HYDAC INTERNATIONAL

Fluid/Air Cooling Systems
FLKS

	Cooler type	H x W x D [mm]	Cooling capacity max. [kW/K]	Flow rate [l/min]	Tank [l]
	**FLKS-1H**	405 x 457 x 276	0.13	2 - 15	7.5
	FLKS-1H+	405 x 483 x 395	0.17	5 - 25	7.5
	**FLKS-2S**	515 x 620 x 315	0.31	5 - 35	19.5
	FLKS-2EC	550 x 620 x 325	0.33	5 - 35	19.5
	**FLKS-3S**	708 x 500 x 443	0.46	5 - 40	28.5
	FLKS-3EC	708 x 500 x 443	0.50	5 - 40	28.5
	**FLKS-4S**	813 x 570 x 485	0.65	10 - 55	43
	FLKS-4EC	813 x 570 x 485	0.70	10 - 55	43
	**FLKS-5S**	983 x 665 x 622	1.05	5 - 100	70
	FLKS-5EC	983 x 665 x 622	1.15	5 - 100	70

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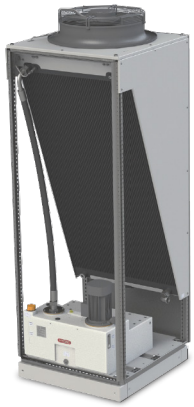
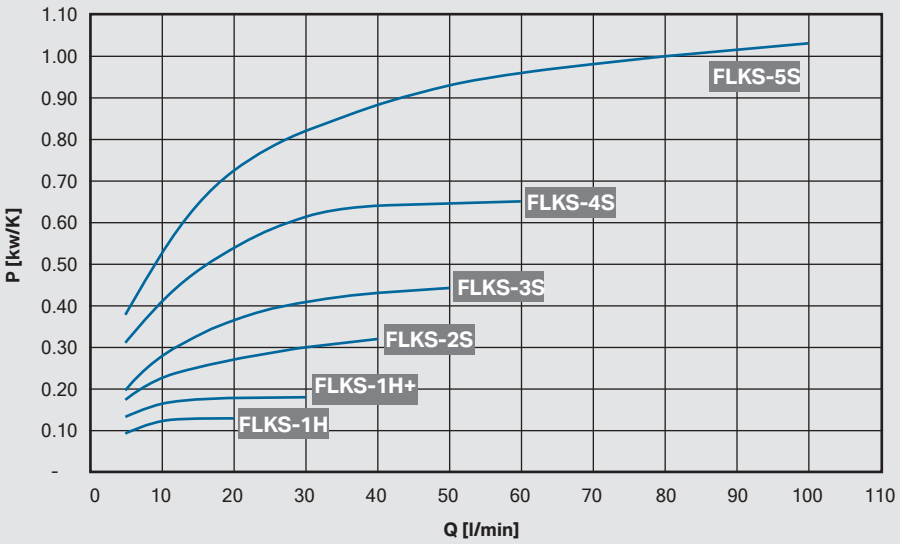
	Cooler type	H x W x D [mm]	Cooling capacity max. [kW/K]	Flow rate [l/min]	Tank [l]
	**FLKS-8EC**	2,273 x 809 x 807	2.00	150	110
	**FLKS-10EC**	2,273 x 1,609 x 807	4.00	300	110

Cooling capacity FLKS-1S – FLKS-5S

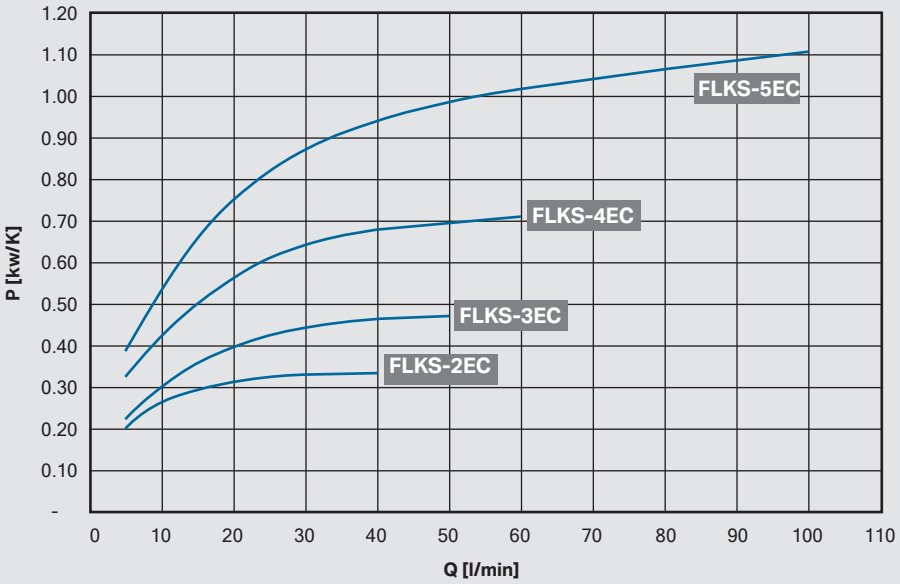
At 50 Hz



Cooling capacity tolerance: ± 5%

Cooling capacity FLKS-2EC – FLKS-5EC with speed control

At 50 Hz and max. drive speed



Cooling capacity tolerance: ± 5%

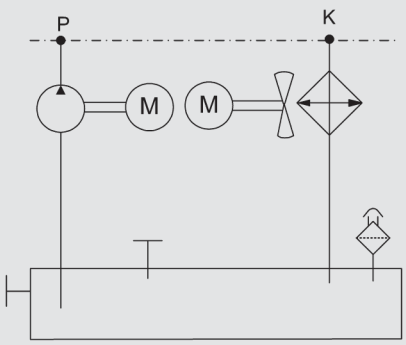
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Fluid/Air Cooling Systems
FLKS-1H

Symbol



General

The **FLKS-1H is a compact fluid / air cooling system with a plastic tank housing and integrated air duct. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium.

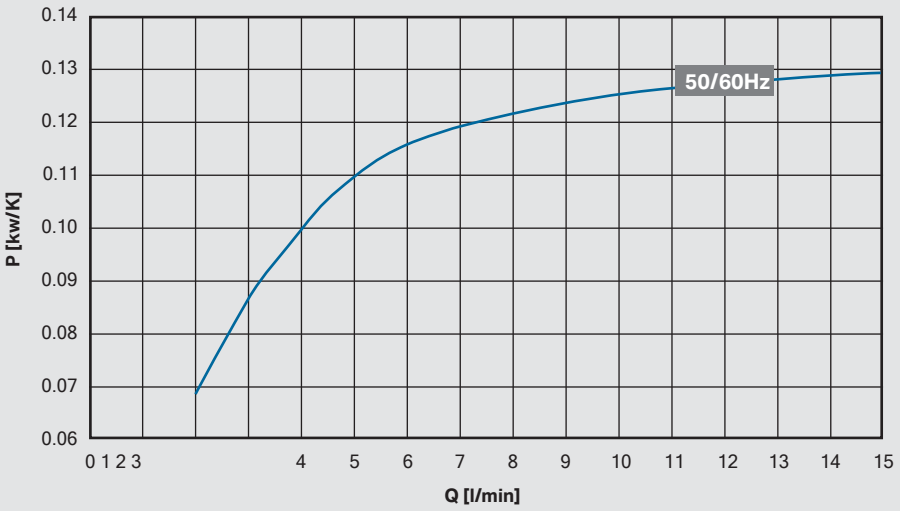
Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.130 kW/K (see cooling capacity diagram)
Flow rate	2 - 15 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	5.5 - 7.5 l
Weight	Max. 22 kg
Noise (acoustic pressure)	70 / 72 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector (connection via terminal box available upon request).
Accessories	Air filter ●Air duct ●Fill level switch ●Fill level and temperature switch ● Flow switch Combinations and other accessories upon request.

Cooling capacity



Cooling capacity tolerance: ± 5%

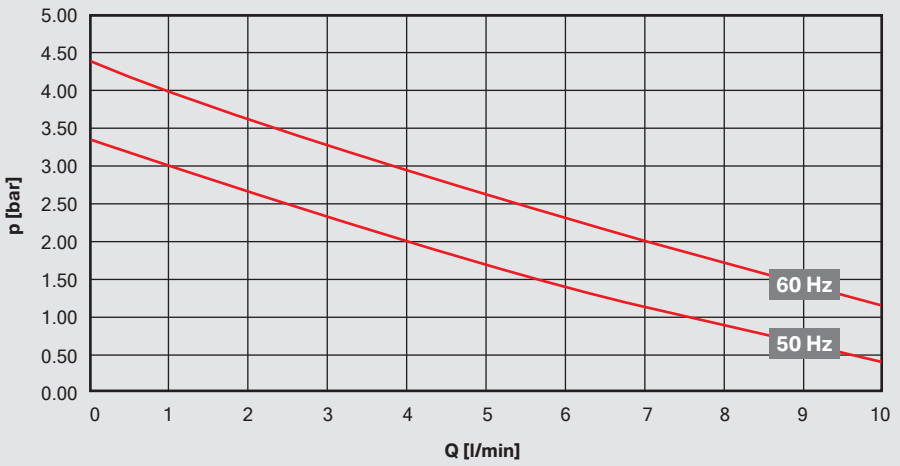
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

Version with pump TKY



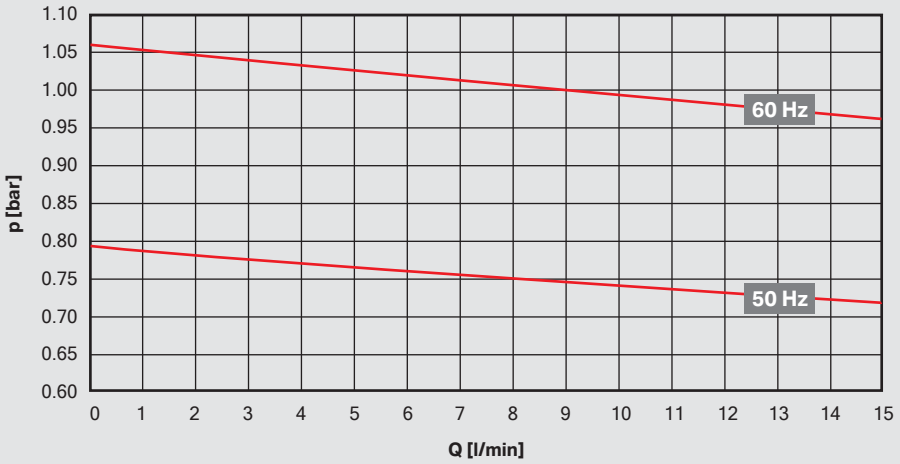
Operating range: 2 - 10 l/min

Electrical data:

Permissible voltage range:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50/60 Hz):
Pump: 0.12 / 0.18 kW
Fan: 0.11 / 0.15 kW

Version with pump MTA50



Operating range: 2 - 15 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

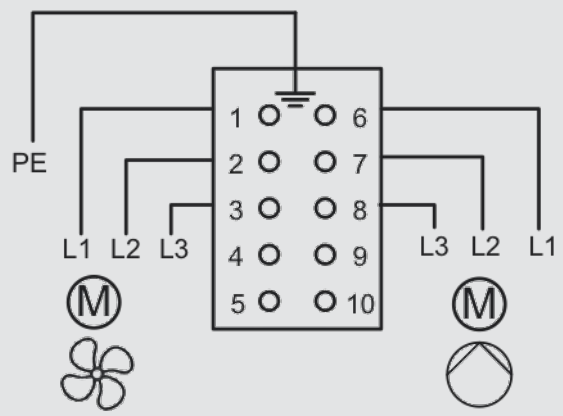
Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50/60 Hz):
Pump: 0.17 / 0.27 kW
Fan: 0.11 / 0.15 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

Electrical connection

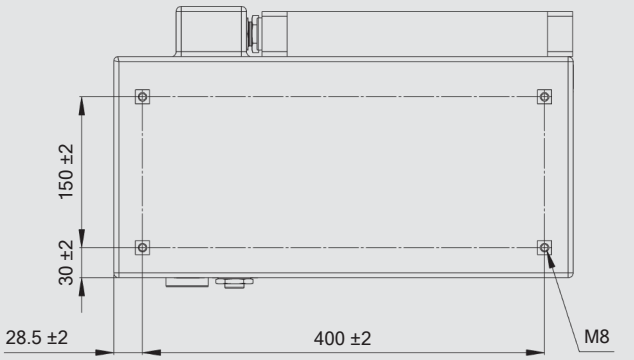


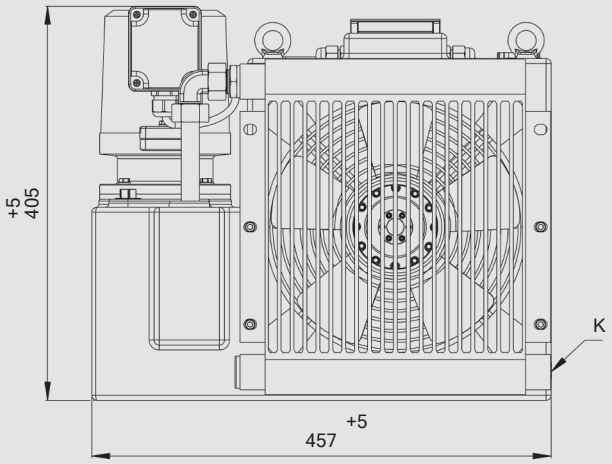
The motor is usually electrically connected using a heavy-duty connector.

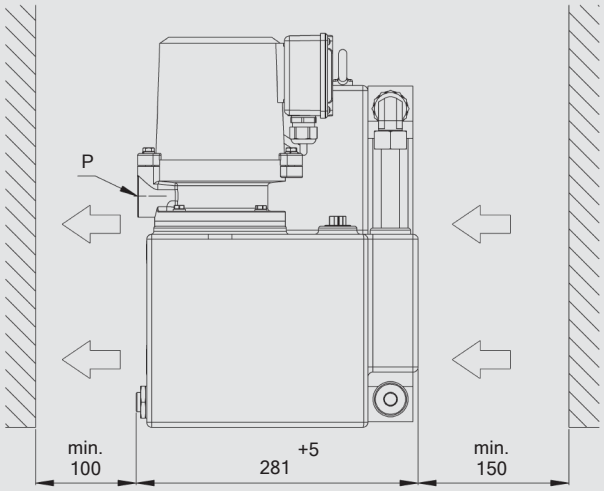
E.g. Harting housing 09300101541 and insert 09330102716.

Dimensions

[mm]







Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 1H - 2.0 - W - YA0 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Type code

Operating fluid
W = water-glycol (standard)

Pump
Y = version with pump TKY
A = version with pump MTA50
Other pumps on request.

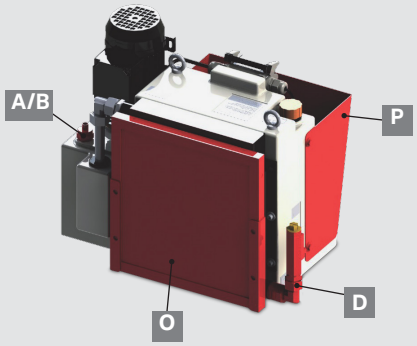
Motor voltage
A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump TKY and MTA50)
See also “electrical data”.

Position of pump connection
0 = standard

Coating
0 = none
(FLKS-1: white plastic tank housing)

Accessories
0 = none (standard)
For corresponding accessory number, see table.

Accessories



A ● ● B	Fill level and 60 °C temperature switch													
	Fill level switch 2 switch points	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	0	1	44	30	14	36	43
D	Flow switch	59	82	122	124	105								
O	Air filter													
P	Air duct													
Accessory number														

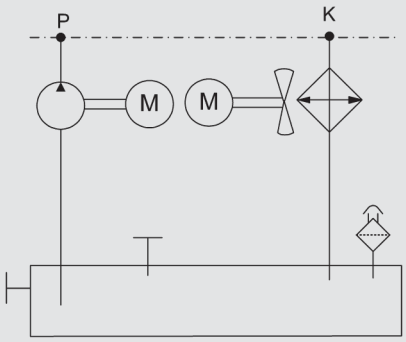
See also “Accessories for FLKS” for more information.

FLKS-1H standard

Part no.	Designation	Pump	Version
3426850	FLKS-1H/2.0/W/YA0/0/0	TKY	No accessories, fixed speed
3322575	FLKS-1H/2.0/W/AA0/0/0	MTA50	No accessories, fixed speed

Fluid/Air Cooling Systems
FLKS-1H PLUS

Symbol



General

The **FLKS-1H PLUS is a compact fluid / air cooling system with a plastic tank housing and integrated air duct. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium.

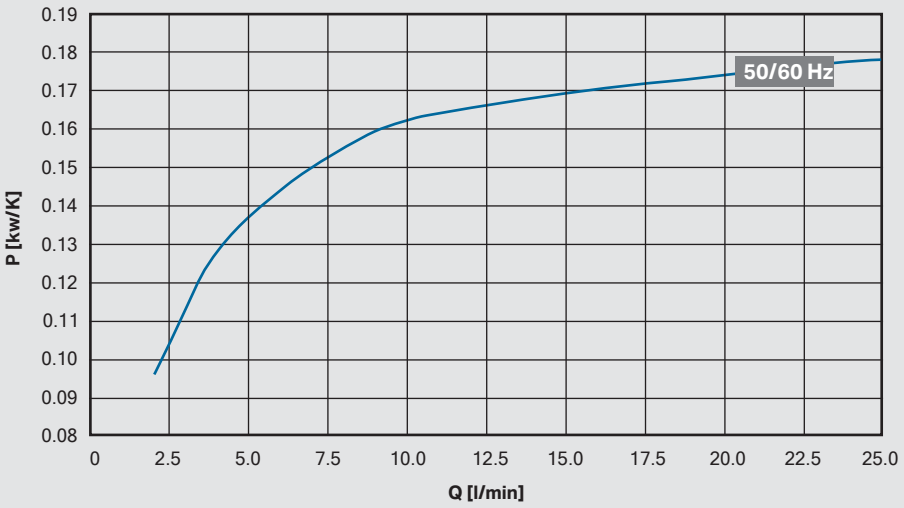
Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.18 kW/K (see cooling capacity diagram)
Flow rate	5 - 25 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	5.5 - 7.5 l
Weight	Max. 26 kg
Noise (acoustic pressure)	69 / 71 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector (connection via terminal box available upon request).
Mounting position	Pump vertical
Accessories	• Air filter • Air duct Combinations and other accessories upon request.

Cooling capacity



Cooling capacity tolerance: ± 5%

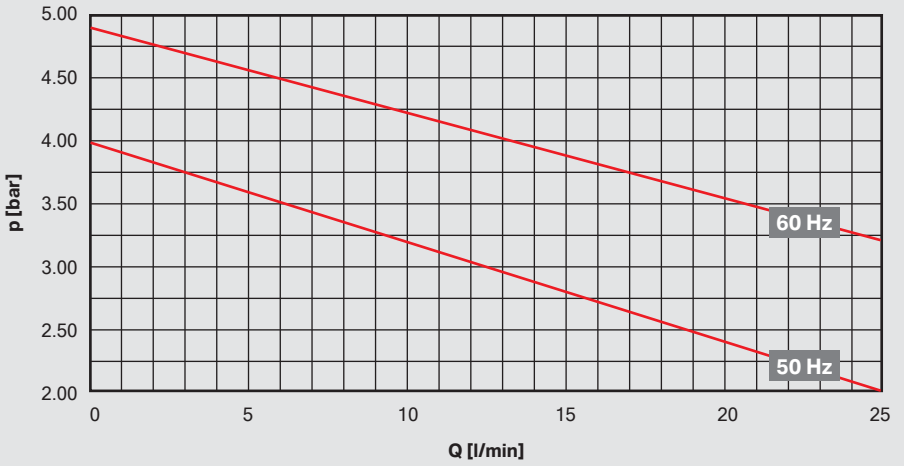
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



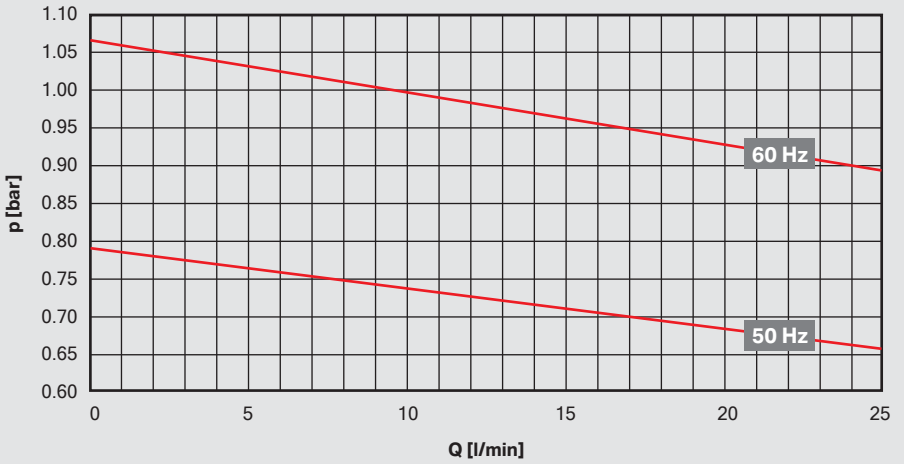
Operating range: 5 - 25 l/min

Electrical data:

Permissible voltage range:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.11 / 0.15 kW

Version with pump MTA50



Operating range: 5 - 25 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

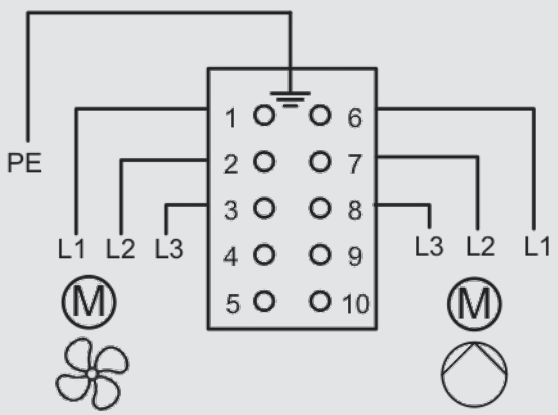
Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.17 / 0.27 kW
Fan: 0.11 / 0.15 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

Electrical connection

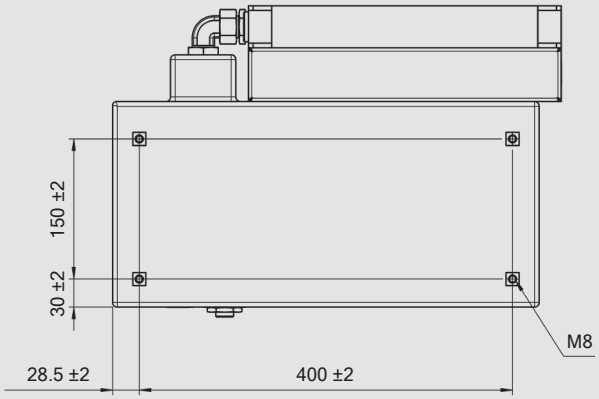


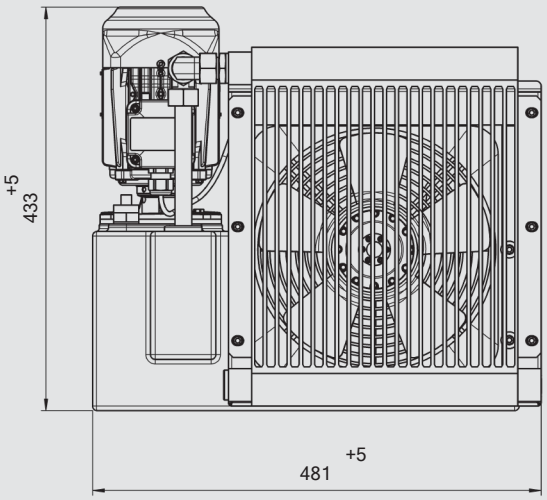
The motor is usually electrically connected using a heavy-duty connector.

