

Multiple Pressure Booster Systems With Variable Speed Controller Type BL



General Characteristics

- Single or multistage pumps
- Horizontal or vertical mounting
- Total head of 30m ~ 250m
- Material of construction: Cast Iron or Stainless Steel
- Sealing with mechanical seal
- Single stage electric motor (230V / 50 Hz) up to 2.4kw
- Three phase electric motor (400V/440V – 50 Hz /60 Hz)
- Pressure vessel size upon application
- Common collection suction – discharge or calculated diameter
- Cast Iron or Stainless Steel Collection

Applications

- High rise buildings
- Offices
- Schools
- Irrigation systems
- Industrial production
- Municipal supply systems
- Agriculture

Technical Data

- Liquid Temperature: 0 ~ 70° C
- Ambient Temperature: Max. 40° C

General

This variable speed controlled booster system is a sophisticated system, composed of latest technology with variable speed control cabinet and more than two sets of parallel pumps. It can be automatically adjust to fulfill the requirement of constant pressure, variable flow water supply. The pressure of the water supply pipe network keeps constant and the whole water supply system always keeps the best state of high efficiency and energy saving. There are two types of water supply, one is by frequency conversion and the other is by pressure. Water supply by frequency can automatically adjust the rotating speed of one pump or start/stop pumps, which is the best way to keep the pipelines pressure constant, it is easy to operate.

Applications

Resident water for living: such as high-rise building, resident community etc.

Public place: such as hospital, school, airport, gymnasium etc.

Commercial building: such as hotel, office building, departmental store, large scale sauna etc.

Irrigation: such as park, amusement park, orchard, farm etc.

Industrial production: such as manufacturing, washing device, food industry etc.

Advantages

Solve the problem of low hydraulic pressure

- The booster system keeps The water pressure stable in the whole building.

Avoid water pollution caused by roof tank

- Replace the traditional roof tank water supply way, eliminate the source of water pollution.

Reduce the construction cost and enlarge the space

- Eliminate traditional roof tank, reduce the stress for the building, structure is simple and lower the construction cost.

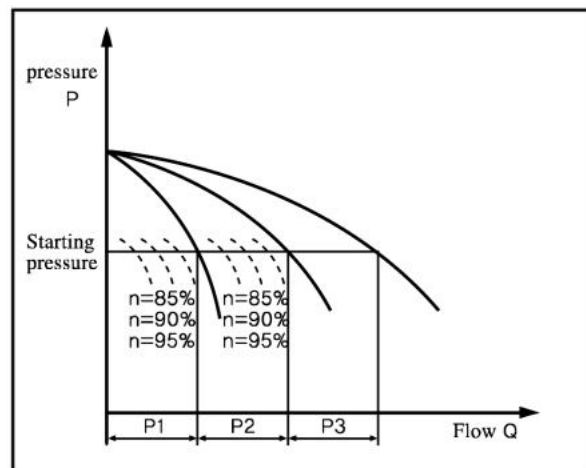
Save power, less space

- Compared with common water supply system, it may save more than 30% electric energy. This system covers less floor area, its installation is simpler and construction period is shorter.

Characteristics of Control Mode

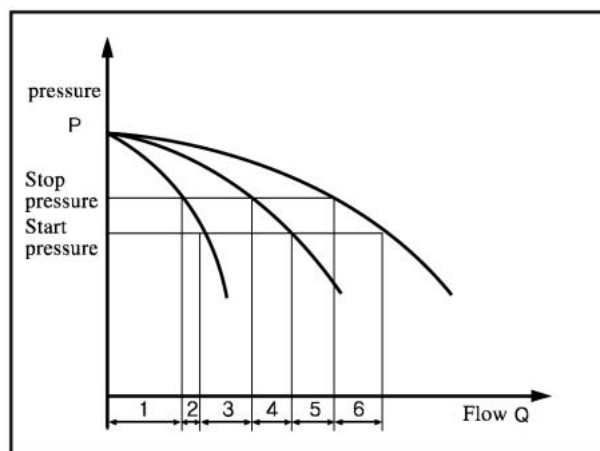
Controller by frequency conversion	Controlled by air pressure
<p>■ Operation mode</p> <ul style="list-style-type: none"> - Keep the water pressure constant through the change of the rotational speed of the water pump 	<p>■ Operation mode</p> <ul style="list-style-type: none"> - Control the pressure by the pressure tank and pressure switch
<p>■ Characteristics</p> <ul style="list-style-type: none"> - Higher cost than common system - Stable supply of water pressure - Electricity saving and low operation cost - Long life of water pump and motor - Without the phenomenon of water hammer, stable operation 	<p>■ Characteristics</p> <ul style="list-style-type: none"> - Lower cost - Larger deviation of water supply pressure - Simple control mode and convenient maintenance - Short life of water pump and motor

