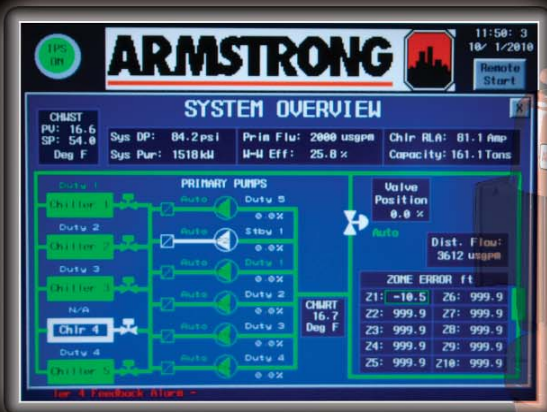


# ARMSTRONG



## Integrated Pumping Systems

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# Integrated Pumping Systems...The Concept.

Armstrong's Integrated Pumping System (IPS) automatically ensures delivery of required pumping capacity to match key building loads, while maintaining pumping energy costs at a minimum.

With the use of system load detectors, such as differential pressure sensors, at one or more remote load locations, the Armstrong IPS automatically and continuously provides just the required flow for the current needs.

HVAC system load requirements vary considerably during a typical day. Considerable energy savings result when pumping capacity is continuously matched to the load.

Pumps may be operated as 100% standby or in a multiple pump, staged parallel sequence.

Armstrong's IPS can control as many as six (6) pumps in parallel, with up to eighteen (18) remote system load sensors.

Dedicated Variable Frequency Drives (VFDs) may be used, with or without power bypass systems.

Armstrong offers the most advanced IPS available, with the flexibility to meet the most demanding pumping applications.

See the illustration on pages 3 & 4 for typical Integrated Pumping System (IPS) components.



IPS 3000



IPS 5000



IPS 9000



Complete IPS Rack Assembly (2-Drives)



## Integrated Pumping System - System Responsibility

### "Who Is Responsible?"

- ▶ To Resolve an Issue
- ▶ To Diagnose a Problem
- ▶ To make Commitments & Take Action
- ▶ To provide Solutions
- ▶ To overcome Technical & Financial Risks

### Armstrong is with the IPS!

Armstrong provides the key single source responsibility for the Integrated Pumping System.

Your project can start with expert assistance from the Armstrong team. Armstrong's IPS design and specification assistance will assure you of an advanced reliable design with built-in energy efficiency.

All Armstrong IPS components are carefully selected and interfaced as an integrated system to assure trouble-free start-up and effective operation.

Documentation begins with project specific submittal data and ends with a comprehensive operator's manual. On-site operator training is a standard and vital component of each Armstrong IPS.

The Armstrong team has the pumping system expertise to ensure a successful IPS installation. The service network provides the long-term support you require.

## IPS Controllers Capability and Feature Matrix

		Control Limits			Operator Interface (HMI)	Special Features	
		Zones	Pumps	Chillers/Boilers			
IPS 3000	3001	2	3	N/A	4x20 backlit LCD, 6 buttons, 4 LED keypad	Variable secondary; Built-in protocols	
	3002	5	4				
IPS 5000	5001	5	4	N/A	5.7" touch-screen, backlit	Variable secondary; Optional flow sensor input(s); Customized programming	
	5002	8	4				
	5003	11	4				
IPS 9000	9100	9101	6	N/A	10.4" 256-color touch-screen with system schematics and variable display	Variable secondary; Speed matching on pump staging; Staging/de-staging on VFD bypass	
		9102	12				6
		9103	18				6
	9200	9201	6	N/A	10.4" 256-color touch-screen with system schematics and variable display	Constant Primary and Variable Secondary pump control; Speed matching on pump staging; Staging/de-staging on VFD bypass	
		9202	12				6
		9203	18				6
	9500	9501	6	4	3	10.4" 256-color touch-screen with system schematics and variable display	Variable Primary; Speed matching on pump staging; Chiller sequencing/flow control
		9502	12	5	4		
		9503	18	6	5		

## Integrated Pumping System - General Sequence of Operation

The Armstrong Integrated Pumping System (IPS) provides a means of automatically ensuring delivery of required pumping capacity to match key building loads, while maintaining pumping energy costs at a minimum.

Using system load detectors, such as differential pressure sensors, at one or more remote load locations, the IPS detects where a deficiency in flow is occurring and adjusts the flow rate to match the requirement, by adjusting the pump speed.

The pump speed can be lowered, to reduce flow, when the differential pressure is above that required at all locations. The Armstrong IPS continuously and automatically makes these precision adjustments to match the pumping flow to the current load requirements.

Variable Frequency Drives (VFDs) may be used, with or without power bypass systems. Pumps may be operated as 100% standby or in a multiple pump staged parallel sequence.

Where the pumping system consists of a single operating pump, with a 100% standby pump, the operating pump speed will be modulated throughout the operating range.

Factory set *End of Curve Protection* will operate to protect the pump. Pump speed and pressure is closely monitored to protect against this possible service life reducing condition. Pump speed corrections will continue to achieve the load requirements, while monitoring the *End of Curve* condition at each speed setting.

Where multiple pumps are operating in parallel the precise DDC control capability of the Armstrong IPS controller ensures that the speed of all pumps is maintained to within  $\pm 1\%$ .

The Armstrong IPS provides this precision speed control of each pump with a *Closed Loop* DDC control. The electronic signal level to each VFD is continually checked and adjusted to automatically keep the actual pump speed at the required setting.

This precision control is one of the very significant factors which is essential to the application of an Armstrong IPS.

Where multiple parallel pumps are sequenced through the load profile, pumps will be added to the operating set, only after an unsatisfied load requirement has persisted for a fixed staging time interval.

As an additional pump is activated, the speed of the operating pumps is reduced to the pre-set staging level. The speed of all pumps is then increased to meet the load requirements. A similar sequence occurs when staging OFF one of the operating pumps. This *Soft System Staging* ensures smooth staging transition and prevents flow or power surges.

The Armstrong *Plant Efficient Staging* option sets the staging points based on the actual monitored operating efficiency of the pumping plant. The Armstrong IPS continuously monitors energy consumption throughout the plant flow range for each combination of operating pumps. Using the on-line data, the decision to switch is based on the automatic selection of the known highest energy efficiency operational state.

The Armstrong IPS may consist of up to six (6) parallel pumps with as many as eighteen (18) remote sensors.

**Armstrong offers the most advanced Integrated Pumping System available...  
with the flexibility to meet the most demanding pumping applications.**

EXPERIENCE BUILDING...

**S. A. Armstrong Limited**  
23 Bertrand Avenue  
Toronto, Ontario  
Canada, M1L 2P3  
T: (416) 755-2291  
F (Main): (416) 759-9101

**Armstrong Pumps Inc.**  
93 East Avenue  
North Tonawanda, New York  
U.S.A., 14120-6594  
T: (716) 693-8813  
F: (716) 693-8970

**Armstrong Holden Brooke Pullen**  
Wenlock Way  
Manchester  
United Kingdom, M12 5JL  
T: +44 (0) 161 223 2223  
F: +44 (0) 161 220 9660



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