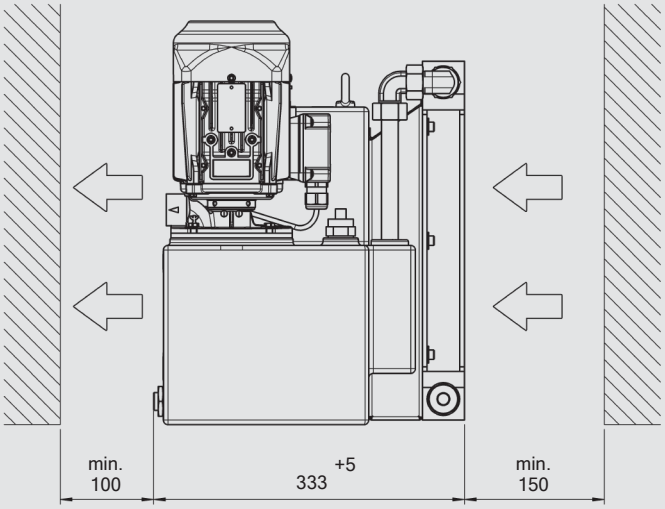
E.g. Harting housing 09300101541 and insert 09330102716.

Dimensions

[mm]







Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 1H PLUS - 2.4 - W - 601A2 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Type code

Operating fluid
W = water-glycol (standard)

Pump
601 = version with pump 601
A = version with pump MTA50
Other pumps on request.

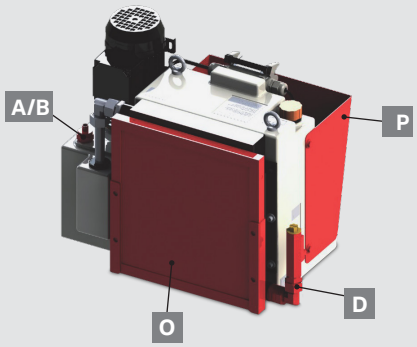
Motor voltage
A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601 and MTA50)
See also “electrical data”.

Position of pump connection
0 = standard
2 = rotated 180°

Coating
0 = none
(FLKS-1: white plastic tank housing)

Accessories
0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch			●									●
B	Fill level switch 2 switch points			●					●			●	
D	Flow switch				●			●			●		
O Air filter						●		●	●	●	●	●	●
P	Air duct							●	●		●	●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

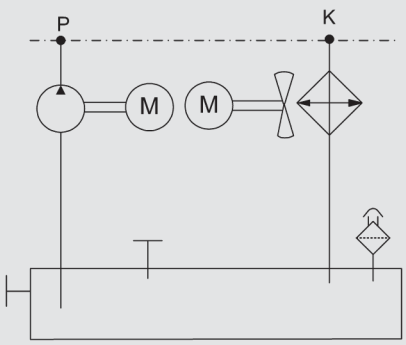
See also “Accessories for FLKS” for more information.

FLKS-1H PLUS standard

Part no.	Designation	Pump	Version
3924557	FLKS-1H PLUS/2.4/W/601A2/0/0	601	No accessories, fixed speed
3908279	FLKS-1H PLUS/2.0/W/AA0/0/0	MTA50	No accessories, fixed speed

Fluid/Air Cooling Systems
FLKS-2S

Symbol



General

The **FLKS-2S is a compact fluid / air cooling system with a plastic tank housing and integrated air duct. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium.

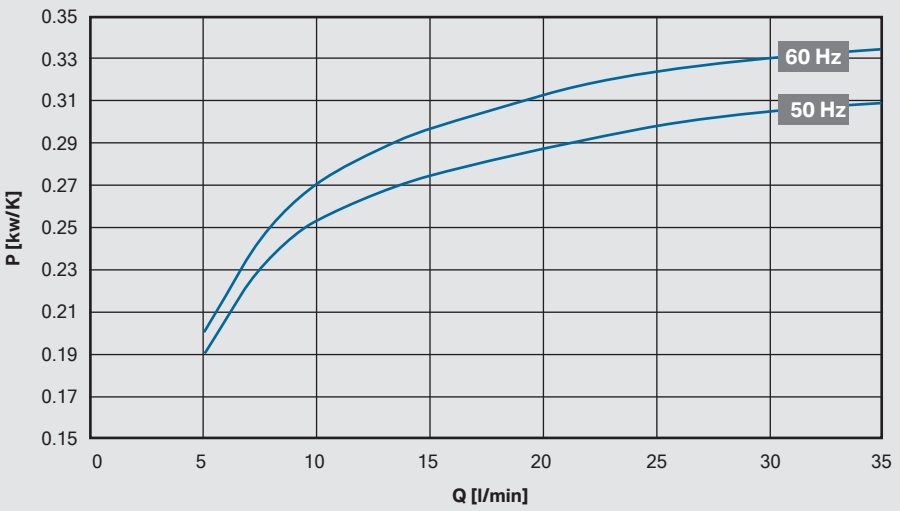
Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.31 kW/K (see cooling capacity diagram)
Flow rate	5 - 40 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	15.0 - 19.5 l
Weight	Max. 32 kg
Noise (acoustic pressure)	62 / 63 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector (connection via terminal box available upon request).
Mounting position	Pump vertical
Accessories	• Air filter • Air duct □☞♓●● ●♏❖♏● ♦♦♓♦♍♒ □☞♓●● ●♏❖♏● ♋■♎ ♦♏❍◘♏❒♋♦◆❒♏ ♦♦♓♦♍♒ □☞●□♦ ♦♦♓♦♍♒ Combinations and other accessories upon request.

Cooling capacity



Cooling capacity tolerance: ± 5%

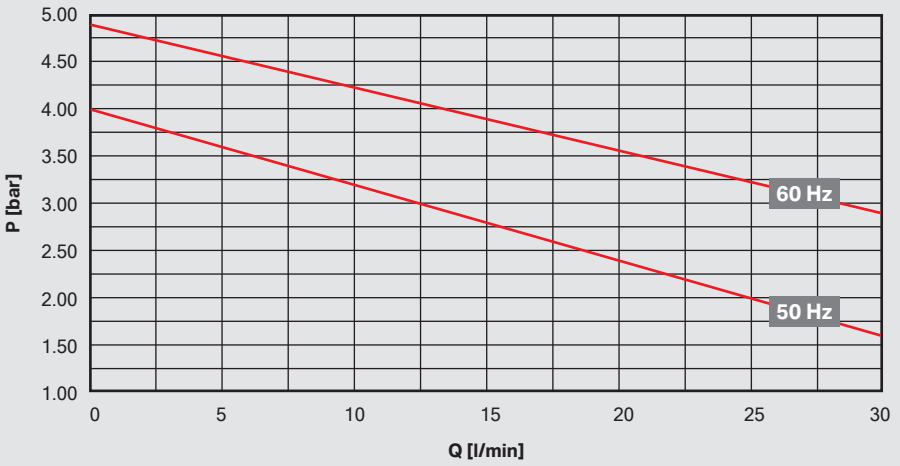
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



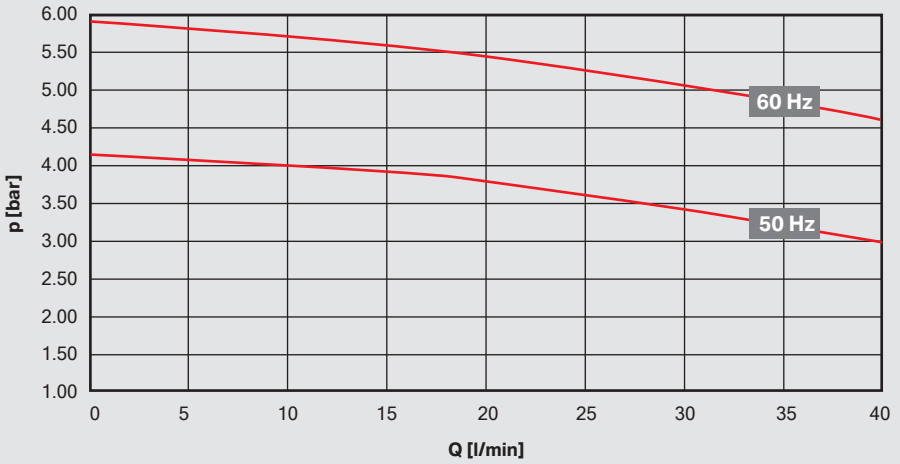
Operating range: 5 - 30 l/min

Electrical data:

Permissible voltage range:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.11 / 0.145 kW

MTH2-4 pump version



Operating range: 10 - 40 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

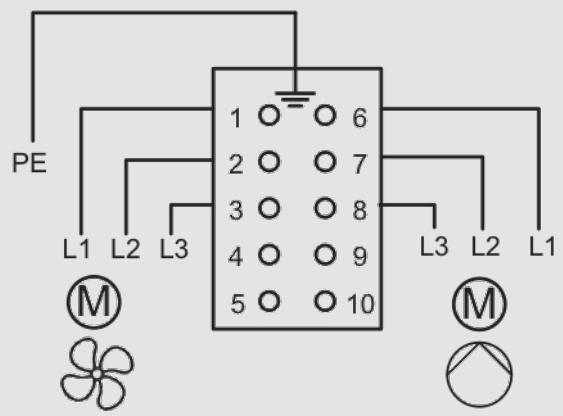
Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.62 / 0.90 kW
Fan: 0.11 / 0.145 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements).
In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

Electrical connection

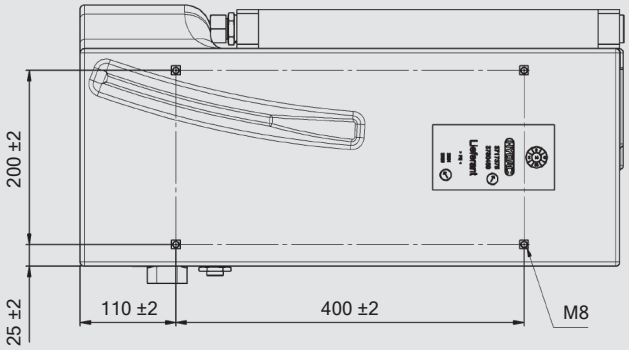


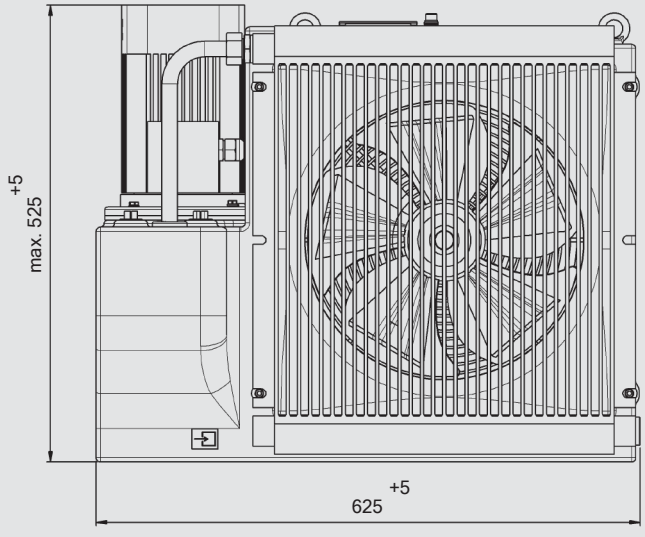
The motor is usually electrically connected using a heavy-duty connector.

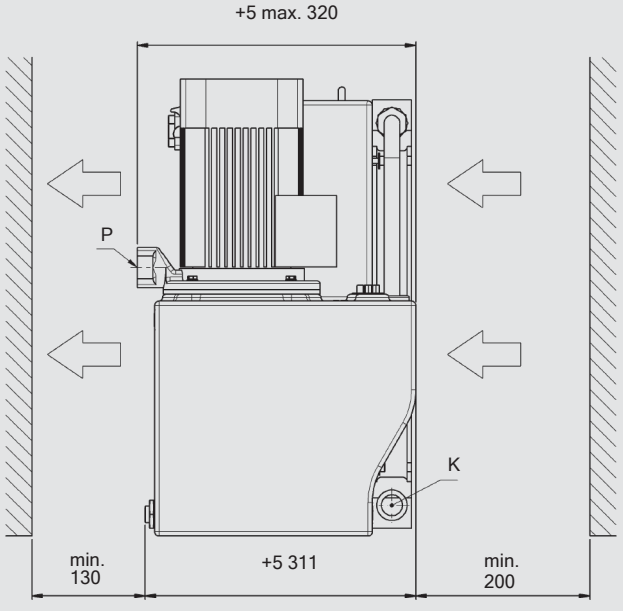
E.g. Harting housing 09300101541 and insert 09330102716.

Dimensions

[mm]







Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 2S - 1.0 - W - 601A0 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Type code

Operating fluid
W = water-glycol (standard)

Pump
601 = version with pump 601
H2 - 4 = version with pump MTH2 - 4
Other pumps on request.

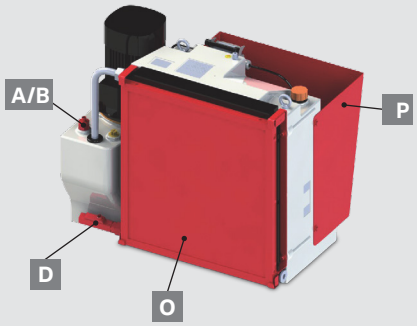
Motor voltage
A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601)
B = 380 - 415 V - 50 Hz / 380 - 440 V - 60 Hz, 3PH (pump MTH2-4)
See also “electrical data”.

Position of pump connection
0 = standard

Coating
0 = none
(FLKS-2: white plastic tank housing)

Accessories
0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch			●									●
B	Fill level switch 2 switch points			●					●				●	
D	Flow switch				●			●			●		
O Air filter						●		●	●	●	●	●	●
P	Air duct						●	●		●		●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

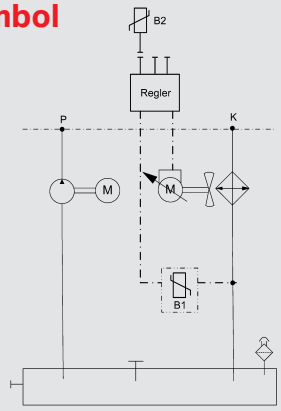
See also “Accessories for FLKS” for more information.

FLKS-2S standard

Part no.	Designation	Pump	Version
3811499	FLKS-2S/1.0/W/601A0/0/0	601	No accessories, fixed speed
3905239	FLKS-2S/1.0/W/H2-4B0/0/0	MTH2-4	No accessories, fixed speed

Fluid/Air Cooling Systems
FLKS-2EC with speed control

Symbol



General

The **FLKS-2EC is a compact fluid / air cooling system with a plastic tank housing, integrated air duct, pump and variable-speed fan. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium. The speed can vary depending on the application.

Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.33 kW/K (see cooling capacity diagram)
Flow rate	5 - 40 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	15.0 - 19.5 l
Weight	Max. 33 kg
Noise (acoustic pressure)	< 64 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector.
Mounting position	Pump vertical
Accessories	Fill level and temperature switch Flow switch Combinations and other accessories upon request.

Speed control

The temperature sensor of the **FLKS-2EC5 measures the water-glycol outlet temperature from the cooling system. The sensor's 0 – 10 V analogue signal is assigned a temperature range of 25 – 45 °C. The signal is forwarded to the EC fan according to the measured fluid outlet temperature to control the speed. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).**
Even at low ambient temperatures, the fluid temperature cannot drop below 28 °C given constant power input. This prevents condensation on electrical components.

Application:

Specially suited for low air temperatures, e.g. outdoors.

Speed control

The **FLKS-2EC3 also comes with a PID controller (closed loop). The temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the reference value (ambient temperature + set differential D ΔT). THE PID CONTROLLER CONTINUALLY ADJUSTS THE SPEED OF THE FAN, IN ORDER TO ALIGN THE FLUID TEMPERATURE WITH THE AMBIENT TEMPERATURE.**
The outlet temperature remains at a set differential above the ambient temperature regardless of the input temperature of the fluid (performance of the machine).

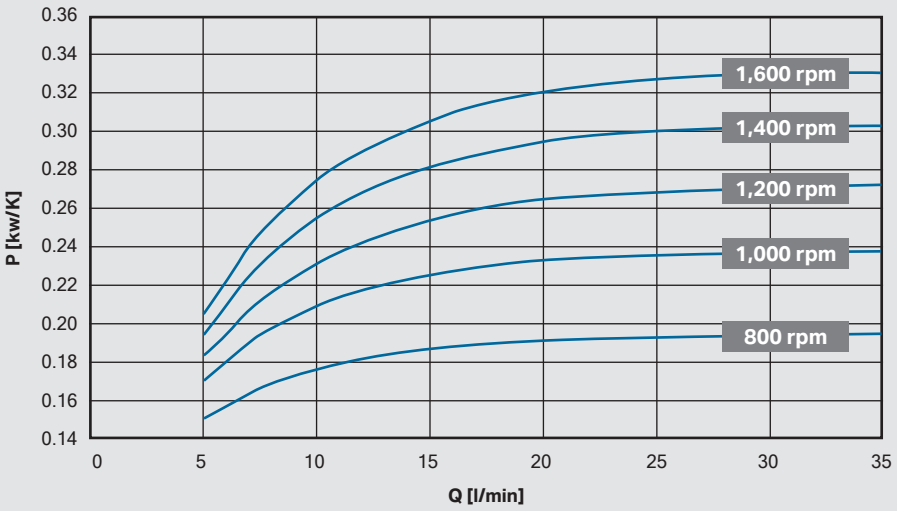
Application:

Particularly for precision cooling (e.g. in machine tools).

