



# eSG Electronic StraightGate Instructions

Product Name:	eSG Electronic StraightGate
Product Description:	eSG Electronic StraightGate External Wastegate
Product Number:	<a href="#">TS-0563-1002</a> , <a href="#">TS-0565-1002</a> , <a href="#">TS-0567-1002</a>



## Important Notes on Your New Electronic StraightGate

- Turbosmart accepts no responsibility whatsoever for incorrect installation of this product which is potentially hazardous and can cause serious engine damage or personal injury.
- The Straight external eWastegate is designed for use with a turbocharger that does not have an internal wastegate.
- Consult your local specialist before setting your desired boost pressure, setting boost beyond your engines capability may result in engine damage.
- Use only high-quality fittings ensuring maximum sealing reliability.
- It is important during the setup of the eGate, that some precautions are taken to ensure that the unit does not malfunction. Firstly, the output from the ECU should be limited to 15%. As well as an inline fuse (5A-10A) or breaker to protect the eGate. Once correct operation has been verified the fuse and limits can be restored to a more suitable limit.
- Incorrectly wiring sensor to Chassis ground will cause calibration issues, Sensor Ground must be connected to the ECU Sensor ground. Do NOT connect ECU Grounds and Chassis Grounds together they must remain separate.
- Correctly setting up a sensible boost control strategy to ensure engine safety is highly recommended.



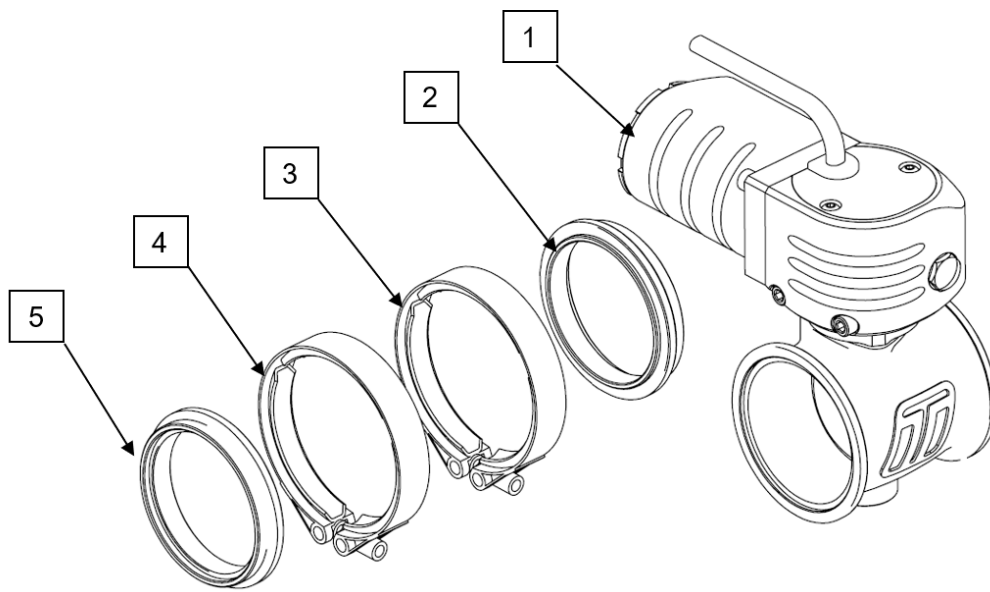
## Recommendations

- Always disconnect motor wires before removing the end cap off the actuator
- Allow for adequate cool airflow around electronic actuator paired with water cooling.

- DO NOT Mount the electronic wastegate so that the electronic actuator is less than 100mm from a heat source.
- DO NOT wrap the body of the wastegate with exhaust wrap.
- Fitting your Electronic Straight Wastegate may require fabrication or modification to your exhaust manifold. Turbosmart recommends that your wastegate is fitted by an appropriately qualified technician.
- Turbosmart recommends that the engines Air/Fuel ratio is checked while setting the desired boost pressure, as any increase in boost pressure can cause the engine to run “LEAN”, resulting in possible engine damage.
- Turbosmart recommends that boost pressure is set using a dynamometer and not on public roads.
- Turbosmart recommends that a boost gauge be permanently fitted to the vehicle.

## Kit Contents

Part	Description	Use	QTY
1	Turbosmart Electronic Waste Gate	Main unit	1
2	Inlet V-Band clamp	Inlet V-band clamp	1
3	Inlet Weld flange	Inlet V-band weld flange (O-Ring included)	1
4	Outlet V-Band clamp	Outlet V-band clamp	1
5	Outlet weld flange	Outlet V-band weld flange (O-ring included)	1
6	Turbosmart Sticker	Turbosmart sticker	1



## **① Tools Required**

- ¼" drive socket 5mm
- ¼" drive extension
- ¼" drive ratchet
- 3/8" square drive deep socket
- 14mm square drive deep socket
- Square drive ratchet wrench
- Torque wrench (3/8" drive)
- Metric Allen Key set - 2.5mm, 3mm, 4mm Allen key
- Non-marking spanners to tighten fittings



## **Suggested lubricants and Sealants**

- Loctite 243 Thread locker
- Loctite 567 Thread Sealant
- Resbond 907TS Red
- Penetrating oil
- Inox MX8 spray grease (Or Equivilant)

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## **Quick Start Guide**

**⚠ CAUTION!** It is important during the setup of the eGate, that some precautions are taken to ensure that the unit does not malfunction. Firstly, the output from the ECU should be limited to 15%. As well as an inline fuse (5A-10A) or breaker to protect the eGate. Once correct operation has been completed, initial safety setups can be lifted to operational limits.

