

## Pump-Transfer Cooler Filtration Unit UKF-3 / UF-3



# PUMP-TRANSFER COOLER FILTRATION UNIT UKF-3/ UF-3

## 1. DESCRIPTION

### 1.1 GENERAL

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

### 1.2 FEATURES

Offline unit consisting of:

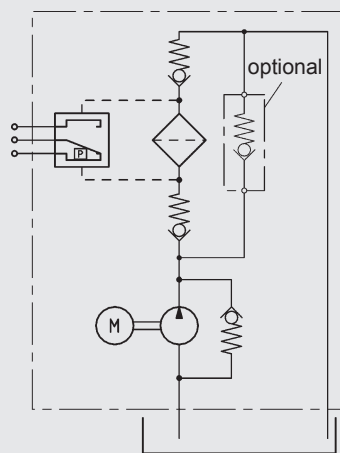
- Low-noise feed pump
- Filter
- Oil-water plate heat exchanger
- The circuit is fitted with check valves to isolate the filter when used with a positive head tank when changing the filter element

### 1.3 APPLICATIONS

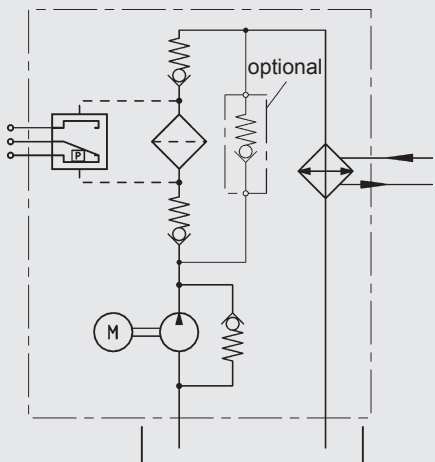
- Plastic injection moulding machines
- Transmission systems
- Pressing / Stamping
- Machining centres
- Hydraulic systems

### 1.4 HYDRAULIC CIRCUIT

#### UF (without heat exchanger)



#### UKF



## 2. TECHNICAL SPECIFICATIONS

### 2.1 OPERATING PRESSURE

Oil side max. 10 bar  
Water side max. 30 bar (static)

### 2.2 SUCTION PRESSURE ACROSS THE SUCTION CONNECTION

Max. -0.4 bar to 0.5 bar

### 2.3 MEDIUM

Oil side: Mineral oil to DIN51524 Part 1 and 2

Permitted contamination  
≤ NAS 12 or ISO4406: 22/21/18

### 2.4 TEMPERATURE OF MEDIUM

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

### 2.5 MAX. VISCOSITY

See Point 7.

### 2.6 AMBIENT TEMPERATURE

+10 °C to +40 °C

### 2.7 MOUNTING POSITION

Vertical

### 2.8 RPM

Min. 1000 rpm  
Max. 1800 rpm

### 2.9 DIRECTION OF ROTATION

Clockwise, see direction of arrow

### 2.10 DRIVE

Three-phase electric motor  
Insulation class F  
Protection class IP55

### 2.11 VOLUMETRIC EFFICIENCY

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

### 2.12 NOISE LEVELS

Pump [cm <sup>3</sup> /rev]	1 bar	6 bar
20	61	61
30	61	62
40	62	63
50	64	66
70	67	68
100	68	70
130	70	72

dB(A)  
at 1500 rpm

Test medium ISO VG46 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) (UF + heat exchanger + filter)

UF:  
1.5 kW 44 kg  
2.2 kW 48 kg  
4 kW 52 kg

Heat exchanger:  
610-20 11 kg  
610-40 14 kg  
610-70 17 kg  
610-100 22 kg  
610-120 25 kg  
615-20 14 kg  
615-40 18 kg  
615-60 24 kg  
615-80 30 kg

Filter:  
MF180 2 kg  
LF330 5 kg  
LF500 7 kg  
LF660 8 kg

### 2.14 OPERATING DATA FOR HEAT EXCHANGER

- Medium (water side):
  - Water glycol (HFC)
  - Water
  - Oils
- Contamination:
  - The level of particles in suspension should be less than 10 mg/l
  - Particle size > 0.6 mm (spherical)
  - Thread-like particles cause a rapid increase in pressure drops
- Corrosion:
  - The following limits correspond 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;
    - $\text{Cl} < 200 \text{ ppm}$  at 50 °C
  - Other limits:
    - 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, potassium
- Heat exchanger connections:
  - Female thread (max. torque value 160 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-3 / 1.0 / P / 70 / 2.2 / 610-70 / LF330 / 10 / D**