Lower fan speed

= lower sound level
= lower power consumption
= lower contamination

Cooling capacity



Cooling capacity tolerance: ± 5%

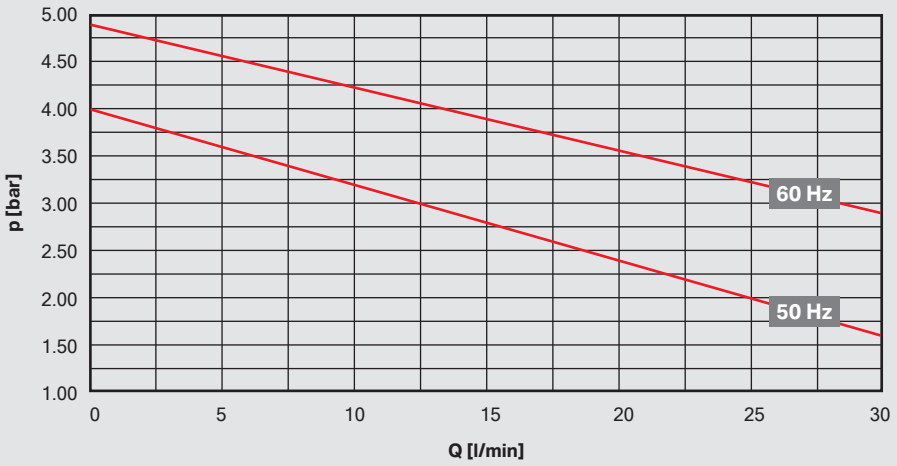
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



Operating range: 5 - 30 l/min

Electrical data:

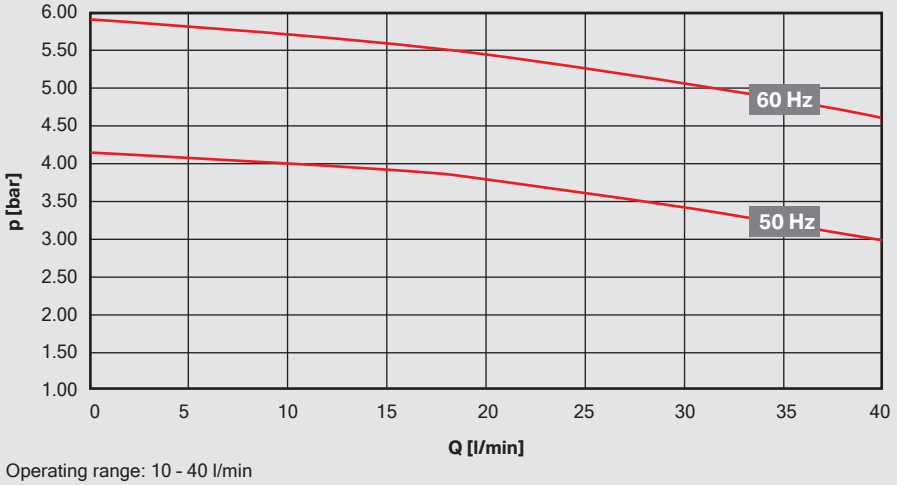
Permitted voltage range:

Pump:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Fan:
200 - 240 V - 50 / 60 Hz - 1 PH
Voltage tolerance ± 10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.14 kW

MTH2-4 pump version



Operating range: 10 - 40 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permitted voltage range:

Pump:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Fan:
200 - 240 V - 50/60 Hz - 1 PH
Voltage tolerance ± 10 %

Motor capacity (50 / 60 Hz):
Pump: 0.62 / 0.90 kW
Fan: 0.14 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

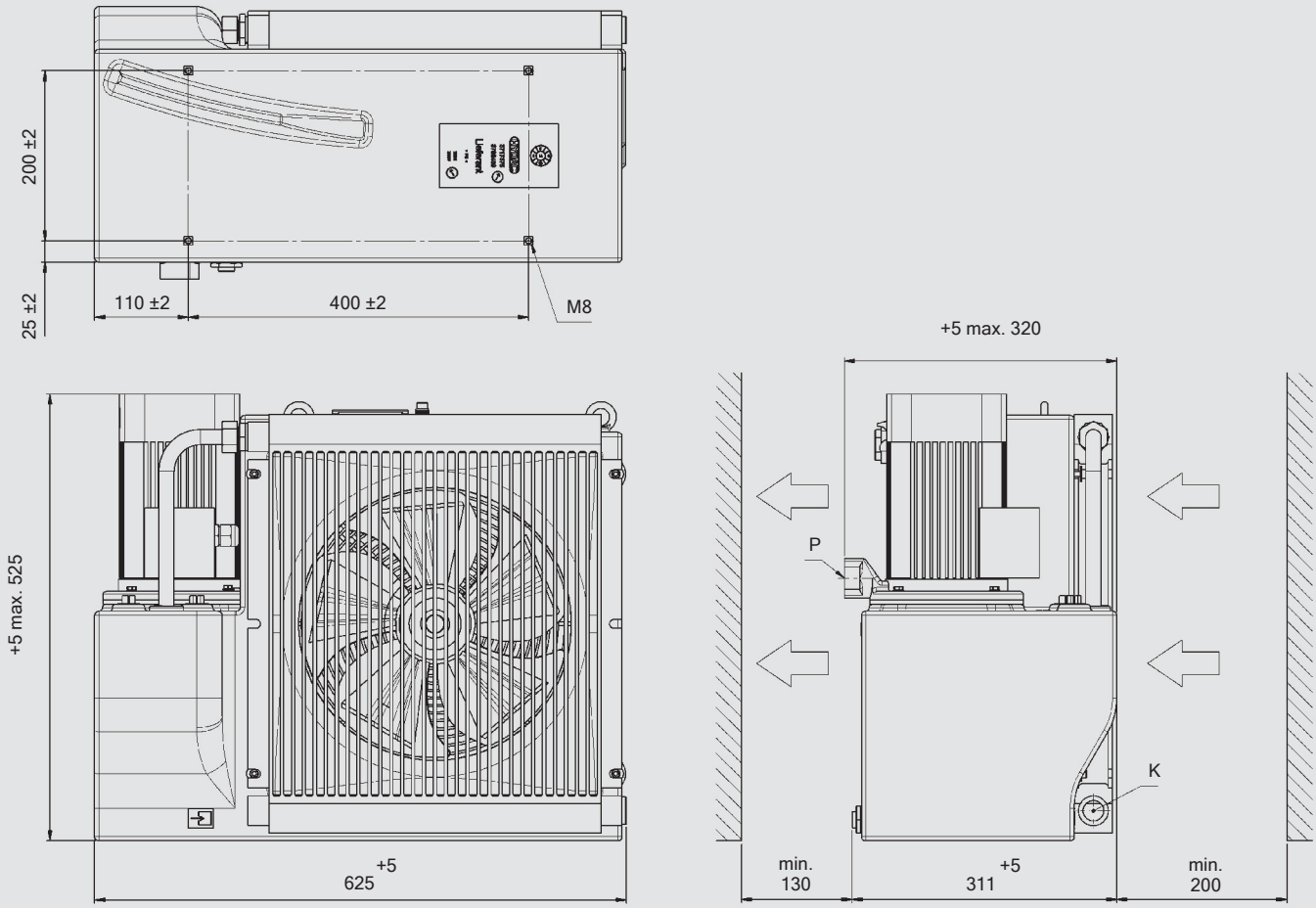
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

Additional 24 V DC control voltage, more information available upon request.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 2 - EC3 - 1.0 - W - 601A0 - 0 - 0

Type

FLKS = fluid / air cooling system

Size

Speed control (open-loop / closed-loop)

EC3 = speed control, closed-loop (with PID controller)
EC5 = speed control, open-loop (with temperature sensor)

Type code

Operating fluid

W = water-glycol (standard)

Pump

601 = version with pump 601
H2 - 4 = version with pump MTH2 - 4
Other pumps on request.

Motor voltage

A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601)
200 - 240 V - 50 / 60 Hz, 1PH (fan) = 380 - 415 V - 50 Hz / 380 - 440
B V - 60 Hz, 3PH (pump MTH2-4) 200 - 240 V - 50 / 60 Hz, 1PH (fan)

See electrical data.

Position of pump connection

0 = standard

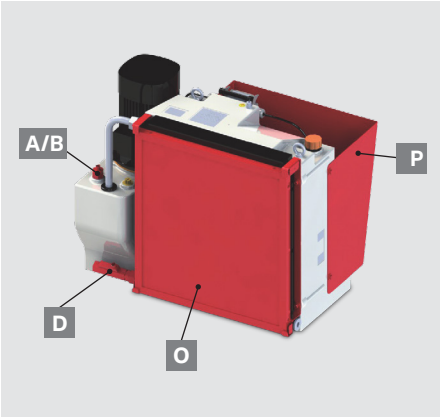
Coating

0 = none
(FLKS-2: white plastic tank housing)

Accessories

0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch			●									●
B	Fill level switch 2 switch points			●					●			●	
D	Flow switch				●			●			●		
O	Air filter					●		●	●	●	●	●	●
P Air duct							●	●		●		●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

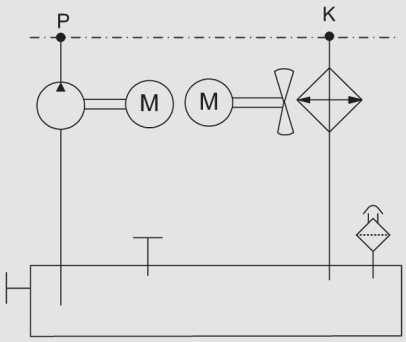
See also “Accessories for FLKS” for more information.

FLKS-2EC standard

Part no.	Designation	Pump	Version
3900715	FLKS-2EC3/1.0/W/601A0/0/0	601	No accessories, speed control
3951357	FLKS-2EC3/1.0/W/H2-4B0/0/0	MTH2-4	No accessories, speed control

Fluid/Air Cooling Systems
FLKS-3S

Symbol



General

The **FLKS-3S is a compact fluid / air cooling system with a plastic tank housing and integrated air duct. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium.

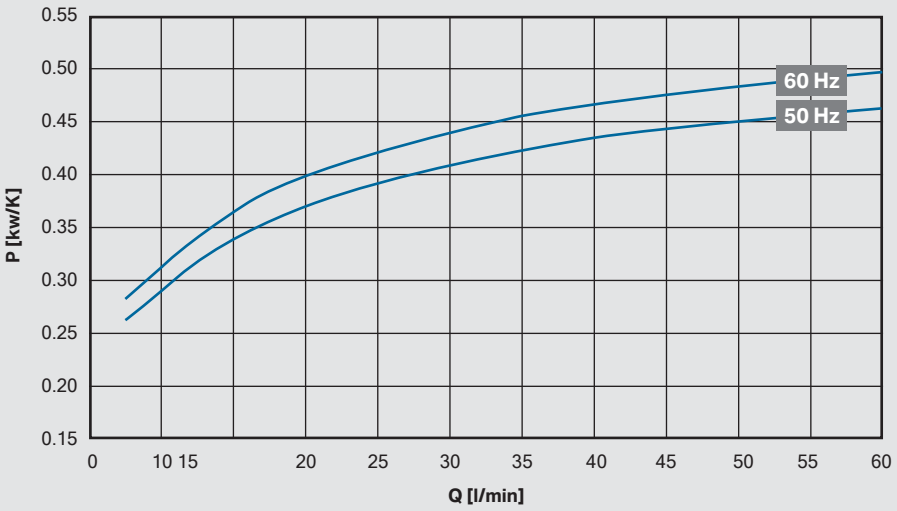
Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.46 kW/K (see cooling capacity diagram)
Flow rate	5 - 40 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	20.0 - 28.5 l
Weight	Max. 45 kg
Noise (acoustic pressure)	64 / 67 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector (connection via terminal box available upon request).
Mounting position	Pump vertical
Accessories	• Air filter • Air duct □☞♓●● ●♏❖♏● ♦♦♓♦♍♒ □☞♓●● ●♏❖♏● ♋■♎ ♦♏❍◘♏❒♋♦◆❒♏ ♦♦♓♦♍♒ □☞●□♦ ♦♦♓♦♍♒ Combinations and other accessories upon request.

Cooling capacity



Cooling capacity tolerance: ± 5%

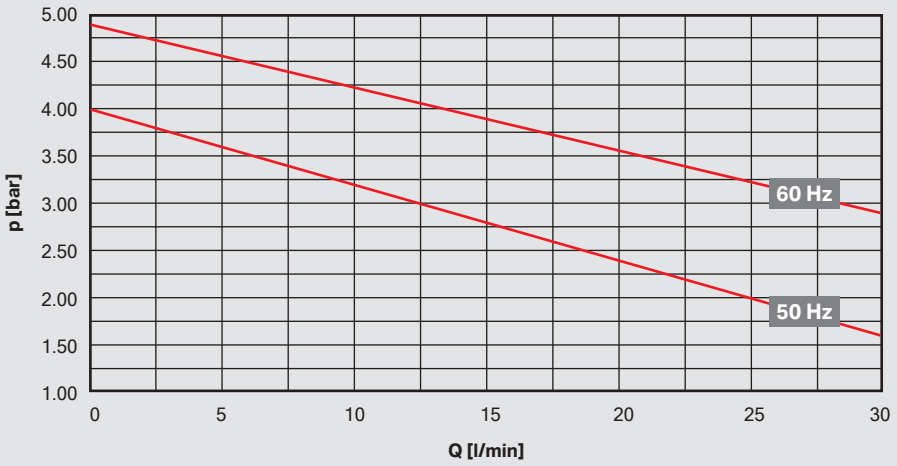
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



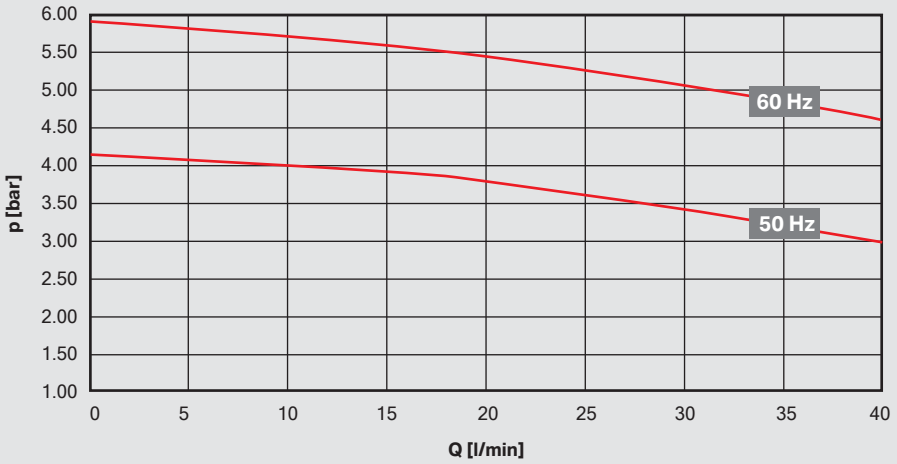
Operating range: 5 - 30 l/min

Electrical data:

Permissible voltage range:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.17 / 0.23 kW

MTH2-4 pump version



Operating range: 10 - 40 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

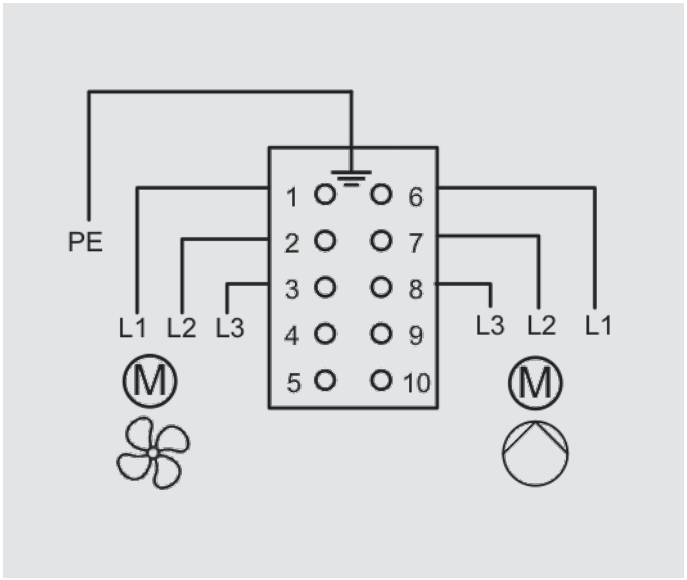
Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.62 / 0.90 kW
Fan: 0.17 / 0.23 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements).
In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

Electrical connection

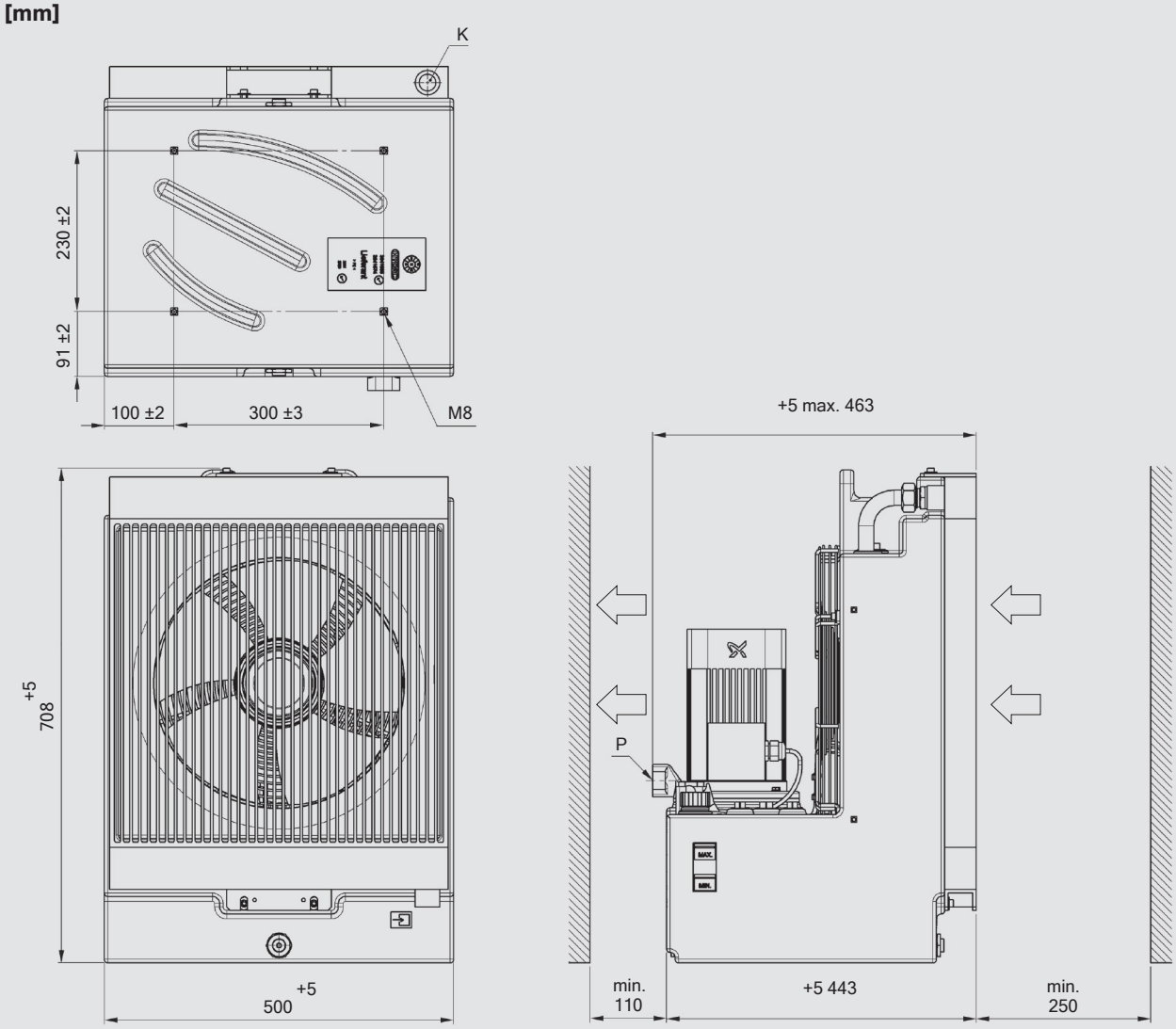


The motor is usually electrically connected using a heavy-duty connector.

E.g. Harting housing 09300101541 and insert 09330102716.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 3S - 3.0 - W - 601A0 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Type code

Operating medium
W = water-glycol (standard)

Pump
601 = version with pump 601
H2 - 4 = version with pump MTH2 - 4
Other pumps on request.

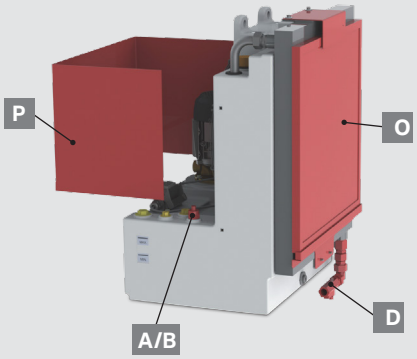
Motor voltage
A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601)
B = 380 - 415 V - 50 Hz / 380 - 440 V - 60 Hz, 3PH (pump MTH2-4)
See also “electrical data”.

Position of pump connection
0 = standard

Coating
0 = none
(FLKS-3: white plastic tank housing)

Accessories
0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch			●									●
B Fill level switch 2 switch points				●				●			●	
D	Flow switch				●			●			●		
O	Air filter					●		●	●	●	●	●	●
P	Air duct						●	●		●		●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

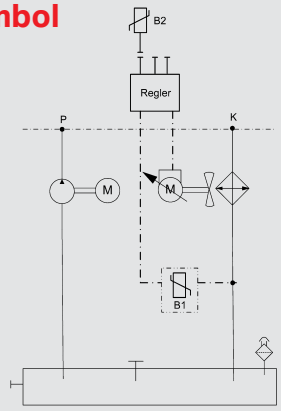
See also “Accessories for FLKS” for more information.

FLKS-3S standard

Part no.	Designation	Pump	Version
3991017	FLKS-3S/3.0/W/601A0/0/0	601	No accessories, fixed speed
3991211	FLKS-3S/3.0/W/H2-4B0/0/0	MTH2-4	No accessories, fixed speed

Fluid/Air Cooling Systems
FLKS-3EC with speed control

Symbol



General

The **FLKS-3EC is a compact fluid / air cooling system with a plastic tank housing, integrated air duct, pump and variable-speed fan. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium. The speed can vary depending on the application.

Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.50 kW/K (see cooling capacity diagram)
Flow rate	5 - 40 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	20.0 - 28.5 l
Weight	Max. 45 kg
Noise (acoustic pressure)	< 67 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector.
Mounting position	Pump vertical
Accessories	Fill level and temperature switch Flow switch Combinations and other accessories upon request.

Speed control

The temperature sensor of the **FLKS-3EC5 measures the water-glycol outlet temperature from the cooling system. The sensor's 0 – 10 V analogue signal is assigned a temperature range of 25 – 45 °C. The signal is forwarded to the EC fan according to the measured fluid outlet temperature to control the speed. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).**
Even at low ambient temperatures, the fluid temperature cannot drop below 28 °C given constant power input. This prevents condensation on electrical components.

Application:

Specially suited for low air temperatures, e.g. outdoors.

Speed control

The **FLKS-3EC3 also comes with a PID controller (closed loop). The temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the reference value (ambient temperature + set differential D ΔT). THE PID CONTROLLER CONTINUALLY ADJUSTS THE SPEED OF THE FAN, IN ORDER TO ALIGN THE FLUID TEMPERATURE WITH THE AMBIENT TEMPERATURE.**
The outlet temperature remains at a set differential above the ambient temperature regardless of the input temperature of the fluid (performance of the machine).

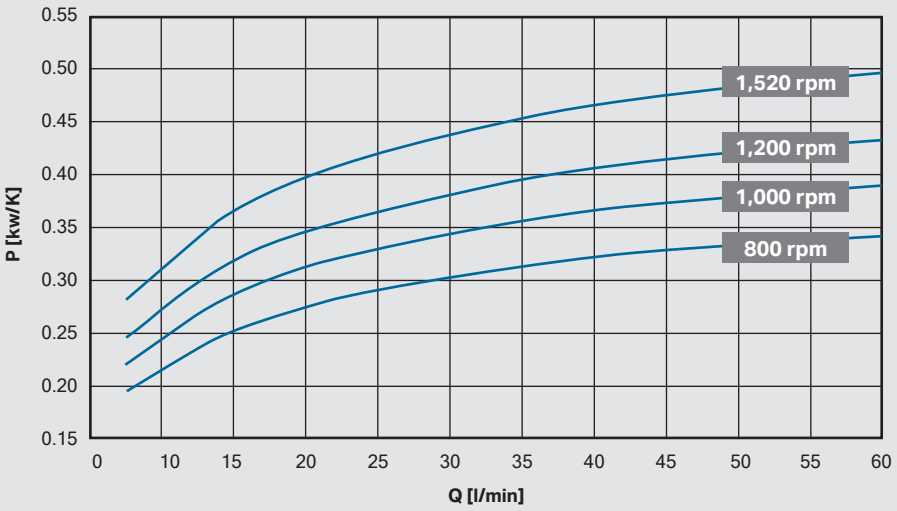
Application:

Particularly for precision cooling (e.g. in machine tools).

