HYDAC INTERNATIONAL

Pump-Transfer Cooler Filtration Unit
UKF-1

E 5.403.2/07.09

PUMP-TRANSFER COOLER FILTRATION UNIT UKF-1

1. DESCRIPTION

1.1 GENERAL

The UKF-1 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

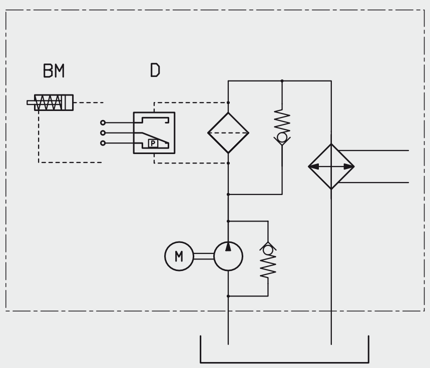
Offline unit consisting of:

- Low-noise feed pump
- Filter
- Oil-water plate heat exchanger

1.3 APPLICATIONS

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

1.4 HYDRAULIC CIRCUIT UKF-1



2. TECHNICAL SPECIFICATIONS

2.1 OPERATING PRESSURE

Oil side: max. 6 bar

Water side max. 30 bar (static)

2.2 SUCTION PRESSURE ACROSS THE SUCTION CONNECTION

Max. –0.4 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

Optional, but easier to maintain if filter below pump

2.8 RPM

1500 rpm @ 50 Hz
1800 rpm @ 60 Hz

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 ν = 40 mm²/s

2.12 NOISE LEVELS

< 64dB(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)

Basic unit + heat exchanger
Basic unit: 12 kg
610-10: 3 kg
610-20: 5 kg
615-10: 6 kg
615-20: 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: Cl_2 < 0.5 ppm
  - Chloride ions:

    Cl < 700 ppm at 20 °C;

    Cl < 200 ppm at 50 °C
  - Other limits:

    pH 7-10

    Sulphate SO_4^{2-} <100 ppm

    $[HCO_3]/[SO_4^{2-}] > 1$

    Ammonia, NH_3 < 10 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-1 / 1.0 / P / 3.5 / 0.37 / 610-10 / MF160 / 10 / BM

Type

UKF pump + heat exchanger + filter
UK pump + cooler

Type

1.0 : heat exchanger 610
2.0 : heat exchanger 615

Seals

P+V static seal Perbunan + dynamic seal Viton

P static and dynamic seal Perbunan

Pump flow rate: cm³/rev

cm³/rev	1500 rpm
3.5	5 l/min
5	7.5 l/min
7	10 l/min
10	15 l/min

Motor

0.37 kW @ 50Hz
0.55 kW @ 50Hz

Wide voltage range motor

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

Plate heat exchanger

	No. of plates
Series **610**	**-10**
	-20
Series **615**	**-10**
	-20

Filter

N5AM/DM
MF 160
MF 180

Filtration rating

MF 160 and MF 180		**N5DM**		**N5AM**	
-03	3µm	**02**	2µm	**02**	2µm
-05	5µm	**05**	5µm	**20**	20µm
-10	10µm	**10**	10µm		
-20	20µm	**20**	20µm		

For further details on filter elements, see brochure Spin-On Filters 7.301..

Differential pressure clogging indicator 2 bar

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

Other indicators on request
For further details: see Clogging Indicator brochure 7.050..

