

Product Name:
Product Description:
Product Number:
Document Version:

Gen V eALV40 Electronic Anti-Lag Valve

Gen V eALV40

TS-0552-16XX

V1.00 Rev A



IMPORTANT NOTES ON YOUR ANTI-LAG VALVE

- Turbosmart accepts no responsibility whatsoever for incorrect installation of this product which is potentially hazardous and can cause serious engine damage or personal injury.
- Antilag produces excessive heat in the exhaust system and may shorten the life of your exhaust manifold and turbo.
- Consult your local specialist before setting your antilag valve, setting antilag levels beyond your engines capability may result in engine or turbo damage.
- Use only high-quality fittings ensuring maximum sealing reliability. Optional Turbosmart fitting kit available.
- Turbosmart's ALV valve is recommended for race applications only.
- 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.

RECOMMENDATIONS

- Always disconnect motor wires before removing the top cap of the actuator
- Allow for adequate cool airflow around electronic actuator.
- DO NOT Mount the antilag valve so that the electronic actuator is less than 100mm from a heat source.
- DO NOT wrap the body of the antilag valve with exhaust wrap.
- Fitting your Gen V antilag valve may require fabrication or modification to your exhaust manifold. Turbosmart recommends that your antilag valve is fitted by an appropriately qualified technician.
- Fitting the ALV to your turbocharger system introduces fresh air into the exhaust system post engine and therefore air fuel ratios will show as lean.
- Turbosmart recommends that antilag settings are set using a dynamometer and not on public roads.
- Turbosmart recommends that a boost gauge be permanently fitted to the vehicle.

KIT CONTENTS

Please check that the following items have been provided in your Gen V Anti lag valve kit.

Part	Description	Use
1	Turbosmart Gen V Anti lag valve	Main unit
2	Valve Seat	Valve seat
3	Inlet V-Band clamp	Inlet V-band clamp
4	Inlet Hose Adaptor	Inlet Hose Adaptor
5	Outlet V-Band clamp	Outlet V-band clamp
6	Collar tool	Adjusting actuator location
7	Turbosmart Sticker	Turbosmart sticker
8	Inlet O ring	O-ring seal for inlet

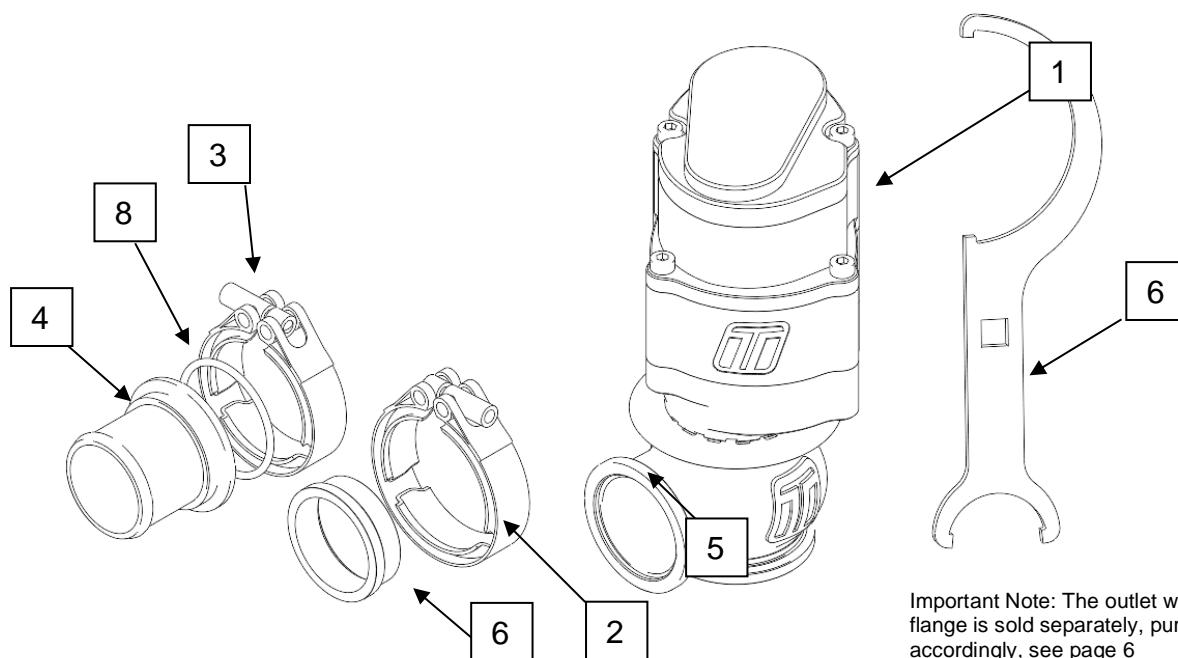


Figure 1 - Kit Contents

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TOOLS REQUIRED

- 1/4" drive socket 5mm
- 1/4" drive extension
- 1/4" drive ratchet
- 3/8" square drive deep socket
- Square drive ratchet wrench
- Torque wrench (3/8" drive)
- Non-marking spanners to tighten fittings
- Supplied collar tool

