



GRUNDFOS
ECADEMY

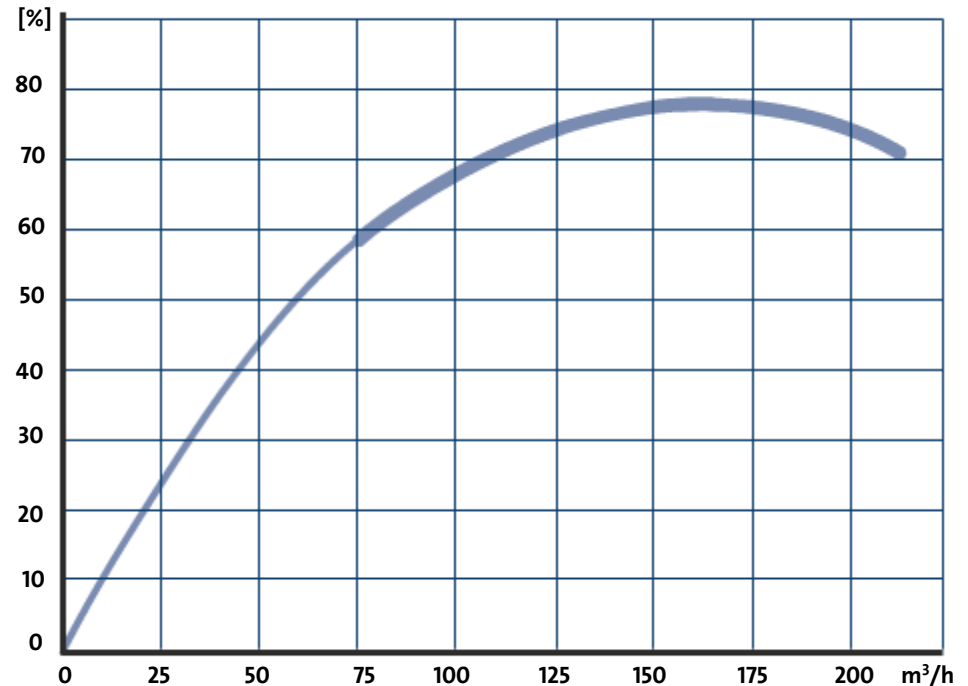
BASIC HYDRAULICS AND PUMP PERFORMANCE

REASONS FOR REDUCTION IN PUMP PERFORMANCE

Reasons for loss of efficiency

Pumps can lose efficiency because of:

- Cavitation
- Water hammer
- Wear from sand and other abrasive materials in water
- Bad power supply
- Changes in flow or head requirements