## HOW TO USE

The Turbosmart Straight Gate is a brand-new way to control boost pressure, it involves using an electric motor to drive the position of the butterfly valve, this allows far greater control over conventional pneumatic boost control during its actuation on the car. This paired with an aftermarket ECU controlling the straight gate, allows for plenty of new and safer ways to control boost on your car.

The Body will need to be fitted to the vehicle. This involves the two V Bands clamps, the Inlet (fitted on the exhaust manifold), and the outlet which is where the regulated exhaust gases are bypassed. It is important to have the butterfly valve manually set to about the middle of its stroke. This will allow for an easier installation. The Straight Gate can be used in both directions.

Please see below for a more detailed and helpful way of installing the Turbosmart Electronic Straight Wastegate.

## MAINTENANCE

Turbosmart Electronic Straight Wastegate will require periodic reapplication of spray grease such as Inox MX8 spray (Any high temperature high pressure grease will suffice), grease, this is important that the manual override is used to move the butterfly valve through its range of motion, allowing the grease to be applied throughout the entire butterfly valve gearbox. Turbosmart recommends that this is done regularly at least half yearly or more in demanding temperature environments.

It is also important to check V Band tightness after the wastegate has run through a couple of heat cycles. To ensure that the wastegate is seated and sealing correctly.

## TEMPERATURE

The Turbosmart Electronic Straight Wastegate has a maximum thermal stress of 1250degC (2282degF) for 24hr if thermally cooled with the water-cooling ports. It is important that the actuator internal housing doesn't go above a temperature of 150degC (302degF) as this may cause damage to the internal electronics. Turbosmart recommends that the eWastegate is water cooled and paired with good airflow over the body to help regulate temperature. Turbosmart also recommends data logging the temperature sensor that is seen inside the actuator.

It is recommended that water cooling is in line with the turbo this will increase the longevity of the Electronic Straight Gate and allow it to operate seamlessly. This does depend on the certain application and the rate and period at which the Electronic Straight Gate is exposed to the high temperatures.

## BASIC TUNING PARAMETERS

It is important that the basic tuning parameters are discussed with a trained professional, please consult your ECU manufacture. There are a few basic parameters that are worth noting.

Motor polarity is important, Due to the nature of PID controllers (Proportional-integral-derivative controller) the Electronic Straight Gate will be targeting a set position, this will move further away if the motor polarity is wrong as it is trying to reach its setpoint.

Current limitations, it is important that the Current that is driven through the motor is limited to no more than 20amps for more than 1 second and 5 amps for more than 5 seconds. It is important that the current values such as the dead band are correctly set in the ECU to allow for the motor to only be active if needed.

Sensor Diagnostic limits should be monitored for values that are lower than 0.1V and higher and 2.15V with respect to the Temperature sensor and 0.1V-4.9V with the position sensor. It is also recommended that safety tuning strategies are in place to lower temperatures if the eWastegate internally reaches a temperature of 150degC (302degF).

Butterfly Position limits should be set to target 0% for butterfly closed and 90% for completely open, Since the design of the end stops is biased to operate better with the butterfly in the closed position it is recommended to avoid opening the butterfly at full opening.

Boost cut should be set to ensure the safety of your engine a sensible boost cut should be set with in the ECU to control any possible over boost issues that could be detrimentally to your engine.

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## WHAT'S NEW

The new Turbosmart Electronic Straight Gate is Turbosmart's addition to its electronic wastegate line-up. A new level of control is now available with the butterfly valve and offers the option for customers who require another packaging or new level of control.

### Control

With the introduction of the electronic motor to drive the Electronic Straight Gate, a new level of control is now available to boost control, there is a wide range of tuning strategies that can be implemented to better control boost as well as engine protection. This allows the Engine to maintain much better control over the turbocharger.

### Adjustability

The straight gate now offers 3 options for the motor and body to be mounted in, this is coupled with infinite possibilities of the body and exhaust piping with the weld flanges. So, if you need the Electronic Straight Gate mounted in the opposite orientation to stop fouling with parts within the engine bay, there is an orientation that is suitable for the Electronic Straight Gate to operate in. This mixed without the need of having to remove and

reassemble due to changes in base wastegate spring pressure the Electronic Straight Gate has next level control adjustability of the position of the wastegate butterfly valve.