#### Type

**UKF** pump + heat exchanger + filter  
**UF** pump + filter

#### Model

**1.0** heat exchanger series 610  
**2.0** heat exchanger series 615  
**1.2 / 2.2** with filter bypass

#### Seals

**P+V** static seal Perbunan + dynamic seal Viton  
**P** static and dynamic seal Perbunan

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

cm <sup>3</sup> /rev	1000 rpm	1500 rpm
<b>20</b>	20 l/min	30 l/min
<b>30</b>	30 l/min	45 l/min
<b>40</b>	40 l/min	60 l/min
<b>50</b>	50 l/min	75 l/min
<b>60</b>	60 l/min	90 l/min
<b>70</b>	70 l/min	105 l/min
<b>100</b>	100 l/min	150 l/min
<b>130</b>	130 l/min	185 l/min

#### Motor

**1.5** kW @ 1000 rpm  
**2.2** kW @ 1500 rpm  
**2.2-6p** kW @ 1000 rpm (6 pole motor)  
**4** kW @ 1500 rpm  
**4-6p** kW @ 1000 rpm (6 pole motor)

#### Plate heat exchanger

	No. of plates
Series <b>610</b>	- 20
	- 40
	- 50
	- 70
	-100
	-120
Series <b>615</b>	- 20
	- 40
	- 60
	- 80

#### Filter

**MF 180**  
**LF 330**  
**LF 500**  
**LF 660**

#### Filtration rating

**-03** 3 µm  
**-05** 5 µm  
**-10** 10 µm  
**-20** 20 µm

For further details on filter elements, see Filtration Technology catalogue.

#### Differential pressure clogging indicator 2 bar

**BM:** VM 2 BM.1 (2 bar; visual; manual reset)  
**C:** VD 2 C.0 (2 bar; electrical)  
**D:** VM 3 D.0 / -L24 (3 bar; electrical/visual)

Other indicators on request

For further details: see Clogging Indicator brochure

## 4. DETERMINING THE COOLING CAPACITY OF UKF

### 4.1 ESTIMATING THE COOLING CAPACITY REQUIREMENT FOR MINERAL OIL BASED ON INCREASE IN TANK TEMPERATURE

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

**P** = heat dissipation [kW]  
**ΔT** = temperature increase in tank [K]  
**V** = tank volume [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

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

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

### 4.2 ESTIMATING THE COOLING CAPACITY REQUIREMENT BASED ON INSTALLED ELECTRICAL POWER

$$P \approx \frac{1}{4} \cdot \text{installed electrical power}$$

#### Calculating the oil and water outlet temperature

Drop in oil temperature:

$$\Delta T \approx \frac{P}{Q_{\text{oil}}} \cdot 36$$

Increase in water temperature

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

**P** = cooling capacity [kW]  
**Q<sub>oil</sub>** = oil flow rate [l/min]  
**Q<sub>water</sub>** = water flow rate [l/min]

A calculation program is available to calculate accurately the required cooling capacity and a suitable plate heat exchanger. For this, five of the following seven variables are required:

- Oil inlet and outlet temperature
- Oil flow rate
- Water inlet and outlet temperature
- Water flow rate
- Cooling capacity

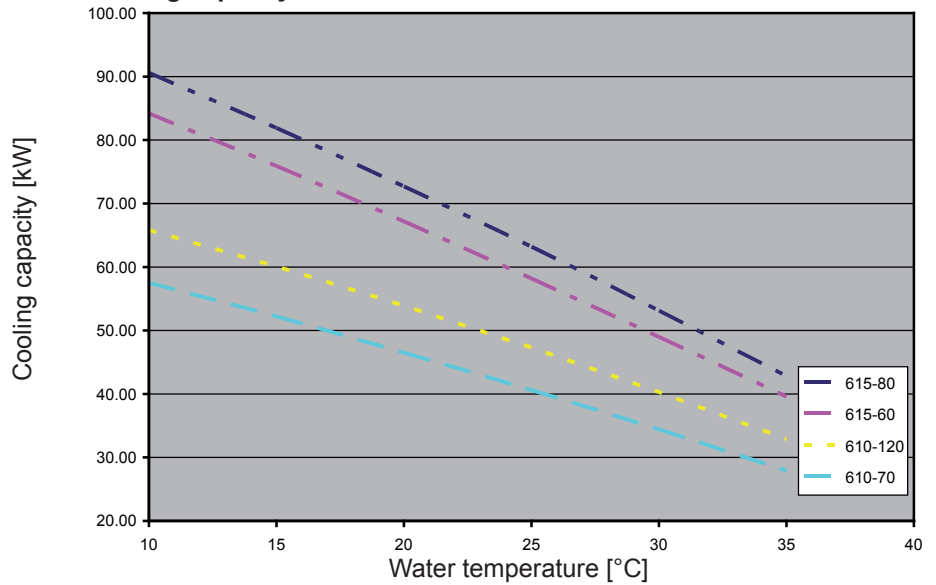
In addition, the viscosity of the oil is required.