Frequency Conversion Control



Keep the pressure of pipe network constant by adjusting the rotational speed of the water pump. When the pressure inspected at the outlet pipe of the system is smaller than the start pressure value of the water pump, it is able to automatically adjust the rotational speed of the water pump to keep the outlet pressure constant. In case the pump is operated at the rotational speed of power frequency while the pressure cannot reach setting pressure, the system will start P2, P3 pump in tum. With the reduction of water consumption, the outlet pressure increases, and the rotational speed of the water pump goes down gradually. If the rotational speed of the water pump reduces to the lowest speed set by the system, the system will stop the operation of the water pump in the tum of P3, P2, and P1.

Air Pressure Control



In case the pressure of the pipe network is larger than that of start setting value, the pressure tank connected with outlet pipeline supplies water. In case the pressure of the pipe network is equal to that of start setting value, start the pump. When the pressure of the pipe network reaches stop pressure during operation, stop the operation of the water pump. After the pump starts, when the pressure of pipe network exceeds the start pressure, not reaching the stop pressure, the water pump continues operating. After the water pump is operated at full speed, when the pressure of pipe network has not reached the start pressure, the spare water pump start.

Moving Control Type Controller of Constant Pressure and Frequency Conversion

- Self developed moving control type water supply equipment of constant pressure and frequency conversion can save 3 to 7% of electric energy, compared with former water supply of constant pressure and frequency conversion.
- This product is especially applicable to the sites of large power, large variation of flow and frequency start. The system has high operation efficiency and obvious electricity saving effect.

1. Moving Mode of Frequency Converter Control

One set of frequency converter plays the effect of many sets of frequency converter and saves electric power and start pump softly. The start current of spare pump is 200 to 300% of rated current.

Increase of water consumption	Pump 1	Pump 2	Pump 3
0%	Operation of frequency conversion		
33%	Operation of working frequency →	Operation of frequency conversion	
66%	Operation of working frequency →	Operation of working frequency →	Operation of frequency conversion

Increase of water consumption	Pump 1	Pump 2	Pump 3
100%	Operation of working frequency ←	Operation of working frequency ←	
66%	Operation of working frequency ←	Operation of frequency conversion	
33%	Operation of frequency conversion		

2. Stationary Mode of Frequency Converter Control

The frequency converter control is fixed on one pump. When the supplementary pump starts, the start current will be too large and the fluctuation of the pressure is large. The start current of the supplementary pump is 500 to 600% of rated current.

Increase of water consumption	Pump 1	Pump 2	Pump 3
0%	Operation of frequency conversion		
33%	Operation of frequency conversion	Operation of working frequency →	
66%	Operation of frequency conversion	Operation of working frequency →	Operation of working frequency →

Increase of water consumption	Pump 1	Pump 2	Pump 3
100%	Operation of frequency conversion	Operation of working frequency ←	Operation of working frequency ←
66%	Operation of frequency conversion	Operation of working frequency ←	
33%	Operation of frequency conversion		

The difference between moving mode and alternate operation mode of frequency converter control

Alternate operation is the fundamental function of water supply of constant pressure and frequency conversion. After stop, when all water pumps restart, the initial started pump is operated by frequency control, and it is major pump. Alternatively starting the major pump every time or within any setting time shall prevent certain pump from starting frequency

Alternate operation	Pump 1	Pump 2	Pump 3
At the time of initial start	1 Operation of frequency conversion	2 Operation of working frequency	3 Operation of working conversion
At the time of restart	3 Operation of working frequency	1 Operation of frequency conversion	2 Operation of working frequency
At the time of restart	2 Operation of working frequency	3 Operation of working frequency	1 Operation of frequency conversion

Operation Performance Test Curve of Control System of Frequency Converter (50 Hz)

Keep constant pressure by virtue of intelligent controller under the situation of extreme change of flow. It is observed that the water supply system of frequency conversion has the best performance to supply water

