Submittal

Ref. #: SQFJP004848_3

Design Envelope Split-Coupled Horizontal Base-Mounted End Suction Pump with Parallel Sensorless Controller

Model: Series Design Envelope Sensorless 4200H 0413-020.0 with Service Kit

Project name:	CHA, Albany Terrace Apartments Renovation	**Representative:**	Josh Oswalt
Location:		**Phone number:**	
Date submitted:	10/11/2022 6:37 PM	**e-mail:**	Josh@MaddockIndustries.com
Engineer:	The Engineering Studio, Inc.	**Submitted by:**	Oswalt, Josh

Application design data

Tag number:	P-1, 2	Configuration:	Parallel
Service:	MAIN LOOP	Suction pressure:	0 ft
Location:	MECH RM	Fluid:	Non-Potable Fluid - Water
Qty:	2	Operating temperature:	60 °F
Total system flow:	1100 USgpm	Duty flow per pump:	550 USgpm
System head:	80 ft	Viscosity:	31 SSU
Environment:	Indoors	Specific gravity:	1.0000
Total dissolved solids:	0 ppm	Safety factor % flow:	0 %
Efficiency at Design:	77.88 %	Safety factor % head:	0 %
NPSHR:	3.28 ft	Absorbed Power/BHP:	28.54 hp
Min. maintained system pressure*:	32 ft	Impeller diameter:	10 in
PEIvl:	0.46575141	ERvl:	53.42485901
Standby qty:	0	Pump/motor run qty:	2
Outlet velocity:	13.86 ft/s		

*If minimum maintained system pressure is not known, default is 40% of design head.

Materials of construction

Construction:	Bronze Fitted	Impeller:	Bronze
Rating:	ANSI-125	Pump shaft:	416 Stainless Steel
Connections:	Inlet: 6in, Outlet: 4in	Flush line:	Braided Stainless Steel
Casing (volute):	Cast Iron	Casing gasket:	Confined Non-Asbestos Fiber

Mechanical seal data

Seal type:	Outside Balanced	Rotating face:	Resin Bonded Carbon
Manufacturer code:	C-SSC AB2	Stationary seat:	Sintered Silicon Carbide
Springs:	Stainless Steel	Secondary seal:	Viton
Rotating hardware:	Stainless Steel	Maximum total dissolved solids (TDS)****:	2000 PPM

Electrical data

Supplier:	Factory Choice	Insulation class:	Class F Insulation
Size:	20 hp	Motor type:	Inverter Duty
Frame size:	256TC	Efficiency:	NEMA Premium 12.12
Enclosure:	TEFC	Power supply:	460/3/60
Operating speed @ 100% flow:	1698 rpm	Operating speed @ 50% flow***:	1197 rpm

