Leading the world
in chemical injection pump technology

MANUAL

INSTALLATION, OPERATION & MAINTENANCE

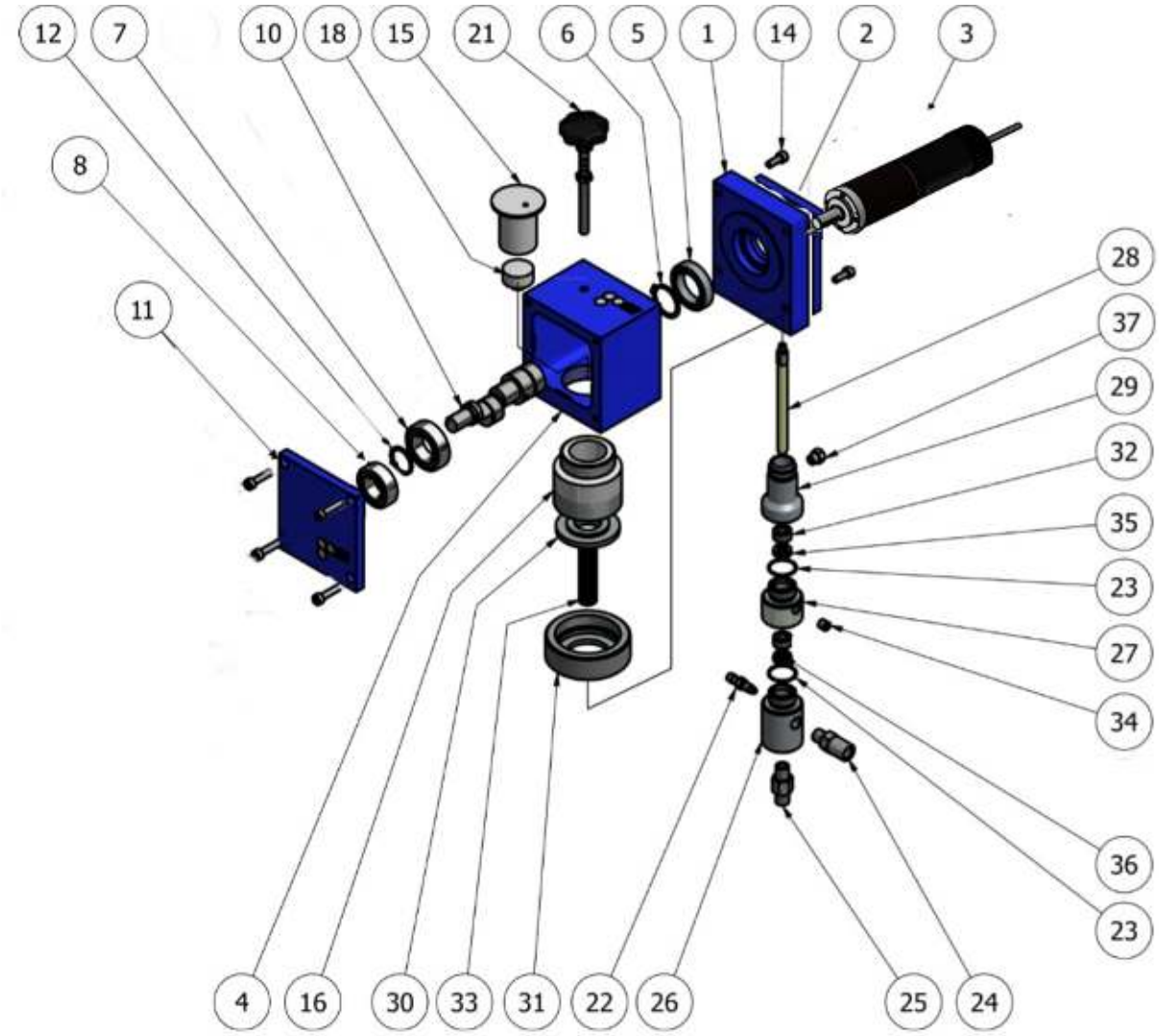
SiA LEGACY SERIES CHEMICAL INJECTION PUMP

SIA-24-L15-CR-TCFM-150113-HIEC

Solar Injection
AUSTRALIA

ILLUSTRATION & PARTS LIST:

SIA-24-L15-CR-TCFM-150113-HIEC



Item #	Item Code	Description	Qty
1	40044-1	MOTOR END PLATE	1
2	40019-1	HIEC ADAPTOR PLATE	1
3	40085-24-150113-HIEC	24VDC 150W IECEx MOTOR/GEARBOX 113:1	1
4	40042	DRIVE CASE	1
5	40023	BEARING	1
6	40029	CIRCLIP	1
7	40024	BEARING	1
8	40032	BEARING	1
10	40045-8	CRANKSHAFT 8MM	1
11	40047	BEARING END PLATE	1
12	40033	CIRCLIP	1
14	40011-16	SCREW	4
15	40043	PLUNGER ADAPTOR UPPER	1
16	40046-L	PUMP ADAPTOR	1
18	40008-L	PLUNGER ADAPTOR LOWER	1
21	40084	STROKE LENGTH ASSEMBLY	1

Item #	Item Code	Description	Qty
22	40064	BLEED VALVE	1
23	40067-021	ORING VITON	2
24	40063-1	CHECK VALVE OUTLET	1
25*	40214-V	CHECK VALVE INLET	1
26	40059-1	PUMP BODY LOWER	1
27	40060	PUMP BODY MIDDLE	1
28	40066-4	PLUNGER CERAMIC 0.125"	1
29	40061	PUMP BODY UPPER	1
30	40057	FLANGE	1
31	40058	PUMP CONNECTION RING	1
32			2
33	40056-2	RETURN SPRING	1
34	40068	LUBE PLUG	1
35	40065-4-7	MAIN SEAL TCFM SUIT 0.125"	1
36			1
37	40089	VENT SCREEN - S/S	1

* Item # 25, previous item code 40062 has been superseded by item code 40130, shown above

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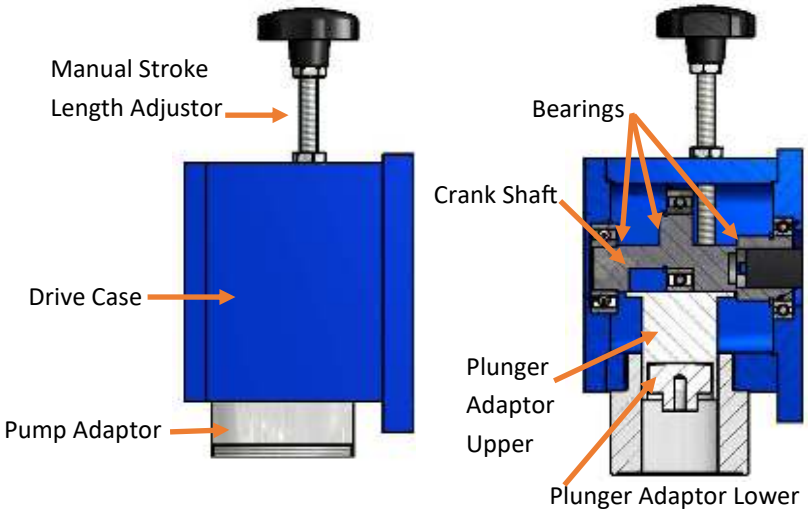
SECTION 1 GENERAL DESCRIPTION

