InGovern Series

Electronic Engine Speed Governor

Instruction manual

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Version:	3.9
Edition:	30.01.2022
PC Software Version:	3.0.0.97
Firmware Version:	2.28
Hardware Version:	E

HUEGLI TECH AG (LTD) Switzerland

Support Matrix

	PC software version **< 3.0.0.81**	PC software version **>= 3.0.0.81**
Firmware version **<2.23**	✔️	✔️
Firmware version **>=2.23**	❌	✔️

Table of contents

1 Installation declaration (for an incomplete machine)
Installation declaration
(Directive 2006/42/EC, Appendix II B)

The manufacturer: Huegli Tech Murgenthalstrasse 30 4900 Langenthal Switzerland

hereby declares that the incomplete machinery:

General description: InGovern Series

complies with the basic health and safety requirements of machinery directive 2006/42/EC Appendix I.

The special technical documents in compliance with Appendix VII part B have been produced.

The incomplete machine corresponds with the following other EC directives:
  Low tension directive 2006/95/EC

The following harmonised norms were applied:
  EN ISO 12100-1; EN ISO 12100-2; EN ISO 14121-1;

Authorised representative for creation of the technical documents:
  M. Gutierrez Murgenthalstrasse 30 4900 Langenthal

The special technical documents are transmitted in electronic form as required by individual state offices.

Operating the incomplete machine is not permitted until the incomplete machine is built into a machine that conforms to the provisions of the machinery directive and an EC conformity declaration in compliance with Appendix II A is provided.

Langenthal 01.05.2015   Huegli Tech AG,

Dr. Marcos Gutierrez   Huegli, Daniel
Technical Manager   President
Gas Systems

2 General

2.1 Introduction

The InGovern Series electronic engine speed governor consist of models suitable for both diesel and gas engines. Its digital processing capability not only provides flexibility in configuration but also allows CAN J1939 data exchange with many modern controllers. The unit will internally convert the signal from a standard inductive flywheel pick-up to an RPM value, display it on the 4-digit LED display and send it as a standard J1939 value to a connected controller.

The unit's desired speed can also be set by standard J1939 SpeedUp/SpeedDown commands over the CAN Bus connection as well as by a conventional 0-10V synchronizing and load sharing signal input. This J1939 integration simplifies the wiring thus saving installation time and also allows implementation of more sophisticated controller features.

InGovern smart speed controllers are fully potted for sealing and vibration resistance and suitable for mounting on or close to a running engine. They provide precise (<0.25%) isochronous rotational speed control.

The unit is supplied pre-configured and once the number of flywheel teeth is input (1 x press of [Fn] button then [+] or [-] until the correct value is displayed) then the engine will run. All parameters are stored in non-volatile memory.

Fine tuning of the main PID loop and other common features can be done using the same 3 buttons on the front panel. The supplied PC software (which connects via a standard USB cable – no dongle required) provides an overview of all settings, allows user-friendly PID adjustment on a running engine and allows access to secondary parameters including a second PID loop. The final configuration can be saved and downloaded to other similar units for multiple engine applications or for series production.

2.2 Safety instructions and Warnings

Before installing and starting the device, please read the operating instructions. These contain important notes for safety and use.

No liability can be accepted for damage arising from failure to follow the instructions or any inappropriate use.

The governor may only be used for the manner of operation prescribed in the operating instructions and only in connection with third-party devices and components recommended or installed by us or software supplied by us. Any other use shall be considered inappropriate use and will result in the voiding of all liability and warranty claims against the manufacturer.

Interventions and alterations that influence the safety technology and the functionality of the governor may be carried out only by the manufacturer. Fault-free and safe operation is conditional upon competent transport, assembly, and installation as well as qualified use and correct maintenance.
All relevant accident prevention regulations and other generally recognised technical safety and health and safety at work rules are to be observed. Fault-free functioning of the machinery and its peripheral components is only guaranteed with original accessory parts and spare parts.

The InGovern engine speed governor is robust enough to be placed in a control cabinet with other operating control devices or installed on the motor. If water, mist, or condensation can come into contact with the controller, it should be mounted vertically, allowing the liquid to flow away from the controller. Extremes of heat should be avoided.

2.2.1   Overspeed protection

i	**IMPORTANT**
	An overspeed shut down mechanism must be installed separately from the control system as a safety measure, to prevent motor faults that may result in damage or injury to machinery or persons. A secondary shut down device (fuel valve) must be installed.

2.2.2   Safety protection

i	**IMPORTANT**
	• Protective Earth (PE) must be connected with Battery Minus terminal always.
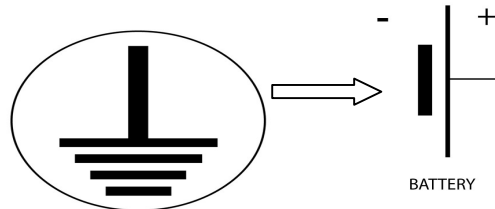
2.3   Guarantee terms and conditions

2.3.1   Correct use

The device is intended for exclusive use under the conditions described in the "Technical Data" rubric. Other uses are potentially dangerous. Huegli-Tech AG cannot accept liability for damage which results from incorrect use or application other than that for which it was intended.

2.3.2   Use of Accessories

Accessory parts may be installed or added only when they have been explicitly authorised by Huegli Tech AG. Any claims under guarantee, warranty or product liability shall be void if other parts are used.

The general guaranteed terms and conditions of Huegli Tech AG shall apply.

3 Installation and connection

3.1 General Features

Governor Type/ Features	SG50	SG100	SG100H	SG200	SG300
Actuator Driver Type	Spring Loaded	Spring Loaded	Spring Less	Spring Loaded	Spring Loaded
Overspeed Setting	4000rpm Fixed	✔	✔	✔	✔
Speed &Fuel Ramp	1sec Fixed	✔	✔	✔	✔
Start Fuel and Fuel limit	100% Fixed	✔	✔	✔	✔
Speed2 Selection	✖	✔	✔	✔	✔
Speed3 Selection	✖	✔	✖	✖	✔
Variable Speed using POT	✖	✔	✖	✔	✔
Variable Speed using external Input: 0-10VDC	✖	✔	✔	✔	✔
Actuator Control Frequency Selection	✔	✔	3.9kHz Fixed	✔	✔
Over Speed & Crank Termination Relay Output	✖	✖	✖	✖	✔
Acceleration and Deceleration between speed selection	✖	✖	✖	✖	✔
Variable speed using Binary Input	✖	✔	✖	✔	✖
Position Mode	✖	✔	✔	✔	✖

3.2 General information

The magnetic RPM sensor cable should be shielded to guarantee that no electromagnetic interference can reach the engine speed governor. The shield should be on-sided on the battery negative.

To maintain the correct distance between the flywheel and the magnetic RPM sensor, the sensor must be rotated in until the flywheel clicks and then rotated out again for ¾ of a rotation. This achieves the correct spacing between flywheel and sensor. To be able to start the motor, the sensor must generate at least 1V AC RMS during the start.

SG-50/100/200

Speed2 Speed3 5K Ohm Speed Trim Idle Gain2 on/off Drooop on/off 0-10vdc + -

A	B	C	D	E	F	G	H	I
SPEED2	GND	SPEED3	+5VDC	GND	IDLE	GAIN	EXT SPEED	GND

CE
In Govern

Fn — +

ACTUATOR BATTERY PICK UP CAN DROOP
+ - - + - + LO HI
J K L M N O P Q R

Actuator Battery Pick-Up

SG-100H

Speed2 Actuator Idle Gain2 on/off Drooop on/off 0-10vdc + -

A	B	C	D	E	F	G	H	I
SPEED2	GND	FEED-BK	+5VDC	GND	IDLE	GAIN	EXT SPEED	GND

CE
In Govern

Fn — +

ACTUATOR BATTERY PICK UP CAN DROOP
+ - - + - + LO HI
J K L M N O P Q R

Actuator Battery Pick-Up

Cross-section of the battery and actuator cable at terminals L, M, J and K:

   1.5 mm^2 for 24 VDC or
   2.5 mm^2 for 12 VDC

> ## IMPORTANT
> - The pick-up must be mounted so as to sense the teeth of a full gear. The flywheel ring-gear is suitable.
> - Note: any missing teeth will negatively affect the pick-up signal.

For longer cables (>5m) the cable cross-section is to be increased appropriately to keep the voltage drop low.

- Battery positive (+) input, connection M, should be fused 10 A.
- The governor should be installed such that the housing has connection with the chassis of the control cabinet.
- The cable of the actuator must be shielded along its entire length.
- The cable of the magnetic engine speed sensor must be shielded along its entire length.
- The cable of the variable RPM speed input can be up to 5m long. For longer cables, a shielded cable must be used.
- The shielding must always be grounded such that it does not come into contact with the chassis of the machine. This is to prevent stray signals from entering the governor and causing interference. The shield must be grounded at one end.

Important: The InGovern Series is equipped with overcurrent protection on the (Terminal J & K) output to the actuator. Please note that even through overcurrent protection is in place, repeatedly subjecting the actuator output to overcurrent or short circuit condition can still result in permanent damage to the product. Overcurrent protection is activated when the digital display shows = = = =*.*

3.3 Connection terminals

<u>SG50/100/200</u>

Connection Terminal	Description	Definition
A	SPEED2	Speed selection 2
B	GND	Ground/chassis
C	SPEED3	Speed selection 3
D	+5VDC	5VDC Supply (Feedback sensor)
E	GND	Ground
F	IDLE	Idle speed selection
G	Gain	PID selection set A or B
H	EXT SPEED	Load Distribution / Synchronization
I	GND	Ground

SG-100H

Connection Terminal	Description	Definition
A	SPEED2	Speed selection 2
B	GND	Ground/chassis
C	FEED-BK	Actuator feedback
D	+5VDC	5VDC Supply (Feedback sensor)
E	GND	Ground
F	IDLE	Idle speed selection
G	Gain	PID selection set A or B
H	EXT SPEED	Load Distribution / Synchronization
I	GND	Ground

SG-50/100/100H/200/300

Connection Terminal	Description	Definition
J	Actuator +	Actuator drive supply +ve
K	Actuator -	Actuator drive supply -ve
L	Battery -	System Power supply -ve
M	Battery +	System Power supply +ve
N	Pickup -	Pickup sensor -ve
O	Pickup +	Pickup sensor +ve
P	CAN low	CAN bus LOW
Q	CAN high	CAN bus HIGH
R	DROOP	DROOP active low

SG-300

Connection Terminal	Description	Definition
A	N. O	Normally open contact
B	COM	Common contact of relay output
C	SPEED3	Speed selection 3
D	+5VDC	5VDC Supply (Feedback sensor)
E	GND	Ground
F	IDLE	Idle speed selection
G	Gain	PID selection set A or B
H	EXT SPEED	Load Distribution / Synchronization
I	GND	Ground

3.4 Electrical connection

The InGovern Series has a range of different connection options for various applications.
The following describes the applications and relevant connection configurations

3.4.1 Fixed RPM, optional with load distribution or for parallel operation with the mains

With this application, up to three fixed RPM speeds can be selected by wiring in inputs SPEED2(A) and SPEED3(C). The RPM speed can be set using the *HT Speed Governor Configuration* software and the selected speed will be highlighted in green in the software.