## Upgrades and Servicing

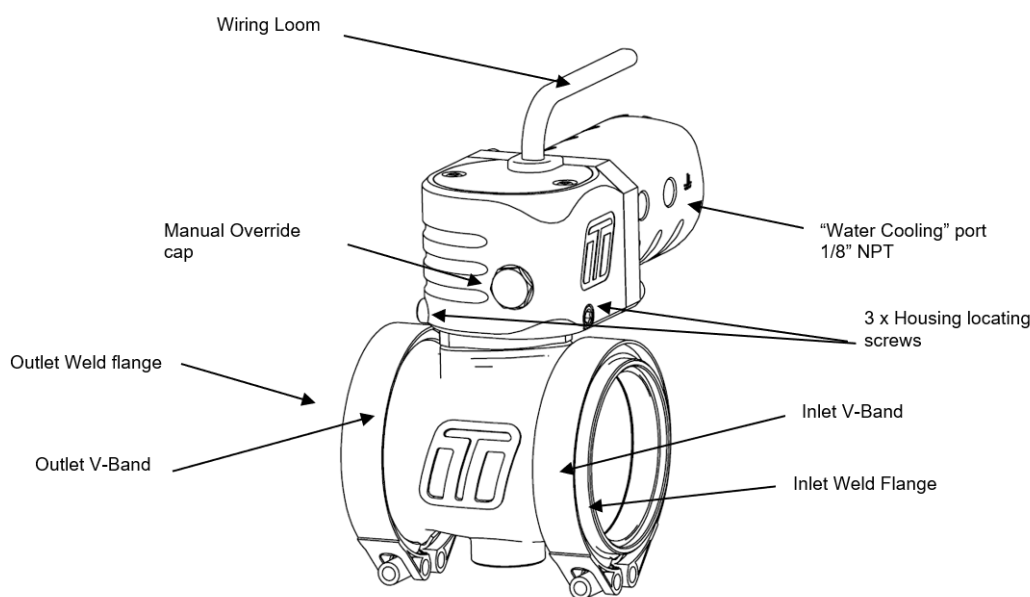
Due to the modular construction, the new range is also upgradeable and completely serviceable, as all components can be removed or upgraded. Components have been tested for over one million cycles, so reliability is rock-solid.

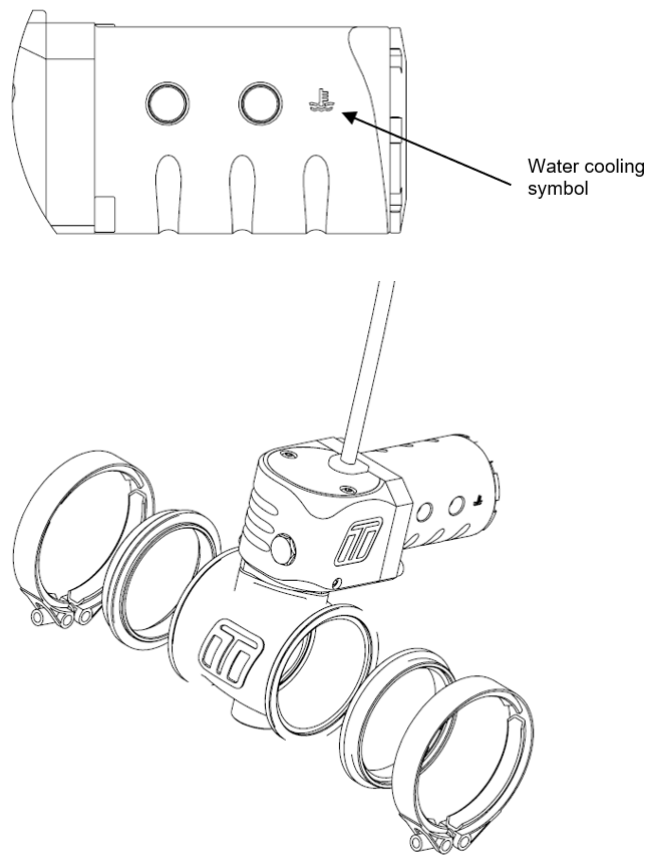
## Flow and Thermal Performance

The new straight wastegate is a world first in its class. It features excellent flow properties thanks to our world-leading engineering and simulation abilities. Thermal performance is a critical key performance factor within the design of all our products. Thermal stability and longevity are further extended with the liquid cooling ports for further thermal performance if required.

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## StraightGate Electronic Wastegate Overview





## Fitting Your Electronic Wastegate

### Mounting your new Turbosmart Electronic Straight Wastegate

The weld flanges should be welded to your exhaust system. The weld flanges are compatible with Stainless Steel and Mild steel welding rod material.

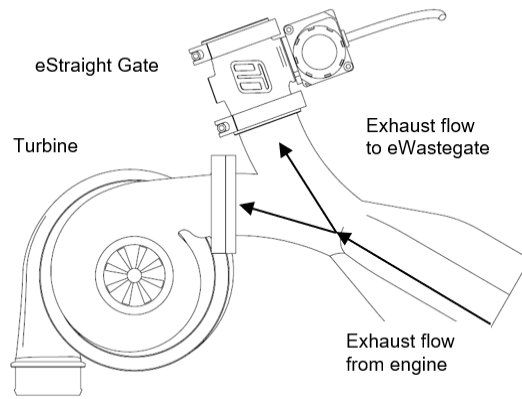
The Straight Gate utilises WG60 Outlet Flanges, this allows for a straight swap over for engines running WG60 Valves. A new exhaust side will need to be fabricated for cars running the poppet valve.

