Engine Governing System

SDG500 Series
Smart Digital Governor

Governors America Corp.

Please read the following instructions and visually inspect this product for damage from shipping before installing. It is your responsibility to have a qualified person install this unit and make sure it conforms to local codes.

! This bulletin is not intended to replace the Product User Guide. Refer to the **SDG500 Series** PUG4124 for complete product overview available for download at www.Governors-America.com.

The **SDG500 Series (Smart Digital Governor)** is designed to regulate engine speed on diesel and gas/gasoline reciprocating engines. The **SDG500 Series (Smart Digital Governor)** is a suitable replacement for any mechanical system that needs more flexibility, precision or control in governing speed. The **SDG500 Series** is an integral part of a closed loop control. When connected to an electric actuator and supplied with a magnetic speed sensor signal, the governor will direct the engine to the desired speed setting. The **SDG500 Series (Smart Digital Governor)** is designed for industrial applications ranging from generators and mechanical drives to pumps and compressors. (see **Table 1.**)

TABLE 1.

Devices covered in this manual.		
Model	**Description**	
SDG510	**Deutsch Connector**	Packard Actuator Connector
SDG511	**Samtec Connector**	2 Pin Actuator Connector
SDG512	**Deutsch Connector w/ Gain Adjustment**	Packard Actuator Connector
SDG513	**Samtec Connector w/ Gain Adjustment**	2 Pin Actuator Connector
SDG514	**Deutsch Connector**	Connection Directly to Deutsch

DESCRIPTION

The **SDG500 Series** is a solid state microprocessor based speed control unit that offers precise (+/- 0.25%) speed control with fast response to transient load changes in isochronous and droop modes. Designed for high reliability and ruggedly built, the **SDG500 Series** is hard potted to withstand the harsh engine environment and can be mounted directly in the engine compartment. The **SDG500 Series** has several built in configurable features: three fixed and variable speed with correlating droop settings; engine overspeed shutdown protection; speed ramping from idle to operation speed; and starting fuel control for lower engine exhaust emissions.

Configuration and tuning of the **SDG500 Series** can be accomplished via **GAC's SmartVU™** configuration software and the **TSE304 GAC's Programming Connector Unit** for the **SDG511** and **SDG513** and **CH1330 Cable Harness** for **SDG510, SDG512** and **SDG514**. Configurations can be saved to file for use in configuring multiple units. Refer to the **SDG500 Series** Product User Guide (**PUG4124**) available for download on **www.Governors-America.com** for configuration instructions.

GAC's SmartVU™ configuration software is availble for download at www.Governors-America.com.

MOUNTING

Locate the **SDG Series** control a distance from extreme heat, wires or coils. Operating temperature range is from -40˚ to 85˚ C (-40˚ to 180˚F).

To mount the **SDG** to a panel, drill 2 (Ø.181 / .176 [4.6 /4.5mm drill size) holes for mounting screws. Place module in front of the panel aligning with the pre-drilled holes. Secure the module in place with two M-4 screws. (see **Diagram 1.**)