Speed2 Input	Speed3* Input	Active Speed				
		SG-50	**SG-100**	**SG-100H**	**SG-200**	**SG-300**
Open	Open	Speed1	Speed1	Speed1	Speed1	Speed1
Close	Open	Speed1	Speed2	Speed2	Speed2	Speed1
Open	Close	Speed1	Speed3	Speed1	Speed1	Speed3
Close	Close	Speed1	Speed3	Speed1	Speed2	Speed3

*_Speed3 not applicable for SG100H_*

Synchronization

SG-100/SG-200*   ### SG-300
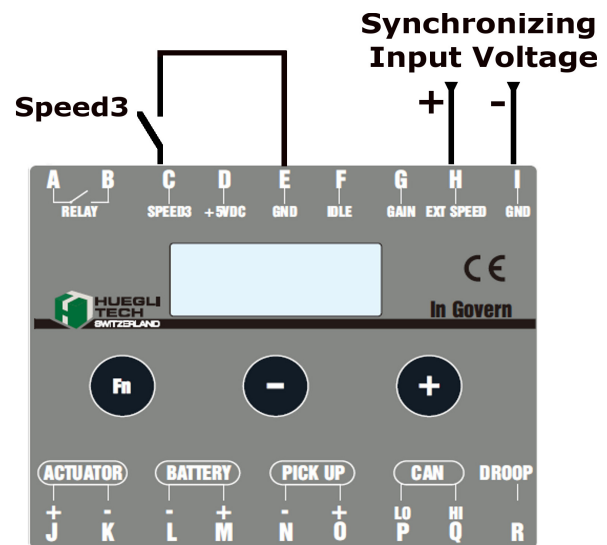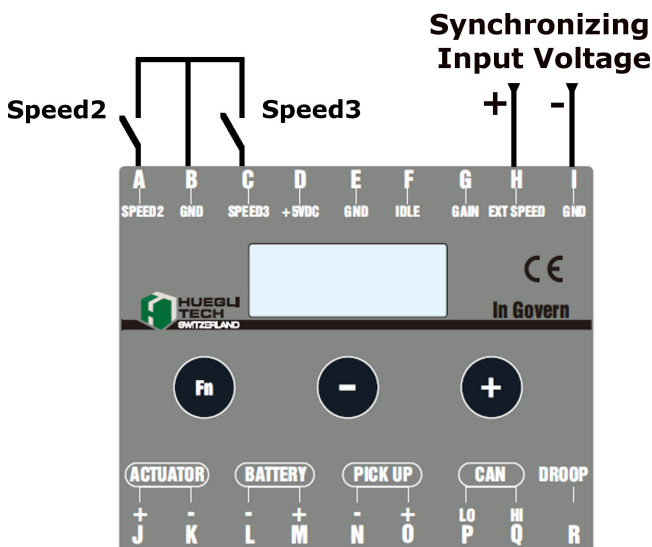
*Note: Speed3 is not available on SG200 & SG100H

If a load distribution and/or synchronisation/load control (for parallel operation with the mains) is additionally required, this can be achieved by wiring in the input EXT SPEED.

Here a signal of 0 – 10 V DC (zero point = Bias voltage) is required. The InGovern Series can work on both negative or positive principle depends on the configuration. The Sync/Load Sharing functions must be activated using the *HT Speed Governor Configuration* software.

Example

1. Negative speed regulation

Input Voltage (Ext Speed)	Bias Voltage	Full Scale voltage	Requested Speed
0.0V	5.0V	10.0V	1560rpm
5.0V	5.0V	10.0V	1500rpm
10.0V	5.0V	10.0V	1440rpm

2. Positive speed regulation

Input Voltage (Ext Speed)	Bias Voltage	Full Scale voltage	Requested Speed
0.0V	0.0V	10.0V	1440rpm
5.0V	0.0V	10.0V	1500rpm
10.0V	0.0V	10.0V	1560rpm

Note: This option only available on Firmware version>=2.25 and PC software >=3.0.0.81

3.4.2 Variable RPM with external voltage input (SG-50/100/100H/200/300)

Example: If for *Speed Trim DS* 1500 RPM and for *Speed Trim FS* 1799 RPM are required, these settings can be achieved variably with the external potentiometer or with the 0-10Vdc input.

Speed Trim with 0-10Vdc input
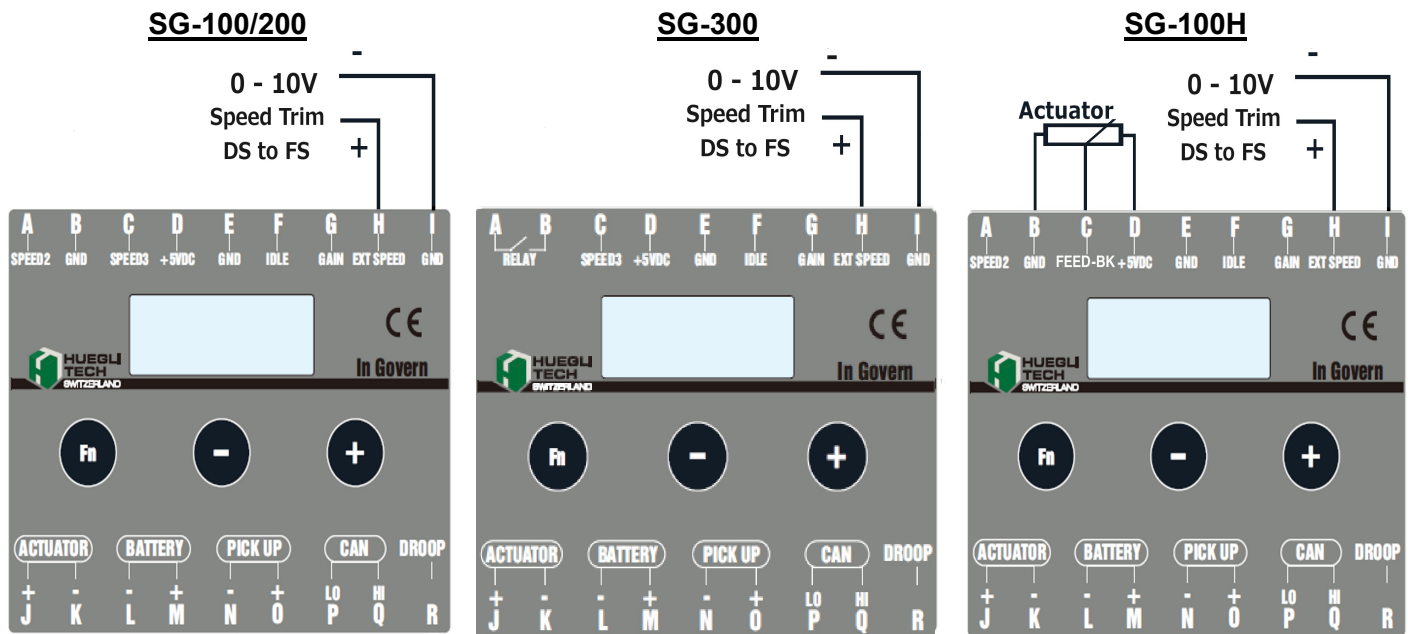
3.4.3 Variable RPM with external potentiometer (SG-50/100/200/300)

If the motor must be run with a variable Speed setting, this can be achieved with an external potentiometer (5kOhm) via Speed3 input or by a 0-10V voltage input via the Ext. Speed. This is to be connected according to the following diagram.

Variable RPM using external 5K Ohms potentiometer
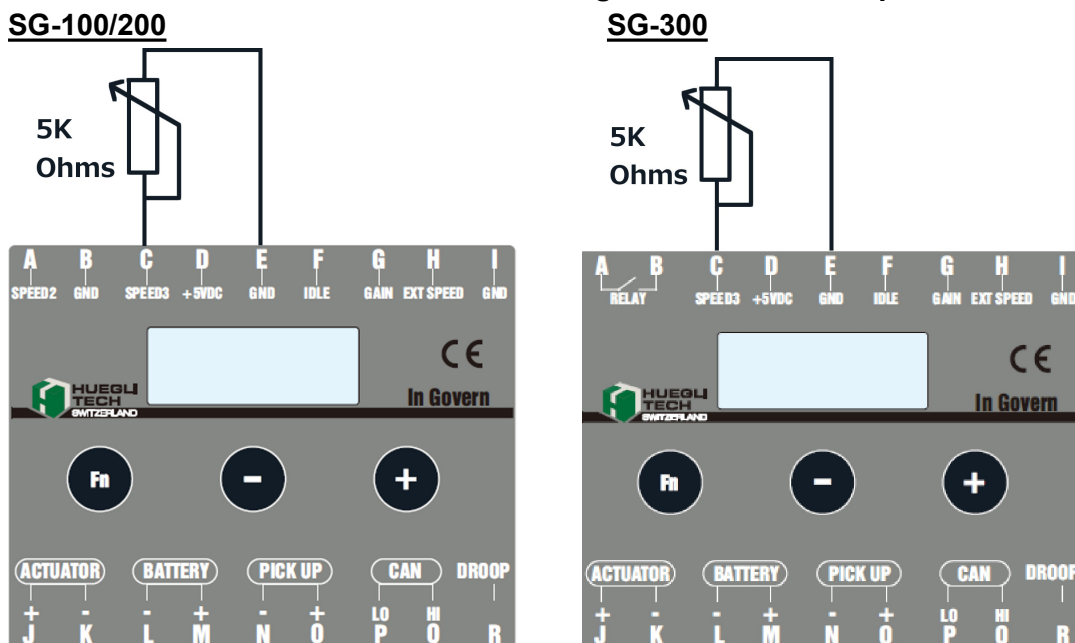
The External Speed Trim function must be activated in the *HT Speed Governor Configuration* software with the right input type chosen. In addition, the Speed Trim DS and Speed Trim FS parameters of the desired values can also be set.

3.4.4 Crank or Over speed relay (available on HT-SG300 only)

Through the Configuration Software, you can select which event (Overspeed or Crank Termination) occurrence to turn on (energise) the relay located at terminal A & B. The relay will be turned off (de-energise) when the engine comes to a complete halt (speed detected = 0 rpm).
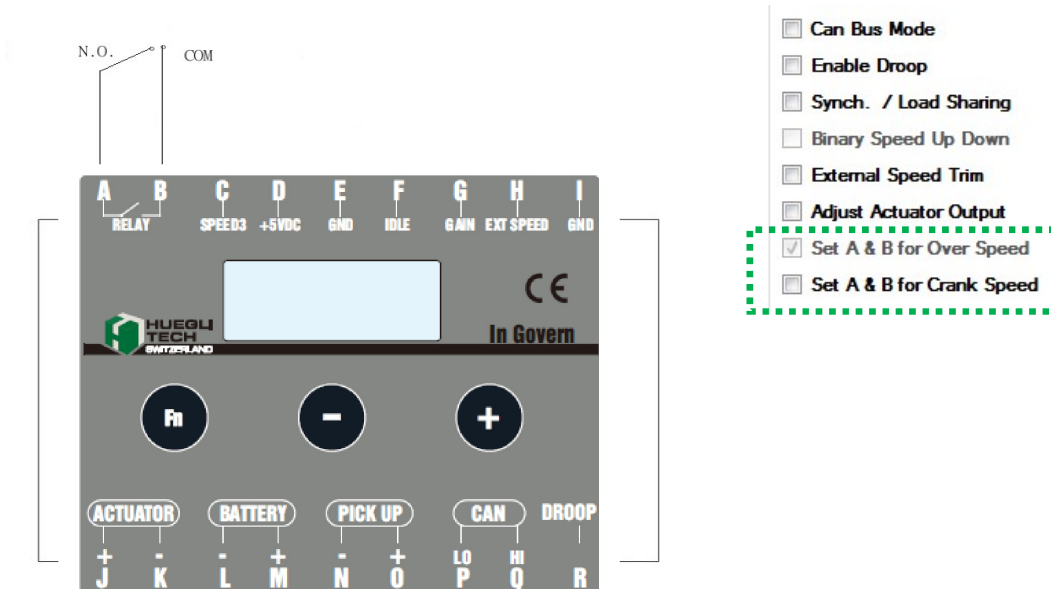
3.4.5 RPM adjustment via digital signal (available on HT-SG100/200 only)

If the speed setting is required to be set via a digital signal, this is also possible with the InGovern Series. This may be necessary during parallel operation with the mains if the motor control only   delivers digital signals for synchronisation and/or load control. The Binary Speed Up Down function in the Speed Governor Configuration software must be activated.
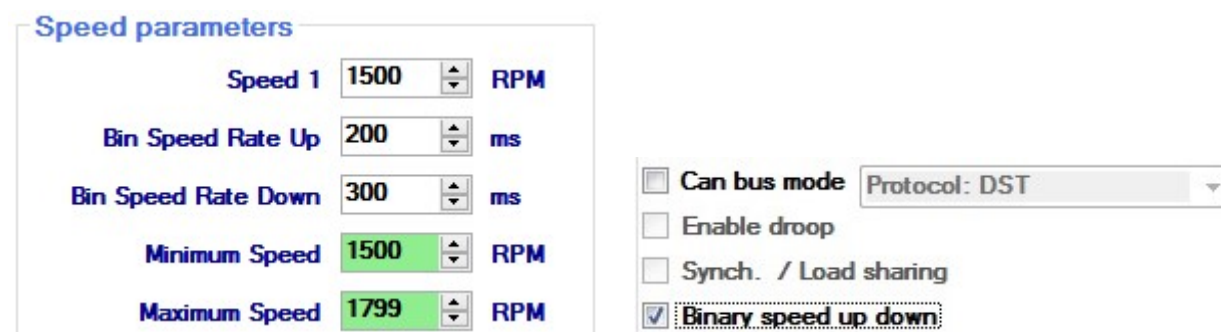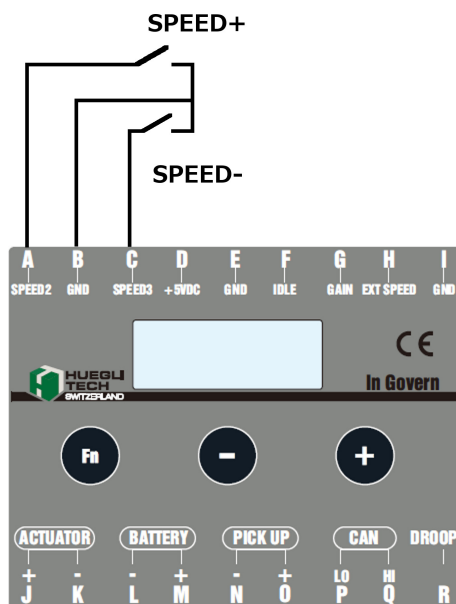
Speed2 Input	Speed3 Input	Bin Speed Rate Up (milliseconds)	Bin Speed Rate Down (milliseconds)	Requested Speed (rpm)
Open	Open	200	300	No Change in Requested speed
Close	Open	200	300	Requested speed + 1 for every 200 milliseconds
Open	Close	200	300	Requested speed -1 for every 300 milliseconds
Close	Close	200	300	No Change in Requested speed

3.4.6 RPM adjustment via digital signal with Droop (available on HT-SG100/200 only)

This feature necessary during parallel operation with the mains if the motor control only delivers digital signals for synchronisation and/or load control. The Binary Speed Up Down function in the Speed Governor Configuration software must be activated and droop input must be connected.