For best results, an attempt should be made, if space allows, to mount the Straight Gate at an angle to the exhaust flow to allow for better flow than a 90-degree mounting. See the schematic diagrams below for examples of mounting positions.

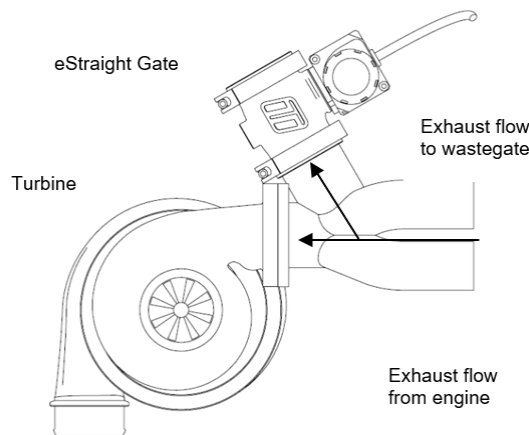


**NOTE! The Straight Gate can be used in both directions. Both directions will regulate the same. It is advisable however to place the Butterfly Valve pins exhaust side up.**

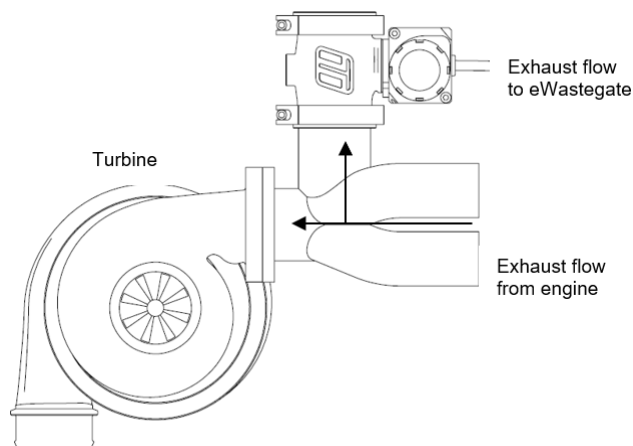
**Water cooling is highly recommended for sustained heat exposure.**



(Best Flow) Symmetric mounting allows an excellent flow of exhaust to the Straight Gate

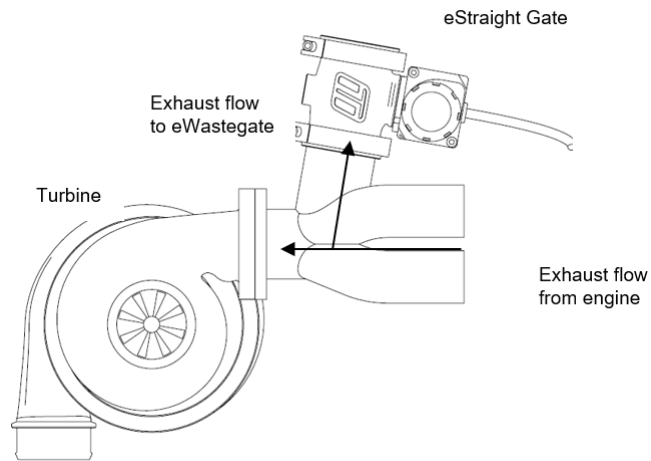


(Good Flow) Angle mounting allows a good flow of exhaust flow to the Straight Gate.



(Poor Flow) 90 Degree mounting gives poor exhaust flow to the Straight Gate and in some circumstances may contribute to over boosting.





⚠ **Not Recommended** - Less than 90 Degree Mounting. An angle mounting as shown in not recommended and gives extremely poor exhaust flow to the Straight Gate which can contribute to poor boost control and over boosting.

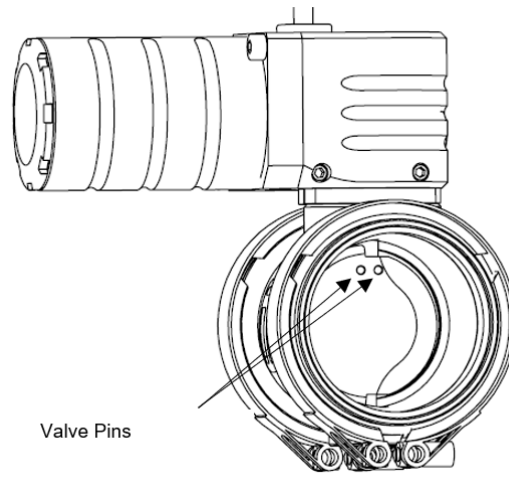
⚠ **CAUTION!** Do not place the Straight Gate near a significant heat source as this could shorten the life of the internal electronics.