1.0 Drive Assembly

Drive Assembly Main Components

- Crank Shaft
- Main Bearings
- Cam Bearing
- Drive Case
- Pump Adaptor
- Plunger Adaptor (Upper, Lower)
- Manual Stroke Length Adjustor (Micrometer option available)



1.01 How the Drive Works

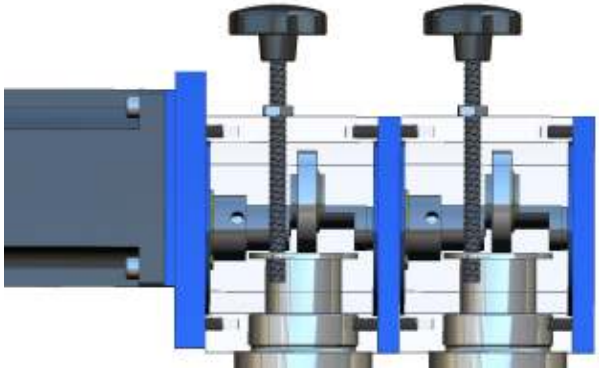
The SiA Drive Assembly has been designed to give a reliable means of driving a reciprocating chemical injection pump by means of electricity in general, and solar energy in particular.

The standard motive force of the Drive Assembly consists of a PMDC, BLDC or A.C. motor driving through an integrally mounted gearbox. This gear-motor mounts directly to the drive case's flange mount and the drive shaft connects to the drive crank shaft via a keyed connection. The crank shaft is supported either end by oversized sealed bearings so as to eliminate all overhung loads. This greatly increases the life of the gear-motor's gearbox.

By applying a rotary force to the end of the crank shaft, the force is transmitted to the pump by way of the plunger adaptor, which is directly acting on the pump plunger.

Multiplex

The SiA Multiplex works as described above, with the added benefit of allowing combined or multiple separate chemical flows in the 1 chemical injection pump.



Multiplex 2 Configuration

Liquid Ends can be configured as required:

Simplex—1 liquid end per drive case with Stroke Adjustment

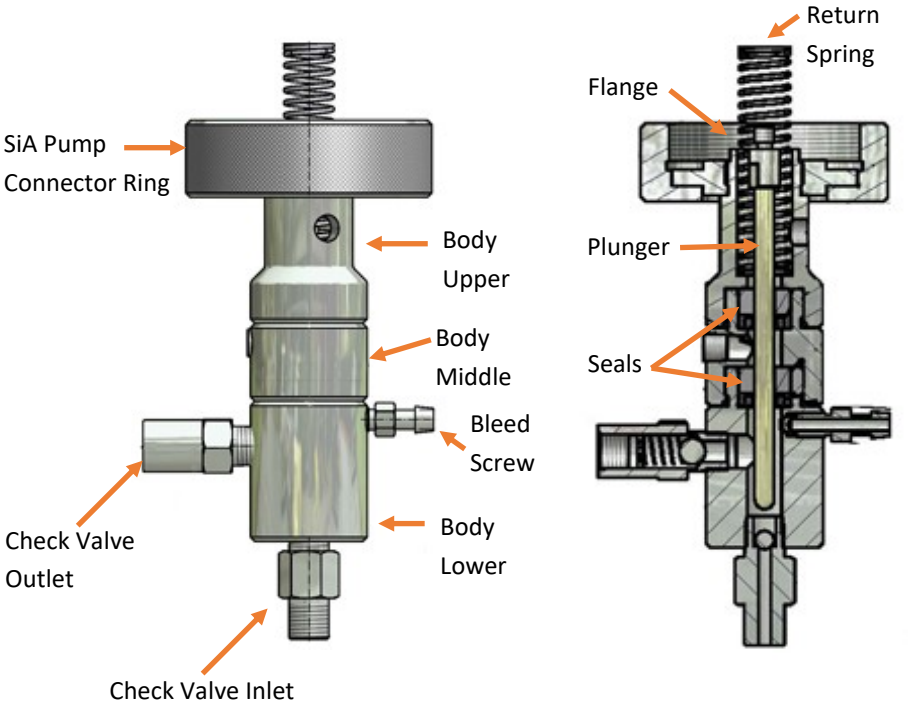
Duplex—2 liquid ends per drive case without Stroke Adjustment

Duplex Configuration

1.1 Liquid End

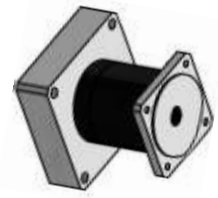
Liquid End Main Components

- Body (Lower, Middle, Upper)
- Plunger
- Seals
- Return Spring
- Bleed Screw
- Check Valves (Inlet, Outlet)
- Flange
- SiA Pump Connector Ring



1.2 Motor & Gearbox

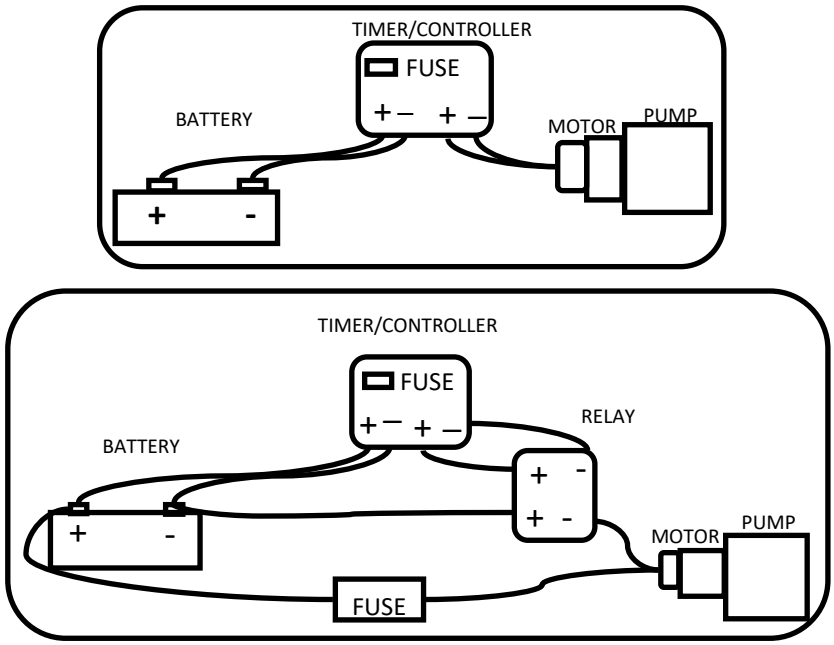
A number of motor/gearbox options are available with SiA pumps depending on your application's requirements. The table below provides an outline of these different options, refer to the BOM attached to this manual for part numbers specific to your pump.

	Voltage	Watts	Ratio	Gearbox Type	Hazardous Area Certifications
High Efficiency 	24	150; 100 (IECex)	113	Ceramic Planetary Heavy Duty option available	IECex
Standard 	12; 24; 120/240; 220/415;	20; 40; 60; 90; 120; 150;	50; 75; 150	Spur	N/A
Heavy Duty (Motor optional) 	12; 24; 120/240; 220/415;	Motor dependant	26; 32	Planetary	IECex; ATEX; UL/CSA

SECTION 2 INSTALLATION

2.0 Fuses: PLEASE READ BEFORE INSTALLING

Always ensure the correct fuse is fitted and connections are as per diagrams below to prevent damage to the pump that could void warranty.



