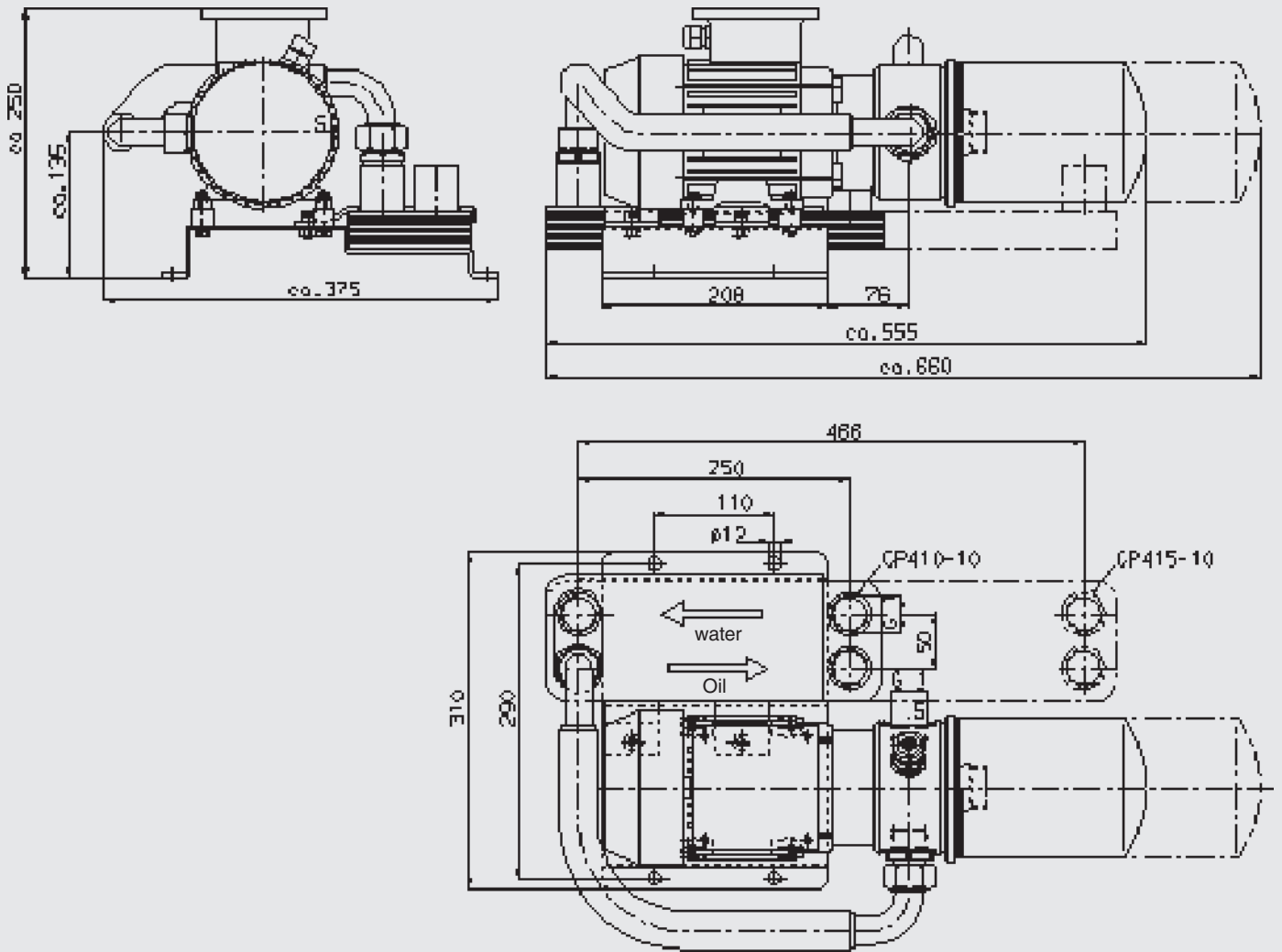
The higher the viscosity index, the smaller the change in viscosity in relation to the temperature.

⇒ Oils with a high viscosity index have a lower viscosity at low temperatures than oils with a low viscosity index.