DIAGRAM 1. PHYSICAL DIMENSIONS OF SDG510/512

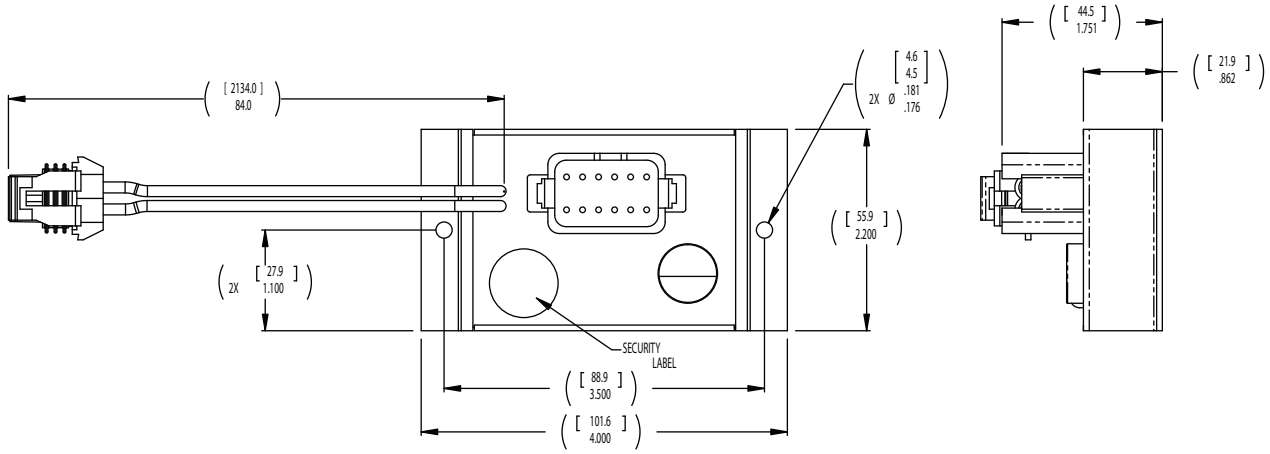


DIAGRAM 2. PHYSICAL DIMENSIONS OF SDG511/513

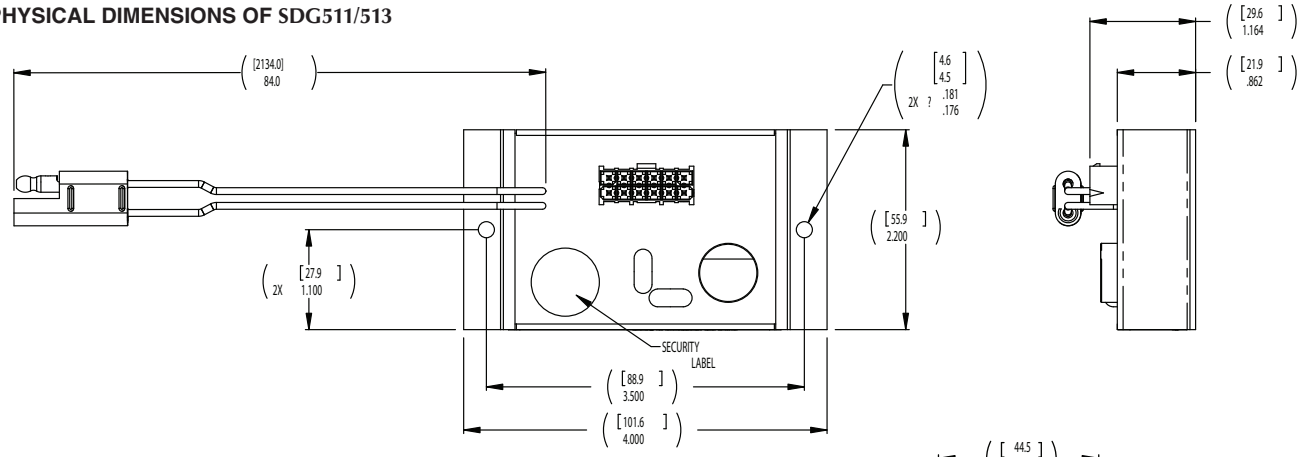
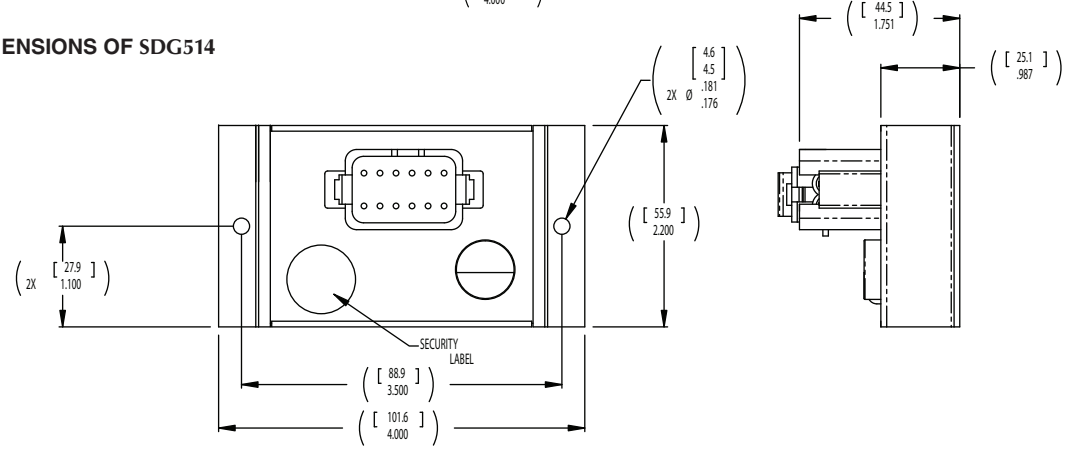


