ARMSTRONG

DESIGN ENVELOPE

Intelligent Variable Speed pumps

SOLUTION OUTLINE

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DATE: AUGUST 2017

SUPERSEDES: 100.11
DATE: MARCH 2017

DESIGN ENVELOPE

OPTIMUM PERFORMANCE ANY GIVEN TIME

Armstrong Design Envelope pumps are a complete solution for heating, cooling and plumbing systems. The integration of a perfectly matched pump, motor and intelligent variable speed controller creates the highest value pumping solution.

Whether driven by social, environmental or fiscal responsibility, forward-thinking organizations must embrace energy-saving technologies and practices.

Through design advances,

Armstrong has eliminated the cost trade-offs that are frequently attached to sustainable choices. Design Envelope offers the lowest installed cost and the lowest life cost of any pumping solution today.

UP TO

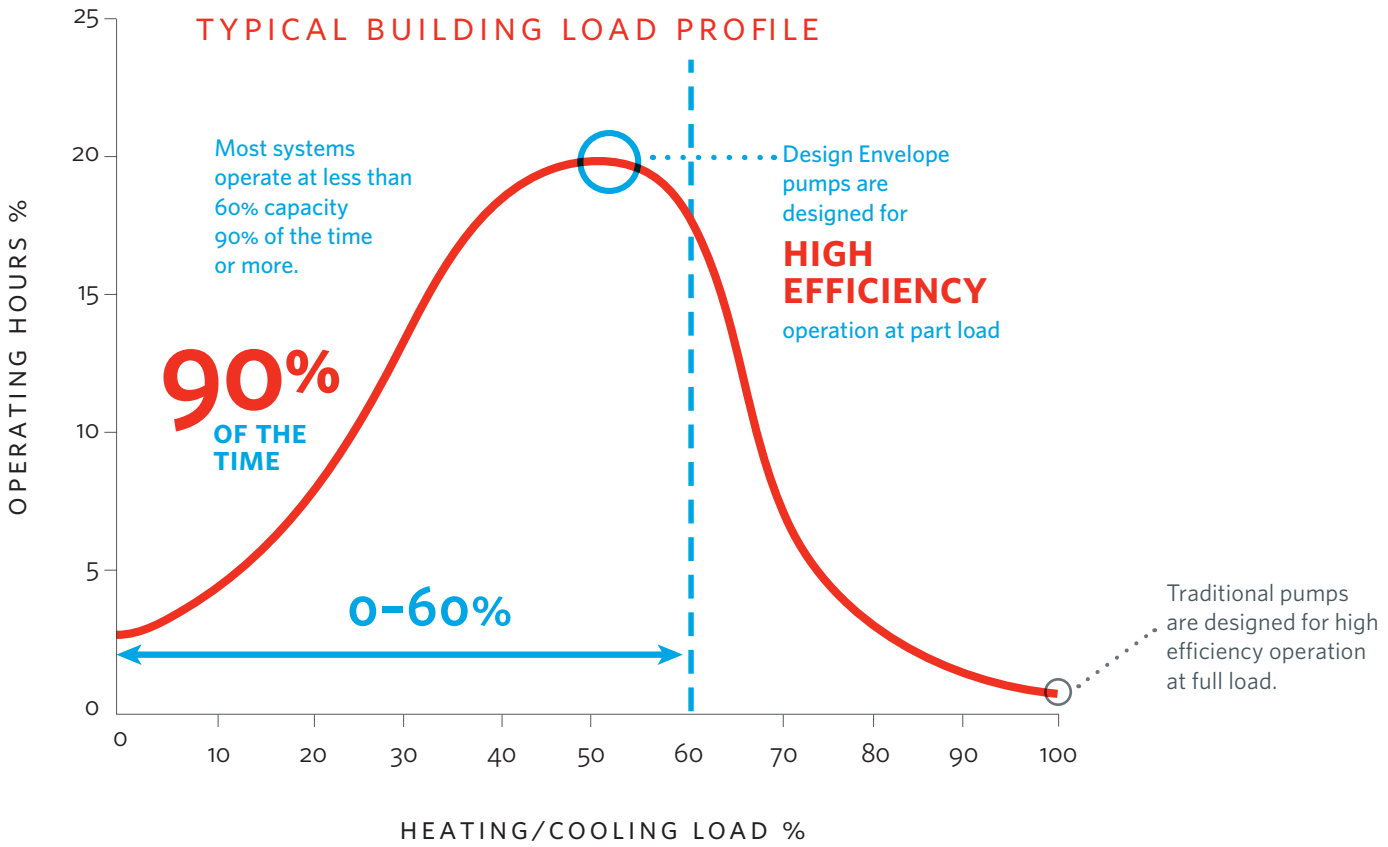
65%

INSTALLED COST SAVINGS

UP TO

80%

ENERGY SAVINGS



Design Envelope solutions reduce pumping costs through variable speed, demand-based operation — consuming only the energy required, based on current system demand.

Design Envelope pumps use a combination of optimized impeller size and speed control for energy efficient operation within a given performance envelope. The performance envelopes are selected for the best pump efficiency where variable flow systems operate most often. This ensures a building's pumping system consumes as little energy as possible. It also ensures that the installation meets or exceeds ASHRAE 90.1 guidelines requiring 70% energy savings at 50% of peak load.

