



# Balanced Flow™ Constant Pressure Controller for 2 HP Submersible Pumps

**BF20**

## SPECIFICATIONS

- Controller will operate a 3-phase, 230V submersible motor up to:
    - Max. HP: 2
    - Min. HP: ½
    - Max. SFA: 8.1 amps.
    - 30 – 60 Hz speed.
    - 30 – 80 Hz optional.
  - Controller Ambient Temperature Range:
    - Min.: 0°F
    - Max.: 122°F (50°C)
  - Input Voltage: single-phase, 230 volt, two (2) wire grounded system.
  - Output Voltage: Variable frequency, 230 volt, three-phase power to the motor.
  - Pressure Sensor: Standard 0-100 psi sensor and 25' sensor cable are included with controller. Sensors with higher pressure ranges available.
  - BF20 Dimensions and Weight:
    - Height: 18.57"
    - Width: 9.88"
    - Depth: 5.29"
    - Weight: 18.3 lbs.
  - Packaged Dimensions and Weight:\*
    - Height: 21"
    - Width: 13"
    - Depth: 8"
    - Weight: 22.9 lbs.
- \* Includes carton plus sensor and sensor cable.

## FEATURES

- **Enclosure Rating:** NEMA 3R, IP22 rainproof, indoor/outdoor enclosure. Allows mounting the controller outdoors near the well to allow replacement of existing 2-wire subs without digging up the lawn to install new wiring.
- **Output Filter:** Output power is filtered to protect the motor from damaging voltage spikes.
- **Current Limit Selector Switch:** Rotary switch to select one of 10 possible current limit values: 2.9, 3.4, 3.8, 4.4, 4.7, 5.4, 5.9, 6.8, 8.1
- The controller may be used on smaller pump/motor combinations as long as the motor SFA is within the current limit range of the controller. Example: the BF20 can operate a 1.5 HP pump and motor with a 5.9 SFA.
- **Communications Port:** RS-232 serial port to facilitate software updates and future expansion.

■ **Constant Pressure:** The system provides consistent pressure even as system flow requirements vary.

■ Controller acts as a pump protection device and as a troubleshooting device.

■ Controller will operate between 190 and 260 volts, see note on low/high voltage effect on pump performance in IOM.

■ Standard pressure sensor cable is 25' long, optional lengths of 10', 50' and 100' are available.

■ Flashing LED lights indicate system faults by number of flashes:  
 2 = dry well / low pressure  
 3 = pressure sensor fault  
 4 = pump bound  
 5 = short circuit  
 6 = ground fault  
 7 = high controller temp.  
 8 = an open power lead

■ Integrated output motor filters protect the motor from voltage spikes even with up to 1,000' of wire between the controller and motor. They also limit electrical interference with devices such as portable telephones, radios, televisions and garage door openers.

■ Dual sized knockouts for installation flexibility.

■ **Cooling fan:** Allows operation in ambient temperatures up to 122°F. It runs for a few seconds on start-up and after that only when needed.

■ **Required Components:**

- BF20 Controller/Sensor
- Up to:
  - 2 HP Water End (pump)
  - 2 HP Motor, 3Ø, 230V
- Pressure Tank: See tank sizing chart.
- Wire: See wire sizing chart.

## AGENCY LISTINGS



Tested to UL 778, 508C and  
 CSA 22.2 108-M89, 14-95  
 Standards By Canadian  
 Standards Association  
 File #LR38549

**MOTOR SFA, CIRCUIT BREAKER SIZING, GENERATOR SIZING**

Motor HP	3 Phase Motor SFA (Controller Output)		Circuit Breaker or Dual Element Time Delay Fuse Size (Controller Input)		240 VAC Generator Size (VA)	
			1 PH			
	200V	230V	200V	230V	1 PH	3 PH
½	3.4	2.9	15	15	2200	
¾	4.4	3.8	15	15	2900	
1	5.4	4.7	15	15	3500	
1½	6.8	5.9	20	20	4400	
2	–	8.1	30	20	6100	

