

6800 Design Envelope Booster

Technical overview

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1.0 PRODUCT INTRODUCTION

SUMMARY

Armstrong Design Envelope 6800 boosters feature Vertical Multistage pumps in a 2 to 5 pump arrangement combined with variable speed controls and pump staging logic to create broad envelopes of efficient hydraulic performance. The Design Envelope 6800 booster reduces a building's domestic water pumping costs by varying operating speed to ensure optimum water pressure is provided to the building's top floors at all times. This control strategy is far superior to traditional constant speed boosters that would maintain constant discharge pressure by running at full capacity and then immediately reduce any excess pressure with pressure reducing valves. Design Envelope boosters can typically save 60–80% in energy over constant speed boosters.

Some of the industry leading comfort and energy-saving features of the Design Envelope 6800 booster include Soft fill, Pressure setback, No flow shutdown and No flow pressure optimization.

BACKGROUND

Buildings decorate the landscape of major cities around the world. Every building requires clean, safe water for basic human activities such as drinking, cooking, washing dishes or showering. The role of the booster pump system is to increase the pressure of the domestic water supplied by the utility if it is not adequate to supply the upper levels of buildings.

Water usage can vary considerably throughout the day in buildings. For example, a residential building could experience peak flow usage in the morning as many people get ready for work at the same time. In the evenings, this same building could use almost no water when most people are sleeping. Even though the flow rate used in the building could vary greatly, each fixture still requires constant pressure for proper operation.

Traditional booster pump systems maintain a constant pressure supply to the building via a pressure reducing valve (prv). This configuration is inefficient because the booster pumps run at full capacity to increase the water pressure and then the pressure is immediately reduced by the prv. The water pressure to the building stays constant but the utility bills are higher than necessary. Constant speed systems also consume excess water through flow and leakage associated with higher operating pressures.

Armstrong's Design Envelope boosters reduce a building's pumping costs through intelligent variable speed demand-based operation – consuming only the energy required based

on a building's water consumption. With variable speed control, the motors on the booster system vary in operating speed to satisfy a pressure sensor located in the domestic water supply piping at a high point in the building to ensure that the top floors are receiving adequate water pressure at all times. This control strategy allows the booster to automatically adjust its speed to maintain constant discharge pressure, despite any variations in flow or suction pressure, and eliminates surges and water hammer to provide smooth, energy efficient operation.

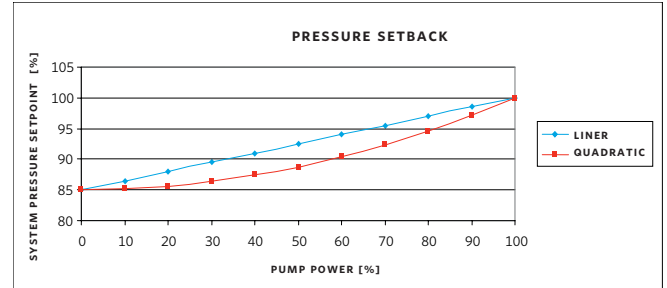
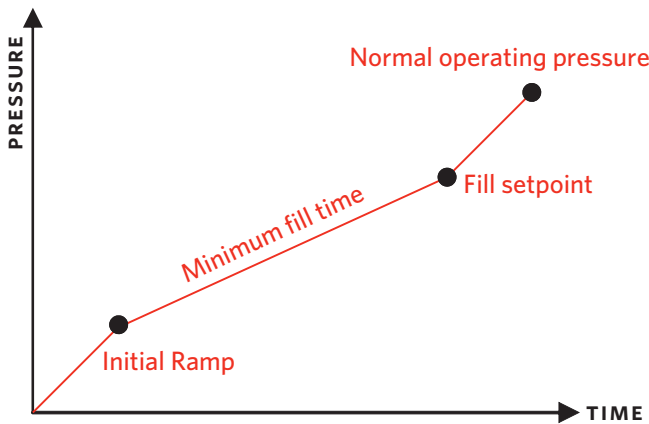
The Design Envelope approach to selection reduces design risk and avoids wasted time caused by equipment change orders. The selected booster system can accommodate changes during the design and construction phases and over the life of the building.

Core benefits include:

- Reduced costs for system maintenance.
- Reduced energy costs.
- Reduced carbon footprint and greenhouse gas emissions.
- Increased tenant comfort.
- Extended system life.
- Maximum performance, energy efficiency and reliability.
- Reduced equipment, installation and commissioning costs.
- Reduced water consumption.

Soft Fill makes the Design Envelope 6800 series a market leader.

