

## PumpSmart® PS220

Smart Control and Protection



# PumpSmart PS220

## PumpSmart®

The industry award-winning and patented pump control logic delivers real-time control and protection of your pumps while also providing valuable process insight. By protecting against pump failure due to process upsets, PumpSmart keeps your operation running longer and reduces unplanned repair activities and expense. By right-sizing your pumps to your system, we can reduce not only your energy consumption, but also wear & tear on your process systems.

ITT was an early adopter of variable speed pumping technology due to the inherent improvements that could be found in both efficiency and reliability of the pumping system. Leveraging electronic variable speed controllers allowed us to measure key parameters about the electric motor's performance and apply our unique expertise to create the PumpSmart Drive System. Functions unique to PumpSmart include calculating the flow and head of the pump without sensors, sensorless pump protection from process upset conditions, intelligent sleep and balancing load between multiple pumps.

### Process Control

- Sensorless Flow Control
- Multipump Control
- Smart Control
- Intelligent Sleep
- Cavitation Control

### Pump Diagnostics

- Sensorless Pump Protection
- Smart Flow
- % BEP Operation
- Smart Total Dynamic Head
- Flow Economy

## PumpSmart® PS220

PumpSmart PS220 provides the next level in intelligent pumping by using a standard variable frequency drive and directly embedding pump specific algorithms onto the drive. The PS220 drive is a microprocessor based Direct Torque Controlled (DTC) adjustable speed AC drive. Pump specific algorithms combined with the advantage of sophisticated high-performance control of AC motors make it the ultimate variable speed drive solution for any pumping application.



### 3-Year Reliability Assurance Program

Protect your Goulds pump with a PumpSmart product and we'll **GUARANTEE** it against failure from pump process upsets for up to 3 Years<sup>1</sup>...or the parts are on us.

Goulds Pumps and PumpSmart Control Solutions are proud to offer this innovative new program that protects against pump failure that commonly results from inadvertent dry-running or operation against a closed discharge valve. If your Goulds pump fails while a PumpSmart Control product is on the job, we will provide the pump and seal repair parts free of charge.

See your Goulds Pumps representative to get started today.

<sup>1</sup> Program starts 3 years from pump shipment.



-PumpSmart is used across a wide-range of industries-

# Sensorless Technology

## Smart Flow & Smart TDH

Using speed and torque data from the motor and modelling the pump performance curve, PumpSmart is able to calculate the flow and the total dynamic head generated by the pump without instruments.

Determining the flow of a centrifugal pump can be a challenging exercise without a flow meter. PumpSmart is able to capture real-time data such as speed, torque and power and use this information to calculate the flow of the pump.

Smart Flow requires only four pieces of standard price book performance curve data. A self-calibration function takes into account changes in mechanical losses and volumetric efficiency, and separates the true hydraulic load to calculate the actual pump flow.



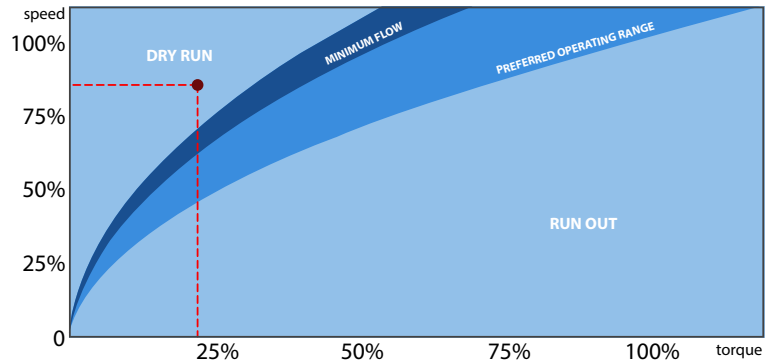
**SmartFlow PID Control** - PumpSmart allows controlling system flow in single pump or multi-pump systems without the need of an external flowmeter.

**SmartFlow Flow Totalizer** - Dial in a flow rate and let the PS220 do the rest. Run your batch operations to pump fixed volumes without using an external flowmeter.

**Flow Economy** - Flow Economy is a simple metric that defines how much fluid is moved per unit of energy. Similar to fuel economy of your car, Flow Economy defines how much flow (gpm or m<sup>3</sup>/h) can be moved with 1 kilowatt (kW) of power. Combined with Smart Flow, PumpSmart is able to calculate the Flow Economy of your pump allowing you to know what the true pump system efficiency is.