Lower fan speed

= lower sound level
= lower power consumption
= lower contamination

Cooling capacity



Cooling capacity tolerance: ± 5%

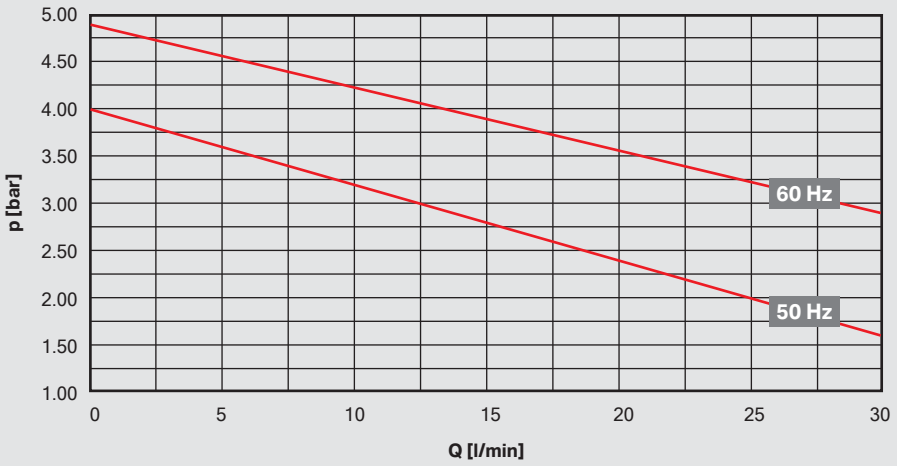
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



Operating range: 5 - 30 l/min

Electrical data:

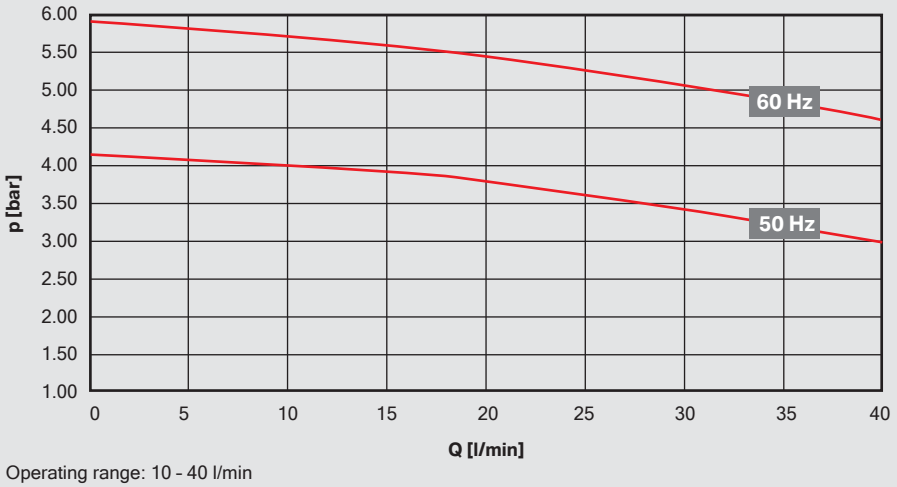
Permitted voltage range:

Pump:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Fan:
200 - 240 V - 50/60 Hz - 1 PH
Voltage tolerance ± 10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.165 kW

MTH2-4 pump version



Operating range: 10 - 40 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permitted voltage range:

Pump:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Fan:
200 - 240 V - 50 / 60 Hz - 1 PH
Voltage tolerance ± 10 %

Motor capacity (50 / 60 Hz):
Pump: 0.62 / 0.90 kW
Fan: 0.165 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

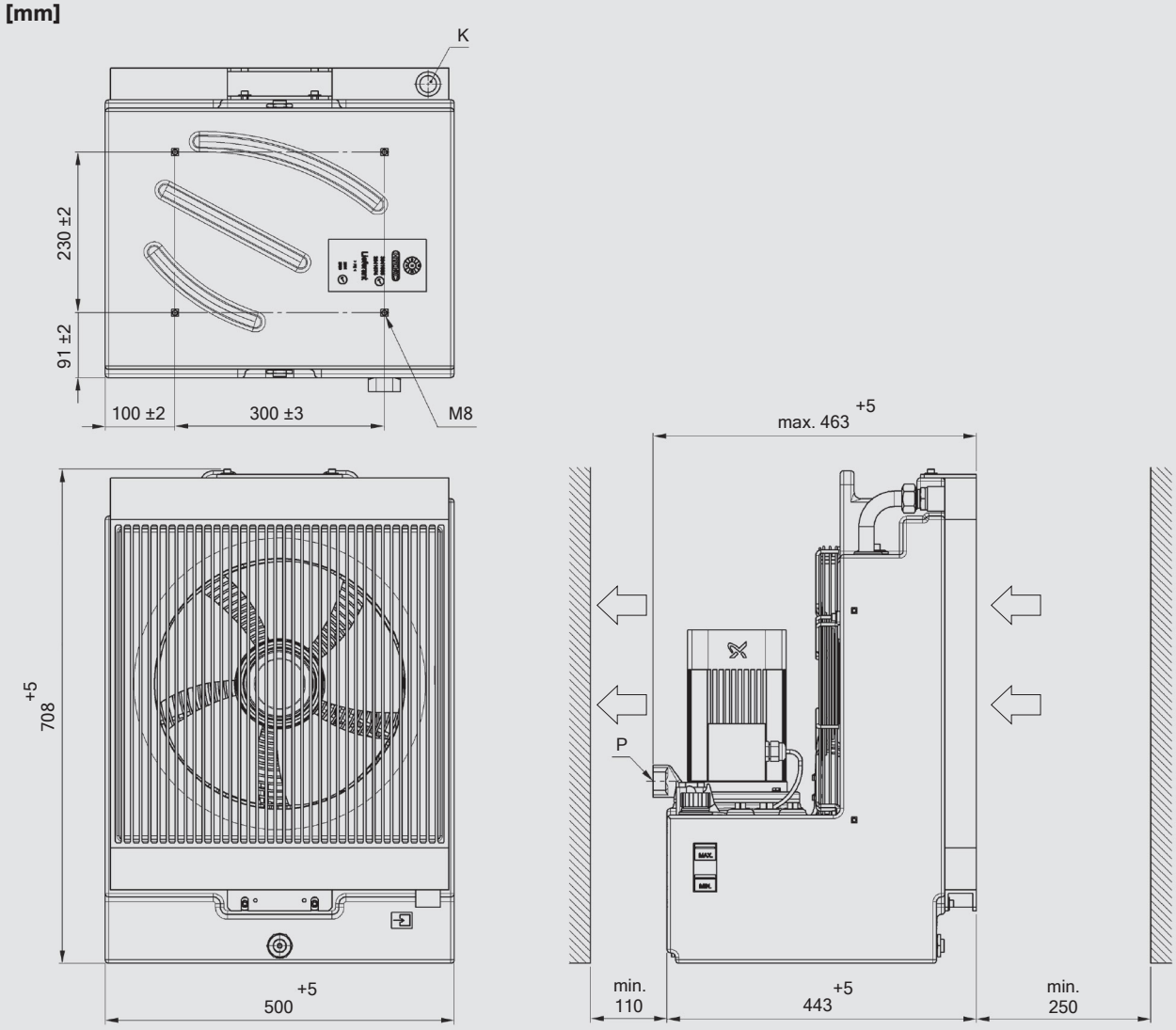
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

Additional 24 V DC control voltage, more information available upon request.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 3 - EC3 - 3.0 - W - 601A0 - 0 - 0

Type

FLKS = fluid / air cooling system

Size

Speed control (open-loop / closed-loop)

EC3 = speed control, closed-loop (with PID controller)
EC5 = speed control, open-loop (with temperature sensor)

Type code

Operating fluid

W = water-glycol (standard)

Pump

601 = version with pump 601
H2 - 4 = version with pump MTH2 - 4
Other pumps on request.

Motor voltage

A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601)
200 - 240 V - 50 / 60 Hz, 1PH (fan) = 380 - 415 V - 50 Hz / 380 - 440
B V - 60 Hz, 3PH (pump MTH2-4) 200 - 240 V - 50 / 60 Hz, 1PH (fan)

See also electrical data.

Position of pump connection

0 = standard

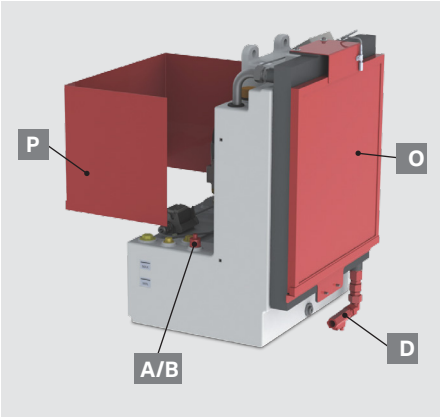
Coating

0 = none
(FLKS-3: white plastic tank housing)

Accessories

0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch B Fill level switch 2 switch points		●										●
			●					●			●	
D Flow switch				●			●			●		
O Air filter					●		●	●	●	●	●	●
P Air duct						●	●		●		●	
Accessory number	**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

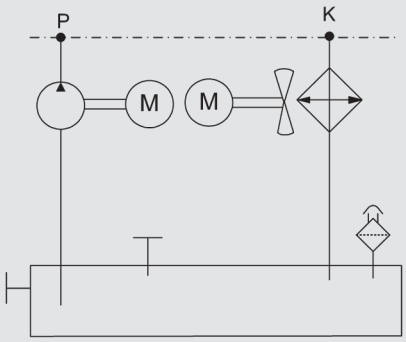
See also “Accessories for FLKS” for more information.

FLKS-3EC standard

Part no.	Designation	Pump	Version
3980425	FLKS-3EC3/3.0/W/601A0/0/0	601	No accessories, speed control
4009719	FLKS-3EC3/3.0/W/H2-4B0/0/0	MTH2-4	No accessories, speed control

Fluid/Air Cooling Systems
FLKS-4S

Symbol



General

The **FLKS-4S is a compact fluid / air cooling system with a plastic tank housing and integrated air duct. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium.

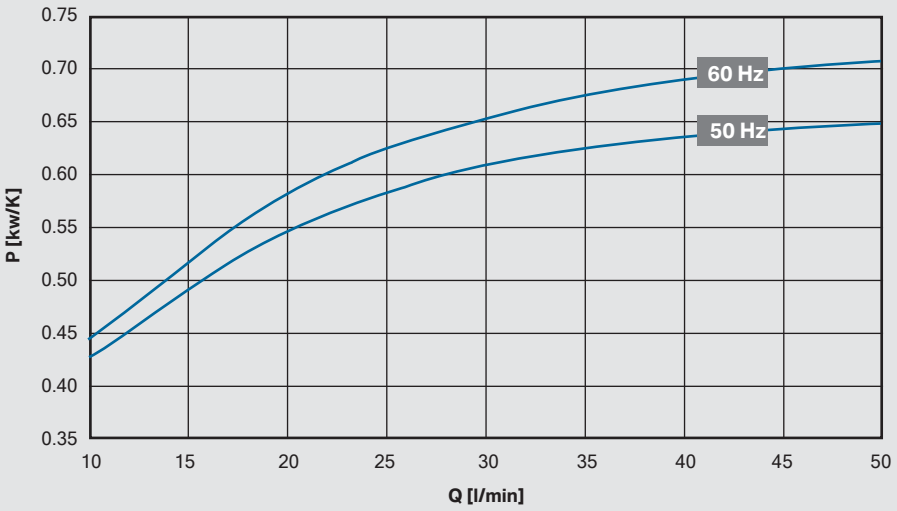
Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.65 kW/K (see cooling capacity diagram)
Flow rate	5 - 55 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	31.0 - 43.0 l
Weight	Max. 49 kg
Noise (acoustic pressure)	69 / 72 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector (connection via terminal box available upon request).
Mounting position	Pump vertical
Accessories	• Air filter • Air duct □☞♓●● ●♏❖♏● ♦♦♓♦♍♒ □☞♓●● ●♏❖♏● ♋■♎ ♦♏❍◘♏❒♋◆◆❒♏ ♦♦♓♦♍♒ □☞●□♦ ♦♦♓♦♍♒ Combinations and other accessories upon request.

Cooling capacity



Cooling capacity tolerance: ± 5%

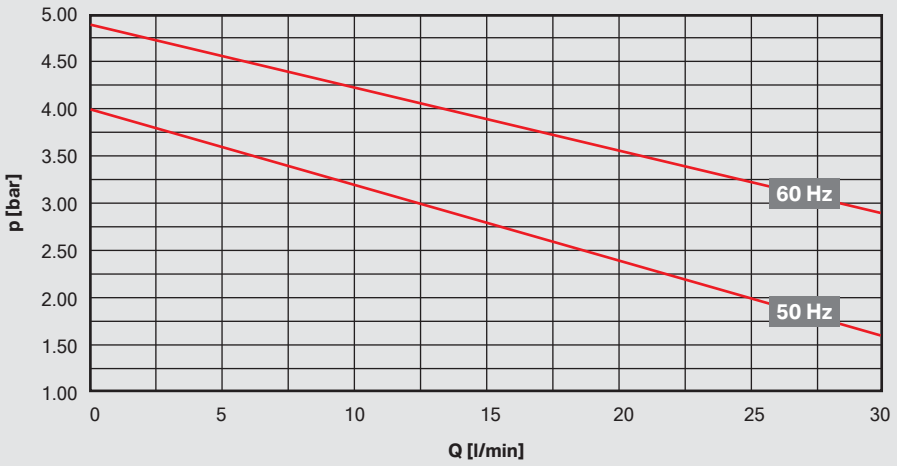
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



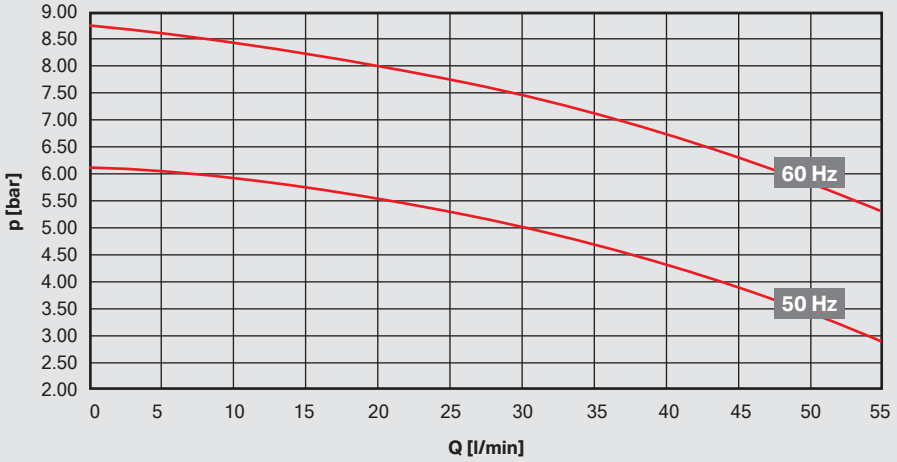
Operating range: 5 - 30 l/min

Electrical data:

Permissible voltage range:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.45 / 0.70 kW

MTH2-6 pump version



Operating range: 15 - 55 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

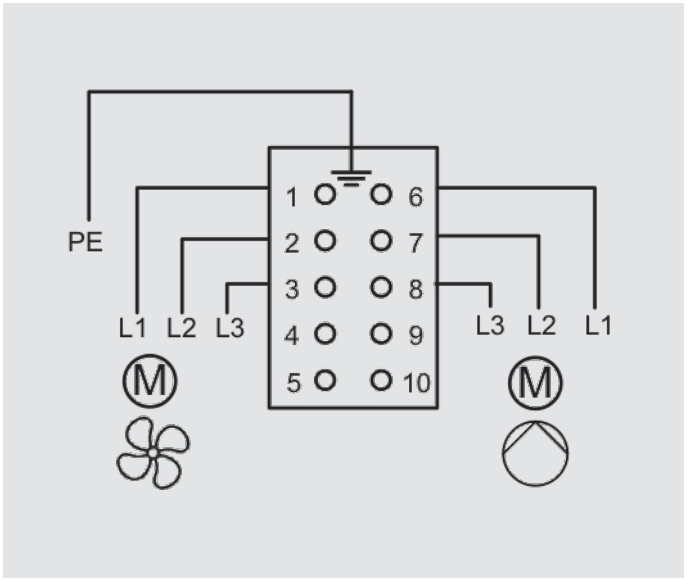
Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.845 / 1.28 kW
Fan: 0.45 / 0.70 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

Electrical connection

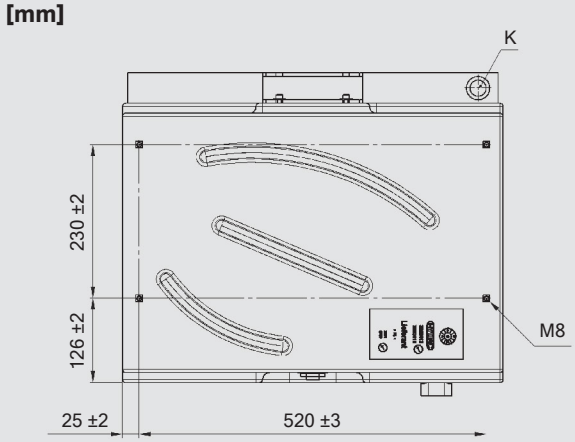


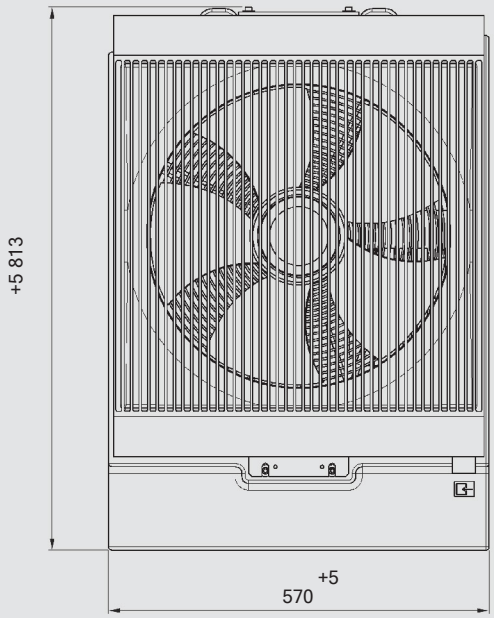
The motor is usually electrically connected using a heavy-duty connector.

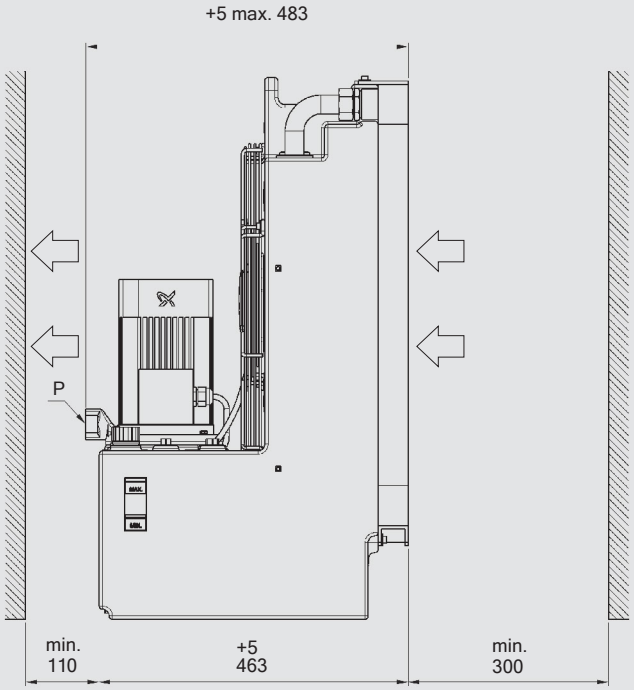
E.g. Harting housing 09300101541 and insert 09330102716.

Dimensions

[mm]







Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 4S - 2.0 - W - 601A0 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Type code

Operating fluid
W = water-glycol (standard)

Pump
601 = version with pump 601
H2 - 6 = version with pump MTH2 - 6
Other pumps on request.

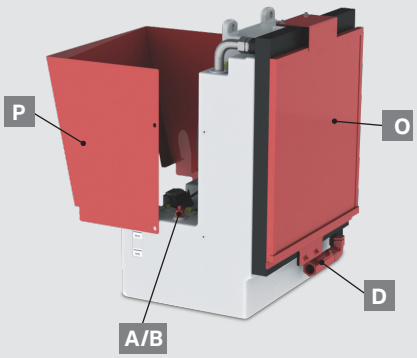
Motor voltage
A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601)
B = 380 - 415 V - 50 Hz / 380 - 440 V - 60 Hz, 3PH (pump MTH2-6)
See also “electrical data”.

Position of pump connection
0 = standard

Coating
0 = none
(FLKS-4: white plastic tank housing)

Accessories
0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch			●									●
B	Fill level switch 2 switch points			●					●			●	
D	Flow switch				●			●			●		
O Air filter						●		●	●	●	●	●	●
P	Air duct							●	●		●	●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

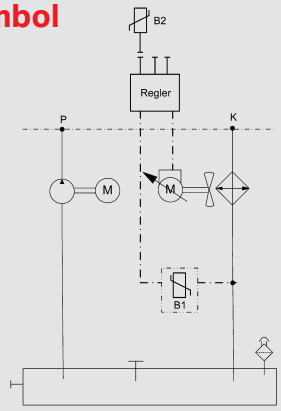
See also “Accessories for FLKS” for more information.

FLKS-4S standard

Part no.	Designation	Pump	Version
3951597	FLKS-4S/2.0/W/601A0/0/0	601	No accessories, fixed speed
3932404	FLKS-4S/2.0/W/H2-6B0/0/0	MTH2-6	No accessories, fixed speed

Fluid/Air Cooling Systems
FLKS-4EC with speed control

Symbol



General

The **FLKS-4EC is a compact fluid / air cooling system with a plastic tank housing, integrated air duct, pump and variable-speed fan. This lightweight and robust design makes it suitable for diverse applications.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium. The speed can vary depending on the application.

Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 0.70 kW/K (see cooling capacity diagram)
Flow rate	5 - 55 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	31.0 - 43.0 l
Weight	Max. 47 kg
Noise (acoustic pressure)	< 71 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G¾" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector.
Mounting position	Pump vertical
Accessories	Fill level and temperature switch ● Flow switch Combinations and other accessories upon request.

Speed control

The temperature sensor of the **FLKS-4EC5 measures the water-glycol outlet temperature from the cooling system. The sensor's 0 – 10 V analogue signal is assigned a temperature range of 25 – 45 °C. The signal is forwarded to the EC fan according to the measured fluid outlet temperature to control the speed. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).**
Even at low ambient temperatures, the fluid temperature cannot drop below 28 °C given constant power input. This prevents condensation on electrical components.

Application:

Specially suited for low air temperatures, e.g. outdoors.

Speed control

The **FLKS-4EC3 also comes with a PID controller (closed loop). The temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the reference value (ambient temperature + set differential D ΔT). THE PID CONTROLLER CONTINUALLY ADJUSTS THE SPEED OF THE FAN, IN ORDER TO ALIGN THE FLUID TEMPERATURE WITH THE AMBIENT TEMPERATURE.**
The outlet temperature remains at a set differential above the ambient temperature regardless of the input temperature of the fluid (performance of the machine).

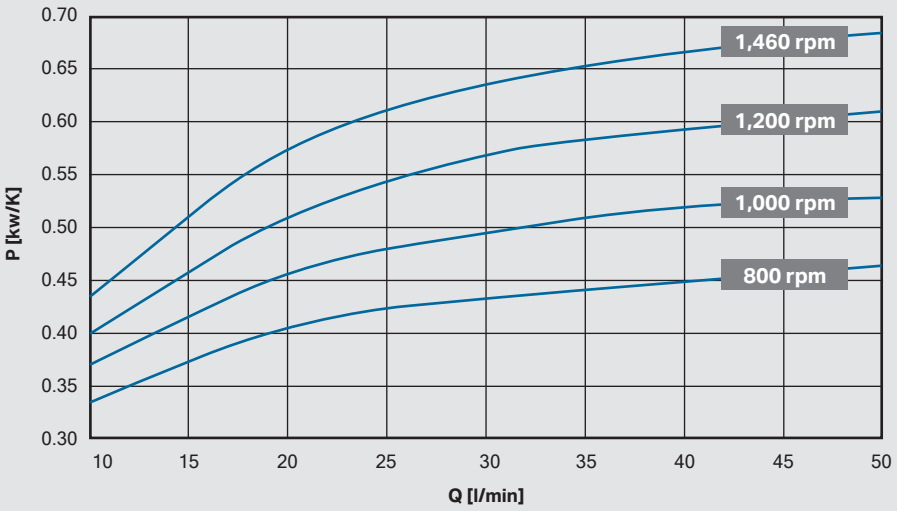
Application:

Particularly for precision cooling (e.g. in machine tools).

Lower fan speed

= lower sound level
= lower power consumption
= lower contamination

Cooling capacity



Cooling capacity tolerance: ± 5%

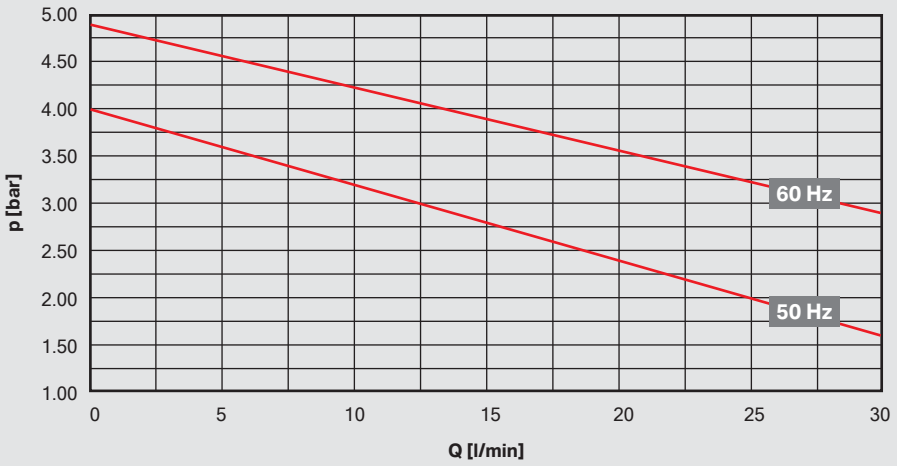
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

601 pump version



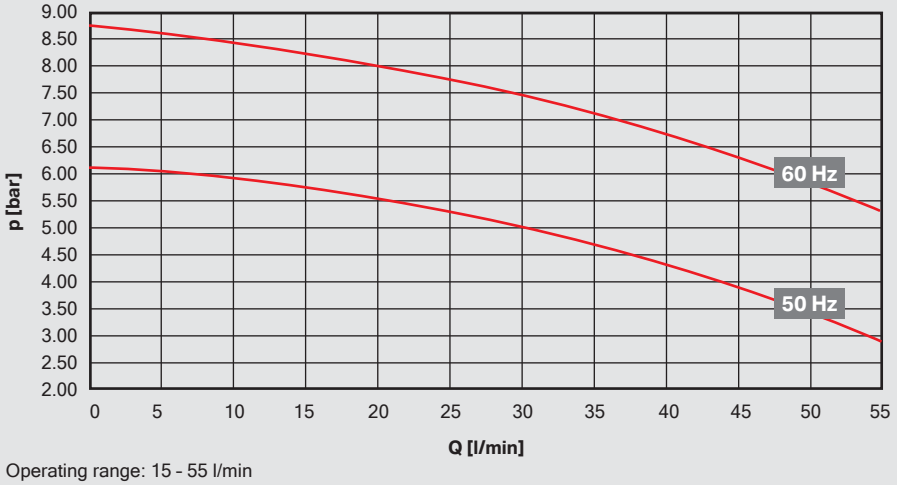
Operating range: 5 - 30 l/min

Electrical data:

Permissible voltage range:
380 - 420 V - 50 Hz - 3 PH
400 - 480 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.50 / 0.70 kW
Fan: 0.53 kW

MTH2-6 pump version



Operating range: 15 - 55 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH 380 - 440 V - 60 Hz - 3 PH Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.845 / 1.28 kW
Fan: 0.53 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

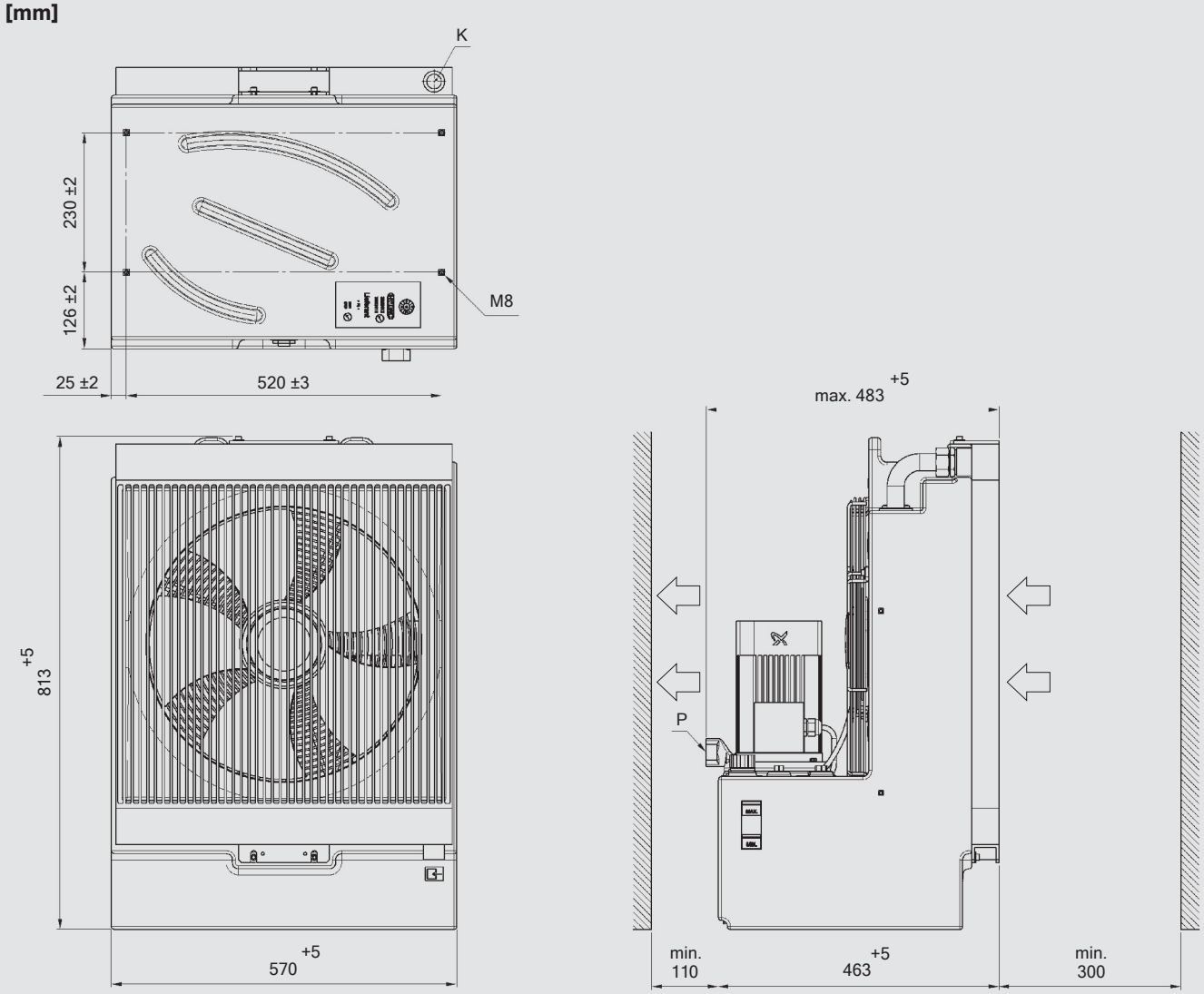
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

Additional 24 V DC control voltage, more information available upon request.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 4 - EC3 - 2.0 - W - 601A0 - 0 - 0

Type

FLKS = fluid / air cooling system

Size

Speed control (open-loop / closed-loop)

EC3 = speed control, closed-loop (with PID controller)
EC5 = speed control, open-loop (with temperature sensor)

Type code

Operating fluid

W = water-glycol (standard)

Pump

601 = version with pump 601
H2 - 6 = version with pump MTH2 - 6
Other pumps on request.

Motor voltage

A = 380 - 420 V - 50 Hz / 400 - 480 V - 60 Hz, 3PH (pump 601)
B = 380 - 415 V - 50 Hz / 380 - 440 V - 60 Hz, 3PH (pump MTH2-6)
See also “electrical data”.

Position of pump connection

0 = standard

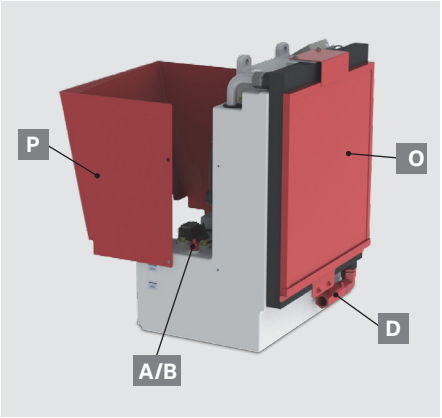
Coating

0 = none
(FLKS-4: white plastic tank housing)

Accessories

0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch B Fill level switch 2 switch points			●									●
				●				●			●	
D	Flow switch				●			●			●		
O Air filter						●		●	●	●	●	●	●
P	Air duct							●	●		●	●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

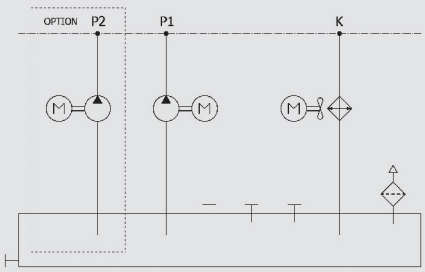
See also “Accessories for FLKS” for more information.

FLKS-4EC standard

Part no.	Designation	Pump	Version
3902038	FLKS-4EC3/2.0/W/601A0/0/0	601	No accessories, speed control
3901788	FLKS-4EC3/2.0/W/H2-6B0/0/0	MTH2-6	No accessories, speed control

Fluid/Air Cooling Systems
FLKS-5S/3.x

Symbol



General

The **FLKS-5S is a compact fluid/air cooling system with a plastic tank housing and integrated air duct. This lightweight and robust design makes it suitable for diverse applications.**

For the optional version with two pumps, two cooling circuits with different functions (flow / pressure loss) can be operated.

Function

The pump conveys the operating fluid from the plastic reservoir over the parts being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium.

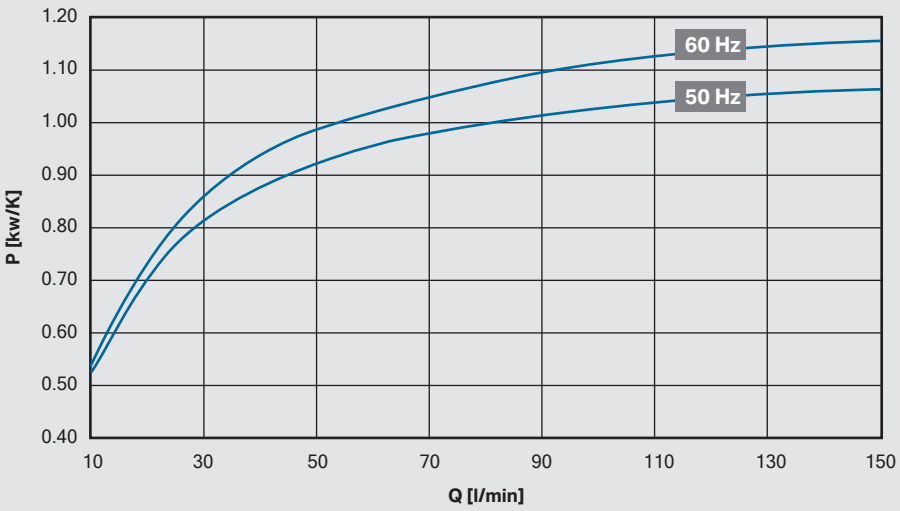
Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 1.05 kW/K (see cooling capacity diagram)
Flow rate	5 - 100 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	55.0 - 70.0 l
Weight	65 kg
Noise (acoustic pressure)	69 / 71 dB(A) at 50 / 60 Hz (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G1" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector (connection via terminal box available upon request).
Mounting position	Pump vertical
Accessories	• Air filter • Air duct □☞♓●● ●♏❖♏● ⬧⬧♓♦♍♒ □ ☞♓●● ●♏❖♏● ♋■♎ ♦♏❍◘♏❒♋◆❒♏ ⬧⬧♓♦♍♒ □☞●□⬧ ⬧⬧♓♦♍♒ ♑□❍♌♓■♋♦♓□■⬧ ♋■♎ □♦♒♏❒ ♋♍♍♏⬧⬧□❒♓♏⬧ ◆□□■ ❒♏❑◆♏⬧♦☞

Cooling capacity



Cooling capacity tolerance: ± 5%

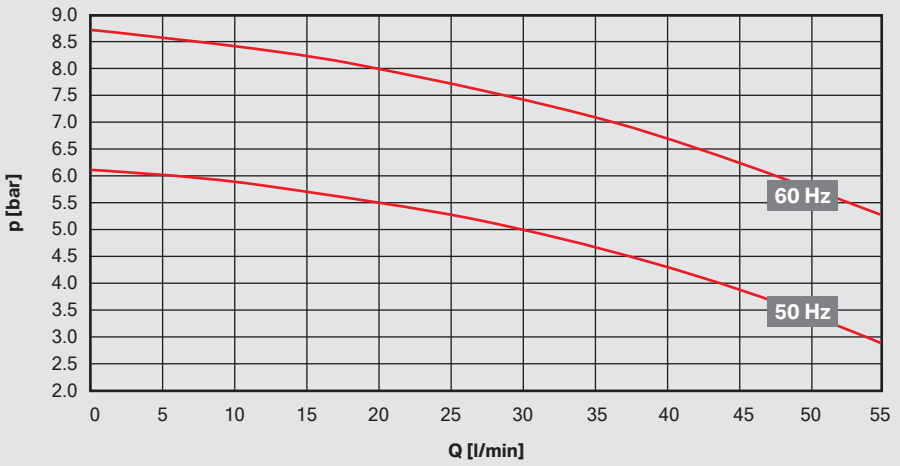
The cooling capacity is calculated via the following formula:

$P\ [kW] = P_{spec.}\ [kW/K] \times ITD\ [K]$

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

MTH2-6 pump version



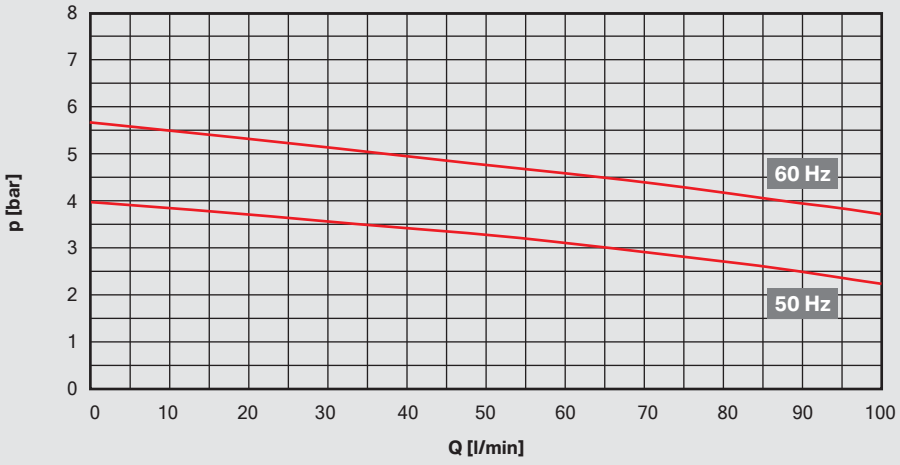
Operating range: 5 - 55 l/min

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.845 / 1.28 kW
Fan: 0.45 / 0.70 kW

MTH4-4 pump version



Operating range: 5 - 70 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.96 / 1.51 kW
Fan: 0.45 / 0.70 kW

The version with two pumps is available on request.

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

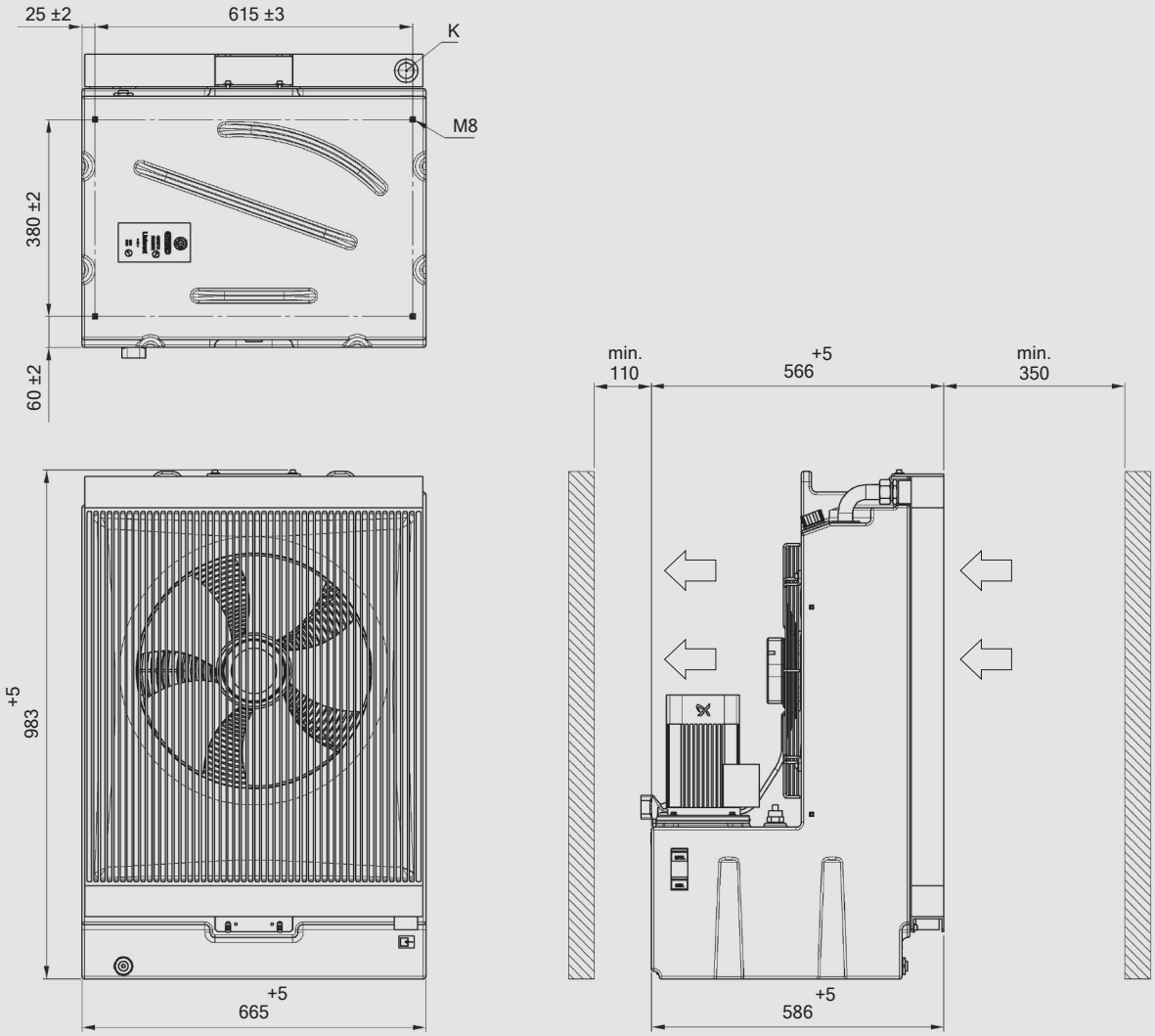
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

For PIN configuration see the data sheet or electric diagram of the FLKS.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 5S - 3.0 - W - H4-4B0 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Type code

Operating fluid
W = water-glycol (standard)

Pump
H2-6 = version with pump MTH2-6
H4-4 = version with pump MTH4-4
Version with two pumps on request.