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## Fitting the StraightGate

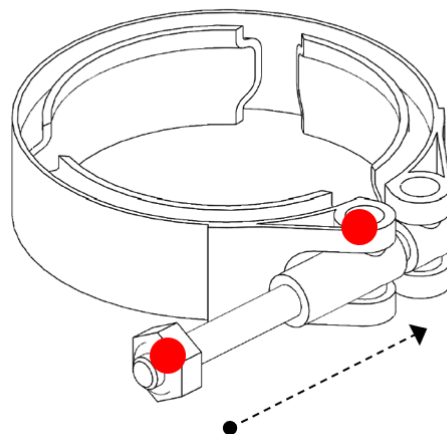
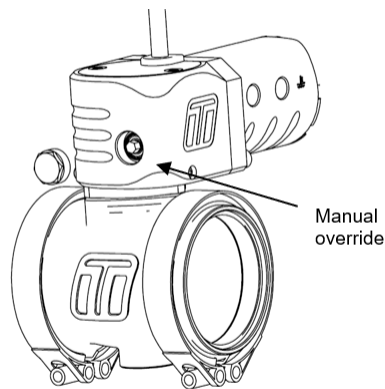
Even though possible to mount the Straight gate in both directions, it is suggested that the Butterfly valve pins are facing towards the exhaust exit.

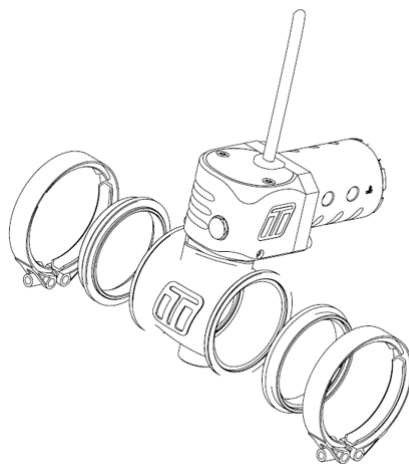
Prior to mounting the Straight Gate, place v-band (Figure 10) over weld on flange by unscrewing the nut on the v-band as far out as possible and then squeezing the bolt in a syringe motion to expand the v-band (squeeze the dots together below). Once the v-band is in its fully expanded position, slide the v-band over the flange to allow for the wastegate to be installed.



Using the 3/8" deep socket and a torque wrench Tighten the V-Band to 7N.m (5 ft/lbs). Ensure the wastegate is home correctly while torquing the nut to not have a false torque as this will likely contribute to exhaust leaks.

- ❗ It is important that the butterfly valve sits slightly open for installation. This allows for no interference during the installation process. This can be adjusted via the manual override.






## Connecting your Turbosmart Electronic Wastegate


The Turbosmart Electronic wastegate comes unterminated with 7 wires.


### Wiring Pinout

Revision B (current) – Wiring

	Colour	Description
<b>1 single core wire each</b>	Large Gauge Red	Motor A tending towards 0%
	Large Gauge Black	Motor B tending towards 100%
<b>Multi Core Wire</b>	Red**	5V
	Black***	Sensor ground 0V
	White	Position Signal 0-5V
	Blue (Rev B Only)	*Unfiltered Signal Output (Position Output)
	Yellow (Orange Rev A)	Temperature Signal 0-5V

 \*Note: The Blue (unfiltered position signal) is not required for use & is for development purposes only.


 \*\*Note: The 5V red wire has no reverse polarity protection, use only 5V wired in correctly.

 \*\*Note: The sensor ground must be grounded at the ECU Sensor ground and NOT the chassis

## Sensor Voltage Limits

Deg C (Deg F)	Temperature Sensor Output (mV)
0 (32)	2630
150 (302)	538

Position Sensor	Target Voltage (V)	Duty Cycle
100% (Open)	0.2-0.6V	~16%
0% (Closed)	4.2-4.6V	-84%

 **CAUTION!** Turbosmart recommends calibrating the position sensor before connecting the motor wires to your motor drive.

The two large wires are directly connected to the motor of the wastegate and need to be connected to high power drives in a Full bridge configuration like that of an electronic throttle drive circuit, see your ECU supplier documents for suitable connections. Turbosmart recommends the eWastegate should be driven by an External dual H-Bridge, which is at least 20A for seamless operation.

Connect the small Red Wire to a 5V power source from your ECU as well as the Black wire to Sensor ground. Connect the white wire to a 0-5V analogue input on your ecu as well as the orange temperature sensor signal. The blue wire (Revision B only) is an unfiltered position output signal for development purposes - This can be left unterminated.




### CAUTION!

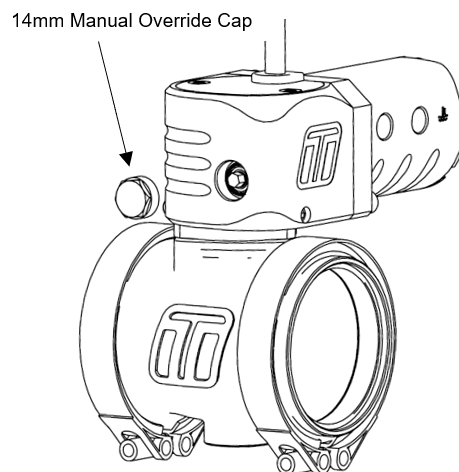
- Whilst the temperature sensor is not required for operation it is recommended for activating failsafe protocols.
- Ensure all connections are high quality and away from any heat source.

