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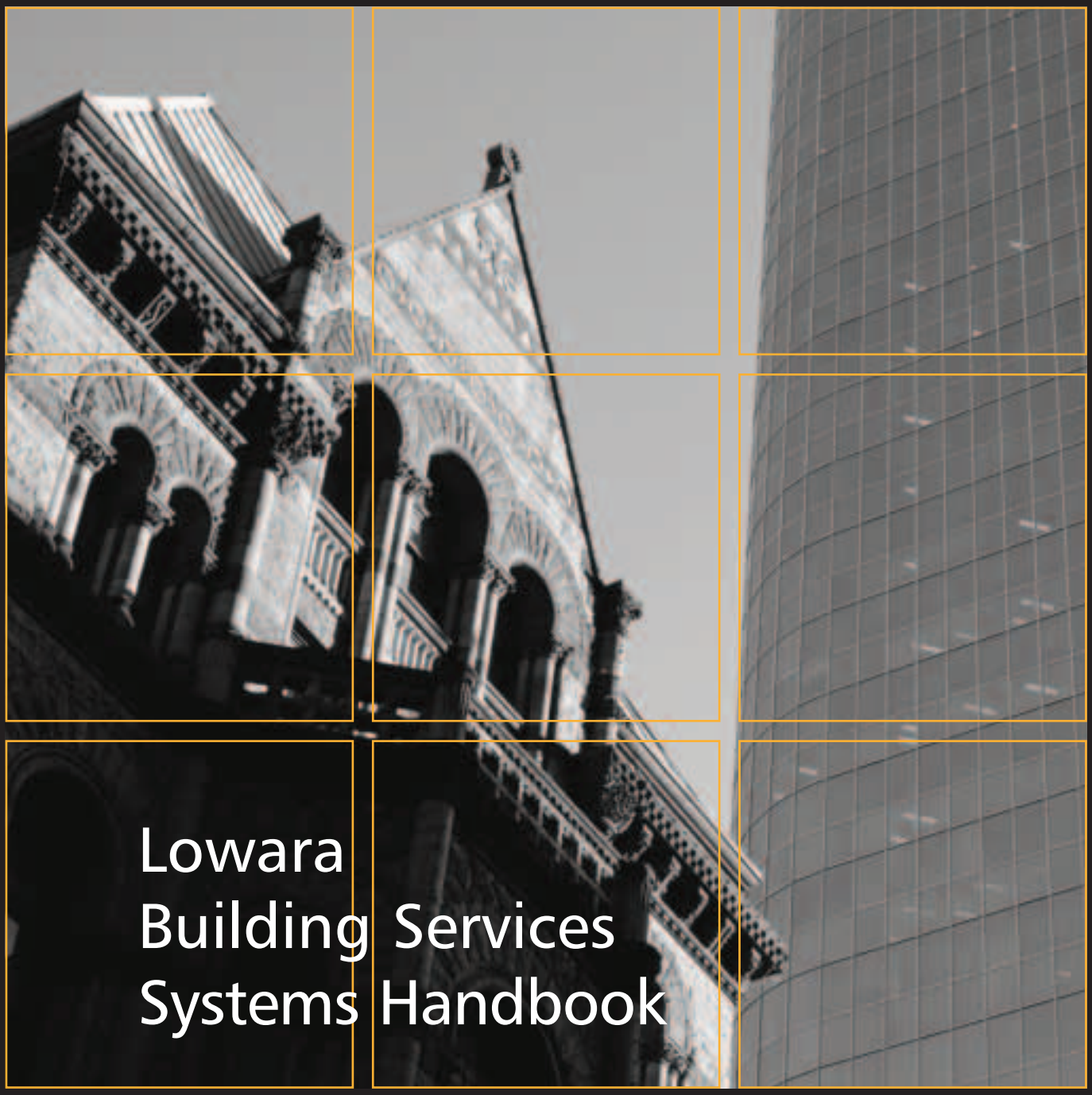

Lowara Building Services Systems Handbook

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1. Introduction

2. Heating

3. Air Conditioning

4. Water Supply

5. Waste Water

6. Irrigation

7. Variable Speed Devices and retrofit

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Building Services, Systems handbook

Preface

Lowara, part of the ITT Residential and Commercial Water Group, has made the commitment to be your preferred solution provider in a variety of water systems, including the Building Services. A dedicated team has therefore produced this handbook, a new tool intended to present the most common systems used from Residential to Commercial Building Services, where a fluid is used in order to provide:

- Heating;
- Air Conditioning;
- Water supply;
- Waste water treatment;
- Irrigation;

by adding all the benefits that variable speed drives can offer, to help improving efficiency, energy saving and finally environment care.

Each chapter of this *Building Services, Systems handbook* consists of several sections, treating the following topics:

- systems structures and specific features;
- suitable product families.

Generally, sections end with a recommendation on the product selection.

This ***Building Services, Systems handbook*** is not meant to incorporate all the knowledge and experience in designing and balancing systems, which is suggested to be completed by referring to dedicated publications. It is rather meant to provide an extensive overview very likely to be applicable everywhere, while local peculiarities will continue to be present.

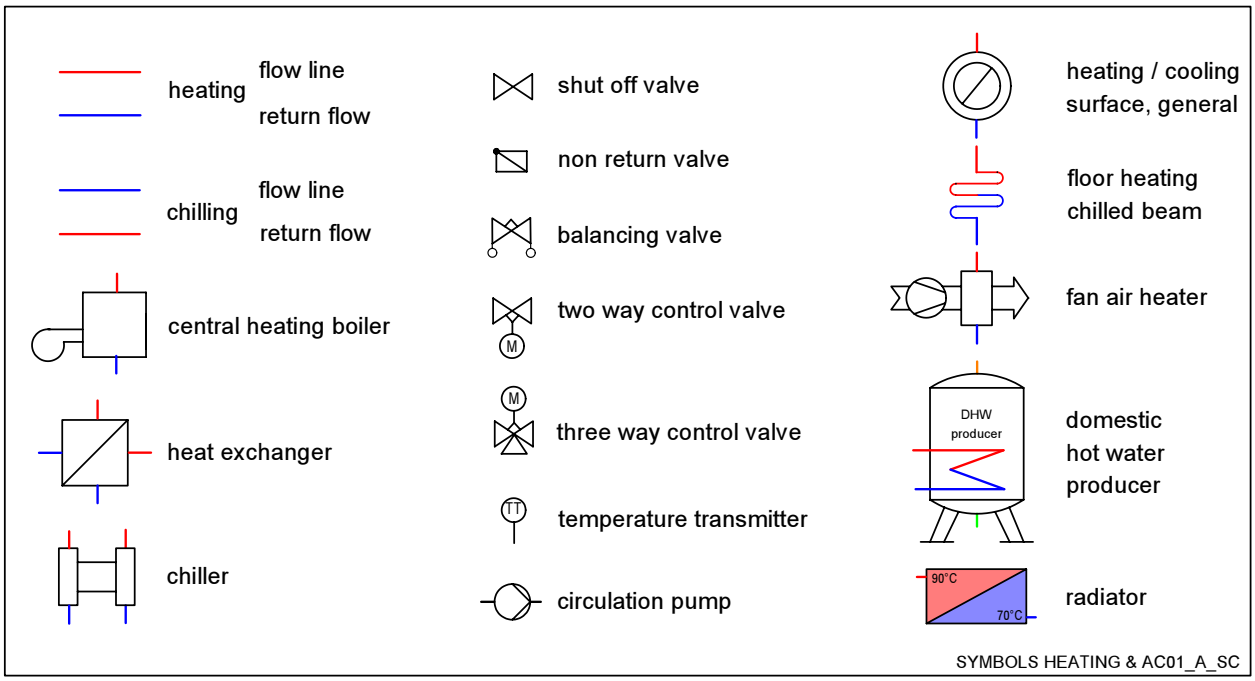
This ***Building Services, Systems handbook*** is addressed to people who design and install systems, who already possess the relevant knowledge and expertise. For them, this handbook can be of help in providing guidelines on the different functions that the selection of different electric pumps and variable speed drives enable, when a wide product offer is available.

This ***Building Services, Systems handbook*** has been jointly drawn up by professionals of Lowara organization, with experience in providing solutions for each of the described systems. Such experience has been improving day by day during years, thanks to a continuous joint effort with users.

This ***Building Services, Systems handbook*** is a new tool that Lowara offer to the users, together with the standard set of services, the technical support and the deep commitment of the whole organization to pursue and encourage the most fruitful relationship with our customers, for the greatest advantage of all the users.

LOWARA
the Building Services Team

Legend of symbols



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1. General

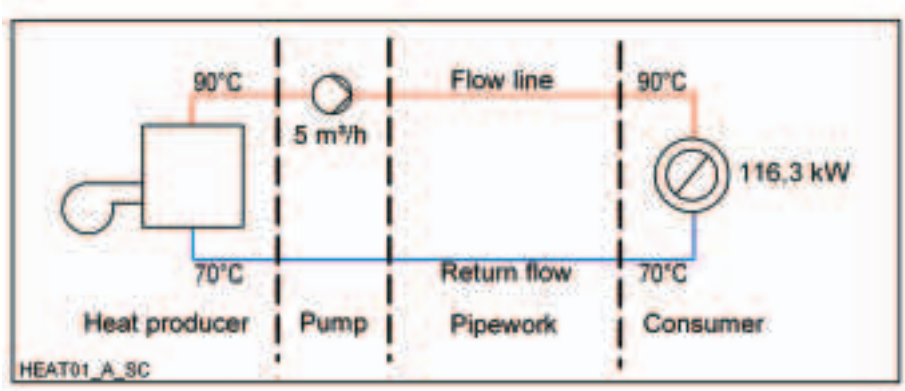
What is warm water heating?

With this definition, all systems are included, where:

- warm water has a temperature less than 100°C
- generated in a central place,
- is used to transport heat in closed loop systems
- to individual consumers in one or more buildings.

The range of these systems are from a one-family house to a district heating network for a whole city.

All different variations follow the same simple principle and are composed by the same main components:



The generator of heat will be in most cases a boiler, fired by oil, gas or several solid fuel.
It also may be a heat exchanger in a district heating system, a heat pump or a solar panel.
It must be dimensioned regarding to the maximum possible load.

The pipework of a heating system must be designed based on the maximum probable flow, or project flow.

The project flow essentially depends on two factors:
- The required heating power, depending on the dimension of the building, the quality of its thermal insulation and the expected minimum outdoor temperature.
- The differential temperature between the flow line and the return flow of the system.

With these basic data the designer has to find an economic balance for the dimensions of the pipework:
- The flow resistance in the pipework is linked to the energy consumption to the pumps, which are necessary to make the water flow.
- The operational costs of pumps in heating systems, caused by consumption of electrical energy are an essential factor for the design of pipe systems in a building.

These factors and much more are considered in the actual European standards, which should be applied by the designer and installer.

The consumers may be for instance radiators, air heaters, floor heating systems or domestic hot water systems.

The pumps are necessary to make the water in the system flow. Two main factors are important for dimensioning a pump:

- The discharge flow. We have to use the maximum probable flow.
- The delivery height, which is necessary to override the flow resistance, caused by the pipework and the consumption. It is the result of dimensioning the pipework.

Some further basics

The following basic values are necessary for calculating heating loops:

The flow rate per hour	Q [m³/h]
The temperature difference between flow line and return flow	dT [K]
The power factor for the transport medium (water = 1,163)	1,163 [-]
The heating load	P [kW]

- With three of these values we can calculate the fourth. In most cases we know the load and the design temperature and have to calculate the flow for dimensioning the pipework and the pump:

The formula is: $$\frac{P\ [kW]}{dT\ [K] * 1{,}163} = Q\ [m^3/h]$$

For example: $$\frac{116{,}3\ kW}{(80 - 70) * 1{,}163} = 10{,}0\ m^3/h$$

or: $$\frac{116{,}3\ kW}{(90 - 70) * 1{,}163} = 5{,}0\ m^3/h$$

The example above shows, that the load of a heating system can be controlled either by varying the flow line temperature or by varying the flow.
In some systems we have the free choice between these two methods (Radiator systems), other systems work correctly with only one of these methods.

Fixed speed or variable speed?

Our products are available as either a fixed speed or a variable speed design.
The decision what to use should be done dependant upon the type of control loop where the pump is intended to be installed:

- In a control loop with variable flow a variable speed pump, controlled by differential pressure for instance, should be the first choice.
- In a control loop with constant flow a simple fixed speed pump will meet the requirements.

Wet-runner or Dry-runner?

Typically small to medium pumps are wet-runners (up to app. 50 m³/h at a delivery height of app. 1,0 bar = 10 mWc = 100 kPa), medium to large pumps are dry-runners, with a transition zone, where both solutions are available

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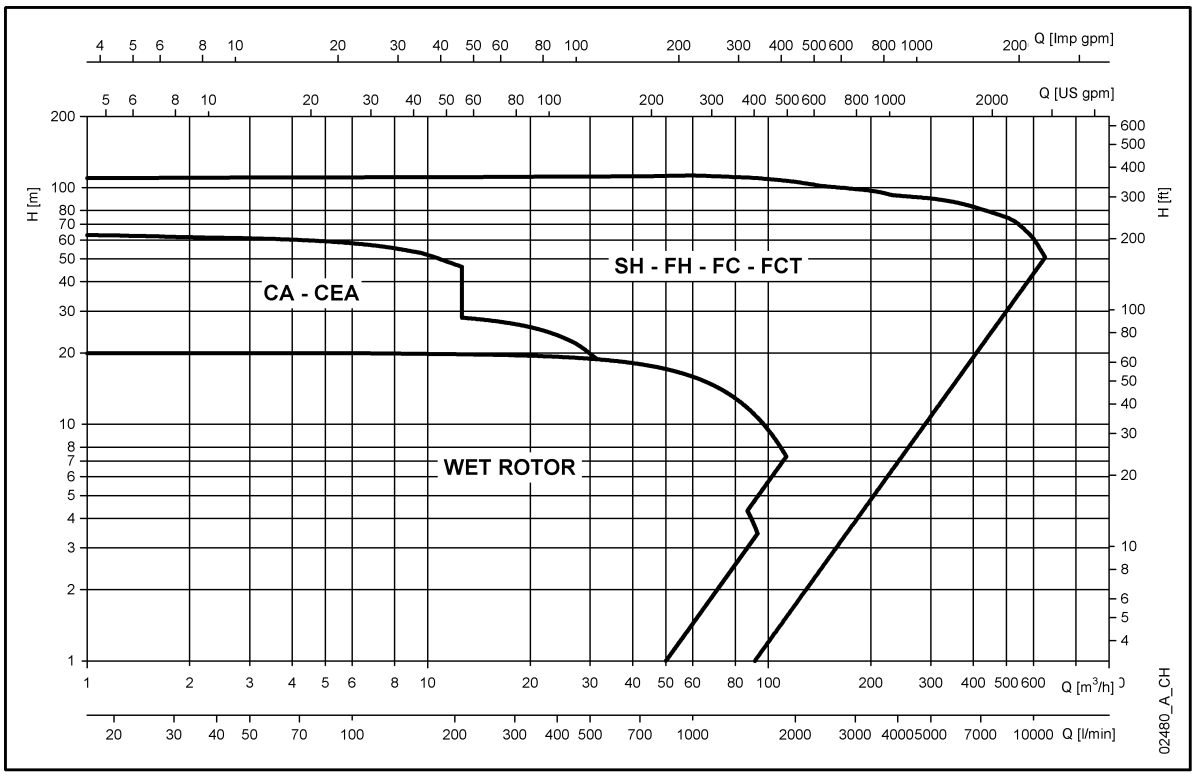
2. Summary of products for warm water heating

The range of the products for the "warm water heating" is divided in to four main families: Wet runners / Dry runners and Fixed speed / Variable speed.

	Wet-runners	Dry-runners	
		Inline pumps	Block pumps
Fixed speed	TCR	FC	CEA / CA
	TCB	FCT	FH
	TC-FC		SH
Variable speed	ETCR	FC-H	CEA / CA
	ETC	NCLG-H	FH-H
	EFC		SH-H



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3. Product family

TCR, ETCR Series

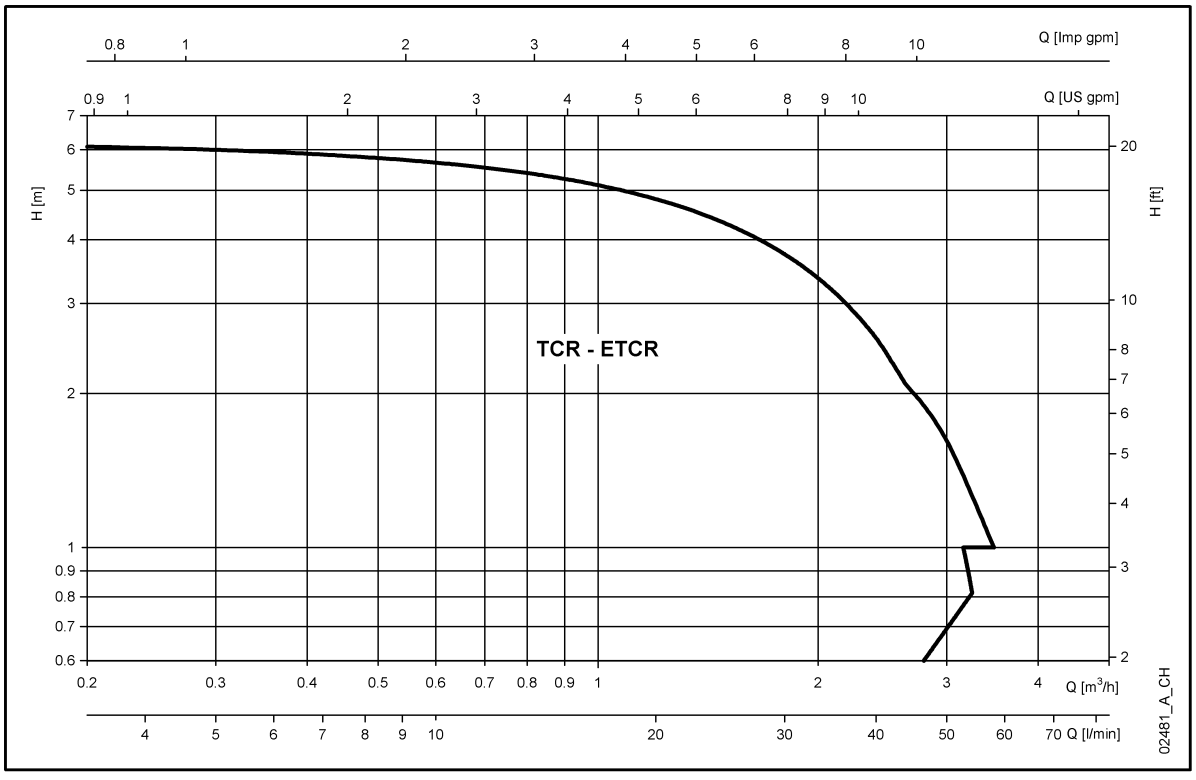
Wet rotor inline circulators for residential applications, fixed speed with manual selection (TCR) and automatic regulation (ETCR), cast iron pump body.

Specifications

Delivery:	up to 4 m³/h
Head:	up to 6,5 m (series TCR) up to 5 m (series ETCR)
Liquid temperature range:	-10°C ÷ +110°C for TCR series +2°C ÷ +95°C for ETCR series
Maximum system pressure	10 bar (PN10)
Power supply:	single phase, 230 V 50 Hz
Connections:	unions, 1", 1" ¼ e 1" ½.

Product Features

Easy to install
Easy selection of speed or regulation
Extremely low noise
Long lifetime



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TCB Series

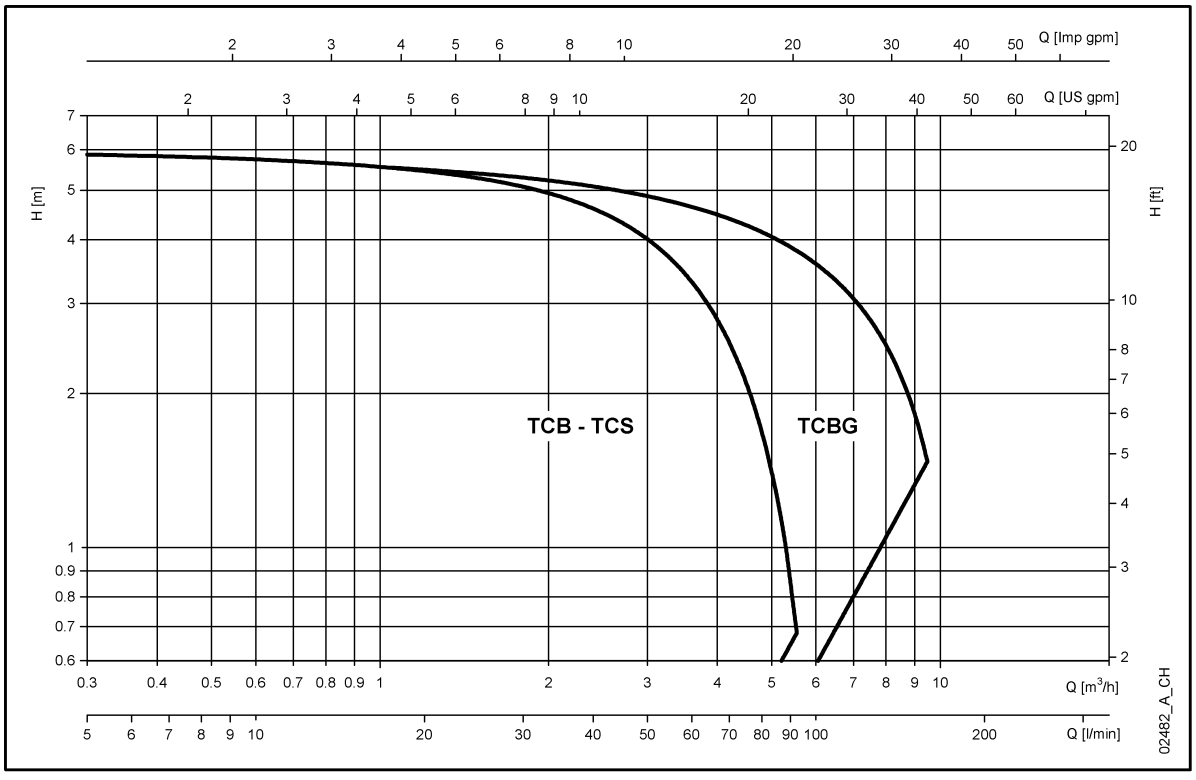
Wet rotor inline circulators for sanitary hot water circulation, fixed speed with manual selection, bronze (TCB) or stainless steel (TCS) pump body, single and twin pump body executions.

Specifications

Delivery:	up to 6 m³/h
Head:	up to 6,5 m
Liquid temperature range:	0°C ÷ +110°C
Maximum system pressure	10 bar (PN10)
Power supply:	single phase, 220 V 50 Hz
Connections:	unions, 1", 1" ¼ e 1" ½.

Product Features

Easy to install
Easy selection of speed or regulation
Extremely low noise
Long lifetime



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TC, FC, ETC, EFC Series

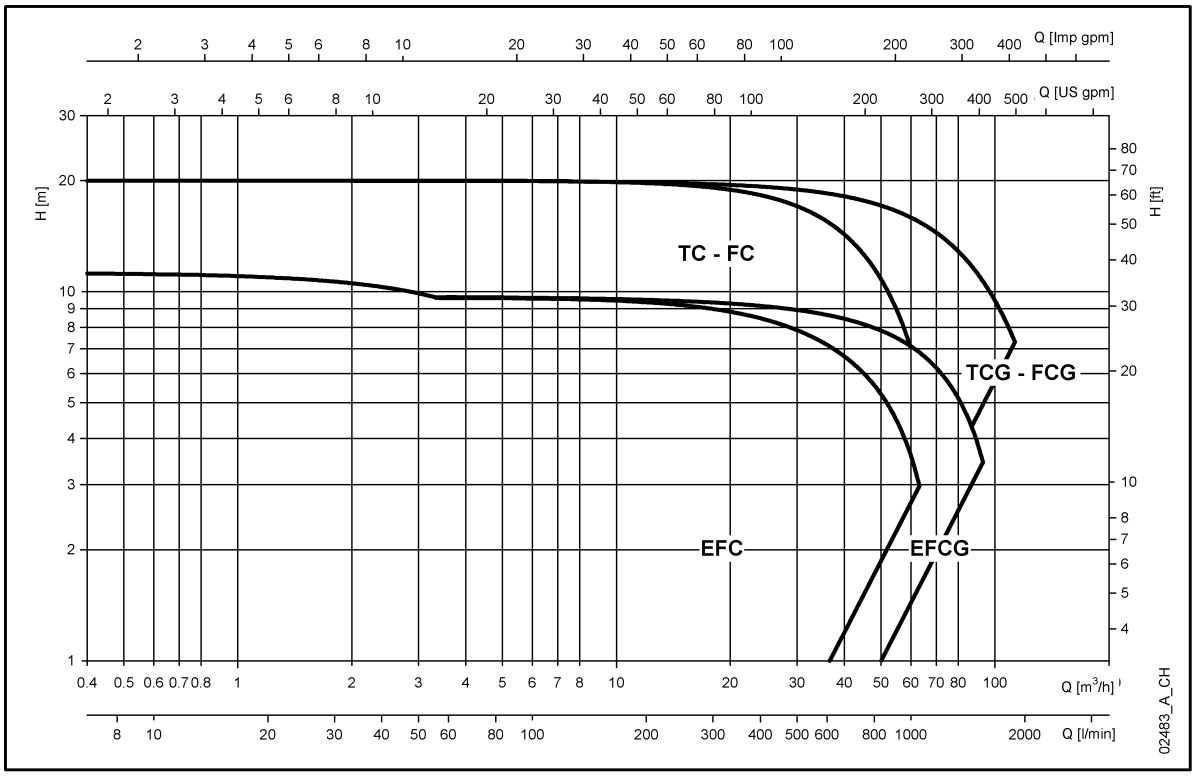
Wet rotor inline circulators for commercial applications, fixed speed with manual selection (TC, FC) and automatic regulation (ETC, EFC), cast iron pump body, single and twin pump body executions.