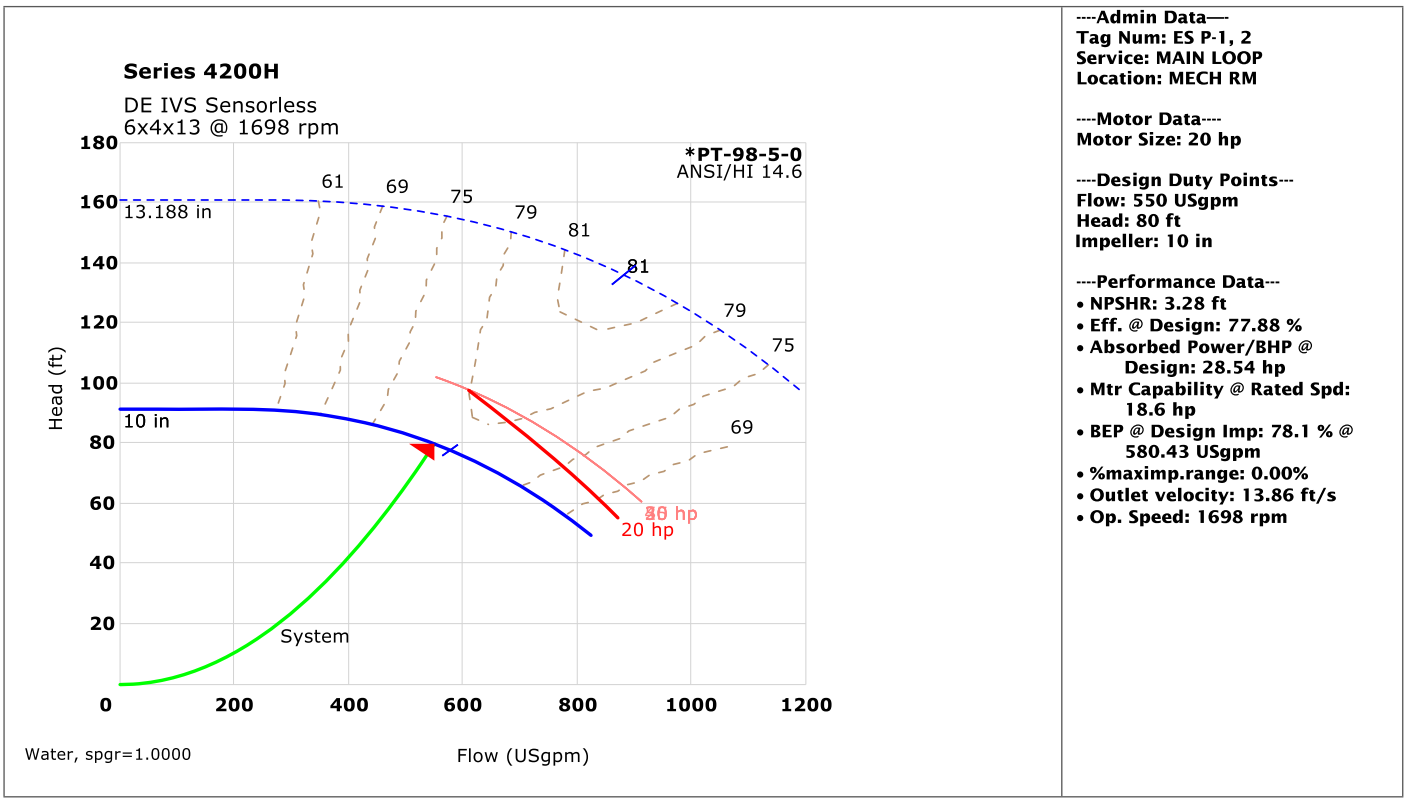
***Based on minimum pressure setting of 40% of design head.
****Note: Please ensure proper seal is selected by inputting Total Dissolved Solids (TDS) in PPM in ADEPT if water quality is poor at site. Also select Flush Line Filter or Cyclone Separator if there are other contaminants in the fluid

IVS controller data

Sensorless control:	Yes - Quadratic press control	Communication port:	RS 485
Communication protocol (*):	Default Field Reconfigurable	Analog inputs:	2 (current or voltage)
Enclosure:	UL Type 12/IP55	Analog outputs:	1 (current)
Fused disconnect switch:	None	Digital inputs:	4 (programmable)
Control orientation:	STD	Digital outputs:	2 (programmable)
Expansion card:	None	Cooling:	Fan cooled through back channel
Absorbed Power/BHP at 50% load/flow and 55% of design head:	7.85 hp	Ambient temperature:	14˚F to 113˚F (up to 3280 ft elevation)
Meets ASHRAE 90.1:	Yes	EMI/RFI control:	Integrated filter to meet EN61800-3
		Harmonic suppression:	Integrated DC link reactor**

(*): If Default - Field reconfigurable is selected, Default from factory will be BACnet MS/TP and can be reconfigured in the field.
** The IVS control is a low harmonic control with a built-in DC link reactor equivalent in performance to a 5% AC line reactor. This does not guarantee performance to any system wide harmonic specification or the costs to meet a system wide specification. If supplied with the system electrical details, Armstrong will run a computer simulation of the system wide harmonics. If system harmonic levels are exceeded, Armstrong can also recommend additional harmonic mitigation and the cost for such mitigation.