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 diswsipation	[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 (= 50K) in 30 minutes. The tank volume is 100 l

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

$$P = 4.8\ [kW]$$

4.2 ESTIMATING THE COOLING CAPACITY REQUIREMENT BASED ON INSTALLED ELECTRICAL POWER

$P \approx ¼ \cdot$ installed electrical power

Calculating the oil and water outlet temperature

Drop in oil temperature:

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

Increase in water temperature

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

P	= cooling capacity	[kW]
Q_{oil}	= oil flow rate	[l/min]
Q_{water}	= 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:

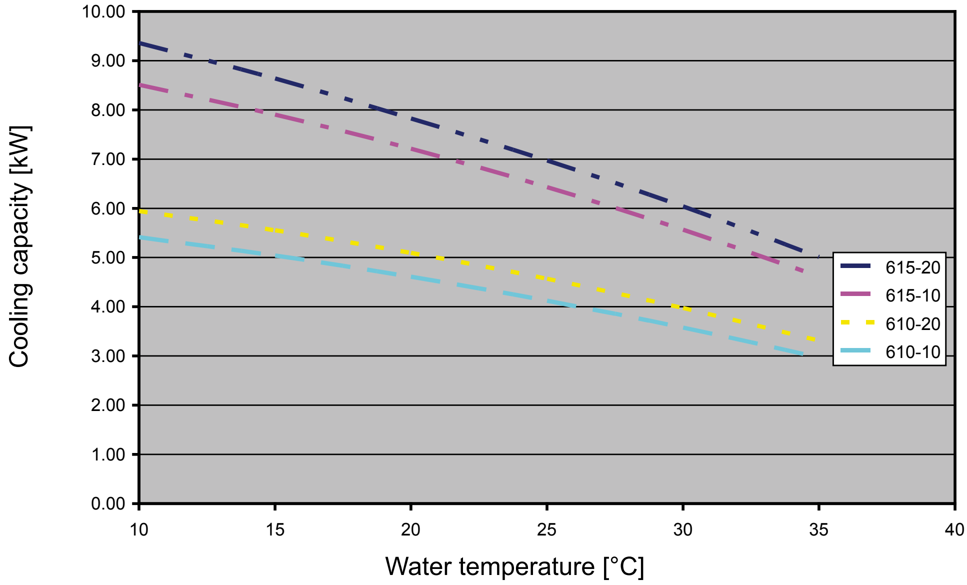
- Oil inlet and outlet temperature
- Oil flow rate
- Water inlet and outlet temperature
- Water flow rate
- Cooling capacity

In addition, the viscosity of the oil is required.

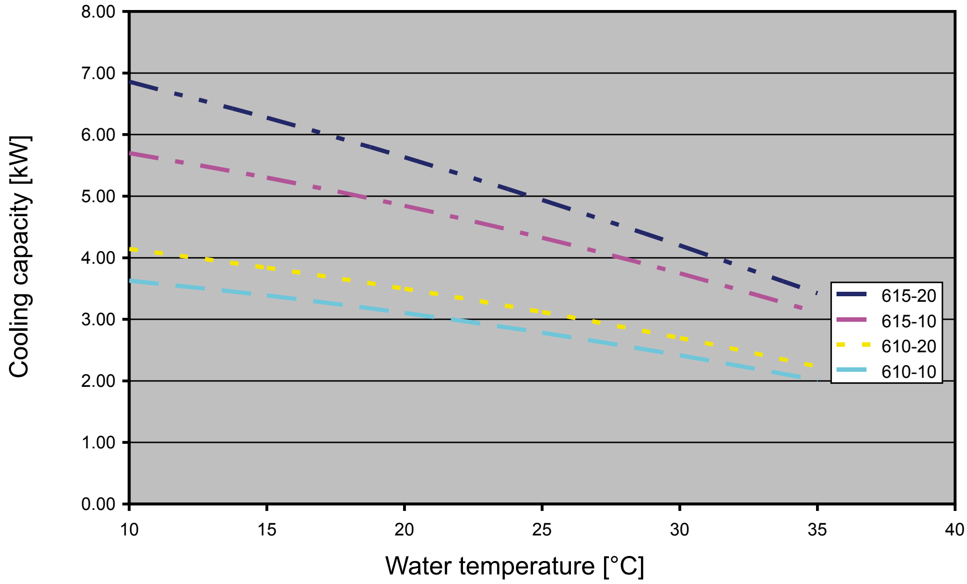
5. SELECTION OF THE PLATE HEAT EXCHANGER