Performance Test: Variable Speed Controlled Booster System

Model: 3BL10-6

Capacity: 200 L/min x 68 x 3 sets

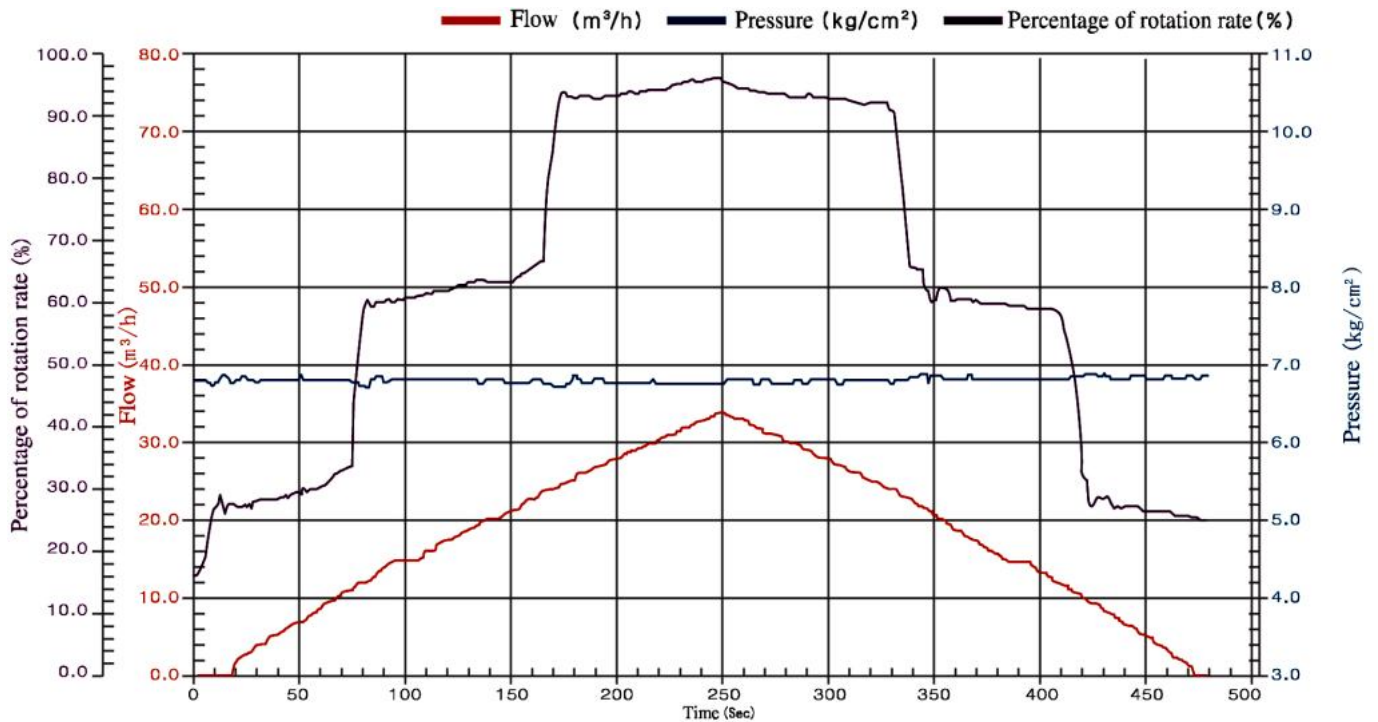
Capacity of Pressure Tank: 100L

Control Mode: Frequency conversion and constant pressure

Start Mode: Direct

Test Time: 8 minutes

Test Curve for the variable speed controlled booster system



Diaphragm Type Pressure Tank

Selection of Pressure Tank

The capacity of the pressure is selected according to the flow of pump, delivery head and start frequency.
 The pressure level of the pressure tank is selected according to the system pressure.

1. Calculation of effective capacity (Vesp)

$$V_{esp} = 16.5 \times Q/n$$

Q : Flow of pump (LPM)
 n : Start frequency (Times/h)

Motor Power (HP)	Below 5HP	7.5 ~ 10	15 ~ 30	40 ~ 75
Start Frequency (Times/h)	Below 30	Below 20	Below 12	Below 8

2. Calculate the effective capacity coefficient (Z) based on the features of pump's start and stop

$$Z = \frac{P_i + 1.033}{P_f + 1.033}$$

Z (Effective flow coefficient) = the ratio of occupying coefficient of effective capacity for pressure tank under the condition of assigned start, stop pressure of pump