Specifications

Delivery:	up to 70 m³/h (series TC, FC, 130 m³/h with two pumps on)
Head:	up to 20 m (series TC, FC) up to 11 m (series ETC, EFC)
Liquid temperature range:	-20°C ÷ +130°C for TC, FC series +20°C ÷ +110°C for ETC, EFC series
Maximum system pressure	10 bar (PN10)
Power supply:	single phase, 230 V 50 Hz and / or three-phase 230 / 400 V 50 Hz
Connections:	unions, 1" 1/4 and flanges DN 40, 50 65, 80.

Product Features

Easy to install
Easy selection of speed or mode of regulation (manual, automatic or external set)
Extremely low noise
Long lifetime



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FC - FCT Series

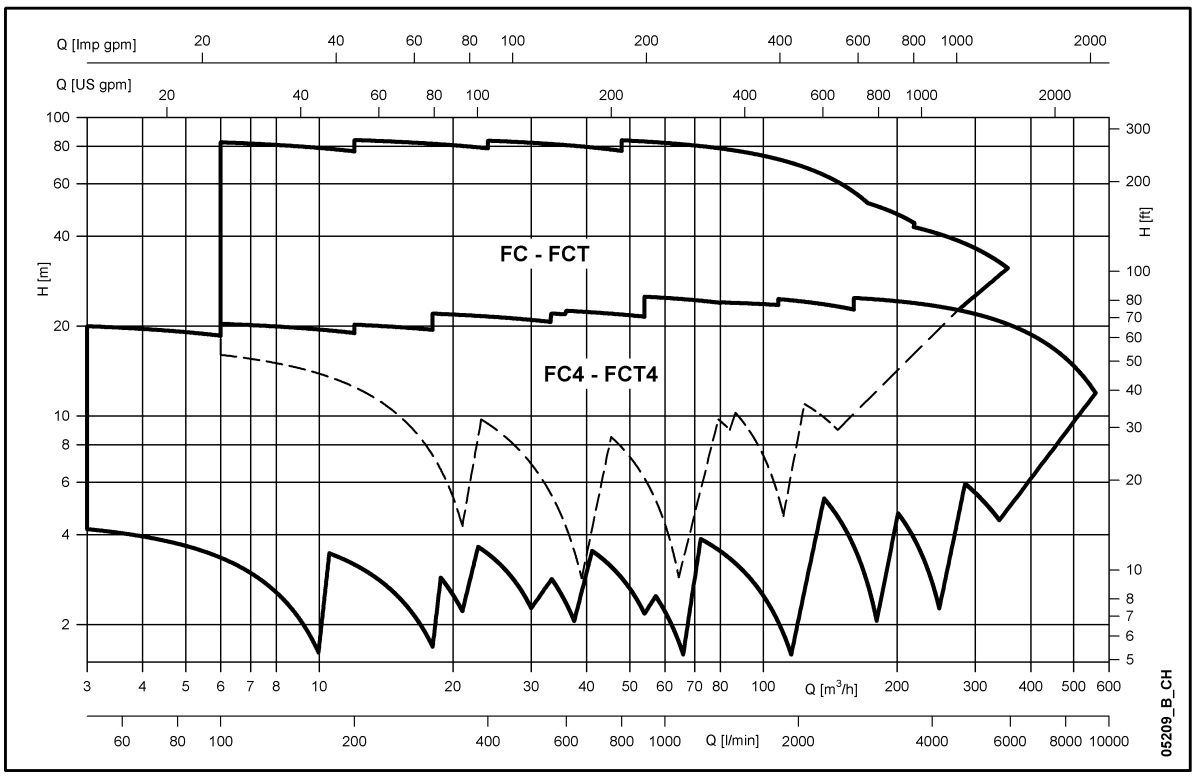
Cast iron in-line centrifugal pumps, single and twin versions
In-line electric pumps with cast iron pump body, AISI 316L stainless steel impeller entirely welded using laser technology (for models with 40, 50 and 65 nominal port diameter). Suitable for handling hot or cold moderately aggressive liquids.

Specifications

Delivery: up to 190,00 m^3/h
Head: up to 90,0 m
Power supply: three-phase 50 and 60 Hz
Power: from 0,25 kW up to 22,00 kW
Maximum operating pressure: 12,0 bar
Temperature range: from -20 °C to 130 °C

Applications

H.V.A.C.
Cooling and chillerWater distribution
Industrial washing equipment
Heat recovery
Filtration equipment
General industry
Auxiliary equipment
Irrigation



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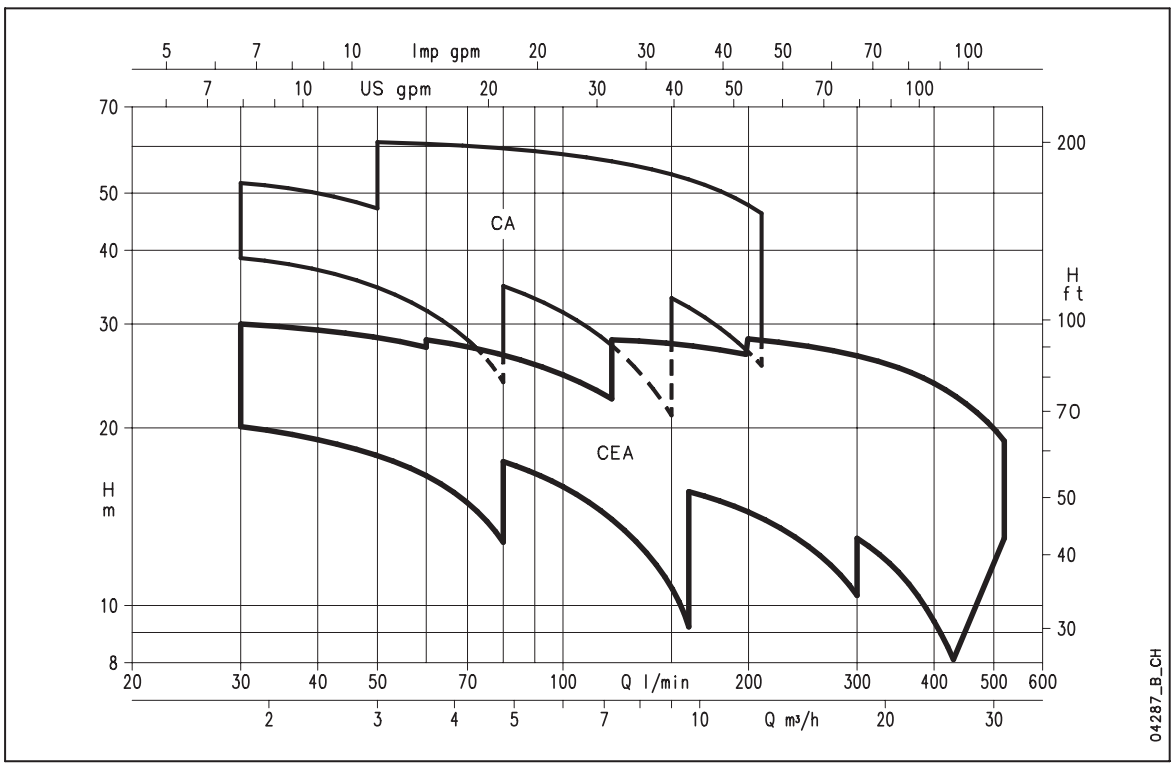
CEA / CA Series

Stainless steel threaded centrifugal pumps
Wide range of pumps for domestic and industrial applications.
Single-impeller (CEA) and dual-impeller (CA) models available.

Specifications
Delivery: up to 31,00 m³/h
Head: up to 62,0 m
Power supply: three and single-phase 50 Hz
Power: from 0,37 kW up to 3,00 kW
Maximum operating pressure: 8,0 bar
Temperature range: from -10 °C to 110 °C

Applications
Water distribution
Rain water collection
Industrial washing equipment
Pressure boosting
General industry
Irrigation
Water treatment
Cooling and chiller
Swimming pools
Heat recovery
HVAC



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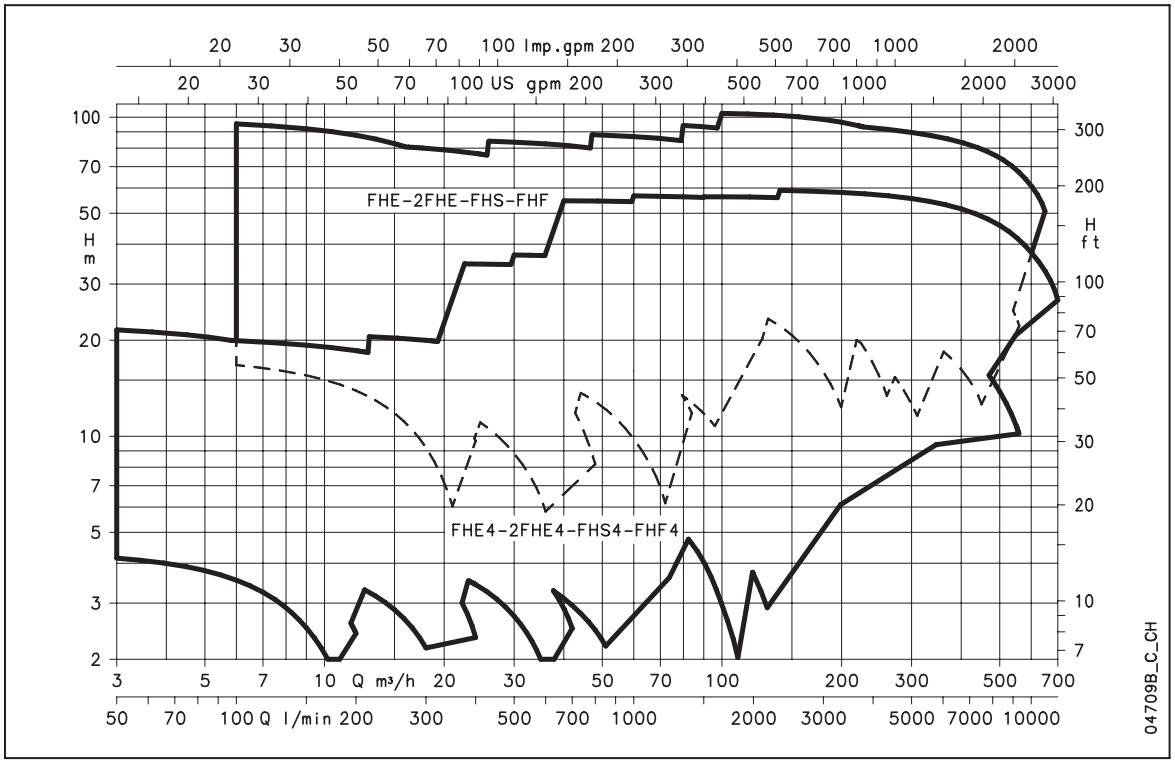
FH Series

Centrifugal electric pumps in compliance with EN 733 - DIN 24255
Cast iron pump body and AISI 316L stainless steel, laser-technology welded impeller (1). Suitable for pumping hot and cold, moderately aggressive liquids.

Specifications
Delivery: up to 500,00 m³/h
Head: up to 95,0 m
Power supply: three and single-phase 50 and 60 Hz
Power: from 0,25 kW up to 55,00 kW
Maximum operating pressure: 12,0 bar
Temperature range: from -20 °C to 120 °C

Applications
H.V.A.C.
Cooling and chiller
Water distribution
Industrial washing equipment
Heat recovery
Pressure boosting
Filtration equipment
General industry
Auxiliary equipment
Irrigation
Water treatment
Fire-fighting equipment



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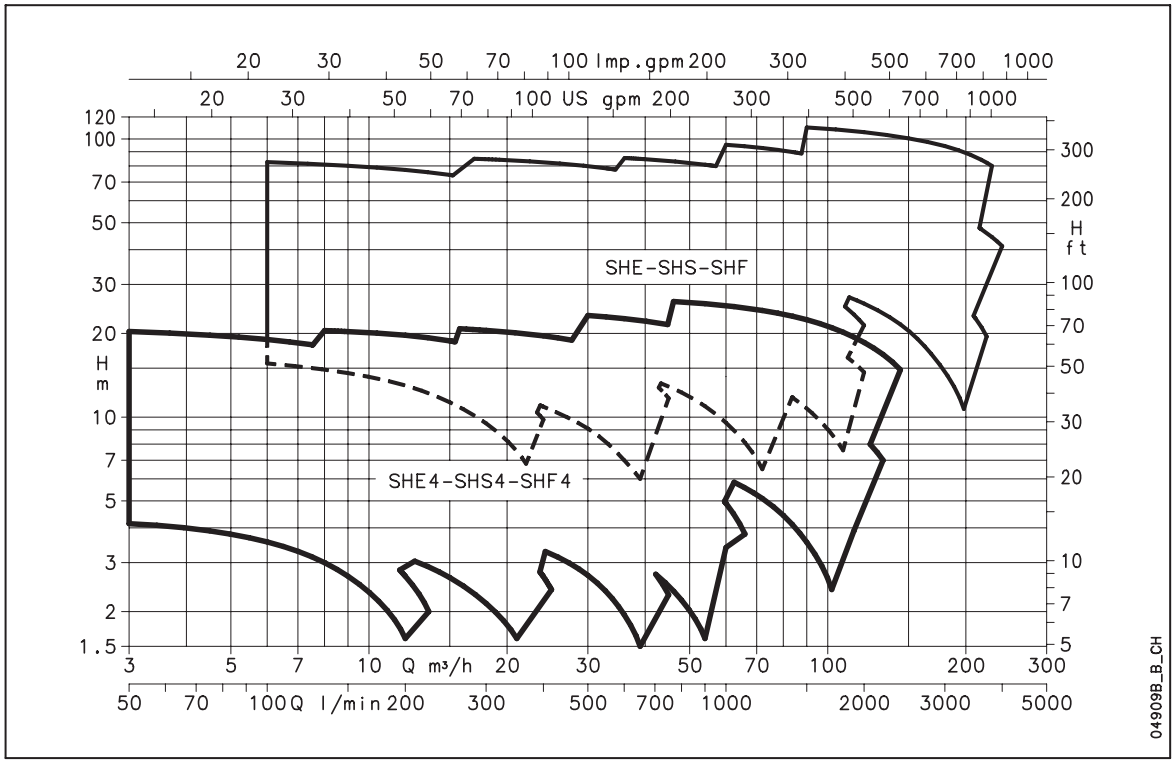
SH Series

Centrifugal pumps, AISI 316 stainless steel in compliance with EN 733 - DIN 24255
Laser-technology welded centrifugal pumps. Designed to handle hot, cold and moderately aggressive liquids.

Specifications
Delivery: up to 240,00 m³/h
Head: up to 110,0 m
Power supply: three-phase 50 and 60 Hz
Power: from 0,25 kW up to 75,00 kW
Maximum operating pressure: 12,0 bar
Temperature range: from -10 °C to 110 °C

Applications
H.V.A.C.
Cooling and chiller
Water distribution
Rain water collection
Industrial washing equipment
Heat recovery
Pressure boosting
Filtration equipment
General industry
Auxiliary equipment
Irrigation
Water treatment



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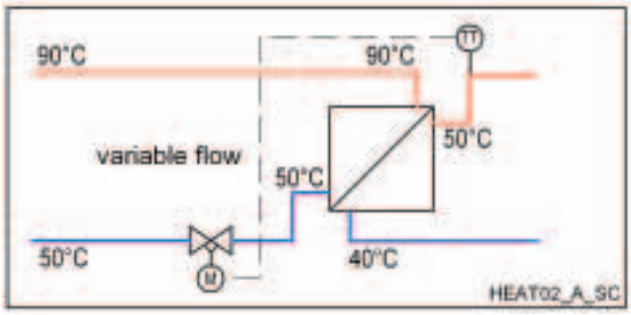
4. Systems overview

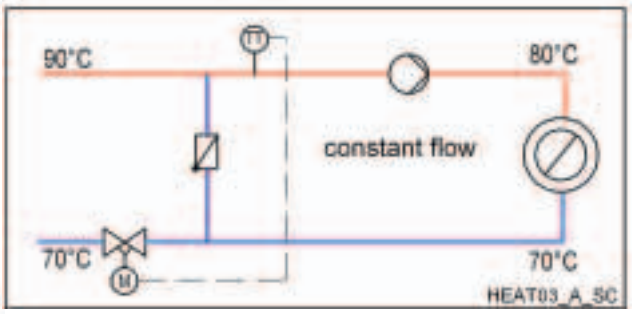
There are different points of view, by which the hydraulic system of "warm water" heating plants can be grouped (This list is not definitive):

4.1 By the type of power control

4.1.1 - Constant temperature / variable flow

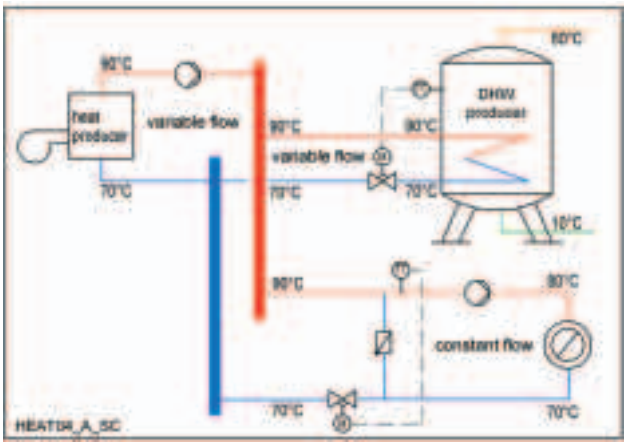


4.4.2 - Variable temperature / constant flow

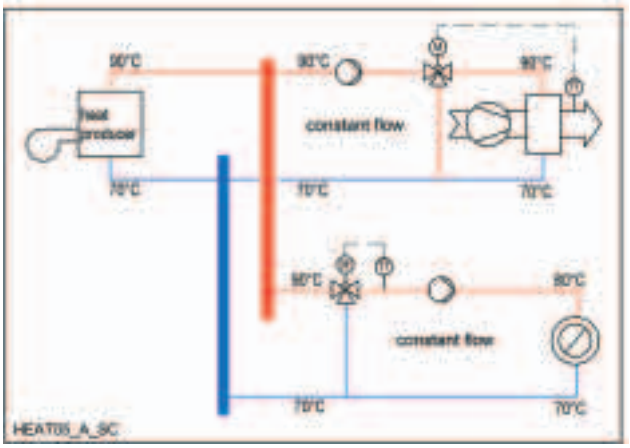


4.2 By the type of manifold

4.2.1 - Manifold with differential pressure (Main pump required)

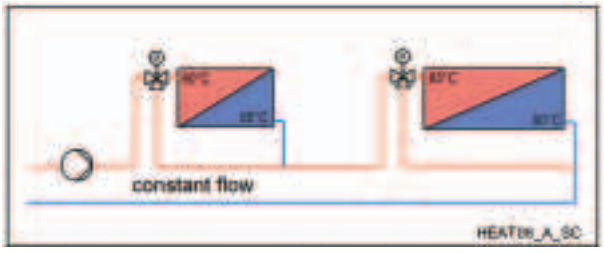


4.2.2 - Manifold without differential pressure (No main pump)

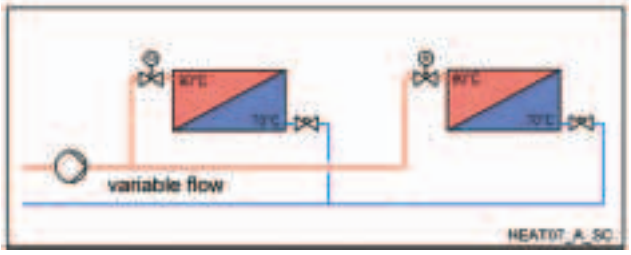


4.3 By the type of pipework

4.3.1 - One pipe system



4.3.2 - Two pipe system



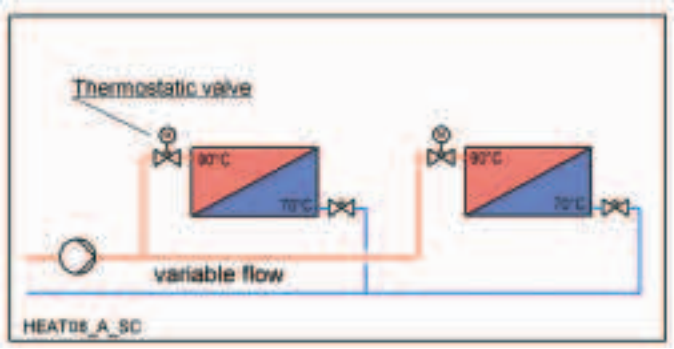
Each "warm water" heating system includes these three main points and is at last a mix of their sub points.

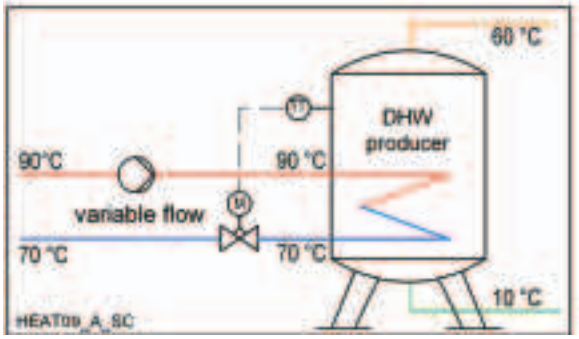
5. Systems and products

Constant temperature / variable flow (4.1.1)

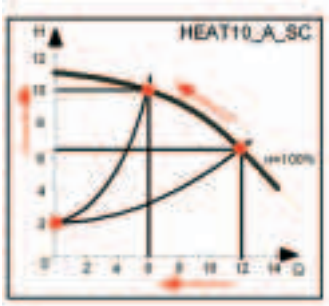
Function

The demand of power rating in a heating system is dependant on factors like outside temperature, number of persons in building, electric equipment in use etc. One possibility to adapt the power rating to the demand is to keep the flow line temperature constant and vary the water flow in the system by using a two-way control valve.
The sensor of the control valve must be placed in the mediums, whose temperature should be regulated.
This method is possible in a system with radiators and it is the preferred way to control a domestic hot water generator or the power rating of a heat exchanger.
The shown examples are systems with a main pump.





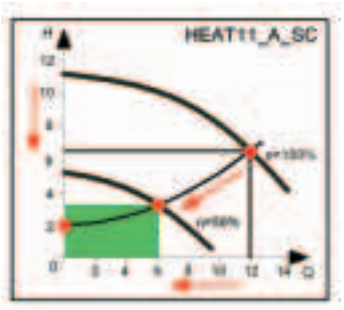
Due to the characteristics of centrifugal pumps one disadvantage is the increasing differential pressure in the system when the flow is throttled. Using it in a radiator system without additional steps, maybe noise problems are caused due to this characteristic.
Another disadvantage is the near constant power consumption of the pump which is independent to the flow.



Recommended products

To avoid these disadvantages and to obtain a proper working and energy saving system, it is recommended to use variable speed pumps in systems with variable flow.

The size of the pump and the type series is dependant to the application. In radiator systems wet runners pumps are preferred, they operate quieter due to their design.



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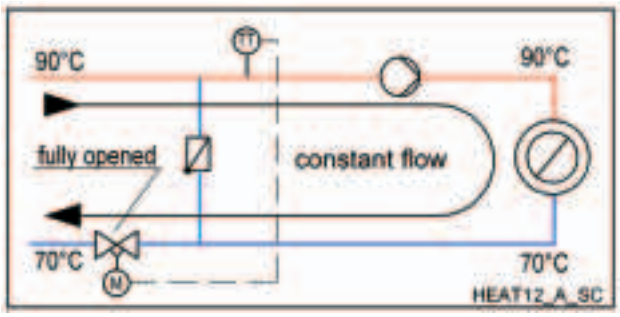
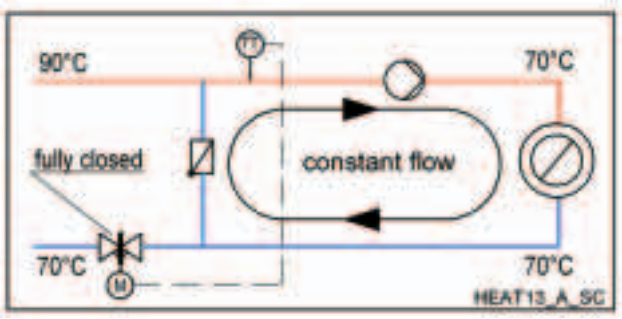
Variable temperature / constant flow (4.1.2)

Function

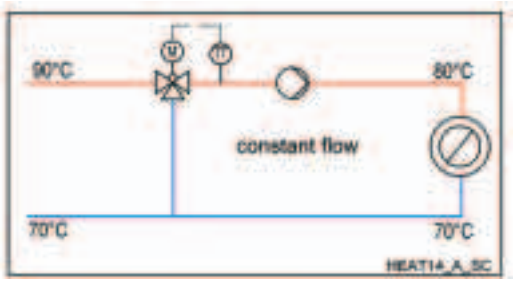
Another possibility of power control is to keep constant the flow and to vary the flow line temperature, dependant on the demand.
This method is a little bit more complex. The temperature of the flow line will be controlled by mixing cooler water from the return flow.
In systems with a main pump it is realized as the solution shown below:



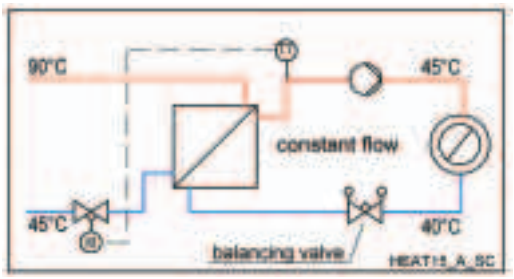


Each position of the control valve between "fully opened" and "fully closed" will produce a mixed temperature.

This principle also works well in systems without a main pump. In this case we have to use a three way valve:



Another typical application of this principle is controlling the flow line temperature in the secondary loop of a heat exchanger system by varying the flow in the primary loop.
This is an optimal solution to control a floor heating system.
To bring the flow in the secondary loop exactly to the calculated point, a balancing valve is used in addition to a carefully dimensioned pump.



Also in district heating systems, where it is very important to have a maximum temperature difference between flow line and return flow, this type of control loop is utilised.

