

# Sidewinder Pumps, Inc.

## Timer/Controller



### 1. BASIC DESCRIPTION:

- 1.1. Sidewinder's Timer/Controller was designed to work with our solar based chemical injection system. Operating and setting the timer is simple via a single toggle switch, and two push-button switches. A large 3-digit LED display is provided for easy viewing during setup. A green indicator light is also provided, which illuminates anytime power is available at the MOTOR+ connection. The timer/controller is rated for motors up to 10 amps. ***Higher amperage will require the addition of an external relay!***
- 1.2. The timer/controller can be programmed to inject as little as one stroke per minute, and up to 60 strokes per minute, providing for metered, continuous dosing, or for more batch type dosing.
- 1.3. Other features include:
  - 1.3.1. Temperature based pump activation.
    - 1.3.1.1. With the addition of a temperature probe plugged into the provided RS232 port, the Timer/Controller will automatically cause the pump to run when temperatures drop below a user set low temperature, and turn back off when the temperatures rise to a user set high temperature.
    - 1.3.2. 24 hour recall – The last 24 hours of dispensing protocol are stored in the unit and are retrievable by the user.
  - 1.3.3. SCADA
    - 1.3.3.1. An RS485 port is provided for communication to/from the Timer/Controller. *Note: SCADA requires the purchase of additional software.*
- 1.4. ***NOTE: While this timer/controller does allow for a wide range of pump output rates, it is critical that each application be evaluated for correct battery and solar panel sizing to insure proper power availability and performance.***

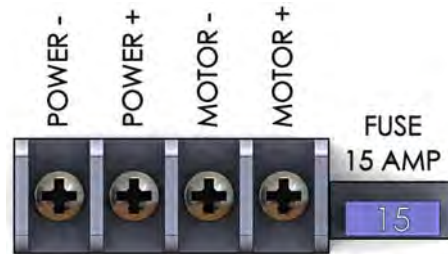
## 2. CONNECTIONS:

**2.1. Before making any connections, be sure that the toggle switch is set to the center, or “OFF” position.**



### 2.2. MAIN POWER AND FEED CONNECTIONS:

**2.2.1.** Screw type terminal connections are provided for incoming feed from the 12/24VDC battery system, and for connection to a 12/24VDC motor. A 15 amp, automotive type fuse is provided for protection of the timer. Connections are clearly labeled as shown below. *Note: Any time power is connected to the timer, it will go through a quick self-test, and the LED display will illuminate briefly.*



### 2.3. TEMPERATURE PROBE & RS485 COMM PORT

- 2.3.1.** The three pin connector to the left of the LED display is provided for a temperature probe. *Use of this feature is optional.*
- 2.3.2.** The four pin connector to the right of the LED display is a communication port. *Use of this feature is optional.*
- 2.3.3.** The 3-pin and/or 4-pin connections must be fully inserted to work properly. They will make a “click” sound when fully inserted. They are locking connectors, and the tang on the connector must be depressed prior to removing it from the jack.



### 3. GENERAL OPERATIONAL INSTRUCTIONS:

- 3.1. To set the timer, and access its various functions, change the toggle switch to the “SET” position.