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

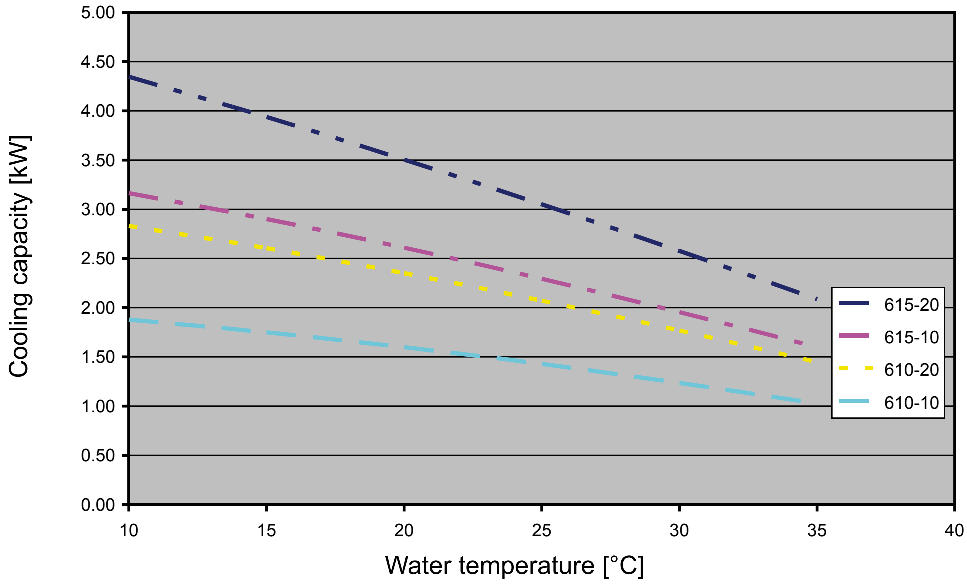
Cooling capacity at 15 l/min



Cooling capacity at 10 l/min

