

Technical information

INSTALLATION STUDY

COMBINATION OF SYSTEM SET AND WORKING POINT

To obtain the characteristic bend of two pumps or more with identical characteristics, working in parallel (SET), it is necessary - with the same head - to add together the flow rates of each single pump in the direction of the horizontal axle (i.e. the flow rate one). This is illustrated in the figure, which clearly shows that the characteristic bend of the additional pumps straightens out in comparison with that of the first pump; this causes a shift of the working point from A_1 to A_2 when 2 pumps are working in parallel, or to A_3 in the case of 3 pumps in parallel. Of course, the characteristic bend R of the system remains unaltered.

When a set works in a system, the **working point** P_0 is the intersection between the characteristic bend of the set and that of the system, as explained below.

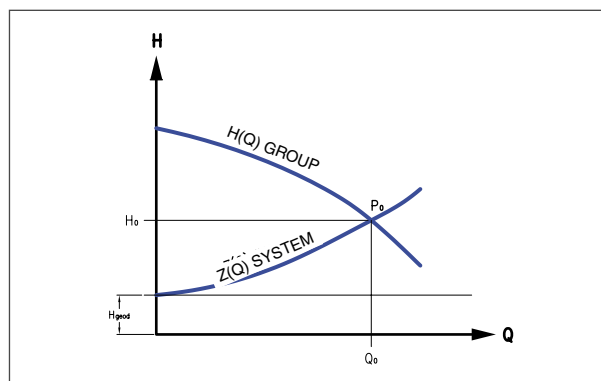
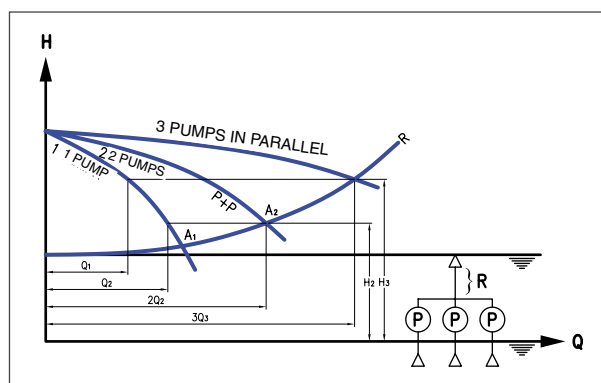
The coordinates H_0 and Q_0 are respectively the head and flow rate that the set guarantees to the system during operation.

It is important to emphasise that the working point may be anywhere on the set bend depending on the shape of the characteristic bend of the system. The aim is to choose the set that not only enables the working point to guarantee the required flow rate and head, but enables it to do this with the highest possible productivity - i.e. as close as possible to the point of maximum efficiency (BEP).

It is taken that the working flow rate Q_0 is $0.8 \div 1.1$ times the BEP flow rate. For a system to function regularly therefore, the working point must be:

- in an area where the set works well (good efficiency and low NPSH field as the field within the rated points) for all the working conditions envisaged
- stable (explained in the next paragraph)

The characteristic bend of the system, and in particular the total pressure drops, must therefore be calculated carefully. An incorrect assessment of the pressure drops will cause a shift in the working point. Finally, it is worth remembering that the system pressure drops may increase over time due to encrustation in the pipes.



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STABILITY

For the working point to be stable, the slope of the characteristic bend **R** of the system must be greater than that of the characteristic bend **P** of the set (both evaluated on the working point considered). The greater the angle formed by the intersection of the two bends, the greater the operating stability, in that slight oscillations in the geodetic height and/or the pressure drops in the duct lead to minor flow rate variations.

For example, the working point **B** in the figure has the above-mentioned features, and so is stable. The same cannot be said for point **B2**, because an accidental increase in the pressure drops and/or the geodetic height would lead the set to work in point **B1**. Even when the initial conditions are restored, the set will not be able to return to **B2**, so the flow rate will remain at the reduced level. The disturbance cannot therefore be recovered; on the contrary, if we are in **B1** (where the slope of the characteristic bend **R** of the system is less than the characteristic bend **P** of the pump), a slight reduction in the geodetic height will produce a reduction in the flow rate rather than the increase that would be possible when starting from points **B** and **B2**.