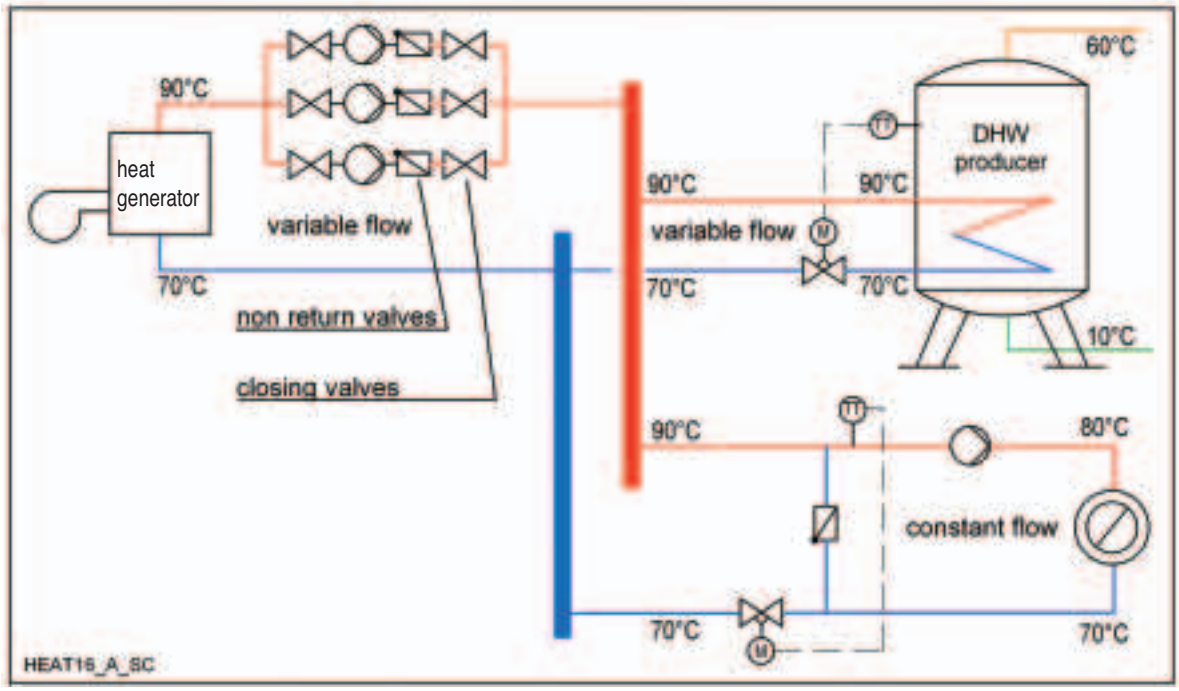
Recommended products

As a rule, fixed speed pumps will be a good choice for the applications shown above. Instead of using a balancing valve a speed controlled pump can be applied to fix the flow to the calculated point. This solution would save energy.
For a final decision it is necessary to contemplate the complete system.

Manifold with differential pressure (4.2.1)

Function

In systems, where a differential pressure between the flow line and the return flow manifold is required, it is necessary to have a pump in the loop between the heat generator and the manifold. The function of that pump is to override the flow resistance of the pipework between the heat generator and the manifold, including the flow resistance of the control valves of the control loops, provided by the manifold.
One criteria to choose this system is a large distance between the heat generator and the manifold.
District heating systems are a typical example to supply this solution, the distances between heat generator and users can be several kilometers. The supplied objects replace the manifold in this case.
To optimize those systems and to maximize the reliability of supply, is is suggested to split the flow to two or three pumps.



Installing pumps in parallel it is important to install non return valves for a proper work of the system and isolating valves before and after the pumps for easy maintenance.

Each change in the load of the supplied control loops will cause a change of the flow in the providing pipework and consequently in the load of the main pump.

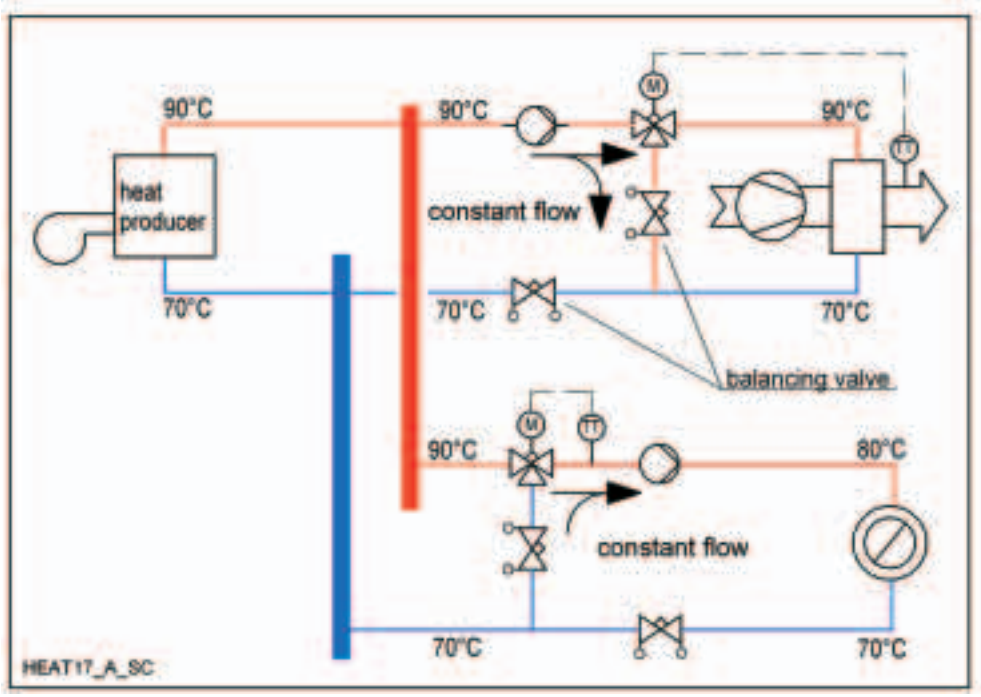
Recommended products

This is a typical example where variable speed pumps can demonstrate all their advantages

Manifold without differential pressure (4.2.2)

Function

In situations with a low distance between the heat generator and the manifold, we can renounce using a main pump.
In this case the pumps of the control loops have to override the flow resistance of the pipework of the control loop, the control valve and the pipework between the heat generator and the manifold.
In most cases three way valves are used in this type of control loop.



In control loops as illustrated in the example above, it is essential for a proper function of the system to apply balancing valves at the displayed positions:

- in the return flow they are necessary to bring the flow exactly to the calculated point.

- in the shortcut between the control valve and the return flow they are needed to balance the flow resistance of the shortcut.

These types of control loops are typically used in one family houses, equipped with more than one control loop.

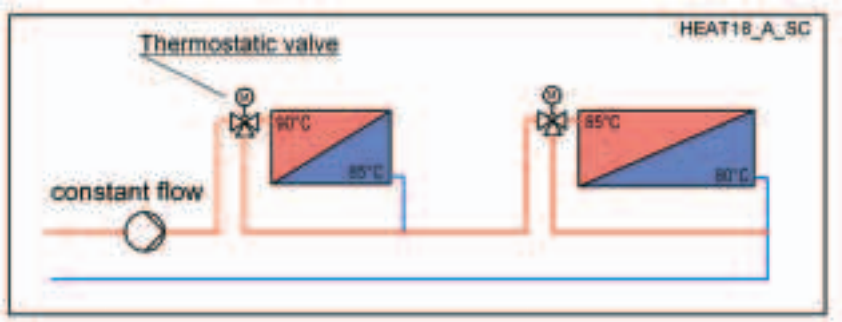
Recommended products

As a rule, fixed speed pumps will be a good choice for applications as shown above.
Instead of using a balancing valves, a speed controlled pump can be applied to fix the flow to the calculated point. This solution would save energy.
For a final decision it is necessary to contemplate the complete system.

One pipe system (4.3.1)

Function

In radiator systems the water passes the heating surfaces which emit the heat to the surrounding area. Thereby the water cools down.
The output power of a radiator is depending to the flow line temperature and the size of the radiator.
In one pipe systems the return flow of the first radiator is the flow line of the second radiator, and so on.



This requires that radiators with the same power output have to be larger as they are placed to the end of the system.

Throttling or closing the radiator valves in those systems, the water which is not needed for heating will take a bypass. If all radiators are closed, all the water takes the bypasses and the temperature of the return flow is identical to the temperature of the flow line.
This property of a one pipe system prohibits using it in buildings which are supplied by a district heating system.

Apart from this limitation, the one pipe system may be combined with variable and to constant temperature control loops.

Recommended products

Depending to the type of control loop we should find the optimal type of pump:

- A variable speed type should be selected for use in a constant temperature loop

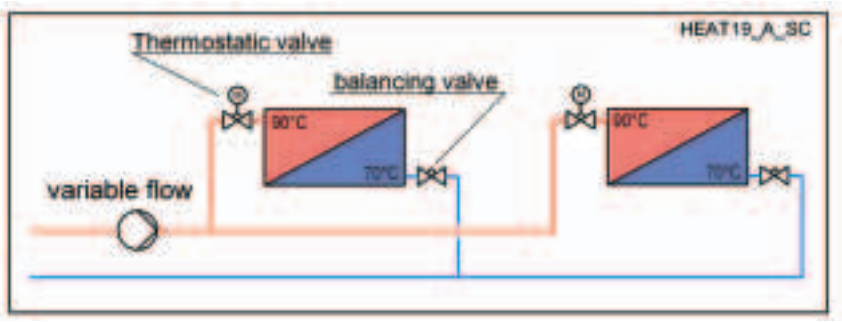
- For use in a variable temperature loop a fixed speed type may be adequate.

Independent to controlled speed or fixed speed for using in radiator systems we should try to find a matching type from the wet runner series, due to their more quiet operation.

Two pipe system (4.3.2)

Function

As the essential difference to the one pipe system, the flow line temperature is the same at each radiator. This means that radiators with the same power output have the same size.



To optimize the distribution of the flow to the radiators it is important to apply balancing valves to each radiator

Without any limitation radiators in a two pipe system may be combined with variable and constant temperature control loops.

However, best results can be expected using them in loops with constant flow and variable flow line temperature following the outdoor temperature, as a definitive control and applying all radiators with thermostatic valves for fine control.

Recommended products

Depending to the type of control loop we should find the optimal type of pump:

- A variable speed type should be selected for use in a constant temperature loop

- For use in a variable temperature loop, a fixed speed type may be adequate.

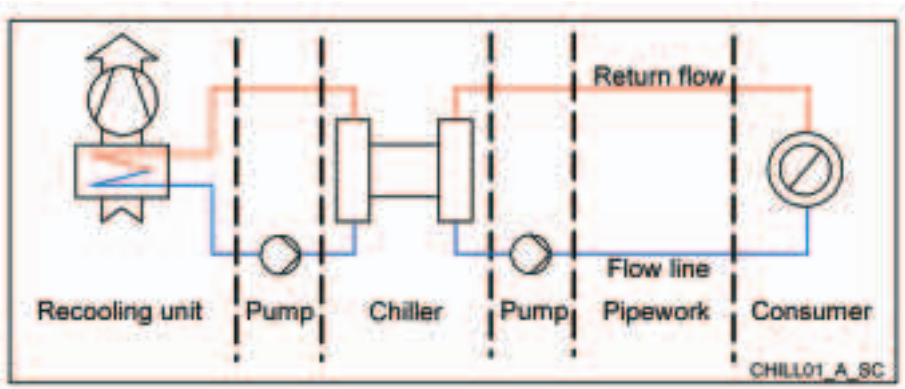
Independent to controlled speed or fixed speed, for using in radiator systems we should try to find a matching type from the wet runner series, due to their quieter operation.

1. General

What is Air conditioning?

With this definition, all systems are included which cool down the temperature and control the humidity and the total air quality in residential, commercial, industrial, and other buildings.
For this purpose cold water, produced at a central point, is used to transport cooling energy in closed loops of pipework to individual users in a building.

All different variations follow the same principle and are composed by the same main components:



The chiller for use in HVAC applications will be in most cases a compressor type.
It must be dimensioned taking into account the maximum possible load.

The pipework of an air conditioning system must be designed based on the maximum probable flow, or project flow.

The project flow essentially depends on two factors:

- The required cooling power, depending on the dimension of the building, the quality of its thermal insulation and the expected maximum outdoor temperature.

- The differential temperature between the flow line and the return flow of the system.

With these basic data the designer has to find an economic balance for the dimension of the pipework:

- The flow resistance in the pipework is linked to the energy consumption to the pumps, which are necessary to make the water flow.

- The operational cost of pumps in heating systems, caused by the consumption of electrical energy are an essential factor for the design of pipe systems in a building.

These factors and much more are considered in the European standards, which should be applied by the designer and installer.

The consumers may be for example cooler batteries, chilled beams / floors or fan coils.

The pumps are necessary to make the water in the system flow. Two main factors are important for dimensioning a pump:

- The discharge flow. Selecting the pump, we must follow the maximum probable flow.
- The delivery height, which is necessary to override the flow resistance, caused by the pipework and the consumers. It is the result of dimensioning the pipework.

Some further basics

The following basic values are necessary for calculating cooling loops:

The flow rate per hour	Q [m³/h]
The temperature difference between flow line and return flow	ΔT [K]
The power factor for the transport medium (water = 1,163)	1,163 [-]
The cooling energy	P [kW]

With three of these values the fourth can be calculated. In most cases we know the load and the design temperature and have to calculate the flow for dimensioning the pipework and the pump:

The formula is: $$\frac{P\ [kW]}{dT\ [K] * 1{,}163} = Q\ [m^3/h]$$

For example: $$\frac{34{,}9\ kW}{(18 - 15) * 1{,}163} = 10{,}0\ m^3/h$$

Fixed speed or variable speed?

Our products are available as fixed speed type or variable speed design. The decision what to use should be done dependant to the type of control loop where the pump is intended to be applied:

- In a control loop with variable flow a variable speed pump, controlled by differential pressure for example, should be the first choice.
- In a control loop with constant flow a simple fixed speed pump will meet the requirements.

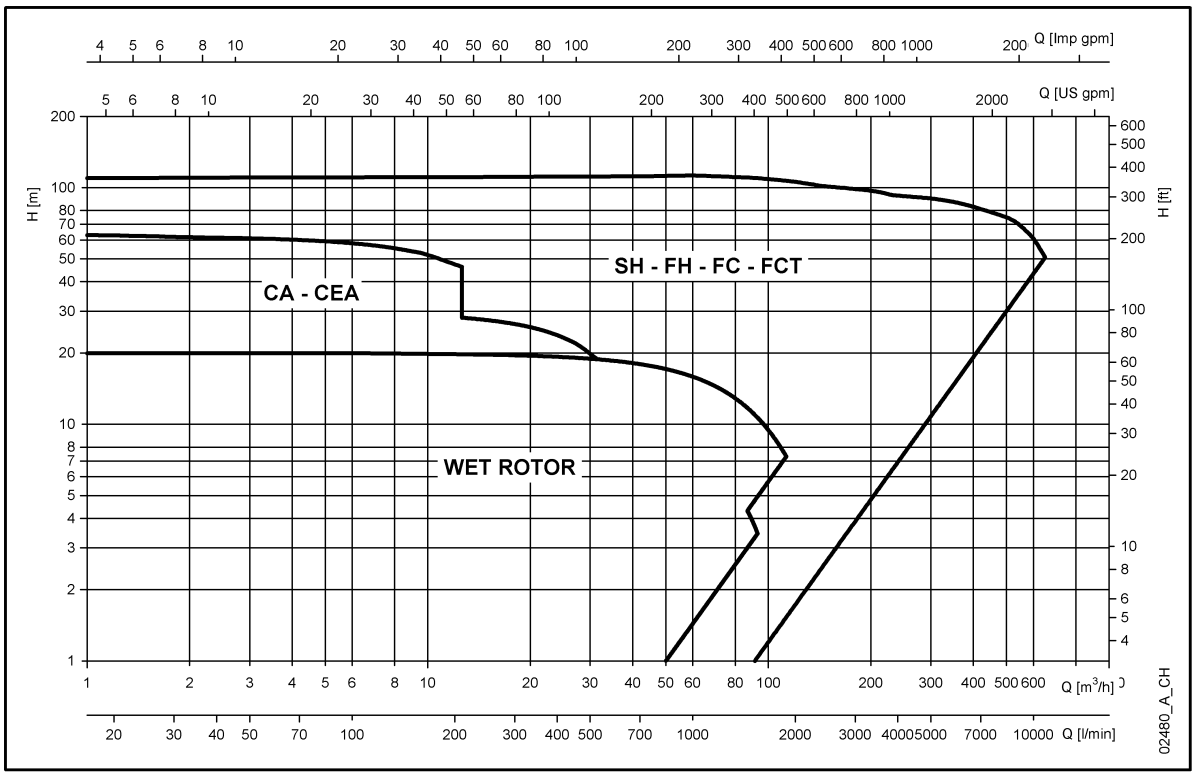
Wet-runner or Dry-runner?

Typically small to medium pumps are wet-runners (up to app. 50 m³/h at a delivery height of app. 1,0 bar = 10 mWc = 100 kPa), medium to large pumps are dry-runners, with a transition zone where both solutions are available.

2. Summary of products for Air conditioning

The range of the products for the Air conditioning is divided in four main families:
Wet runners / Dry runners and Fixed speed / Variable speed.

	Wet-runners	Dry-runners	
		Inline pumps	Block pumps
Fixed speed	TCR	FC	CEA / CA
	TCB	FCT	FH
	TC-FC		SH
Variable speed	ETCR	FC-H	CEA / CA
	ETC	NCLG-H	FH-H
	EFC		SH-H



3. Product family

TCR, ETCR Series

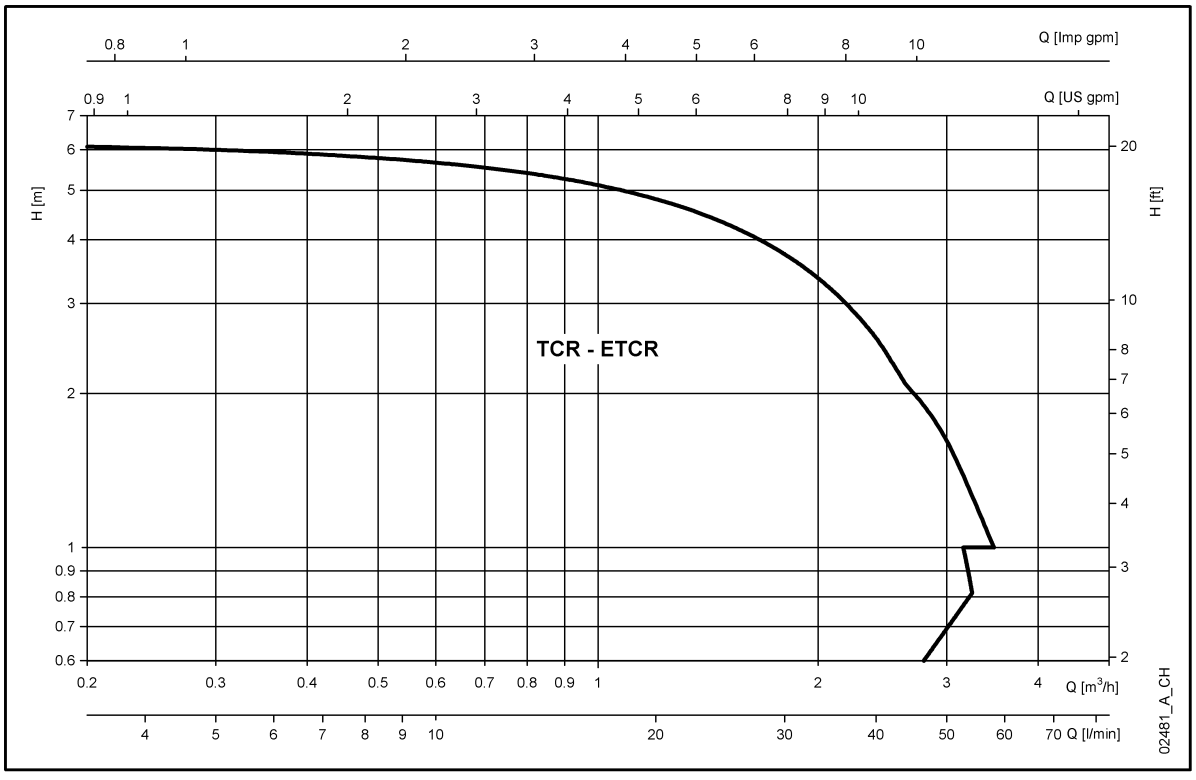
Wet rotor inline circulators for residential applications, fixed speed with manual selection (TCR) and automatic regulation (ETCR), cast iron pump body.

Specifications

Delivery:	up to 4 m³/h
Head:	up to 6,5 m (series TCR) up to 5 m (series ETCR)
Liquid temperature range:	-10°C ÷ +110°C for TCR series +2°C ÷ +95°C for ETCR series
Maximum system pressure	10 bar (PN10)
Power supply:	single phase, 230 V 50 Hz
Connections:	unions, 1", 1" 1/4 e 1" 1/2.

Product Features

Easy to install
Easy selection of speed or regulation
Extremely low noise
Long lifetime



3

TCB Series

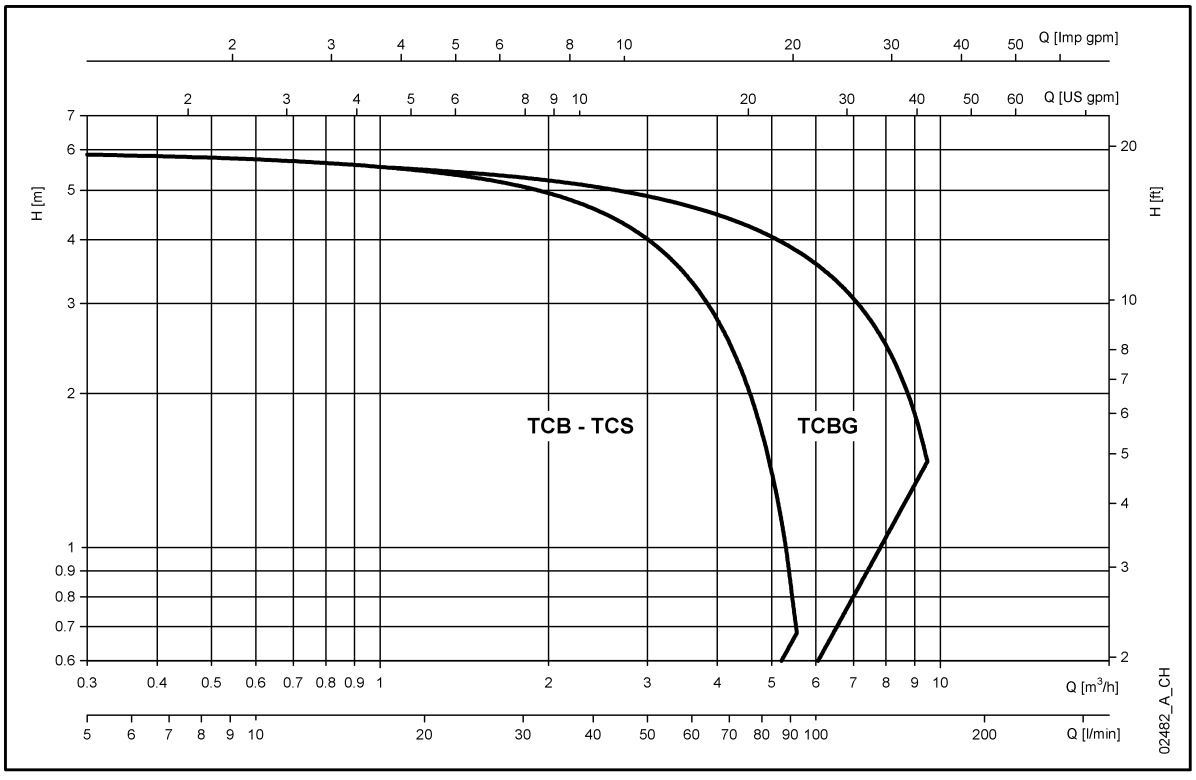
Wet rotor inline circulators for sanitary hot water circulation, fixed speed with manual selection (TCR), cast iron or stainless steel pump body, single and twin pump body executions.

Specifications

Delivery:	up to 6 m^3/h
Head:	up to 6,5 m
Liquid temperature range:	0°C ÷ +110°C
Maximum system pressure	10 bar (PN10)
Power supply:	single phase, 220 V 50 Hz
Connections:	unions, 1", 1" 1/4 e 1" 1/2.

Product Features

Easy to install
Easy selection of speed or regulation
Extremely low noise
Long lifetime



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TC, FC, ETC, EFC Series

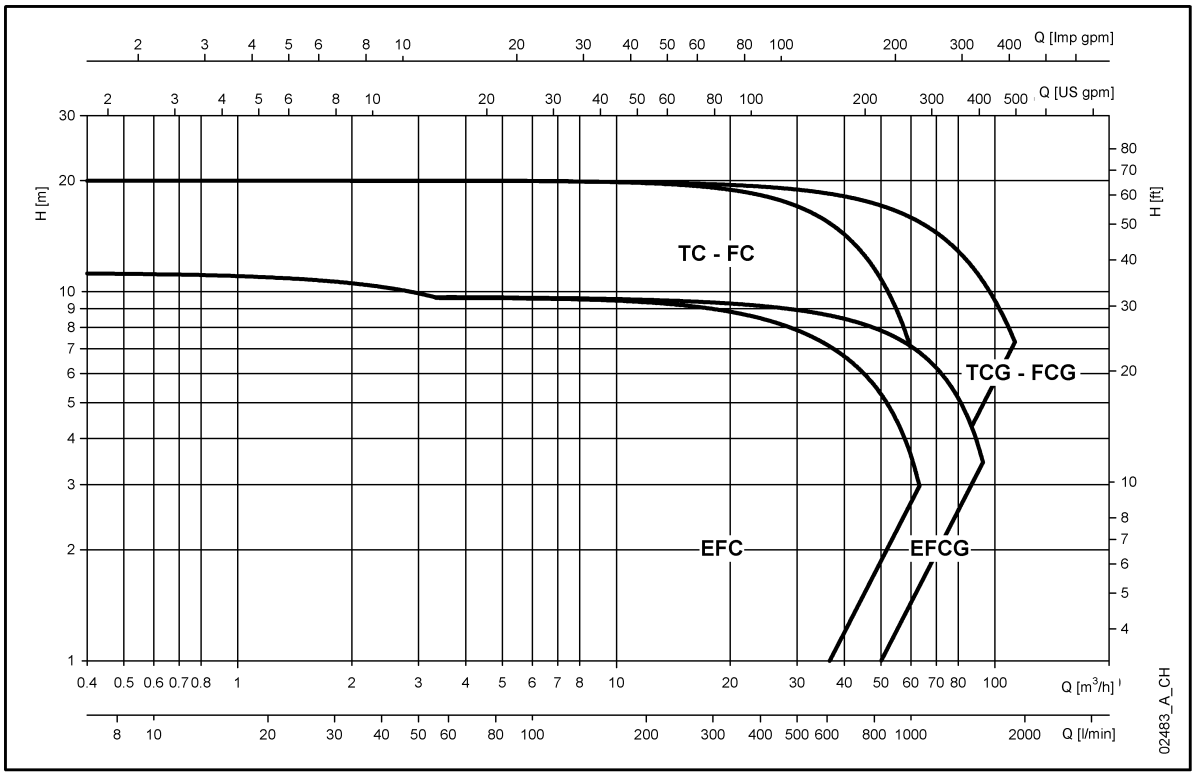
Wet rotor inline circulators for commercial applications, fixed speed with manual selection (TC, FC) and automatic regulation (ETC, EFC), cast iron pump body, single and twin pump body executions.