DIAGRAM 3. PHYSICAL DIMENSIONS OF SDG514



WIRING THE SDG

SDG510 & SDG512 use the below listed DIAGRAMS & TABLES	SDG511 & SDG513 use the below listed DIAGRAMS & TABLES
GENERAL WIRING INSTRUCTIONS	GENERAL WIRING INSTRUCTIONS
DIAGRAM 4	DIAGRAM 5
TABLE 2 & 3	TABLE 2 & 4
Deutsch Cable Connector DT06-12SA & W12S	SAMTEC IPBD-06-D
Duetsch Pins 0462-201-16141	SAMTEC Pins CC69L-1620-01-T-HP
Deutsch Pins 0462-201-16141	SAMTEC Pins CC69L-1620-01-T-HP

SDG514 use the below listed DIAGRAMS & TABLES
GENERAL WIRING INSTRUCTIONS
DIAGRAM 6
TABLE 2 & 5
Deutsch Cable Connector DT06-12SA & W12S
Duetsch Pins 0462-201-16141

TABLE 2.

All SDG500 Series		Speed Select
Connector Pin 2	Connector Pin 3	
No Connect	No Connect	Variable Speed*
No Connect	Battery -	Fixed Speed 1
Battery -	No Connect	Fixed Speed 2
Battery -	Battery -	Fixed Speed 3
*A 10K Variable Speed Potentiometer needs to be connected to activate.		

BEFORE BEGINNING INSTALLATION

! Disconnect all electrical power to the machine. Make sure the machine cannot operate during installation. Follow all safety warnings of the machine manufacturer. Read and follow instructions carefully.

GENERAL WIRING INSTRUCTIONS

1. For specific wiring instructions on **Connector Pins 2** & **3** for the **Samtec & Deutsch Connector** see **TABLE 2.**
2. Battery connections to **Connector Pins 1** & **5** should be 16AWG (18mm^2) or larger. Long cables require an increased wire size to minimize voltage drops.
3. Battery positive(+) input to **Connector Pin 1** should be fused for 15A.
4. The Magnetic Speed Sensor connections to **Connector Pin 11** on the ***SDG510, SDG512 & SDG514*** and **Connector Pin 8** on the ***SDG511 & SDG513*** must be twisted and/or shielded for their entire length. The speed sensor cable shield should be connected to ground.
5. The shield should be insulated to insure that no other part of the shield comes in contact with engine ground, otherwise stray signals may be introduced into the ***SDG500 Series*** causing erratic operation.
6. Connect the **Actuator Connector** to the connector on the actuator (**SDG510, SDG512, SDG511 & SDG513 only**).