Performance curve

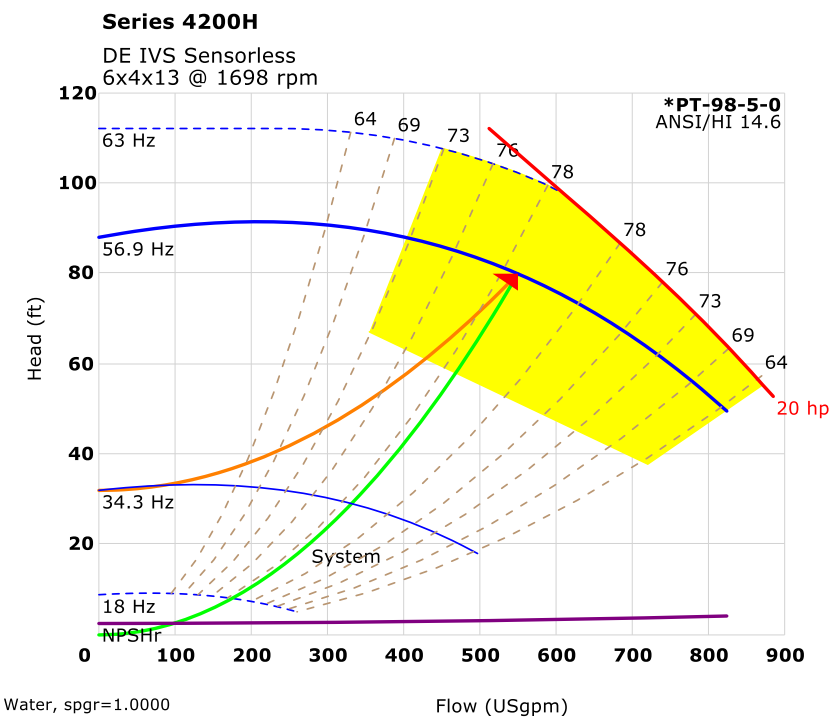


----Admin Data----
Tag Num: ES P-1, 2
Service: MAIN LOOP
Location: MECH RM

----Motor Data----
Motor Size: 20 hp

----Design Duty Points---
Flow: 550 USgpm
Head: 80 ft
Impeller: 10 in

----Performance Data---
- **NPSHR: 3.28 ft**
- **Eff. @ Design: 77.88 %**
- **Absorbed Power/BHP @ Design: 28.54 hp**
- **Mtr Capability @ Rated Spd: 18.6 hp**
- **BEP @ Design Imp: 78.1 % @ 580.43 USgpm**
- **%maximp.range: 0.00%**
- **Outlet velocity: 13.86 ft/s**
- **Op. Speed: 1698 rpm**



