

When the standard solution will not do:  
**Engineered pump control systems**



## Your go-to professional for demand-driven operation

The requirements of complex plant processes frequently go beyond the technical possibilities of an integrated variable speed system. With an engineered pump control system, KSB can offer you the optimal solution for your specific application.

The processes of multiple-pump systems must be optimally coordinated to ensure that the plant can operate in a trouble-free manner as well as reliably and efficiently. An integrated variable speed system comprising a frequency inverter with just one controller, however, frequently reaches the limits of what it can do when complex plant processes are involved. This is where an intelligent

pump control system comes in, which keeps an eye on all relevant details and responds automatically and flexibly at the critical moment.

The engineered pump control systems from KSB are the quiet and unsuspecting heroes in the background: Customised to meet your requirements and prevailing plant conditions and equipped with





high-quality components as well as intelligent software, they control and monitor your hydraulic processes.

When process conditions change, the control system automatically adapts itself during operation. This not only ensures that the pump system runs very reliably, but also at maximum efficiency.

Our offering applies to new pump control systems as well as to modification and expansion of existing pump control systems, such as Hyamaster SPS and Hyamaster ISB. Experienced project engineers accompany you in each phase of the automation project – from targeted planning, to quality implementation, through to professional commissioning.

## Your benefits

- Reliable, trouble-free and efficient operation
- Protects pumps from inadmissible operating modes by automatically compensating for all load and malfunction scenarios
- Operating and maintenance costs are reduced as the pumps are run in the optimum efficiency range
- Easy, intuitive operation of the pump control system
- Fast and straightforward commissioning thanks to the customised software concept
- Service work on the control cabinet can also be performed during operation
- Increased availability upon failure of the PLC via emergency operating mode

### Applications:

- Drinking water supply
- Well systems
- Waste water pumping stations
- Local and district heating
- Boiler feed water supply
- Cooling water supply
- Refrigerant circuits
- Process water supply
- Cooling lubricant systems
- Pump used as turbine



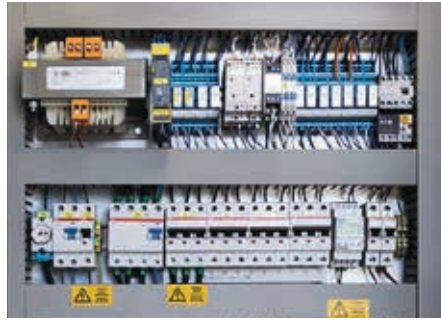
## One system that controls and monitors – professionally and automatically

The control system has a number of pump-specific functions that are interlinked in the modular control cabinet. Attributes such as flexibility and ultra-high process and system reliability are good reasons to opt for the intelligent solution from KSB.

### Scope of supply:

- Power distribution
- Fused outgoing circuits
- Filter fan
- Electrical mains bypass (upon request)
- Master switch
- Frequency inverter (manufacturer as per customer requirement)
- PLC-controlled mode / manual mode without PLC
- Touch panel for easy operation
- Profibus DP, Profinet, Ethernet TCP/IP interface





## Flexible process adjustments

- The use of proven software modules minimises the time to commissioning, thus saving money.
- The software framework can be easily expanded to accommodate additionally required functions such as butterfly valve control or filter monitoring, depending on the plant conditions or customer requirements.
- Customer-defined or plant-specific failure and fault scenarios are taken into account.
- The pump control system can be remotely operated, monitored and parameterised using an Internet browser.
- The control system can be integrated in the plant using any one of several common bus systems such as Profibus DP, Profinet or Ethernet TCP/IP.

## High operating reliability

- A wide range of monitoring functions detects potential malfunctions early on.
- The pump control system can be run in emergency mode for a PLC malfunction or for maintenance work via the manual mode function
- Independent operation of the pump control system if the higher-level process control system has failed or is being reconfigured
- Controllers optimised for the hydraulic systems enable high process reliability.
- Also with a mains bypass facility to avoid downtime caused by frequency inverter failure if requested by the customer