Specifications

Delivery:	up to 70 m³/h (series TC, FC, 130 m³/h with two pumps on)
Head:	up to 20 m (series TC, FC) up to 11 m (series ETC, EFC)
Liquid temperature range:	-20°C ÷ +130°C for TC, FC series +20°C ÷ +110°C for ETC, EFC series
Maximum system pressure	10 bar (PN10)
Power supply:	single phase, 230 V 50 Hz and / or three-phase 230 / 400 V 50 Hz
Connections:	unions, 1" 1/4 and flanges DN 40, 50 65, 80.

Product Features

Easy to install
Easy selection of speed or mode of regulation (manual, automatic or external set)
Extremely low noise
Long lifetime



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3

FC - FCT Series

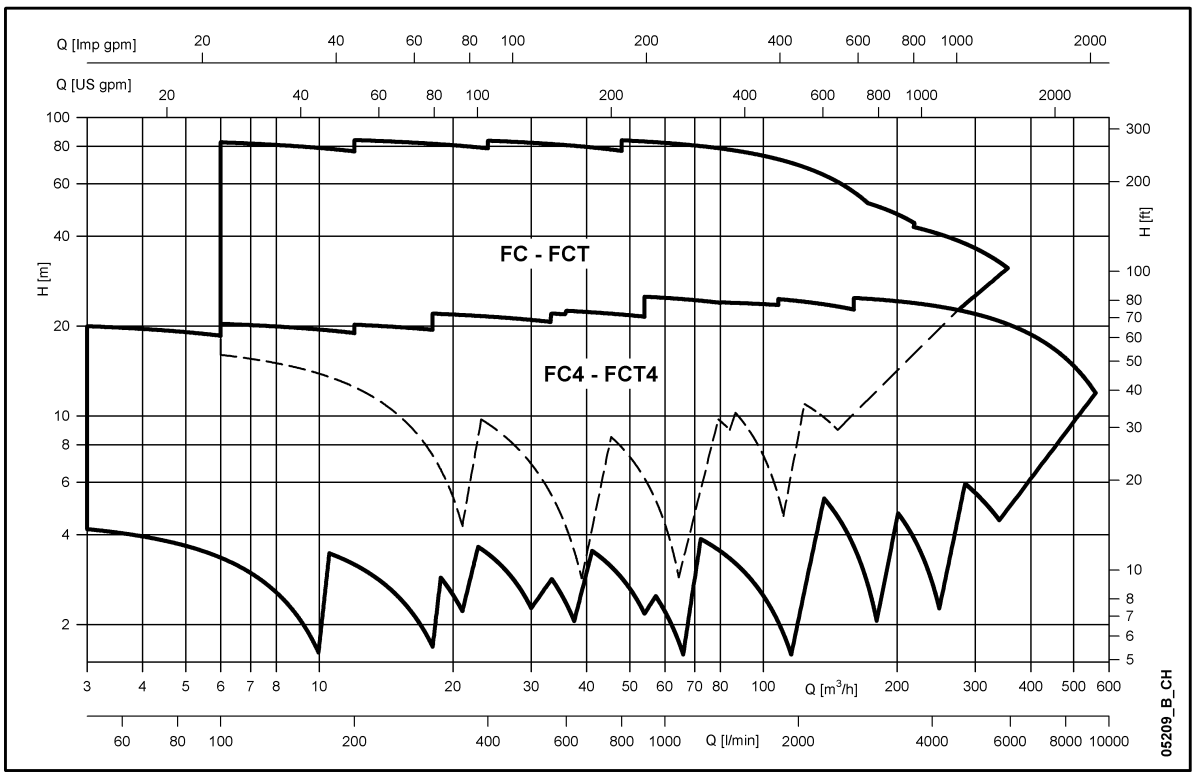
Cast iron in-line centrifugal pumps, single and twin versions
In-line electric pumps with cast iron pump body, AISI 316L stainless steel impeller entirely welded using laser technology (for models with 40, 50 and 65 nominal port diameter). Suitable for handling hot or cold moderately aggressive liquids.

Specifications

Delivery: up to 190,00 m³/h
Head: up to 90,0 m
Power supply: three-phase 50 and 60 Hz
Power: from 0,25 kW up to 22,00 kW
Maximum operating pressure: 12,0 bar
Temperature range: from -20 °C to 130 °C

Applications

H.V.A.C.
Cooling and chiller
Water distribution
Industrial washing equipment
Heat recovery
Filtration equipment
General industry
Auxiliary equipment
Irrigation



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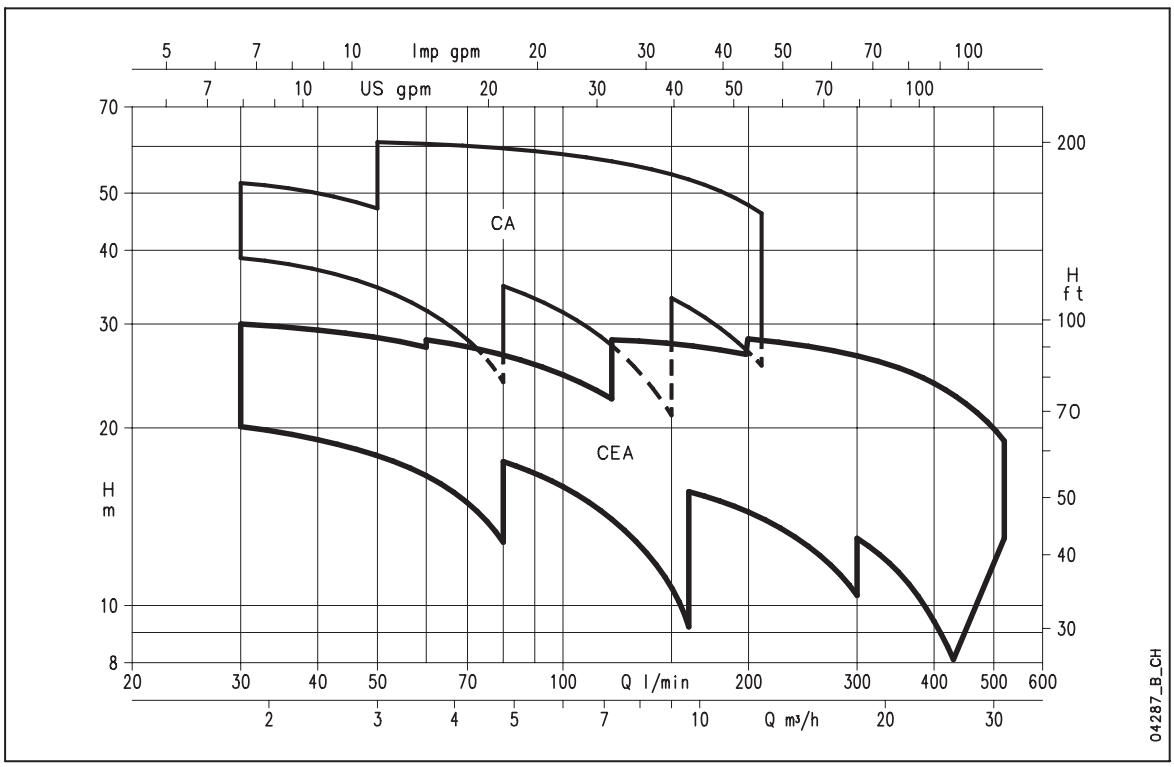
CEA / CA Series

Stainless steel threaded centrifugal pumps
Wide range of pumps for domestic and industrial applications. Single-impeller (CEA) and dual-impeller (CA) models available.

Specifications
Delivery: up to 31,00 m³/h
Head: up to 62,0 m
Power supply: three and single-phase 50 Hz
Power: from 0,37 kW up to 3,00 kW
Maximum operating pressure: 8,0 bar
Temperature range: from -10 °C to 110 °C

Applications
Water distribution
Rain water collection
Industrial washing equipment
Pressure boosting
General industry
Irrigation
Water treatment
Cooling and chiller
Swimming pools



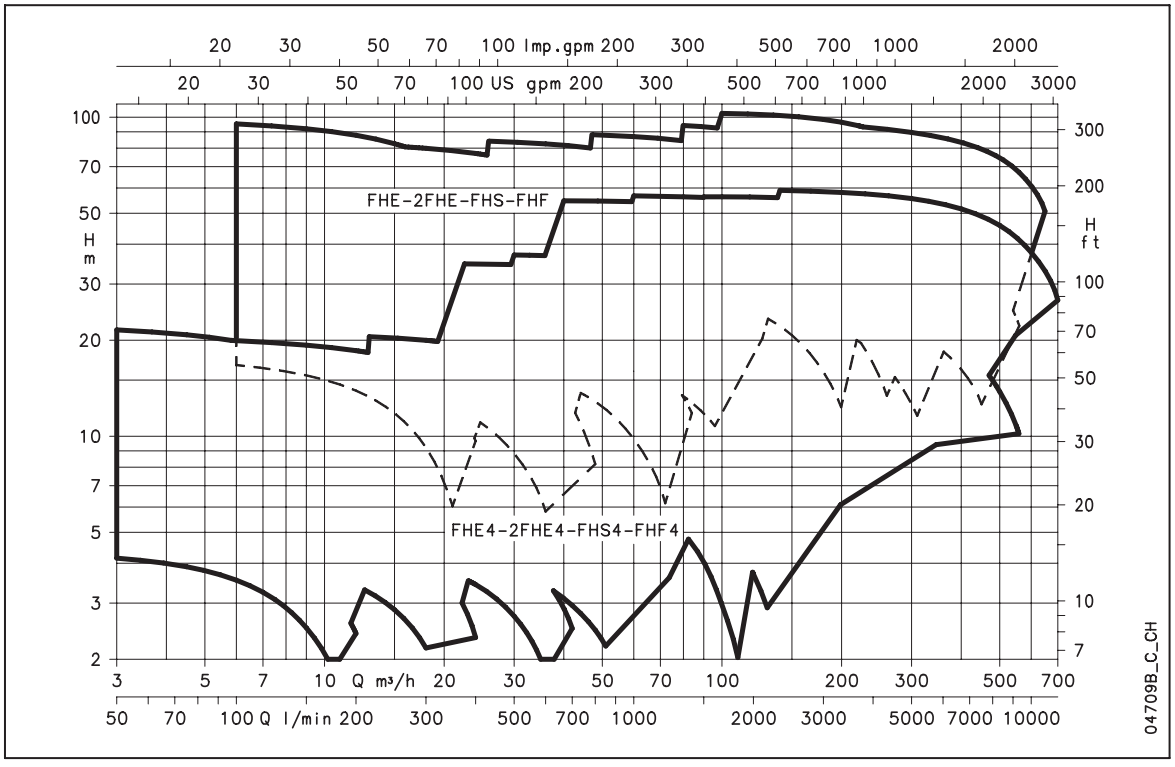
3

FH Series

Centrifugal electric pumps in compliance with EN 733 - DIN 24255
Cast iron pump body and AISI 316L stainless steel, laser-technology welded impeller (1). Suitable for pumping hot and cold, moderately aggressive liquids.

Specifications
Delivery: up to 500,00 m³/h
Head: up to 95,0 m
Power supply: three and single-phase 50 and 60 Hz
Power: from 0,25 kW up to 55,00 kW
Maximum operating pressure: 12,0 bar
Temperature range: from -20 °C to 120 °C

Applications
Water distribution
Industrial washing equipment
Heat recovery
Pressure boosting
Filtration equipment
General industry
Auxiliary equipment
Irrigation
Water treatment
H.V.A.C.
Cooling and chiller
Fire-fighting equipment



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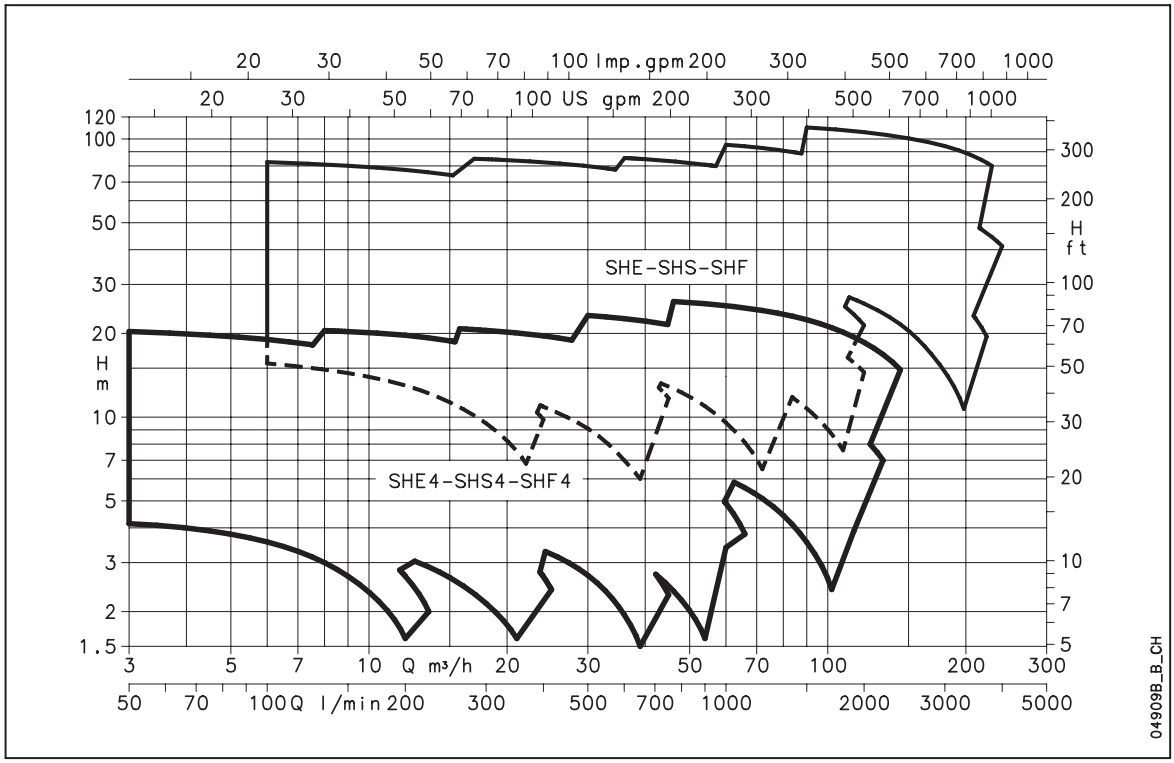
SH Series

Centrifugal pumps, AISI 316 stainless steel in compliance with EN 733 - DIN 24255
Laser-technology welded centrifugal pumps. Designed to handle hot, cold and moderately aggressive liquids.

Specifications
Delivery: up to 240,00 m³/h
Head: up to 110,0 m
Power supply: three-phase 50 and 60 Hz
Power: from 0,25 kW up to 75,00 kW
Maximum operating pressure: 12,0 bar
Temperature range: from -10 °C to 110 °C

Applications
Water distribution
Rain water collection
Industrial washing equipment
Heat recovery
Pressure boosting
Filtration equipment
General industry
Auxiliary equipment
Irrigation
Water treatment
H.V.A.C.
Cooling and chiller



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4. Systems overview

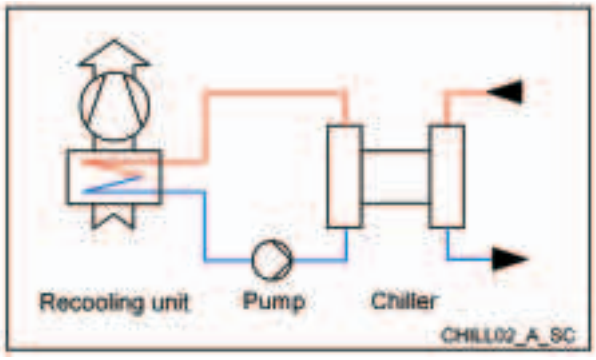
There are different points of view, by which the hydraulic system of air conditioning plants can be grouped (This list is not definitive):

4.1 By the type of chiller cooling

4.1.1 - Condenser direct air cooled

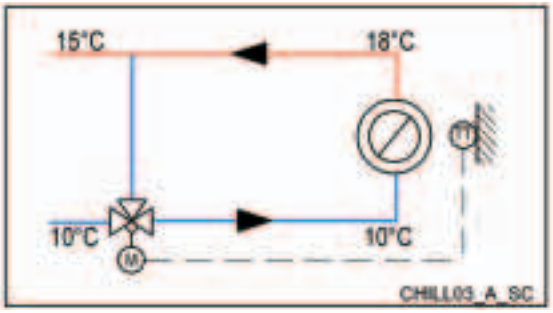
The recooling unit is part of the chiller.
No additional external equipment is necessary.

4.1.2 - Condenser water cooled

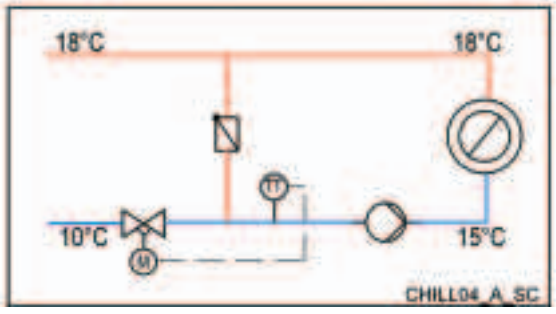


4.2 By the type of control

4.2.1 - diverting control (variable flow)

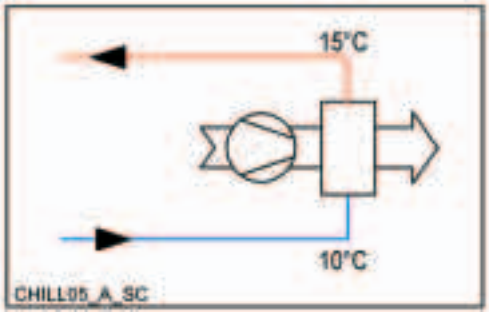


4.2.2 - mixing control (constant flow)

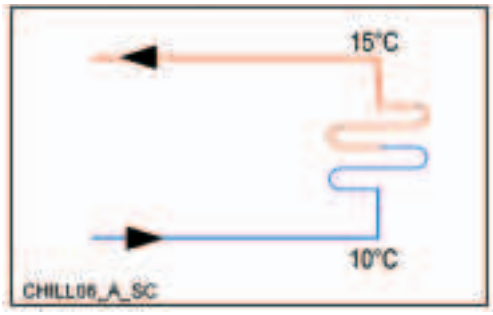


4.3 By the type of consumer

4.3.1 - cooler battery



4.3.2 - chilled beam



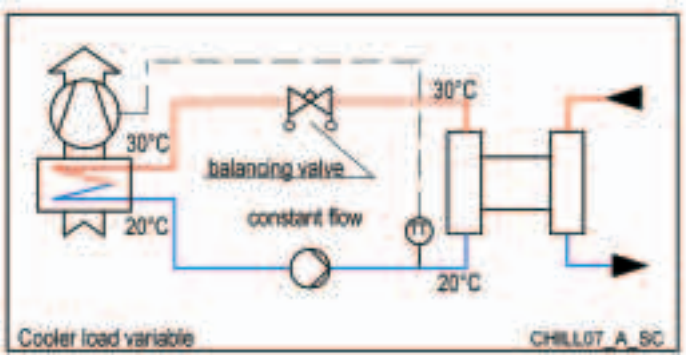
Each air conditioning system includes these three main points and is at last a mix of their sub points.

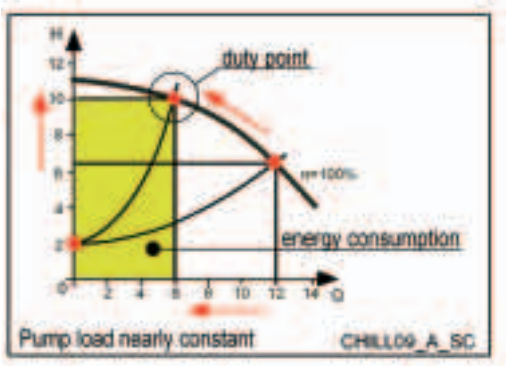
5. Systems and products

Condenser water cooled (4.1.2)

Function

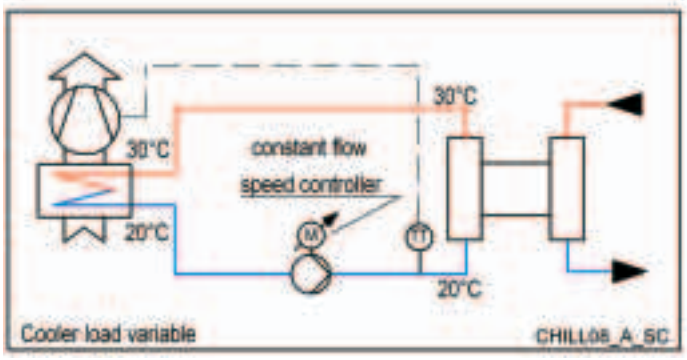
With this solution the cooling of the condenser is done by an external unit, which is connected to the chiller by an intermediate circuit.
Due to the risk of frost, usually a glycol mixture is used in these circuits.
The chiller varies its power output dependant to the demand of the system. This results in the load of the external cooling unit varying.
The temperature in the return flow to the condenser is controlled by varying the speed of the cooler fan.
The flow in the loop is adjusted by a balancing valve.

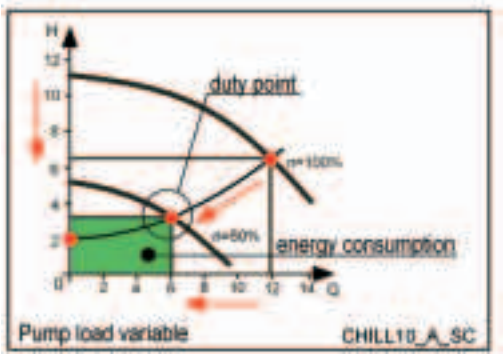




A disadvantage of this solution is the high power consumption of the pump.

Another way to meet the requirements is to adjust the water flow in the system by using a variable speed pump:





As a benefit you get a not only proper working, but also energy saving system.

Recommended products

Fixed speed or variable speed pumps, depending to the method of adjusting the flow.
Pay attention, the chosen type is compatible to the chemical composition of the used fluid.

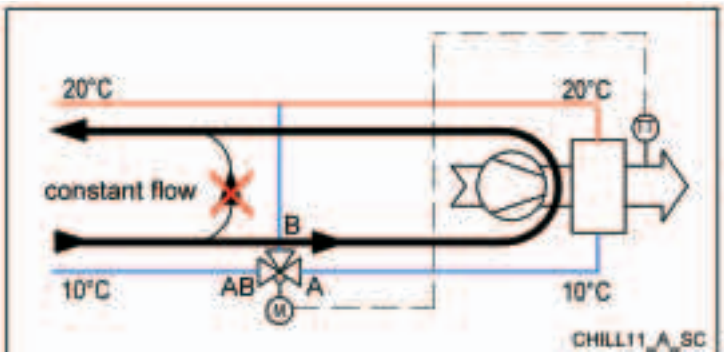
Diverting control (4.2.1)

Function

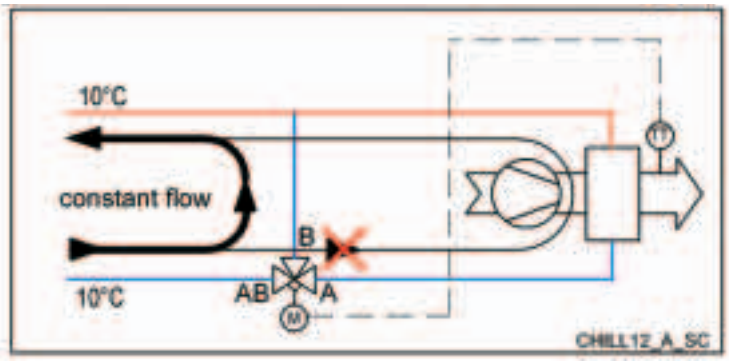
One method of power control is to vary the flow at the consumer by diverting it using a three way valve.

3

At maximum load the way "AB - A" of the three way valve is fully opened and the primary return flow temperature will be identical to the return temperature of the consumer:

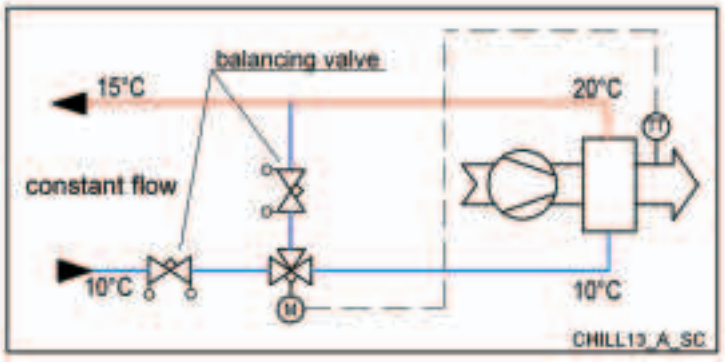


If there is no cooling demand, the way "AB – A" is closed. In this position the way "AB – B" is fully opened. The water coming from the chiller is completely by-passed and the temperature of the return flow is identical to the temperature of the flow line:



Each position in between causes a mixed temperature of the return flow.