SPEED+

SPEED−

A	B	C	D	E	F	G	H	I
SPEED2	GND	SPEED3	+5VDC	GND	IDLE	GAIN	EXT SPEED	GND

In Govern

CE

Fn − +

(ACTUATOR)		(BATTERY)		(PICK UP)		(CAN)		DROOP
+	−	−	+	−	+	LO	HI	
J	K	L	M	N	O	P	Q	R
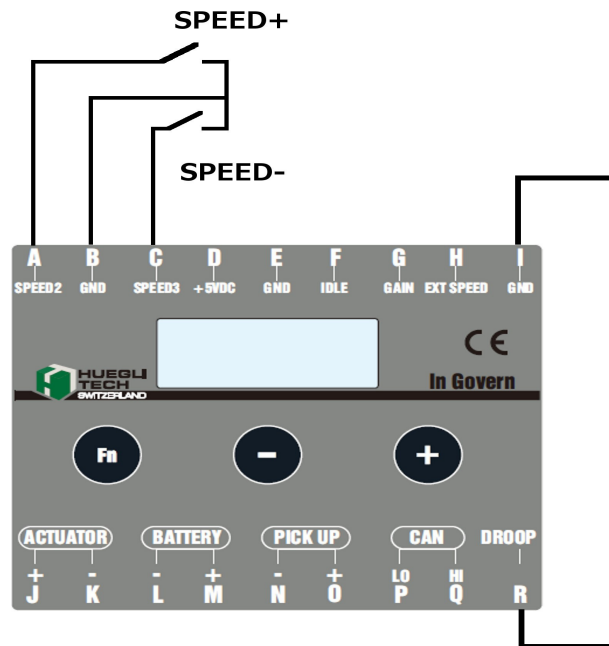
Speed2 Input	Speed3 Input	Bin Speed Rate Up (milliseconds)	Bin Speed Rate Down (milliseconds)	Speed Change (rpm)	Requested Speed
Open	Open	200	300	**X** = Requested speed	Requested Speed = **X** + (Droop% of **X**)
Close	Open	200	300	**X** =(Requested speed + 1)/200ms	
Open	Close	200	300	**X** =(Requested speed - 1)/300ms	
Close	Close	200	300	**X** = Requested speed	

3.4.7 Droop Mode using potentiometer (SG50/100/200/300)

Droop is for load sharing purpose. Droop function reduces the reference speed as load increases. It allows the engine to run at lower speed when the load increases and at rated speed at no load. Droop mode can be enabled on the InGovern series by Terminal R (Droop) to GND (Terminal I).

Depending on the software configuration, the requested speed can be change via a 5k ohms potentiometer.

3.4.8 Droop Mode using external voltage input (SG50/100/100H/200/300)

Depending on the software configuration, the requested speed can be change via the EXT Speed input. Software configuration related to **Droop** can be found in section 5.3

SG-50/100/200

5K Ohms

0 - 10V
Bias 5V

-

+

A	B	C	D	E	F	G	H	I
SPEED2	GND	SPEED3	+5VDC	GND	IDLE	GAIN	EXT SPEED	GND

CE

In Govern

ACTUATOR		BATTERY		PICK UP		CAN		DROOP
+	-	-	+	-	+	LO	HI	
J	K	L	M	N	O	P	Q	R

SG-300

5K Ohms

0 - 10V

-

+

A	B	C	D	E	F	G	H	I
	RELAY	SPEED3	+5VDC	GND	IDLE	GAIN	EXT SPEED	GND

CE

In Govern

ACTUATOR		BATTERY		PICK UP		CAN		DROOP
+	-	-	+	-	+	LO	HI	
J	K	L	M	N	O	P	Q	R

SG-100H

Actuator

0 - 10V
Speed Trim
DS to FS

-

+

A	B	C	D	E	F	G	H	I
SPEED2	GND	FEED-BK	+5VDC	GND	IDLE	GAIN	EXT SPEED	GND

CE

In Govern

ACTUATOR		BATTERY		PICK UP		CAN		DROOP
+	-	-	+	-	+	LO	HI	
J	K	L	M	N	O	P	Q	R

3.4.9   Position Mode (available on HT-SG100/100H/200 only)

The InGovern series provides a special function named position mode. When it uses, it allows the HT-InGovern Series to work like an electronic throttle control. To use this function, an actuator with feedback sensor is required. Huegli Tech's very own HT-TM2200 Actuator supports this function with its build in feedback sensor. For use with GAC actuators, Version ….-F is required. The following table shows how wiring connection between the actuators and the InGovern Series should be:

Terminal	Description	HT-TM2200 Actuator Wiring Color	GAC Actuator Wiring Color	Comments
D	+5VDC	Red	Brown	Sensor Power Supply
E	GND	Black	Green	Sensor Ground
C	SPEED3	Yellow	White	Feedback Signal

The wiring for the position mode should look like the below picture:
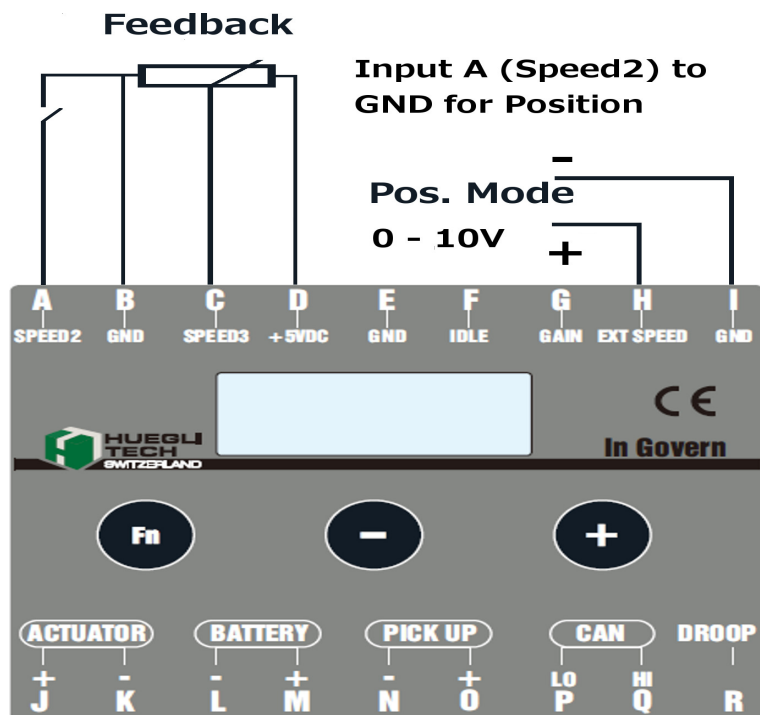
=>SPEED2 needs to be activated for position mode to be activated.

It supports for two actuator types
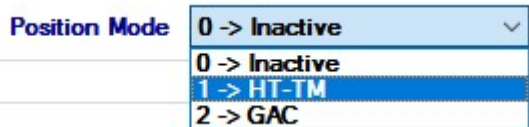
Position Voltage Configuration

Options			
BiasVoltage [Volt]	5.0	☐ Fast Speed Measurement	
FS for Synch/Load Sharing [Volt]	10.0	☑ Soft Coupling	
☑ Ext. Speed Input Positive Regulation		☐ Over Speed Latching	
☑ Over Current Shutdown (Actuator)		☑ Lead	☐ Lag

● Online

Input Voltage vs Actuator Position

Input Voltage (volts)	Bias Voltage Setting	Full-scale Voltage Setting	Speed Regulation setting	Actuator Movement range
0.0 - 5.0	5.0V	10.0V	Positive	0%
5.0 - 10.0	5.0V	10.0V	Positive	0 to 100%
5.0 - 0.0	5.0V	10.0V	Negative	0 to 100%
5.0 - 10.0	5.0V	10.0V	Negative	0%

Once the position mode is activated, the PC software will show that the position mode feature is active and PID parameter 2 will be selected.

Speed Governor Online: COM6	
File Setup Help	
Main Configuration PID Configuration	
Speed parameters	
Speed 1 1500 RPM	
Position Mode Active	
Speed 3 1500 RPM	

PID Parameters 1 — Gain(%) 44.6 Int(%) 3.5 Der(%) 30.6
PID Parameters 2 — Gain(%) 21.0 Int(%) 12.0 Der(%) 0.0

It is important to know that the PID Parameters determine the response of the actuator once the Position Mode is active.

Position Mode 1 (= Actuator HT-TM...) and 2 (= GAC Actuator with Feedback)

The Position Mode function is mainly used for Parallel-To-Mains applications. Once the engine is Synchronized to the grid there is no longer a speed governing required because the engine is "pulled "by the grid frequency.

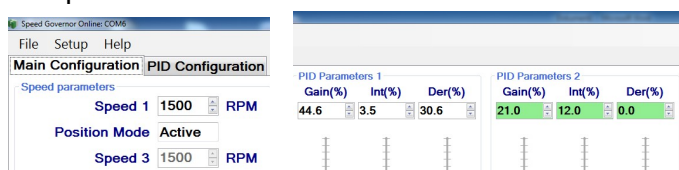On Parallel-To-Mains application. The terminals H + I (Ext. Speed) are connected to the speed regulation output of the genset controller (for example DST 4602). This signal must be set to a bias of 5 V with negative characteristic for speed regulation, it means signal < 5 V = Speed up, signal >5 V = Speed down.

Depending on the actuator the position mode 1 (actuator HT-TM…) or position mode 2 (with GAC actuator) must be selected.

As long the engine is not connected to the grid (GCB open) the InGovern Series works in normal speed governing mode (Input A open) with the signal at H + I (Ext. Speed) coming from the genset controller the engine the engine is synchronized to the grid. Once the GCB is closed the InGovern Series must be set to position mode by switching input A (Speed 2) to GND. This can be done by a free feedback contact of the GCB.

Now the InGovern Series is in Position Mode and the Load Control Signal (on Ext. Speed) from the genset controller controls the position of the actuator. The lower the voltage the further the actuator opens (negative regulation setting). If the GCB is opened and input A is switched off the InGovern Series return to normal speed governing mode.

3.5 Other Inputs (SG-50/100/100H/200/300)

3.5.1 Idle

If this contact is closed, the motor runs at the Configured idle speed.

3.5.2 Gain

The InGovern Series has two parameter sets for the PID governor.
If the contact is open, parameter set 1 is active, when the contact is closed, parameter set 2. For some applications it may be necessary to use other parameters in idle as under load.
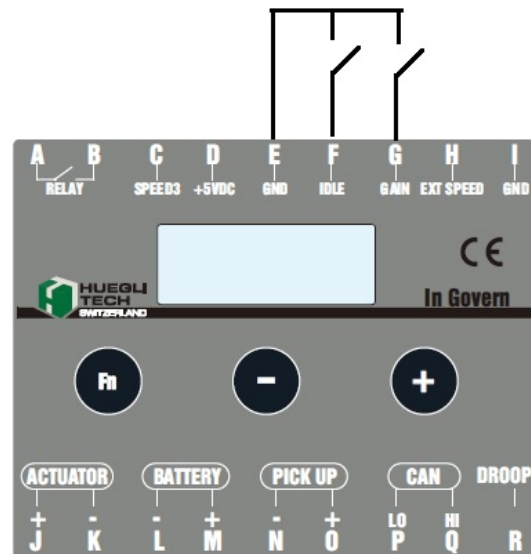
3.6 CAN BUS Connection (SG-50/100/100H/200/300)

Using the CAN Bus connection, the bus cable must be connected to the terminals Q (Can HI) and P (Can LO). If the InGovern series is the first or the last device in the bus, a termination resistor (120Ohms) is required. Shielded cable (for example, HELUKABEL CAN BUS 2x0.22) must be used for the CAN Bus connection.