## 5. SELECTION OF THE PLATE HEAT EXCHANGER

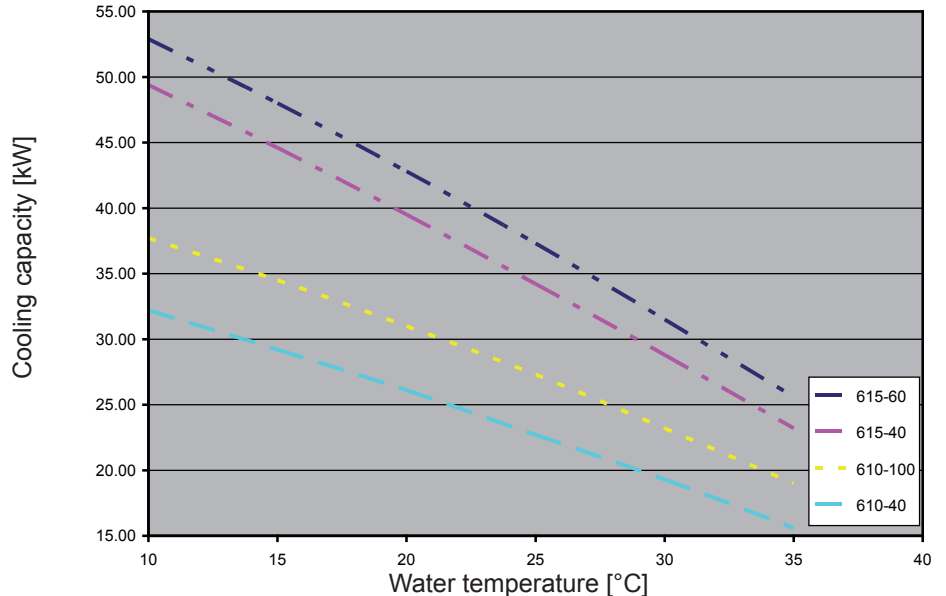
The following graphs show the selection of plate heat exchangers based on cooling capacity.