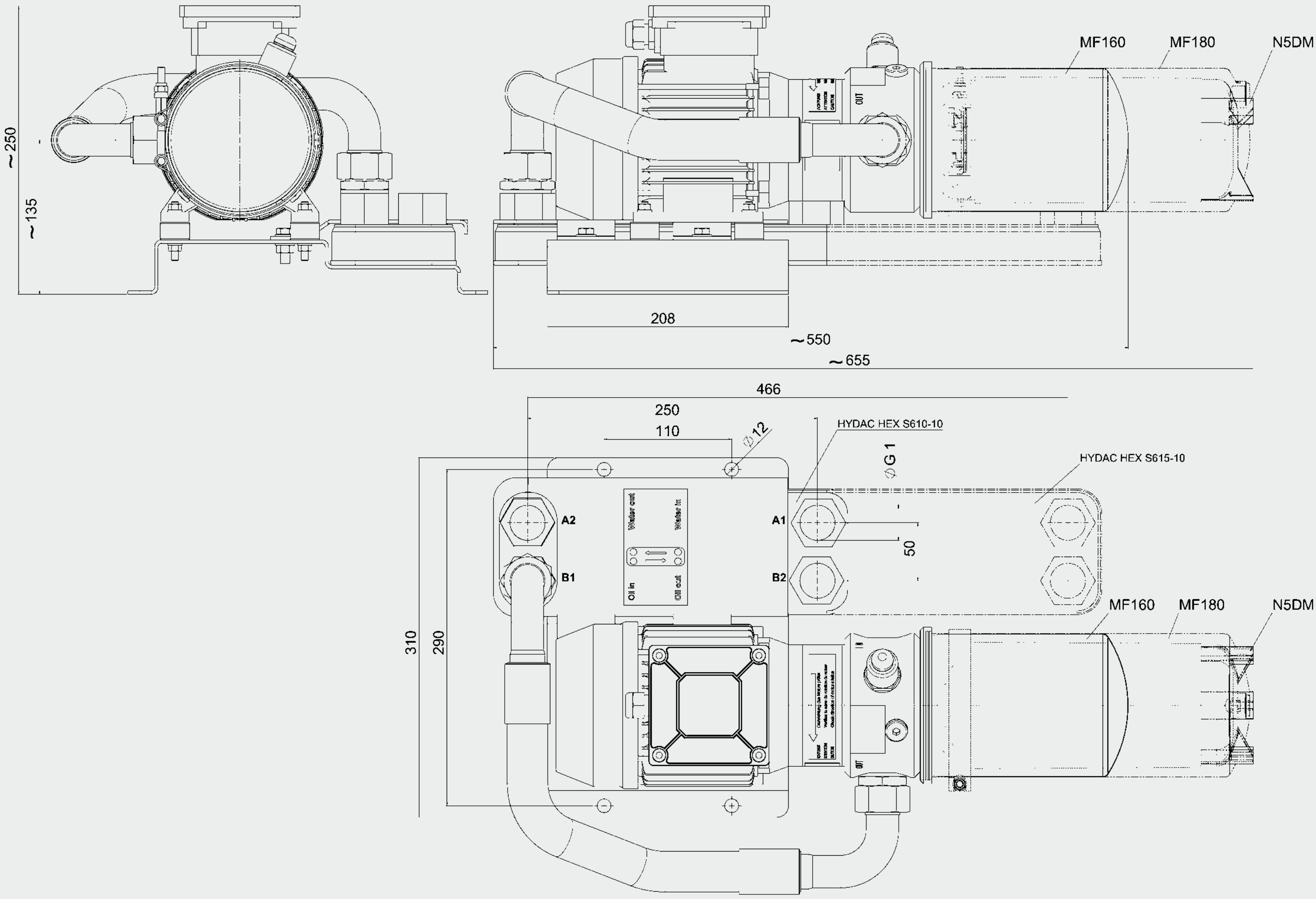


Cooling capacity at 5 l/min



Operating condition:
T_{oil} = 55 °C; oil ISO VG 46; $\frac{Q_{oil}}{Q_{water}} = 1$