**Wire Sizing – Service Entrance to Controller**

Controller Input	Motor HP	Copper Wire Size 75°C Insulation Exposed to a Maximum of 50°C (122°F) Ambient Temperature												
		14	12	10	8	6	4	3	2	1	1/0	2/0	3/0	4/0
230V 1 PH	½	366	583	925	1336	2107	3345	4175	5267	6637	8364	10555	13291	16756
	¾	279	445	706	1020	1608	2552	3186	4019	5065	6383	8055	10143	12788
	1	226	360	571	824	1300	2064	2576	3250	4095	5161	6513	8201	10339
	1½	0	286	455	657	1036	1644	2052	2589	3262	4111	5188	6533	8236
	2	0	0	331*	478	754	1197	1495	1886	2376	2995	3779	4659	5999
	3	0	0	246*	355*	561	890	1111	1401	1766	2225	2808	3536	4458

\* Using 90°C copper wire

**Wire Sizing – Controller to Motor**

Controller Input	Motor HP	Copper Wire Size 75°C Insulation Exposed to a Maximum of 50°C (122°F) Ambient Temperature												
		14	12	10	8	6	4	3	2	1	1/0	2/0	3/0	4/0
230V 3 PH	½	905	1442	2290	3306	5213	8276	10331	13032	16422	20696	26118	32887	41461
	¾	690	1100	1748	2523	3978	6316	7884	9945	12533	15795	19932	35098	31641
	1	558	890	1413	2040	3216	5106	6375	8041	10133	12770	16115	20292	25582
	1½	445	709	1126	1625	2562	4068	5078	6406	8072	10173	12838	16165	20379
	2	324	516	820	1184	1866	2963	3699	4666	5879	7410	9351	11774	14844
	3	241	384	609	880	1387	2202	2749	33467	4369	5506	6949	8750	11031
200V 3 PH	½	772	1230	1953	2820	4446	7059	8812	11115	14007	17653	22277	28051	35364
	¾	596	950	1509	2179	3436	5455	6809	8589	10824	13641	17214	21675	27327
	1	486	774	1230	1775	2799	4444	5548	6999	8819	11115	14026	17661	22266
	1½	386	615	977	1410	2223	3529	4406	5558	7003	8826	11139	14025	17682
	2	282	450	714	1031	1625	2581	3222	4064	5121	6454	8144	10255	12929
	3	210	335	531	767	1209	1920	2397	3023	3810	4802	6059	7630	9619

As they become available, 30 – 60 Hz variable speed range curves will be added to our website, [www.goulds.com](http://www.goulds.com) in the Residential Water Section under Balanced Flow. Printed range curve books will be available by request from the Literature Distribution Center – by phone (315-255-3378), fax (315-253-7408) or email ([wtdldc@itt.com](mailto:wtdldc@itt.com)). The curves will cover all models/series of 4" pumps between 5 and 80 GPM.

For published Selection Charts, please see the standard pump product bulletins.

Our new SPAIX pump sizing software, coming late in 2005 will have the capability to create and print variable speed submersible pump curves.

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## TANK SIZING RECOMMENDATIONS

- The diaphragm style pressure tank pre-set should be 20 psi below the system operating pressure.  
Ex. For a 50 psi system the tank pressure should be set at 30 psi.
- Total Tank Volume, not drawdown volume, is used to select the proper tank size. The total tank volume should be 20% of the pump maximum flow. Ex. A 100 gpm pump requires a 20 gallon tank or a V60. A 50 gpm pump requires a minimum 10 gallon tank, a V25 at 8.2 gallons may be too small so we would recommend a V45 at 13.9 gallons. These sizing recommendations will prevent objectionable pressure drops on start-up and provide smooth operation for your BF system.