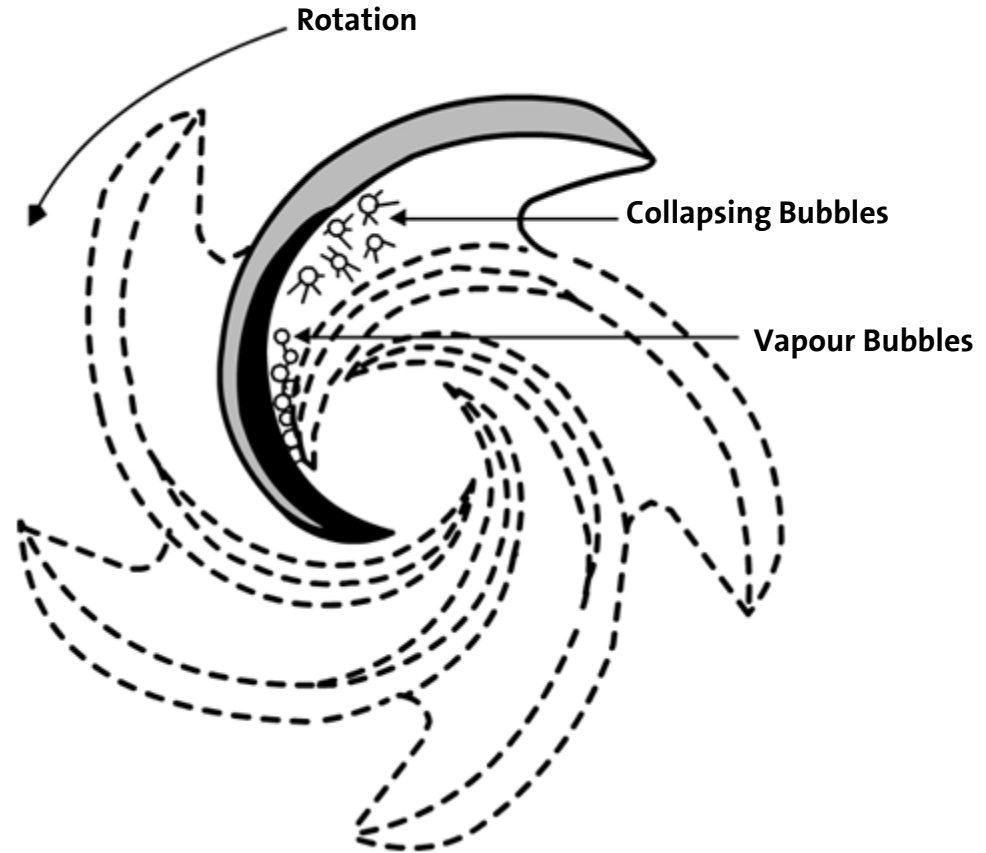


Cavitation

Cavitation is the rapid formation and collapse of air bubbles in water as the water moves through the pump.

Cavitation is a phenomenon caused by boiling water. The water may boil locally because the pressure is dropping locally.

Cavitation is an important issue that must be addressed when working with pumps. It can be devastating for the pumps.



Water hammer

Water hammer can occur when water is flowing in a pipe and a valve is closed too quickly.

The longer the pipe, the worse the impact.

Water hammer:

- Occurs because water cannot be compressed.
- Can be identified as a loud noise, as someone hammers on the pipes.
- Can destroy the pump, pipes, valves and other components.



Avoiding water hammer

Water hammer can be avoided by:

- Introducing an air buffer in the pipeline. Because air is compressible, the energy in the flowing water can be absorbed by the air volume.
- Introducing a soft start and stop to the pump. If the pump is equipped with a Variable Frequency Drive (VFD), the VFD may have the soft start and stop options.



Wear from sand and other abrasive materials

Over time, sand can completely destroy a pump.

A deep-well designed correctly will not produce sand of significant quantities.

The only way to avoid sand from entering the pump is through effective filtering before pump inlet.



Bad power supply

Bad power supply can destroy the electric motor of a pump.

Bad power supply typically occurs because of the following reasons:

- Over/under voltage— not more than 10%
- Phase unbalance— not more than 3% deviation between phase voltage
- Voltage spikes— caused by other equipment starting or stopping, or from use of frequency drives not more than 800 V



High temperatures

High temperatures can occur when the ambient temperature is too high or the cooling is not sufficient.

Usually, electric motors have the maximum ambient temperature mentioned on the nameplate.

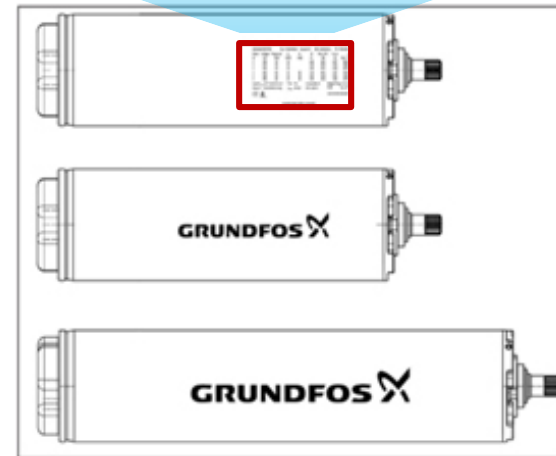
To avoid overheating, the motor should not exceed this maximum ambient temperature.