- 3.2. The “MODE” button is used to access various functions such as cycles per minute “CYC”, high Fahrenheit “HiF”, low Fahrenheit “LoF”, high Celsius “HiC”, low Celsius “LoC”, and manual pump run “Pr”. Each press of the “MODE” button cycles to the next function. The selected function will appear in the LED display. Press the “MODE” button at any time to see which function is currently selected.
- 3.3. The “SELECT VALUE” button is used to change settings, or toggle the value associated with a particular function chosen by the “MODE” button. Each press of the “SELECT VALUE” button will advance the setting until the settings available to that “MODE” are exhausted. At that point, the setting loops back to the initially displayed value. Pressing and holding the “SELECT VALUE” button will advance the numbers more quickly. Press the “SELECT VALUE” button at any time to see the current setting.
- 3.4. Normal Dosing – The timer/controller is factory set to a run time of 2 seconds and 5 cycles per minute. “CYC” (described in detail later in this manual) allows for 1 – 60 cycles per minute, as set by the user.
- 3.4.1. With a 2 second run time each cycle per minute will produce:
- 3.4.1.1. 1/4” Plunger – approximately 0.10 QPH or 2.4 QPD
  - 3.4.1.2. 3/8” Plunger – approximately 0.24 QPH or 5.5 QPD
  - 3.4.1.3. 1/2” Plunger – approximately 0.41 QPH or 9.8 QPD
- 3.4.2. At maximum flow, or 30 cycles per minute, the 2 second run time will produce:
- 3.4.2.1. 1/4” Plunger – approximately 3.06 QPH or 73.3 QPD
  - 3.4.2.2. 3/8” Plunger – approximately 6.88 QPH or 164.6 QPD
  - 3.4.2.3. 1/2” Plunger – approximately 12.22 QPH or 293.2 QPD
  - 3.4.2.4. See Tables 1.1 - 1.3 on sheet 7, 8, and 9 for a chart with all possible combinations calculated for you.
- 3.4.3. *Sidewinder Pumps recommends not operating your system beyond the parameters for which your system was designed. If you are experiencing recurring low voltage issues or battery problems, contact Sidewinder Pumps to confirm the proper design application of your system. Major contributors to early battery discharge are excessive discharge pressure on the pump, and/or excessive run/cycle times. Sidewinder Pumps recommends a maximum runtime per day of 40%, which is indicated on Tables 1.1 – 1.3.*
- 3.4.4. *All flow rates calculated and per tables, are approximate, and Sidewinder Pumps recommends the use of pump calibration gauges to determine actual flow rates.*

## 4. DETAILED OPERATIONAL INSTRUCTIONS:

4.1. This section contains the operational commands. With the toggle switch in the “SET” position (as shown in 3.1 above), press the “MODE” button until the desired function is displayed on the LED readout. Change settings within that “mode” by pressing the “SELECT VALUE” button. The LED readout will display your changed setting. Each press of the “SELECT VALUE” button advances the setting. If you pass the desired setting, simply keep pressing the “SELECT VALUE” button until you reach the desired setting again.

*See 4.1.1. - 4.1.4. for a detailed explanation of each feature.*

4.1.1. “CYC” – Cycles per Minute. Indicates how many times per minute the pump will run. The factory default is five cycles per minute. A chart is provided showing the approximate quarts per day dispensed by varying the number of run time / cycle ratio.



*See Table 1.1 on page 8 for 1/4” Plunger values.*

*See Table 1.2 on page 9 for 3/8” Plunger values.*

*See Table 1.3 on page 10 for 1/2” Plunger values.*

4.1.1.1. **ALTERNATE DOSING:** You may opt to output larger doses, with fewer cycles per minute. This is accomplished by changing the standard two second run time to larger values, or longer run times. Available settings are from 0.5 seconds to 10.0 seconds. *(See Tables 1.1 - 1.3 on pages 8- 10. The factory recommended range is shaded.)*

4.1.1.2. Set the toggle switch to “OFF”.

4.1.1.3. While simultaneously holding down both the “MODE” button and the “SELECT VALUE” button, change the toggle switch to the “SET” position.



4.1.1.4. Release “MODE” and “SELECT VALUE”. The LED will show “rUn”.

4.1.1.5. Press the “SELECT VALUE” button to cycle through and achieve the desired run time per cycle. Possible values range from 0.5 seconds to 10.0 seconds.

4.1.1.6. Set the toggle switch to “OFF”. This saves the new run time.

**NOTE:** “CYC” or cycles per minute will automatically reset to a corresponding factory default as the run time is changed. Possible values for “CYC” vary according to the set value of run time (in 4.1.1.6) and vary from 6 to 60, to insure equal division into a one minute window of operation. Reset the run and cycle times as necessary for desired pump dispense rate.

## 4.1.2. OPTIONAL TEMPERATURE PROBE

**4.1.2.1. “LoF” (Low Fahrenheit) or “LoC” (Low Centigrade)** – When the optional temperature probe is correctly plugged into the timer/controller and the temperature falls below the value set in “LoF” or “LoC”, the unit will begin to pump. *Note: Setting either “LoF” or “LoC” will cause a corresponding change to the other setting. It is not necessary to set both.*

4.1.2.1.1. With the toggle switch in the “SET” position, press “MODE” until “LoF” or “LoC” is displayed.

4.1.2.1.2. Press “SELECT VALUE” until the desired temperature is displayed.

4.1.2.1.3. Turn the toggle back to “OFF”, to save the setting.

**4.1.2.2. “HiF” (High Fahrenheit) or “HiC” (High Centigrade)** – Sets the temperature at which the timer ceases pump operation. *Note: Setting either “HiF” or “HiC” will cause a corresponding change to the other setting. It is not necessary to set both.*