The First and the last Device of the Can Bus must be Terminated by a 120 Ohms Resistor !
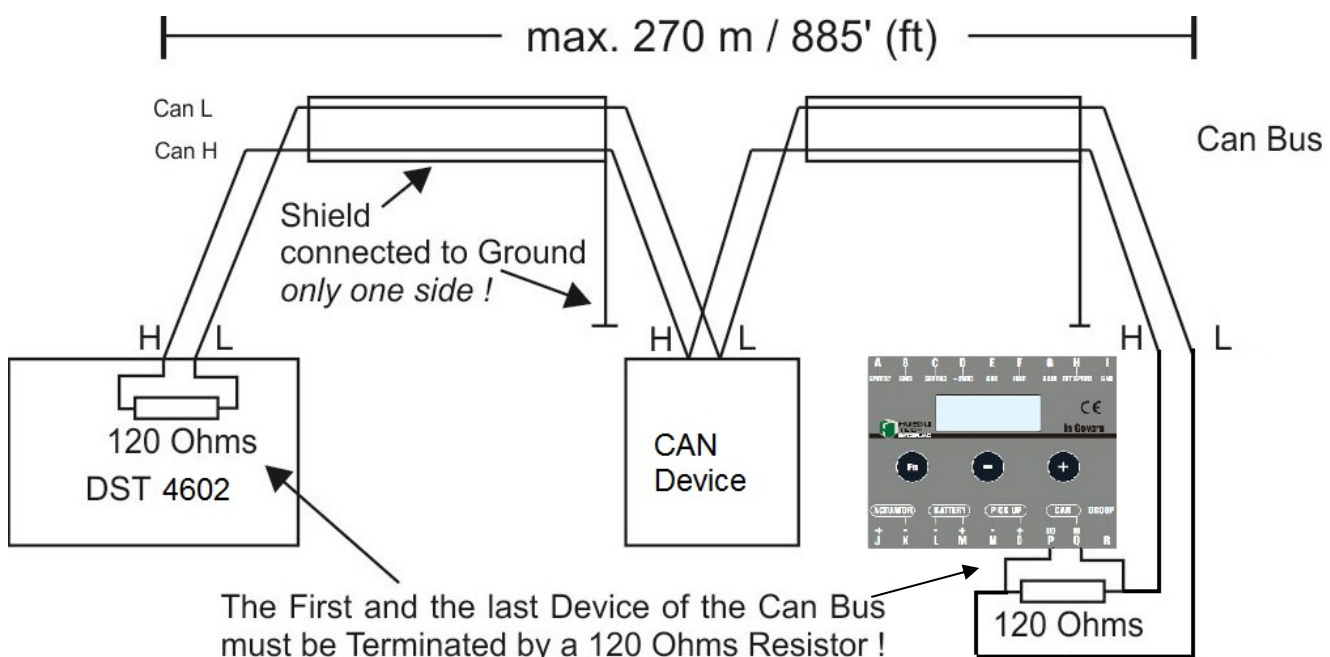
3.7   Accessing the functions by keypad (SG-50/100/100H/200/300)

The InGovern Series has three menu buttons, with which all parameters can be set locally. The set values are indicated on the LED display. In normal operating mode, the RPM is indicated on the display.

SG-100/200
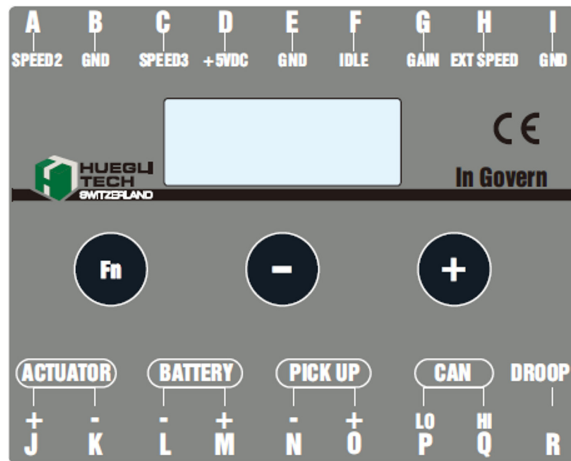
SG-300

SG-100H

The keypad are locked by default to prevent any accidental misconfiguration. To lock or unlock the keypad, Press & Hold [Fn] and [+] button for 3 seconds to lock/unlock.

The functions listed below can be accessed using the Fn (Function) button. Each press of the Fn button makes the next menu active. The active menu is shown on the LED display for 2 seconds, after which the relevant value of this function appears. Settings are changed with the arrow keys [+] [-] and raise/lower the value by 1 or 0.1 depending on configuration type. If the arrow keys [+] or [-] held down longer, the value increases or decreases at a greater rate.

Regular Mode			
Normal operating mode	1 5 0 0	RPM	Default: 1500rpm
Press & Hold [Fn] and [+] button for 3 seconds to unlock			
After 3 seconds	S p d. 1	Speed1, Speed2, Speed3, Idle speed & Speed trim can be selected by hardware to adjust here	Default: 1500

[Fn] button:1x press	G E A r / 5 0	Number of teeth	Default: 50 teeth
[Fn] button:2x press	G A i. / 2 2. 0	P value*	Default: 22.0%
[Fn] button:3x press	i n t. / 1 0. 0	I value*	Default: 10.0%
[Fn] button:4x press	d E r. / 1 5. 0	D value*	Default: 15.0%
[Fn] button:5x press	L. t i m	PID Loop time	Default: 15ms
[Fn] button:6x press	C r A n / 2 0 0	Crankspeed	Default: 200 rpm
[Fn] button:7x press	F u. r A / 3	Fuel Ramp	Default: 3 sec.
[Fn] button:8x press	S P. r A / 1	Speed Ramp	Default: 1 sec.
[Fn] button:9x press	S t. P o / 5 0	Start Position	Default: 50%
[Fn] button: 10x press	F u e. 1 / 100	Fuel limit	Default: 100%
[Fn] button: 11x press	o. S P d / 2 0 0 0	Overspeed	Default: 2000 rpm
[Fn] button: 12x press	d r o o / 3. 0	Droop %	Default: 3.0%
[Fn] button: 13x press	C t r 1 / 90	Actuator control frequency	Default: 90Hz
[Fn] button: 14x press	1 5 0 0	RPM display	Default: 1500 rpm
[+] button: 1x press	2 0 0 0 →2 0 0 1	Increase value by 1	for all parameters
[-] button: 1x press	2 0 0 0 →1 9 9 9	Reduce value by 1	for all parameters
Press & Hold [Fn] button for 3 seconds To select Quick mode if required	q u i	To select quick mode display	to access only PID Menus
*Display of the values is dependent on input G (Gain). If this is open, parameter set 1 (Gain 1, Int 1 and Der 1) is shown; if the input is closed, parameter set 2 (Gain 2, Int 2 and Der 2) is shown.			
Quick Mode			
Normal operating mode	1 5 0 0	RPM	Default: 1500rpm
[Fn] button: 1x press	G A i. / 2 2. 0	P value*	Default: 50.2 %
[Fn] button: 2x press	i n t. / 1 0. 0	I value*	Default: 21.9 %
[Fn] button: 3x press	d E r. / 1 5. 0	D value*	Default: 7.0 %
[Fn] button: 4x press	L. t i m	PID Loop time	Default: 15ms
[Fn] button: 5x press	1 5 0 0	RPM display	Default: 1500rpm
Press & Hold[Fn] button for 3 seconds To select Regular mode if required	r E G	To select regular mode display	to access all the Menus
General Features for all Types and Modes			
Press & Hold [+] and [-] button for 3 seconds to know the firmware version	V 2. 2 5	Working firmware version	Current version
Press [Fn] and [-] button to exit from Menu display	1 5 0 0	RPM display	Default: 1500 rpm
[+] button: 1x press	2 0 0 0 →2 0 0 1	Increase value by 1	for all parameters
[-] button: 1x press	2 0 0 0 →1 9 9 9	Reduce value by 1	for all parameters
Press & Hold [Fn] and [+] button for 3 seconds to lock/unlock key pad			for all parameters
*Display of the values is dependent on input G (Gain). If this is open, parameter set 1 (Gain 1, Int 1 and Der 1) is shown; if the input is closed, parameter set 2 (Gain 2, Int 2 and Der 2) is shown.			

4   Installation of PC software

Operating system requirement is Windows XP or later.
Please ensure that you have internet access during the entire software installation process to ensure that the necessary drivers are downloaded automatically. If not, please approach the Huegli Tech Support Team for the necessary additional installer software and drivers.

Prior to installation, please also ensure that you have Microsoft Framework Version 4.0 and above already installed.

Installation of the software is carried out by running the
"HT Speed Governor Configuration Vx.x.x.xx.exe"

1. Choose the desired Language	8. Click 'Install drivers'	9. Drivers are installed. Click 'close'
2. Click 'Next'	7. Installing……	10. Click 'Finish'
3. Don't change the default location	6. Click 'Install'	11. Software Launched
4. Click 'Next'	5. Click 'Next'	12. Double click this icon for subsequent opening of software from desktop
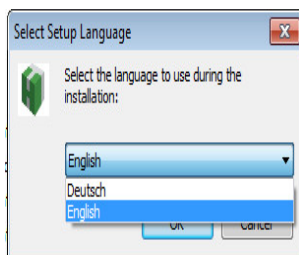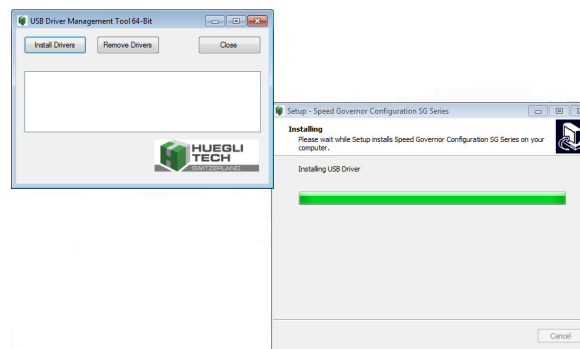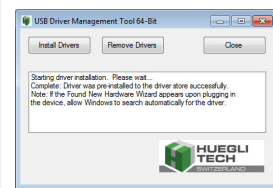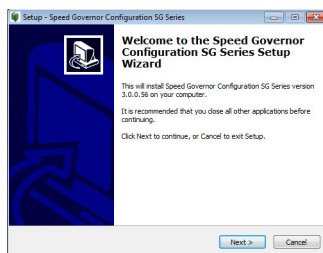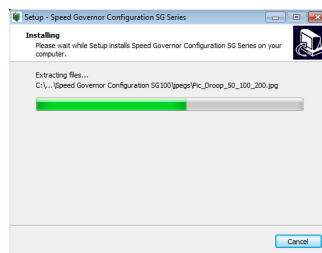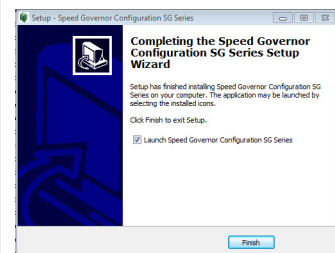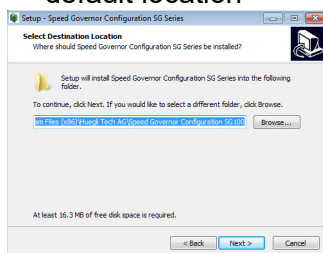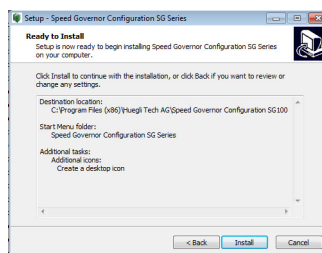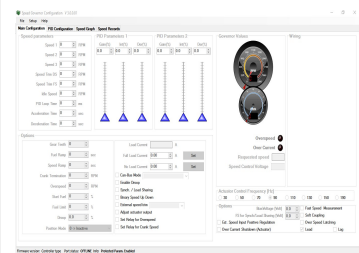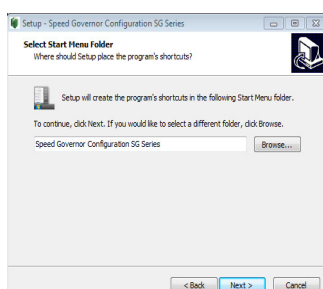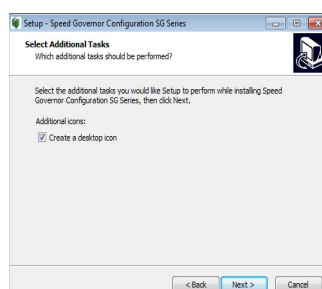
Power up the InGovern series and connect the USB (Type B on InGovern Series side) cable. Windows will search for the latest required driver online. Once it is completed, you will be notified either through a pop up message box or through a notification at the icon tray.