## Sensorless Pump Protection

With patented sensorless pump protection algorithms, the PS220 determines the operating point of the pump at any speed and provides critical diagnostic information such as operation in relation to best efficiency point and protection against upset conditions such as dry-run, dead-head, shut-off, minimum flow and run-out.



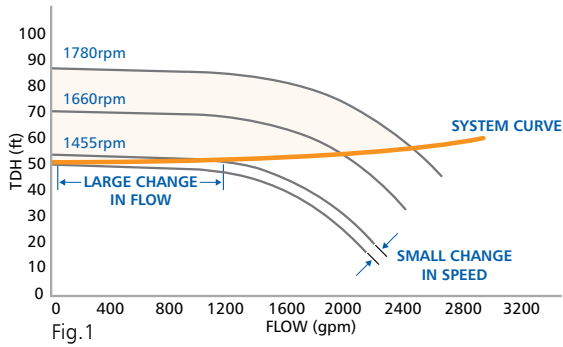
**Intelligent Sleep** - A standard variable speed drive enables pump sleep mode based on the combination of system demand and a single preset minimum speed. Dynamic system conditions where static heads change make this method ineffective. The PS220's intelligent sleep mode function provides true protection against no demand conditions regardless of the user defined minimum speed.

**Minimum Flow Bypass Control** - By leveraging SmartFlow, the PS220 can trigger a relay output to energize a valve which will open and close a bypass line. A minimum flow setpoint triggers the bypass valve to open and when the pump reaches a user defined safe flow output which is corrected for speed by the PS220, the relay output triggers the bypass valve to close.

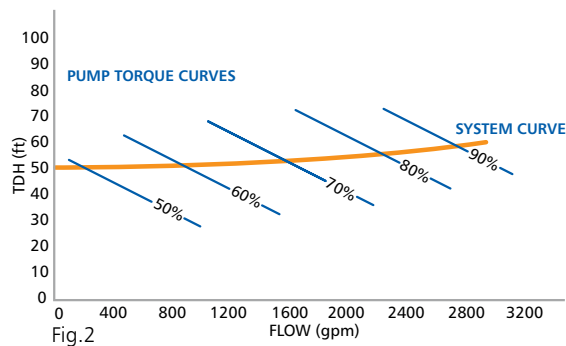
# Intelligent Single & Multi-pump Control

## Smart Torque Control

When changing the speed of a pump with a relatively flat head-capacity curve, a small speed change can result in a large swing in flow. This type of system can result in unstable flow, making control very difficult. (Fig.1)



Smart Control is able to increase and decrease pump flow by changing the pump torque rather than the pump speed. Controlling to pump torque can change a relatively flat pump performance curve into a steep, easy-to-control pump performance curve. (Fig.2)



## Multi-Pump Control

All too often, multi-pump systems end up running with all the pumps on, all the time. This situation leads to high vibrations, pressure buildup and excess energy consumption...to name a few. The PS220 runs only the pumps necessary to meet the system demand.

- Control up to a six-pump multi-pump system.
- Roaming master functionality allows for uninterrupted operation should any pump or drive become unavailable within the system.
- Balanced flow output between the operating pumps using Smart Torque Control functionality.
- Industry's first variable speed Sensorless Multi-pump Flow control solution.
- Selectable functions to limit the minimum or maximum allowable pumps to operate in a process.
- Switch leag lag status of pumps to maintain even wear between them based on runtime hours or number of Starts.
- Adjustable individual proof timers for staging and destaging pumps to reduce process fluctuations while bringing pumps online or taking them offline.

In summary, energy consumption is greatly reduced, and mean time between failure of the pumps and the surrounding system is vastly improved.



# Process Control & Protection

As standard PumpSmart systems come equipped with advanced process control features that help optimize your pumping system for maximum uptime, reliability and energy savings.

PumpSmart is pump-specific and was developed to protect the pump and optimize pump control. PumpSmart can be applied to any manufacturer's centrifugal or positive displacement pump.



Horizontal Centrifugal Pump



Between Bearing Centrifugal Pump



Submersible Pump



Vertical Centrifugal Pump



Twin Screw/Gear Pump



Progressive Cavity Pump

## Waste Water Functions

**Pump Clean** - The PS220 automatically detects and removes clogging substances from the pump impeller by monitoring the pump motor torque preventing damage from pump lockup.