To have accurately defined hydraulic conditions and in the following a proper working system, it is important to apply balancing valves at the marked positions:



Recommended products

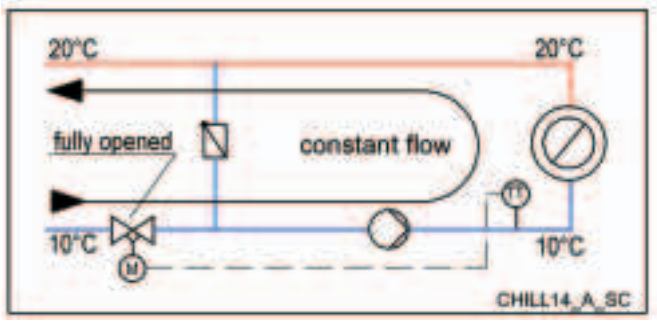
This type of control loops will bring their best performance, supplied by a fixed speed main pump

Mixing control (4.2.2)

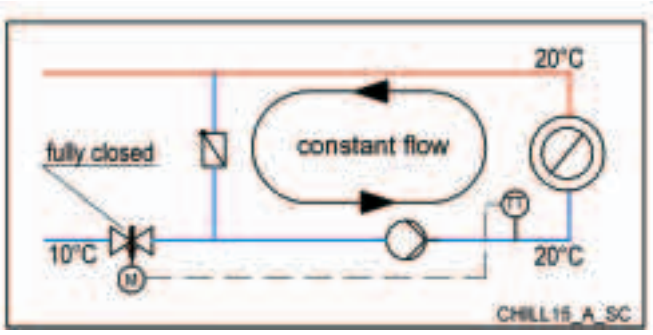
Function

Another possibility of power control is to keep constant the flow in the secondary circuit and to vary the flow line temperature, dependant to the demand. The temperature of the flow line will be controlled by mixing warm water from the return flow.

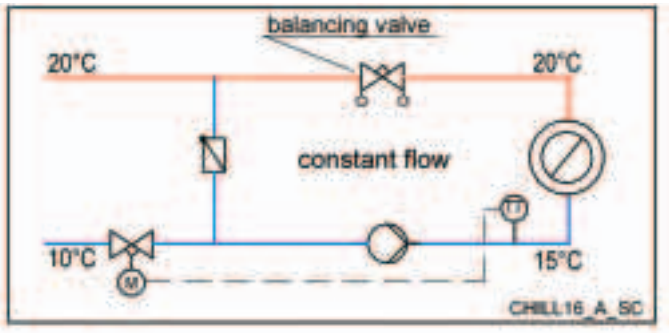
At maximum load the control valve is fully opened and the primary return flow temperature will be identical to the return temperature of the consumer:



If there is no cooling demand, the control valve is closed. In this position the secondary line works in a closed loop, there is no flow at the primary side.



Each position of the control valve between "fully opened" and "fully closed" will result in a mixed temperature of the flow line:
To bring the flow in the secondary loop exactly to the calculated point, we suggest to apply a balancing valve at the displayed position, additional to a careful dimensioning of the pump.



Recommended products

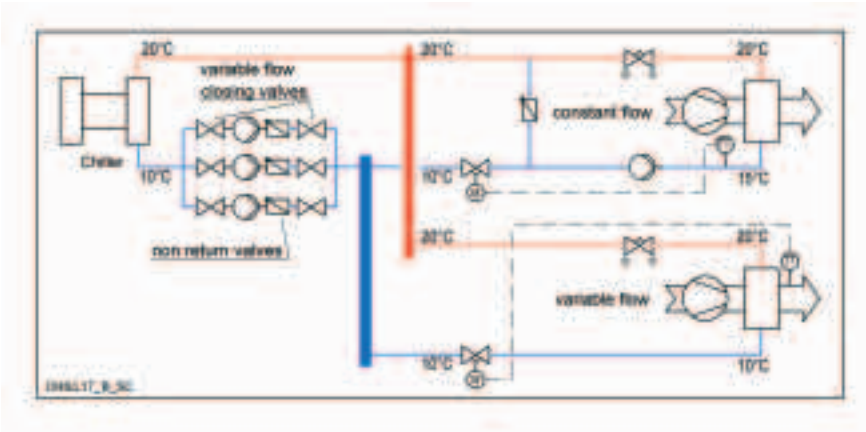
Usually fixed speed pumps will be an adequate choice for use as internal pumps in loops as shown above.
Instead of using a balancing valve, a speed controlled pump can be applied to fix the flow to the calculated point. This solution would save energy.
For a final decision it is necessary to consider the complete system.

Cooler battery (4.3.1)

Function

A cooler battery cools down the air blown into the building by the air conditioning system to a desired temperature depending on the outdoor temperature.

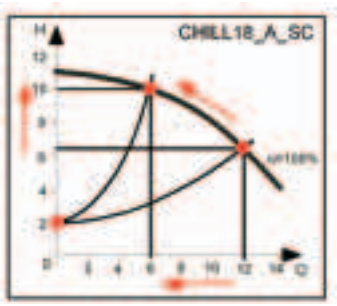
The cooler battery output can be controlled by using different types of control loops:



To optimize those systems and to maximize the reliability of supply, it is suggested to split the flow of the primary side to two or three pumps.
Installing pumps in parallel, it is important to install non return valves for a correct operation of the system and isolating valves before and behind the pumps for easy maintenance.

Each change in the load of the supplied control loops will cause a change of the flow in the pipework and consequently the load of the main pump.

Due to the characteristics of centrifugal pumps a disadvantage is the increase in differential pressure in the system when the flow is throttled:

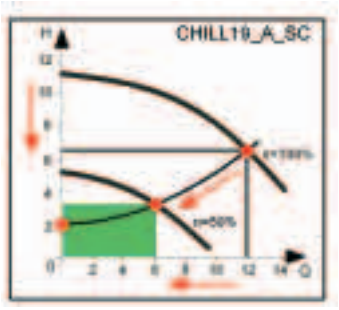


Another disadvantage is the nearly constant power consumption of the pump, independent to the flow.

Recommended products

We have the typical situation, where variable speed pumps can demonstrate all their advantages.

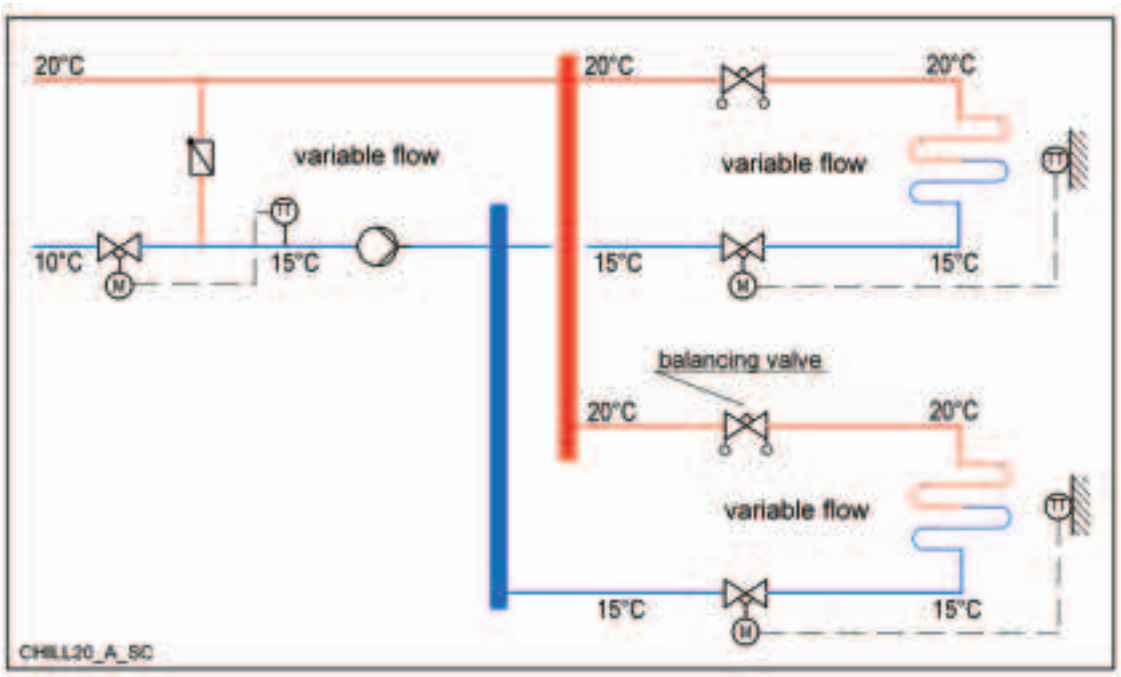
The size of the pump and the type series is depending to the application.



Chilled beam (4.3.2)

Function

To avoid condensation, the fluid temperature providing a chilled beam system must in most cases be higher than the flow line temperature, produced by the chiller. A mixing type control loop, operating with two way or three way control valves, regulates the flow line temperature following the outdoor temperature.
Due to variation in use and cooling demand in different parts of the building, the cooling load of the chilled beam system is locally controlled by thermostatic valves.



In control loops like shown in the example above, it is essential for a proper function of the system to apply balancing valves at the displayed positions.

Recommended products

We have a typical example, where variable speed pumps can demonstrate all their advantages.

1. General

What is water supply?

With this definition, it includes the net work of the sanitary water systems, the cold water network, hot water network, and circulation systems.
In this case distribution taps must be served, they are at a height, where the water cannot arrive naturally it is necessary to install a pressure booster system.
Currently the following three systems are previewed:

Systems that use booster set with membrane tank, for small and medium users.
Systems that use booster set with air cushion tank for medium users.
Systems that use booster set with VFD for medium and big users.

This division has been decided from economic requirements and ease of installated, the space available and their operational way. To look at the actual tendency to avoid large dimensioned tanks, in order to have a compact set, all the functions to satisfy the requirements of the different systems.

The sanitary water system must be planned on basis of maximum probable flow, or project flow.
The project flow depends from many factors, which for example:
Number of sanitary devices used their unitary flow, the duration of distributions, the frequency and the random use.
These factors are difficult to calculate.
In order to help the consultant and the installer, the value of project flow (standards should be used such as), EN 806-3 European norm, in accordance with the most important European rules as BS 6700 (UK), DVGW 308 (Germany), and DTU 60.11 (France).

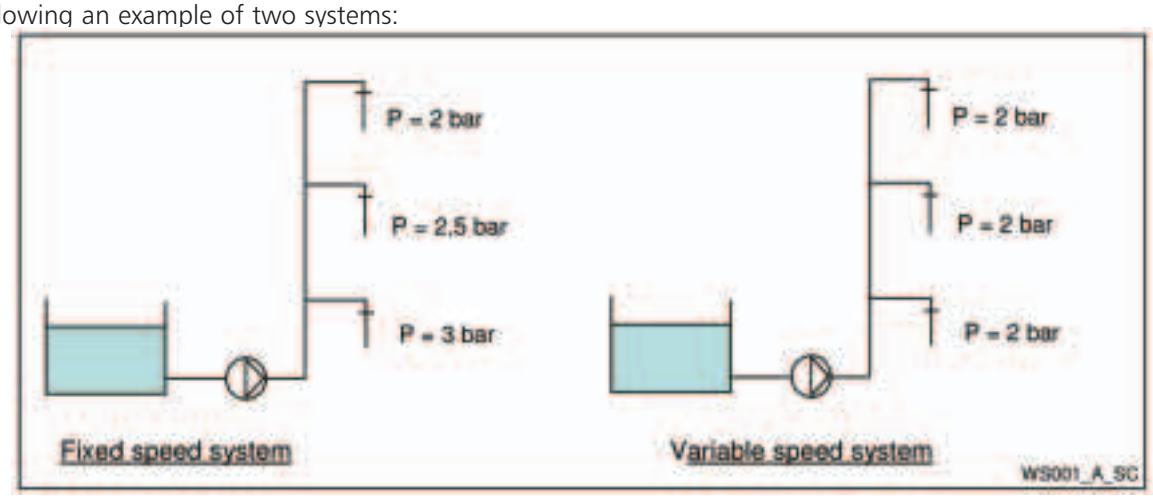
2. Summary of products for water supply

The range of the products for the water supply is divided in two main families:
Fixed speed and variable speed.

	Pump type	Booster set type		
Fixed speed	HM BG CEA CA	GXS	GM	GS
Variable speed	HVW TKS	GTKS	GHV	

When to choose the fixed speed and when the variable speed:

One of the main concepts is the quality of the system that needs to be realized. The quality is the relation between the economic value invested and its return in the time, as energy saving, limited and ease of maintenance, performances that are in accordance with the applied technology, and to guarantee to the user a satisfaction on the functionality of the system.
Variable speed sets are more expensive than traditional ones, but they have advantages and benefits that have been described previously.
Example: In a system where there are many users as a hotel, with frequent uses, the use of variable speed is suggested.
Following an example of two systems:



Fixed speed system

Variable speed system

How it can be seen from the example it possible to have the constant pressure value by variable speed system.

3. Product family

Centrifugal pumps BG, HM, CA, CEA series

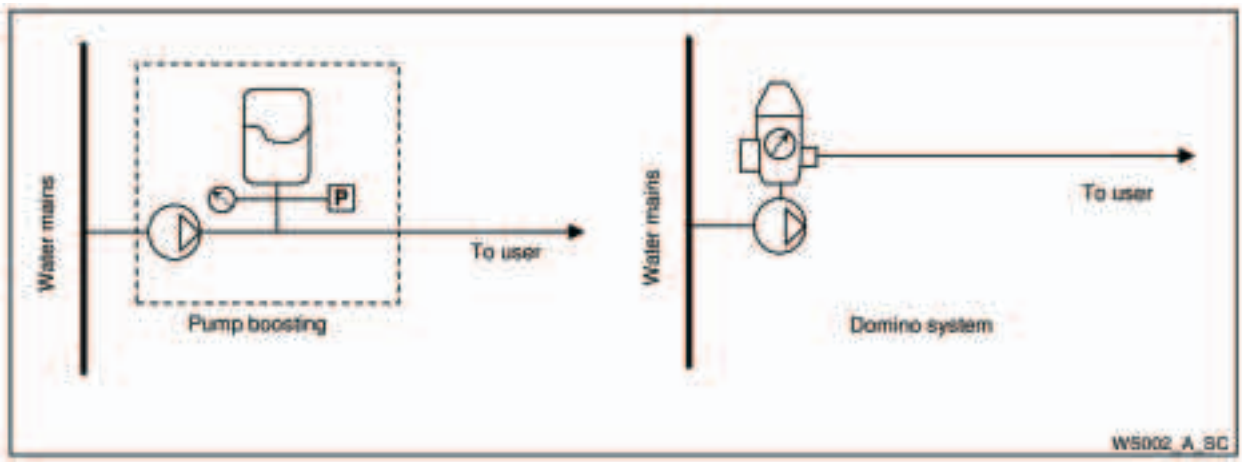
Technical data

Delivery up to	30 m^3/h
Head up to	60 mt
Power range	1 x 3 kW
Motor start	D.O.L (single-phase or three- phase)
Maximum temperature	from - 10°C to +40°C BG pump from - 10°C to +60°C HM pump from - 10°C to +85°C CA CEA pump

Materials

Pump body	Aisi 304
Impeller	Aisi 304 (BG, CA, CEA) Thermoplastic material (HM)
Diffusers	Aisi 304 (HM, CA, CEA) Thermoplastic material (BG)
Shaft extension	Aisi 316
Mechanical seal	Ceramic/carbon/NBR (BG, CA, CEA) Carbon/ceramic/EPDM (HM)

The single pump is used in domestic area for the supply water in a single house, or small building.
It is possible to connect the pump directly to the system or to use it as water transport in a tank.
Normally the pump needs some accessories like pressure switch, membrane tank, pressure gauge, or others such as the Lowara Domino system.



GXS series

Technical data

Number of pumps	2
Delivery up to	28 m^3/h
Head up to	120 mt
Panel supply voltage	1 x 230 V 50 Hz (single-phase)
Power range	2 x 1, 5 kW
Motor start	D.O.L
Maximum temperature	from 0°C to +40°C
Pumps type:	horizontal and vertical pump

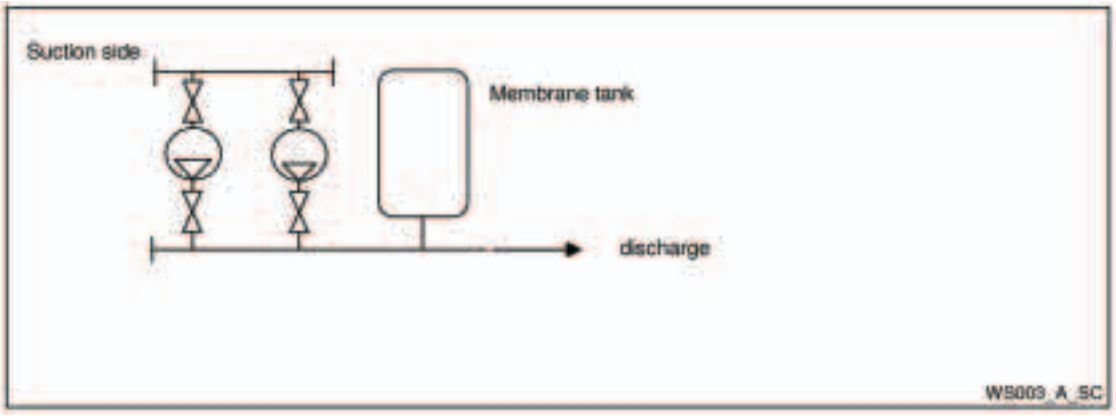
Materials

Pump	stainless steel
Manifolds	zinc plated / AISI 304
Base	zinc plated

Product Features

Easy to install
Easy maintenance
Control by pressure switch
Compact solution for residential use
Dry running protection
Automatic changeover
Antivibration dampers fixed under the base
Control box in plastic material IP 55
The unit is assembled, set and tested at the factory

The booster set is to fixed speed, where the start and the stop of the pumps are on the flow demand.
In this model it is necessary to install a membrane tank, in order to reduce the numbers of start per hour.
The capacity of the tank depends to the size of the system and on the number of starts and stop that we can decide to do on the pumps.



GMD series (small set)

Technical data

Number of pumps	2
Delivery up to	36 m^3/h
Head up to	150 mt
Panel supply voltage	3 x 400 V 50 Hz (three-phase)
Power range	2 x 4 kW
Motor start	D.O.L
Maximum temperature	from 0°C to +40°C
Pumps type:	horizontal and vertical pump

Materials

Pump	stainless steel
Manifolds	zinc plated / AISI 304
Base	zinc plated

Product Features

Easy to install
Easy maintenance
Control by pressure switch
Compact solution for residential use
Dry running protection
Automatic changeover
Antivibration dampers fixed under the base
Control box in metal material IP 54
The unit is assembled, set and tested at the factory

GM series (medium set)

Technical data

Number of pumps	2
Delivery up to	600 m³/h
Head up to	160 mt
Panel supply voltage	3 x 400 V 50 Hz (three-phase)
Power range	2 x 55 kW
Motor start	D.O.L up to 7,5 kW, star delta for higher power
Maximum temperature	from 0°C to +40°C
Pumps type:	horizontal pump FH series and SV vertical pump

Materials

Pump	cast iron and stainless steel
Manifolds	Aisi 304
Base	painted steel

Product Features

Easy to install with flanged manifolds
Easy maintenance
Control by pressure switch
Compact solution
Dry running protection
Automatic changeover
Control box in metal material IP 54
The unit is assembled, set and tested at the factory

GS series

Technical data

Number of pumps	3 to 4
Delivery up to	1200 m^3/h
Head up to	150 mt
Panel supply voltage	3 x 400 V 50 Hz (three-phase)
Power range	4 x 37 kW
Motor start	D.O.L up to 7,5 kW, star delta for higher power
Maximum temperature	from 0°C to +40°C
Pumps type:	horizontal pump FH series and SV vertical pump

Materials

Pump	cast iron and stainless steel
Manifolds	Aisi 304
Base	painted steel

Product Features

Easy to install with flanged manifolds
Easy maintenance
Control by pressure transducer
Compact solution
Dry running protection
Automatic changeover
Control box in metal material IP 54 with digital electronic card
The unit is assembled, set and tested at the factory

HVW series

Technical data

Number of pumps	1
Delivery up to	5-6 m^3/h
Head up to	40-50 mt
Panel supply voltage	1 x 230 V 50/60 Hz (single-phase)
Power range	1 x 0,75 kW
Motor start	by VFD
Maximum temperature	
Of pumped liquid	up to +50°C
Pumps type:	centrifugal pump
Pump body	Aisi 304
Impeller	Aisi 304 (BG, CA, CEA) Thermoplastic material (HM)
Diffusers	Aisi 304 (HM, CA, CEA) Thermoplastic material (BG)
Shaft extension	Aisi 316
Mechanical seal	Ceramic/carbon/NBR (BG, CA, CEA) Carbon/ceramic/EPDM (HM)

Product Features

Easy to install
Control without external pressure transducer
Compact solution
Frequency drive cooled by pumped liquid
Dry running protection
Thermal protection
Up or under voltage protection
Overload protection

TKS series

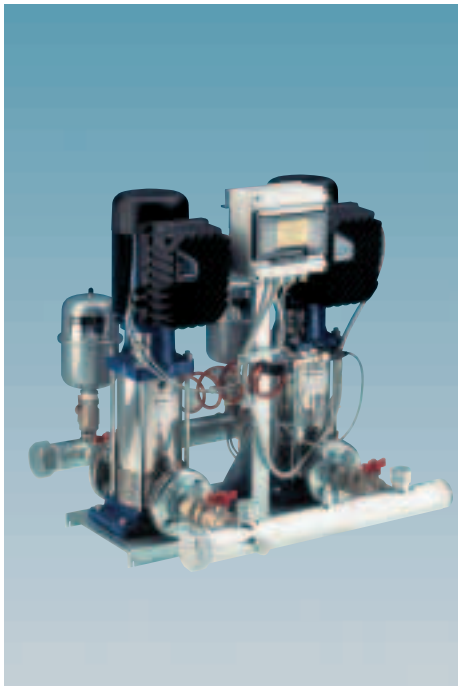
Technical data

Number of pumps	1
Delivery up to	10 m^3/h
Head up to	75 mt
Panel supply voltage	1 x 230 V 50/60 Hz (single-phase)
Power range	1 x 1, 1 kW
Motor start	by VFD
Maximum temperature	
Of pumped liquid	from 0°C to +40°C
Pumps type:	horizontal and vertical pump
Pump	stainless steel

Product Features

Easy to install
Easy maintenance
Control by pressure transducer
Compact solution
Constant pressure at your outlet
The motors work at variable speed and consequently
Have a reduced noise level
Dry running protection

GTKS series



Technical data

Number of pumps	2
Delivery up to	16 m^3/h
Head up to	75 mt
Panel supply voltage	1 x 230 V 50/60 Hz (single-phase)
Power range	2 x 1,1 kW
Motor start	by VFD
Maximum temperature	
Of pumped liquid	from 0°C to +40°C
Pumps type:	horizontal and vertical pump
Materials:	
Pump	stainless steel
Manifolds	zinc plated / AISI 304
Base	zinc plated

Product Features

Easy to install
Easy maintenance
Control by pressure transducer (one for each pump)
Compact solution for residential use
Constant pressure
Guaranteed water supply in case if one pump is in fault
Dry running protection
Automatic changeover
Antivibration dampers fixed under the base
Control box in plastic material IP 55
The unit is assembled, set and tested at the factory

4

GHV series

Technical data

Number of pumps	2 to 4
Delivery up to	400 m^3/h
Head up to	150 mt
Panel supply voltage	1 x 230 V 50 Hz up to 2,2 kW 3 x 400 V 50 Hz starting from 2,2 Kw
Power range	4 x 45 kW
Motor start	by VFD
Maximum temperature of pumped liquid	from 0°C to +40°C
Converter	IP55 up to 11 Kw IP54 above 11 Kw
Pumps type:	vertical pump SV range

Materials

Pump	stainless steel
Manifolds	Aisi 304
Base	painted steel

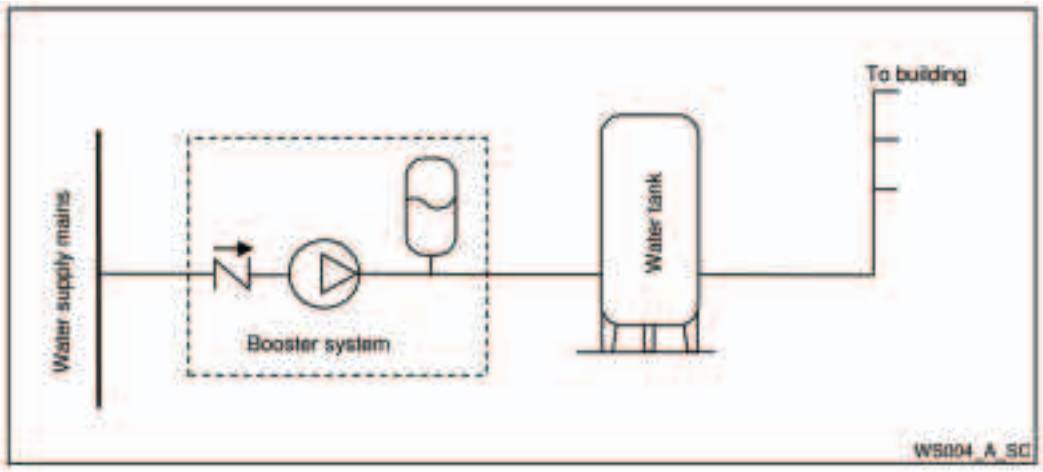
Product Features

Easy to install
Easy maintenance
Control by pressure transducer (one for each pump)
Compact solution
Constant pressure
Dry running protection
Automatic changeover
Control box in plastic material IP 55 single phase version, and in metal material IP55 for three phase version
The unit is assembled, set and tested at the factory

4. Systems overview

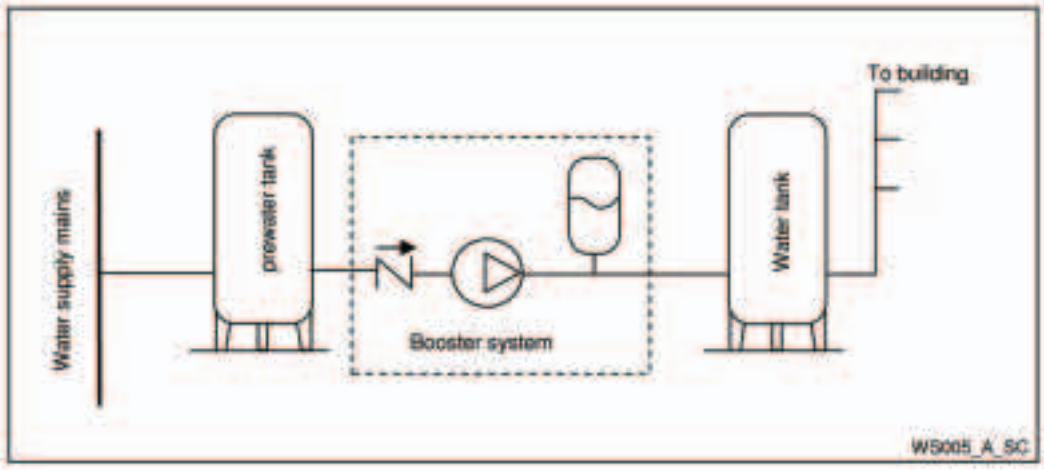
The choice of the booster set depends on the type of system to be supplied.
There are different systems for different uses, following is a quick overview of the main systems.