5 Using the Speed Governor Configuration Software

Before using the InGovern Series for the first time, the basic parameters of the InGovern Series must be configured.

5.1 Main Screen
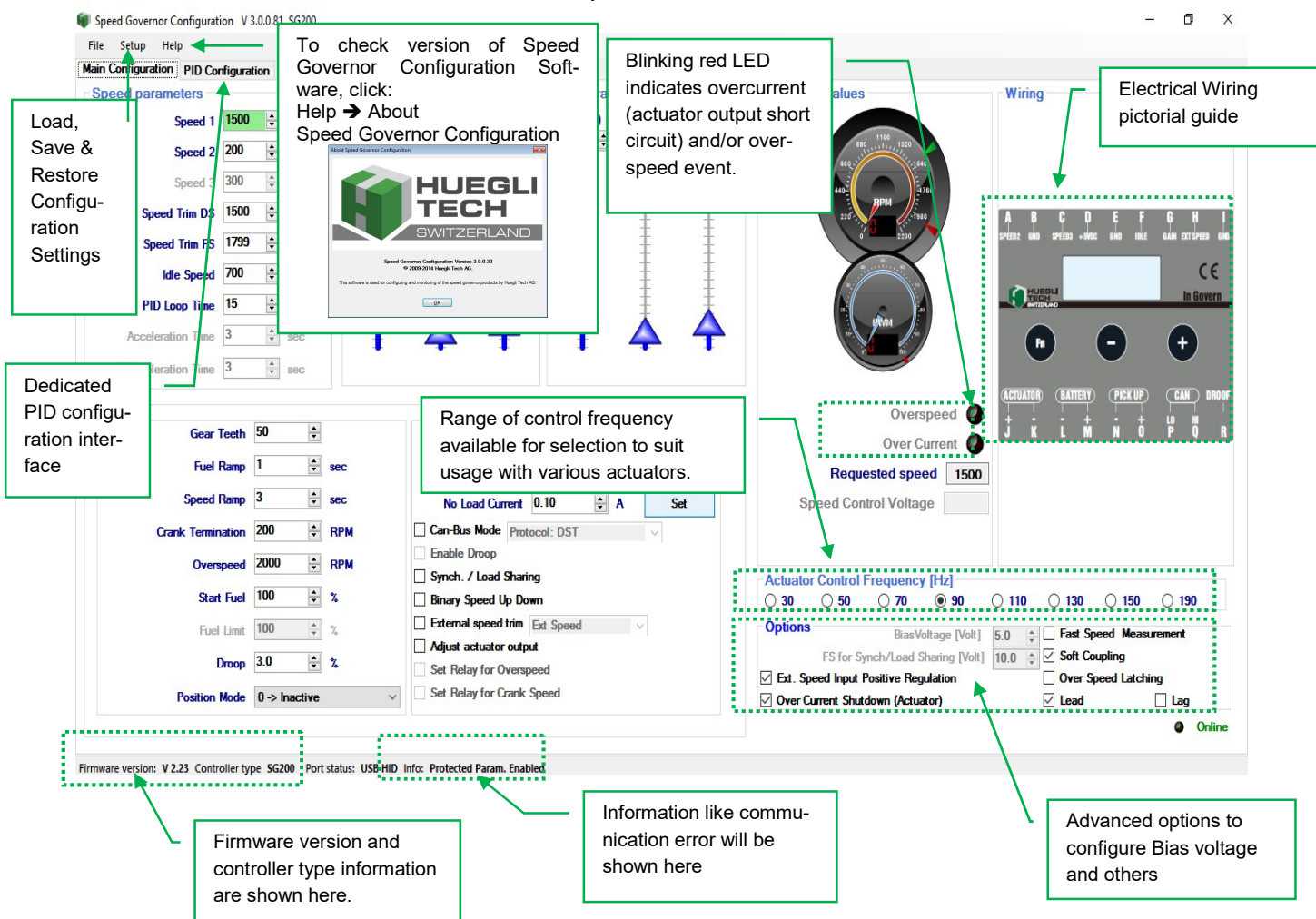
Start the software by click on the short cut icon created after installation. After the software has started, a screen appears which looks dull and faded out. This means that the PC is not yet connected to the InGovern Series.
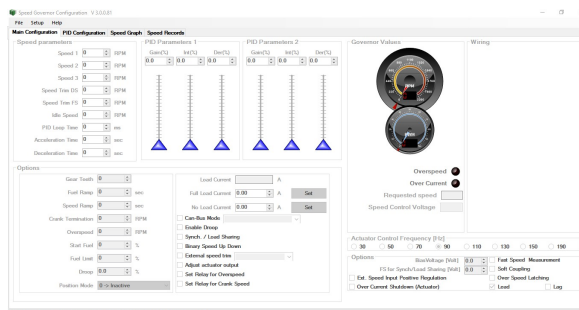
Offline Mode

If the InGovern Series is connected to the PC   and the InGovern Series will be created automatically. When the connection is successful established, the screen will look vibrant. There is a onscreen LED Indicator at the bottom right hand of the screen to Indicate that the software is now online.

The current InGovern Series configurations values will also be displayed and the configuration values can also be altered. Click on the relevant input field (current value will then be displayed blue) and use the key-pad to enter the new value. The type and firmware version of the speed governor is shown at the right bottom of the screen. To exit from the software, please click on File ➔ Exit.

Various values are represented both graphically and numerically in the Main Screen.

Nominal speed*

overspeed

Fuel/Current limit

Current RPM

Current % of output PWM for current/fuel

Nominal speed*

Requested Speed   1500
Speed Control Voltage   5.116
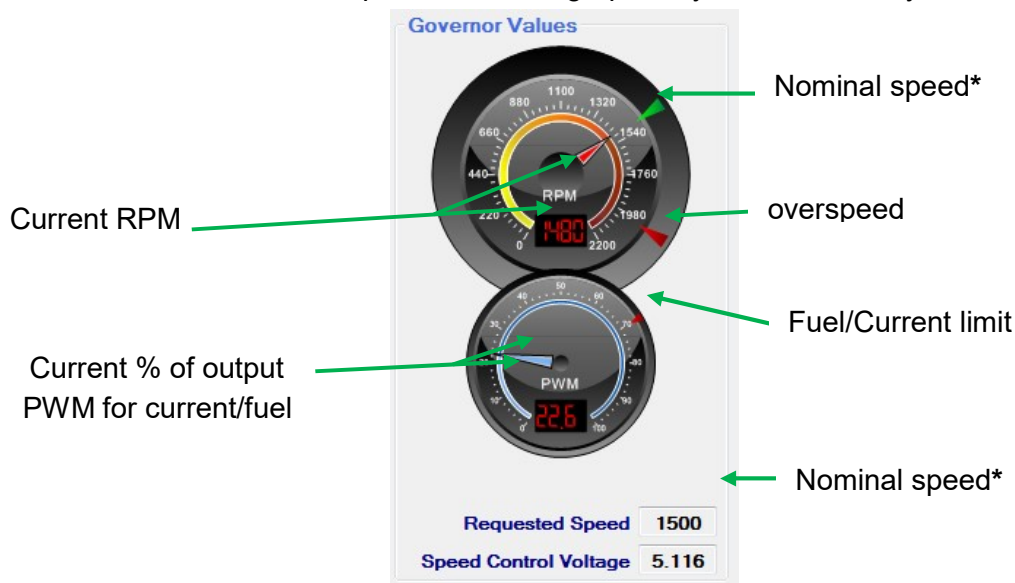
*If the Synch. /Load Sharing, Binary Speed Up Down or External Speed Trim function is activated, this value changes to reflect current speed setting. This allows monitoring of whether the external signals are functioning without fault. This is especially helpful with the Synch/Load Sharing function to monitor the corresponding signal from the motor controls.

5.1.1   Speed Related Parameters

Speed 1:   First fixed RPM, input Speed 2 open/Speed 3 open
Speed 2***/+:   second fixed RPM, input Speed 2 closed/Speed 3 open
Speed 3***/++   third fixed RPM, input Speed 2 open/Speed 3 closed
Speed Trim DS*:   lowest RPM for variable speed
Speed Trim FS*:   highest RPM for variable speed
Idle Speed: idle RPM, must be set to 600 – 700 rpm even if this function is not used; higher where required.
PID loop: interrogation cycle for PID governor

*Active only when External Speed Trim is selected
*** Not available on SG50
+Not available on SG300
++Not available on SG200

5.1.2   Other Parameters

Gear Teeth 50	Number of teeth on the flywheel. This parameter is used to calculate the current RPM.
* Fuel Ramp 1 sec	This parameter determines the timing required to reach start position. If the current speed exceeds the crank termination speed, the speed ramp feature will take over.
* Speed Ramp 3 sec Crank Termination 200 RPM *	The speed ramp determines the following: • Ramp up timing after crank termination speed to Requested Speed • Ramp down timing Nominal(Requested) Speed to Idle Speed • Ramp up timing from Idle Speed to Nominal(Requested) Speed This value is to determine if the motor is starting or running. As soon as the motor RPM exceeds this limit, the InGovern Series switches from the start routine to PID regulation. As a guide value, an RPM of 200 – 300 rpm should be entered here. **This value must be smaller than the IDLE SPEED.**

Setting	Description
Overspeed 2000 RPM *	If the overspeed value is exceeded, the engine speed governor is switched off to stop the motor. The digital display toggle between - - - - and occurred over-speed.
Start Fuel 100 % *	Position of the actuator when the motor starts. The actuator remains in this position as long as the crank termination value (starter cut-out) is not exceeded.
Fuel Limit 100 % ***	This is the fuel/current limit of the actuator, so that under full load the actuator does not consume excessive amounts of electricity and also limits the maximum about of fuel fed. The limit should be set such that e.g. with a limit of 80, the actuator still works properly under full load condition. If this is not the case, this limit must be increased.
Droop 3.0 %	Enabled when used for parallel application. Activated by external wiring.
Full Load Current 4.50 A	Current drawn by actuator under full load conditions during droop Operation.
No Load Current 0.10 A	Current drawn by actuator under no load conditions during droop Operation
☑ **Can-Bus Mode** Protocol: J1939 ECU / Protocol: DST / Protocol: J1939 ECU	Activates Can Bus for communication with external controller.
☐ **Synch. / Load Sharing**	Activates analogue input for load distribution and/or a synchronisation/load control, see 3.4.1
☑ **Ext. Speed Input Positive Regulation** / ☐ **Ext. Speed Input Positive Regulation**	This option is valid for position mode and Synch/load sharing. If this option is selected the requested speed will get increase for the corresponding voltage input in loadsharing mode. If this option is deselected the requested speed will get decrease for the corresponding voltage input in loadsharing mode.
BiasVoltage [Volt] 5.0	This parameter is valid only for Synch/load sharing and position mode. Load sharing requested speed zero point is decided by this setting.
FS for Synch/Load Sharing [Volt] 10.0	Full scale voltage setting for synch/loadsharing mode
DS for Speed Trim [Volt] 5.0	Down scale voltage setting for External speed trim voltage input mode (Ext Speed).
FS for Speed Trim [Volt] 10.0	Full scale voltage setting for External speed trim voltage input mode (Ext Speed).
☑ **Binary Speed Up Down**	Activates digital mode for speed setting, see 3.4.5 When this mode is activated, the Speed Values are altered. The values for Bin Speed Rate UP & DOWN, Minimum Speed and Maximum Speed can be set.
☑ **External speed trim** Ext Speed / Speed3 / Ext Speed	Variable Speed setting by potentiometer or 0-10Vdc, see 3.4.3
☐ **Adjust actuator output**	This function is only active when the motor is not running. If this function is activated, the Start Position value is transmitted directly to the actuator. A visual inspection can then determine how far the actuator actually moves during the start without having to actually start the motor.