- Soft Fill is a fully automatic process, which controls the pump and increases operating speed gradually as the system reaches a fill setpoint.
- Soft Fill reduces the occurrence of water hammer associated with the rapid exhaustion of air from piping systems. An example of when this might occur is following a mains power failure and resumption where attempted water draw off has led to air entering the system.
- A minimum fill time can be adjusted to suit site conditions. This setting determines the minimum amount of time the unit will take to reach the fill setpoint.
- Pressure is increased at a controlled rate, so that air trapped in the system is released gradually.
- Water is introduced into the pipework under controlled conditions, which prevents damage to fittings.
- After initial start-up, when the system is in normal use, the booster set reverts back to its usual working conditions, reaching target pressures as quickly as possible.



No flow shutdown:

Pumps are turned off during periods of low demand. This feature eliminates the need for recirculation lines with Aquastat & solenoid valves and saves energy during low demand.

Pressure setback

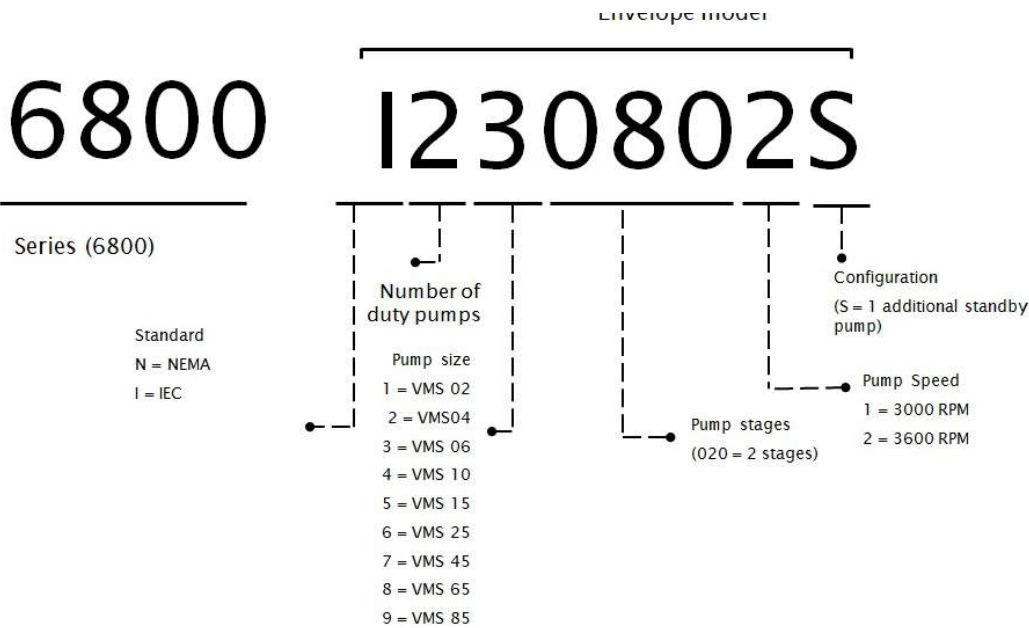
Pressure setback is the adjustable reduction of the system discharge pressure setpoint to compensate for lower system friction losses. Reduces speed and consumes energy according to demand. This is done with quadratic pressure control (QPC) for up to 20% energy savings over constant pressure control (CPC).

No flow pressure optimization

This is a part of shutdown routine. The system generates additional boost of pressure under no-flow conditions to increase volume of water in tank. This feature allows smaller tank and prolongs the shutdown period to prevent short-cycling of pumps

2.0 PRODUCT DATA

NOMENCLATURE



OPERATING CONDITIONS

Operating pressure

As standard, the maximum operating pressure is 25 bar*.

NOTE:

*Smaller models have a maximum operating pressure of up to 16 bar.