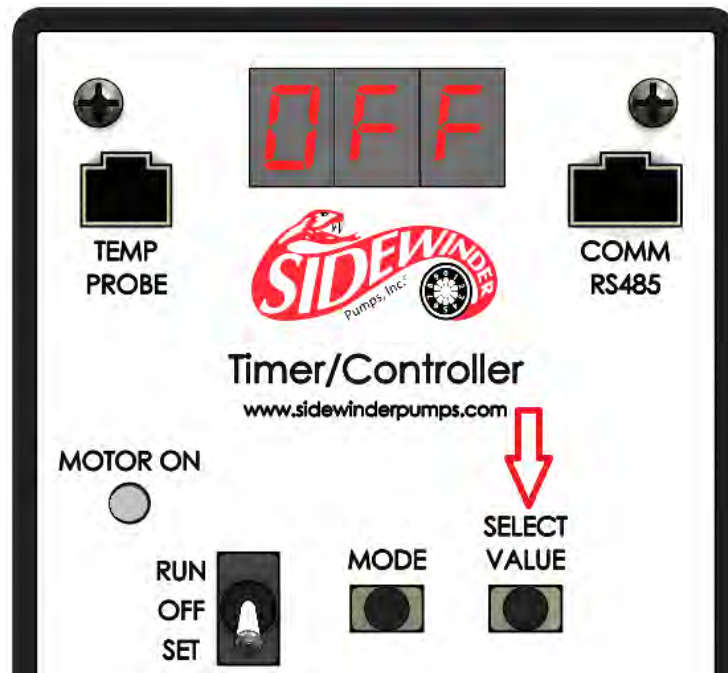
4.1.2.2.1. With the toggle switch in the “SET” position, press “MODE” until “HiF” or “HiC” is displayed.

4.1.2.2.2. Press “SELECT VALUE” until the desired temperature at which the unit will stop pumping is reached. **NOTE: if you set this lower than the setting you set in 4.2.1, “LoF” and “LoC” will automatically default back to their lowest setting, and you will have to set “LoF” or “LoC” again.**

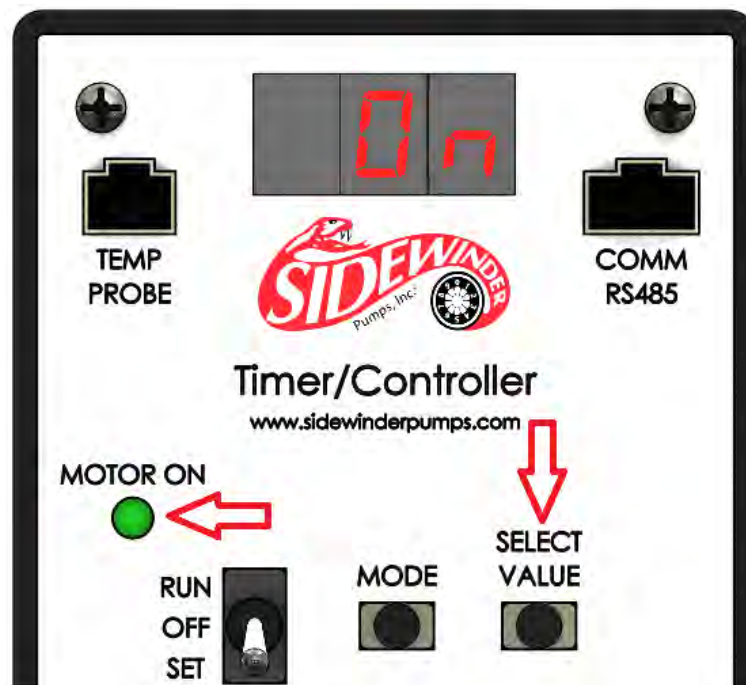
**4.1.3. “Pr” Manual Pump Run Mode** - While in this mode the “SELECT VALUE” pushbutton becomes a manual run button. (momentary operation)



- 4.1.3.1. With “Pr” displayed, press the “SELECT VALUE” button to enable this mode. “OFF” will be displayed.