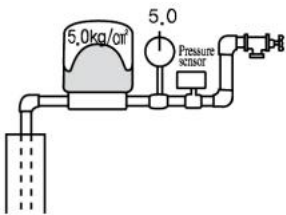
P_i (Start Pressure of Pump) = Actual Head + Pipe Loss + System Required Pressure

P_f (Stop pressure of pump) = Generally, (P_i + 1 ~ 2 kg/cm²)

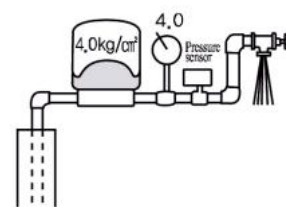
3. Calculate the Capacity of Pressure Tank V_T from VESP

$$V_T = V_{ESP} / Z$$

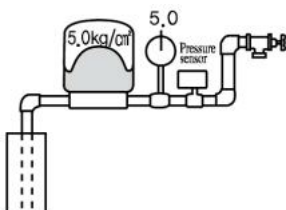
Working Principle of Pressure Tank



■ At the initial operation of the pump, fill water in the pressure tank. After it reach setting pressure with the increasing of the pressure, the water pump stop.



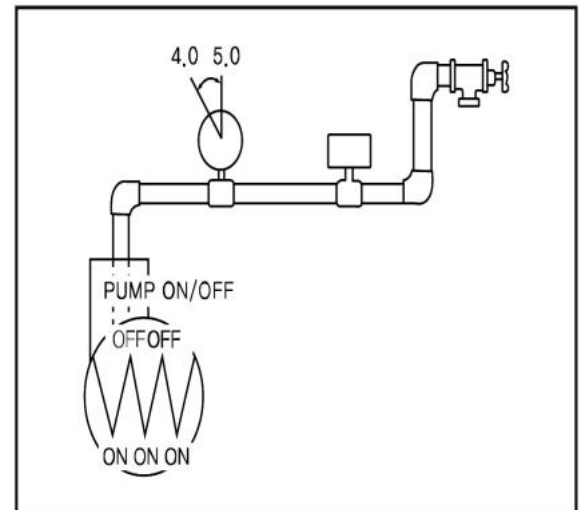
■ For initial water consumption, the water is supplied by the pressure tank. With the gradual reduction of the internal pressure of the pressure tank, the water is supplied by the frequency conversion.



■ When the supply volume is small or stopping water consumption, the water pump continues filling the water in the pressure tank. It will stop until it reached setting pressure.



Operational situation of the system in case of without pressure tank



Water is non-compressible fluid so the pressure will change rapidly when little water flows into or out. For the pressurization water supply, without pressure tank or small capacity, the change of water consumption volume will start the water pump frequently and result in the great increase of fault rate for pressure controller, relay, contactor, etc. and large damage and loss for the pump and motor, lowering the reliability.

Variable Speed Controlled Booster System



Main Features

High quality intelligent computer control

Special purpose, self-developed, varied functions, precise control of sophisticated level, world leading standard.

Energy Saving System

The system is able to adjust the rotational speed and start/stop pumps in accordance with required water consumption volume, saving electric energy more than 30%.

Keep Constant Pressure

In case of rapid change of water consumption volume, the outlet pressure can keep stable to provide the consumer with comfortable water supply environment.

Made of High Grade Material

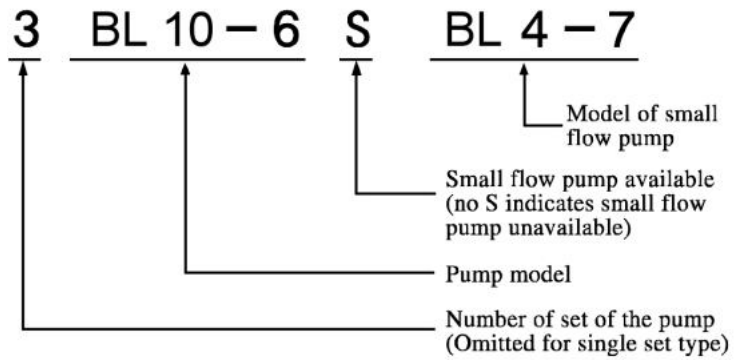
Water pump, main pipeline and accessories are made of stainless steel to provide clean water quality.

Customer Centered Product Design

Standardized design may guarantee timely delivery. LCD Manual to facilitate consumer's use.