Temperature

Liquid temperature: 0 to 60°C

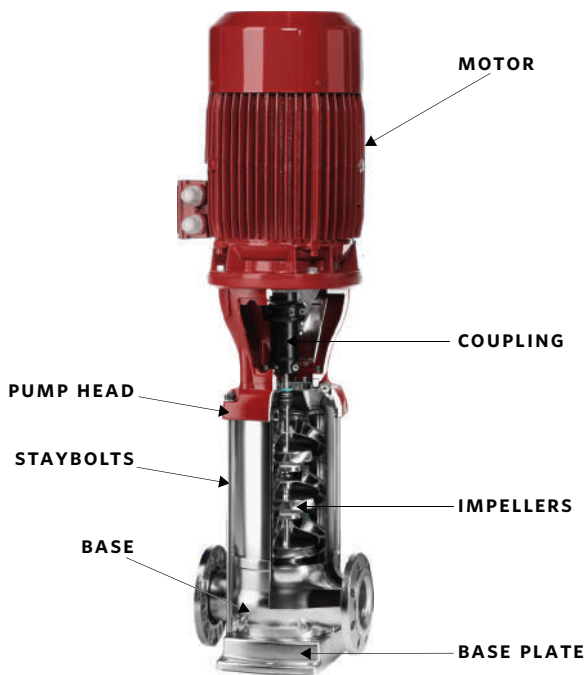
Ambient temperature: 0 to 40°C

Relative humidity

Maximum relative humidity: 95%

3.0 CONSTRUCTION

PUMP

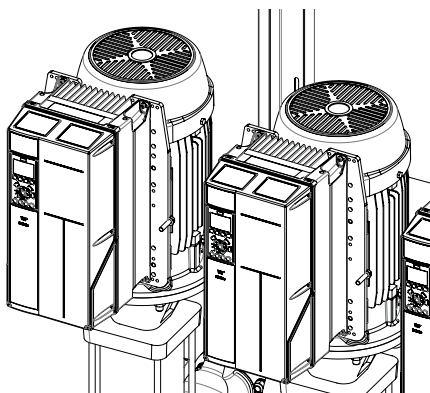


MOTOR

Totally enclosed fan cooled squirrel cage 3 ph induction motors-flange mounted

Enclosure conforming to protection IP 55 flange mounted (any other mounting than B3), continuously rated (S1) suitable for operation on $415 \pm 10\%$ V, 3 phase 50Hz $\pm 5\%$ AC supply with ambient 50°C, class F insulation with temperature rise limited to class B and altitude less than 1000 m above M.S.L. Efficiency values are conforming to IS 12615:2011 IEC 60034-30-2008.

DRIVE



SPECIFICATIONS

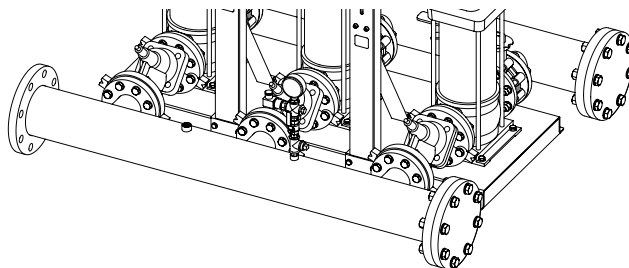
Enclosure: IP55.

EMI/RFI control: Integrated filter designed to meet EN61800-3.

Harmonic suppression: Integrated DC link reactor.

Cooling: Fan-cooled through back channel.

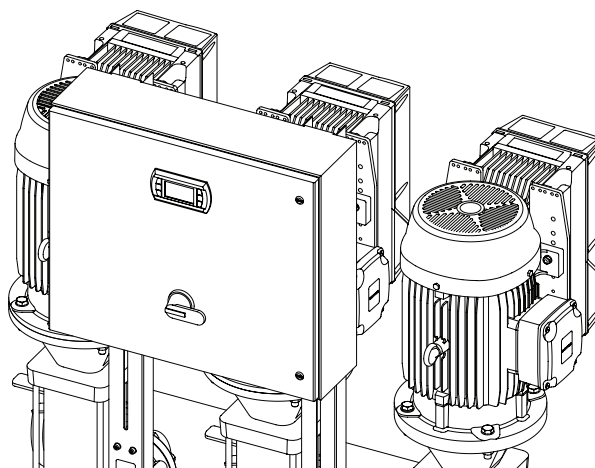
MANIFOLD



SPECIFICATIONS

Stainless steel inlet and outlet manifolds is standard.

CONTROL CABINET



SPECIFICATIONS**Enclosure:** IP54

- Low suction shutdown and auto re-start.
- Mains disconnect with interlock.
- MPCB motor protection.
- SMPS for control circuit.
- Motor run indication on HMI.
- Virtual H-O-A for each pump.
- No-flow shutdown and automatic alternation.
- Soft fill mode.
- Pressure setback mode.
- Field adjustable set points, alarms and timers.
- Flash memory storage.
- No-flow pressure optimization.