Setting	Description
** ☑ Set Relay for Overspeed ☐ Set Relay for Crank Speed	Relay at terminal A&B (Normally Open contact) will be switched on when over speed occurs and switched off when speed is zero. This parameter can be accessed only when speed is zero.
** ☐ Set Relay for Overspeed ☑ Set Relay for Crank Speed	Relay at terminal A&B (Normally Open contact) will be switched on when speed > crank speed and switched off when speed is zero. This paramter can be accessed only when speed is zero.
** Acceleration Time **25** sec	Ramp up timing required within SPEED1,2,3 switchover & Variable Speed changes.
** Deceleration Time **25** sec	Ramp down timing required within SPEED1,2,3 switchover & Variable Speed changes.
☑ Over Current Shutdown (Actuator) ☐ Over Current Shutdown (Actuator)	This option is to switch off the actuator output and stop the engine when over current or short circuit occurs on actuator output. If this option is deselected Ingovern series will not stop the engine but show only the over current Indication ====
☑ Over Speed Latching ☐ Over Speed Latching	This option is to prevent cranking the engine after overspeed occurrence. User needs to press the "Fn" key or power on/Off to reset the error otherwise display toggle between the detected overspeed and overspeed symbol ----. If this option is deselected and overspeed occurred then Ingovern series display toggle between the detected over speed and overspeed symbol ----. The next crank attempt will clear the error automatically.
☑ Lead ☐ Lag ☐ Lead ☑ Lag	PID for phase Lead compensation PID for phase lag compensation
☑ Soft Coupling	Speed measurement configuration for 2 cylinder engines
☑ Fast Speed Measurement	Speed measurement configuration for all the engines except 2 cylinder

Note: Not available on SG50
**Only available on SG300*
***Note: Not available on SG200*

5.1.3 Loading/Saving/Restoring Configuration settings

The following functions are only available when the InGovern Series is connected to the PC.

Configuration can be saved on the computer by clicking the Save Configuration Setting.

If you wish to transfer a saved configuration to another InGovern Series, click on the Load configuration menu and select the desired configuration file. The configuration will then be loaded onto the new InGovern series Unit.

A particular and very helpful function is offered by the Restore Start Up Values. If you have adjusted the InGovern Series and cannot reproduce the original values (and have not stored them), this function can be used to retrieve it. The PC software saves the settings that were stored at the time the connection was established.

```
Speed Governor Online: USB HID
File   Setup   Help
Main        Save Configuration Settings
Spe         Load Configurartion Settings
            Restore Start Up Values
            View File Configuration Settings
            Enable Protected Parameters
```
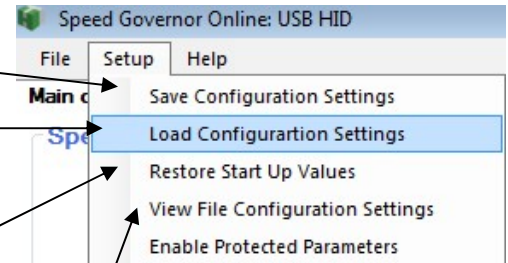
5.1.4 Viewing Configuration Settings File

To view the saved configuration file, click on View File configuration settings and you will be able to view the configured values as shown below:

```
FormConfigurationView
Controller type: 100
Firmware version: 2.04
Over speed: 2000
Start position: 50
Speed ramp: 3
Fuel ramp: 1
Crank termination: 200
Speed time FS: 1799
Speed time DS: 1500
Idle speed: 700
Speed 3: 1300
Speed 2: 1400
Speed 1: 1500
```
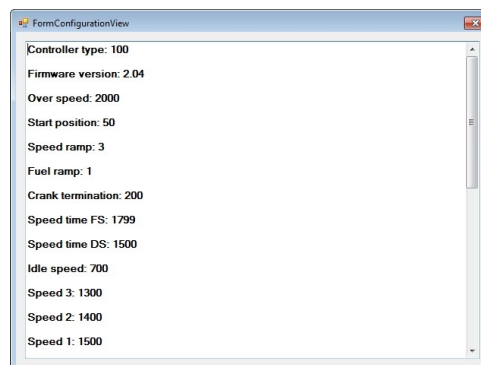
5.1.5 Password Protected Parameters

To prevent accidental misconfiguration, some of the parameters are password protected by default. These features are:

- Gain 2/Int 2/Der 2
- Actuator Control Frequency
- CAN Bus
- PID Loop Time
- Full/No Load Parameters

The password to unlock the parameters is **4900**

To unlock the parameters, Go to Setup ➔Enable Protected Parameters➔ Key in Password➔OK
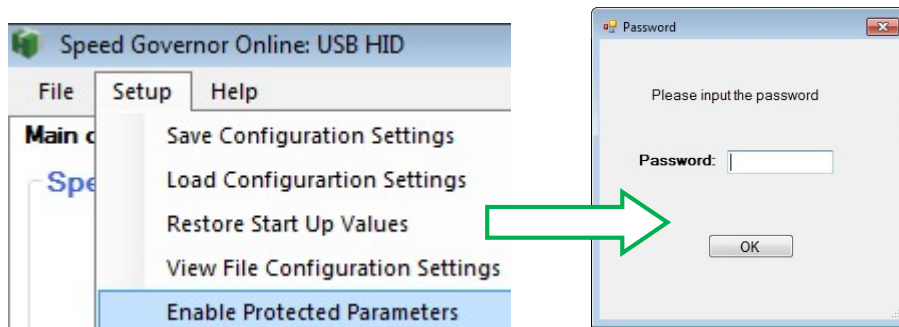
Once the protected parameters are unlocked, the screen will look like the following:
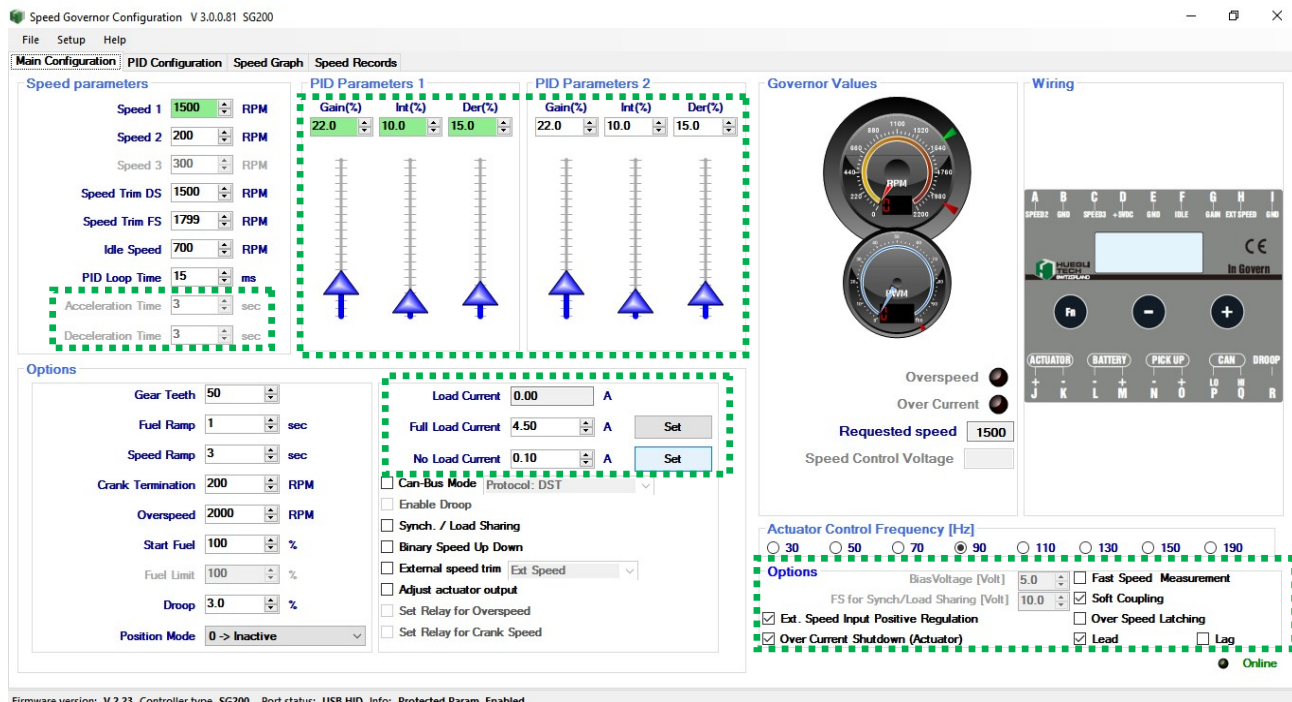
To lock the parameters, -Go to Setup ➔Disable Protected Parameters.

5.2   PID Parameters

All PID parameters are factory-preset for best overall operation performance. Depending on the individual dynamics of each engine, subsequent adjustments may be required.

For new applications, these parameters must be defined before starting the motor.

Gain 1:   P value parameter set 1 (input Gain (G) open)
Int 1:   I value parameter set 1 (input Gain (G) open)
Der 1:   D value parameter set 1 (input Gain (G) open)
Gain 2:   P value parameter set 2 (input Gain (G) closed)
Int 2:   I value parameter set 2 (input Gain (G) closed)
Der 2:   D value parameter set 2 (input Gain (G) closed)
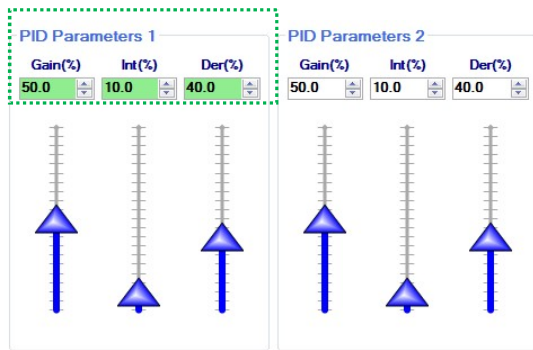
PID parameters from main configuration tab
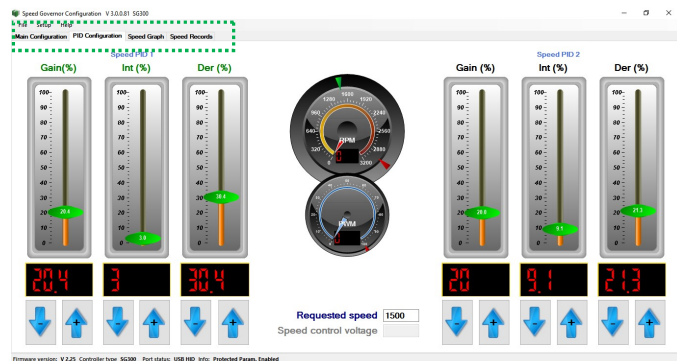
PID parameters from PID configuration tab

The currently active PID parameter (PID Parameter 1) is indicated in a green font as highlighted by the green dash light boxes. If a dedicated interface for PID adjustment is required, please select the PID Configuration Tab.

Alteration of the P, I and D parameters can be done by the following methods when the motor is active or idle:

From Main Configuration tab
- Sliding and releasing the Arrow bars.
- Clicking on the up & down arrow key next to the PID values
- Keying in the values directly into the text box and press enter

From PID Configuration tab
- Slide and releasing the green bars.

Clicking on the + & - arrow key next to the PID values

5.3   Droop

When the hardware connection required to activate droop (See section 3.3.6) is made, the Enable Droop box becomes checked.
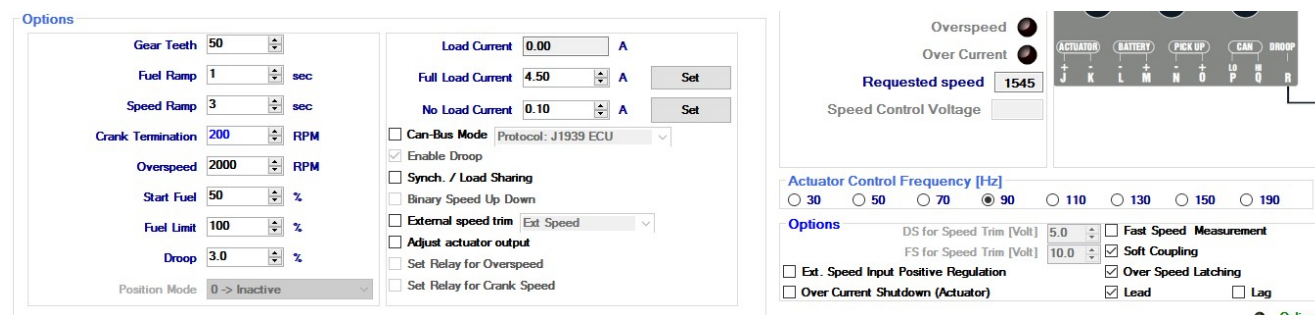
The Load current box shows the current drawn by the actuator which acts as feedback to allow the InGovern Series to know the load being drawn.