EVOLUTION OF PUMPING

& INSTALLED COSTS

DESIGN ENVELOPE TANGO/DUALARM

> Managed redundancy and parallel operation replaces duty/standby
> Reporting and proactive management
> Smaller units are easier to handle
> Two rotating devices sharing one casing
> Optimized lifetime performance

DESIGN ENVELOPE VERTICAL IN-LINE

> Integrated, sensorless variable speed controller
> Eliminates wiring from VFD to pump and shaft grounding
> Supports smaller motor selections
> No feedback sensor or wiring required
> Internal harmonic filter
> No requirement for wall space
> One-touch auto-flow balancing
> Onboard Web services and connectivity

Saves an additional $2000 on average

VERTICAL IN-LINE WITH VARIABLE SPEED CONTROL

> Wall/rack mounted VFD
> System feedback sensor
> Partially reduces energy costs

CONSTANT SPEED PUMP
3-WAY VALVE

VARIABLE SPEED PUMP
WITH CONTROLS DISABLED (PUMP IN HAND)

> Constant speed operation
> Base case for pump energy usage
> Pump runs at design point, controlled by throttling

AVERAGE 15% ENERGY SAVINGS

VARIABLE SPEED PUMP
WALL-MOUNTED CONTROLLER/2-WAY VALVE

> Constant reduced speed
> Reduce motor speed in lieu of throttling flow

VERTICAL IN-LINE SPLIT-COUPLING

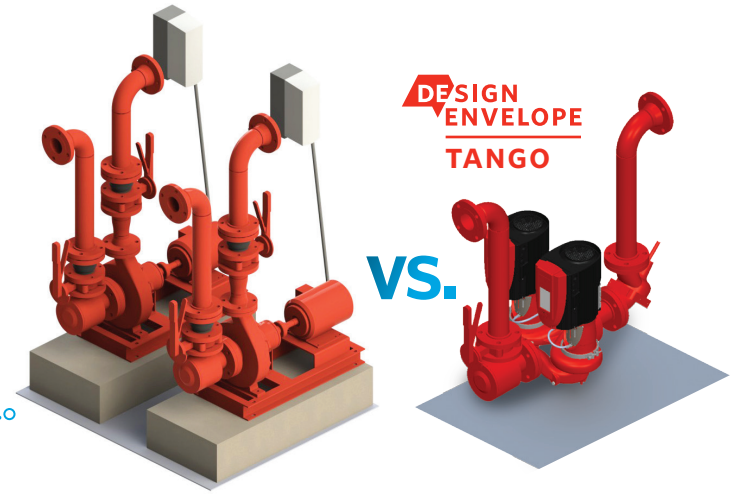
> **Eliminates the need for:** housekeeping pads, inertia base, flex connections, grouting and alignment
> Reduced installation labor costs
> Smaller mechanical room footprint (50–75%)