The table below outlines the correct fuse for gearmotors supplied with pumps. Using a fuse of higher rating than outlined below will void warranty, unless specifically recommended by Solar Injection Australia.

	Motor Wattage	FUSE REQUIRED	
		12 Volt	24 Volt
High Efficiency	**150**	NA	7.5 amp
	100 (IEC)	NA	5 amp
Standard	**40**	5 amp	2.5 amp
	60	10 amp	5 amp
	90	15 amp	7.5 amp
	120	20 amp	10 amp
	150	25 amp	12.5 amp

For other wattage motors, or where no motor is supplied with the pump, please consult Solar Injection Australia to ensure correct fuse.

If the motor is being driven directly via an SIAT71500 Timer/Controller the maximum fuse rating is 10 amp.

Note: Drive case is limited to maximum input of 22 Nm, maximum of 150 Watts at 60 rpm. For loads above this, our Heavy Duty Drive should be used.

2.1 Mounting , Orientation & Environment

The preferred orientation for mounting is with the Liquid End pointing down, the Timer Module on top and the Gearmotor horizontal to the ground. This facilitates "bleeding" of the pump and maximises the life of the seals within the pump. The inlet of the Liquid End should be no higher than level with the lowest chemical level, to ensure a positive head on the inlet check valve. With Duplex configurations (ie 2 liquid ends on 1 drive), the Liquid Ends will be horizontal to the ground and the position of the inlet and outlet check valves will be reversed. Ensure that the inlet check valves, which are gravity-style, are facing downwards.

We recommend installing the assembly within a weatherproof enclosure. Where this is not practical, ensure as much weather and dust protection is afforded the whole assembly and the motor in particular. An SiA custom cover for the motor and gearbox assembly can be ordered separately if required.

Where environmental conditions are harsh, ie very wet, where there is salt water &/or dust or snow, consider coating the assembly with an appropriate coating or cover. In wet conditions in particular, we recommend use of a non hardening mastic on all mating parts, which is available as an option. Please contact Solar Injection Australia or an SiA Authorised Technical Agent before finalising the design of the installation.

Use the two M6 mounting holes to securely mount the assembly to any rigid frame or sub-assembly with mounting brackets (not supplied but available).

2.2 Installation — Step by Step

1. Discard all plastic closures on the Liquid End and align pump connections as dictated by your overall system design.
2. Connect the suction check valve to a gravity-fed chemical source. **This pump requires a flooded suction. We recommend installation of filters to the suction of each Liquid End and some form of pump inlet isolation. Warranty may be affected if you do not.**
3. Connect the discharge check valve to the process line. **We recommend installation of a pressure relief valve to the discharge of each Liquid End. Warranty may be affected if you do not.**
4. Check that the pump adaptor ring is firm.
5. Open the bleeder valve until chemical starts to flow then re-tighten.
6. Ensure that the DC power supply that you are using corresponds to the DC power required. 12 volts supply to 12 volts equipment. 24 volts supply to 24 volts equipment

   WARNING: Ensure the DC power supply to the DC Drive Motor is fused with the correct fuse. See Section 2.0 for details.

   WARNING: For AC models, all AC equipment must be installed by licenced electrical personnel.
7. Before connecting the supply leads to the DC motor make ensure the supply is isolated.
8. Connect motor power leads to supply, Red to Red (+) and Black to Black (-).

   If installing with an SIAT71500 Timer/Controller, connect the battery power supply and motor leads to the four screw terminals clearly marked and located on the lower front face of the timer.

   WARNING: Connecting the main power supply in the reverse polarity can cause immediate failure of the electronics within the timer module.

   WARNING: As the control and isolation of the DC Drive is supplied by the operator, care must be taken in selecting equipment to carry out these functions. We recommend discussing alternative operator-designed control methods prior to installation.

SECTION 3 PUMP OPERATION

3.0 Operating Pump with SiA Timer/Controller: SIAT75000

SIAT75000 QUICK START GUIDE

3.01 Physical Installation

The SIAT75000 is fitted with DIN Rail mounts and it is strongly recommended that they be used to mount the timer within a suitable cubicle fitted with DIN rails. The timer can be mounted in any orientation but the most suitable is with the GUI facing the operator.

The timer should be mounted in a well-ventilated, dry situation that prevents direct sun-light and precipitation from coming in contact with any part of the timer. When using the timer at high loads (above 10 amps and either continuous or high cycle rates, it can generate high temperatures. The temperature operating limitations of the timer are -30C~+50C.

Please ensure the correct fuse and wire size is used.

Warranty is voided if incorrect fuse, wire size, or poor physical installation is used.

3.02 Important information before Connecting Power to the SIAT75000

Ensure you have the correctly wired the power connections to the Male Power Terminal Header (PTH). Refer to front of the timer's User Interface for correct connections.

Ensure that only either 12 or 24 volt DC Power is connected to the "IN" terminals

Ensure the correct rated fuse is installed in the Fuse Holder (Refer to Section: Fuses)

NOTE: As the timer will always return to the state it was last in before power was disconnected, the timer could give an output to the Motor Terminals on the PTH immediately when the power is connected. If this is unsatisfactory, fit an On/Off isolating switch between the timer's Motor Terminals on the PTH and the motor's terminals.

The SIAT75000 Timer must not be installed or operated in a defined Hazardous Area

3.03 Fuses

It very important that correctly sized fuses are installed on the Timer. At no time should a fuse greater than 20 amps be used. Suggested Type and brand: Littlefuse ATO Automotive Quick Acting Fuses

Providing that the requirement calls up for a fuse of no more than 20 amps, the rating of the fuse can be suited for the protection of other equipment within the electrical circuit. Usually, the most important piece of equipment within the timer circuit is the DC Motor. However, there may be other factors limiting the rating of the fuse. To ascertain the current fuse rating to protect the motor, please refer to the Data-plate attached to the motor. In the case of SiA PMDC motors the following table is a guide:

Power (watts)	Voltage	Recommended maximum Fuse Rating	Littelfuse Part Number	Littelfuse colour
25	12	5	142.6185.450	Lt Brown
25	24	2	142.6185.420	Grey
40	12	5	142.6185.450	Lt Brown
40	24	3	142.6185.430	Purple
60	12	10	142.6185.510	Red
60	24	5	142.6185.450	Lt Brown
90	12	10	142.6185.510	Red
90	24	5	142.6185.450	Lt Brown
120	12	15	142.6185.515	Blue
120	24	7.5	142.6185.475	Dk Brown
HE	24	5	142.6185.450	Lt Brown

If the motor power selected requires a fuse greater than 15 amps, SiA recommends the use of a suitable relay that can carry the extra load required. Refer to SiA for recommendations.

3.04 First time Connection of Power to the SIAT75000 (Timers with Standard Software and Default Settings)

When installing the Timer from new with the Standard Software and Factory Default Settings it is important to review those default settings (See Default Settings in full IOM document). In particular, the Default Supply Voltage is set at 12 volts. If the supply is 24 volt, the default setting must be changed first, before any further operations or User Defined Setting changes are made.

When power is connected for the first time (from factory) the screen will display:

Mode Set

Continuous

under the following circumstances:

If the supply voltage is 12 volts.

No Temperature Probe is required

The correct Fuse has been installed

The Timer may be operated immediately, follow the Quick Start-Up section.