1. direct connection to network



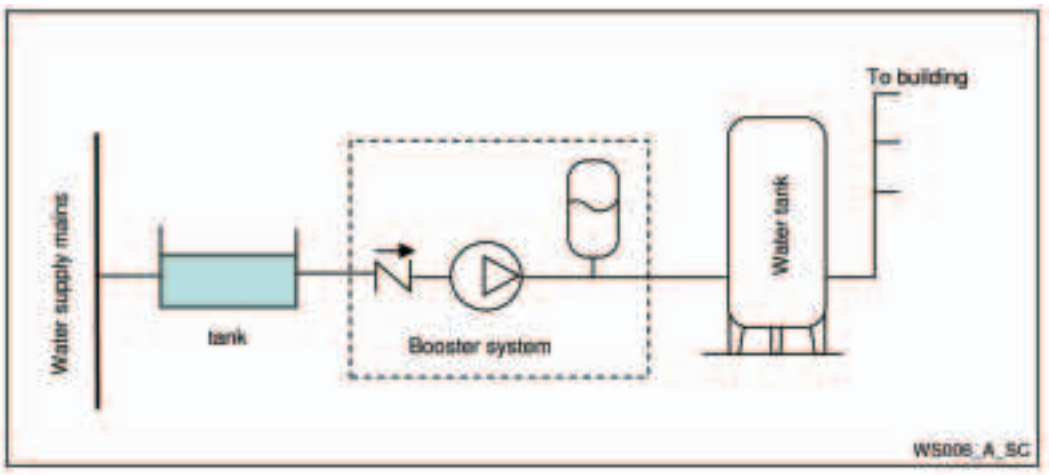
The simplest solution is that described over, but the pumps can cause pressure variations in the network.

2. connection to network by prewater tank



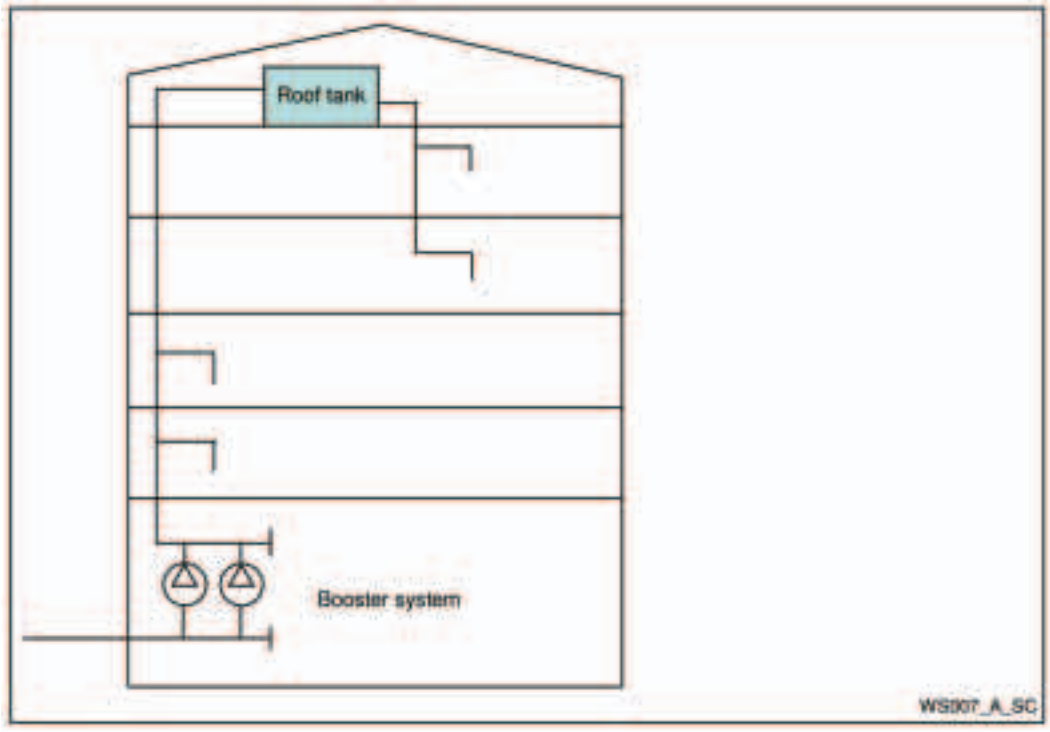
The solution above, it limits the pressure variations in the network, caused by pumps.
The tank between the network and the pumps is often required when; pulling from the municipal network isn't allowed in many countries local rules, the performances of the network are variables.

3. connection to network by atmospheric pressure tank



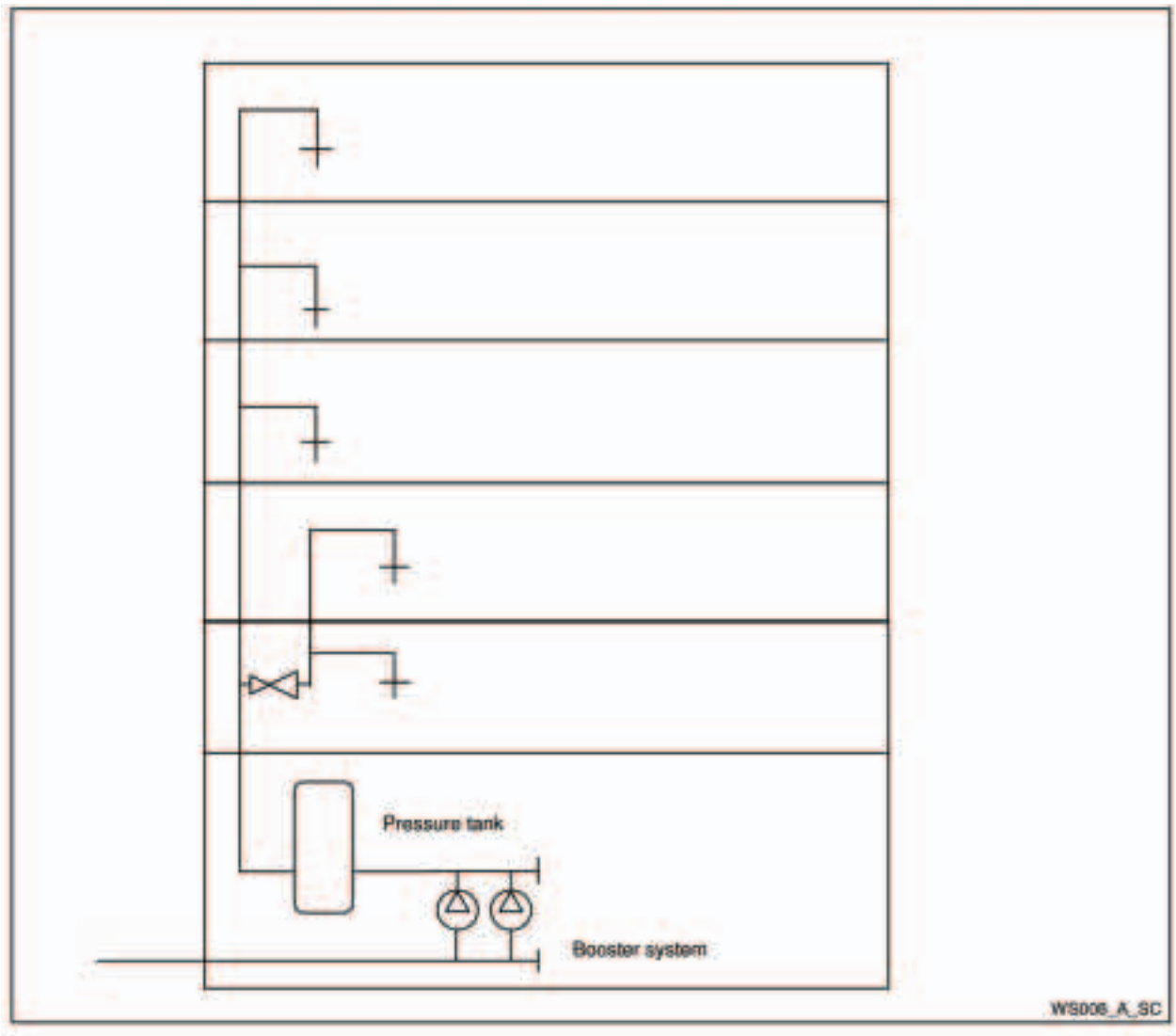
The solution above, it limits the pressure variations in the network, caused by pumps. However it must be considered that this type of connection demands more powerful pumps, because the pressure available from the network is not used.

4. water distribution with reservoir tank



In some case, the reservoir tank is required, to ensure water supply during a period where it is possible to have water available in the network (dry season, maintenances...) or electric fault.
It is possible to use the booster system for the lower floors, and the rest of building is supplied by gravity.

5. water distribution with booster system and pressure tank

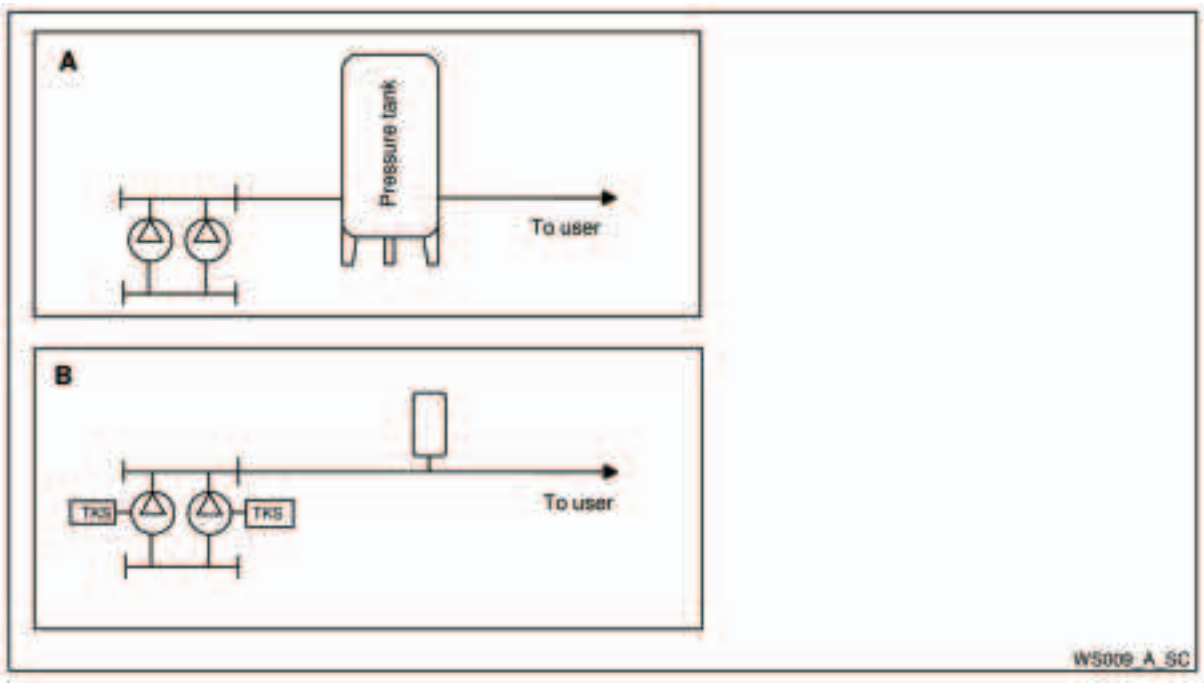


The booster set supplies the water (pressure) to the building, but the lower floors a pressure reducer since the pressure to the nearest user points is too high.
The capacity of the pressure tank reduces the starts of the pumps.

5. Systems and product

Products and systems as already detailed are in relation to realize a correct application.
Following, some examples as a quick guide, with the typical application.

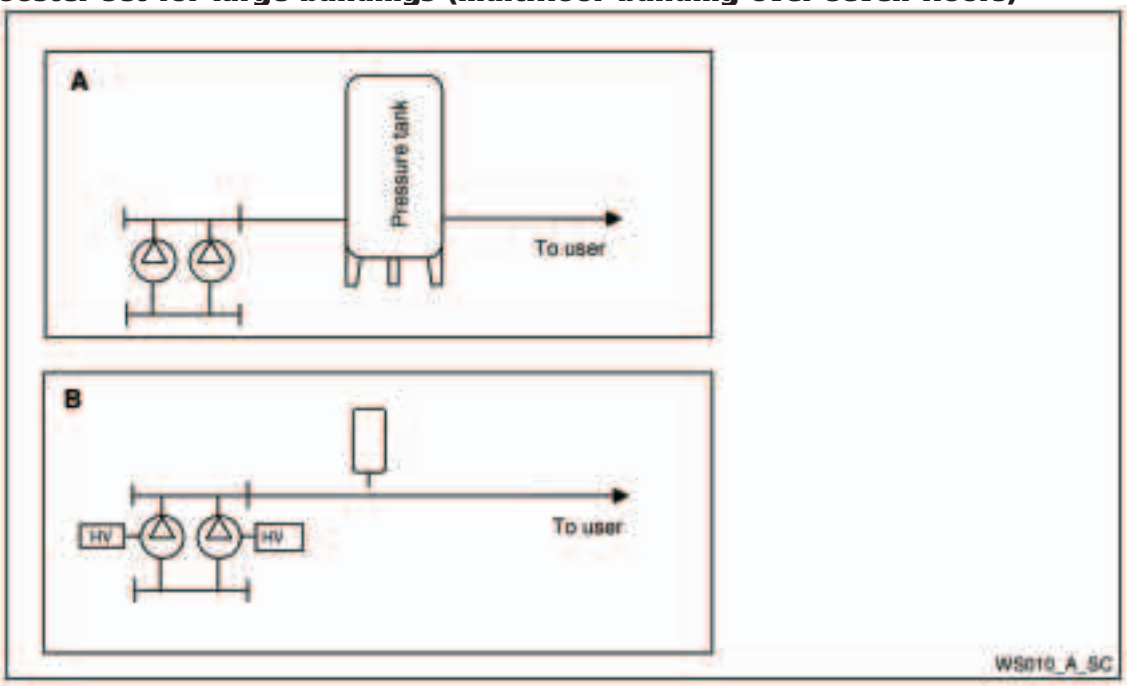
1. Booster set for small and medium building (multifloor building from three up to seven floors)



A) Booster set fixed speed, GXS or GMD series, with membrane tank.

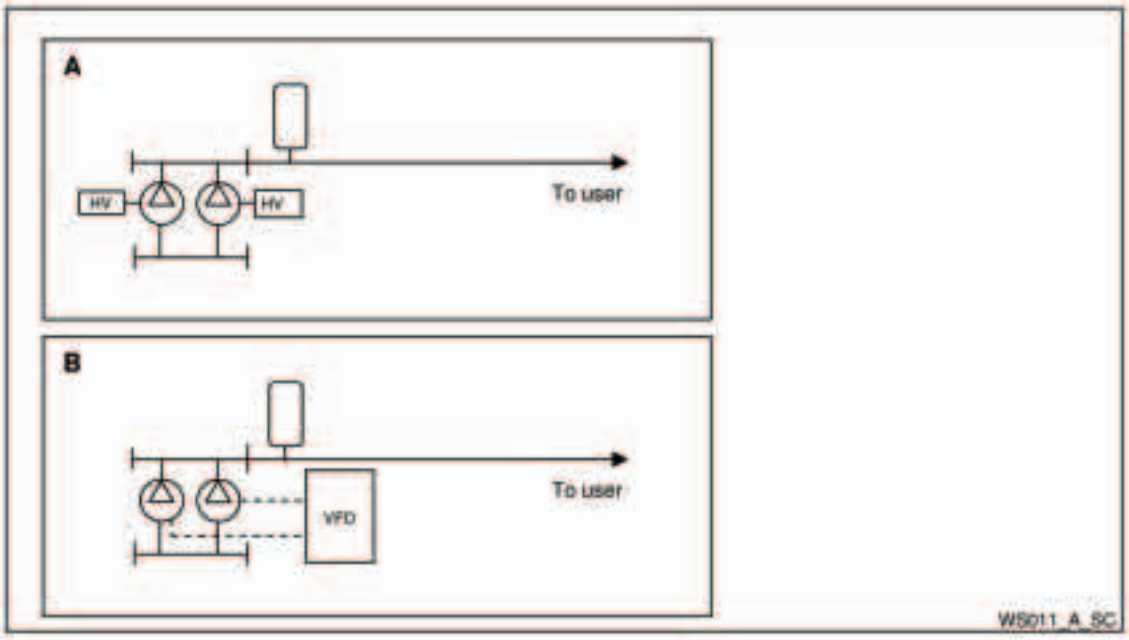
B) Booster set variable speed GTKS series with small membrane tank.

2. Booster set for large buildings (multifloor building over seven floors)



A) Booster set fixed speed, GMD series, with membrane or air cushion tank.
B) Booster set variable speed GHV series with small membrane tank.

3. Booster set for community building (hospital, school, hotels, departments store)



A) Booster set variable speed, GHV series, with small membrane tank.

B) Booster set variable speed drive inside the panel with small membrane tank.

1. General

With the term "waste water" we want to indicate the water that has solid or liquids refusals, natural or chemical, or others elements, that they don't allow the immediate re use of it, but it is necessary to make a water depuration treatment.
It is possible to divide waste water, in two main families, in order to have the products for the correct application.

Dirty water
Surface rain water, drainage water, emergency use, laundry, domestic washing machines, emptying of tank.

Sewage
Sewage water with suspended solids and filaments, septic tanks and residential sumps, flooded excavations and marshy ground.

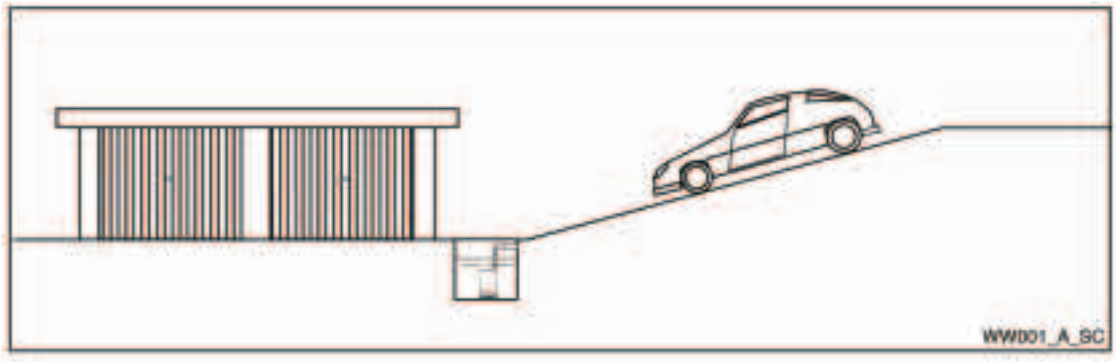
The main objective of a drainage system is to remove the water in controlled way, in order to avoid some dangers, for the man's health.
All the buildings, with continuous presence of people, must be equip with a drainage system of used waters, that it must be independent from the rain water system or "white" waters, until the delivery point.
The delivery must be in accordance with the local rules and the law dispositions.
The delivery directed in a water course is not admitted without a biological treatment.

2. Summary of products for waste water

The range of the products for the waste water is divided in two main families:
Dirty water and sewage

	Pump type				
Dirty water	DOC	DIWA	DN	MINIBOX	DIGGER
Sewage	DOMO	DL	FDL-FXDL	SINGLEBOX DOUBLEBOX DEPURBOX	FDLT "GRINDER"

The drainage pumps for dirty water are used in the domestic applications of small systems, easy use and fast installation without having excessive system cost.
The use of drainage pump for water rain, for example it can avoid the flooding of cellars or garages.



Normally the drainage systems are automatic, with the use of float switch, the pump starts or stops on the water level.

3. Product family

Submersible electric pump DOC series

Technical data

Delivery up to	13, 5 m³/h
Head up to	11 mt
Maximum immersion Depth	5 mt
Suspended solids	from 10 up to 20 mm in diameter
Power range	1 x 0,55 kW
Motor start	D.O.L (single-phase or three- phase)
Maximum liquid temperature:	+40°C with partially submerged pump

Materials

Pump body	plastic (noryl)
Impeller	plastic (noryl)
Outer sleeve	stainless steel AISI 304
Shaft extension	Aisi 416
Elastomers	nitrile rubber

Product Features

Easy to install
Easy maintenance
Dry motor
Class B insulation

(Single-phase version)
Pre assembled float
Built in capacitor
Thermal overload protection

The electric motor is protected by three lip seal

Submersible electric pump DIWA series

Technical data

Delivery up to	25 m^3/h
Head up to	21 mt
Maximum immersion Depth	7 mt
Suspended solids	up to 8 mm in diameter
Power range	1 x 1,5 kW
Motor start	D.O.L (single-phase or three- phase)
Maximum liquid temperature:	+50°C with partially submerged pump

Materials

Pump body	stainless steel Aisi 304
Impeller	stainless steel Aisi 304
Outer sleeve	stainless steel Aisi 304
Shaft extension	Aisi 304
Lower mechanical seal	Silicon carbide
Upper lip seal	Silicon carbide

Product Features

Easy to install
Easy maintenance
Dry motor
Class F insulation

(Single phase version)
Pre assembled float
Built in capacitor
Thermal overload protection
The electric motor is protected by three lip seal

5

Submersible electric pump DN series

Technical data

Delivery up to	17 m^3/h
Head up to	20 mt
Maximum immersion Depth	5 mt
Suspended solids	up to 5 mm in diameter
Power range	1 x 0,75 kW
Motor start	D.O.L (single-phase or three- phase)
Maximum liquid temperature:	+25°C with partially submerged pump 50 °C with totally submerged pump

Materials

PPump body	cast iron
Impeller	steel + nitrile rubber
Shaft extension	Aisi 303
Mechanical seal	Carbon/Ceramic
Wear flange	Aisi 304

Product Features

Easy to install
Easy maintenance
Squirrel cage motor in a dielectric non-toxic oil bath
Class F insulation

Single phase
with built in automatic reset overload protection
and capacitor housed in a control panel

Three phase
Overload protection to be provided by user and installed
In the control panel

Minibox - Prefabricated compact lifting stations

Technical data

85 liters polyethylene tank housing a DOC electric pump and all its accessories.

The set includes

DOC submersible electric pump equipped with a float for automatic operation.

85-litre polyethylene tank
1 ¼" flexible pipe equipped with a check valve left or right hand connection.

Power cable outlet
Screens
Basin filled with sand and gravel to filter solid particles
the Minibox set can be equipped with a DOC3 or a DOC7 pump

Product Features

Installation is fast and easy, just connect the pipes and plug it in.
minibox can be installed on the floor buried underground or in concrete (to withstand vehicle traffic)
Minibox is equipped with a screen and sand filter basin for the collection of water infiltration or runoff as in case of a garage ramp.

Submersible electric pump Digger series

5

Technical data

Delivery up to	18 m^3/h
Head up to	14 mt
Maximum immersion Depth	5 mt
Suspended solids	up to 7 mm in diameter
Power range	1 x 0,75 kW
Motor start	D.O.L single-phase
Maximum liquid temperature:	+35°C

Materials

Pump body	Aisi 304
Impeller	die-cast polyurethane with steel core
Shaft	Aisi 304
Mechanical seal	Carbon/Ceramic
Wear flange	Aisi 304
Double mechanical seal	sic/sic +carbon ceramic with oil chamber

Product Features

Draining of building yards
Draining of sumps not containing large suspended solids
Industrial pumping of liquids containing abrasive substances
Models are available in the automatic version with float and manual version.
Dry motor class F insulation
Built in capacitor and thermal overload protector

Submersible electric pump Domo series

Technical data

Delivery up to	40 m³/h
Head up to	14 mt
Maximum immersion Depth	5 mt
Suspended solids	up to 50 mm in diameter
Power range	1 x 1,5 kW
Motor start	D.O.L single-phase or three phase
Maximum liquid temperature:	+35°C with fully submerged pump

Materials

Pump body	Aisi 304
Impeller	Domo 7 fiberglass reinforced nylon Domo 10-15-20 Aisi 304
Shaft extension	Aisi 304
Mechanical seal	Silicon carbide
Handle	nylon

Product Features

Pumping of effluent (Vx versions can also Handle suspended solids)
Emptying of septic tanks and residential sumps.
Draining of flooded basements and garages.
Dry motor (class F insulation)
Stainless steel twin-channel or vortex impeller

Submersible electric pump DL

Technical data

Delivery up to	100 m³/h
Head up to	20 mt
Maximum immersion Depth	5 mt
Suspended solids	up to 65 mm in diameter
Power range	1 x 4 kW
Motor start	D.O.L single-phase or three phase
Maximum liquid temperature:	+50°C with fully submerged pump

Materials

Pump body	cast iron
Impeller	Aisi 304
Shaft extension	isi 304
Mechanical seal	Carbon ceramic
Handle	Aisi 304

Product Features

Pumping of sewage with suspended solids and filaments.
Emptying of sumps, septic tanks and wastewater discharge tank.
Draining of flooded excavations and marshy ground.
Squirrel cage motor in a dielectric non-toxic oil bath which ensures the lubrification of the ball bearings and more efficient cooling.
Class F insulation
Mechanical seal protected by sand labyrinth

Submersible electric pump FDL

Technical data

Delivery up to	1140 m³/h
Head up to	up to 65 mt
Maximum immersion Depth	20 mt
Suspended solids	30 up to 105 mm in diameter
Power range	1 x 42 kW
Motor start	D.O.L or Star Delta three phase
Maximum liquid temperature:	25 ÷ 40°C

Materials

Pump body	cast iron
Impeller	cast iron
Shaft	stainless steel Aisi 420B
Upper seal	Carbon ceramic
Lower seal	Silicon carbide

Product Features

Solid cast iron construction or Aisi 316 stainless steel
Or B 10 bronze.
Channel or open vortex type impeller
Double seal silicon carbide inner seal
ceramic carbon upper seal or seal ring
with oil chamber
Adjustable volute bottom cover to compensate
for impeller wear and ensure stable long-lasting
hydraulic performances
Motor with IP68 protection class H insulation

Singlebox and doublebox

PREFABRICATED LIFTING STATIONS WITH ENTRAINED SOLIDS WASTE WATER

The ideal solution when domestic wastewater must be delivered to sewer mains located at a higher level, or where gravity drainage is not possible

The pumping station, installed in the basement or buried outdoors, collects domestic effluent (toilet included) without any need for initial treatment.