MS6000REST40		No 78105616		Model C		S/N 10000001		PC P21242	
Phase	Voltage	Frequency	P2	P2	SF	Max. SF C.	Cos ϕ	n	
[-]	[V]	[Hz]	[kW]	[hp]	[-]	[A]	[-]	[min-1]	
3	220	50	15			59.5	0.84	2860	
3	220	50	15			59.0	0.81	2860	
Liquid t_{max} 40 °C at 0.15 m/s / °F at ft/s					Weight 53 kg / lb		Connection D		
Duty S1 Transmitter temp.					p _{max} 60 bar		IP 68 Ins. cl. F		

CE EAC

DK-8850 Bjerringbro, Denmark

MADE IN HUNGARY

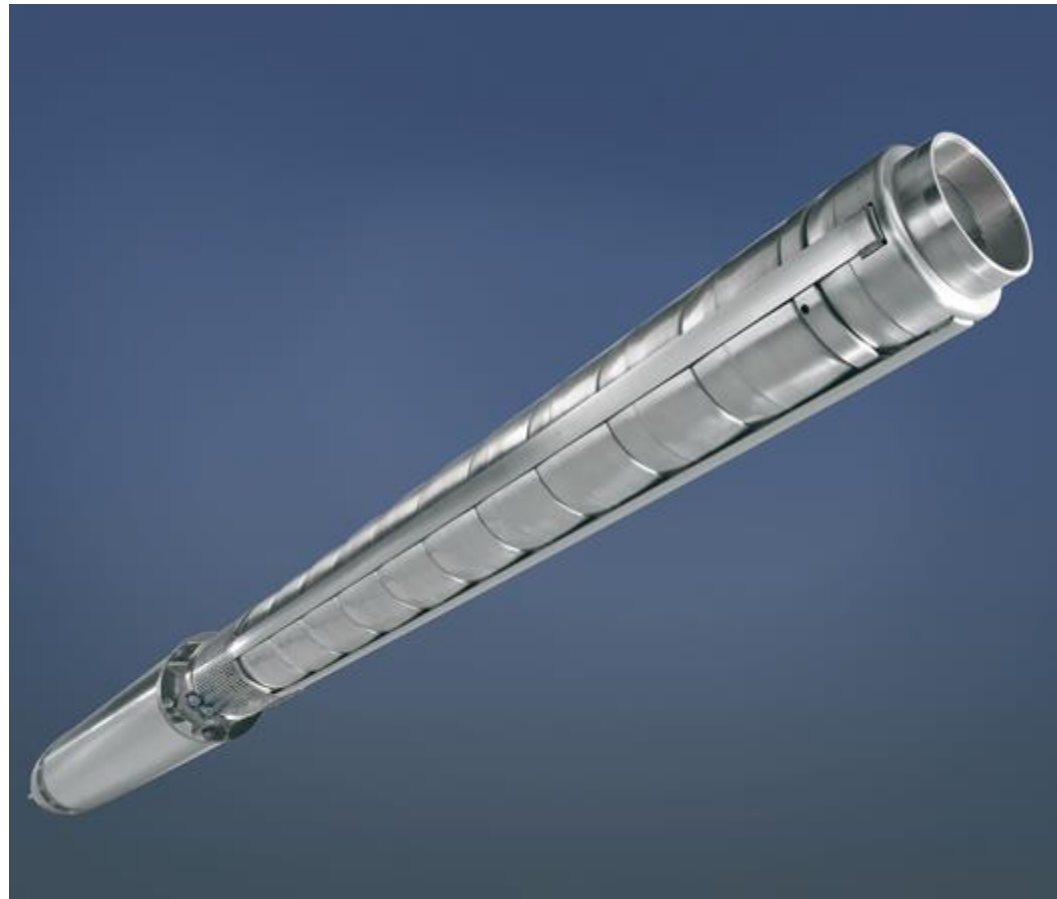


Logo etched in outer sleeve. name plate laser engraved.