15 minute seal change: saves up to $700

Saves over $5000 for an 8" pump

BASE-MOUNTED END SUCTION

> Legacy design
> Base case for comparison
> Time intensive seal change



SUPERIOR PERFORMANCE

& ENERGY SAVINGS

UP TO 50% ENERGY SAVINGS

VARIABLE SPEED PUMP
WALL-MOUNTED CONTROLLER/2-WAY VALVE

> Sensor in mechanical room
> Maintain constant design head
> No savings if sensor stops working

UP TO 65% ENERGY SAVINGS

VARIABLE SPEED PUMP/
WALL-MOUNTED CONTROLLER/2-WAY VALVE

> Inefficient induction motor operation
> Pump selected to design point
> Sensor located at remote load
> Maintain pressure at remote zone
> No savings if sensor stops working

UP TO 70%+ ENERGY SAVINGS

DESIGN ENVELOPE 3.1

> Pump speed control through Sensorless technology
> Detailed mapping of performance curve
> Smaller motor selection on 25% of projects
> Integrated controller — higher motor efficiency
> Flow measurement accuracy of ±5%
> Optimized selection against load profile

UP TO 80%+ ENERGY SAVINGS

DESIGN ENVELOPE GENERATION 5
(1–10 HP)

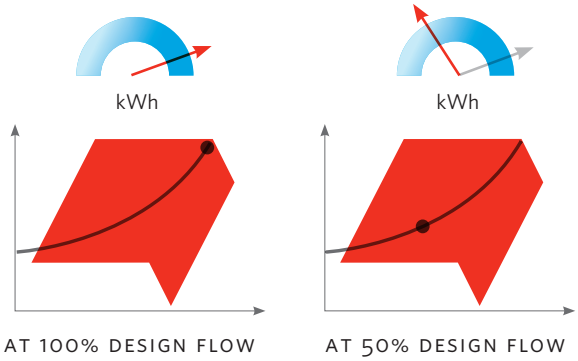
> Advanced digital controls
> Control tuned to specific motor
> IECM motor: IE5 efficiency rating
> Advanced hydraulics

NEXT LEVEL THINKING

> Multi-pump load sharing
> Best-efficiency staging (Parallel Sensorless Pump Control)
> Onboard diagnostics and trending
> Real-time performance management