Definition of Model

Example: 3 pumps including a small flow pump

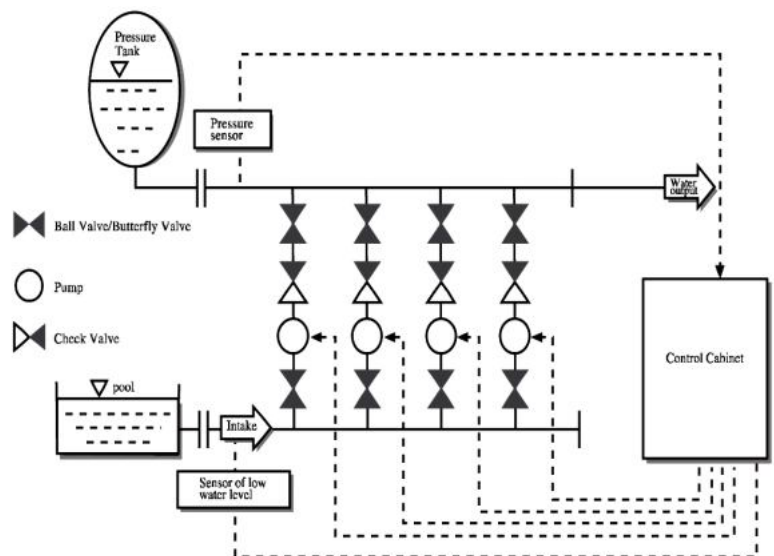


■ Note: Standard pressure of the pressure tank is 10 bars. It shall be remarked for more than 10 bars when ordering.

Operating Environment

Control Mode	Frequency Conversion
Installation Site	Indoor
Environment Temperature	5° C to 40° C
Conveying Liquid	Clean Water
Liquid Temperature	0° C to 70° C
Extreme Service Pressure (Suction Pressure + Head of Pump at Shut-off Point)	20 kg/CM ²
Minimum Suction Pressure	0.2 kg/CM ²
Allowable Suction Pressure	Restricted by maximum use pressure
Pump	Vertical / Horizontal Multistage Centrifugal Pump
Combined Sets of Water Pumps	2 to 6 Sets
Power Supply	3 Phase x 230/415V x 50 Hz
Suction Pipe/ Output Pipe	Stainless Steel Pipe