SUGGESTED LUBRICANTS AND SEALANTS

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

PART NUMBERS

TS-0552-1601 – GenV eALV40 Electronic Anti-Lag Valve Black

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 verified the fuse and limits can be removed.

HOW TO USE

The Turbosmart anti lag valve is a brand-new way to drive aftermarket Anti lag valve valves, it involves using an electric motor to drive the position of the valve, this allows far greater control over the valve during its actuation on the car, this paired with an aftermarket ECU controlling it, allows for plenty of new and safer ways to anti lag strategies on your car.

The Body will need to be fitted to the vehicle. **Please see the exploded drawing.** This involves the two V Bands clamps, the outlet (fitted on the exhaust manifold), and the inlet where the diverted boost pressure is fed into the exhaust. A Valve seat is fitted inside the outlet V Band allowing the valve to seal upon closing. It is important to have the valve manually set to about the middle of its stroke as well as the valve seat installed. This will allow for an easier installation.

Please see below for a more detailed and helpful way of installing the Turbosmart Gen V Anti lag valve.

MAINTENANCE

Turbosmart's Gen V Anti lag valve will require periodic reapplication of spray grease such as Inox MX8 spray grease, this is important that the manual override is used to move the valve up and down allowing the grease to be applied throughout the entire valve gearbox. Turbosmart recommends that this is done regularly at least half yearly or in demanding temperature environments.

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

TEMPERATURE

The Turbosmart Gen V Anti lag valve has a maximum thermal stress of 1250°C for 24hr if thermally cooled through the water-cooling ports, it is important that the actuator internal housing doesn't go above a temperature of 150°C as this may cause damage to the internal electronics. Turbosmart recommends that the Anti lag valve is water cooled and paired with good airflow over the body to help regulate temperature. Turbosmart also recommends data logging the temperature that is seen inside the actuator using the temperature sensor included onboard.

It is recommended that water cooling is in line with the turbo this will increase the longevity of the Anti-lag valve and allow it to operate seamlessly. This does depend on the certain application and the rate and period at which the Anti lag valve 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 Anti lag valve will be targeting a set position, this will move further away if the motor polarity is wrong as it's 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 Anti lag valve internally reaches a temperature of 150degC (302degF).

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

WHAT'S NEW

Our Electronic Anti-Lag Valves are a direct fit upgrade to all 5th-generation Turbosmart Anti lag valves and feature our unique collar-locking system, variable motor cap and base, strap-type V-band clamps, liquid-cooling, 1/8" NPT ports.

Control

With the introduction of the electronic motor to drive the Anti lag valve, a new level of control is now available to antilag control strategies, there is a wide range of tuning strategies that can be implemented to better control how antilag is operated. This allows the engine to maintain much better control of how the Anti lag valve is operated.

Adjustability

The 5th generation Anti lag valve range has been designed with maximum user-adjustability, without comprising performance. We designed this unit with almost infinite possibilities of directions in which the motor assembly can be mounted with the engine bay. So, if you need the Anti lag valve mounted in the opposite orientation to stop fouling with parts within the engine bay, there is an orientation that is suitable for the Anti lag valve to operate in. This mixed without the need of having to remove and reassemble due to changes in base spring pressure the Anti lag valve has next level control adjustability of the position of the 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 will be rock-solid.

Flow and Thermal Performance

Our new range of Anti lag valves out-flow all competitors thanks to our world-leading engineering and simulation abilities. Thermal performance has been improved drastically compared to our nearest rival, and all Anti lag valves feature liquid cooling ports for further thermal performance if required.