It is important during the setup of the eGate, that some precautions are taken to ensure that the unit does not malfunction. Firstly, the output from the ECU should be limited to 15%. As well as an inline fuse (5A-10A) or breaker to protect the eGate. Once correct operation has been verified the fuse and limits can be removed.

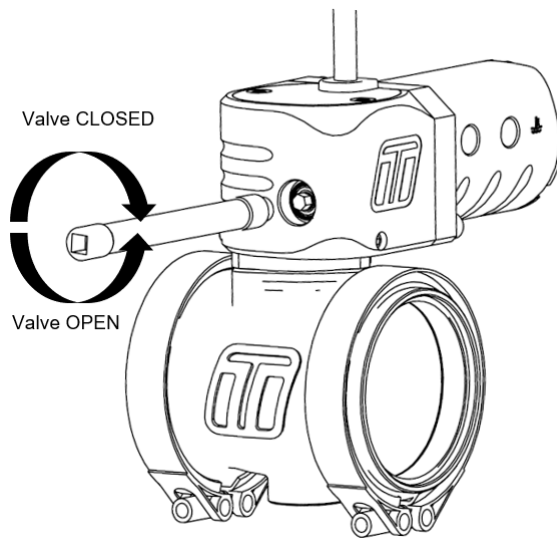
## Calibration

 **CAUTION!** Disconnect the motor wires to prevent accidental spin up.

To calibrate the electronic straight gate firstly the manual override cap must be removed to allow access to the manual override. A non marking 14mm is required to remove the cap from the body.



Using a ¼” drive extension with a 5mm socket, turn the manual override in a clockwise direction with your fingers until the mechanism stops rotating. In this position the butterfly valve should be home against the valve seat and will be your 0% position.



⚠ **CAUTION!** Do not apply excessive force to the manual override, doing so will damage the product and effect the performance.

Using your ECU manager software, read the voltage from the sensor and set this as your closed position.

Wind the manual adjustment in an anticlockwise direction until it stops. From this position rotate the adjustment 2 full turns in a clockwise direction. Read the sensor value and set this as 100% butterfly valve travel.

Monitor sensor signal voltage to ensure no wrap around occurs throughout the stroke of the butterfly valve that could affect operation.

⚠ **CAUTION!** It is critical not to set the 100% position at the end of the travel as this may lead to seizing of the wastegate and overloading the system.

📄 **NOTE!** Turbosmart recommends allowing additional clearance from the end stops until the wastegate control is tuned to minimise risk of overshoot into end stops at high speeds.

## Tuning

The eWastegate will come calibrated from Turbosmart, the targeted values have been set with regards to the position sensor are approx. 0.5V (completely open) and approx. 4.5V as (completely closed), It is important to note that as the wastegate butterfly valve moves through its range of motion that the butterfly valves are monitored to move from 4.5V decreasing to 0.5V, 0% open to 100% open. This should be done manually with the ECU package monitoring Voltage Values. The electronic motor should be disconnected at this point.

Voltage wraps around will cause errors with the eWastegate, this is when the Voltage increases from 4.8V up to 5V and jumps through to 0V.

Position Sensor	Target Voltage (V)	Duty Cycle
100% (Open)	0.2-0.6V	~16%
0% (Closed)	4.2-4.6V	-84%

- ❗ It is important to set up the correct limits manually with eWastegate. Turbosmart recommends that the butterfly valve is only ever driven electronically to the maximum butterfly position of 90 %.

Driving the butterfly valve to 100% will cause increased wear on components such as the electronic motor as it tries to force the butterfly valve to completely open.

Adjust the calibration to allow plenty of overshoot to the end stops of the butterfly valve, recalibrate as above once you have good control of butterfly position.

- 📄 PLEASE NOTE: That temperatures over 180 degC (356degF) will create an error in the temperature sensor readings. Therefore, the internal temperature is rated to a temperature of 150degC (302degF) it is recommended to log and place sufficient alarms to monitor this.

- 📄 PLEASE NOTE: When driving the electronic actuator, the current should be limit to no more than 20 amps at a period of 1 second and 5 amps for more than 5 seconds.

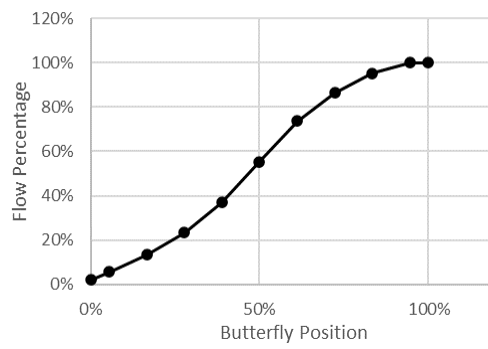
Follow your ECU manufacturers guidelines for tuning wastegate servo control. Ensure dead band is set to a reasonable level to not have the output active when not needed.