## Pump-specific functions

- Characteristic curve control to protect the pumps against inadmissible operating modes and to optimise the efficiency of pump operation
- The characteristic curve control function can likewise be used to balance out unstable pump characteristic curves.
- Dynamic pressure compensation function (DFS): pressure control with compensation of flow-dependent pipe friction losses for energy savings of up to 60 %
- Adaptive peak load function
- Automatic accommodation of inlet-side disturbance variables
- Active power balancing, e.g. detection and elimination of unbalanced hydraulic loads between pumps
- Pump-selective fault recognition, i.e. analytical detection of hydraulic malfunctions
- Adaptive dynamic speed ramps for smooth hydraulic operation to avoid pressure surges in the plant
- Protective function preventing maloperation, e.g. limitation of the permissible setpoint range
- Subordinate control, e.g. of fluid temperature and system pressure

### Technical data

Number of pumps	max. 6
Frequency Inverter	1 per pump
Power	1000 kW per motor (larger sizes available on request)
Mains voltage	3~400 V, 50/60 Hz 3~500 V, 50/60 Hz 3~690 V, 50/60 Hz
Motor type	Asynchronous motor / reluctance motor (KSB SuPremE®)



## We are with you at every step of your project!



Experienced project engineers accompany and assist you for all processing activities. Equipped with comprehensive automation know-how, they will help you find the pump control system that is perfectly matched to your requirements.

### Planning

KSB is there to lend you a helping hand very early on, in the planning phase. In line with your requirements and the conditions of your plant, our automation experts will consult with you to help you make the best possible pump and valve choice. Moving forward, we will then develop a suitable control concept for your specific application, all the while focusing on ensuring reliable, trouble-free and efficient operation.



### Implementation

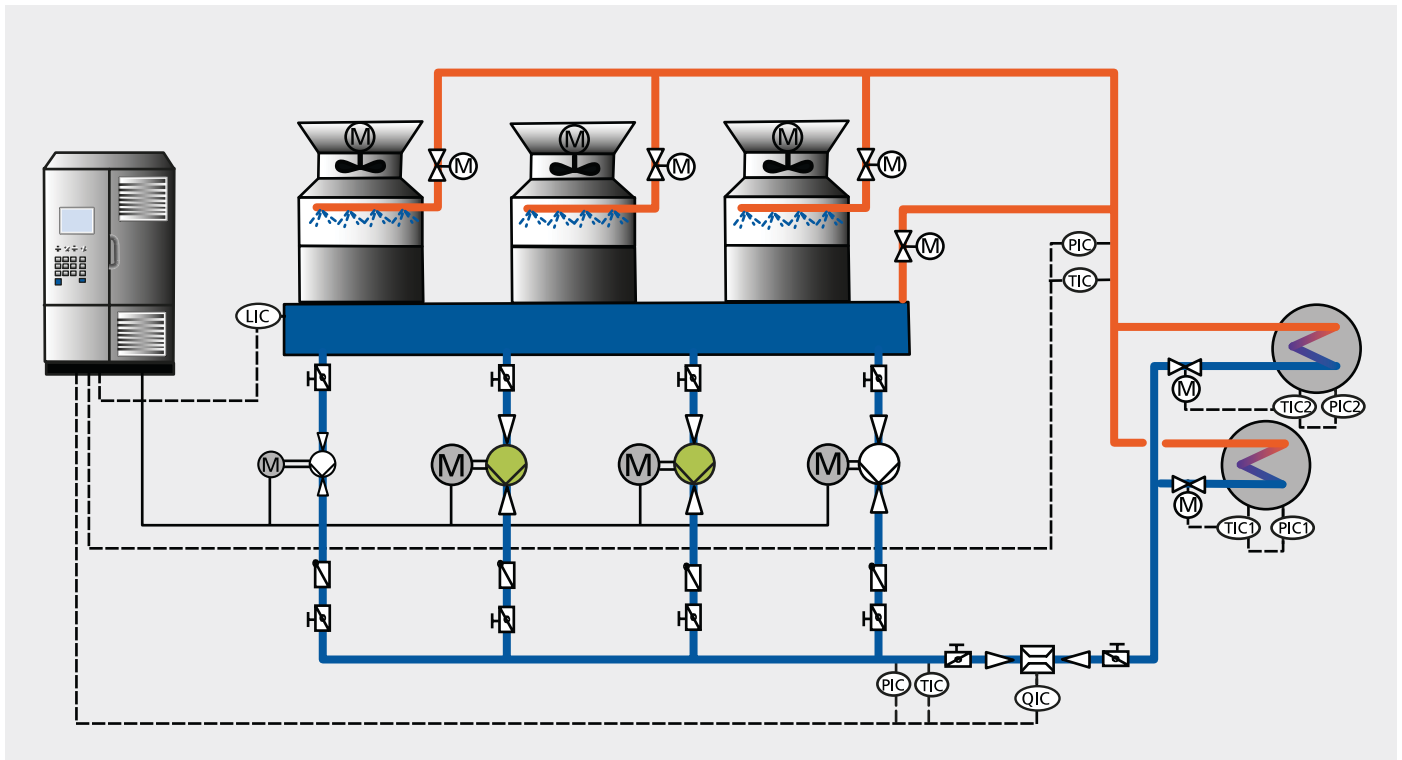
KSB offers a modular, control cabinet-based pump control system that we can adapt in line with your plant conditions. The heart of the system is the PLC: High-quality, industrially tested components that are combined with a software module specially developed by KSB to create the perfect control unit. The software itself incorporates a wide range of intelligent, pump-specific functions to automatically respond to changing process conditions and reliably protect the pumps against inadmissible operating modes.