GEN V ANTI LAG VALVE OVERVIEW

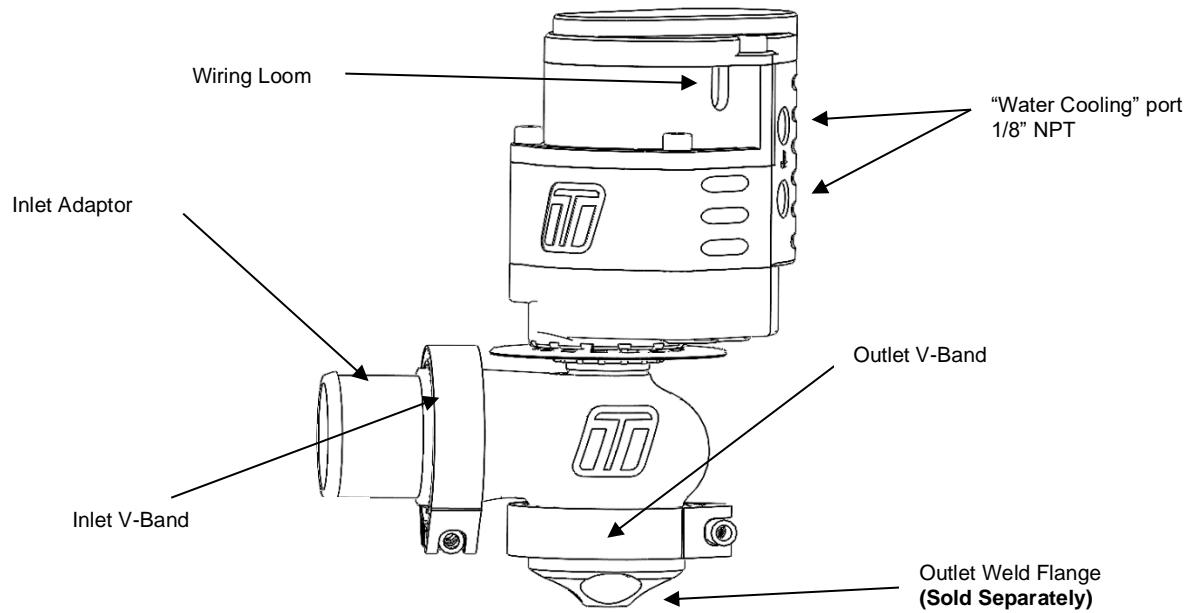


Figure 2 -Gen V Anti lag valve Overview

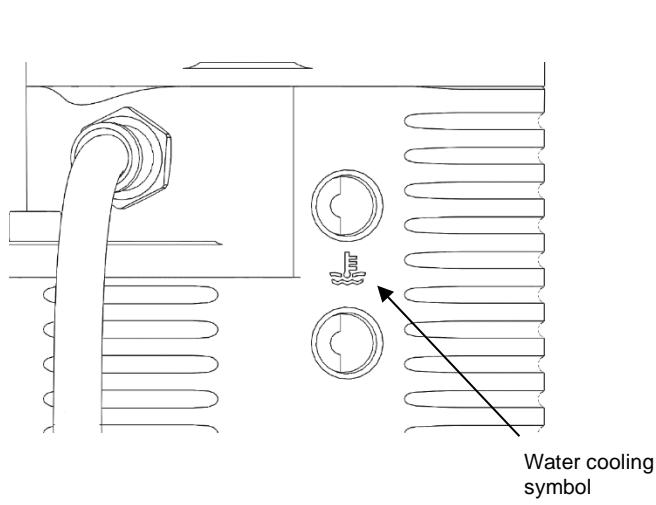


Figure 3 – Gen V eWastegate Water Cooling

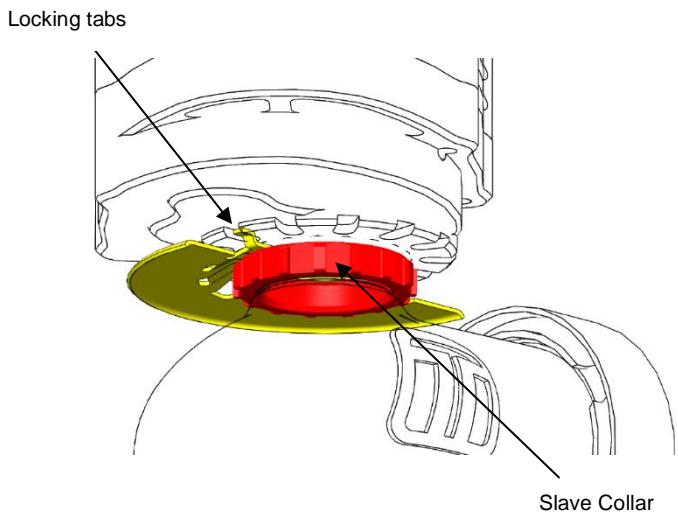


Figure 4 – Gen V eWastegate Locking Collar

GEN V ALV Accessories

TS-0550-3114	ALS 6-1 Weld flange (for 6 cylinder/V12/6 outlet pipes)
TS-0550-3104	ALS 5-1 Weld flange (for 5 cylinder/V10/5outlet pipes)
TS-0550-3098	ALS 4-1 Weld flange (for 4 cylinder/V8/4 outlet pipes)
TS-0550-3099	ALS 3-1 Weld flange (for 3 cylinder/V6/3 outlet pipes)
TS-0550-3100	ALS 2-1 Weld flange (for 2 cylinder/2 outlet pipes)
TS-0505-3001	WG40 Inlet Weld Flange (for single outlet)
TS-0550-3101	Inlet Weld Flange AL
TS-0550-3102	Inlet pipe adapter 1-3/4" OD
TS-0550-3103	Inlet pipe adapter 1-1/2" OD
TS-0552-3001	WG40 Valve Seat
TS-0552-3003	WG40 Inlet/WG45 Outlet V-Band
TS-0552-3004	WG40 Outlet V-Band
TS-0550-3076	WG40 weld purge bung
TS-0550-3080	V-Band Replacement Nut - 2 Pack
TS-0550-3009	WG38/40 Actuator Collar

FITTING YOUR GEN V ALV

1 Mounting your New Turbosmart Gen V ALV (Anti Lag Valve)