4.0 INSTALLATION**PRODUCT SPECIFICATIONS**

The 6800 Design Envelope Series Booster sets are packaged programmed and tested prior to dispatch. All units are tested for pressure and full functionality in all programme sequences. All configurations include the following components and features:

- **Isolating valves:**
 - Suction: Ball-type valve upto 2",
Butterfly-type valve 2.5" onwards
 - Discharge: Ball-type valve upto 2",
Flotrex valve 2.5" onwards
- Poppet-type non-return valves upto 2"
- Stainless steel impellers, shaft, stage pieces, top and bottom covers
- Automatic system Soft Fill mode, with the option of manual fill
- Automatic pump duty changeover:
 - Following a 'sleep' situation
 - Following any fault
 - On a time adjusted basis
 - Sequence - 1-2-3-4, 2-3-4-1, 3-4-1-2, 4-1-2-3, 1-2-3-4
- Automatic omission of failed pump from sequence
- Automatic omission of pumps in the off position
- Automatic reset of pump from a 'minor' alarm situation
- Pump running contact
- Pump fault output
- IP54 control panel enclosure
- Door interlocked isolator
- LCD display with 4 x 20 text display of:
 - Setup menus
 - System pressure

- Pump operating status
- System mode (i.e. fill mode, sleep mode, run mode)
- Pump speed, current, power and alarm description
- Hours run
- System alarms
- Low water level cut-out
- Remote inhibit function
- Lockable Hand / off / auto functionality
- Password protected menu screens
- Standby pump selection
- Common alarm volt-free contact
- Transducer failure protection

5.0 OPTIONAL EQUIPMENT / ACCESSORIES

All optional equipment, if required, must be specified when ordering the Design Envelope Booster system, as it must be fitted from factory prior to delivery.

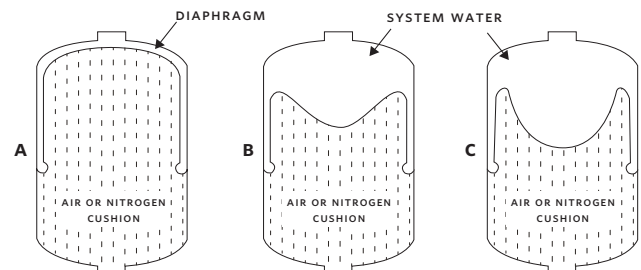
Diaphragm tank

Diaphragm tanks are commonly used in a booster system to provide water storage for the system in very low flow situations. It decreases the running time of the booster pumps, thereby making the system more energy effective.

Diaphragm tanks are pressurized water vessels where the water and air are separated by a flexible diaphragm allowing the water to expand and absorb pressure surges.

Building booster sets with stop function should always be mounted with a diaphragm tank. In water supply applications, the elasticity of the piping often gives sufficient capacity and renders diaphragm tanks superfluous.

In areas where inlet pressure fluctuates, diaphragm tanks are often installed on the suction manifold to reduce damaging peak pressures.



- A. When system is filled, no water enters tank when cushion and water pressure are in equilibrium
- B. As temperature increases, diaphragm moves to accept expanded water
- C. When water rises to maximum, full acceptance of expansion is achieved.

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Dry running protection

The booster system must be protected against dryrunning.

The inlet conditions determine the type of dry-running protection:

- If the system draws water from a tank or a well, select a level switch or an electrode relay for dry-running protection.
- If the system has an inlet pressure, select a pressure transmitter or a pressure switch for dry-running protection.

Expansion Tanks

10 BAR TANKS

MODEL	ITEM CODE	CAPACITY (L) in ltr	PRESSURE in bar	DIAMETER (D) in mm	HEIGHT(H) in mm	PRE-CHARGE in bar	CONNECTION (BSP) in inch
ATANK10-60	572005-700	60	10	389	620	1.9	1
ATANK10-100	572005-701	100	10	430	804	1.9	1
ATANK10-200	572005-702	200	10	534	1041	1.9	1½
ATANK10-300	572005-703	300	10	534	1510	1.9	1½
ATANK10-450	572005-704	450	10	660	1539	1.9	1½

16 BAR TANKS

MODEL	ITEM CODE	CAPACITY (L) in ltr	PRESSURE in bar	DIAMETER (D) in mm	HEIGHT(H) in mm	PRE-CHARGE in bar	CONNECTION (BSP) in inch
ATANK16-100	572005-705	100	16	460	990	4	1
ATANK16-200	572005-706	200	16	590	1120	4	1½
ATANK16-300	572005-707	300	16	640	1230	4	1½
ATANK16-500	572005-708	500	16	750	1550	4	1½

25 BAR TANKS

MODEL	ITEM CODE	CAPACITY (L) in ltr	PRESSURE in bar	DIAMETER (D) in mm	HEIGHT(H) in mm	PRE-CHARGE in bar	CONNECTION (BSP) in inch
ATANK25-100	572005-709	100	25	460	990	4	1
ATANK25-200	572005-710	200	25	590	1120	4	1½
ATANK25-300	572005-711	300	25	640	1230	4	1½
ATANK25-500	572005-712	500	25	750	1550	4	1½

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