--Control Data—

1. Hmax @ 56.92 Hz:
NPSHR: 3.28 ft
Intersection Pt: 550 usgpm @ 80 ft
bhp=14.27 hp, eff=77.88 %%, %bepq=95 %%

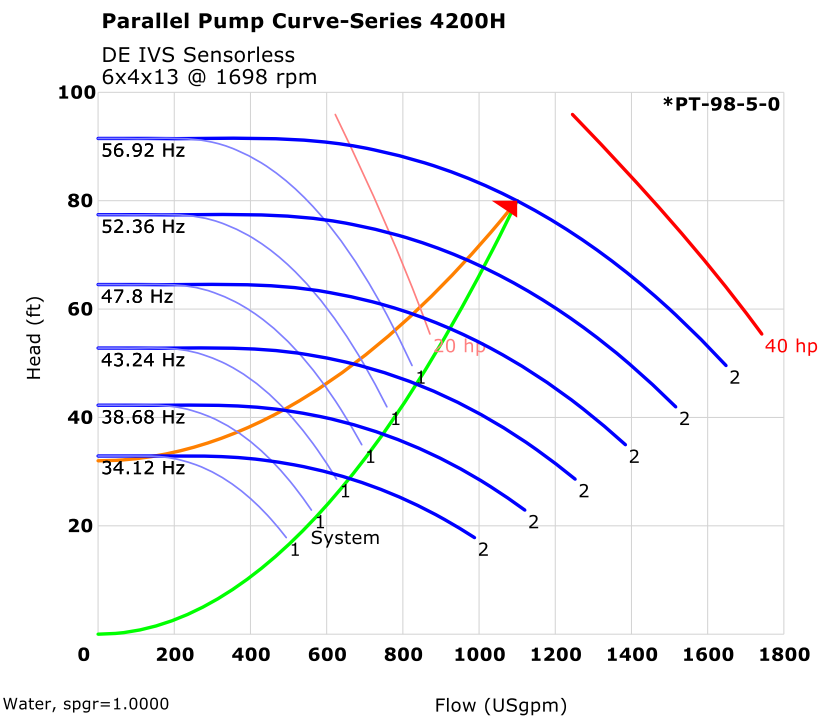
2. Control (QPC) @ 52.4 Hz:
NPSHR: 2.7 ft
Intersection Pt: 481.25 USgpm @ 68.75 ft
bhp=10.79 hp, eff=77.43%, %bepq=90.42%

3. Control (QPC) @ 47.87 Hz:
NPSHR: 2.17 ft
Intersection Pt: 407 USgpm @ 58.28 ft
bhp=7.84 hp, eff=76.44%, %bepq=84.14%

4. Control (QPC) @ 43.35 Hz:
NPSHR: 1.69 ft
Intersection Pt: 324.5 USgpm @ 48.71 ft
bhp=5.39 hp, eff=74.05%, %bepq=74.63%

5. Control (QPC) @ 38.83 Hz:
NPSHR: 1.27 ft
Intersection Pt: 225.5 USgpm @ 40.07 ft
bhp=3.38 hp, eff=67.44%, %bepq=58.17%

6. Hmin: 32 ft 34.31 Hz:
NPSHR: 0.92 ft
Intersection Pt: 0 USgpm @ 32 ft
(Head Q Min) Setting= 40% Hmax



----Admin Data----
Tag Num: ES P-1, 2
Service: MAIN LOOP
Location: MECH RM

----Motor Data----
Motor Size: 20 hp

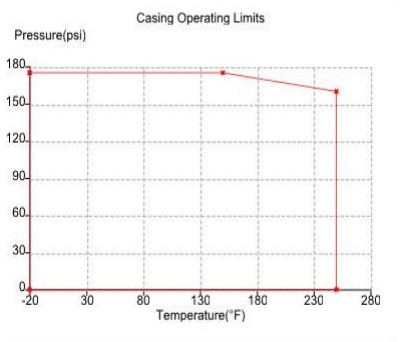
----System Design Data---
Piping: Parallel
Run Qty: 2
Fluid: Non-Potable Fluid
Sp.Gr: 1.0000 ,Vis= 31 SSU
Suction: 0 ft
Total Design Flow= 1100 USgpm
Total Design Head= 80 ft

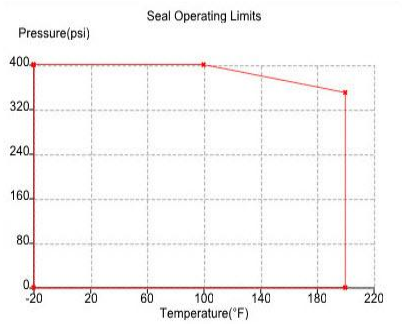
---Performance Data---
NPSHR : 3.28 ft
Flow: 1100 USgpm
Head: 80 ft
Eff: 77.88% ,BEP: 78.07%
%BEP (Flow): 95%
BHP = 28.54 hp
BHP/Pump= 14.27 hp
Total System Flow = 1100 USgpm