The weld flanges should be welded to your exhaust system. The weld flanges are compatible with stainless steel and mild steel welding rod material.

For best results tubes should be plumbed into the turbo manifold as close to the exhaust port of the engine for maximum efficiency. Turbosmart Weld flanges are designed to accept 19mm (3/4") tube, large diameter tubes with the least amount of restriction will achieve a higher amount of usable energy in the manifold.

CAUTION!

Do not place the actuator cap near a significant heat source as this could shorten the life of the diaphragm.

CAUTION!

Use of the Antilag valve produces excessive heat in the exhaust manifold and turbo and may result in shorter than expected life.

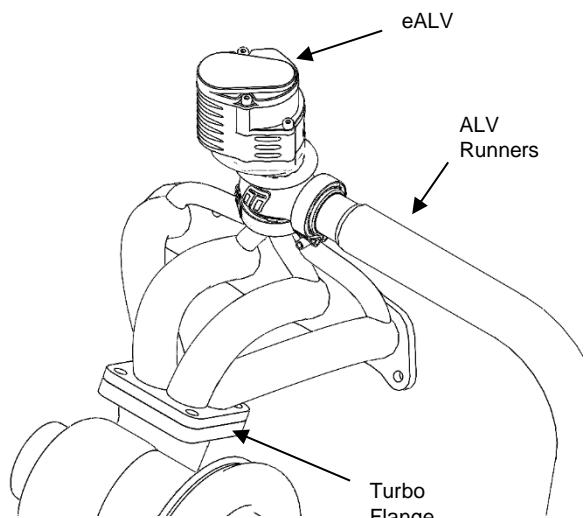


Figure 5 – ALV mounted on Exhaust Manifold

Plumbing the antilag valve into the exhaust port maximises the thermal energy from the exhaust to increase the flame front with fresh air and unburnt fuel.

Connect the inlet of the ALV to the charge intercooler piping pre-throttle body, having the pipe, and attached at an angle in the direction of flow may help the efficiency of the system.