SINGLEBOX consists of a 230-litre polyethylene basin housing a vortex (DLV) or single-channel (DL) sewage pump, a control box and float. It is a complete pumping station equipped with a lowering device.

Where greater capacity is required use DOUBLEBOX, a prefabricated lifting station which has twice the capacity of Biobox (450 litres) and is designed to house two pumps. The operating principle is the same but it produces higher heads.

The system consists of:
230-litre (450 for Doublebox) polyethylene basin with screw down lid.
Cable glands for power supply cords (and float) and installation of cables under the cover.
2" delivery pipe.
Six inlets for discharge or ventilation.
DOMO or DL submersible pump, vortex or channel type.
Lowering device.
Vent or emergency drain plug.
Control box.

IP 68 protection.

Depurbox

Civil sewage DEPURBOX

Depurbox is a range of compact, activated sludge treatment systems that enable discharge of domestic wastewater in accordance with EEC Directive 91/271. The treated effluent can thus be discharged directly into the sewer system or into surface waters or ground (subsequent to optional tertiary treatment).
Three sizes available:
Depurbox Basic, for population equivalent of up to 5 people;
Depurbox Maxi, for population equivalent of up to 10 people, featuring a separate primary settlement tank;
Depurbox Duo, for population equivalent of up to 20 people, with separate double tank and primary settler.

5

Specifications

The system consists of:
a one-piece basin made of fiberglass reinforced polyester resin, featuring three separate chambers corresponding to the three stages of the treatment process: primary settlement, oxygenation and secondary settlement;
a Domo 7 VX single-phase electric pump with Vortex impeller for effluent handling and oxygenation;
a Venturi oxygenation system which, together with the electric pump, ensures a typical treatment efficiency of 90%;
a timer for setting the required operating cycles;
DN 100 inlet and outlet piping.

Three sizes available.
Quick and easy installation: just prepare the excavation, position Depurbox, make the hydraulic and electrical connections (single-phase), then complete the burial by positioning the external air intake and inspection accesses.
Easy maintenance: just check the condition of the sludge at periodic intervals and, if necessary, empty out the basin.

Submersible electric pump FDLT Grinder

Technical data

SUBMERSIBLE PUMP FOR DIRTY WATER CONTAINING SOLIDS
Manufactured in cast iron, open multi-channel impeller with a grinder.

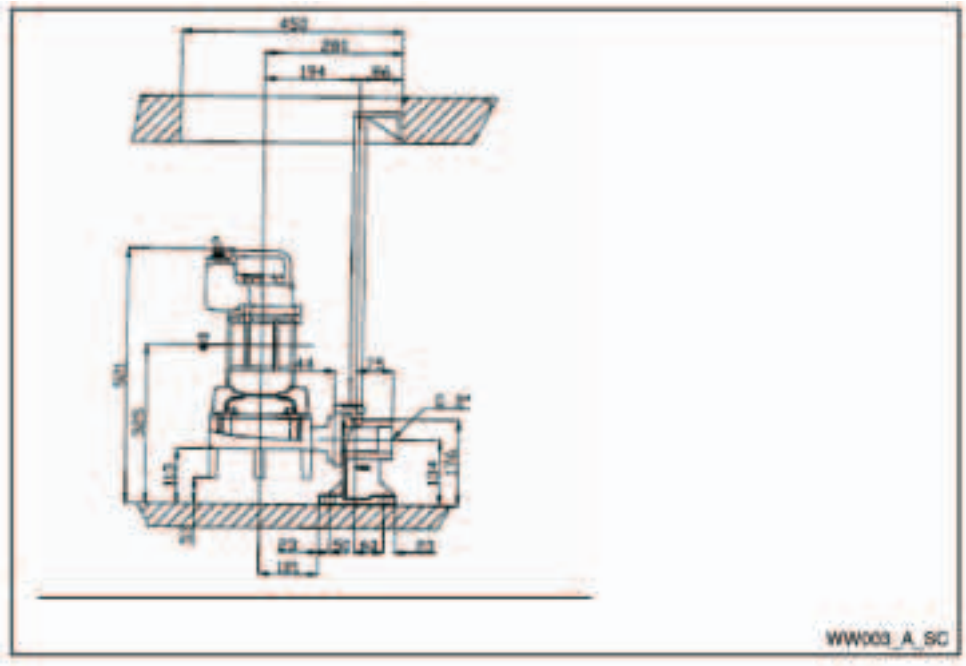
Delivery up to	1, 6 m^3/h
Head up to	15 ÷ 50 mt

Applications

Capacities up to 1÷4,4 L/s head up to 15 ÷ 50 m.
Pump operates with a grinder for dirty water that contains fibres and solids.

Specifications

10 metres of cable with 7 wires.
Mechanical seal system (2 mechanical seals).
Dry motor, class F, 2poles (2850 rpm).
Single phase version up to 2 kW with float switch (FDLTM).

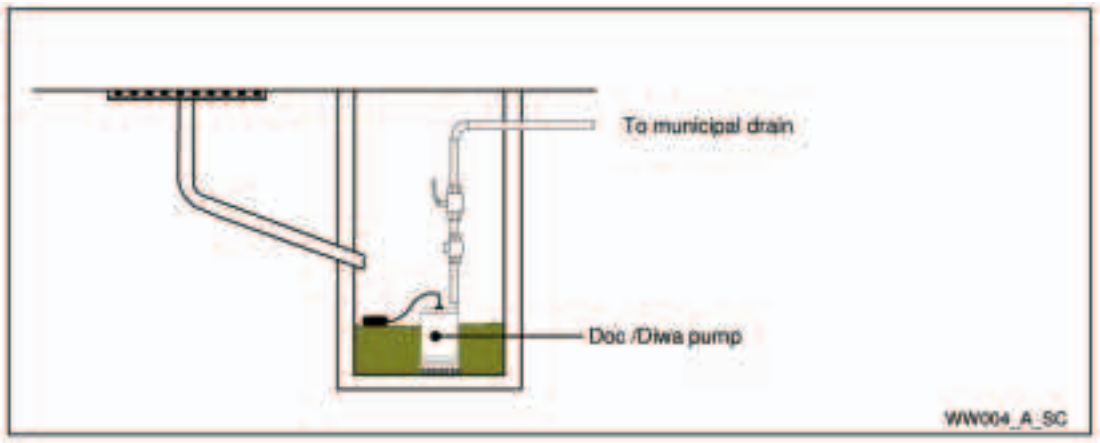


4. System and product overview

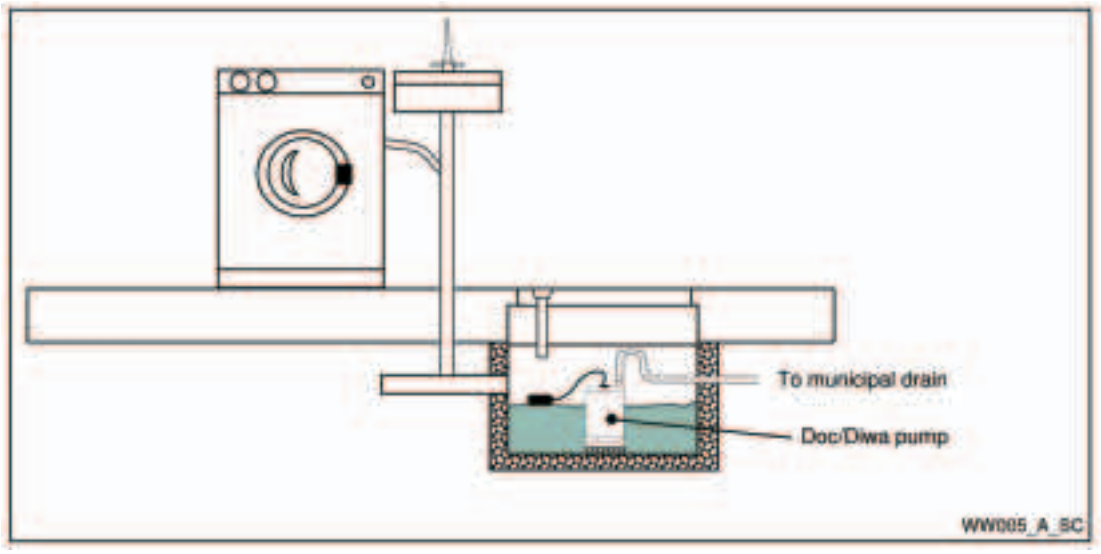
The choice of the drainage pump depends upon the type of system to used. Normally the systems are for dirty water and sewage.

Following are some examples of systems for dirty water:

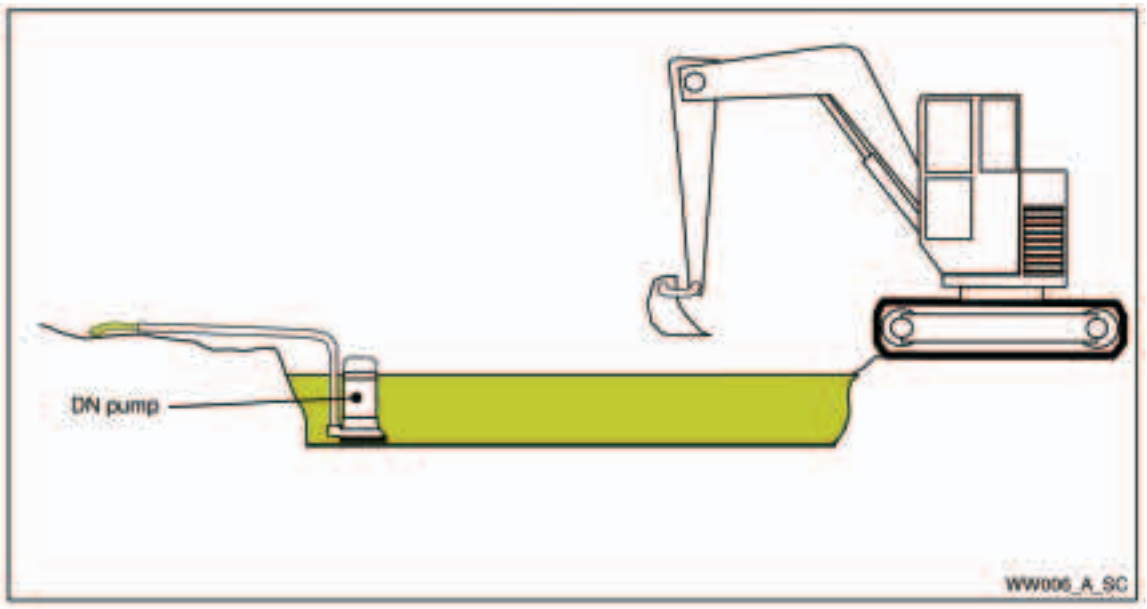
Rain water



Laundry water

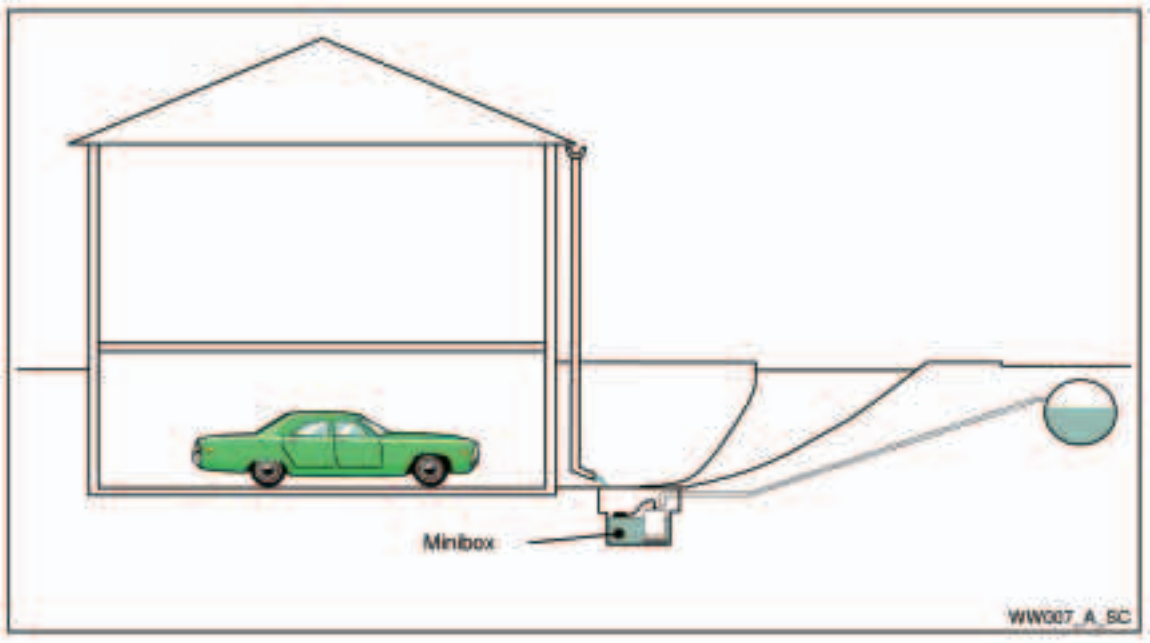


The drainage of flooded excavations and marshy ground



Wher muddy water is present with solids in suspension, the use of open impeller pumps (vortex) should be used.

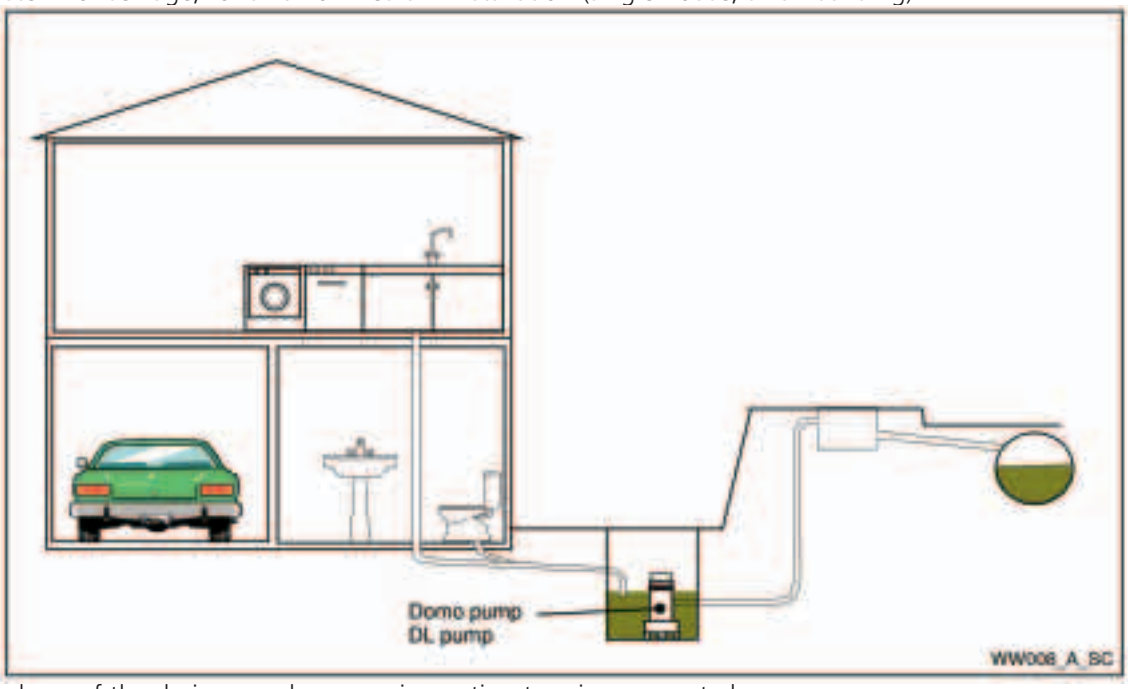
Prefabricated compact lifting stations for solid laden wastewater



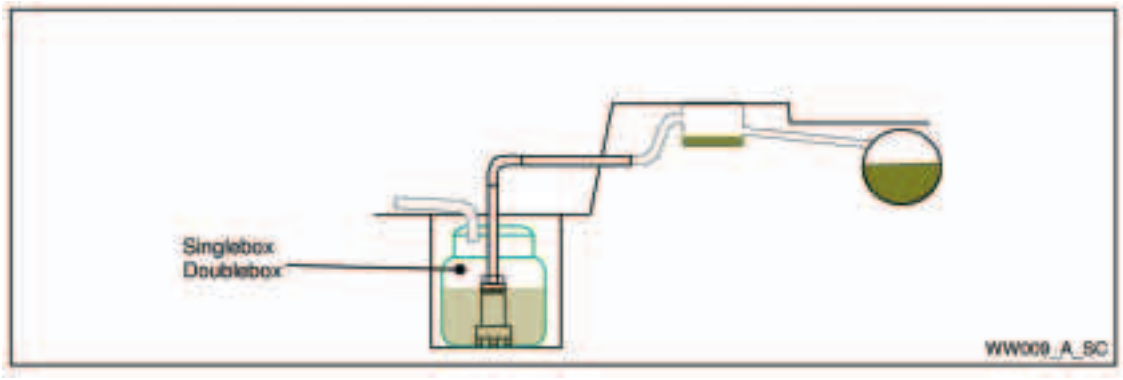
Minibox is a complete lifting station designed for removing domestic effluent (toilet excluded) where gravity drainage is impractical.

Following some examples of systems for sewage

Lift system for sewage, for small or medium installation (single house, small building)

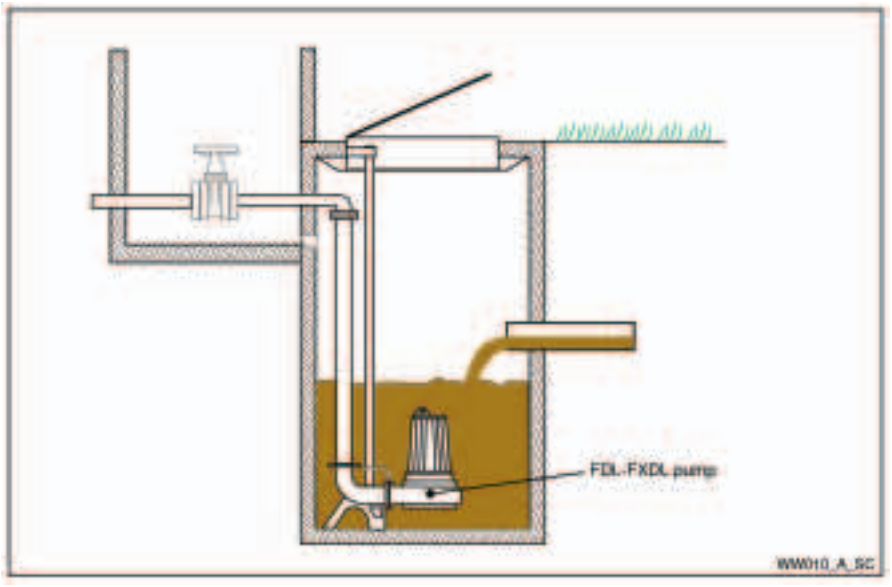


At the base of the drainage column, an inspection trap is represented.
Its function is to allow an inspection of the base of the column, and at the same time to create an air tube, that it makes pad to the overpressures created from the drainages.
When a column, discharges a lost of water, it actis like a piston compressing the air under itself, and the below siphon hydraulic close, the same ones would be subordinates to a pressure that can break off them, with consequent bad air that arrives in the atmospheres.
The trap acts in this case, like a cushion air chamber that accumulates compressed air until it is discharged outside, through ventilation opening, connected to the trap.



Prefabricated compact lifting stations for solid-laden wastewater, the ideal solution when domestic wastewater must be delivered to main sewer located at a higher level or where gravity drainage is impractical.

Lift sewage system, and water-drainage for building area, offices, laboratories, camping, agricultural companies.



Example of installation with lowering system
Access to the electric pump for inspection or maintenance is quick and easy:
To extract the pump, just lift with a chain. The pump's stability and seal are ensured by its weight.
Generally the waste water is collected from the system and then directed through to the main pipe to the street drain.
This happens by gravity, but the street drain must be at a lower level than the main pipe.
If the street drain is an upper level, in this case it is necessary to install a sewage pump.

Domestic sewage treatment systems
Disposal of domestic sewage where a public sewer system is not accessible

The treated effluent can be discharged directly into the sewer system or into surface water or the ground (subsequent to optional tertiary treatment).
Such product is part of biological treatment, with active mud total oxidation cited already in the Italian law n°152 of the 11/05/1999.disciplines of the drainages.

1. General

Irrigation systems

The irrigation systems are of common use for small private garden, public park, municipal garden, roof garden, building garden.
The irrigation systems are generally low pressure systems, and the flow is in relation to the area and to its frequency during the day. This is legacy to the climate and the weather conditions.
Normally where there is a great area to irrigate, it is preferred to divide it in some fields, and to save the water for irrigation.
The beauty of a garden depends on its design, the flowers that compose it and its health.
This result is obtained from a corrected irrigation that it respects the different requirements of the single plant.
The irrigation is really effective when:
Correct water contribution for every type of plant
The possibility to irrigate during the night in order to avoid or to reduce to the plants the thermal shocks.
The elimination of electric power and water consumption, by an aimed distribution water system, that it will be suspended in rain case.
The saving of the time and maintenance, allowing a constant and balanced cure of the plants.
The maximum flexibility of the system, in order to resolve every situation in warm and dry particularly summers.

2. Summary of products for irrigation

The range of the products for the irrigation is divided in two main families:
Fixed speed and variable speed.

	Product range			
Fixed speed	HM	BG	CEA	GS
Variable speed	HVW	TKS	GTKS	GHV

It is possible to use fix speed systems or variable speed systems, and it's depend to the size of the system and the area that must be irrigate.
In a small system, like for example a private garden it is possible to install an only one pump fix speed.
In this case we can have different value of pressure in the pipe and in the sprinklers to, but it is possible to have the same quality of irrigation in the area, because it is small and there will be few losses in the pipe.
Instead, if we have a public park, where there are a lot of sprinklers and a big system with many meters of pipe, in this case it is preferable to use variable speed systems, with one or more pumps installed, where the value of pressure remain constant in every part of it.
In this case we can have a good quality of irrigation in the entire zone, and the same value of pressure in the pipe without unexpected pressure peaks, that they could damage the system.