DIAGRAM 4. WIRING DIAGRAM SDG510/512

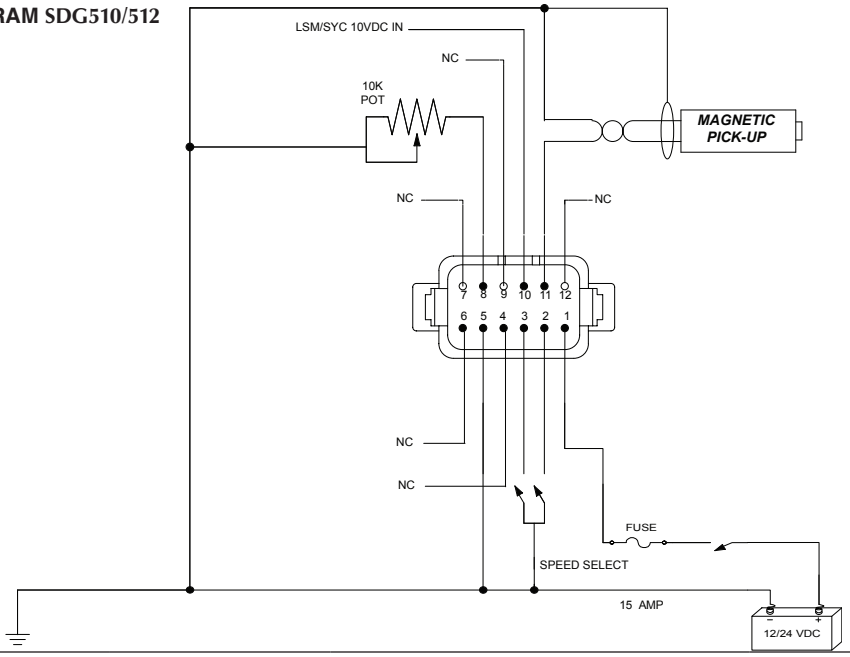


TABLE 3.

Deutsch Connector SDG510 and SDG512			
Connector Pin #	**Description**	**Comment**	**Recommended Wiring**
1	**+12 / 24 VDC Input Power**	Supplies power.	16 AWG
2	**Speed Select 1**	See **Table 2.** for Speed Select Settings	20 AWG
3	**Speed Select 2**	See **Table 2**. for Speed Select Settings	20 AWG
4	**No Connection**	No Connection	NC
5	**Input Power Ground**	Ground (to chassis) for the 12 / 24 VDC Input Power	16 AWG
6	**No Connection**	No Connection	NC
7	**No Connection**	No Connection	NC
8	**POT Input**	Input for 10K Potentiometer for Variable Speed Control	20 AWG
9	**No Connection**	No Connection	No Connection
10	**0-10 VDC Input**	Input for communication of LSM/SYC	20 AWG
11	**MPU +**	MPU speed signal input	Shielded/Twisted Pair
12	**No Connection**	No Connection	NC

DIAGRAM 5. WIRING DIAGRAM SDG511/513

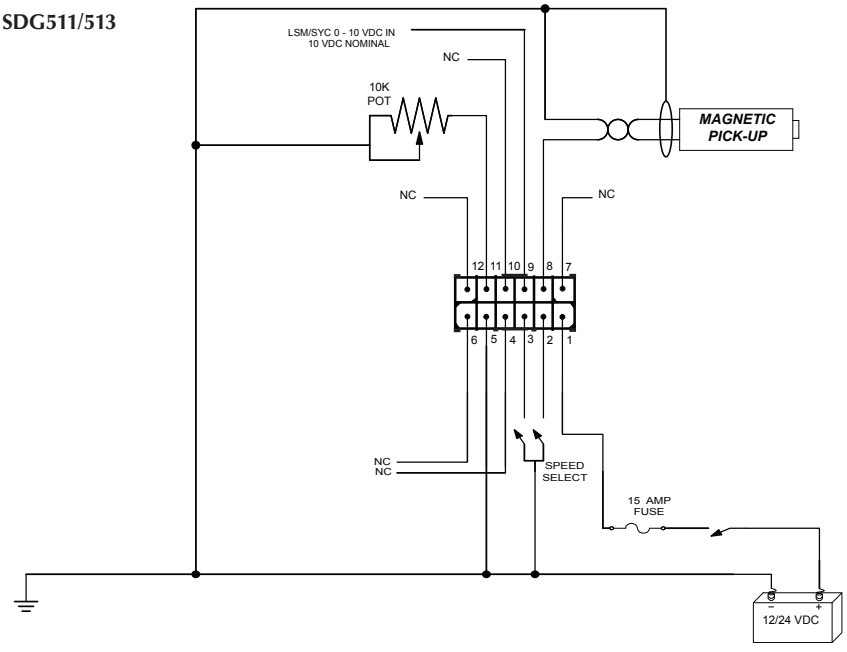


TABLE 4.