Sketch Drawing of Variable Speed Controlled Booster



Components Drawing of Variable Speed Controlled Booster System



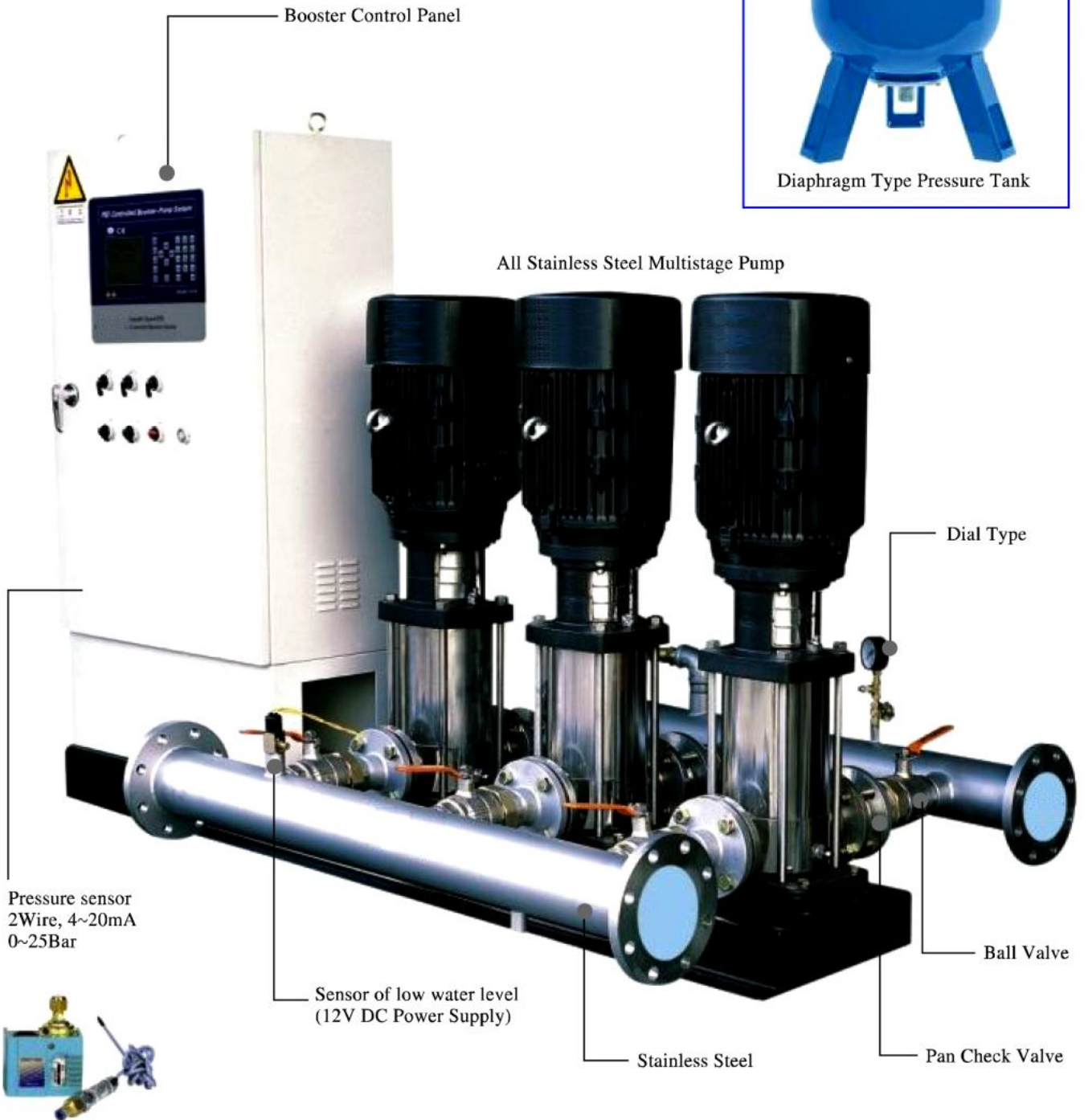
LCD Manual



Controller Board



Diaphragm Type Pressure Tank



Control Panel (Special for Variable Speed Controlled Booster System)



Main Features of Control Cabinet

Self-researched and developed sophisticated technical product (controller) by mature technology and abundant experience is applicable to moving mode of frequency converter control.

Precisely control the constancy of water supply in accordance with change of water consumption.

The LCD manual for easy operation.

The interface of remote control is available.

Performance of Routine Product

Item	Type
Operation Mode	Automatic manual
Display	LCD
Frequency Converter	1 Hp to 60 Hp (50 Hz or 60 Hz)
Pressure Sensor	2 Lines, 4 to 20 mA, 0 to 25 Bar
Remote Control	RS-232C /RS-485, Open of system option

■ Please contact us for special requirement

Major Control Function

Major Function	Content
Moving mode of frequency converter control	Select moving mode or stationary mode of frequency converter control in the manual
LCD Screen	Display various information by wide screen LCD manual
LCD Display	Simple operation
Selection of operation interface	Manual option of English, Chinese, Korean
Latest VSD control	Latest high performance control system
Running pump in turn	Run or stop pump in turn
Prevent from running without water	The pump stop operation and the system gives an alarm when the inlet pipe is short of water
Run through there is failed pump	When the pump breaks down, the system will automatically start the next normal pump to operate.
Adhesion prevention	The system is capable of test run of the pump periodically to prevent the adhesion of the pump due to long term stop.
Over current of motor prevention	Prevent the current of the motor from exceeding the setting value when starting
Overheat of motor prevention	Automatically stop the pump by the temperature switch on the motor
Abnormal high pressure prevention	Prevent abnormal rise of pressure by pressure sensor
Regular operation	Set operation time according to requirements and save energy
Self diagnosed operation	Real time monitoring function may diagnose various faults
High pressure alarm	Automatically stop the pump and give an alarm when exceeding setting pressure and time
Low pressure alarm	Give an alarm when the working frequency of all pumps operates and cannot reach setting value
Deviation adjustment display	Adjustable when the operation pressure of LCD differs from indicated pressure value of pressure gauge
Record and storage of operation content	Record and store of various operation situations
Record and storage of alarm content	display and store of various alarm contents
Emergency measure	Able to shift to manual control when the frequency conversion control fails
Alternate operation	After running some time, other pumps will replace main pump to run, which will make pump run evenly
Combined operation in parallel connection	Maximum 6 sets of pump connected in parallel