### Commissioning/start-up

The tried-and-tested software concept keeps the test phase to a minimum. This time factor provides a considerable benefit, especially when viewed in the context of plant modifications and expansions. It goes without saying that during the commissioning phase our specialists will explain the functions of the system and how to operate it. The intuitive and maintenance-friendly user interface makes it possible to familiarise your operating personnel with the system in record time.

## Pump control system for supplying cooling water with low-load and main-load pumps



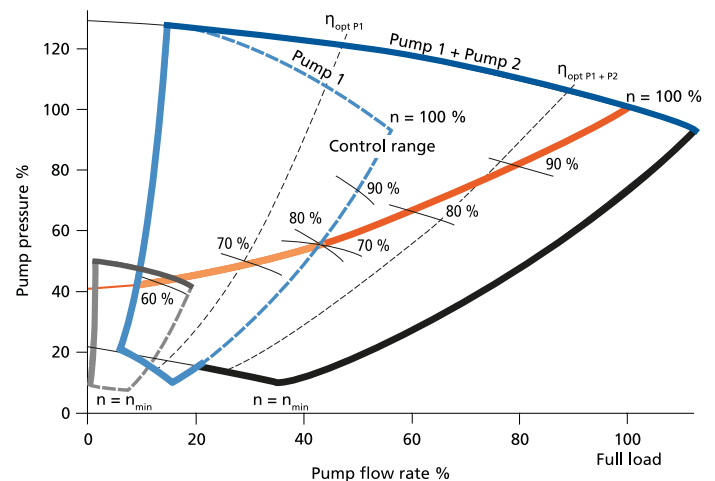
### Plant description:

Cooling water supply with four variable speed pumps comprising three main-load pumps and one low-load pump. Two main-load pumps are sufficient for standard plant operation. The third pump is the stand-by pump. To ensure that operating times are distributed equally, the three main-load pumps are toggled at cyclic intervals. The smaller of the four pumps is used to cover low plant loads, such as on the weekends.

### Control task:

The job of the control system is to maintain the temperature differential of 6 K between the supply and return lines of the plant. At the same time, there must be a minimum pressure differential of 1.2 bar to reliably supply all consumers. This is realised by combined PID controllers that correct both controlled variables without running the risk of producing overshoots.

The engineered pump control system from KSB also leverages the characteristic curve control facility to ensure efficient operation of all pumps along the varying system curve. To this end, the pump speed is adapted to the system load, or pumps are switched on or off accordingly. The parallel fill level monitoring in the inlet tank also protects the pumps against dry running. The engineered pump control system from KSB therefore ensures particularly efficient and exceptionally reliable operation of the pump system.



- Pump characteristic curve for  $n = 100\%$
- Pump characteristic curve for low-load pump ( $n = 100\%$ )
- Operating point curve of a main-load pump in variable speed operation at base load ( $n = \text{variable}$ )
- Operating point curve of two parallel main-load pumps in variable speed operation at peak load ( $n = \text{variable}$ )
- Continuous-operation limit (min.) for main-load pump
- Continuous-operation limit (min.) for low-load pump
- Operating limit (max.)



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