**Pipe Clean** - This function allows flushing of the pipe system that helps with reducing sedimentation in the pipes resulting in lower wear on piping.

**Pipe Fill** - The PS220's pipe fill function allows gradual filling of a pipeline before normal process control operation.

**Snore** - The PS220 snore function overrides the stop level to empty a tank for the purpose of removing oil & grease and other floating debris from the water surface. This results in a cleaner sump with eliminating the need to pump down and clean the sump manually.



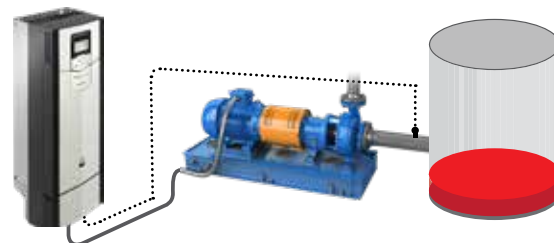
## Cavitation Control & Protection

Low suction pressure can lead to the onset of cavitation, resulting in reduced flow and lower pump efficiencies. Prolonged exposure can even result in eventual pump failure.

PumpSmart can monitor the suction conditions of your pump to protect against cavitation. Cavitation Control improves overall pump reliability in low Net Positive Suction Head (NPSH) services that routinely cause pump failure.

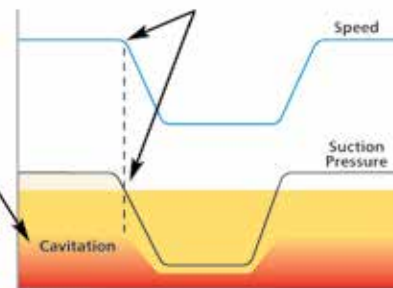
Typical Services:

- Evaporator
- Condensate
- Batch Transfer
- Unloading



As suction pressure drops to a critical level PumpSmart reacts by slowing down the pump.

Operating a pump with low suction pressure can result in the formation of cavitation. Reducing the pump speed can reduce the NPSH requirements of the pump which can help suppress the onset of cavitation.

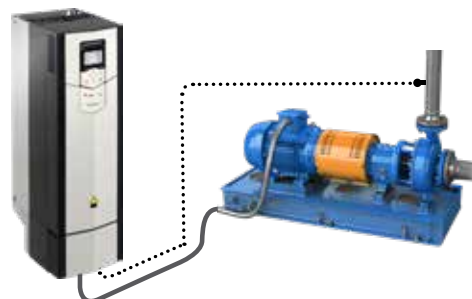


## Integrated Process Control

The PS220 offers automatic pump control by integrating the pump controller in the drive. No external controller is required, making PumpSmart a simple and cost-effective solution for your pumping needs.

Process Control Features

- Single Pump
- Cavitation Control
- Multipump
- PID Smart Flow



# Communications & Other Features

## Ease of Configuration

The PS220 Wizards guide you step by step to take a PS220 from factory defaults to any application specific setup, making it one of the industry's simplest variable speed drives to commission and configure.



## Bluetooth Connectivity

Using Bluetooth, the PS220 offers easy access to drive parameters and control using a bluetooth enabled smartphone or tablet.



## Drive PC Tools

Drive composer provides a built-in drive control panel allowing users to start, stop, and set the direction, speed, and torque reference values of the connected drive.

- View and set drive parameters
- Custom workspace
- Custom windows
- Save and download parameters
- Control the drive using the built-in control panel
- Connects via USB through ACP-AP panel network



## Flexible Connectivity to Plant Automation Systems

Fieldbus adapter modules enable communication and software. The PS220 is compatible with a wide range of fieldbus protocols. The plug-in fieldbus adapter module can easily be mounted inside the drive. Other benefits include reduced wiring costs when compared with traditional input/output connections. Fieldbus systems are also less complex than conventional systems, resulting in less overall maintenance. Adapters can be added to the drive at anytime.



## Safe torque off as standard

Safe torque off (STO) is used to prevent unexpected startup and in stopping-related functions, enabling safe machine maintenance and operation. With safe torque off activated, the drive will not provide a rotational field. This prevents the motor from generating torque on the shaft. This function corresponds to an uncontrolled stop in accordance with stop category 0 of EN 60204-1.



The easy to connect and configure safety functions module (FSO-12 and -21) offers a wide range of safety functions and a self diagnostic function.