- 4.1.3.2. Pressing the “SELECT VALUE” button again will turn the pump on, while simultaneously displaying “On”. Releasing the “SELECT VALUE” button will turn the pump off and display “Off”. This feature may be used any time manual operation of the pump is necessary. The green indicator light labeled “MOTOR ON” illuminates each time the pump is activated.





**4.1.4. “Id” Identifier:** Used to set the address of the unit when using SCADA controls. Any address from 1 – 277 can be selected.



## 5. OTHER FEATURES

**5.1. Dispensing History** – While the toggle switch is in the “RUN” position you can monitor the amount dispensed by simply pressing the “MODE” button. A number will appear which represents the percentage of run time in the last 24 hours. For example if the number 10.0 appears, then the timer ran for a total of 2.4 hours in the last 24 hours or 10% of the time. If “OFF” appears, then the battery was too low and no product was dispensed.

**5.2. Automatic Battery Monitoring-** The timer will turn off when battery voltage drops to 10.5 volts. This keeps the battery from being completely discharged and possibly damaged. At 10.5 volts the system will go into sleep mode and the pump will not function until the battery is recharged to the factory default setting of 13.0 volts, or is replaced with a charged battery. Turning the timer off and back on, will interrupt this protection, and allow operation at partially charged levels. However, operation will cease again when voltage falls to 10.5 volts.

**NOTE:** *The reset voltage can be changed by moving the toggle switch to “SET”, pressing the “MODE” button until the display shows “rP” and then pressing the “SELECT VALUE” button until the desired reset voltage shows on the LED display. Values 11.0 to 13.0 in 0.5 volt increments can be achieved. Sidewinder strongly recommends using the factory default setting of 13.0 volts to improve the life of your battery.*

**5.3. DIN Mounting** – The timer can be easily mounted to a standard DIN rail using our DIN rail mounting clip. Simply position on the bottom of the rail, compress the clip then attach to the top of the rail. The clip is spring loaded to attach easily without tools and hold securely in place.





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**TABLE 1.1: APPROXIMATE QUARTS PER DAY AT THE VARIOUS RUN TIMES AND CYCLES/MINUTE USING A SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)**