3.05 Quick Start-up

Ensure Correct Voltage; Correct Fuse Selection; Correct Wiring Size and Correct Physical Installation before proceeding.

The first Start-Up Screen displays:

Mode Set Continuous

Note: If this screen is NOT displayed it is most likely the timer has been operated previously. In that case one of a number of other screens will be displayed. Please section: **2e: Re-connecting Power**

From this screen, the operator can either:

1. Put the Timer into RUN condition within the Continuous Mode by depressing the RUN/STOP button.
2. Change the Mode of the Timer into Cycle or Adjustable Mode by depressing the + button sequentially to either mode. In these cases the screen will display either:

Mode Set Cycle XX

Mode Set Adjust XX XXX

In either of these modes the cycle rate (Cycle Mode) or the ON & OFF periods (Adjust Mode) will be displayed. If these settings are suitable, then by depressing the **ON** button the timer will run in that particular Mode at the set rate.

If all that is required is to alter the settings of either Mode before setting the Timer to RUN, for example: change the cycle rate in Cycle Mode, simply depress the **Mode** button while the required Mode Set is being displayed. For more information on how to change these setting refer to **Setting or changing the User Defined Set Points within an Operating Mode.**

If any changes to the User Defined Set Points within System Settings are required (refer to Default Settings and System Settings within the full IOM document).

To STOP the timer simply depress the **RUN/STOP** button for approximately 1 second.

3.06 To change the Mode Setting

To change the Mode Setting the timer MUST always be in the STOP condition. If the Timer is in RUN condition Depress the **RUN/STOP** button for 1 second and the timer will revert to the STOP condition. The screen will display "Motor OFF" and the mode the timer is currently in. With the Timer in the Stop condition and in any Mode, Depress the + or - Button causing the screen to sequentially show the following Modes in a loop:

Continuous

- **Cycle**
- **Adjustable**
- **System Settings** (Note: This Mode is NOT an operational mode it is used for system settings see full IOM for details)

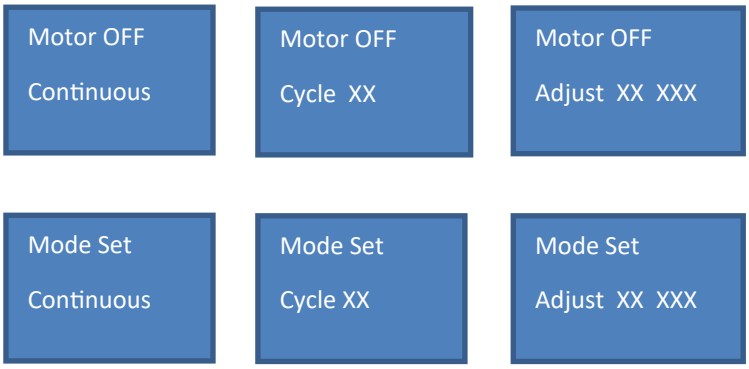
After selecting the Operational Mode required (not System Settings), the user can RUN the unit simply by depressing the RUN/STOP Button. The Timer will then operate within the parameters that have been previously defined for that particular mode. When the ON button is depressed the timer will display "Motor ON" and the Mode most recently defined by the operation above. For example:

Motor ON Cycle XX

3.06 To change the User Defined Set-Point within an Operating Mode

Firstly follow the steps detailed in 4b: To Change the Mode Setting. When in the STOP condition choose which Operational Mode that requires having its User Defined Set-Points revised.

The Timer must display either of the following Operational Mode screens:



In any of the above cases the Timer would be in the **STOP** condition.

Simply depressing the + or - button when displaying any of the above screens will rotate the display through the above screens.

Choose the Operational Mode Set you wish alter the settings for and then depress the Mode button and alter those settings as required.

Please refer to the full Installation, Operations and Maintenance Manual available at solarinjection.com/manuals before installing and running this timer.

3.1 Chemical Injection Flow Rate Adjustment

There are two ways of adjusting the injection flow rate, 1) electronic variable flow and 2) stroke length adjustment . The two methods can be used together to finely tune the flow rate.

3.11 Electronic Variable Flow Adjustment

Depending on the type of electric motor selected, two types of electric variable flow control can be achieved. The cycles per minute (cpm) can be altered from maximum by either slowing the electric motor with an electronic variable speed control device or preferably by using a Cycle Timer to 'start', 'stop' and vary the 'stop' time of the electric motor. We recommend using a cycle timer as it is simpler, more cost effective, robust, capable of operating at more extreme ambients and has been found to use less energy per volume of chemical injected.

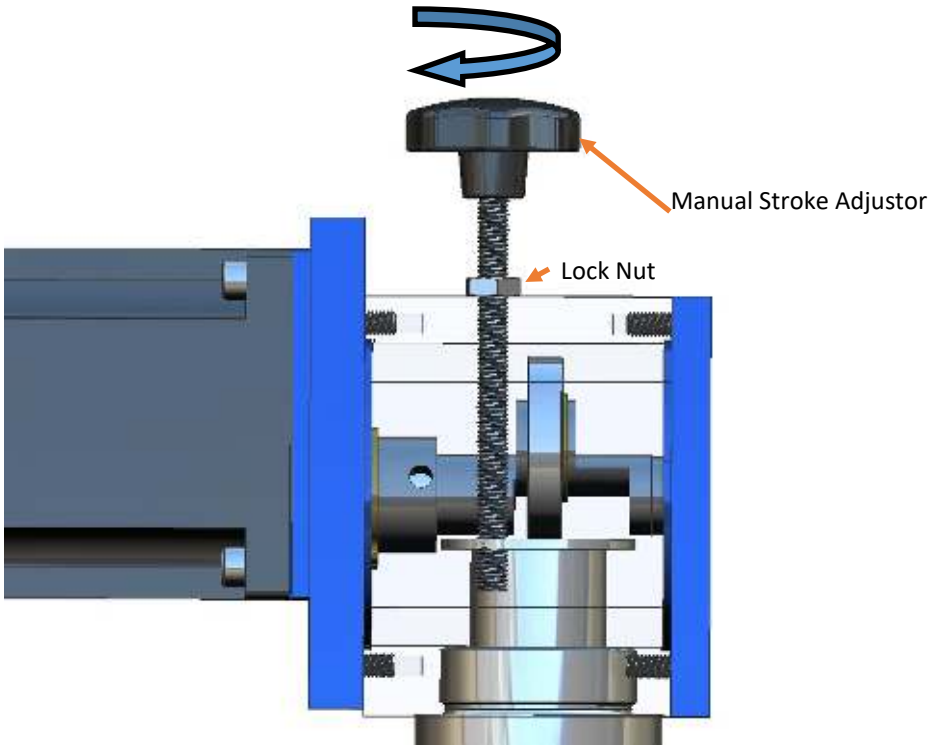
Solar Injection Australia manufactures a range of DC Timers, please contact us or an SiA Distributor for details.

3.12 Stroke Length Adjustment

All drives, except those with a Duplex Liquid End configuration (ie 2 liquid ends on the 1 drive), are fitted with a mechanical stroke length adjustor that allows the operator to adjust the length of the stroke and therefore the output per cycle infinitely between 0% and 100% while the pump is running.

Simply twist the adjustor until the desired flow is achieved. The lock nut provided will hold the chosen setting.

An optional micrometer stroke adjustor is available on request.