6. DIMENSIONS



Clearance for filter removal approx.
50mm

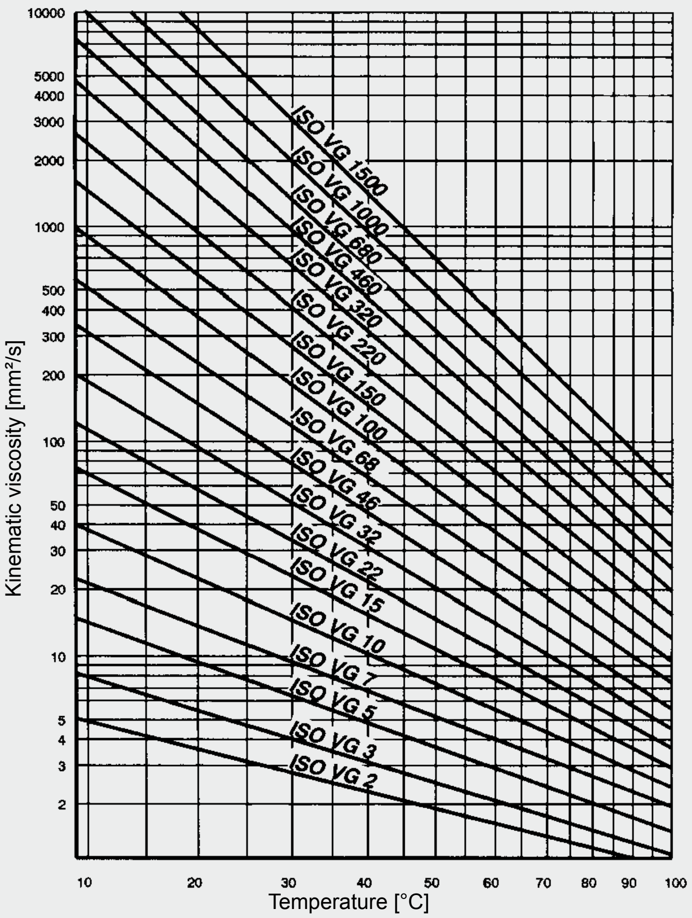
7. CALCULATION CRITERIA FOR THE HEAT EXCHANGER AND FLOW RATES

The following table indicates the highest recommended viscosities [mm²/s] at the operating point.

Heat exchangers	Flow rate			
	5	10	15	[l/min]
HEX 610-10	300	200	150	[mm²/s]
HEX 610-20	400	300	300	[mm²/s]
HEX 615-10	200	100	100	[mm²/s]
HEX 615-20	300	200	150	[mm²/s]

Temperature of medium (oil) +10°C to +80°C; short-term operation at higher viscosities (cold start) is permitted

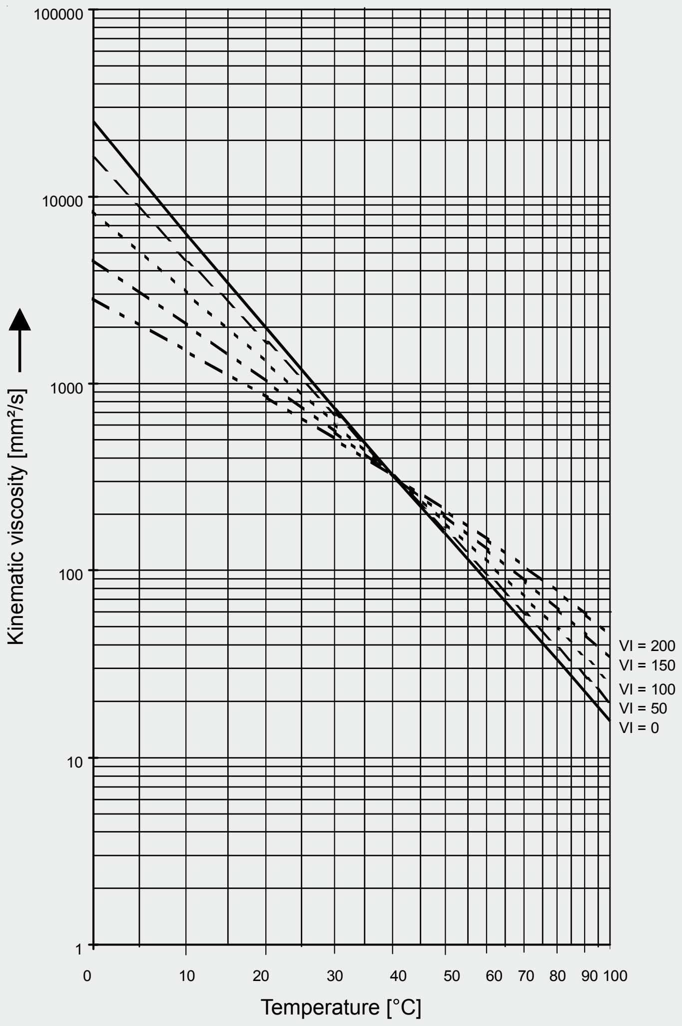
Viscosity / Temperature Graph
to DIN 51519 Viscosity index 50



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

It is a measure of the temperature properties of different oils. The higher the viscosity index of an oil, the smaller the change in viscosity in relation to the temperature.

Viscosity / Temperature Graph
Viscosity index 0 to 200 oil ISO VG 320



8. FILTER SELECTION

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

Filtration rating x ($\beta_{x(c)}$ >= 200)	OIL CLEANLINESS TO ISO 4406
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]

ν = Kinematic viscosity [mm²/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.