1/4" PLUNGER - SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)	SHADED AREAS ARE OUTSIDE SIDEWINDER RECOMMENDED OPERATIONAL RANGE (CALL FACTORY)	RUN TIME (SEC)	"CYC" (NUMBER OF CYCLES / MINUTE) NOTE: SIDEWINDER RECOMMENDS THE MAXIMUM FLOW RATE & RUN TIME BE NO MORE THAN 40% OF MAXIMUM CAPACITY																													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
			0.5	0.6	1.2	1.8	2.4	3.1	3.7	4.3	4.9	5.5	6.1	6.7	7.3	7.9	8.6	9.2	9.8	10.4	11.0	11.6	12.2	12.8	13.4	14.1	14.7	15.3	15.9	16.5	17.1	17.7
1.0	1.2	2.4	3.7	4.9	6.1	7.3	8.6	9.8	11.0	12.2	13.4	14.7	15.9	17.1	18.3	19.5	20.8	22.0	23.2	24.4	25.7	26.9	28.1	29.3	30.5	31.8	33.0	34.2	35.4	36.7		
1.5	1.8	3.7	5.5	7.3	9.2	11.0	12.8	14.7	16.5	18.3	20.2	22.0	23.8	25.7	27.5	29.3	31.2	33.0	34.8	36.7	38.5	40.3	42.2	44.0	45.8	47.7	49.5	51.3	53.1	55.0		
2.0	2.4	4.9	7.3	9.8	12.2	14.7	17.1	19.5	22.0	24.4	26.9	29.3	31.8	34.2	36.7	39.1	41.5	44.0	46.4	48.9	51.3	53.8	56.2	58.6	61.1	63.5	66.0	68.4	70.9	73.3		
2.5	3.1	6.1	9.2	12.2	15.3	18.3	21.4	24.4	27.5	30.5	33.6	36.7	39.7	42.8	45.8	48.9	51.9	55.0	58.0	61.1	64.1	67.2	70.3	73.3	N/A	N/A	N/A	N/A	N/A	N/A		
3.0	3.7	7.3	11.0	14.7	18.3	22.0	25.7	29.3	33.0	36.7	40.3	44.0	47.7	51.3	55.0	58.6	62.3	66.0	69.6	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
3.5	4.3	8.6	12.8	17.1	21.4	25.7	29.9	34.2	38.5	42.8	47.0	51.3	55.6	59.9	64.1	68.4	72.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
4.0	4.9	9.8	14.7	19.5	24.4	29.3	34.2	39.1	44.0	48.9	53.8	58.6	63.5	68.4	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
4.5	5.5	11.0	16.5	22.0	27.5	33.0	38.5	44.0	49.5	55.0	60.5	66.0	71.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
5.0	6.1	12.2	18.3	24.4	30.5	36.7	42.8	48.9	55.0	61.1	67.2	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
5.5	6.7	13.4	20.2	26.9	33.6	40.3	47.0	53.8	60.5	67.2	73.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
6.0	7.3	14.7	22.0	29.3	36.7	44.0	51.3	58.6	66.0	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
6.5	7.9	15.9	23.8	31.8	39.7	47.7	55.6	63.5	71.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
7.0	8.6	17.1	25.7	34.2	42.8	51.3	59.9	68.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
7.5	9.2	18.3	27.5	36.7	45.8	55.0	64.1	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
8.0	9.8	19.5	29.3	39.1	48.9	58.6	68.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
8.5	10.4	20.8	31.2	41.5	51.9	62.3	72.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
9.0	11.0	22.0	33.0	44.0	55.0	66.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
9.5	11.6	23.2	34.8	46.4	58.0	69.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
10.0	12.2	24.4	36.7	48.9	61.1	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
RUN TIME (SEC)		CYC (NUMBER OF CYCLES / MINUTE)																														
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
0.5	18.9	19.5	20.2	20.8	21.4	22.0	22.6	23.2	23.8	24.4	25.0	25.7	26.3	26.9	27.5	28.1	28.7	29.3	29.9	30.5	31.2	31.8	32.4	33.0	33.6	34.2	34.8	35.4	36.0	36.7		
1.0	37.9	39.1	40.3	41.5	42.8	44.0	45.2	46.4	47.7	48.9	50.1	51.3	52.5	53.8	55.0	56.2	57.4	58.6	59.9	61.1	62.3	63.5	64.8	66.0	67.2	68.4	69.6	70.9	72.1	73.3		
1.5	56.8	58.6	60.5	62.3	64.1	66.0	67.8	69.6	71.5	73.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
2.0	CONTINUED FROM ABOVE .... "CYC" VALUES 31 AND GREATER ARE NOT AVAILABLE WITH RUN TIMES 2.0 SECONDS AND GREATER																															
<b>MAXIMUM PRESSURE - LP = 2000 PSI, HP = 5000PSI</b>																																





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**TABLE 1.2: APPROXIMATE QUARTS PER DAY AT THE VARIOUS RUN TIMES AND CYCLES/MINUTE USING A SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)**