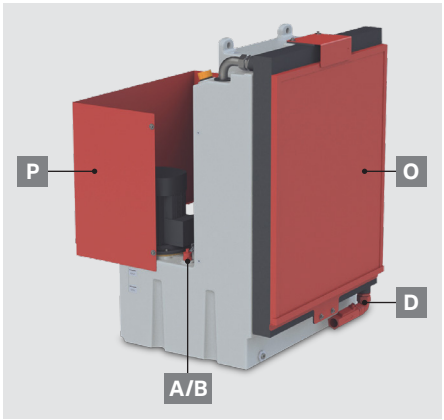
Motor voltage
B = 380 - 415 V - 50 Hz / 380 - 440 V - 60 Hz, 3PH (pump MTH2-6 and pump MTH4-4)
See also “electrical data”.

Position of pump connection
0 = standard

Coating
0 = none
(FLKS-5: white plastic tank housing)

Accessory number
0 = none (standard)
For corresponding accessory number, see table.

Accessories



A Fill level and 60 °C temperature switch		●										●
B Fill level switch 2 switch points			●					●			●	
D Flow switch				●			●			●		
O Air filter					●		●	●	●	●	●	●
P Air duct						●	●		●		●	
Accessory number	**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

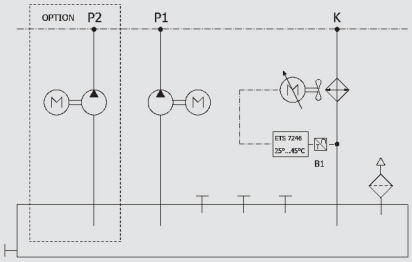
See also “Accessories for FLKS” for more information.

FLKS-5S/3.x standard

Part no.	Designation	Pump	Version
4143591	FLKS-5S/3.0/W/H2-6B0/0/0	MTH2-6	No accessories, fixed speed
4143682	FLKS-5S/3.0/W/H4-4B0/0/0	MTH4-4	No accessories, fixed speed

Fluid/Air Cooling Systems
FLKS-5EC/3.x with speed control

Symbol



General

The **FLKS-5EC is a compact fluid / air cooling system with a plastic tank housing, integrated air duct, pump and variable-speed fan.** This lightweight and robust design makes it suitable for diverse applications.

For the optional version with two pumps, two cooling circuits with different functions (flow/pressure loss) can be operated.

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium. The speed can vary depending on the application.

Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 1.15 kW/K (see cooling capacity diagram)
Flow rate	5 - 100 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	55.0 - 70.0 l
Weight	Max. 64 kg
Noise (acoustic pressure)	< 71 dB(A) at max. drive speed (at 1 m)
Hydraulic connection	Pump P (flow): G¾" Heat exchanger K (return): G1" If possible, refrain from reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector.
Mounting position	Pump vertical
Accessories	Fill level and temperature switch Flow switch Combinations and other accessories upon request.

Speed control

The temperature sensor of the **FLKS-5EC5 measures the water-glycol outlet temperature from the cooling system. The sensor's 0 – 10 V analogue signal is assigned a temperature range of 25 – 45 °C. The signal is forwarded to the EC fan according to the measured fluid outlet temperature to control the speed. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).**
Even at low ambient temperatures, the fluid temperature cannot drop below 28 °C given constant power input. This prevents condensation on electrical components.

Application:

Specially suited for low air temperatures, e.g. outdoors.

Speed control

The **FLKS-5EC3 also comes with a PID controller (closed loop). The temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the reference value (ambient temperature + set differential D ΔT). THE PID CONTROLLER CONTINUALLY ADJUSTS THE SPEED OF THE FAN, IN ORDER TO ALIGN THE FLUID TEMPERATURE WITH THE AMBIENT TEMPERATURE.**
The outlet temperature remains at a set differential above the ambient temperature regardless of the input temperature of the fluid in the cooler (power of the machine).

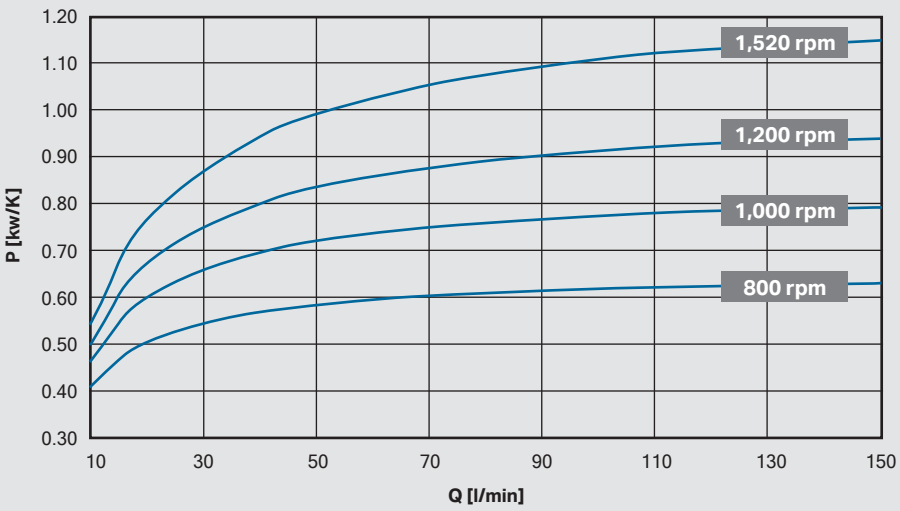
Application:

Particularly for precision cooling (e.g. in machine tools).

Lower fan speed

= lower sound level
= lower power consumption
= lower contamination

Cooling capacity



Cooling capacity tolerance: ± 5%

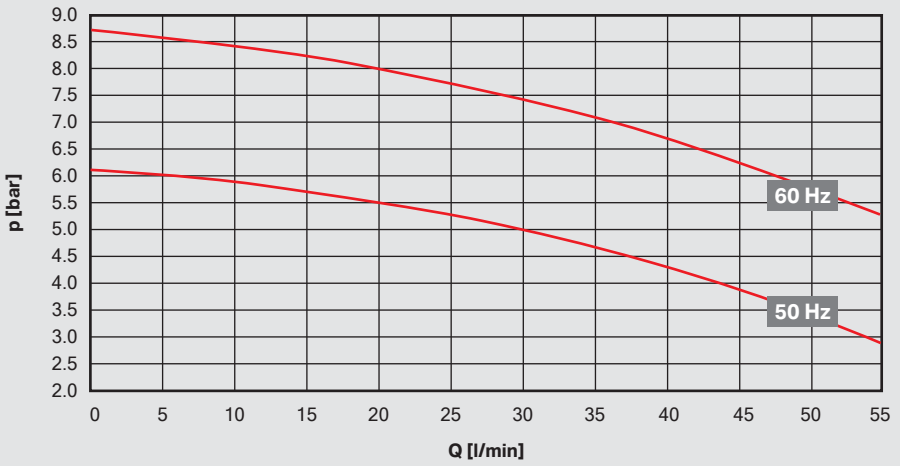
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

MTH2-6 pump version



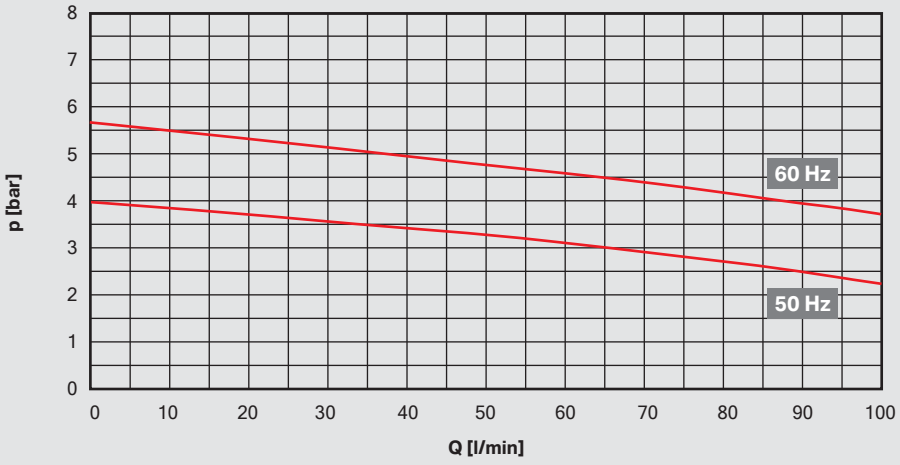
Operating range: 5 - 55 l/min

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
380 - 440 V - 60 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.845 / 1.28 kW
Fan: 0.45 / 0.70 kW

MTH4-4 pump version



Operating range: 5 - 70 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH 380 - 440 V - 60 Hz - 3 PH Voltage tolerance +5 % / -10 %

Motor capacity (50 / 60 Hz):
Pump: 0.96 / 1.51 kW
Fan: 0.45 / 0.70 kW

The version with two pumps is available on request.

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements). In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

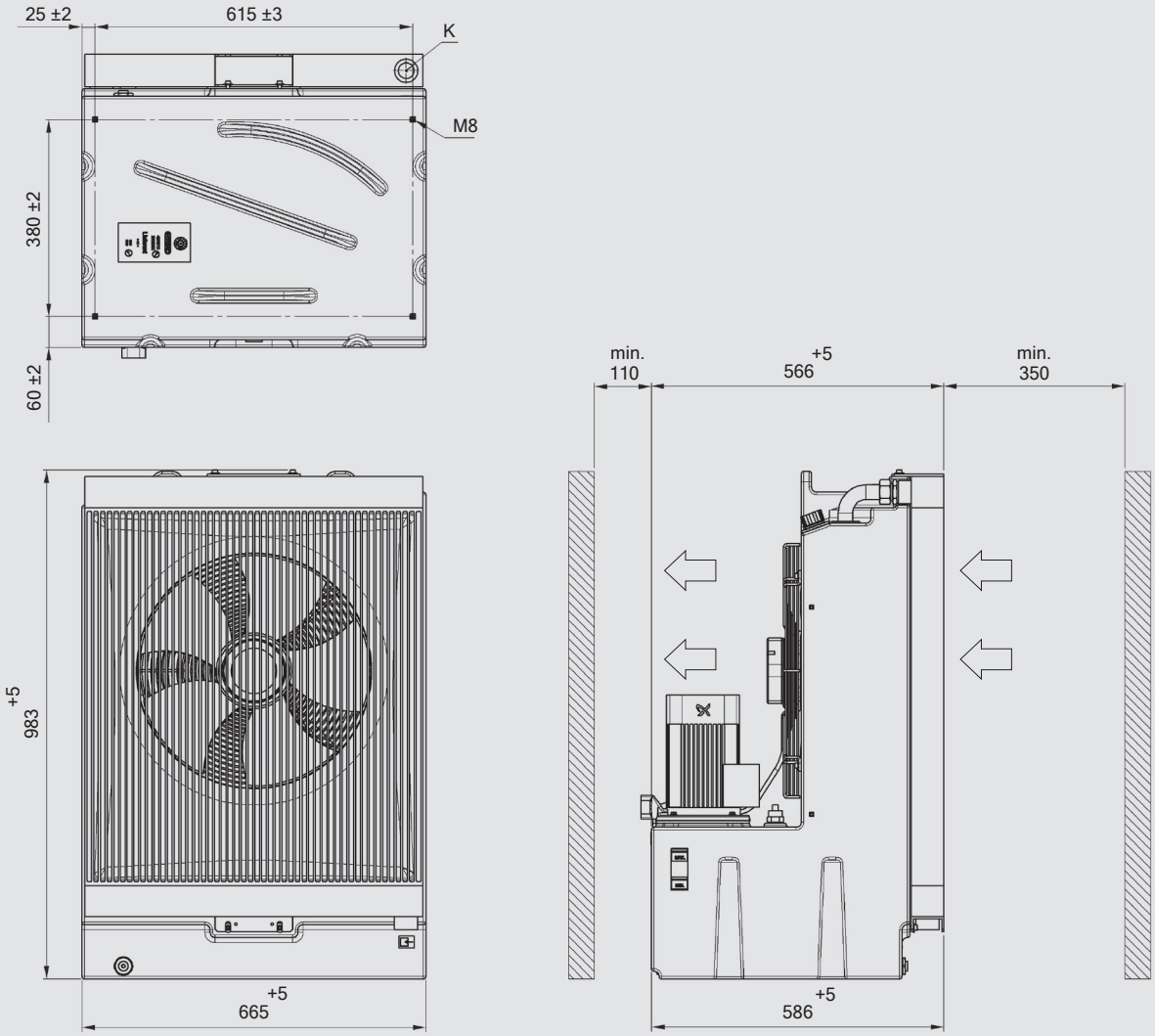
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

For PIN configuration see the data sheet or electric diagram of the FLKS.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 5 - EC3 - 3.0 - W - H4-4B0 - 0 - 0

Type
FLKS = fluid / air cooling system

Size

Speed control (open-loop / closed-loop)
EC3 = speed control, closed-loop (with PID controller)
EC5 = speed control, open-loop (with temperature sensor)

Type code

Operating fluid
W = water-glycol (standard)

Pump
H2-6 = version with pump MTH2-6
H4-4 = version with pump MTH4-4
Version with two pumps on request.

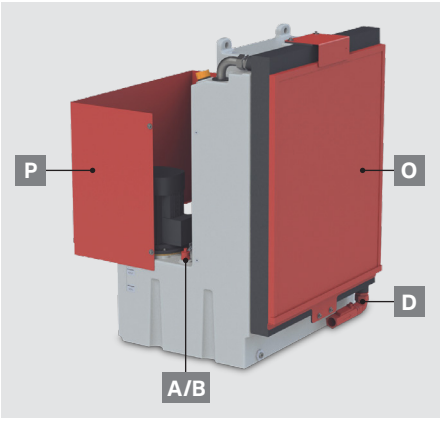
Motor voltage
B = 380 - 415 V - 50 Hz / 380 - 440 V - 60 Hz, 3PH (pump MTH2-6 and pump MTH4-4)
See also “electrical data”.

Position of pump connection
0 = standard

Coating
0 = none
(FLKS-5: white plastic tank housing)

Accessory number
0 = none (standard)
For corresponding accessory number, see table.

Accessories

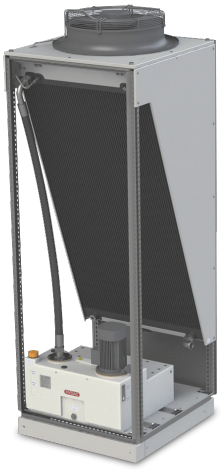


A	Fill level and 60 °C temperature switch		●									●
B	Fill level switch 2 switch points			●					●				
D	Flow switch				●			●			●		
O	Air filter					●		●	●	●	●	●	●
P	Air duct						●	●		●		●	
Accessory number		**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**

See also “Accessories for FLKS” for more information.

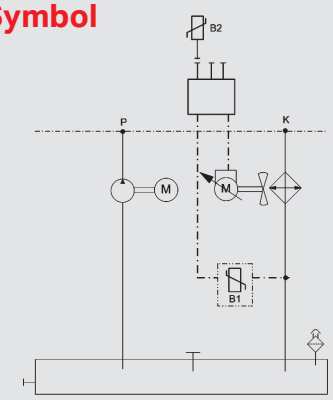
FLKS-5EC/3.x standard

Part no.	Designation	Pump	Version
4143685	FLKS-5EC3/3.0/W/H2-6B0/0/0	MTH2-6	Speed control
4143691	FLKS-5EC3/3.0/W/H4-4B0/0/0	MTH4-4	Speed control



Fluid/Air Cooling Systems
FLKS-8EC with speed control

Symbol



General

The **FLKS-8EC is a fluid/air cooling system with reversing pump, plastic tank, heat exchanger and variable-speed fan. This FLKS was specially designed for high flow rates and high cooling capacities.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium. The speed can vary depending on the application.

Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

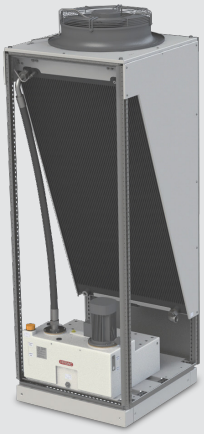
Technical data

Cooling capacity	Max. 2.00 kW/K (see cooling capacity diagram)
Flow rate	max. 150 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	70 / 110 l
Weight	Max. 235 kg (open version) Max. 275 kg (closed version)
Noise (acoustic pressure)	< 77 dB(A) at max. drive speed (at 1 m)
Hydraulic connection	Pump P (flow): G¾" / G2"
	Heat exchanger K (return): G1¼" If possible, refrain from
	reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector.
Mounting position	Pump vertical
Accessories	Combinations and other accessories upon request.

Versions

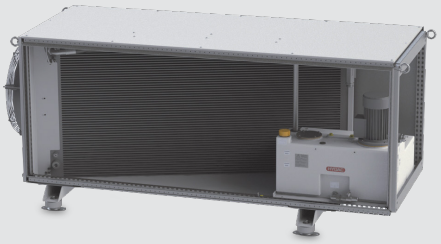
In addition to the standard upright and open version, the FLKS-8EC is also available with a closed housing and in a horizontal version.

Open version, upright



Closed version, upright

Open version, horizontal



Speed control

The temperature sensor of the **FLKS-8EC5 measures the water-glycol outlet temperature from the cooling system. The sensor's 0 – 10 V analogue signal is assigned a temperature range of 25 – 45 °C. The signal is forwarded to the EC fan according to the measured fluid outlet temperature to control the speed. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).**
Even at low ambient temperatures, the fluid temperature cannot drop below 28 °C given constant power input. This prevents condensation on electrical components.

Application:

Specially suited for low air temperatures, e.g. outdoors.

Speed control

The **FLKS-8EC3 also comes with a PID controller (closed loop). The temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the reference value (ambient temperature + set differential D ΔT). THE PID CONTROLLER CONTINUALLY ADJUSTS THE SPEED OF THE FAN, IN ORDER TO ALIGN THE FLUID TEMPERATURE WITH THE AMBIENT TEMPERATURE.**
The outlet temperature remains at a set differential above the ambient temperature regardless of the input temperature of the fluid in the cooler (power of the machine).

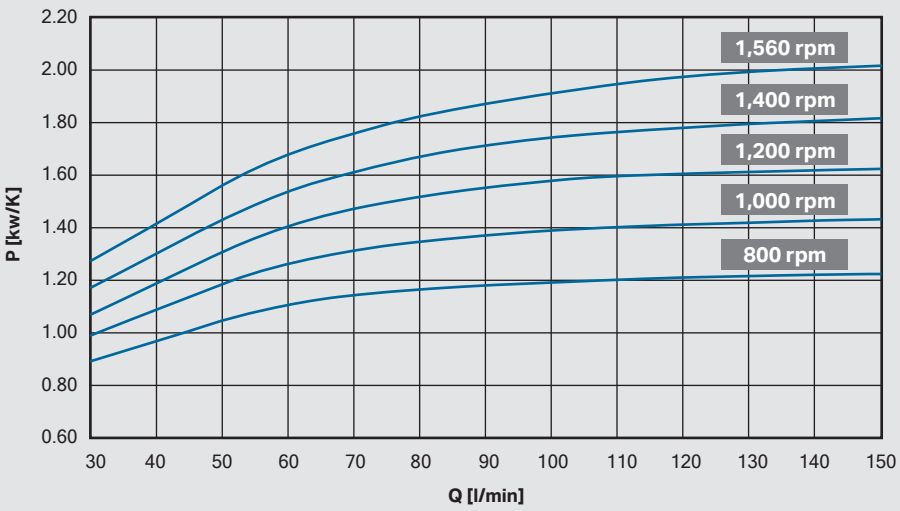
Application:

Particularly for precision cooling (e.g. in machine tools).