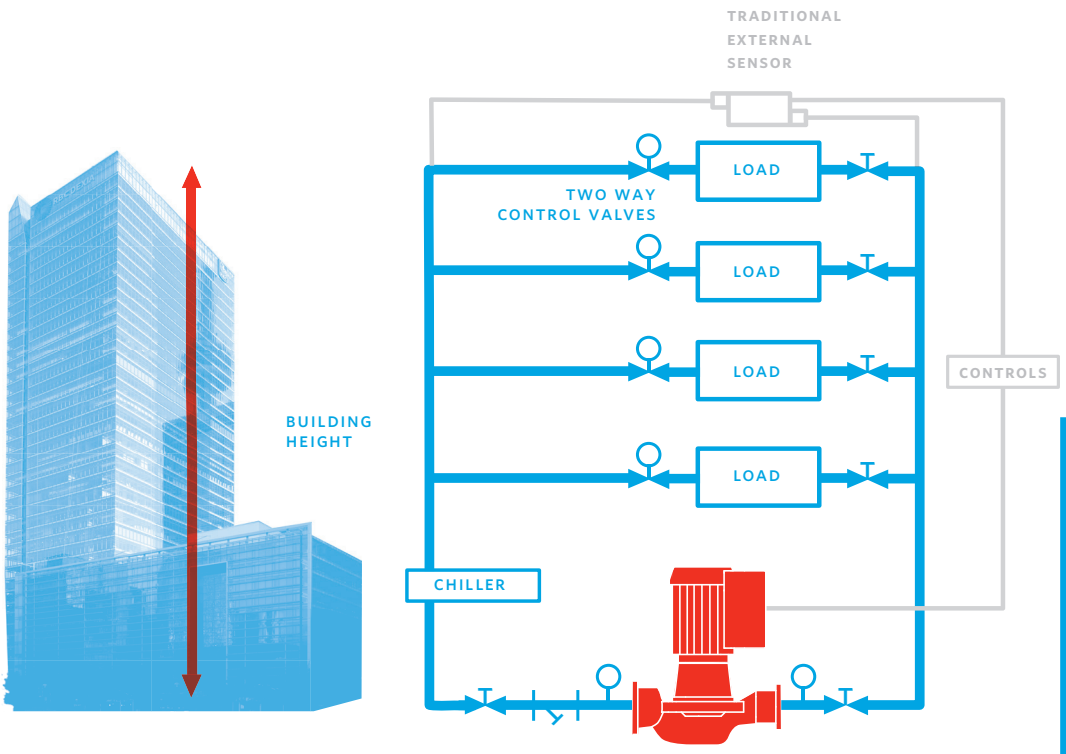
ENERGY SAVINGS

Armstrong Design Envelope variable speed technology fundamentally changes the operation of a pump within the larger HVAC system. The variable speed intelligence embedded in the Armstrong Design Envelope controller adjusts the pump operation to meet the immediate demand. The pump responds instantaneously and draws only the power required to meet that demand.



HOW IT

THE SENSOR WITHIN



Equipped with Sensorless technology, Design Envelope solutions do not require an external sensor to monitor and control the HVAC load.

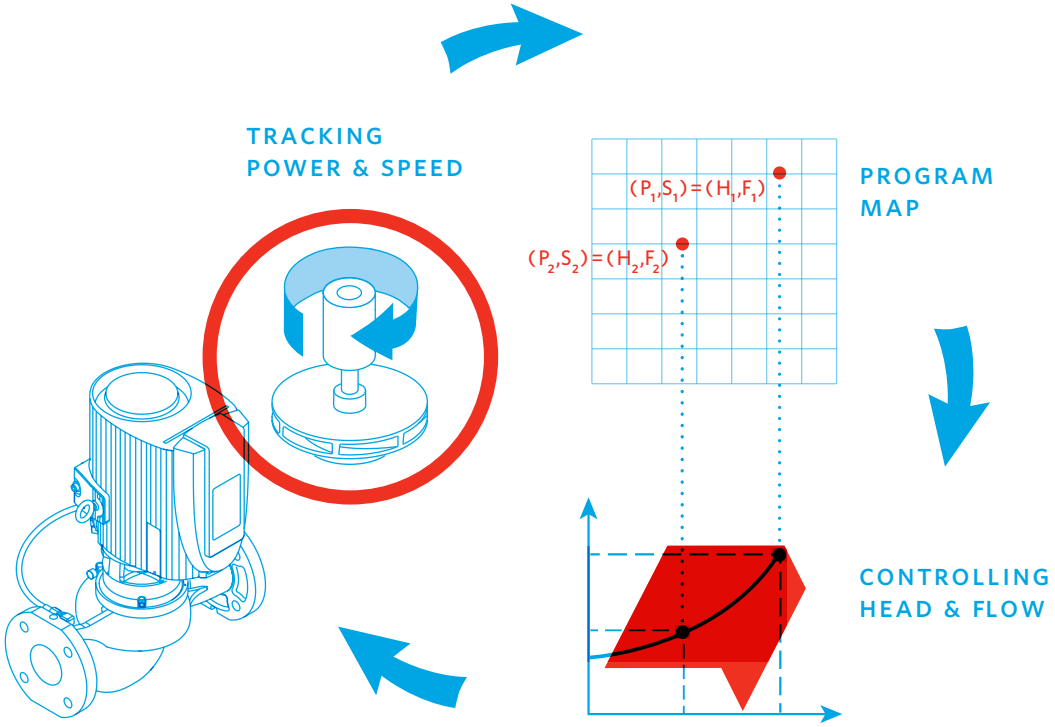
In a chilled water system, a building's temperature controls influence the local flow of control valves that modulate the flow to the cooling coils (load). As the control valves open for more chilled water flow, the differential pressure across the valve decreases.

The controller reacts to this change by increasing the pump speed. If the control valves close to reduce the chilled water flow, the differential pressure across the valve increases and the controller reduces the pump speed.