3. Product family

Centrifugal pumps BG, HM, CA, CEA series

Technical data

Delivery up to	30 m³/h
Head up to	60 mt
Power range	1 x 3 kW
Motor start	D.O.L (single-phase or three- phase)
Maximum temperature	from - 10°C to +40°C BG pump from - 10°C to +60°C HM pump from - 10°C to +85°C CA CEA pump

Materials

Pump body	Aisi 304
Impeller	Aisi 304 (BG, CA, CEA) Thermoplastic material (HM)
Diffusers	Aisi 304 (HM, CA, CEA) Thermoplastic material (BG)
Shaft extension	Aisi 316
Mechanical seal	Ceramic/carbon/NBR (BG, CA, CEA) Carbon/ceramic/EPDM (HM)

6

HVW series

Technical data

Number of pumps	1
Delivery up to	5-6 m^3/h
Head up to	40-50 mt
Panel supply voltage	1 x 230 V 50/60 Hz (single-phase)
Power range	1 x 0,75 kW
Motor start	by VFD
Maximum temperature	
Of pumped liquid	up to +50°C
Pumps type:	centrifugal pump
Pump body	Aisi 304
Impeller	Aisi 304 (BG, CA, CEA) Thermoplastic material (HM)
Diffusers	Aisi 304 (HM, CA, CEA) Thermoplastic material (BG)
Shaft extension	Aisi 316
Mechanical seal	Ceramic/carbon/NBR (BG, CA, CEA) Carbon/ceramic/EPDM (HM)

Product Features

Easy to install
Control without external pressure transducer
Compact solution
Frequency drive cooled by pumped liquid
Dry running protection
Thermal protection
Up or under voltage protection
Overload protection

TKS series

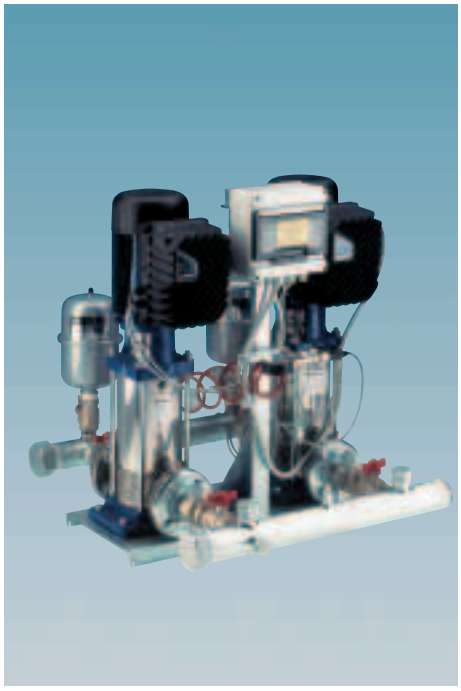
Technical data

Number of pumps	1
Delivery up to	10 m^3/h
Head up to	75 mt
Panel supply voltage	1 x 230 V 50/60 Hz (single-phase)
Power range	1 x 1,1 kW
Motor start	by VFD
Maximum temperature	
Of pumped liquid	from 0°C to +40°C
Pumps type:	horizontal and vertical pump
Pump	stainless steel

Product Features

Easy to install
Easy maintenance
Control by pressure transducer
Compact solution
Constant pressure at your outlet
The motors work at variable speed and consequently
Have a reduced noise level
Dry running protection

GTKS series



Technical data

Number of pumps	2
Delivery up to	16 m^3/h
Head up to	75 mt
Panel supply voltage	1 x 230 V 50/60 Hz (single-phase)
Power range	2 x 1,1 kW
Motor start	by VFD
Maximum temperature	
Of pumped liquid	from 0°C to +40°C
Pumps type:	horizontal and vertical pump

Materials

Pump	stainless steel
Manifolds	zinc plated / AISI 304
Base	zinc plated

Product Features

Easy to install
Easy maintenance
Control by pressure transducer (one for each pump)
Compact solution for residential use
Constant pressure
Guaranteed water supply in case if one pump is in fault
Dry running protection
Automatic changeover
Antivibration dampers fixed under the base
Control box in plastic material IP 55
The unit is assembled, set and tested at the factory

GHV series

Technical data

Number of pumps	2 to 4
Delivery up to	400 m^3/h
Head up to	150 mt
Panel supply voltage	1 x 230V 50Hz up to 2,2 kW 3 x 400V 50Hz starting from 2,2 Kw
Power range	4 x 45 kW
Motor start	by VFD
Maximum temperature of pumped liquid	from 0°C to +40°C
Converter	IP55 up to 11 Kw IP54 above 11 Kw
Pumps type:	vertical pump SV range

Materials

Pump	stainless steel
Manifolds	Aisi 304
Base	painted steel

Materials

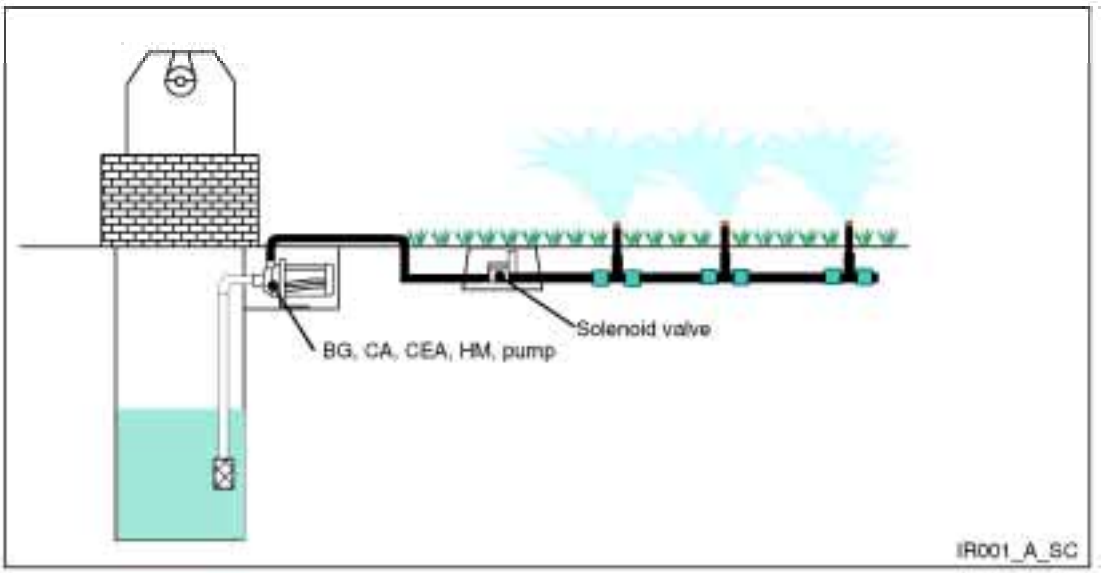
Pump	stainless steel
Manifolds	zinc plated
Base	zinc plated

Product Features

Easy to install
Easy maintenance
Control by pressure transducer (one for each pump)
Compact solution
Constant pressure
Dry running protection
Automatic changeover
Control box in plastic material IP 55 single phase version, and in metal material IP55 for three phase version
The unit is assembled, set and tested at the factory

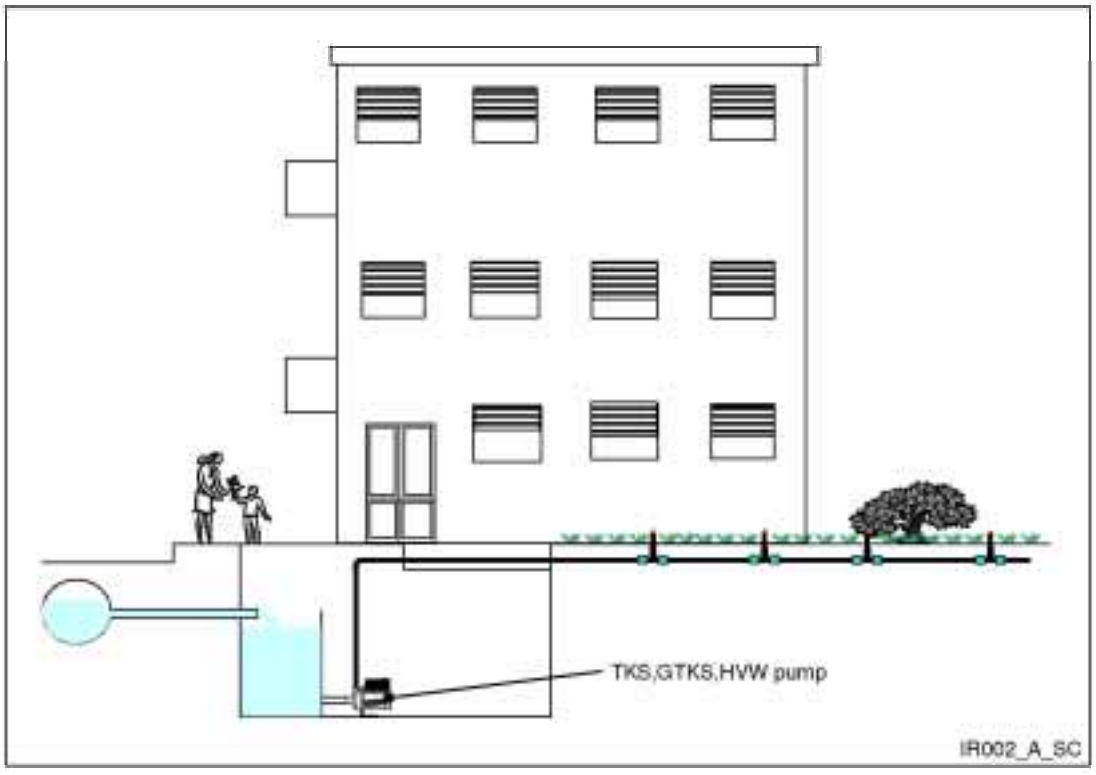
4. Systems and product

Small garden

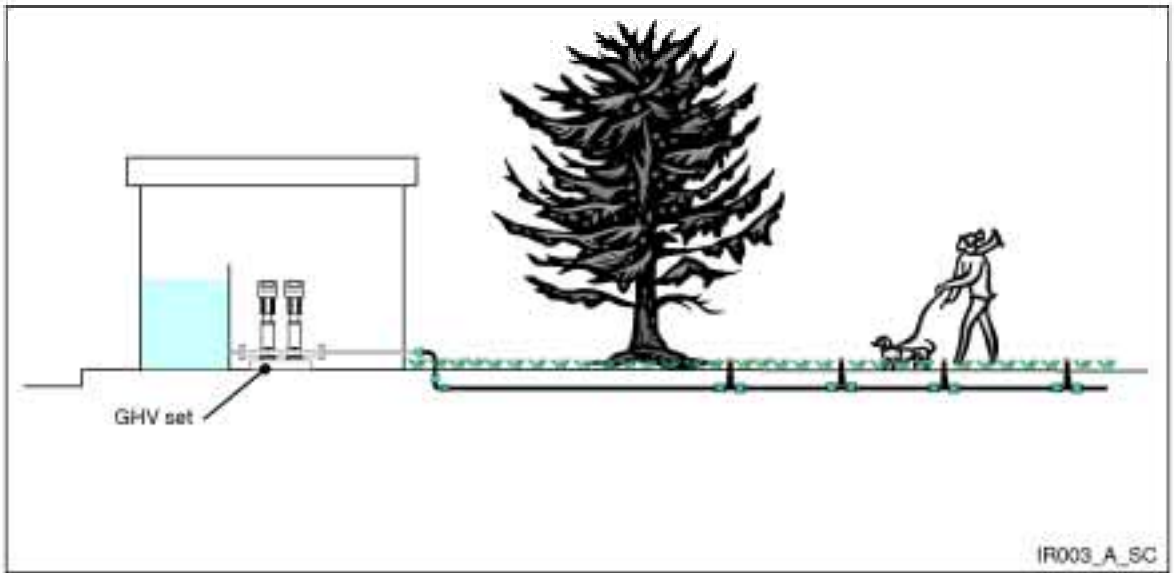


When we haven't a sink, it is possible to use the water of the municipal network with an underground tank.

Green area of residential buildings



Public Park



The irrigation system for a public park, normally it is preferable to use the variable speed set, with the constant pressure in each point of the sprinklers and the pipes.
The choice of this kind of systems, it depends of the size of the ring, and the number of the sprinklers used.

1. General

Variable Speed Control - Hydrovar

Compared with other common control systems like bypass valves, reduction valves or interrupted operation the speed reduction provides significant energy savings at partial load.

In a variable speed controlled system the pump works with the speed, it produces at the reduced flow exactly the required head. Therefore there is no wasted energy given to the system like On/Off or bypass control.

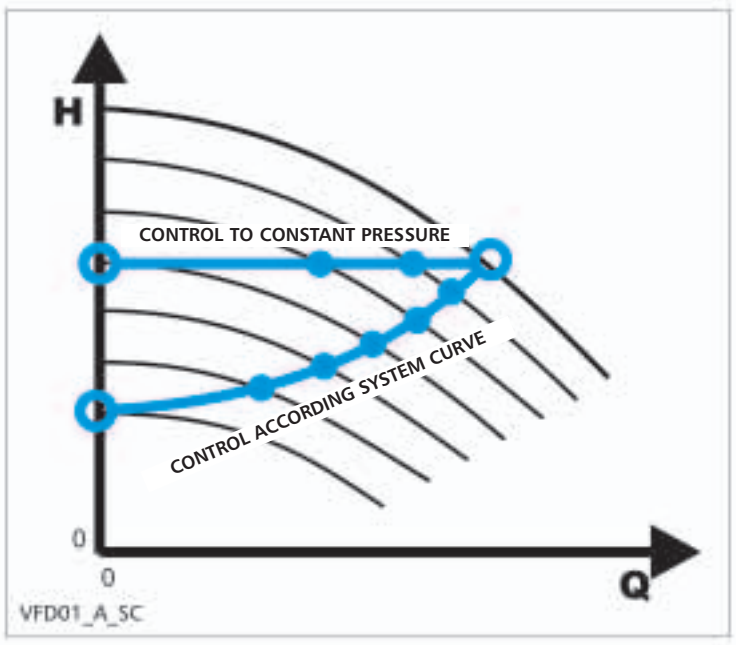
The heart of the energy-saving principle of variable-speed pumps is the basic hydrodynamic law:

- a lowering of the flow according to the linear function
- a reduction of the head according to a quadratic function
- a reduction of the power consumption according to a cubic function!

So if pump speed is reduced to half of the speed, energy consumption is reduced to an eighth of the power consumption at full speed.

If the delivery pressure of a pump is regulated by varying the speed but the pressure held constant, the operational points on the performance diagram moves in a horizontal direction.

In many applications, such as re-circulation systems, it isn't practical to keep the pump's delivery pressure constant for all flow rates.
The pump head is required here largely to cover pipeline losses, which reduce dramatically as the flow rate decreases and results in a quadratic system curve. If the pump is capable of being regulated and achieve these operating points, additional energy can be saved.



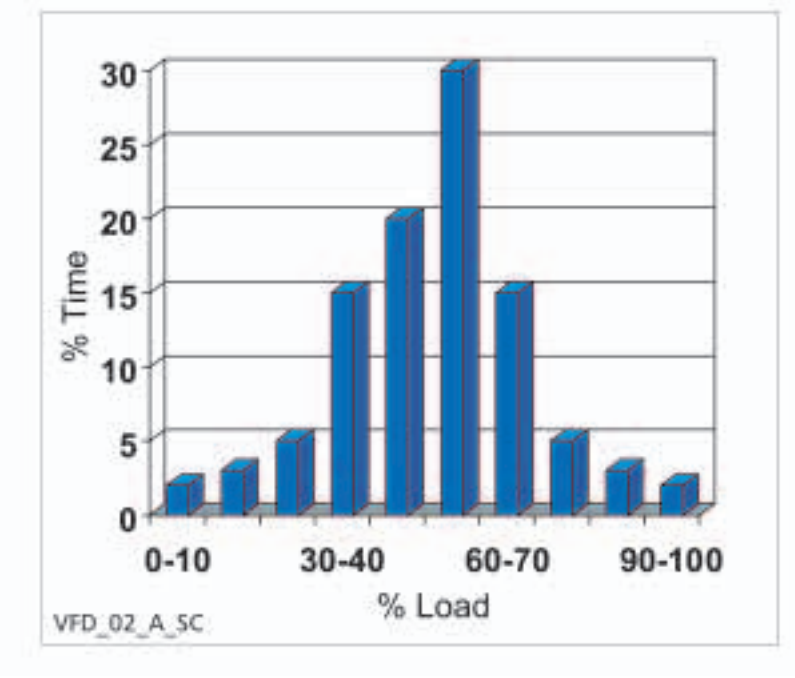
With installation costs dramatically reduced and the plunging costs of electronic components, Hydrovar pumps pay for their higher capital costs many times over during their lifetime. Throughout the world, possibly about 80 per cent of pumps are still constant speed units so the scope for energy saving worldwide is huge.

Many heating, cooling and ventilation distribution systems operate at a constant flow rate, even though peak demand may only be required for a few hours. The conventional response to meeting the changing demand for heating and cooling within a building is to restrict flow to individual rooms, while maintaining peak flow in the central HVAC system. However, through the use of this approach, considerable energy is used and equipment lifetime is shortened.

A much better approach is to use a variable speed drives on HVAC pumps and fans to vary air or water flow to meet more precise changing load demands.

Where air or liquid flows must be controlled vary by 30% or more, they are good candidates for variable-speed control instead of 2-way control valves or dampers. These increase static pressure of the fluid loop to reduce flow, wasting pump energy. The larger and more varied the flow, the greater the energy savings available. It is now economic to use variable-speed motor controllers for most pumps and fans with variable flow and high operating hours.

Typical Load Profile of a pump in a HVAC system:



Also a common way to use VFD's is to control pumps at constant pressure with a varying flow demand in water supply systems. In comparison to standard systems with a pressure switch (On / Off control), the use of speed controlled pumps offers a lot of additional advantages:

- Prevention from water hammers because of soft start/stop of the pump
- Constant output pressure
- Space savings because of reduced size of the pressure vessel
- Noise reduction

Basic Functions

The speed of a simple induction motor depends on the frequency of the AC power supplying it. In most of Europe mains supply is at 50 Hz (cycles per second) and in the United States 60 Hz, so motors connected directly to the mains turn at multiples of these figures depending on how the motor is wound. To alter the frequency of the motor supply and thus regulate pump speed, the Hydrovar system rectifies the mains supply to DC and then inverts it under command from the controller to provide the frequency required to match pump demand.

Input to the frequency controller comes from pressure and flow sensors; these inputs are integrated with the operator's programme to provide a fully flexible operating regime. The system provides not only economical pumping but also incorporates safety features and provides solutions to special requirements.

2. Summary of Variable Speed Control Products

	Single Pump Pressure Boosting	Multipump Pressure Boosting	HVAC applications
Hydrovar Watercooled 0,75 kW	✓		
Teknospeed 1,1 kW	✓	✓	
Hydrovar 1,1 – 22 kW	✓	✓	✓
Hydrovar Sensorless 1,1 – 4 kW			✓
Hydrovar Wall mounting 1,1 – 45 kW	✓	✓	✓
Hydrovar Smart up to 200 kW	✓	✓	✓

3. Product family

Hydrovar Watercooled

Technical data

Power supply:	1 x 220-240 VAC +/- 15%
Output voltage to motor:	3 x Uin (Supply voltage) useable for standard 3~ motors (230/400VAC) in delta configuration
Output power:	0,75 kW / 0,55kW
Max. nominal output current:	4,2 Amps (0,75kW) / 3,2 Amps (0,55kW)
Enclosure:	IP55
Ambient temperature range:	0-50°C
Fluid temperature range:	max. 40°C
Weight:	3,3 kg
Max. system/casing pressure:	6 bar

Product Features

Easy to install
Simple operation by using the 2 push buttons
Control without external pressure transducer
Frequency drive cooled by pumped liquid
Thermal protection
Over and under voltage protection
Overload protection
Shut off the pump at zero demand
Dry running protection
Compact and space-saving design

Teknospeed

Technical data

Power supply:	1 x 220-240 VAC +/- 10%
Output voltage to motor:	3 x Uin (Supply voltage) useable for standard 3~ motors (230/400VAC) in delta configuration
Output power:	1,1 kW
Max. nominal output current:	4,6 Amps
Enclosure:	IP55
Ambient temperature range: (above 40°C only with de-rating)	0-50°C
Max. system pressure:	10 bar

Product Features

Easy to install
Especially for 2 pump booster stations
Simple operation
Thermal protection
Over and under voltage protection
Overload protection
Shut off the pump at zero demand
Dry running protection
Compact and space-saving design
Power Factor Control

Hydrovar HV 1.1 – 3.22

Technical data

Power supply:	1 x 220-240 VAC +/- 15% 3 x 380 – 460 VAC +/- 15%
Output voltage to motor:	3 x Uin (Supply voltage) Output
power:	1,1 – 22 kW
Enclosure:	IP55 (15 - 22kW: IP 54)
Ambient temperature range:	0-52°C
(above 40°C only with de-rating)	

Product Features

Easy to install
Direct pump mounting
Can be retrofitted to existing pumps
Thermal protection
Over and under voltage protection
Overload protection
Shut off the pump at zero demand
Dry running protection
Compact and space-saving design
Control either the pressure or flow according to the system or customer requirements
Multi-pump system without additional control logic possible (each Hydrovar can be the master)
Vary the time of pump speed acceleration and deceleration
Automatic compensation of higher friction losses at high flow rates
Provide analogue signal for remote monitoring of pressure or frequency
Conduct an automatic test run of the pump
Displays all functions on a LCD display in 7 different languages

Hydrovar Sensorless HVS 1.1 – 3.4

Technical data

Power supply:	1 x 220-240 VAC +/- 15% 3 x 380 – 460 VAC +/- 15%
Output voltage to motor:	3 x Uin (Supply voltage) Output
power:	1,1 – 4 kW
Enclosure:	IP55
Ambient temperature range:	0-52°C
(above 40°C only with de-rating)	

Product Features

Sensorless control for circulation systems – no differential pressure sensor required
Control by using the power consumption
Easy to install
Direct pump mounting
Can be retrofitted to existing pumps
Thermal protection
Over and under voltage protection
Overload protection
Compact and space-saving design
Vary the time of pump speed acceleration and deceleration
Automatic compensation of higher friction losses at high flow rates
Provide analogue signal for remote monitoring of pressure or frequency
Conduct an automatic test run of the pump

Hydrovar Wallmounted HV 2.1 – 3.45

Technical data

Power supply:	1 x 220-240 VAC +/- 15% 3 x 380 – 460 VAC +/- 15%
Output voltage to motor:	3 x Uin (Supply voltage) Output
power:	1,5 – 45 kW
Enclosure:	IP55 (15 - 45kW: IP 54)
Ambient temperature range:	0-52°C
(above 40°C only with de-rating)	

Product Features

Easy to install
Thermal protection
Over and under voltage protection
Overload protection
Shut off the pump at zero demand
Dry running protection
Control either the pressure or flow according to the system or customer requirements
Multi-pump system without additional control logic possible (each Hydrovar can be the master)
Vary the time of pump speed acceleration and deceleration
Automatic compensation of higher friction losses at high flow rates
Provide analogue signal for remote monitoring of pressure or frequency
Conduct an automatic test run of the pump
Displays all functions on a LCD display in 7 different languages

Hydrovar Smart

Technical data

Power supply:	3 x 380 – 460 VAC +/- 15%
Output voltage to motor:	3 x Uin (Supply voltage) Output
power:	55 – 200 kW
Enclosure:	IP54
Ambient temperature range:	0-50°C
(above 40°C only with de-rating)	

Product Features

Thermal protection
Over and under voltage protection
Overload protection
Shut off the pump at zero demand
Dry running protection
Compact and space-saving design
Control either the pressure or flow according to the system or customer requirements
Multi-pump system without additional control logic possible (each Hydrovar can be the master)
Vary the time of pump speed acceleration and deceleration
Automatic compensation of higher friction losses at high flow rates
Provide analogue signal for remote monitoring of pressure or frequency
Conduct an automatic test run of the pump
Displays all functions on a LCD display in 7 different languages

4. Retrofit Hydrovar to existing pumps

Hydrovar units can be easily retrofitted on existing pumps!
The ingenious mounting concept enables simple, quick and inexpensive retrofit of Hydrovar to existing pumps.

In the last years, the use of speed controllers for circulation pumps was established as an outstanding instrument to reduce the energy demand of these machines.
The highest energy savings is with circulation pumps in closed loop systems (heating, cooling) because with these plants in the partial load operation with low demand also the pump height can strongly be reduced due to the smaller friction losses in the pipes.

In the past if speed controlled pumps were used only with new plants, the mounting method of the Hydrovar offers now a economical possibility for retrofit to existing pumps.

As a result of the Retrofit an abundance of advantages arise:

- Cost advantage – short amortisation period (payback). The existing pump can be further used – no special motors required for retrofitting. As a result of the substantial energy savings a very short amortisation period arises.

- Less wear during operation
  Less mechanical stress because of lower speed of the pumps during operation and no additional load in the starting moment, because of the soft start.

- Longer maintenance intervals because of less stress to the pump an the motor.

- Lower noise
  Less noise of the pump because of running at lower speeds during operation. Less noise in the pipeline and valves because of adjustment of the pump performance to the actual demand and control along the system curve.

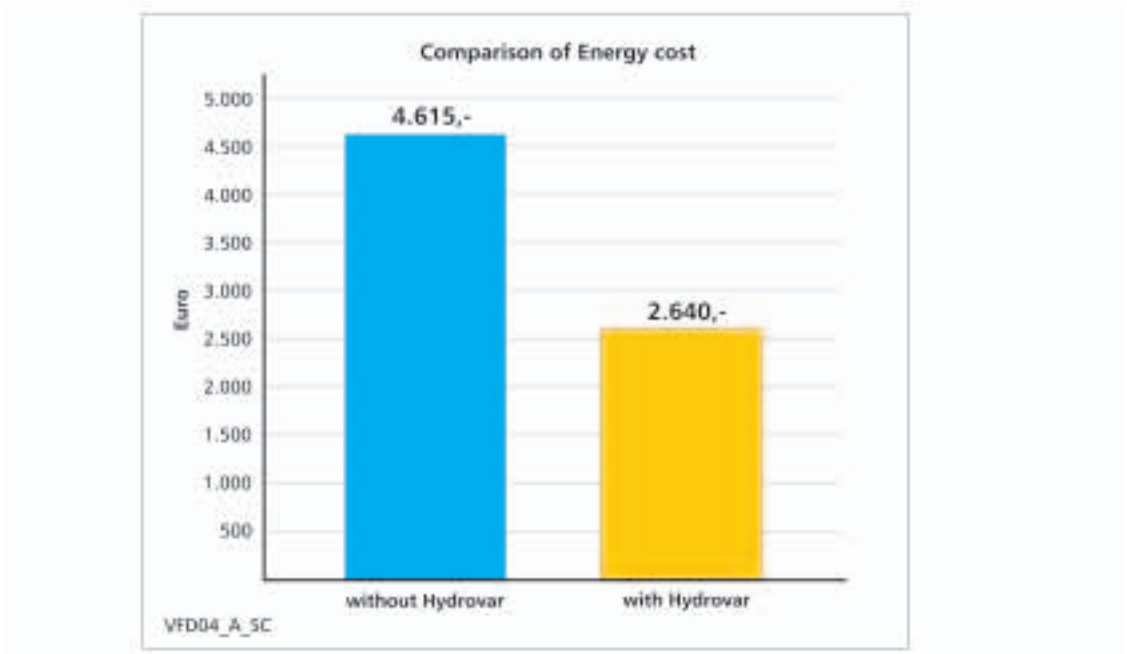
- Lower starting current
  High current peaks are prevented by adjusting the start ramp times.

- No water hammer
  The steady operation of the pumps also in partial loads prevents water hammer, which normally arise in the start/stop operation of full speed pumps.

- Multi pump control possible
  Because of the integrated multi pump controller, all features for lead-lag pump operation and sequencing are possible over the RS 485 interface without any additional devices.

High energy savings are possible with variable speed circulation pump of a Heating or cooling systems, it will be used only the actual energy of the heating or cooling demand.

Example of an circulation pump with 11 kW motor power for heating (eg. 40% of the year no operation)

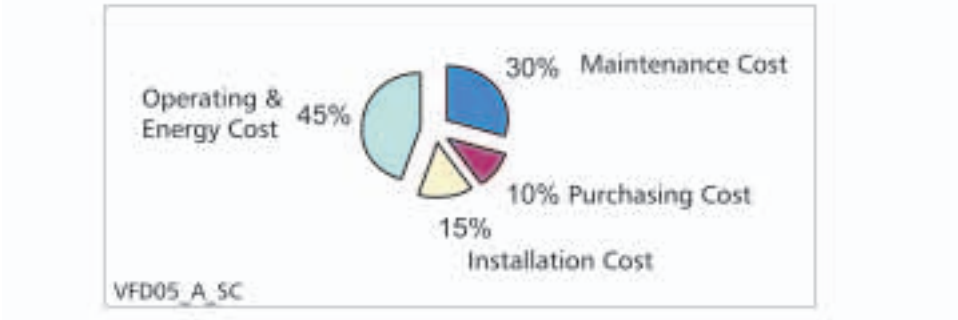


The energy savings in one year (8.760 hours) compared with full speed pump are 17.985 kWh, although the pump is not in operation for 40% of the year (summertime=144 days)!

Hydrovar units for direct mounting on the motor are available for power ranges from 1,1 up to 22kW for retro-fit.

Life Cycle Cost (LCC)

The Life cycle costs („LCC") of a pump are very strong influenced by the operating and energy costs (40-50% of the LCC)
This picture shows the typical LCC of a 15 year life cycle of a variable speed pump. For full speed pumps with other control systems like pressure reduction valves or bypass control this portion can be up to 80%!



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cod. 191000041 05/06