SECTION 4 MAINTENANCE

4.0 Routine Maintenance: Drive Assembly

Providing the Drive Assembly is selected and installed correctly, the Drive should perform for a long period of time with little or no routine maintenance. We recommend however, that checks are made at least every 6 months. The only wearing parts of the Drive are the Bearings and the Plunger Adaptors.

4.01 Bearings

Inspection of the bearings should take place regularly. If operating in clean and dry conditions we recommend 6 monthly inspections of moving parts. If operating in wet and/or dirty conditions, we recommend more frequent inspections, starting with monthly inspections until the operator is comfortable with longer service intervals.

To Inspect Bearings follow these steps (refer to ILLUSTRATION & PARTS LIST Section Page 2):

1. For Simplex pumps, ensure the Liquid End is facing downwards, so that no liquid runs into the Drive Case.
2. For all pump configurations unscrew the Pump Connection Ring by hand to loosen and remove the Liquid End/s.
3. Remove the Gearmotor or Gearbox by removing the 4 long screws attaching it to the Drive Case
4. Unscrew the Bearing End Plate by removing the 4 screws
5. Remove the Crank Shaft and Bearings and inspect. You may need to move the Plunger Adaptor/s to enable you to do this.

WARNING: Should the bearings become worn in any way they should be replaced immediately with new parts available from Solar Injection Australia or SiA Distributors.

6. Place the Crank Shaft and Bearings (or replacement Bearings) into the Drive Case
7. Place the Bearing End Plate back on the Drive Case and secure with the 4 screws
8. Reattach the Liquid End/s and tighten the Pump Connection Ring/s. You may need to carefully push down and hold the Plunger into the Liquid End to enable you to do this.
9. Position the Gearmotor or Gearbox back on the Drive Case and secure with the 4 screws.

All three Precision Roller Bearings are sealed type and do not require in-field lubrication. They have been selected using design loads far in excess of the loads that should be generated by the design limitations of the product. Providing no moisture or dirt penetrates and that the Drive is used in accordance with its design parameters a long life can be expected.

4.02 Plunger Adaptors

We have both Ertalyte and stainless steel versions of our plunger adaptors. No grease is applied on assembly and providing abrasive dirt does not come between the Cam Bearing and the Plunger Adaptor, negligible wear should take place through millions of cycles. If replacing Plunger Adaptors, ensure you replace like for like as Ertalyte and stainless steel versions are not interchangeable.

To Inspect Plunger Adaptor/s follow the steps outlined above for inspecting Bearings. After step 5, remove and inspect Plunger Adaptor/s and then replace and continue to follow steps 6—9.

4.1 Routine Maintenance: SiA Liquid Ends

The maintenance of any Chemical Injection Pump (CIP)/Liquid End, other than an SiA unit is not covered in this document.

WARNING: Solar Injection Australia accepts no responsibility should a Liquid End be fitted to an SiA Drive without first seeking a recommendation from SiA to ensure correct matching of the Gearmotor, Drive and Liquid End (pump).

4.10 Pressure Seal Grease

Check main pressure seal grease periodically and refill when necessary. This is done by removing the Lube Plug on the side of the Liquid End and if required, injecting a small quantity of SiA approved grease.

CAUTION: If injecting chemicals that cause the lubricant to foam, select an alternative lubricant compatible with the injected fluid. When it is essential that the injected chemical must have a high level of purity, use distilled water as the lubricant.

4.11 Injection Chemicals

Ensure the chemicals being injected are clean and free of foreign matter to prevent damage to the seal and the Liquid End's plunger assembly. We recommend the installation of a suitable chemical filter.

4.12 Seals

Check the seals regularly. Seal material and chemical compatibility is paramount. Our standard plunger seal (TS) is a specially formulated PTFE and stainless steel compound that is energized with a Viton o'ring, which is compatible with most chemicals, however we do have numerous alternative materials available, please consult Solar Injection Australia or an SiA Distributor for further assistance with choosing the right seal or when changing the chemicals you are injecting.

To Inspect Seals & Back Ups follow these steps (refer to ILLUSTRATION & PARTS LIST Section Page 2):

1. For Simplex pumps, ensure the Liquid End is facing downwards, so that no liquid runs into the Drive Case.
2. For all pump configurations unscrew the Pump Connection Ring by hand to loosen and remove the Liquid End/s.
3. Carefully remove the Plunger section and place gently on a flat surface.
4. Remove the Flange and the Pump Connection Ring
5. Unscrew the three parts of the Pump Body (Upper, Middle, Lower)
6. Very carefully remove the Back Ups and Seals using either the plunger or a brass or plastic pick. To use the plunger, insert it into the pump body below the seal and push the seal and back up out. To use the pick, hook the seal and back up carefully and pull them out.

CAUTION: Be very careful not to damage the seal or other surfaces when extracting.

7. Replace the Seals and Back ups and then Follow Steps 1– 5 in reverse to complete.

4.2 Routine Maintenance: Gearmotors fitted to the Drive

Generally, the gearmotor does not require routine maintenance other than periodic brush replacement on our Standard DC models. Apart from these brushes there are no service parts available. Should the DC gearmotor fail (or separately the motor or gearbox), we recommend the whole DC gearmotor be replaced with a new unit, available from Solar Injection Australia or an SiA distributor.

We recommend that the brushes be inspected as often as practical until the operator obtains experience of the expected brush life for each situation, but at least every 6 months.

Note: There are no brushes in a BLDC Motor.

To inspect and or replace brushes on our Standard PMDC Gearmotor models, please follow the steps below:

1. Disconnect power to pump before any servicing takes place.
2. Use large flat blade screwdriver to unthread the plastic caps on either side of the motor.
3. Remove the brushes carefully (they're spring loaded).
4. Examine them. They should be at least 1/8" thick. If they are not, replace them. They will not last much longer.
5. Replace new brushes into the holes on either side of the motor's outer shell and rethread the plastic caps.

As with the moving internals of the Drive, the operator can expect longer service intervals and life by keeping the gearmotor clean and dry.

WARNING: Should the gearmotor show signs of wear in any way it should be replaced immediately with new parts available from Solar Injection Australia or SiA Distributors.

4.3 Corrective Maintenance

Situation	Cause	Resolution
NO PUMP DISCHARGE	• Suction &/or discharge check valves not seating • Pump vapour locked • Suction or discharge line plugged/ blocked	• Clean or replace suction &/or discharge check valves • Open bleed plug & prime • Check for closed isolating valve • Check inlet and discharge lines for
PUMP DOES NOT CYCLE	• Plunger stuck due to tight or dry seal • Process line pressure too high for unit selected • Blown fuse • No power supply to DC motor drive • Timer switch in OFF position • Timer set to minimum cycle rate	• Check seal, if swollen , check chemical compatibility and replace • Check selection and ensure discharge line is not blocked • Check and replace fuse in DC supply. If this condition repeats itself, check the drive mechanism for seizure. • Check and connect correct power supply • Set switch to CONTINUOUS for testing • Adjust timer accordingly
SHORT SEAL LIFE	• Nick, Burr or scratches on plunger • Seal &/or plunger materials not compatible with chemical being injected • Lack of lubricant • Incorrect lubricant or chemical crystallising on plunger and scoring seal/plunger	• Replace plunger • Refer to chemical compatibility charts or contact Solar Injection Australia • Maintain visible lubricant level in reservoir. • Change lubricant to be compatible with chemicals being pumped.