3/8" PLUNGER - SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)	SHADED AREAS ARE OUTSIDE SIDEWINDER RECOMMENDED OPERATIONAL RANGE (CALL FACTORY)	RUN TIME (SEC)	"CYC" (NUMBER OF CYCLES / MINUTE) NOTE: SIDEWINDER RECOMMENDS THE MAXIMUM FLOW RATE & RUN TIME BE NO MORE THAN 40% OF MAXIMUM CAPACITY																													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
			0.5	1.4	2.7	4.1	5.5	6.9	8.2	9.6	11.0	12.3	13.7	15.1	16.5	17.8	19.2	20.6	21.9	23.3	24.7	26.1	27.4	28.8	30.2	31.5	32.9	34.3	35.7	37.0	38.4	39.8
1.0	2.7	5.5	8.2	11.0	13.7	16.5	19.2	21.9	24.7	27.4	30.2	32.9	35.7	38.4	41.1	43.9	46.6	49.4	52.1	54.9	57.6	60.3	63.1	65.8	68.6	71.3	74.1	76.8	79.5	82.3		
1.5	4.1	8.2	12.3	16.5	20.6	24.7	28.8	32.9	37.0	41.1	45.3	49.4	53.5	57.6	61.7	65.8	69.9	74.1	78.2	82.3	86.4	90.5	94.6	98.7	102.9	107.0	111.1	115.2	119.3	123.4		
2.0	5.5	11.0	16.5	21.9	27.4	32.9	38.4	43.9	49.4	54.9	60.3	65.8	71.3	76.8	82.3	87.8	93.3	98.7	104.2	109.7	115.2	120.7	126.2	131.7	137.1	142.6	148.1	153.6	159.1	164.6		
2.5	6.9	13.7	20.6	27.4	34.3	41.1	48.0	54.9	61.7	68.6	75.4	82.3	89.1	96.0	102.9	109.7	116.6	123.4	130.3	137.1	144.0	150.9	157.7	164.6	N/A	N/A	N/A	N/A	N/A	N/A		
3.0	8.2	16.5	24.7	32.9	41.1	49.4	57.6	65.8	74.1	82.3	90.5	98.7	107.0	115.2	123.4	131.7	139.9	148.1	156.3	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
3.5	9.6	19.2	28.8	38.4	48.0	57.6	67.2	76.8	86.4	96.0	105.6	115.2	124.8	134.4	144.0	153.6	163.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
4.0	11.0	21.9	32.9	43.9	54.9	65.8	76.8	87.8	98.7	109.7	120.7	131.7	142.6	153.6	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
4.5	12.3	24.7	37.0	49.4	61.7	74.1	86.4	98.7	111.1	123.4	135.8	148.1	160.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
5.0	13.7	27.4	41.1	54.9	68.6	82.3	96.0	109.7	123.4	137.1	150.9	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
5.5	15.1	30.2	45.3	60.3	75.4	90.5	105.6	120.7	135.8	150.9	165.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
6.0	16.5	32.9	49.4	65.8	82.3	98.7	115.2	131.7	148.1	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
6.5	17.8	35.7	53.5	71.3	89.1	107.0	124.8	142.6	160.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
7.0	19.2	38.4	57.6	76.8	96.0	115.2	134.4	153.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
7.5	20.6	41.1	61.7	82.3	102.9	123.4	144.0	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
8.0	21.9	43.9	65.8	87.8	109.7	131.7	153.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
8.5	23.3	46.6	69.9	93.3	116.6	139.9	163.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
9.0	24.7	49.4	74.1	98.7	123.4	148.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
9.5	26.1	52.1	78.2	104.2	130.3	156.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
10.0	27.4	54.9	82.3	109.7	137.1	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		CYC (NUMBER OF CYCLES / MINUTE)																														
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
0.5	42.5	43.9	45.3	46.6	48.0	49.4	50.7	52.1	53.5	54.9	56.2	57.6	59.0	60.3	61.7	63.1	64.5	65.8	67.2	68.6	69.9	71.3	72.7	74.1	75.4	76.8	78.2	79.5	80.9	82.3		
1.0	85.0	87.8	90.5	93.3	96.0	98.7	101.5	104.2	107.0	109.7	112.5	115.2	117.9	120.7	123.4	126.2	128.9	131.7	134.4	137.1	139.9	142.6	145.4	148.1	150.9	153.6	156.3	159.1	161.8	164.6		
1.5	127.5	131.7	135.8	139.9	144.0	148.1	152.2	156.3	160.5	164.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
2.0	CONTINUED FROM ABOVE .... "CYC" VALUES 31 AND GREATER ARE NOT AVAILABLE WITH RUN TIMES 2.0 SECONDS AND GREATER																															
<b>MAXIMUM PRESSURE - LP = 850 PSI, HP = 2500PSI</b>																																



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**TABLE 1.3: APPROXIMATE QUARTS PER DAY AT THE VARIOUS RUN TIMES AND CYCLES/MINUTE USING A SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)**