### 5.1 COOLING CAPACITY

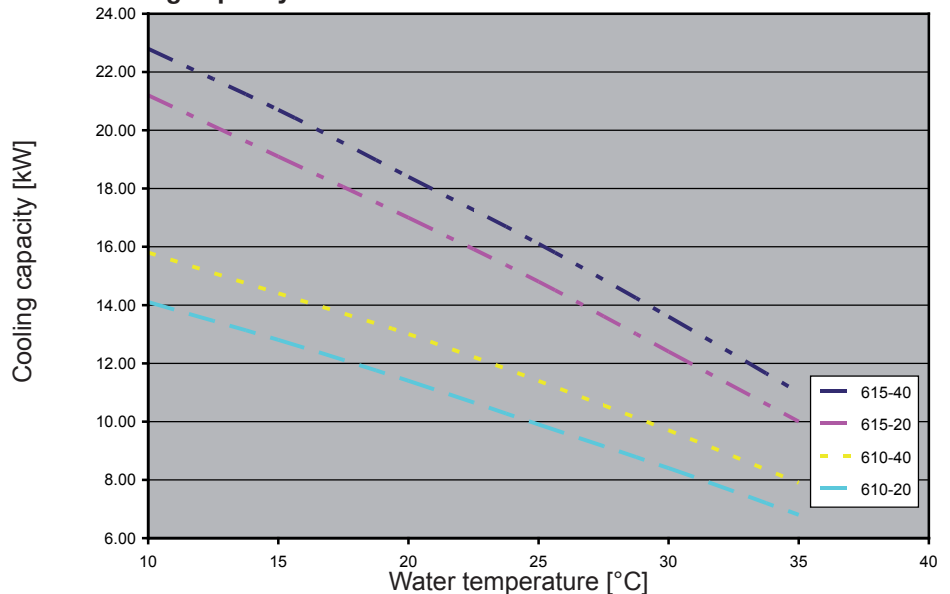
#### Cooling capacity at 185 l/min



#### Cooling capacity at 105 l/min



#### Cooling capacity at 45 l/min

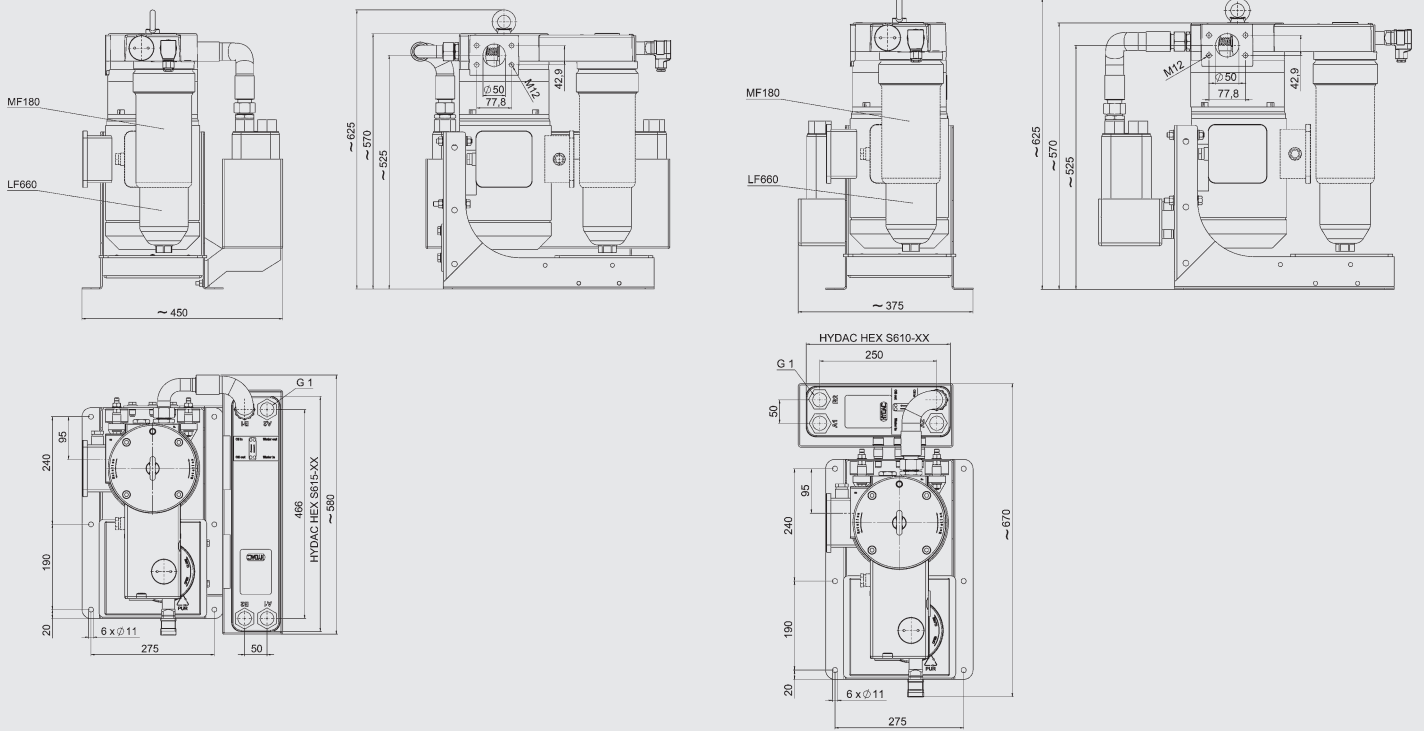


Operating condition:  
 $T_{\text{oil}} = 55 \text{ °C}$ ; oil ISO VG 46;