Appendix: Chemical Compatibility Chart

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Acetaldehyde	B	A	A	A	A	C	C	B	C
Acetate Solvents	B	A	A	A	A	C	C	C	C
AceticAcid,20%	B	A	A	A	A	A	C	A	C
Acetic Acid Concentrated to l5O°F(66° C)		B	A	A	A	C	C		C
Acetic Acid Concentrated to 2l2°F(100 C)	C	B	A	A	A	C	C	C	
Acetic Anhydride	C	B	A	A	A	C	C	A	C
Acetone	B	A	A	A	A	C	C	B	C
Alum	C	C	B	A	A	A	A	A	A
Aluminum Chloride	C	C	C	B	A	A	A	A	A
Aluminum Nitrate	B	A	A	A	A	A	A		
Aluminum Sulfate	C	C	B	A	A	A	A	A	A
Ammonia Anhydrous	A	A	A	A	A		C	A	A
Ammonium Bicarbonate	A	A	A	A	A	A	A		C
Ammonium Bisulfite	B	A	A	A	A	A	A		
Ammonium Bifluoride	C	B	B	A	A		A		A
Ammonium Hydroxide	C	A	A	A	A	A	B	A	A
Ammonium Nitrate	B	A	A	A	A	A		B	C
Ammonium Phosphate	C	B	A	A	A	A	A	A	
Ammonium Sulfate	C	B	B	B	A	A	A	A	C
Ammonium Sulfite	C	A	A	A	A	A	A		
Amyl Acetate Dry	A	A	A	A	A	C	C	C	C
Amyl Alcohol	A	A	A	A	A	B	A	A	B
Amyl Chloride	C	B	A	A	A	C	C	C	
Aniline Chloride	C	B	A	A	A		B		
Aniline Dyes	C	A	A	A	A	C	B	C	
Animal Fats and Oils		A	A	A	A	A	A	C	A
Aqua Regia	C	C	C	C	A		B	C	
Ascorbic Acid	C	A	A	A	A				
Barium Chloride	C	C	C	B	A	A	A	A	A
Barium Sulfite	B	A	A	A	A	A	A	A	
Benzaldehyde	B	A	A	A	A	C	C	C	
Benzene	A	A	A	A	A	C	B	C	C
Benzene Sulfonic Acid lO%	C	B	B	A	A	A	A	C	C
Benzoic Acid	C	B	B	A	A	A		C	A
Benzoyl Chloride	C	C	C	C	A		B		
Boric Acid	C	A	A	A	A	A	A	A	A
Bromine Anhydrous	C	C	C	B	A	C	A	C	C
Bromine Dilute	C	C	C	C	A	B	A	C	C
Bromine Trifluoride	C	C	B	B	A		C		C
Butadiene	C	A	A	A	A		A		C
Butane	B	A	A	A	A	A	A	A	A
Butyric Acid 2O%	C	A	A	A	A		C	A	A
Butyric Acid, Concentrated	C	B	B	B	A		C		A
Calcium Bisulfite	B	A	A	A	A	A	A	A	A
Calcium Carbonate	A	A	A	A	A	A	A	A	A
Calcium Chlorate	C	A	A	A	A	A	A	A	A
Calcium Chloride	C	B	B	A	A	A	A	A	A

Key to Rating: A -Substantial Resistance, B -Moderate Resistance, C -Severe Effect, Blank -No Data

Chemical Compatibility Chart (continued)

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Calcium Hydroxide	A	A	A	A	A	A	A	A	A
Calcium Hypochlorite	C	C	C	C	A	A	A	C	A
Calcium Nitrate	C	A	A	A	A	A	A		
Calcium Sulfite	C	A	A	A	A	A	A		
Calcium Sulfate		A	A	A	A	A	A	C	
Camphor Alcohol Sol	B	A	A	A	A				
Carbon Disulfide	C	A	A	A	A		A	C	
Carbon Tetrachloride Dry	B	A	A	A	A	C		C	
Carbon Tetrachloride Wet	C	B	B	B	A	C		C	C
Carbon Water Slurries	C	B	A	A	A	A	A	A	
Cesium, 260°F(127°C)	C	A	A	A	A	C	C		
Chlorine, Anhydrous	A	A	A	A	A		C	C	C
Chlorine Water	C	C	C	A	A	A	A	C	C
Chloroacetic Acid	C	C	C	C	A		C		C
Chlorobenzene	C	A	A	A	A	C	A		B
Chloroform	B	A	A	A	A	C	A		C
Chlorosulfonic Acid	C	B	B	B	A	C	C	C	B
Choline Chloride	A	A	A	A					
Chromic Acid to l5O°F(66° C)	C	B	B	B	A			C	A
Citric Acid	C	B	B	A	A	A	A	A	A
Copper Chloride	C	C	C	C	A	A	A	A	A
Copper Fluoride	C	B	B	B	A	A			
Copper Nitrate	C	B	A	A	A	A	A	A	A
Copper Sulfate	B	A	A	A	A	A	A	A	A
Cottonseed Oil	A	A	A	A	A	A	A		A
Creosols	A	A	A	A	A	C	C	C	A
Cyclohexane	B	A	A	A	A	C	A	C	A
Cyclohexanone	B	A	A	A	A	C	C	C	B
Dichlorethane, Dry	A	A	A	A	A	C		C	C
Diethanolamine	A	A	A	A	A	C	C		A
Diethyl Benzene	A	A	A	A	A	C			
Diethyl Ether	A	A	A	A	A		C		C
Diethyl Sulfate	C	B	B	A	A				
Diethylene Glycol	B	A	A	A	A		A	A	A
Dimethyl Amine	A	A	A	A	A	C			
Dimethyl Phthalate	A	A	A	A	A	C	C		B
Ether	A	A	A	A	A	C	C		C
Ethyl Acetate	A	A	A	A	A	C	C	C	C
Ethyl Alcohol	A	A	A	A	A	A	C		A
Ethyl Benzene	A	A	A	A	A		A		C
Ethyl Bromide	C	C	C	C	A	C			
Ethyl Chloride	C	A	A	A	A	C	A	C	A
Ethyl Mercaptan	B	A	A	A	A	C	A		C
Ethylene(Liquefied)	A	A	A	A	A				
Ethylene Dichioride	C	A	A	A	A		B	C	A
Ethylene Glycol	B	A	A	A	A	A	A	A	A
Ethylene Oxide	C	A	A	A	A	C	C	C	C

Key to Rating: A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blank - No Data

Chemical Compatibility Chart (continued)