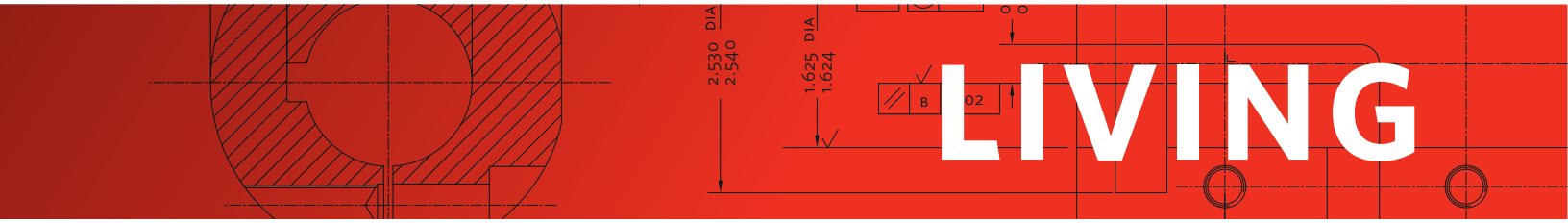
WORKS

MONITOR POWER & SPEED

CONTROL HEAD & FLOW



Equipped with Sensorless technology, a Design Envelope pump's performance characteristic curve (power draw and RPM) and operating curve are pre-programmed into the controller. During operation, the controller monitors the power and speed of the pump and establishes the hydraulic performance and position of the pump's head-flow condition relative to the system requirements. As the building's control valves open or close to regulate flow to the cooling coils and maintain building occupant comfort, the Sensorless controller automatically adjusts the pump speed to match the required system pressure and flow.



LIVING

LOWEST OPERATING COST

UP TO 80% SAVINGS COMPARED TO INDUSTRY STANDARD SOLUTIONS

- Lowest maintenance costs of any pumping configuration
- Extended high-efficiency performance

LOWEST INSTALLED COST

UP TO 65% SAVINGS COMPARED TO INDUSTRY STANDARD SOLUTIONS

- Smaller footprint
- Reduced overall weight
- Fewer connecting components
- Reduced labour cost
- Auto commissioning for immediate maximum efficiency

LOWEST RISK

- Maximum reliability
- Maximum flexibility
- Managed redundancy without duty/standby

EXTENDED PERFORMANCE

Pump Manager is a performance management service to help operators maintain optimized long-term efficiency.

- Early detection of changes in pump condition
- Notification of changes in equipment settings
- Insight into pump status, performance and efficiency
- Extended lifespan and optimum performance with Tango and dualArm configurations

Parallel Sensorless Pump Control (PSPC) is a technology that minimizes the energy costs of multi-pump installations using best efficiency staging.

Most multi-pump control systems stage pumps on the basis of capacity. The PSPC control logic draws on detailed mapping of pump efficiency curves to determine the best possible combination of pumps and operating speeds for any flow requirement.

When the PSPC calculates that a pump array would operate more efficiently with one more pump added to the current set of operating pumps, the control logic turns on one more pump and coordinates the operating speeds of all the operating pumps to share the load.

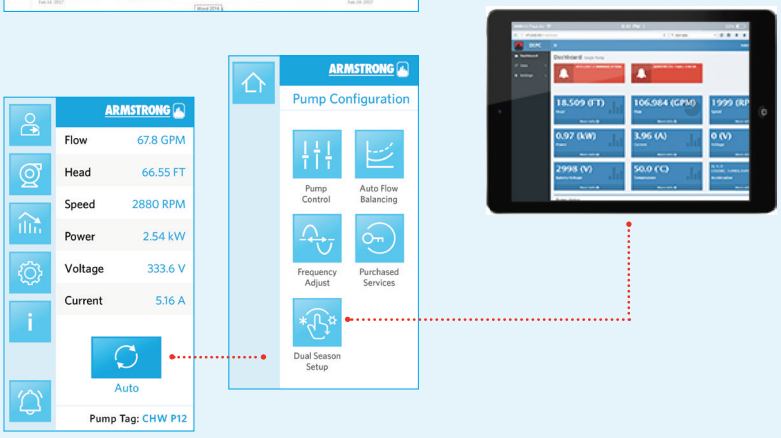
PERFORMANCE

Armstrong has re-invented and redesigned pumping solutions to include connectivity and performance management services. Design Envelope pumps deliver optimal lifetime efficiency through:

- **Expanded performance range and options**
- **One-touch auto-flow balancing**
- **Pump speed modulation based on an adjustable quadratic control curve for best part-load efficiency**
- **Flow measurement accuracy (+/- 5%)**
- **On-board data and diagnostics to provide performance information and notifications**

PERFORMANCE PACKAGES	FUNCTIONS INCLUDED
Sensorless Bundle (standard)	• Sensorless control • Flow readout • Constant flow • Constant pressure
Parallel Sensorless (standard on Tango and dualArm)	• Parallel Sensorless control
Energy Performance Bundle	• Auto-flow balancing • Maximum flow control
Protection Bundle	• Minimum flow control • Bypass valve control
Zone optimization	• Accept up to two dP sensor control signals
Dual-season setup	• Pre-set heating and cooling parameters for two-pipe systems

PUMP MANAGER



CONNECTIVITY

Built-in Wi-Fi capability supports remote control, real-time monitoring and management for lowest operating costs

Local and remote access from any smart device

Adaptive browser-compatible software and intuitive user interface

INDUSTRY-LEADING

DESIGN ENVELOPE

Design Envelope technology offers advanced HVAC performance management, the simplest and fastest commissioning and optimized lifetime performance through real-time insight and action.

HIGHEST
ENERGY EFFICIENCY

LOWEST
INSTALLED COST

LOWEST
OPERATING COST

LOWEST
ENVIRONMENTAL COST

LOWEST
PROJECT & OPERATING RISK

CAPABILITIES

Extended intelligence: integrated controller provides on-board diagnostics, trending, alerts, automatic flow-balancing and optional Parallel Sensorless pump control.

Advanced controls: colour touchpad with intuitive HMI and access to real-time performance and pump conditions.

Real-time connectivity: options include BACnet, BACnet IP, and Modbus. Built-in Wi-Fi and wired connectivity supports web-based control or local control from a handheld unit.

Armstrong intelligent motors: with integrated controls deliver IE5 levels of energy efficiency (on select models) and lowest energy consumption.

VALUE

BUILDING OWNERS

- Lowest operating costs over the life of the pumps
- Additional capacity provides future proofing against changing building loads
- Unmatched space savings, efficiency and redundancy with Tango and dualArm multi-pump configurations

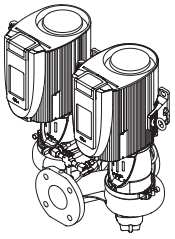
DESIGN ENGINEERS

- Broad range of performance leads to reduced iterations of pump selection and reduced performance risk
- UL STD 778 and CSA STD C22.2 No.108 certified

CONTRACTORS

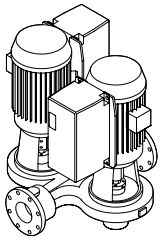
- Easy installation and commissioning
- Express models available for quick delivery
- Single source accountability for all aspects of an integrated pumping solution