Lower fan speed

= lower sound level
= lower power consumption
= lower contamination

Cooling capacity



Cooling capacity tolerance: ± 5%

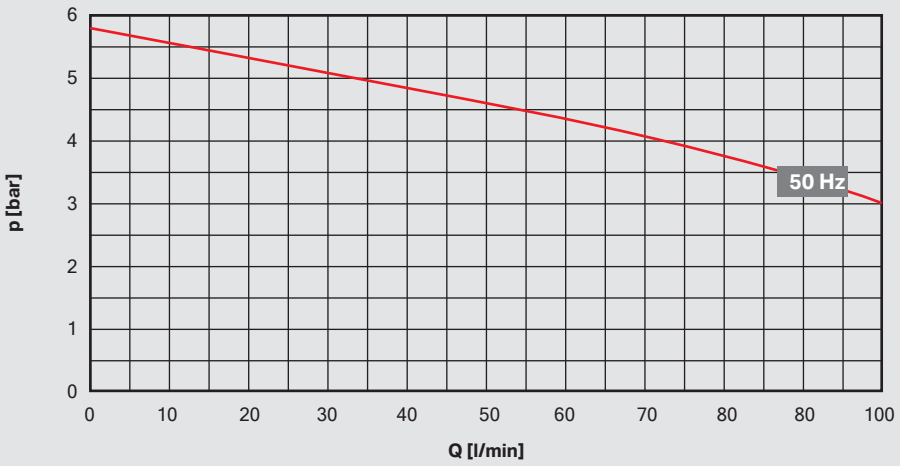
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

MTH4-6 pump version

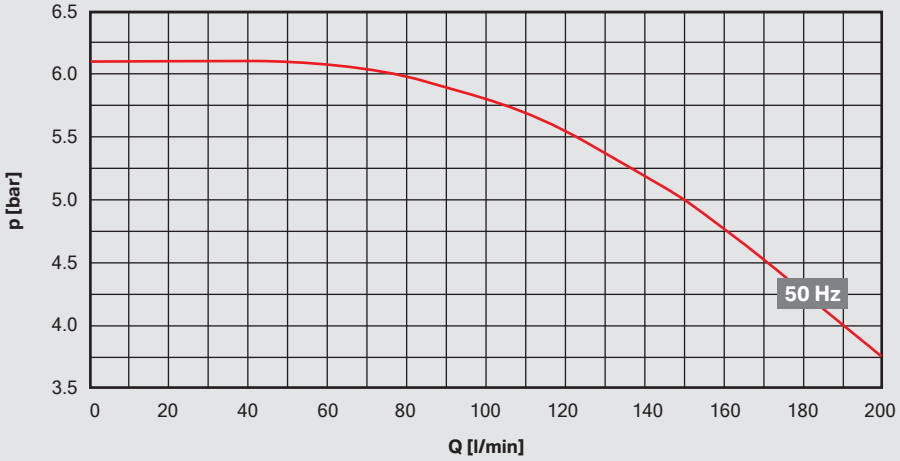


Operating range: 30 - 100 l/min

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
Voltage tolerance +5 % / -10 %
Motor capacity (50 Hz):
Pump: 1.34 kW
Fan: 0.98 kW

MTR10-6 pump version



Operating range: 35 - 150 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
Voltage tolerance +5 % / -10 %

Motor capacity (50 Hz):
Pump: 2.20 kW
Fan: 0.98 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements).
In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

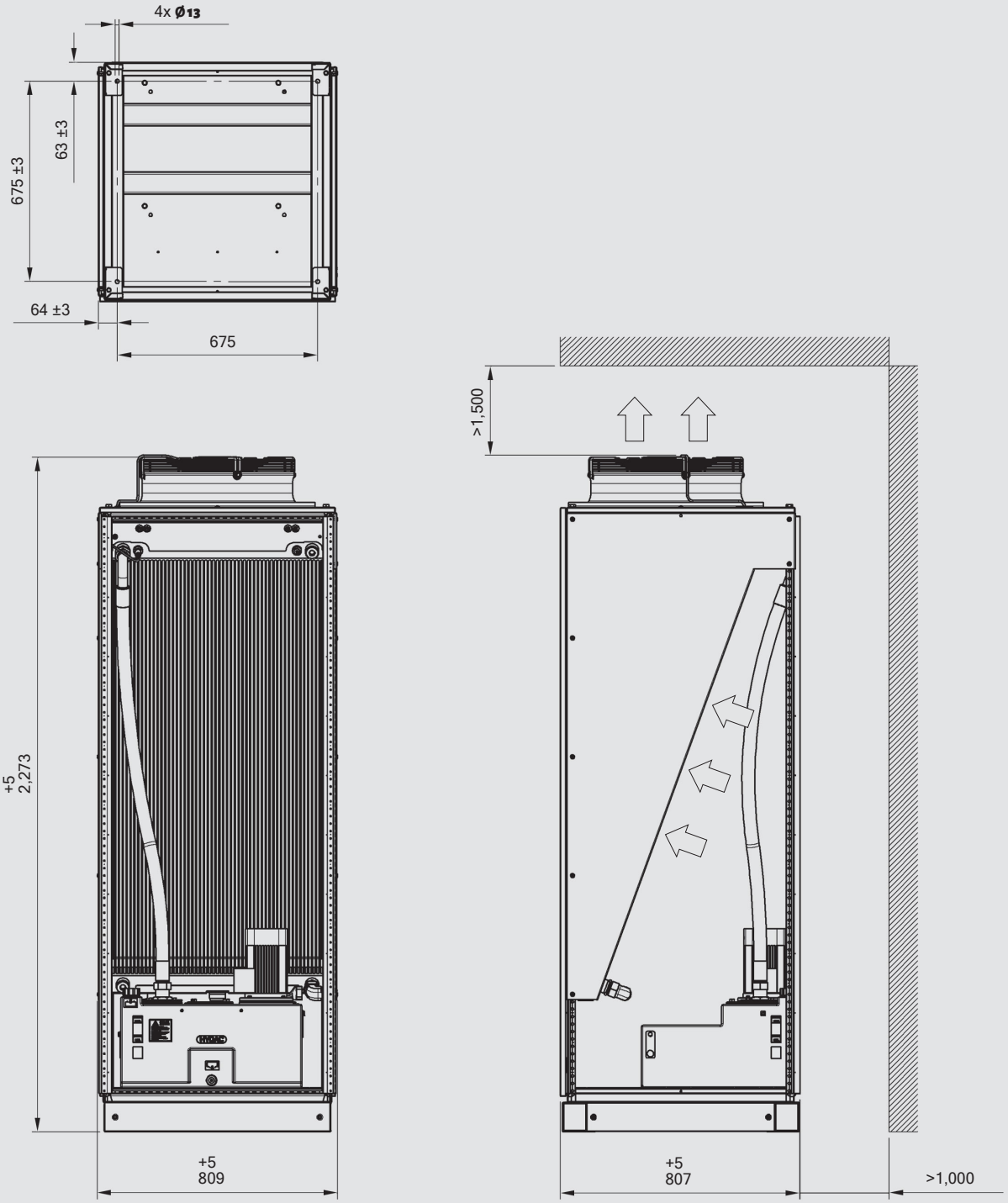
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

Additional 24 V DC control voltage, more information available upon request.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 8 - EC5 - 1.1 - W - H4-6C3 - 2 - 0

Type
FLKS = fluid / air cooling system

Size

Speed control (open-loop / closed-loop)
EC3 = speed control, closed-loop (with PID controller)
EC5 = speed control, open-loop (with temperature sensor)

Type code

Operating fluid
W = water-glycol (standard)

Pump
H4-6 = version with pump MTH4-6
R10-6 = version with pump MTR10-6

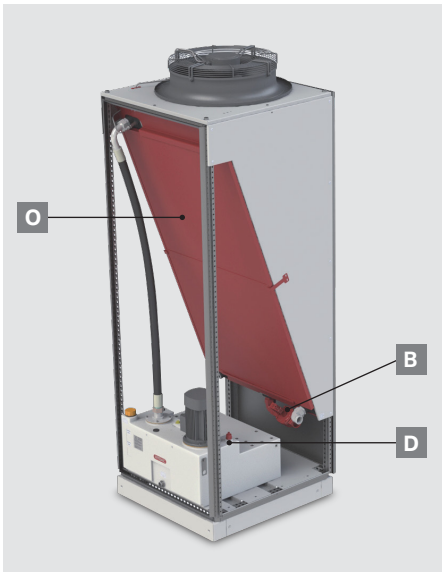
Motor voltage
C = 380 - 415 V - 50 Hz (pump MTH4-6 and pump MTR10-6)
See also “electrical data”.

Position of pump connection
3 = rotated by 270° (clockwise)

Coating
2 = Light grey RAL 7035

Accessory number
0 = none (standard)
For corresponding accessory number, see table.

Accessories



B	Fill level switch 2 switch points		●				●			●
D	Flow switch			●		●			●	
O	Air filter				●	●	●	●	●	●
Accessory number		**0**	**44**	**30**	**14**	**43**	**59**	**82**	**122**	**124**

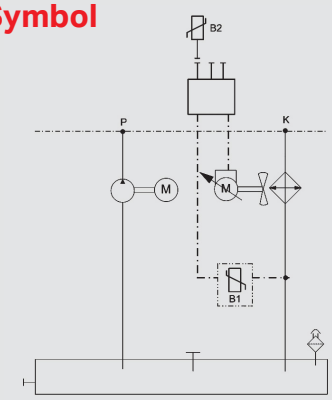
See also “Accessories for FLKS” for more information.

FLKS-5EC standard

Part no.	Designation	Pump	Version
4037512	FLKS-8EC5/1.1/W/H4-6C3/2/0	MTH4-6	Open, upright version, speed control, open-loop
4108524	FLKS-8EC6/2.0/W/H4-6C2/2/14	MTH4-6	Closed, upright version, speed control, open-loop
4153106	FLKS-8EC5/3.1/W/H4-6C3/2/0	MTH4-6	Open, horizontal version, speed control, open-loop

Fluid/Air Cooling Systems
FLKS-10EC with speed control

Symbol



General

The **FLKS-10EC is a fluid / air cooling system with reversing pump, plastic tank, heat exchanger and variable-speed fan. This FLKS was specially designed for high flow rates and high cooling capacities.**

Function

The pump conveys the operating medium from the tank through the part being cooled to the heat exchanger. The axial fan provides the necessary air flow through the heat exchanger to cool the operating medium. The speed can vary depending on the application.

Field of application

- Liquid-cooled drives: motor spindles, torque motors, servo motors, linear motors
- Inverter cooling
- Gearbox cooling and lubrication
- Bearing cooling
- Tool cooling

Technical data

Cooling capacity	Max. 4.00 kW/K (see cooling capacity diagram)
Flow rate	max. 300 l/min (see output diagrams)
Operating fluid	Version with water glycol (W): Potable water with 35 - 40 % ethylene glycol-based or propylene glycol-based antifreeze and anti-corrosion concentration. Other fluids on request (e.g. mineral oil).
Permitted temperatures	Fluid temperature: max. +60 °C Ambient temperature: 0 °C to +45 °C
Tank volume	110 l
Weight	Max. 400 kg (open version) Max. 485 kg (closed version)
Noise (acoustic pressure)	< 80 dB(A) at max. drive speed (at 1 m)
Hydraulic connection	Pump P (flow): G2"
	Heat exchanger K (return): G1½" If possible, refrain from
	reducing the size of the line required for the threaded connections.
Electrical connection	The motors are usually electrically connected using a heavy-duty connector.
Mounting position	Pump vertical
Accessories	• Air filter (optional for open version, standard for closed version) □ ☞♓●● ●♏❖♏● ♦♦♓♦♍♒ □ ☞♓●● ●♏❖♏● ♋■♎ ♦♏❍◘♏❒♋♦◆❒♏ Combinations and other accessories upon request.

Versions

In addition to the standard upright and open version,
the FLKS-10EC is also available with a closed housing.

Open version, upright

Closed version, upright

Speed control

The temperature sensor of the **FLKS-10EC5 measures the water-glycol outlet temperature from the cooling system. The sensor's 0 – 10 V analogue signal is assigned a temperature range of 25 – 45 °C. The signal is forwarded to the EC fan according to the measured fluid outlet temperature to control the speed. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).**
Even at low ambient temperatures, the fluid temperature cannot drop below 28 °C given constant power input. This prevents condensation on electrical components.

Application:

Specially suited for low air temperatures, e.g. outdoors.

Speed control

The **FLKS-10EC3 also comes with a PID controller (closed loop). The temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the reference value (ambient temperature + set differential D ΔT). THE PID CONTROLLER CONTINUALLY ADJUSTS THE SPEED OF THE FAN, IN ORDER TO ALIGN THE FLUID TEMPERATURE WITH THE AMBIENT TEMPERATURE.**
The outlet temperature remains at a set differential above the ambient temperature regardless of the input temperature of the fluid in the cooler (power of the machine).

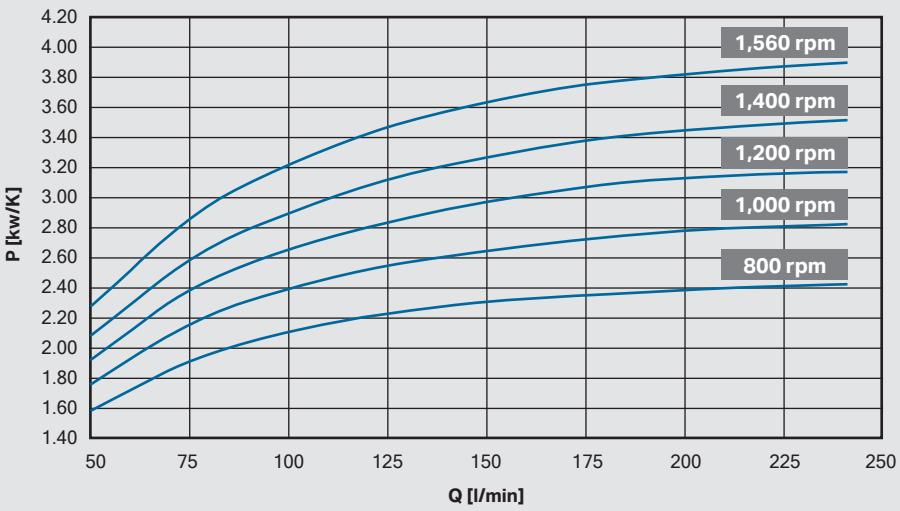
Application:

Particularly for precision cooling (e.g. in machine tools).

Lower fan speed

= lower sound level
= lower power consumption
= lower contamination

Cooling capacity



Cooling capacity tolerance: ± 5%

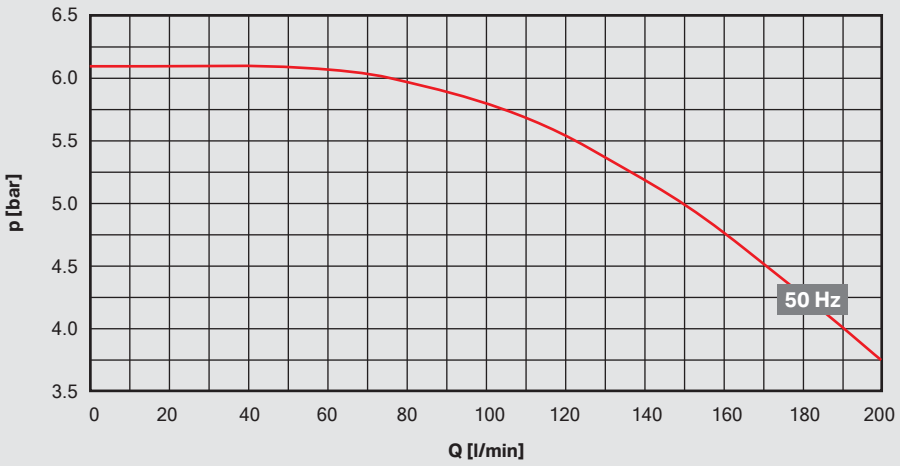
The cooling capacity is calculated via the following formula:

P [kW] = $P_{spec.}$ [kW/K] x ITD [K]

ITD (inlet temperature difference) = cooler inlet temperature of operating medium - air inlet temperature

Output data

MTR10-6 pump version

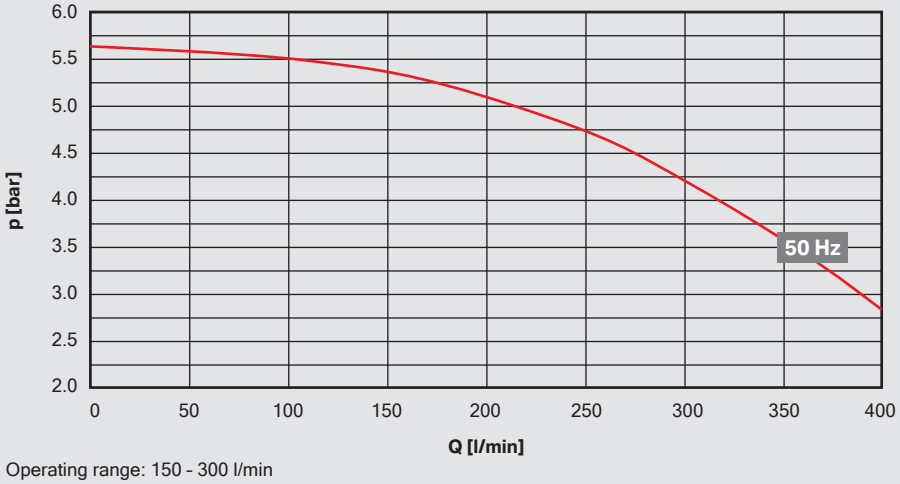


Operating range: 35 - 190 l/min

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
Voltage tolerance +5 % / -10 %
Motor capacity (50 Hz):
Pump: 2.20 kW
Fan: 2 x 0.98 kW

MTR15-4 pump version



Operating range: 150 - 300 l/min
Output tolerance: ± 9%, pumping head tolerance: ±7% as per DIN EN ISO 9906 Cl. 2, App. A

Electrical data:

Permissible voltage range:
380 - 415 V - 50 Hz - 3 PH
Voltage tolerance +5 % / -10 %
Motor capacity (50 Hz):
Pump: 4.00 kW
Fan: 2 x 0.98 kW

Note:
The operating point of the pump (flow rate) depends on the characteristic curve (line sizes, line lengths, screwing elements).
In general, the less the system loses, the greater the flow rate and the greater the cooling capacity.
Please contact Technical Sales with questions on cooling capacity and output data with other operating fluids, as well as on special voltages or other pumps.

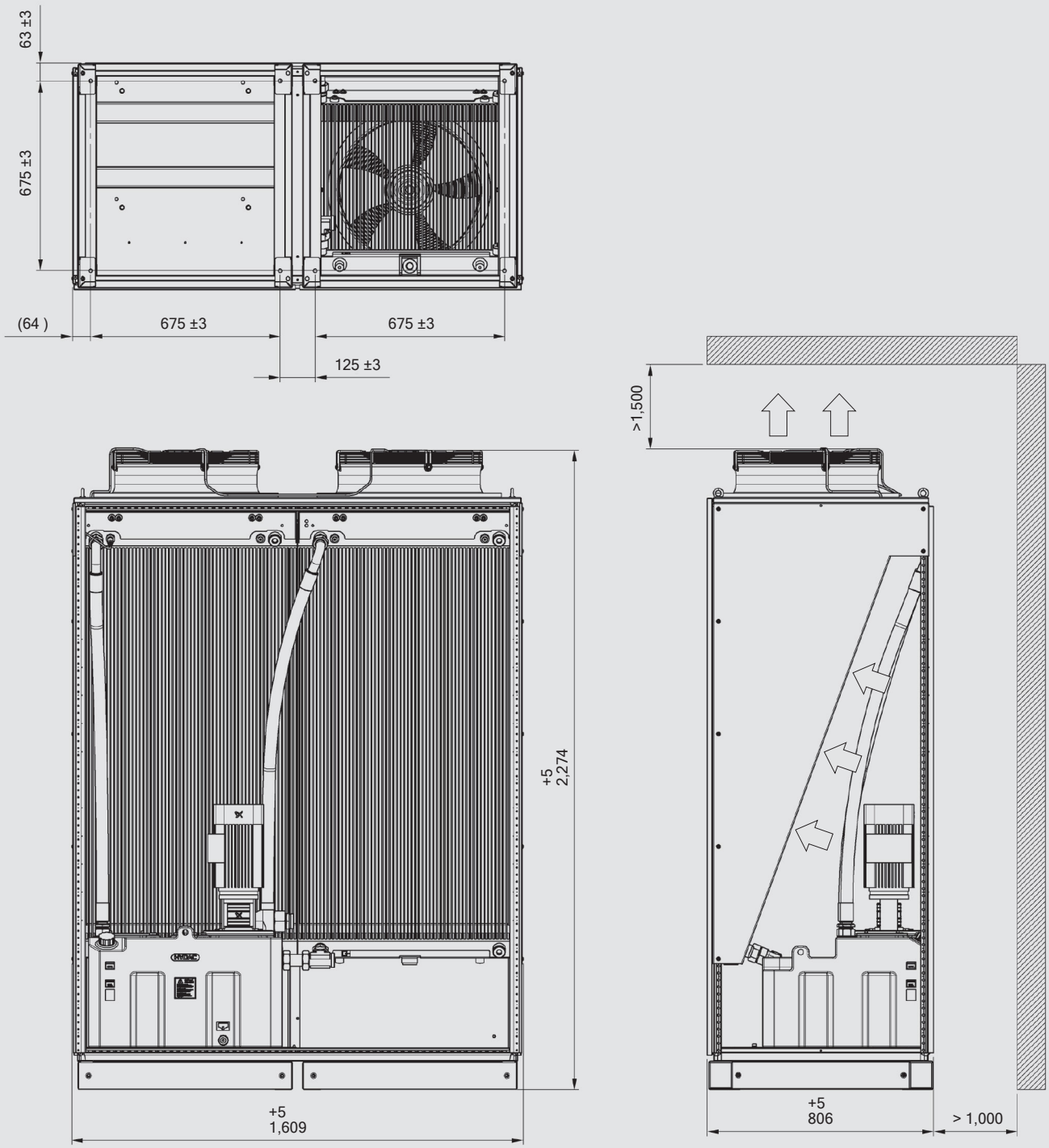
Electrical connection

The motor is usually electrically connected using a heavy-duty connector.

Additional 24 V DC control voltage, more information available upon request.

Dimensions

[mm]



Note:
We recommend maintaining the specified minimum distance to ensure an unimpeded air inlet and air outlet.
Anything below the minimum distance can affect cooling capacity and noise emissions.

Model code

FLKS - 10 - EC2 - 2.0 - W - R10-6C3 - 2 - 0

Type
FLKS = fluid / air cooling system

Size

Speed control (open-loop / closed-loop)
EC2 = speed control, closed-loop (with PID controller)
EC5 = speed control, open-loop (with temperature sensor)

Type code

Operating fluid
W = water-glycol (standard)

Pump
R10-6 = version with pump MTR10-6
R15-4 = version with pump MTR15-4
Version with two pumps on request.

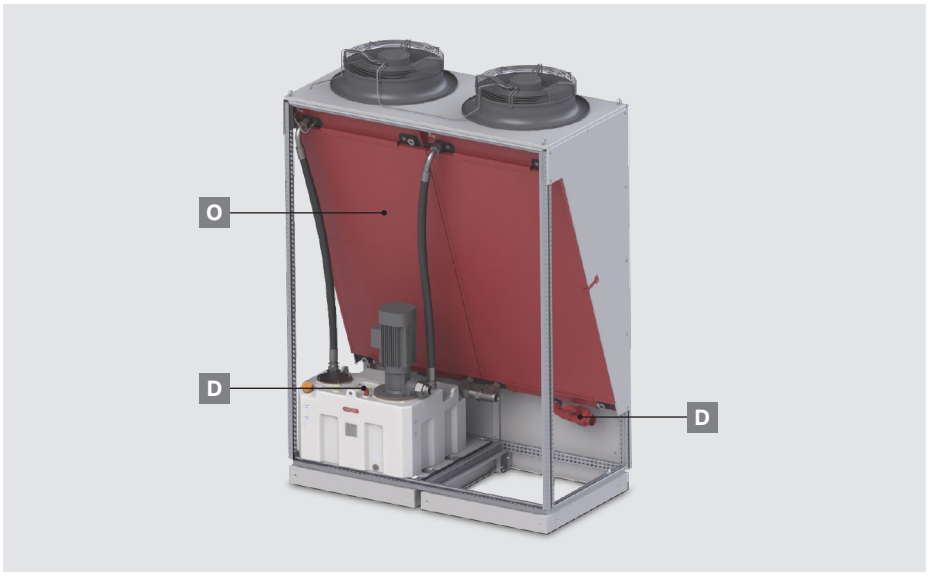
Motor voltage
C = 380 - 415 V - 50 Hz (pump MTR10-6 and pump MTR15-4)
See also “electrical data”.