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Fatty Acids	C	A	A	A	A	A	A	A	
Ferric Chloride	C	C	C	C	A	A	A	A	A
Ferric Nitrate	C	B	B	A	A	A	A	A	
Ferric Sulfate	C	C	B	C	A	A	A	A	A
Ferrous Chloride	C	C	C	C	A	A	A	A	
Ferrous Sulfate	C	C	C	C	A	A	A	A	
Filter Aid Slurries B	A	A	A	A	A	A	A		
Fluosilicic Acid	C	C	C	B	A	A	A	A	
Copper Fluoride	C	B	B	B	A	A			
Copper Nitrate	C	B	A	A	A	A	A	A	A
Copper Sulfate	B	A	A	A	A	A	A	A	A
Cottonseed Oil	A	A	A	A	A	A	A		A
Creosols	A	A	A	A	A	C	C	C	A
Cyclohexane	B	A	A	A	A	C	A	C	A
Cyclohexanone	B	A	A	A	A	C	C	C	B
Dichlorethane, Dry	A	A	A	A	A	C		C	C
Diethanolamine	A	A	A	A	A	C	C		A
Diethyl Benzene	A	A	A	A	A	C			
Diethyl Ether	A	A	A	A	A		C		C
Diethyl Sulfate	C	B	B	A	A				
Diethylene Glycol	B	A	A	A	A		A	A	A
Dimethyl Amine	A	A	A	A	A	C			
Dimethyl Phthalate	A	A	A	A	A	C	C		B
Ether	A	A	A	A	A	C	C		C
Ethyl Acetate	A	A	A	A	A	C	C	C	C
Ethyl Alcohol	A	A	A	A	A	A	C		A
Ethyl Benzene	A	A	A	A	A		A		C
Ethyl Bromide	C	C	C	C	A	C			
Ethyl Chloride	C	A	A	A	A	C	A	C	A
Ethyl Mercaptan	B	A	A	A	A	C	A		C
Ethylene(Liquefied)	A	A	A	A	A				
Ethylene Dichioride	C	A	A	A	A		B	C	A
Ethylene Glycol	B	A	A	A	A	A	A	A	A
Ethylene Oxide	C	A	A	A	A	C	C	C	C
Fatty Acids	C	A	A	A	A	A	A	A	
Ferric Chloride	C	C	C	C	A	A	A	A	A
Ferric Nitrate	C	B	B	A	A	A	A	A	
Ferric Sulfate	C	C	B	C	A	A	A	A	A
Ferrous Chloride	C	C	C	C	A	A	A	A	
Ferrous Sulfate	C	C	C	C	A	A	A	A	
Filter Aid Slurries B	A	A	A	A	A	A	A		
Fluosilicic Acid	C	C	C	B	A	A	A	A	
Formaldehyde,80°F(27° C),Rm. Temp	B	B	A	A	A	B	A	A	C
Formic Acid,80°F(27°C)	C	B	A	A	A	B	B	C	A
Freons, 80°F(27°C)	B	A	A	A	A			C	C
Fuel Oil	A	A	A	A	A	A	A	C	A
Furfural	B	A	A	A	A	C	C	C	A
Furfural Alcohol	B	B	B	A	A	C	C	C	

Key to Rating: A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blank - No Data

Chemical Compatibility Chart (continued)

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Gallic Acid,5%	C	B	B	B	A	A	A	B	
Gasoline	A	A	A	A	A		A	C	B
Glucose	A	A	A	A	A	A	A	A	A
Glycerine	B	A	A	A	A	A	A	A	A
Heptane	B	A	A	A	A	C	A	B	C
n-Hexane	B	A	A	A	A	C	A	B	
Hydrazirie,35% and above	C	A	B	B	A	C	C	B	A
Hydrobromic Acid	C	C	C	C	A	B	A	C	A
Hydrochlodc Acid,37%	C	C	C	C	A	A	A	C	A
Hydrocyanic Acid	C	A	A	A	A	A	A	C	A
Hydrofluoric Acid to 48%	C	C	C	C	A	A	A	C	A
Hydrogen Chloride Dry	A	A	A	A	A				
Hydrogen Cyanide	B	A	A	A	A	A			
Hydrogen Fluoride-Anhydrous	C	C	C	C	A			C	A
Hydrogen Peroxide, 5O%	C	A	A		A		C	C	C
Hydrogen Peroxide, 90%	C	A	A		A	C	C	C	C
Hydrogen Sulfide	C	B	B	B	A	A		A	A
Hydroquinone	A	A	A	A	A	A	C		
Hypo(Sodium Thiosulfate)	C	B	A	A	A	A	A		
Lodine Solution, 5%	C	C	C	C	A	C	A	C	A
Isopropyl Alcohol	A	A	A	A	A		A	A	A
Isopropyl Chloride Dry	B	A	A	A	A				C
Kerosene	A	A	A	A	A	A	A	C	B
Lactic Acid, 50% 80°F(27°C)	B	B	A	A	A	A	A	A	B
Lard Oil	A	A	A	A	A		A	C	A
Lead Acetate	B	A	A	A	A	A	C	A	C
Lead-Tetraethyl	B	A	A	A	A				
Magnesium Carbonate	A	A	A	A	A	A	A	A	
Magnesium Chloride	C	B	B	A	A	A	C	A	
Magnesium Nitrate	A	A	A	A	A	A	A	A	
Magnesium Sulfate	B	A	A	A	A	A	A	A	
MaleicAcid-Dilute	C	B	A	A	A	A	A	C	
Melamine Resins	C	B	B	B	A			C	
Mercaptans	A	A	A	A	A		A	C	
Mercuric Chloride, SoI	C	C	C	B	A	A	A		
Mercury	B	A	A	B	A	A	A	A	
Methyl Alcohol	A	A	A	A	A	A	C	A	
Methyl Celiosolve	A	A	A	A	A		C	B	
Methyl Formate	A	A	A	A	A		C		
Methylene Chloride	B	A	A	A		C	C	C	C
Methyl Ethyl Ketone	A	A	A	A	A	C	C	C	C
Monochloroacetic Acid 70 F	C	B	B	B	A	A			
Morpholine	A	A	A	A	A		C		
Muriatic Acid	C	C	C	C	A	A	A	C	A
Mustard	C	B	A	A	A	A		A	A
Naphtha	B	A	A	A	A	A	A	C	A
Naphthalene, Molten	A	A	A	A	C	C	A	C	C

Key to Rating: A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blank - No Data

Chemical Compatibility Chart (continued)

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Nickel Carbonyl, Solution		B	A	A	A				
Nickel Chloride, Solution		B	B	B	A	A	A	A	A
Nickel Nitrate, Solution		A	A	A	A	A	A	A	
Nickel Sulfate Solution		B	A	B	A	A	A	A	A
Nitric Acid to conc.-Rm		A	A	B	A	C	A	C	B
Nitric Acid,Red Fuming,Rm		A	A	B	A	C	C	C	B
Nitro Benzene to 2l2°F(100° C)		B	A	A		C	B	C	A
Nitrous Acid, 5%		A	A	A	A				
Nitrogen Tetroxide		A	A	A	A		C		
Nitrochlorobenzene				A	A	C	A		
Oleic Acid		A	A	A		A	B	B	
Oleum-25%		B	A	A	A	C	B	C	
Olive Oil	A	A	A	A	A	A	A	C	
Oxalic Acid		B	B	A	A	A	A	B	
Paraffin-Molten	A	A	A	A	A				
Paraldehyde	A	A		A	A				
Pentane	A	A		A	A				A
Perfumes	A	A		A	A				
Phenol-Molten	B	B		B	A		C		A
Phosgene		A		A	A				
Phosphoric Acid,60 Free of HF	C	B		A	A			C	A
Phosphoric Acid, 75% Free of HF	C	B	B	A	A	A	A	C	A
Phosphorous-Molten		B	A	A	A			C	
Phosphorous Oxychloride	C				A				
Phosphorous Trichloride	C	A	A	A	A		A	C	A
Pine Oil	A	A	A	A	A		B		
Phthalic Anhydride		B	B	A	A				B
Potassium Chromate	A	A	A	A	A	A	A	A	
Potassium Bromide	C	B	B	A	A	A	A	A	A
Potassium Carbonate	B	A	A	A	A	A	A	A	A
Potassium Chlorate	B	A	A	A	A	A	A	A	A
Potassium Chloride	C	B	B	A	A	A	A	A	A
Potassium Dichromate	B	A	A	A	A	A	A		A
Potassium Ferrocyanide	B	A	B	A	A	A	A		
Potassium Hydroxide	B	B	A	A	A	A	B	B	A
Potassium Iodide	C	B	B		A	A	A		
Potassium Nitrate	A	A	A	A	A	A	A	A	A
Potassium Permanganate	C	A	A	A	A	A	A	A	A
Potassium Sulfate	B	A	A	A	A	A	A	A	A
Propane	A	A	A	A	A	A	A	B	A
Propylene Dichloride, Dry	B	A	A	A	A	C		C	
Propylene Glycol	A	A	A	A	A		A	C	A
Propylene Oxide	A	A	A	A	A		C	C	C
Pyrogallic Acid	B	A	A	A	A				
Quinoline		A	A	A	A				
Silver Nitrate		A	A	A	A	A	A	A	A
Sodium-Molten		A	A	A	C			C	