High temperatures in submersible pumps

Submersible pump motors are cooled by the water that is being pumped.

If that water is not replaced quickly, it will slowly heat up and exceed the maximum allowable temperature for that motor.

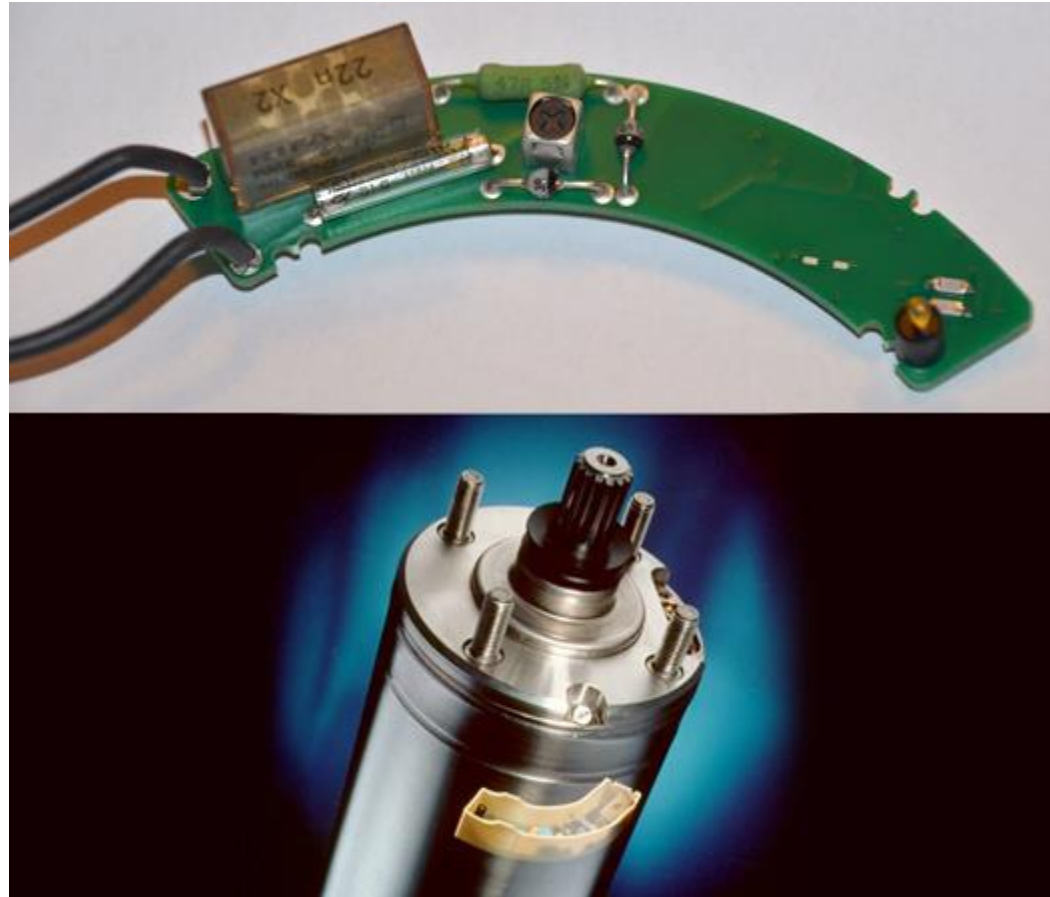


Monitoring high temperatures

Some pump motors come with built-in temperature sensors, which can stop the motor if it exceeds a preset temperature.

Other pump motors require a separate signal wire to transmit the temperature signal to a temperature overload device.

Grundfos submersible motors have built-in temperature transmitters that send a signal to an above-ground protection device with no extra wires.



General overload

A general overload of the pump and motor can cause the temperature in the motor to increase. The increase in temperature can eventually destroy the motor.

It is important to install a good overload device, such as the MP204.

The MP204 device can protect the pump motor against all possible disturbances that may occur, including over temperature.





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