Maximum Pump GPM	Recommended Tanks		
	Total Volume	Order No.	or Order No.
10	2	V6P	TP6P
23	4.5	V15P	TP15P
41	8.2	V25P	TP25P
70	13.9	V45	TP45
100	19.9	V60	TP60
130	25.9	V80	TP80
160	31.8	V100	TP100
225	45.2	V140	TP140
325	65.1	V200	TP200
418	83.5	V250	TP250
425	84.9	V260	TP260
580	115.9	V350	TP350

## HOW TO MAKE A RANGE CURVE

- Performance multipliers – use these multipliers with points from a 60 Hz, 3450 RPM standard curve, to create a minimum performance 30 Hz curve. Since the controller will never let the pump operate outside of the selected speed range and will prevent motor overloading a range curve for these systems is neither required or necessary.

Variable Speed Performance Multipliers				
RPM	Hz	Flow	TDH	HP
3450	60	1	1	1
2875	50	0.83	0.69	0.57
2300	40	0.667	0.444	0.296
1725	30	0.5	0.25	0.125

Take 4 or more points from a 3450 curve and use the multipliers to make a 30 Hz curve. Example: Using 5 points from a 3450 RPM, 60 Hz 25GS30 curve determine the 30 Hz operation points.

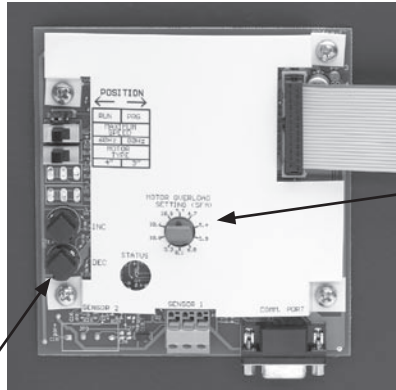
	GPM	30 Hz Mult.	=	30 Hz GPM		TDH	30 Hz Mult.	=	30 Hz TDH
Point 1	0	.5	=	0	Point 1	462	.25	=	116
Point 2	10	.5	=	5	Point 2	440	.25	=	110
Point 3	20	.5	=	10	Point 3	370	.25	=	93
Point 4	30	.5	=	15	Point 4	232	.25	=	58
Point 5	33	.5	=	16.5	Point 5	162	.25	=	41

On the 60 Hz curve, plot the new points: 0 at 116', 5 GPM at 110', 10 GPM at 93', 15 GPM at 58' and 16.5 GPM at 41'. Connecting the dots will create a 30 Hz or lower range curve. The controller will always operate the pump somewhere between the upper and lower curves depending on water depth and required flow.

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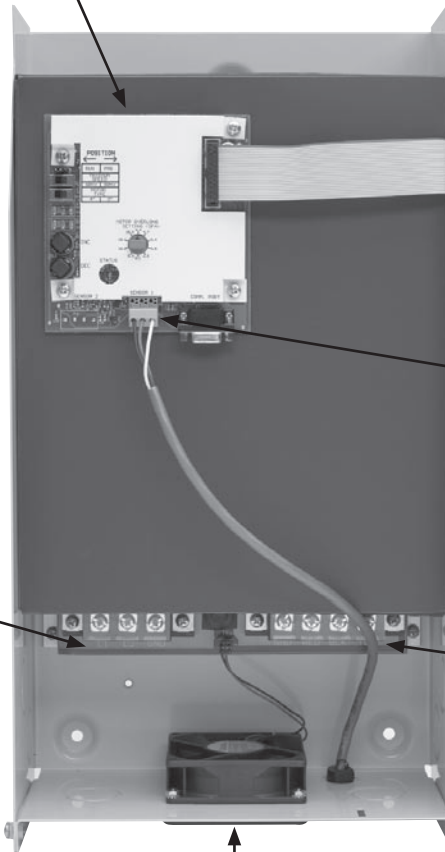
**BF20**

**USER INTERFACE BOARD**



OVERLOAD SETTING DIAL

PRESSURE ADJUSTMENT  
• INCREASE  
• DECREASE



SENSOR CABLE CONNECTION

INCOMING  
1Ø POWER  
(L1, L2, GRD)

PUMP POWER CONNECTIONS  
(GRD, RED, BLACK, YELLOW)

COOLING FAN

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