Samtec Connector SDG511 and SDG513			
Connector Pin #	**Description**	**Comment**	**Recommended Wiring**
1	+12 / 24 VDC Input Power	Supplies power.	16 AWG
2	Speed Select 1	See **Table 2.** for Speed Select Settings	20 AWG
3	Speed Select 2	See **Table 2.** for Speed Select Settings	20 AWG
4	No Connection	No Connection	NC
5	Input Power Ground	Ground (to chassis) for the 12 / 24 VDC Input Power	16 AWG
6	No Connection	No Connection	NC
7	No Connection	No Connection	NC
8	MPU +	MPU speed signal input	Shielded/Twisted Pair
9	0-10 VDC Input	Input for communication of LSM / SYC	20 AWG
10	No Connection	No Connection	NC
11	POT Input	Input for 10K Potentiometer for Variable Speed Control	20 AWG
12	No Connection	No Connection	NC

DIAGRAM 6. WIRING DIAGRAM SDG514

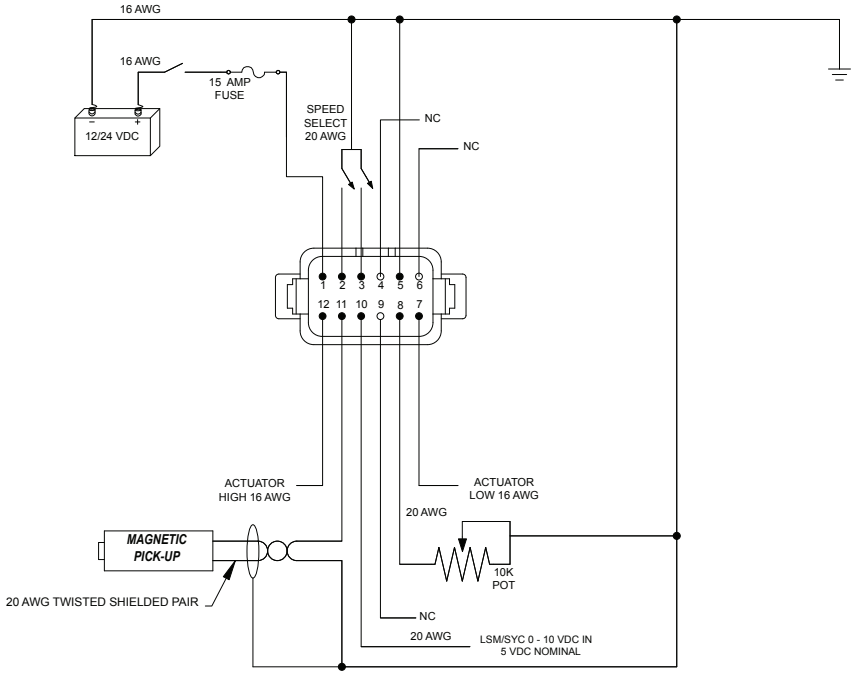


TABLE 5.

Deutsch Connector SDG514			
Connector Pin #	**Description**	**Comment**	**Recommended Wiring**
1	+12 / 24 VDC Input Power	Supplies power.	16 AWG
2	Speed Select 1	See **TABLE 2.** for Speed Select Settings	20 AWG
3	Speed Select 2	See **TABLE 2**. for Speed Select Settings	20 AWG
4	No Connection	No Connection	NC
5	Input Power Ground	Ground for the 12 / 24 VDC Input Power	16 AWG
6	No Connection	No Connection	NC
7	Actuator Low	Output to Actuator	16 AWG
8	POT Input	Input for 10K Potentiometer for Variable Speed Control	20 AWG
9	No Connection	No Connection	NC
10	0-10 VDC Input	Input for communication of LSM / SYC	20 AWG
11	MPU +	MPU speed signal input	Shielded/Twisted Pair
12	Actuator High	Output to Actuator	16 AWG

This bulletin is not intended to replace the Product User Guide. Refer to the **SDG500 Series** PUG4124 for complete product overview available for download at www.Governors-America.com.