## Removable memory unit

Stores all the software and parameter configurations in an easily replaceable and simple-to-install module. Situated on the control unit, the memory unit can easily be removed for maintenance, update or replacement purposes. This common type of memory unit is used throughout the PS220 series.



# Hardware Options

## Hardware Configurations

- Wall Mount Drives
- Ultra Low Harmonic Drives
- Flange Mount Options
- Cabinet Drives
- Regenerative Drives
- Drive Modules

## Main Features on All Drives

- Enclosure classes IP20, IP21, IP55
- Safe torque off (STO) as standard
- Coated boards as standard
- Controllable cooling fan
- EMC filter option
- du/dt filter option
- Built-in choke

### Wall Mount Units



Frames R1-R0  
0.75Kw - 250Kw  
(1HP - 350HP)

Frame Size	Height IP21 in/mm	Depth in/mm	Width in/mm	Weight lb/kg
R1	16 / 405	8.9 / 226	6.1 / 155	13.2 / 6
R2	16 / 405	9.8 / 249	6.1 / 155	17.6 / 8
R3	18.5 / 471	10.3 / 261	6.7 / 172	22 / 10
R4	22.6 / 573	10.8 / 274	8 / 203	40.8 / 18.5
R5	28.7 / 730	10.8 / 274	8 / 203	50.7 / 23
R6	28.6 / 726	14.1 / 357	9.8 / 251	99.2 / 45
R7	34.6 / 880	14.4 / 365	11.2 / 284	121.3 / 55
R8	37.9 / 963	15.2 / 386	11.8 / 300	154.3 / 70
R9	37.9 / 963	16.3 / 413	15 / 380	216 / 98

### Cabinet Drives



Frames R6-R8      Frames R9-R11      Frames n x R8i  
55Kw - 200Kw      200Kw - 500Kw      500Kw - 2800Kw  
(75HP - 200HP)      (250HP - 700HP)      (500HP - 3000HP)

Frame Size	Height IP22/42 in/mm	Height IP54 in/mm	Depth in/mm	Width in/mm	Weight lb/kg
R6	84.4 / 2145	91.2 / 2315	16.9 / 430	26.5 / 673	528 / 240
R7	84.4 / 2145	91.2 / 2315	16.9 / 430	26.5 / 673	550 / 250
R8	84.4 / 2145	91.2 / 2315	16.9 / 430	26.5 / 673	583 / 265
R9	84.4 / 2145	91.2 / 2315	32.7 / 830	27.5 / 698	825 / 375
R10	84.4 / 2145	91.2 / 2315	32.7 / 830	27.5 / 698	1169 / 530
R11	84.4 / 2145	91.2 / 2315	32.7 / 830	27.5 / 698	1279 / 580

## Additional Features for Cabinet Drives

- Cabinet light and heater option
- Marine construction option

Main Connection		Product Compliance CE, UL cUL 508A or cUL 508C CSA C22.2 NO. 14-10, C-Tick, RoHS ATEX-certified Safe Disconnection Function Low Voltage Directive 2006/95/EC Machinery Directive 2006/42/EC EMC Directive 2004/108/EC Quality assurance system ISO 9001 & Environmental system ISO 14001
Voltage Range	3-phase, $U_{N2} = 208$ to 240 V	
	3-phase, $U_{N3} = 380$ to 415 V	
	3-phase, $U_{N5} = 380$ to 500 V	
	3-phase, $U_{N7} = 525$ to 690 V	
Frequency	50/60 Hz $\pm$ 5%	
Motor Connection		
Voltage	0 to $U_{N2}$ $U_{N3}$ $U_{N5}$ $U_{N7}$	
Frequency	0 to +500 Hz	
Motor Control	Direct torque control	
		EMC according to EN 61800-3:2004 + A1:2012
		Categories C3 and C2 with internal option

## Engineered Options

Pre-engineered control panels for indoor, outdoor and water tight installations rated for NEMA 1 (IP21), NEMA 12 (IP54), NEMA 3R and NEMA 4/4X (IP66) environments.

- Simplex
- Duplex
- Triplex
- Quad



Packaged systems which include pumps, controls and piping providing a complete skid mounted solution.



Bucket Mounted options for easy installations into a motor control center.



Electrical Houses with HVAC, lighting and complete "turn-key" integration including customer specific options such as redundant PLC's, transformers & soft starts.





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