Design envelope pumping unit capability

Operating point	Flow	Head	Efficiency
Full capability at 100% design flow	550 USgpm	0 ft	0
Design point	550 USgpm	80 ft	77.88 %
50% average flow (with default load profile)	275 USgpm	44 ft	71.47 %

Operating limits (temperature - pressure)





Maximum pressure: 175 psi

Maximum temperature: 200 ˚F

All Pump casings are hydrostatically tested to requirements of ANSI/HI 14.6 standard.

Options

Sensorless Bundle:	Yes	DEPC Parallel Sensorless:	Yes*
Energy Performance Bundle:	No	Protection Bundle:	No
Dual Season Setup:	No	Zone Optimization Bundle:	No

*This feature is embedded into the controls of up to 4 pumps.

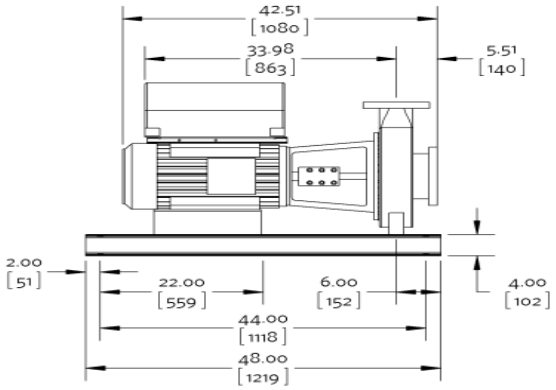
Cooling		Heating	
Q1:	N/A	Q2:	N/A
H1:	N/A	H2:	N/A
H1min:	N/A	H2min:	N/A
Maximum Flow:	N/A	Minimum Flow:	N/A

Optional Services

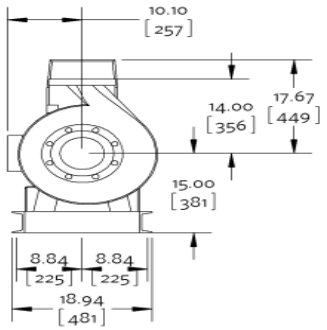
On-Site Pump Commissioning:	Cost not Included	Extended Warranty:	No
Pump Manager:	Yes	Include Spare Parts Qty:	0

Dimensional data (not for construction)

Side view



Top view



Inverter motor type: Inverter duty

Weight: 728 lb [330.22 kg], Units of measure: inches [millimeters]
- R = minimum lifting clearance required above motor
- Coupling guard and flush line (not shown) are supplied
- Tolerance of ± 0.125 inch (± 3 mm) should be used
- For certified dimensions, please contact your Armstrong representative
- Pump equipped with casing drain plug and ¼ inch NPT suction and discharge gauge ports

Connection details

Connection	Size	Rating	OD	Bolt quantity*	BCD	Bolt size
Inlet	6	ANSI-125	11.00	8	9.50	0.75
Outlet	4	ANSI-125	9.00	8	7.50	0.625

*Equally spaced straddling centreline

Flow Readout Accuracy

The Design Envelope model selected will provide flow reading on the pump touchscreen & digitally for the BMS. The flow readout will be factory tested to ensure ± 5% accuracy.

Special instructions

Reference Motor Specification AES 05007.
The program has defaulted to a NEMA Premium Efficiency motor supplied with NEMA MG-1 Part 31.4.4.2 insulation standards for inverter-fed polyphase motors.
UL STD 778 & CSA STD C22.2 no.108 certified

Selected options

Testing: No Test Certification Required
Seal Environment Accessories: None
Pre-Wired Control Bridge: No
Sensorless Bundle: Sensorless control
Constant flow control
Constant pressure control
Flow readout
Parallel Sensorless : Yes