Key to Rating: A -Substantial Resistance, B -Moderate Resistance, C -Severe Effect, Blank -No Data

Chemical Compatibility Chart (continued)

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Sodium-Potassium, NaK Alloy		A	A		C				
Sodium Acetate		B	A	A	A	A	C	B	C
Sodium Aluminate	B	A	A	A	A	A	B	A	A
Sodium Bicarbonate	B	A	A	A	A	A	A	A	A
Sodium Bichromate	B	A	A	A	A	A	A		
Sodium Bifluoride Slurry		A	A	A			C		
Sodium Bisulfate		B	A	A	A	A	A	A	A
Sodium Bisulfite	B	A	A	A	A	A	A	A	A
Sodium Borate	B	A	A	A	A	A	A	A	A
Sodium Bromide	C	B	B	A	A	A	A	A	
Sodium Carbonate	B	A	A	A	A	A	A	A	A
Sodium Chlorate	C	B	B	A	A	A	A	A	
Sodium Chloride	C	B	B	A	A	A	A	A	A
Sodium Chlorite	C	C	C	C	A	A	A	C	
Sodium Citrate	B	A	A	A	A	A			
Sodium Cyanide	B	A	A	A	A	A	A	A	C
Sodium Dichromate	A	A	A	A	A	B	A	B	
Sodium Ferricyanide, 5%	B	A	A	A	A	A	A	B	
Sodium Fluoride	C	C	B	B	A	A	A	C	
Sodium Hydroxide, 50%	A	A	A	A	A	A	B	B	A
Sodium Hydroxide, 73%	B	B	B	B	A		C	B	A
Sodium Hypochlorite, 5%	C	C	C	C	A	A	A	C	B
Sodium Hypochlorite, 20%	C	C	C	C	A	A	B	C	A
Sodium Metaphosphate	B	A	A	A	A	A	A	B	A
Sodium Nitrate	B	A	A	A	A	A	A	A	C
Sodium Nitrite		B	A	A	A	A	A	A	
Sodium Peroxide	C	A	A	A	A		A	A	A
Sodium Silicate	B	A	A	A	A	A	A	A	A
Sodium Sulfate	A	A	A	A	A	A	A	A	A
Sodium Sulfite		A	A	A	A	A	A	A	A
Sodium Thiosulfate (Hypo)	C	B	B	A	A	A	A	A	
Stannic Chloride	C	C	C	B	A	A	A	C	
Stannous Chloride		B	A	A	A	A	A	A	
Stearic Acid		A	A	A	A	A	A	B	A
Styrene		A	A	A	A		C	C	
Sulfamic Acid				B	A			B	
Sulfur-Molten		A	A	A	A		C		B
Sulfur Chloride		C	C	A	A		C	C	C
Sulfur Dioxide Dry	A	A	A	A	A			C	A
Sulfan	C	B	A	A	A		C		
Sulfur Trioxide	C	B	A	A	A		C		A
Sulfuric Acid below 93%	C	C	C	A	A	B	A	C	A
Sulfuric Acid-Commercial Concentrated	C	C	A	A	A	C	A	C	A
Sulfuric Acid, Fuming, 20%		B	A	A	A	C	B	C	A
Sulfurous Acid		B	B	A	A	A	A		
Tannic Acid, 1O%		A	A	A	A	A	A	A	A
Tartaric Acid		B	A	A	A	A	A	A	A

Key to Rating: A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blank - No Data

Chemical Compatibility Chart (continued)

Corrosive Agent	Steel	304 SS	316 SS	C-20	Teflon	PVC	Viton	Buna-N	Fluoraz
Thionyl Chloride	C	C	B		A	C			
Titanium Dioxide Slurry	B			A	A	A	A	A	
TitaniumTetrachloride, Dry	A	A	A	A	A		A	B	C
Toluene	A	A	A	A	A	C	B	C	C
Tributyl Phosphate	B	A	A	A	A	C	C	C	
Trichloroethylene, Dry	A	A	A	A	A	C	A	C	
Tricresyl Phosphate	B	A	A	A	A	C	B	C	A
Triethanolamine		A	A	A	A	B	C	A	A
Trisodium Phosphate, Sol	B	A	A	A	A	A	A	A	A
Tung Oil	A	A	A	A	A		A		
Turpentine	A	A	A	A	A	A	A	C	A
Urea Formaldehyde	A	A	A	A	A				
Vegetable Oils	A	A	A	A	A	A	A	C	A
Uranium Nitrate		A	A	A	A				
Vinyl Acetate		A	A	A	A		C	C	
Vinylidene Chloride		A	A	A	A				A
Vinylidene Fluoride	B	A	A	A	A				
Xylene		A	A	A	A	C	C	C	C
Zinc Oxide Slurry	B	A	A	A	A	A	A	A	
Zinc Sulfate	B	A	A	A	A	A	A	A	A
Zinc Chromate		A	A	A	A	A	A		

Key to Rating: A - Substantial Resistance, B - Moderate Resistance, C - Severe Effect, Blank - No Data

About Solar Injection Australia

Specialising in chemical injection pump technology for the oil and gas industry, Solar Injection Australia is a leading design and manufacturing business focussed on delivering innovative, quality solutions.

Our approach is to innovate rather than imitate. The SiA brand of high quality and highly efficient pumps includes solar-powered; pneumatic/gas; and AC chemical injection pumps that are suitable for a wide range of applications, including hazardous area, sour gas and where other specialist requirements are needed. Our timers, controllers and detection accessories give our customers unparalleled control of the pumps both onsite and remotely (via SCADA).

One of our major strengths is our long history of designing and manufacturing engineered systems for the oil and gas industry including chemical injection packages, test equipment packages, high pressure gas systems and well head control panels. Our ISO9001 certification is further testimony to our commitment to quality control across all aspects of our business.

With our network of distributors, we design and deliver customised solutions throughout the world.

Solar Injection Australia also has a Communications Division, which has partnered with ORBCOMM, to offer remote monitoring and control of our pumps as well as any other remote assets where cellular/mobile phone services do not exist.

Why Choose Solar Injection Australia

Quality

In everything we do and in the materials we use.

Innovation

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Experience

You can rely on. 30+ years in the Oil & Gas Industry.

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Certified System Quality ISO 9001 SAI GLOBAL

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