Steps to setup InGovern series to run droop function (Assuming PID settings are now optimum)
1. Key in the required droop %(Typically 3%-default value).
2. Start the motor at no load condition. Once motor stabilizes, click on Set for No load current.
3. Run the motor at full load condition. Once motor stabilizes, click on Set for Full load current.

Alternatively, you could also key in the full/no load current manually by observing the load current value.

Droop function will also work with Loading Sharing and External Speed trim. If none of these 2 features are used, by default you can connect a 5K potentiometer to the SPEED3 input (See section 3.3.6) for speed variation of +/-100rpm.

* SG100H droop working based on actuator position feedback %. Instead of no load and full load current must set no load and full load position %.

* SG100H droop cannot use external potentiometer for droop instead must use external dc input voltage 0-10V for droop adjustment.

Here are some examples on what the requested speed will be at various running load:
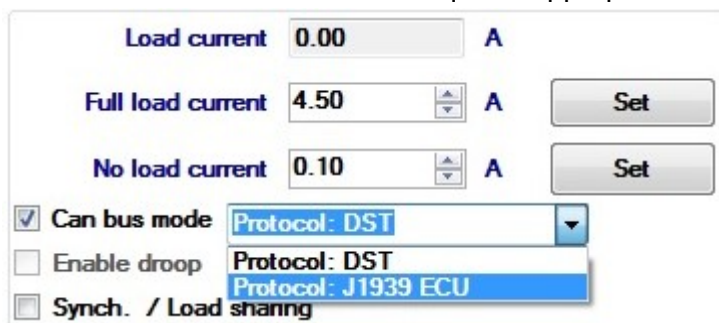
Selected Reference-SPEED1	1500	RPM
Full Load Current Setting	4.5	A
No Load Current Setting	0.1	A
Load Current Reading	0.1	A
Droop	3.0	%
Requested Speed	**1545**	RPM

Selected Reference-SPEED1	1500	RPM
Full Load Current Setting	4.5	A
No Load Current Setting	0.1	A
Load Current Reading	4.5	A
Droop	3.0	%
Requested Speed	**1500**	RPM

Selected Reference-SPEED1	1500	RPM
Full Load Current Setting	4.5	A
No Load Current Setting	0.1	A
Load Current Reading	2.5	A
Droop	3.0	%
Requested Speed	**1525**	RPM

5.4   CAN Bus

The CAN bus protocol available on the InGovern Series are J1939 ECU & DST. Click on the Can Bus Mode check box and select the required appropriate CAN Bus protocol.

5.4.1   Supported J1939 ECU CAN Bus Register

Communication Messages

CAN Communication (Genset controller ➔ SG100)

PGN FEE4							
SG100 Designation	J1939 Designation	Byte	Data Range	Resolution	Offset	Unit	SPN
Shutdown Command	Engine protection system approaching Shutdown	Byte 5.3 & 5.4	0 – 1	-	-	On/off	1109
1=Shutdown, 0= Run							

CAN Communication from SG100 to Genset Controller(DM1 Messages)

PGN FECA
SG100 Failure Designation: Overspeed
J1939 Designation: Engine Speed

Byte#	Bits assignment & description	Values(Dec)	Data Range	Resolution	Unit
1	bits 8-7 Malfunction Indicator Lamp Status	00			
	bits 6-5 Red Stop Lamp Status	01			
	bits 4-3 Amber Warning Lamp Status	00			
	bits 2-1 Protect Lamp Status	00			
2	bits 8-7 Reserved for SAE assignment Lamp Status	00			
	bits 6-5 Reserved for SAE assignment Lamp Status	00			
	bits 4-3 Reserved for SAE assignment Lamp Status	00			
	bits 2-1 Reserved for SAE assignment Lamp Status	00			
4 to 3	SPN (16 most significant bits)	701			
5	Bits 8-6 SPN (3 most significant bits)		0 - 524,287	1	SPN
	bits 5-1 FMI	3	0-31	1	FMI
6	bit 7-1 Occurance Count	Variable	0-126	1	count

PGN FECA
SG100 Failure Designation: Fuel Limit Reached
J1939 Designation: Engine Throttle Position

Byte#	Bits assignment & description	Values(Dec)	Data Range	Resolution	Unit
1	bits 8-7 Malfunction Indicator Lamp Status	00			
	bits 6-5 Red Stop Lamp Status	00			
	bits 4-3 Amber Warning Lamp Status	01			
	bits 2-1 Protect Lamp Status	00			
2	bits 8-7 Reserved for SAE assignment Lamp Status	00			
	bits 6-5 Reserved for SAE assignment Lamp Status	00			
	bits 4-3 Reserved for SAE assignment Lamp Status	00			
	bits 2-1 Reserved for SAE assignment Lamp Status	00			
4 to 3	SPN (16 most significant bits)	562			
5	Bits 8-6 SPN (3 most significant bits)		0 - 524,287	1	SPN
	bits 5-1 FMI	51	0-31	1	FMI
6	bit 7-1 Occurance Count	Variable	0-126	1	count

PGN FECA
SG100 Failure Designation: Pickup Fault
J1939 Designation: Engine Timing Sensor

Byte#	Bits assignment & description	Values(Dec)	Data Range	Resolution	Unit
1	bits 8-7 Malfunction Indicator Lamp Status	00			
	bits 6-5 Red Stop Lamp Status	00			
	bits 4-3 Amber Warning Lamp Status	01			
	bits 2-1 Protect Lamp Status	00			
2	bits 8-7 Reserved for SAE assignment Lamp Status	00			
	bits 6-5 Reserved for SAE assignment Lamp Status	00			
	bits 4-3 Reserved for SAE assignment Lamp Status	00			
	bits 2-1 Reserved for SAE assignment Lamp Status	00			
4 to 3	SPN (16 most significant bits)	637			
5	Bits 8-6 SPN (3 most significant bits)		0 - 524,287	1	SPN
	bits 5-1 FMI	7	0-31	1	FMI
6	bit 7-1 Occurance Count	Variable	0-126	1	count

5.4.2   Supported DST CAN Bus Register

The InGovern Series can communicate with Huegli Tech Controller HT-DST4602 HT controller by CAN Bus through DST protocol.

The designated port to be used on the DST4602 is CAN_0 (J11, ECU Interface). The Engine Type 200 – HT gas must be selected in menu 7, P.700 on the DST 4602.

The following setting must be entered manually into the DST 4602:

- Gain1
- Int1
- Der1
- Gain2
- Int2
- Der2
- Start Position
- Speed Ramp

Once the values have been entered into the DST 4602, the CAN bus mode can be activated. When the CAN bus mode is activated, no further access to the Controller Settings menu is possible via the PC software, as the DST 4602 setting values will now be displayed.

DST 4602 values, address 234 (EAh)
The identifier has the following appearance: 1CFF50EA and/or 1CFF51EA

PGN FF50

Designation	Byte	Data Range	Resolution	Offset	Unit
Gain 1	0 + 1	0 - 100.0	0.1	0	%
Integration 1	2 + 3	0 - 100.0	0.1	0	%
Derivative 1	4 + 5	0 - 100.0	0.1	0	%
Speed Ramp	6 + 7	1 - 100	1	0	sec

PGN FF51

Designation	Byte	Data Range	Resolution	Offset	Unit
Gain 2	0 + 1	0 - 100.0	0.1	0	%
Integration 2	2 + 3	0 - 100.0	0.1	0	%
Derivative 2	4 + 5	0 - 100.0	0.1	0	%
Start Postion	6 + 7	0 - 100	1	0	

HT-SG100 values, address 0 (0h)
The identifier has the following appearance: 14FF2100

PGN FF21

Designation	Byte	Data Range	Resolution	Offset	Unit
Speed	0 + 1	0 - 4000	1	0	RPM
Actuator Output	2 + 3	0.0 - 100.0	0.1	0	%
Speed Control Voltage	4 + 5	0 - 10000	0.001	0	V
Selected PID Set	6.0	0 - 1	1	0	
Idle Speed Selected	6.1	0 - 1	1	0	
Speed 1 Selected	6.2	0 - 1	1	0	
Speed 2 Selected	6.3	0 - 1	1	0	
Speed 3 Selected	6.4	0 - 1	1	0	
Overspeed	6.5	0 - 1	1	0	

5.5   Speed Graph

Click on the Speed Graph tab to view the RPM sensed by the pickup sensor for the past 40 seconds.
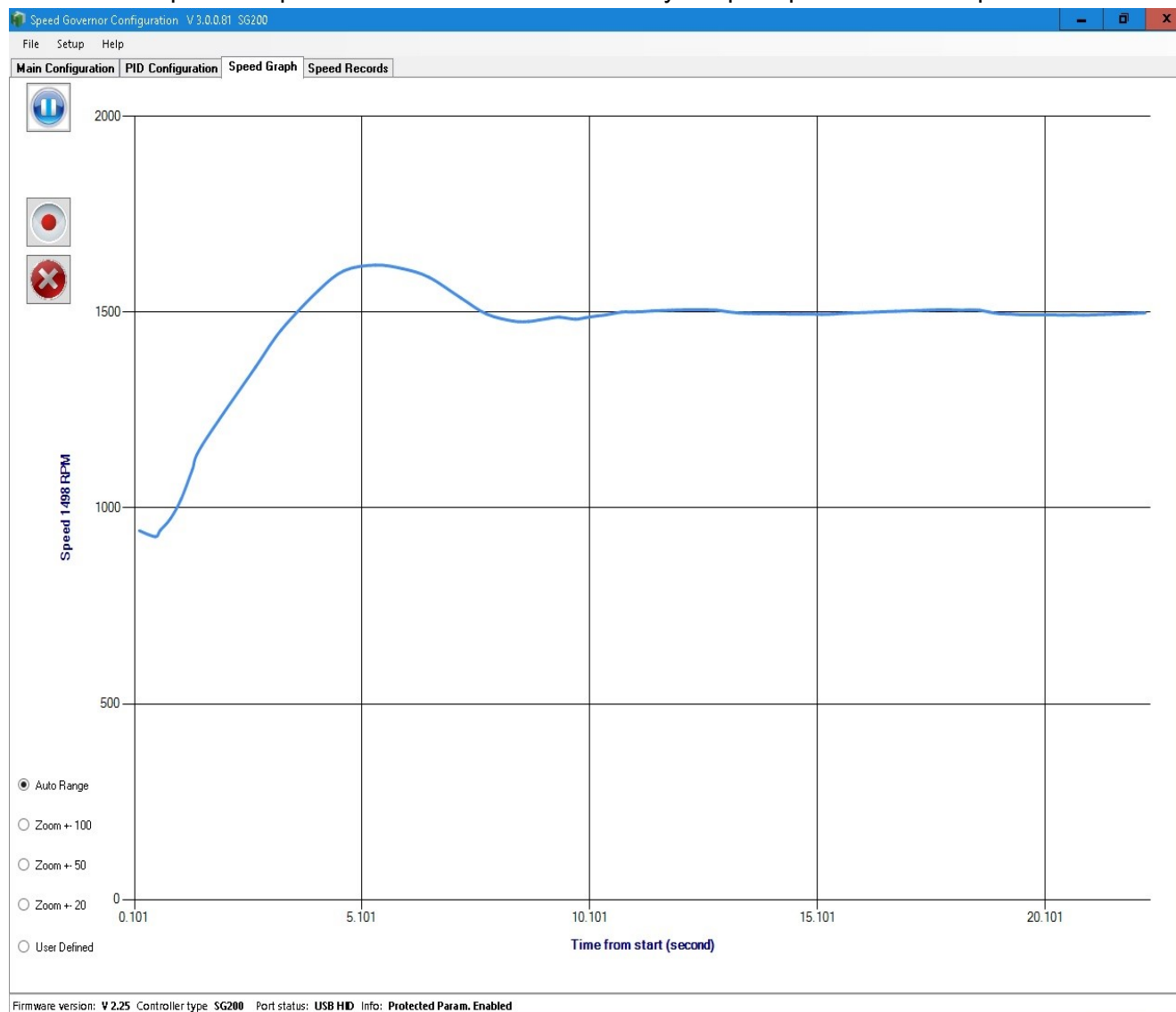
6   Dimensions
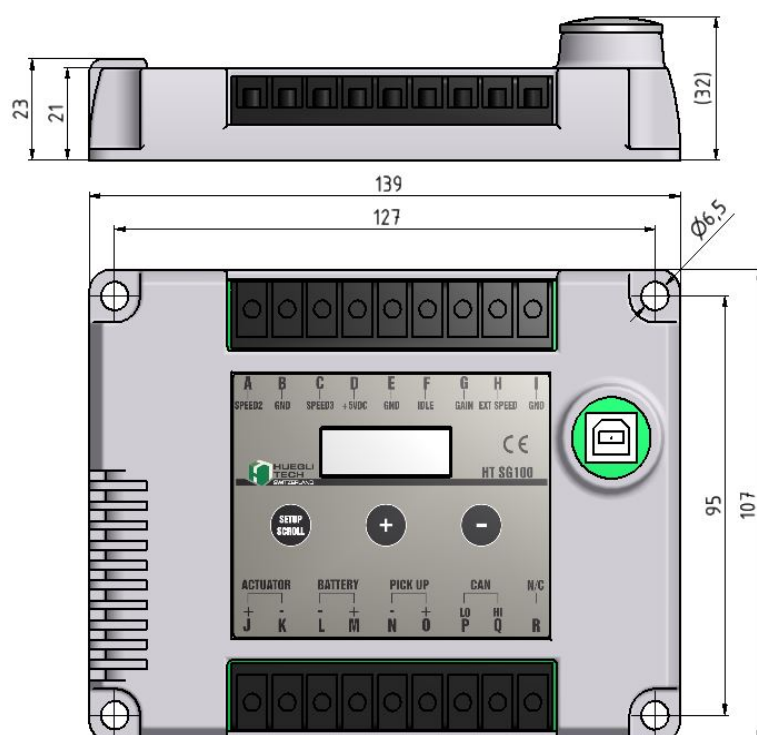
7   Starting the motor