DESIGN ENVELOPE
PUMP RANGE*



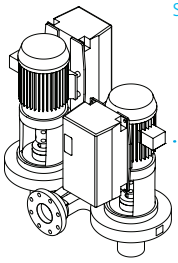
4322/4372
Split and close-coupled Tango

INDOOR	OUTDOOR
1 hp – 10 hp	1 – 10 hp
Express models available	



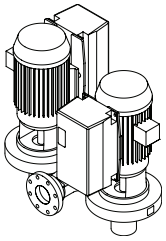
4302
Split-coupled dualArm

INDOOR	OUTDOOR
1 – 100 hp	1 – 100 hp



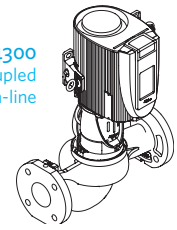
4312
Split-coupled Twin

INDOOR	OUTDOOR
1 – 40 hp	1 – 40 hp



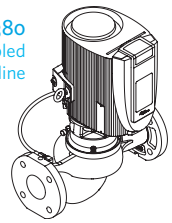
4392
Close-coupled Twin

INDOOR	OUTDOOR
1 – 7½ hp	1 – 7½ hp



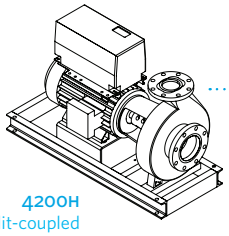
4300
Split-coupled vertical in-line

INDOOR	OUTDOOR
1 hp – 450 hp	1 – 125 hp
Standalone 450 hp – 1250 hp	
Express models available	



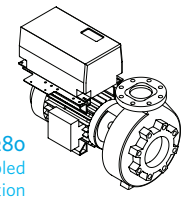
4380
Close-coupled vertical in-line

INDOOR	OUTDOOR
1 – 10 hp	1 – 10 hp
Express models available	



4200H
Split-coupled end suction

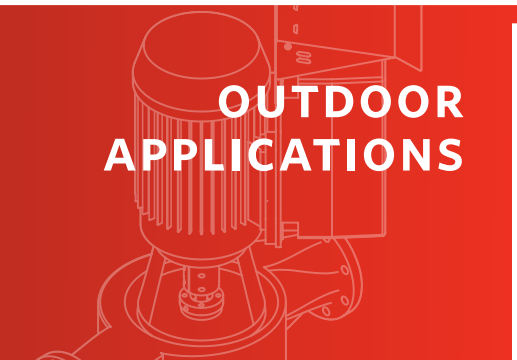
INDOOR	OUTDOOR
1 – 125 hp	N/A
Express models available	



4280
Close-coupled end suction

INDOOR	OUTDOOR
1 – 7½ hp	N/A
Express models available	

* Single phase available to 7½ hp / 5½ kW



OUTDOOR APPLICATIONS

- Rated for UL type 4X with TEFC motor standard.
- Epoxy coated controller electronics protect against condensation.
- Stainless steel backplate prevents corrosion between the backplate and the heat sink.
- Stainless steel overhead weather shield protects the keypad from UV rays, prevents overheating due to sun exposure, and prevents accumulation of ice on sensitive areas.

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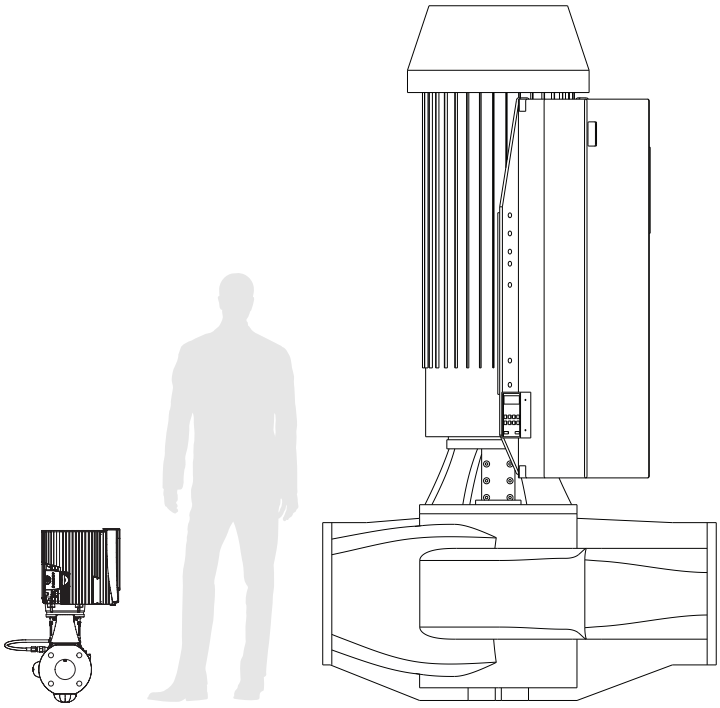

1 hp **450 hp**

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View your savings and ROI using real data from your installation. Ask your Armstrong representative.

MAKING ENERGY MAKE SENSE™