TROUBLE SHOOTING

Engine will not start checklist after you stop cranking.

1. Check for battery connection, proper polarity, and proper charge.
2. Recheck **Flywheel Teeth**, **Overspeed Setting**, **Variable** and **Fixed Speed Settings**.

Engine will not start – checklist while cranking the engine.

1. Measure the battery voltage while attempting a crank. If the voltage drops below 8 Volts then the battery is not sufficiently charged.
2. Check that the actuator voltage is no less than 2 volts below than battery voltage. If the actuator voltage checks then verify the proper connection of the actuator.
3. Check **Crank Termination** setting. Typically the **Crank Termination** should be set to at least 50RPM higher than the maximum cranking speed of the engine. If possible measure the cranking RPM of the engine. You can try increasing in 100RPM increments. If engine appears to start but cuts out then the **Fuel Limit** may be too low. Try increasing the **Fuel Limit** to 100% initially to disable the **Fuel Limiting**. If the engine starts, the **Fuel Limit** will have to be reduced from 100% to more optimum level.
4. Verify the **Mag Pickup** is properly connected. If possible measure the pickup signal while the engine is cranking. The voltage must be a minimum of 0.5VRMS for proper operation.
5. If possible through the configuration software check the **Starting Fuel Limit** and the **Starting Fuel Start Point**.
6. Set fuel ramp to the shorter time of **Fuel Ramp Up** through the configuration software.

Engine Starts but not running at proper speed.

1. Check to see if the **Fixed Speed** inputs are properly configured. If one or both of the **Fixed Speed** inputs are not connected to ground the **SDG** will operate in variable speed mode.
2. Make sure the correct number if **Flywheel Teeth** is set using the configuration software.
3. Make sure the proper **Fixed Speed** is set using the configuration software.
4. Check mag pickup signal.

Engine not running at the correct **Variable Speed**

1. Make sure the **Variable Speed Potentiometer** is connected properly. Refer to the configuration section for proper setup. Verify, through the configuration software, that the MIN speed setting is less than the MAX speed setting.
2. Be sure the proper number of **Flywheel Teeth** are set.

Overspeed during load transient.

1. The **Overspeed** may be set too low. Recheck the overspeed setting.
2. The **SDG** is not tuned properly for the application. Try retuning the **SDG.**

Overspeed during speed changes.

1. **Overspeed** setting may be too low. Recheck the **Overspeed** setting.
2. **Speed Ramp** setting is set too low. Increase the **Speed Ramp** setting. This will cause the engine to accelerate more slowly

SPECIFICATIONS

Performance

Isochronous Operation/Steady State Stability	±0.25%
Speed Range/Governor	400-10KHz
Speed Drift w/ Temp	< ± 1% Max.
Idle Adjust	Full Range
Droop Range	1-17% Regulation
Speed Trim Range	± 5% of Rated Speed

Environmental

Ambient Operating Temperature Range	-40° to +85°C (-40° to +180°F)
Relative Humidity	Up to 95%

Reliability

Vibration	7G @ 20-100Hz
Testing	100% Functionally Tested

Input/Output Parameters

Supply	12 - 24 VDC Battery Systems (6.5VDC to 33VDC)
Polarity	Negative Ground (Case Isolated)
Ground Power Consumption	70 mA max. Continuous plus actuator current
Speed Sensor Signal	0.5-120 VRMS
Actuator Current	7 Amps continuous
Load Share/Synchronizer Input	0-10VDC

Configuration Parameters

Flywheel Teeth	50-250
Range (Gain/Stability multiplier)	1-10
Fixed Speed Settings*	0-max RPM
Variable Speed Settings*	0-max RPM
Overspeed Setting*	0-max RPM
Starting Fuel Preset*	0-max Fuel

* Maximum RPM is based on the Flywheel Teeth. RPM = Frequency x 60/Flywheel Teeth. Maximum Frequency is 10,000Hz.