1/2" PLUNGER - SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)	RUN TIME (SEC)	"CYC" (NUMBER OF CYCLES / MINUTE) NOTE: SIDEWINDER RECOMMENDS THE MAXIMUM FLOW RATE & RUN TIME BE NO MORE THAN 40% OF MAXIMUM CAPACITY																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		0.5	2.4	4.9	7.3	9.8	12.2	14.7	17.1	19.5	22.0	24.4	26.9	29.3	31.8	34.2	36.7	39.1	41.5	44.0	46.4	48.9	51.3	53.8	56.2	58.6	61.1	63.5	66.0	68.4	70.9
1.0	4.9	9.8	14.7	19.5	24.4	29.3	34.2	39.1	44.0	48.9	53.8	58.6	63.5	68.4	73.3	78.2	83.1	88.0	92.9	97.7	102.6	107.5	112.4	117.3	122.2	127.1	132.0	136.8	141.7	146.6	
1.5	7.3	14.7	22.0	29.3	36.7	44.0	51.3	58.6	66.0	73.3	80.6	88.0	95.3	102.6	110.0	117.3	124.6	132.0	139.3	146.6	153.9	161.3	168.6	175.9	183.3	190.6	197.9	205.3	212.6	219.9	
2.0	9.8	19.5	29.3	39.1	48.9	58.6	68.4	78.2	88.0	97.7	107.5	117.3	127.1	136.8	146.6	156.4	166.2	175.9	185.7	195.5	205.3	215.0	224.8	234.6	244.4	254.1	263.9	273.7	283.5	293.2	
2.5	12.2	24.4	36.7	48.9	61.1	73.3	85.5	97.7	110.0	122.2	134.4	146.6	158.8	171.1	183.3	195.5	207.7	219.9	232.1	244.4	256.6	268.8	281.0	293.2	N/A	N/A	N/A	N/A	N/A	N/A	
3.0	14.7	29.3	44.0	58.6	73.3	88.0	102.6	117.3	132.0	146.6	161.3	175.9	190.6	205.3	219.9	234.6	249.3	263.9	278.6	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3.5	17.1	34.2	51.3	68.4	85.5	102.6	119.7	136.8	153.9	171.1	188.2	205.3	222.4	239.5	256.6	273.7	290.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4.0	19.5	39.1	58.6	78.2	97.7	117.3	136.8	156.4	175.9	195.5	215.0	234.6	254.1	273.7	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4.5	22.0	44.0	66.0	88.0	110.0	132.0	153.9	175.9	197.9	219.9	241.9	263.9	285.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5.0	24.4	48.9	73.3	97.7	122.2	146.6	171.1	195.5	219.9	244.4	268.8	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5.5	26.9	53.8	80.6	107.5	134.4	161.3	188.2	215.0	241.9	268.8	295.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6.0	29.3	58.6	88.0	117.3	146.6	175.9	205.3	234.6	263.9	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6.5	31.8	63.5	95.3	127.1	158.8	190.6	222.4	254.1	285.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7.0	34.2	68.4	102.6	136.8	171.1	205.3	239.5	273.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7.5	36.7	73.3	110.0	146.6	183.3	219.9	256.6	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8.0	39.1	78.2	117.3	156.4	195.5	234.6	273.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8.5	41.5	83.1	124.6	166.2	207.7	249.3	290.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9.0	44.0	88.0	132.0	175.9	219.9	263.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
9.5	46.4	92.9	139.3	185.7	232.1	278.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10.0	48.9	97.7	146.6	195.5	244.4	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1/2" PLUNGER - SIMPLEX PUMP (MULTIPLY X 2 FOR DUPLEX OPERATION)	RUN TIME (SEC)	CYC (NUMBER OF CYCLES / MINUTE)																													
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	0.5	75.8	78.2	80.6	83.1	85.5	88.0	90.4	92.9	95.3	97.7	100.2	102.6	105.1	107.5	110.0	112.4	114.9	117.3	119.7	122.2	124.6	127.1	129.5	132.0	134.4	136.8	139.3	141.7	144.2	146.6
	1.0	151.5	156.4	161.3	166.2	171.1	175.9	180.8	185.7	190.6	195.5	200.4	205.3	210.2	215.0	219.9	224.8	229.7	234.6	239.5	244.4	249.3	254.1	259.0	263.9	268.8	273.7	278.6	283.5	288.3	293.2
	1.5	227.3	234.6	241.9	249.3	256.6	263.9	271.2	278.6	285.9	293.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	2.0	CONTINUED FROM ABOVE .... "CYC" VALUES 31 AND GREATER ARE NOT AVAILABLE WITH RUN TIMES 2.0 SECONDS AND GREATER																													
<b>MAXIMUM PRESSURE - LP = 500 PSI, HP = 1250PSI</b>																															

# NOTES



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Manufacturer recommends not using poly tubing, copper tubing, or seamed tubing as a discharge line. Manufacturer recommends using 316 SS seamless tubing rated for maximum discharge pressure of the specific pump model being used. Use of incorrect material may result in discharge line failure leading to personal injury, death, and/or compromise to intended injection objectives. Good engineering practices and the manufacturer recommend placement of properly sized pressure relief valve on pump discharge line for safety purposes