Position of pump connection
3 = rotated by 270° (clockwise)

Coating
2 = Light grey RAL 7035

Accessory number
0 = none (standard)
For corresponding accessory number, see table.

Accessories



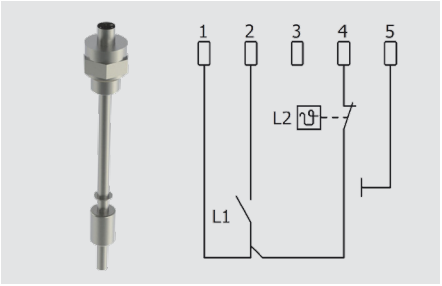
B	Fill level switch 2 switch points		●				●			●
D	Flow switch			●		●			●	
O	Air filter				●	●	●	●	●	●
Accessory number		**0**	**44**	**30**	**14**	**43**	**59**	**82**	**122**	**124**

See also “Accessories for FLKS” for more information.

FLKS-10EC standard

Part no.	Designation	Pump	Version
4051523	FLKS-10EC5/1.0/W/R10-6C3/2/0	MTR10-6	Open, upright version, speed control, closed-loop
4115359	FLKS-10EC2/2.0/W/R10-6C3/2/0	MTR10-6	Closed, upright version, speed control, closed-loop

FLKS Accessories

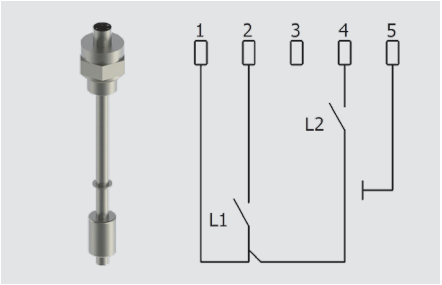


Fill Level and Temperature Switch

For monitoring the level and temperature of the operating medium in the tank.

- 1 fill level switch point
- 1 fixed temperature switch point of 60 °C

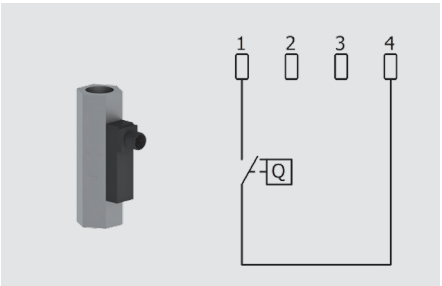
Accessory number: 1



Fill Level Switch (2 switch points)

For monitoring the level of the operating medium in the tank.

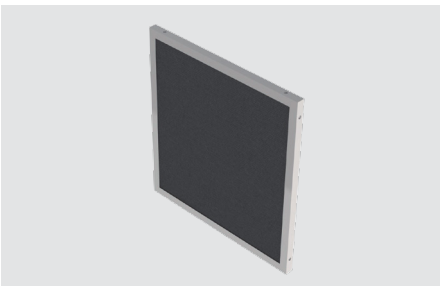
Accessory number: 44



Flow Switch

For monitoring the continuous flow of the operating medium.

Accessory number: 30



Air Filter Grid

Mounted in front of the heat exchanger to prevent dust and dry particles from entering that could contaminate the heat exchanger. Accessory number: 14

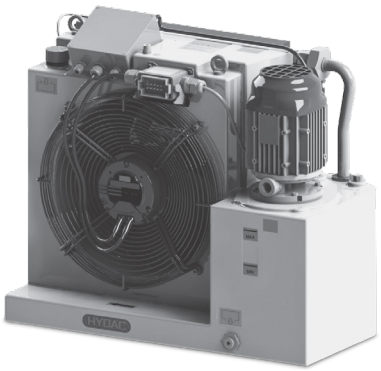
Air Duct

For directing the flow of air upward.

Accessory number: 36

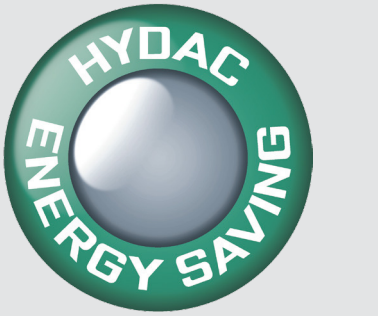
Possible accessory combinations

Fill level and 60 °C temperature switch		●										●
Fill level switch 2 switch points			●					●			●	
Flow switch				●			●			●		
Air filter					●		●	●	●	●	●	●
Air duct						●	●		●		●	
Accessory number in model code	**0**	**1**	**44**	**30**	**14**	**36**	**43**	**59**	**82**	**122**	**124**	**105**



Fluid/Air Cooling Systems

Systems with closed-loop speed control FLKS-2EC, FLKS-3EC, FLKS-4EC, FLKS-5EC, FLKS-8EC and FLKS-10EC



Lower speed

= lower noise level

= lower power consumption

= lower contamination level

= no condensation in electrical components at low ambient temperatures

The FLKS-EC HYDAC Cooling series offers various possibilities for open-loop and closed-loop control. This means the right solution can be found for every application.

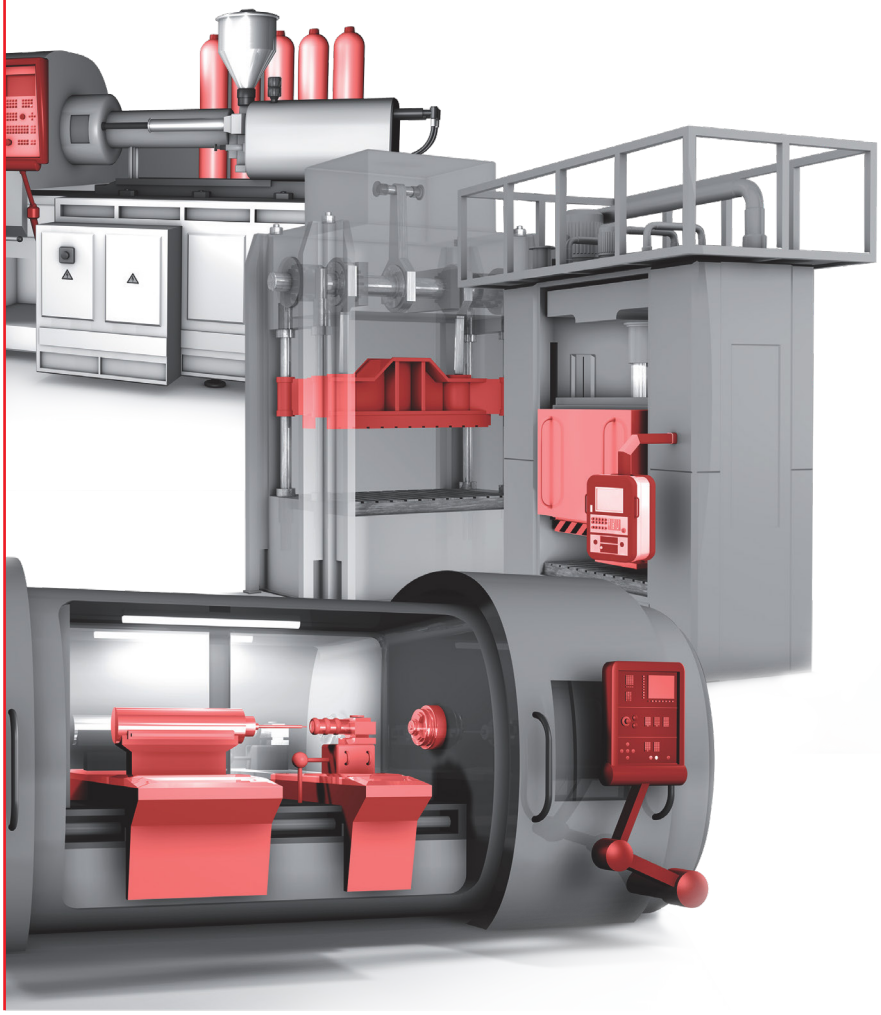
Available in the sizes:
FLKS-2EC, FLKS-3EC, FLKS-4EC, FLKS-5EC, FLKS-8EC and FLKS-10EC.

FLKS – systematic closed-loop control

Noise reduction and energy savings - these are two of the biggest issues of the future in mechanical engineering.

FLKS - Fluid-air cooling systems - are cooling, as the name indicates, with air. A fan ensures that the necessary air flow is present to cool down the warm fluid in the cooling element. In a conventional fan with a fixed speed, the fan begins to run as soon as the cooling system starts up, irrespective of the ambient temperature and the power input from the consumer. This fan constantly uses energy and creates permanent noise.

Systems with open-loop and closed-loop speed control can change this: at low ambient temperatures the fan still runs but at a low speed; if the inlet temperature to the cooler is only just over the needed outlet temperature (e.g if the machine is at a standstill due to a tool change and therefore only a little heat is fed into the medium), the speed is also reduced.



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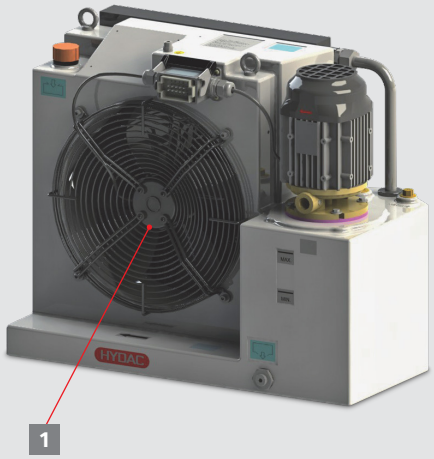
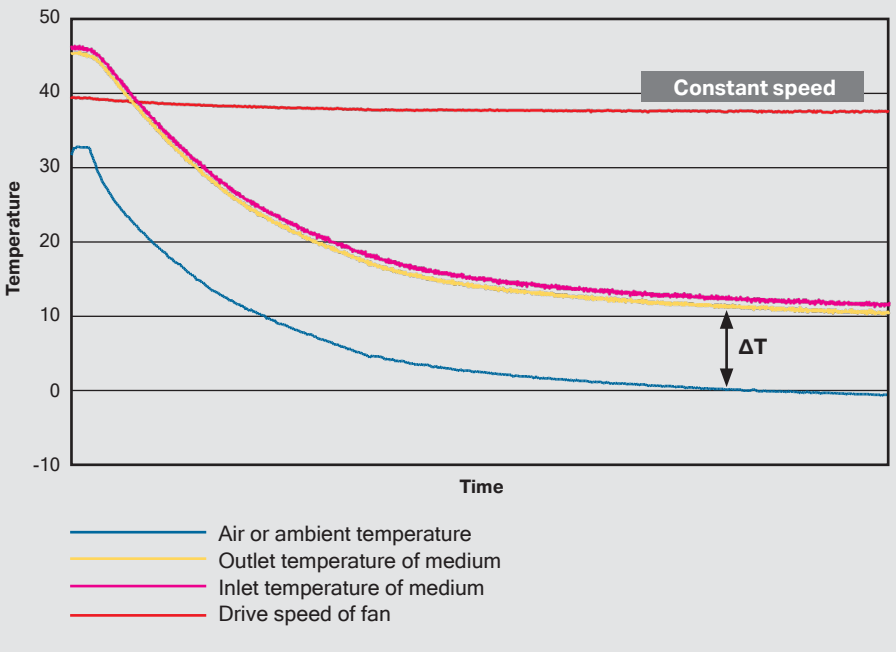
FLKS with constant speed (FLKS-xS)

The FLKS with AC fan drive operates with a constant speed and is therefore ideally suited to use in air-conditioned machine halls.



1 AC fan



FLKS with AC fan drive:

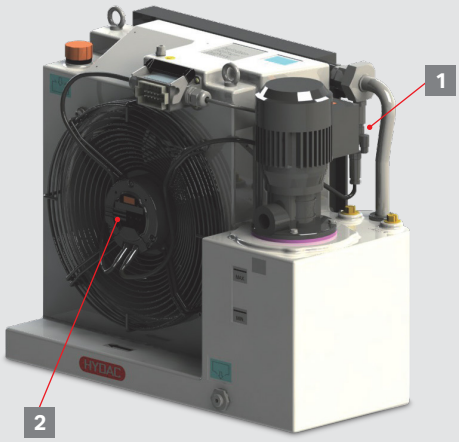
Temperature response at decreasing ambient temperature and constant power input.

The medium's temperature curve follows the ambient temperature (at distance ΔT).

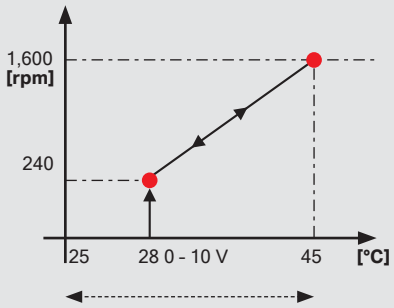
FLKS with open-loop speed control (FLKS-xEC5)

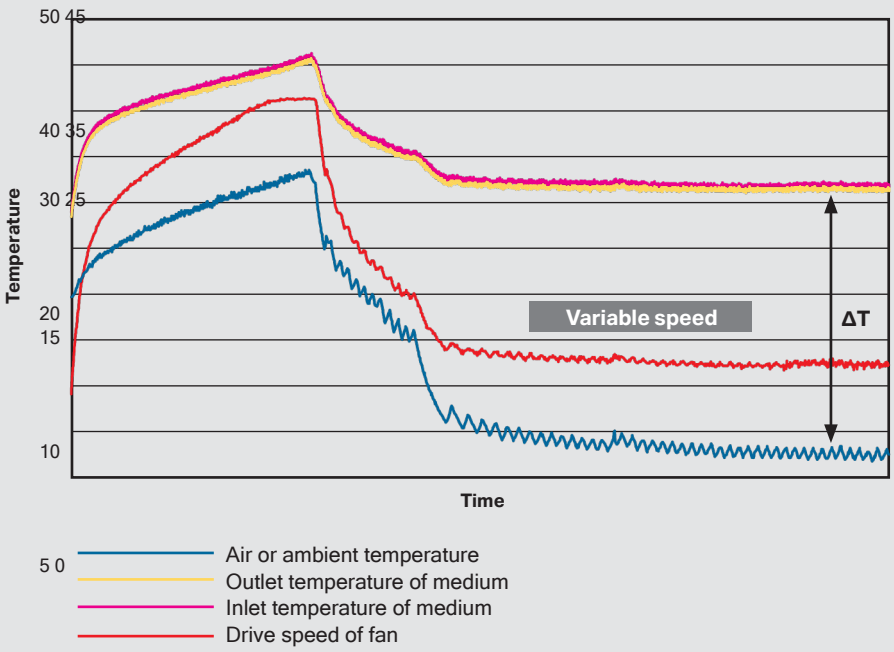
The FLKS with an EC fan drive is also equipped with a temperature sensor. The sensor's 0 - 10 V analogue signal is assigned a temperature range of 25 - 45 °C. An analogue signal is forwarded to the EC fan for open-loop control according to the measured fluid outlet temperature. The fan switches on at 1.5 V (= 28 °C) and reaches its maximum speed at 10 V (= 45 °C).

This FLKS is particularly suited to outdoor installation (e.g. for inverter cooling in cogeneration plants).



1 Sensor, outlet temperature 2
EC fan





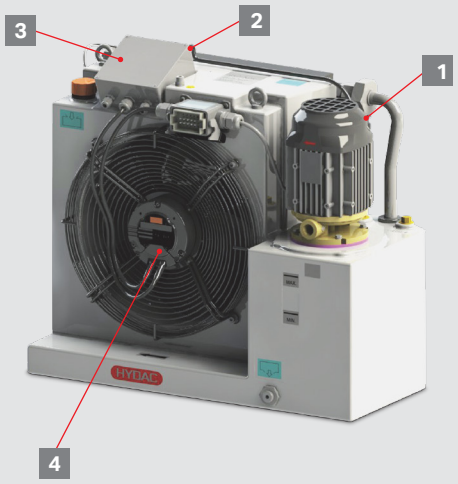
FLKS with open-loop speed control:
The fluid temperature is maintained at a temperature above 28 °C by the fan control, even when the ambient temperature falls to approx. 3 °C as is shown in the diagram (ΔT).

FLKS with closed-loop speed control (FLKS-xEC3)

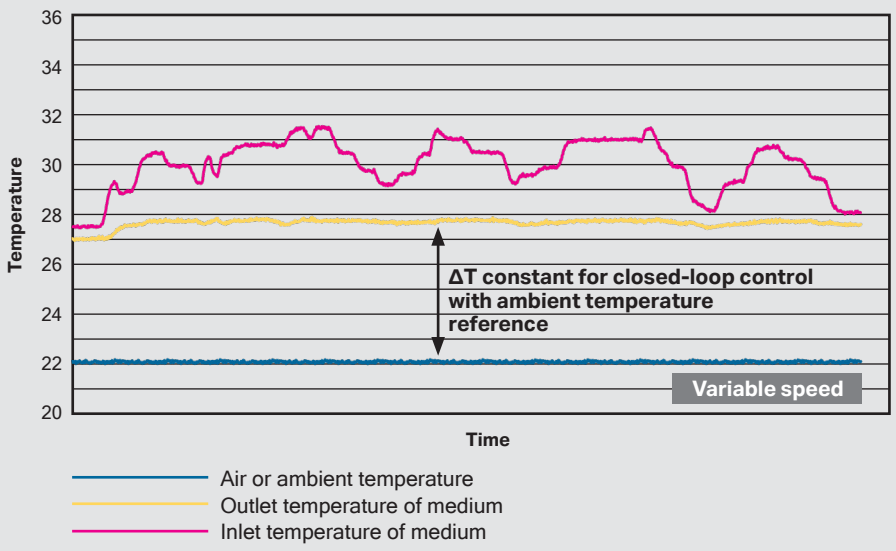
Closed-loop control is when measurements are continually taken to determine to what extent the control variable corresponds with the guide value and – in contrast to open-loop control – a deviation automatically leads to adjustment of the control variable.

A temperature sensor measures the fluid outlet temperature (variable). This temperature is continuously compared with the guide value (ambient temperature + set differential ΔT). The PID controller continually adjusts the speed of the fan, in order to align the outlet temperature with the ambient temperature.

The FLKS with closed-loop speed control is mainly used in machine tools where high fluid temperature accuracy is required.



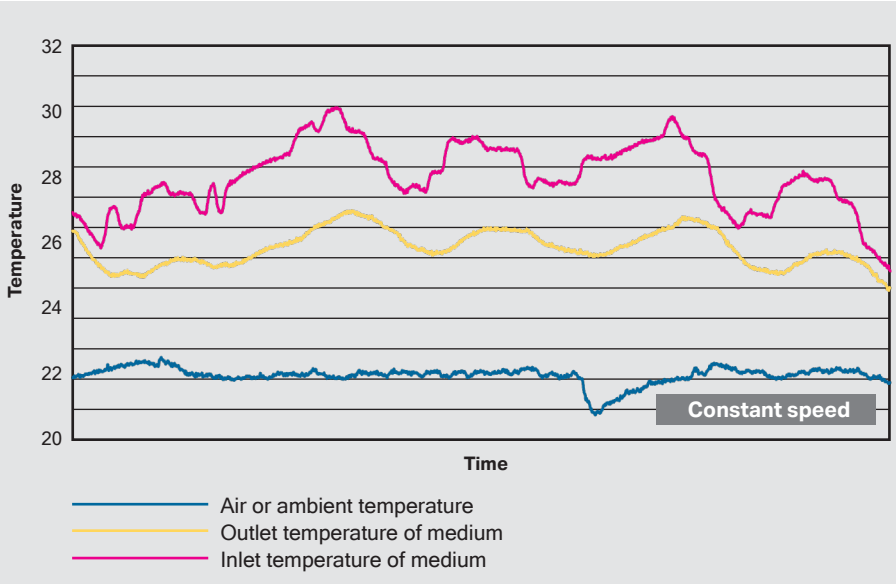
1 Sensor, outlet temperature
2 Sensor, ambient temperature
3 PID controller
4 EC fan



FLKS with closed-loop speed control:

Temperature trend with fluctuating power input.

The outlet temperature remains at a set differential (ΔT) above the ambient temperature regardless of the input temperature of the fluid (performance of the machine).



FLKS without closed-loop speed control:

Temperature trend with fluctuating power input.

The outlet temperature of the fluid fluctuates according to the power input. During machine downtimes it almost reduces to ambient temperature.

Note

Medium inlet and outlet are considered with regard to the cooling system, i.e. inlet from the consumer to the FLKS, outlet from the FLKS to the consumer.

The diagrams on the FLKS with constant speed and with open-loop speed control were created from tests in the cold chamber; the diagrams on closed-loop speed control were created from measuring results from practical tests on a machine tool.

Fluid / Air Cooling System (FLKS) design sheet

Project: _____

Contact: _____

Telephone: _____

E-mail: _____

Author: _____ Date: _____

Application: _____

_____

Operating fluid: ○ Water glycol ☐ % glycol: _____ %

Mineral oil Viscosity at 10 °C: Viscosity at 40 °C: ☐ ISO VG _____ cSt _____ cSt

_____

_____

_____

Operating fluid temperature: Input flow to consumer: _____ °C

Return flow to consumer: (where required) _____ °C

Required cooling capacity: _____ kW

Flow rate of operating medium: _____ l/min

Pressure differential of operating medium: _____ bar At flow rate: _____ l/min

Max. permitted pressure _____ bar

Ambient temperature: min.: _____ °C max.: _____ °C

Altitude: _____ m above sea level

Place of installation: ○ Indoors ○ Outdoors

Cavity: Height: _____ mm Width: _____ mm Depth: _____ mm

Electrical data: Voltage: V Frequency: Hz ○ **None** ○ **Open-loop speed**

Temperature regulation of operating medium: **control (FLKS-xEC5) e.g. for outdoors** ○ **Closed-loop speed control (FLKS-xEC3)**

Accessories:

- ○ Fill level and temperature switch
- ○ Fill level switch
- ○ Flow switch
- ○ Air filter
- ○ Air duct
- ○ Other

Other requirements:

Annual unit qty.:

Note

The information in this brochure relates to the operating conditions and applications described.

For applications and operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

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