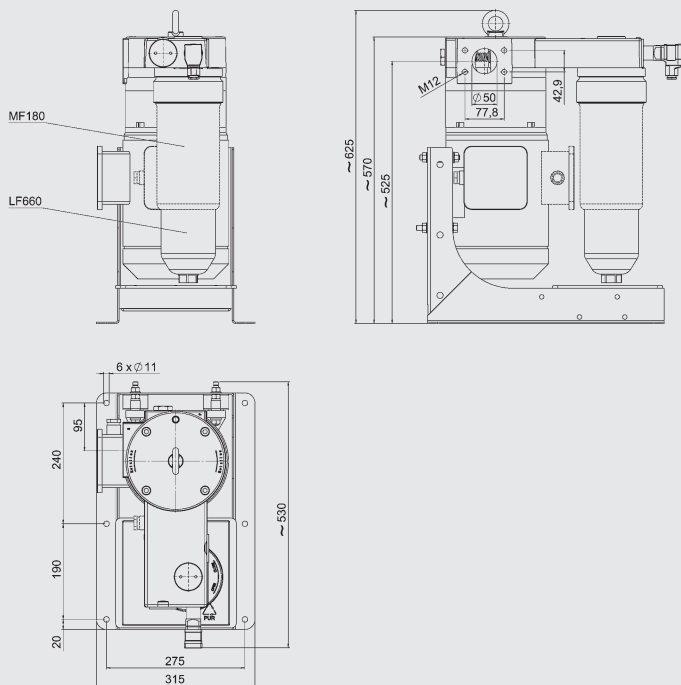
$$\frac{Q_{\text{oil}}}{Q_{\text{water}}} = 4$$