7.1   Before starting the motor with the InGovern, follow this procedure:

a.   Turn on the power supply to the InGovern but do not start the motor.
b.   Check all the important parameters for correct values in SETUP mode:
     Number of teeth, overspeed, RPM settings, crank termination and start position.

7.2   Starting and motor tuning

The fuel supply to the motor is pre-set by the actuator according to the FUEL RAMP parameter. The Fuel Ramp controls the rate at which fuel is increased to start the motor.

If the motor fails to run in a stable fashion after starting, set the GAIN, stability and Derivative with appropriate parameters until the motor is stable.

7.3   Optimisation of dynamic settings (Tuning)

Increase the GAIN by pressing the + button until the motor oscillates, then slowly ease back by pressing the – button until the motor runs smoothly. Set Integral in the same manner.

The performance can be further optimized by monitoring the reaction time of the actuator after giving the lever several short manual taps. The GAIN and INT should be adjusted during this period to ensure the short possible reaction time is be archived.

In some cases it can be necessary to adjust the speed compensation (DER) as well.

If the motor oscillates quickly, even if the GAIN is set low, the DER can be reduced by pressing the – button.

If the motor oscillates very slowly, the DER can be increased by pressing the + button.

8 Configurable parameters, values in [ ] = factory settings

Description	Term	Definition	Range
Speed 1	Fixed RPM 1	Speed setting 1, Input Speed 2 open, Speed 3 open	0 – Overspeed rpm [1500]
Speed 2	Fixed RPM 2	Speed setting 2, Input Speed 2 closed, Speed 3 open	0 – Overspeed rpm [1400]
Speed 3	Fixed RPM 3	Speed setting 3, Input Speed 2 open, Speed 3 closed	0 – Overspeed rpm [1300]
Speed Trim DS	RPM MIN	Minimum nominal speed when function *External Speed Trim* is activated	0 – (Speed Trim FS - 10) [1500]
Speed Trim FS	RPM MAX	Maximum nominal speed when function *External Speed Trim* is activated	0 – Overspeed rpm [1799]
Bin Speed Rate UP	Rate of change in speed(increase)	Update time for nominal speed adjustment when function *Binary Speed Up Down* is activated	0 – 1500 ms [1400]
Bin Speed Rate DOWN	Rate of change in speed(decrease)	Update time for nominal speed adjustment when function *Binary Speed Up Down* is activated	0 – 1500 ms [1300]
Speed MIN	RPM MIN	Minimum nominal speed when function *Binary Speed Up Down* is activated	0 – (Speed MAX -10) [1500]
Speed MAX	RPM MAX	Maximum nominal speed when function *Binary Speed Up Down* is activated	0 – Overspeed rpm [1799]
Idle Speed	idle	RPM of *motor* when idle input is closed	0 – 3000 rpm [700]
PID Loop	PID update	Update time of the PID.	0 – 255 ms [15]
Gear Teeth	Number of teeth	Number of teeth on flywheel	50 – 255 [50]
Fuel Ramp	Fuel ramp	Time to reach start position after switching on motor	0 – 20 Sec, 0 = no ramp [1]
Speed Ramp	Speed ramp	Ramp from start to nominal speed	0 – 100 Sec [3]
Crank Termination	Starter cut-out	RPM at which the InGovern Series switches from start mode to control mode	0 – 2000 rpm [200]
Over-speed	Over-speed	Maximum RPM of the motor	0 – 4000 rpm [2000]
Start Position	Start Position	Position of actuator when switching on motor	0 – 100 % [50]
Fuel Limit	Fuel limit	Current limit for actuator	0 – 100 % [100]
Gain 1	Proportional value 1	Parameter set 1 for Proportional value of the engine speed governor, input GAIN (G) open	0 – 100 % [22.0]
Int 1	Integral value 1	Parameter set 1 for Integral value of the engine speed governor, input GAIN (G) open	0 – 100 % [10.0]
Der 1	Differential value 1	Parameter set 1 for Differential value of the engine speed governor, input GAIN (G) open	0 – 100 % [15.0]
Gain 2	Proportional value 2	Parameter set 2 for Proportional value of the engine speed governor, input GAIN (G) closed	0 – 100 % [22.0]
Int 2	Integral value 2	Parameter set 2 for Integral value of the engine speed governor, input GAIN (G) closed	0 – 100 % [10.0]
Der 2	Differential value 2	Parameter set 2 for Differential value of the engine speed governor, input GAIN (G) closed	0 – 100 % [15.0]
Droop	Droop %	Droop % for droop mode	0 – 25.0% [3.0]
Full Load Current	Full Load Current	Full Load current for droop mode	0 – 6.0A [4.5]
No Load Current	No Load Current	No Load current for droop mode	0 – 6.0A [0.1]
Acceleration Time	Acc Time	Speed Ramp Up Time	0 – 25 Sec [3]
Deceleration Time	Dec Time	Speed Ramp Down time	0 – 25 Sec [3]
Bias Voltage	Bias voltage	Bias voltage for synchronisation or load sharing for parallel operation	0 – 10.0V[5.0]
FS for Synch/Load Sharing	FS for load sharing	Full scale voltage for load sharing	0 – 10.0[10.0]
DS for Speed trim	DS for speed trim	Down scale voltage for external voltage input speed trim	0 – 10.0[5.0]
FS for Speed trim	FS for speed trim	Full scale voltage for external voltage input speed trim	0 – 10.0[10.0]

9 Correction system faults

WARNING
Disconnect the connector cable to the actuator only when power is off.

9.1 Motor does not start

Fault, LED signal	Possible cause	Check	Action
Power supply?	Voltage too low	Check voltage between connection M(+) and L(-)	Adjust power supply and polarity (min.17 V for 24V system)
	Battery and wiring	Check battery voltage during start procedure; check wiring.	Voltage drop to large because of small cable cross-section or low battery.
Display shows 0000	No signal from magnetic RPM sensor.	Measurement of voltage between terminals N and O (during start-up)	Should be min. 1.0 VRMS during start-up
	Actuator fault	Check wiring. Measure voltage at terminals J and K. Measure resistance.	See connection diagram. Note actuator specification. **Do not separate cables when the actuator is under power!**
	Fuel supply	Check if fuel is sufficient	Top up fuel if necessary
Configuration, wiring	Terminals A and C are not connected correctly.	Check wiring	If neither A nor C are connected, the InGovern series is configured for SPEED1
Engine does no start	Incorrect number of teeth		Correct setting
	Incorrect Speed setting		

9.2 Motor does not run with the correct variable RPM

Fault	Possible cause	Check	Action
Potentiometer wiring	Terminals B,C;D not correctly connected	Check wiring.	see connection diagram
	Incorrect number of teeth		Adjust setting
Configuration	Incorrect configuration		
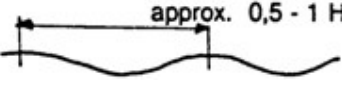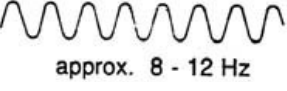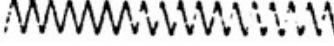
9.3 Over-speed during start process

Fault, LED display	Possible cause	Check	Action
display - - - -	Over-speed limit value set too low		Adjust value
	Tuning sub-optimal		Increase GAIN, INT. and speed ramp where required.
	Starter cut-out set too high		Adjust value

9.4 Overcurrent during start and/or engine running process

Fault, LED display	Possible cause	Check	Action
display = = = =	Terminal J, K short circuited or connected wrongly.	Check wiring	Rectify misconnection
	Actuator is damaged.	Check actuator resistance	Replace actuator.
	Actuator is not suitable for usage	Check actuator specification	Replace actuator.

9.5 Engine unstable

Fault, LED signal	Possible cause	Check	Action
Slow periodic vibration approx. 0,5 - 1 Hz	Friction on connection shaft or control rod	Check mechanical parts.	Remove source that is causing friction
	Battery voltage too weak	check battery and wiring: min. 20V for 24V system	Replace battery, Adapt wiring accordingly
	Actuator too weak		Use stronger actuator
	Too little speed compensation		Increase DER
Fast periodic vibration approx. 8 - 12 Hz	GAIN too high		Reduce GAIN
	Too much speed compensation		Reduce DER
	Fault in fuel supply		Remove fault in injection system
	Spongy or worn clutch	Check play in clutch	Correct fault
Governor is ok but actuator control (actuator lever)l vibrates ca. 1 mm	Rotary oscillation caused by spongy clutch or too much clutch free play		Correct fault
	Misfire of a cylinder		Correct fault

10 Technical Data

10.1 Performance

Isochronous/stability ....±0.25%
RPM range ....300 - 8 KHz (112-4000 RPM for flywheel with 160 teeth)
RPM variation with temperature.. ±0.25% max.
Idle adjustment ....Full Range
Speed Trim..Programmable 0-100%,

10.2 Surroundings

Temperature range ....-40° to 85°C (-40 to +180°F)
Relative humidity .... up to 95%
Surfaces finish... Fungus Proof and Corrosion Resistant
CE certificate EN55011, EN61326-1

10.3 Input/output parameters

Supply voltage..12 or 24 VDC Battery, (6.5 VDC to 33 VDC)
Polarity ....Negative Ground (housing isolated)
Current Consumption ....90 mA max. continuous, (Excluding actuator drawn current)
Max permitted actuator current..8 A continuous (at 25°C
Engine speed sensor signal..1 – 120 V RMS
+5VDC Output (Terminal D) ....up to 12 mA
Load Share/Synchronizer Input ....0-10 VDC
Reverse Power Protection ....Yes
Transient Voltage Protection 60V

10.4 Norms/standards

Authorizing office... CE and RoHS requirements
Communication ....SAE J1939, DST Mode

10.5 Reliability

Vibration...7G, 20-100 Hz
Shock .... 20G Peak
Inspection...100% functionality inspection

10.6 Mass and weight

Dimensions .... 139 x 107 x 32 mm
Weight... 0.372 kg
Installation .... direct on motor chassis, preferably vertical, with rubber shock absorbers, insulated, or in control cabinet

10.7 Configuration parameters

Number of flywheel teeth, range .... 50 -250 teeth
Overspeed protection .... max. 4000 rpm
Starter cut-out speed ....4000 rpm*
Fixed RPM ....4000 rpm*
Variable RPM ....4000 rpm*
Prescribed start quantity...0 - 100 %
Fuel ramp...0 – 20 secs.
Speed ramp...0 - 100 secs.
Depending on Overspeed Protection. These values are always < Overspeed.