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## Sensor Linearisation

Due to the nature of the butterfly valve design, the flow characteristics are nonlinear. In some cases, it may be advantages to correlate the linear sensor output to match the flow of the valve. The following plot compares butterfly valve position with valve flow. A 3rd order polynomial is provided to relate sensor position to flow. Note due to the design of the electronic straight wastegate, the butterfly valve is on a preloaded mechanism to minimise binding at the end stops, this results in the sensor reading past the home positions and for this reason the calibration sequence with low force is essential.

$$y = -2.1519x^3 + 3.0586x^2 + 0.0582x + 0.0326 \quad R^2 = 0.999$$



Butterfly Position	Flow Percentage
0%	3.3%
3%	3.7%
6%	4.7%
10%	6.7%
20%	14.9%
30%	26.7%
40%	40.8%
50%	55.7%
60%	70.4%
70%	83.4%
80%	93.5%
90%	99.4%
100%	100.4%

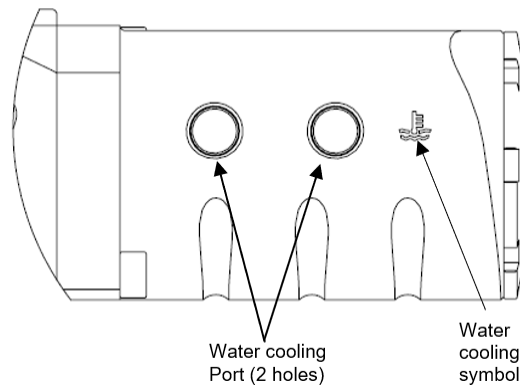


90%	99.4%
100%	100.0%

## ADVANCED FEATURES ON THE STRAIGHT WASTEGATE

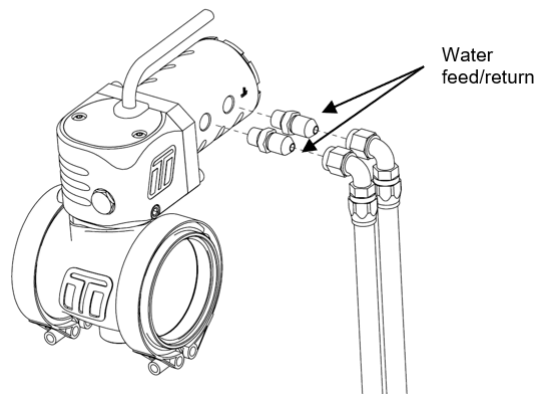
### Water Cooling

- Turbosmart's StraightGate is equipped with water cooling ports to keep the wastegate cool in the most extreme conditions and keep consistent actuator temperature.
- Identify the water cooling ports on the bottom of the actuator adjacent to the water-cooling symbol engraved in the actuator.



Fit water-cooling port fittings Prior to mounting the wastegate, install 1/8" NPT fittings into the water ports, apply thread lubricant and screw in clockwise until finger tight, then tighten further 1-2 turns for seal. Choose feed and drain source for the water and connect to the wastegate. Turbosmart recommends -4SAE fittings and hose compatible with coolant. It is **not** important which way the water flows through housing.

**⚠ CAUTION!** Check for leak, ensure the water-cooling circuit is free from leaks.

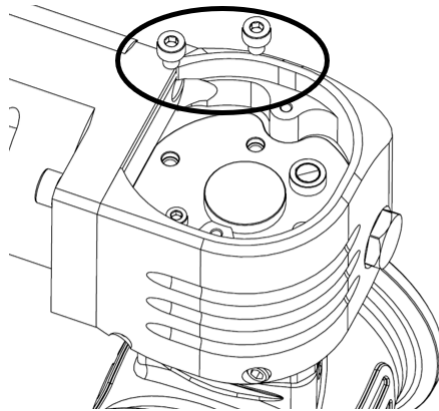


# How to Conduct Maintenance on Your Electronic StraightGate

## Basic Maintenance

The Straight gate will require periodic maintenance depending on application. In high demand, unusually environments, it is advisable to increase the service interval.

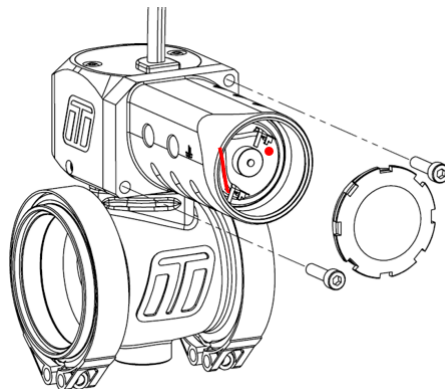
Turbosmart recommends that the internal gearbox is regreased with a spray type grease such as Inox MX8 spray grease this should be conducted half yearly or more depending on environment. With the top plate removed grease can be sprayed into the small inspection hole located near the magnet covered by a M4 bolt as well as located near the motor.