# 6. DIMENSIONS

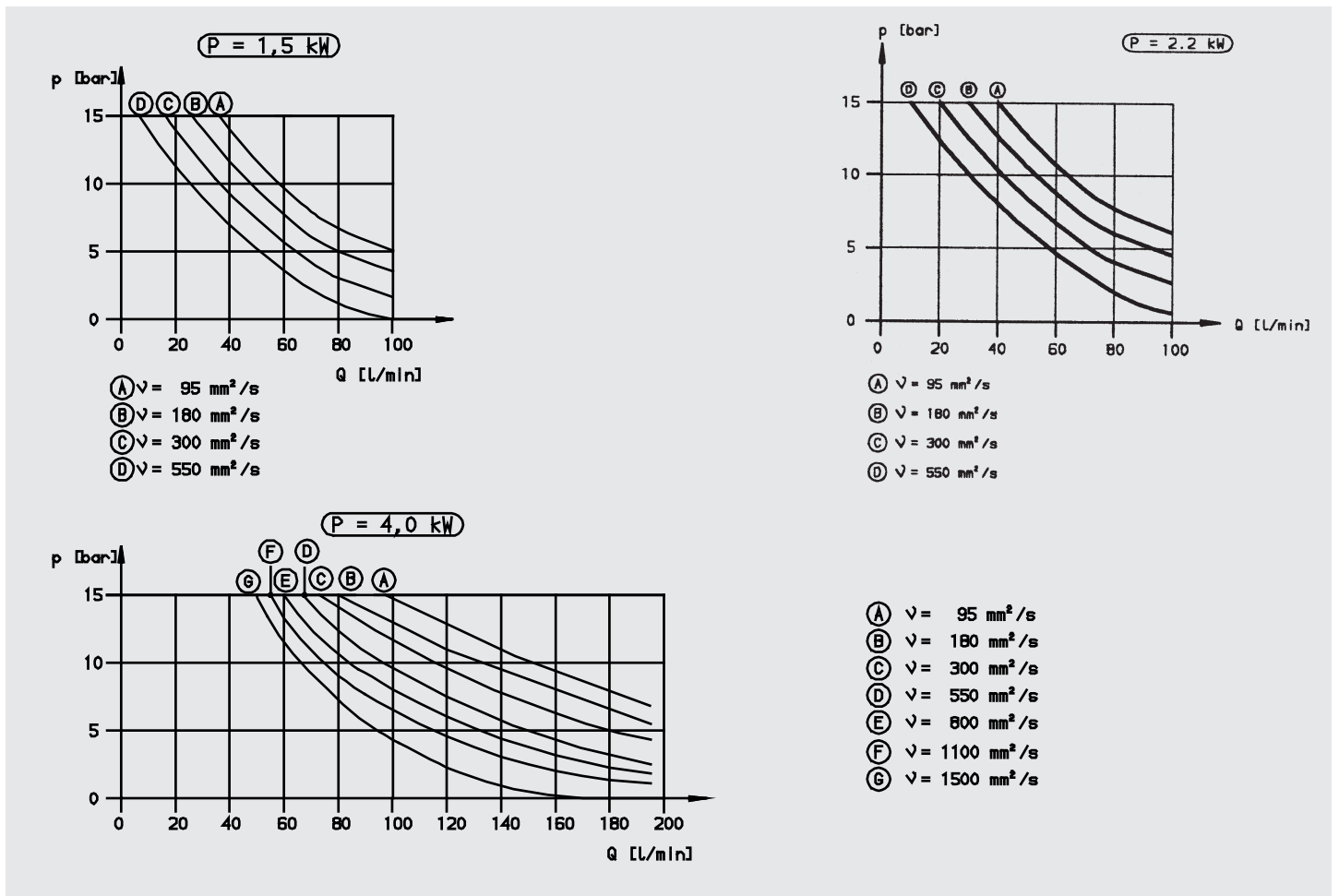
## UKF-3



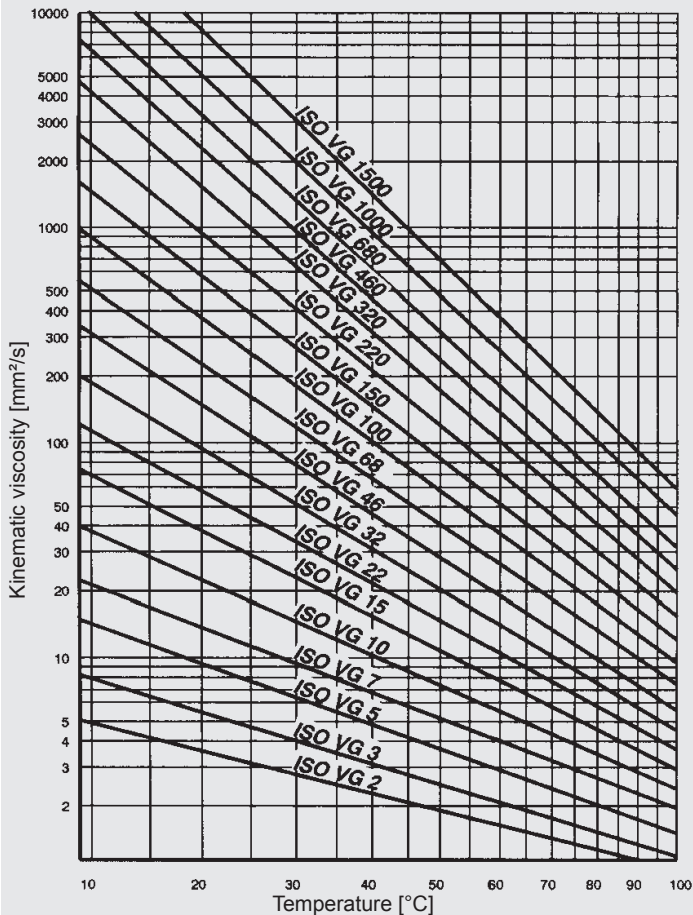
## UF-3



## 7. GRAPHS FOR MOTOR-PUMP SELECTION



Viscosity / Temperature Graph  
to DIN 51519 Viscosity index 50



## 8. FILTER SELECTION

Depending on the conditions of the system and the environment, filters with the same filtration rating perform differently. Typical fluid cleanliness classes achieved with HYDAC elements are shown below:

Filtration rating x ( $\beta_{x(e)} \geq 200$ )	25										19/16/13 - 22/19/16		
	20										18/15/12 - 21/18/15		
	15										17/14/11 - 20/17/14		
	10										15/12/9 - 19/16/13		
	5										12/9/6 - 17/14/11		
	3										10/7/4 - 13/10/7		
	10/7/4	11/8/5	12/9/6	13/10/7	14/11/8	15/12/9	16/13/10	17/14/11	18/15/12	19/16/13	20/17/14	21/18/15	22/19/16

### OIL CLEANLINESS TO ISO 4406

## 9. NOTES ON INSTALLATION

The pressure differential in a hydraulic line is dependent on:

- Flow rate
- Kinematic viscosity
- Pipe dimensions and can be estimated for hydraulic oils as follows:

$$\Delta p = 5.84 \cdot \frac{l}{d^4} \cdot Q \cdot \nu \text{ [bar]}$$

$l$  = Pipe length [m]

$d$  = Pipe internal diameter [mm]

$Q$  = Flow rate [l/min]

$\nu$  = Kinematic viscosity [mm<sup>2</sup>/s]

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

Additional threaded connections and pipe bends increase the pressure differential

### Note:

- As few threaded connections as possible
- Few pipe bends; if unavoidable, 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
- Do not reduce pipe cross-section predetermined by the unit

## 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.