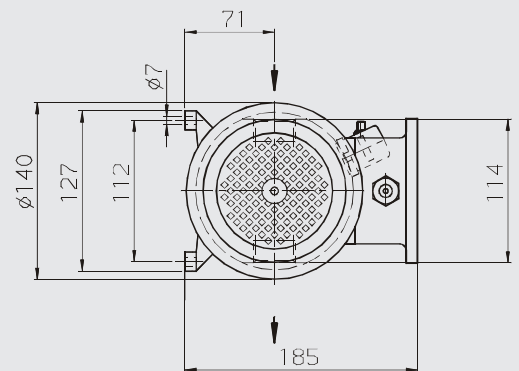
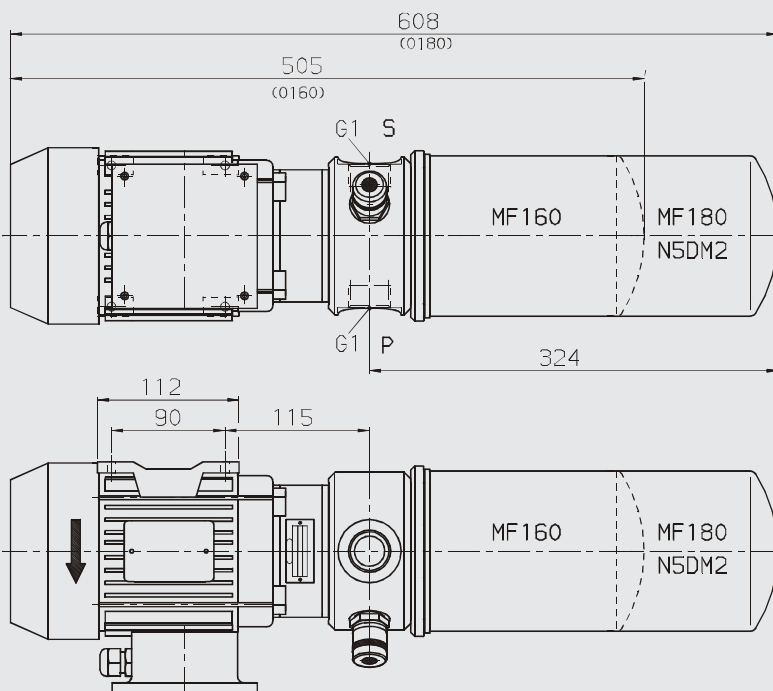


## 6. DIMENSIONS:

UKF-1 / x.x with plate heat exchanger CP 410 or CP 415



Filter removal dimension approx. 50 mm  
 UF-1 / 1.0/P/.../0.37/MF160/2/BM



## 7. FILTER SIZE – FILTER MATERIAL – FILTRATION RATING

### 7.1 SELECTING THE FILTRATION RATING ACCORDING TO MANUFACTURERS' AND OPERATORS' EXPERIENCE

Permissible contamination class to		Suggested filtration rating x in µm (βx = 100)	Type of hydraulic system
NAS 1638	ISO 4406		
3 - 5	13/ 9	3 µm	To prevent fine contamination in highly sensitive systems with a high reliability requirement, primarily aerospace and laboratory conditions
5 - 6	15/11	3 - 5 µm	Sensitive high performance systems & control systems in high pressure applications, frequently in aerospace technology, industrial robots and machine tools where proportional and servo valves are used
7 - 8	17/13	5 - 10 µm	High performance industrial hydraulic systems with a high level of operating safety, using precision hydraulic components such as, for example, control pumps
8 - 10	18/14	10 - 20 µm	General hydraulic and mobile hydraulic systems with conventional hydraulic components
9 - 11	19/15	15 - 25 µm	Systems in heavy machinery hydraulics, primarily in the low pressure sector
11 - 12	21/17	20 - 40 µm	Low pressure systems with large tolerances and low demands for contamination protection

## 8. NOTES ON INLINE MOUNTING

The pressure differential in a hydraulic line is dependent on:

- 1) Flow rate
- 2) Kinematic viscosity
- 3) Pipe dimensions

and can be estimated for hydraulic oils as follows:

$$\Delta p \approx 5.84 \times \frac{l}{d^4} \times Q \times v \text{ [bar]}$$

- l = pipe length [m]  
d = pipe internal diameter [mm]  
Q = flow rate [l/min]  
v = kinematic viscosity [mm<sup>2</sup>/s]

This applies to straight pipe runs and hydraulic oils as well as laminar flow.

- Additional threaded connections and pipe bends increase the pressure differential

#### Note:

- As few threaded connections as possible
- Few pipe bends; if required, use large radius
- Difference in height between pump and oil level as small as possible
- Hoses must be suitable for a vacuum of min. 5000 mmW (e.g. hoses to be steel-reinforced (wire-braided))
- Do not reduce pipe cross-section predetermined by the unit
- Valves on the water side must be fitted at the inlet of the heat exchanger

## 9. NOTES ON CALCULATING THE UKF

### 9.1 ESTIMATE OF THE COOLING CAPACITY REQUIREMENT FOR MINERAL OIL

#### 9.1.1 Via increase in tank temperature

$$P = \frac{\Delta T \times V}{t} \times \frac{1}{35}$$

- P = heat dissipation [kW]  
ΔT = temperature increase in tank [°C]  
V = tank contents [l]  
t = operating time [min]

#### Example:

In a system the tank temperature increases from 20 °C to 70 °C (= 50 K) in 30 minutes. The tank volume is 100 l

$$P = \frac{50 \times 100}{30} \times \frac{1}{35}$$

$$P = 4.8 \text{ kW}$$

#### Note:

All calculations for the heat exchanger are based on oil data provided by the Aral company.

## 10. 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.