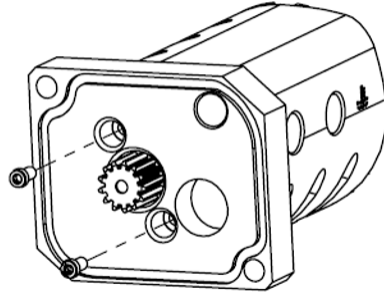
## Motor Replacement

In the event of the motor failing, it can be easily replaced. The Motor Housing must be disassembled, the cap must be removed with the Turbosmart rear housing tool, this opens the rear of the motor housing, once open the motor wires will need to be moved out of the way. The black wire is matched to the red dot on the back of the motor cover. With the wiring clear the 4mm Allen keys will need to be removed. The rear housing will separate. Pulling it off the back. The replacement motor part number

([TS-0550-3123](https://support.turbosmart.com/portal/en/kb/articles/straight-gate))

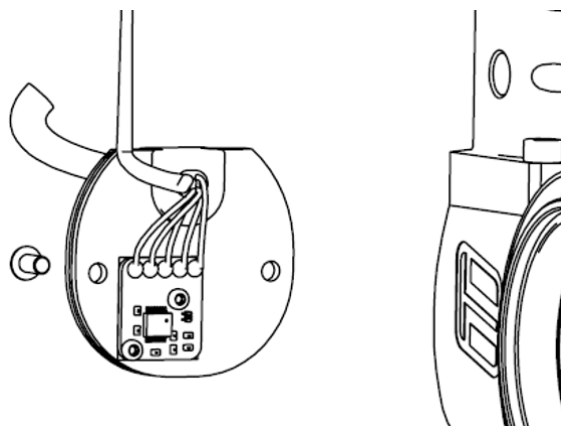
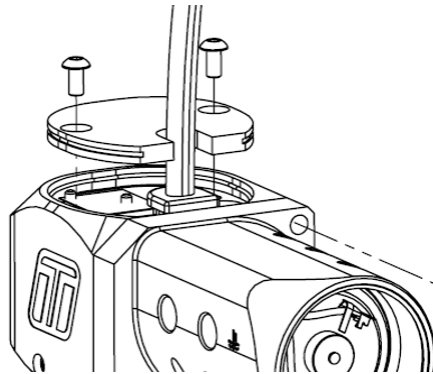


A 2.5mm Allen key will be required to remove the motor screws. With both undone. The motor can be lightly pushed out. When reinstalling, use a small application of Loctite 243.



## Sensor Replacement

In the event that the sensor fails, it is located under the top cap, it is held on with two 2.5mm Allen keys for the cap and two 2.5mm for the encoder. The replacement sensor part number ([TS-0550-3123](#)). The encoder is located underneath the top cap of the Electronic straight gate. The grommet will remain attached to the top cap and be removed as one piece.



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## Actuator Replacement

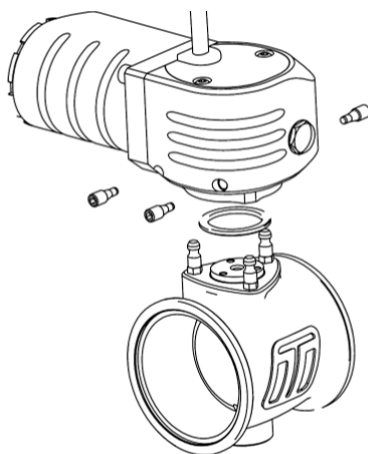
The actuator can be removed and rotated through 3 different orientations; these are parallel to the body, 30 deg to the body and the current configuration 90 deg to the body.

The actuator locking pins are 3mm Allen keys that lock the body to the actuator. It is important that the butterfly remains in the same position, the recommended position is to be just off the valve seat. It is also advisable to not to move the manual override during this process.

**⚠ CAUTION!** Moving body and actuator while separated will cause issues with calibration. If moving to one of three mounting options observe positions before moving readjusting.

With the Allen key pins removed the body can be separated from the actuator and one of the three options can be picked.

The actuator locking pins are to be Torqued to 6N/mm as well as a new application of Loctite 243 is also required.



## **❶ Troubleshooting**

- Wastegate not actuating - Confirm continuity of wiring, manually adjust butterfly position and feel for binding.
- Poor wastegate actuation – Ensure wiring is correct, check for dirt and smooth operation by manual override, ECU that is driving the butterfly may not be set up correctly.
- Wraparound of signal on position sensor – Turbosmart Pre “time” every sensor, contact Turbosmart if this occurs.
- Wastegate fluctuates and fails to find targeted position, motor wires may be the incorrect way. Swap and test to see. Ensure to use sensible current limits to prevent over currenting.
- Wastegate seized – Remove cap and manually move butterfly feeling for resistance.
- Wastegate moves but sensor not reading – Check connections.

- Boost creeping at high rpm - Wastegate flow path is poor, wastegate is too small for the application.
- Failing the above, submit a [Technical Support Query Form](#) with information about your engine, oil type and photos of the installation and one of our expert technicians will respond as soon as possible.