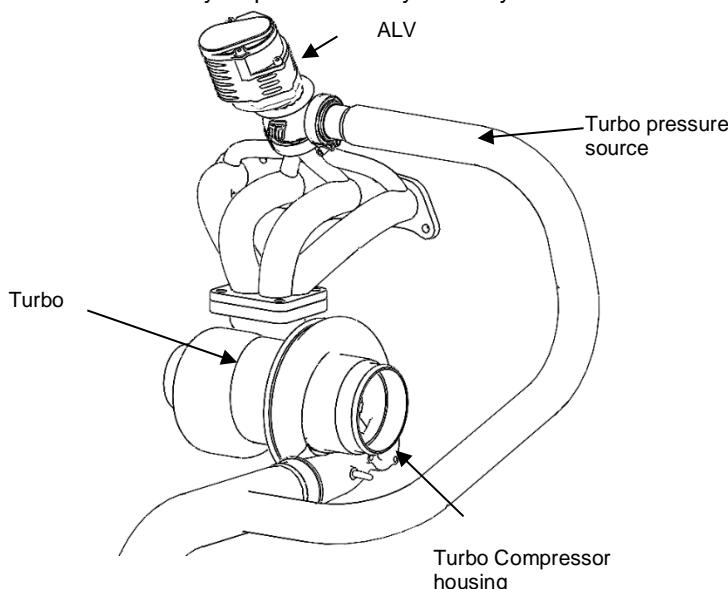


Figure 6 – ALV mounted on Turbo system

2 Fitting the Gen V ALV

Prior to mounting the Gen V ALV, place v-band 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 ALV to be installed.

Do not forget to put the valve seat into the body before mounting the unit on the exhaust manifold. Using the 3/8" deep socket and a torque wrench Tighten the V-Band to 7N.m (5 ft/lbs). Ensure

the Anti Lag Valve is home correctly while torqueing the nut to not have a false torque as this will likely contribute to exhaust leaks. Ensure O-Ring is in place on the inlet compressed air side of the valve.

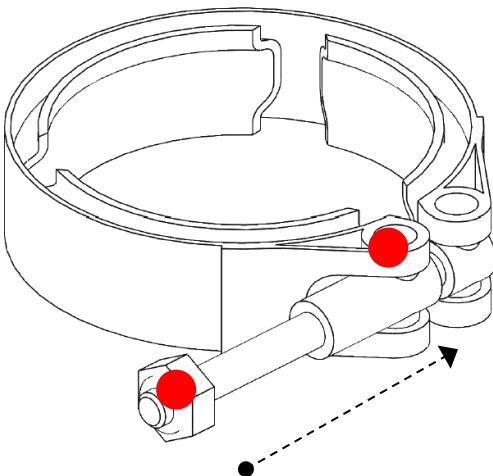


Figure 7 – Vee Band Clamp

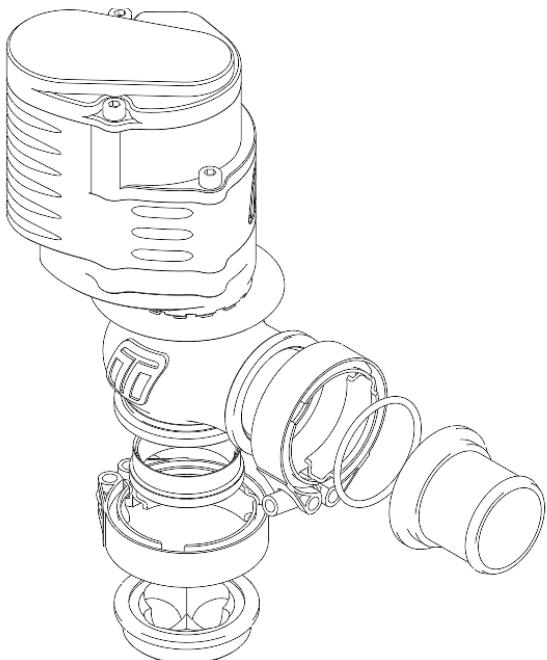


Figure 8 – Exploded Drawing

3 Connecting Your Anti lag valve

The Turbosmart Electronic Anti-lag valve comes unterminated with 6, or 7 wires. A revision was made to include the additional (Blue) wire for internal / development only purposes. **Revision A** can be identified by its total of 6 wire count, while **Revision B** can be identified by its total wire count of 7.

Revision B (current) – Wiring

	Colour	Description
1 single core wire each	Large Gauge Red	Motor A tending towards 0%
	Large Gauge Black	Motor B tending towards 100%
Multi Core Wire	Red	5V
	Black	Sensor ground 0V
	White	Position Signal 0-5V
	Blue	*Unfiltered Signal (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.

Sensor Voltage Limits

Deg C (Deg F)	Temperature Sensor Output (mV) Rev A	Temperature Sensor Output (mV) Rev B
0 (32)	500	2630
150 (302)	2000	538
Position Sensor	Target Voltage (V)	Duty Cycle (Rev B only)
100%	0.20-0.60V	~16%
0%	4.40-4.80V	~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 anti-lag valve 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 anti-lag valve should be driven by an External dual H-Bridge, that 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.

CAUTION!

Ensure all connections are high quality and away from any heat source.

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 verified the fuse and limits can be removed.

4**Calibration****CAUTION!**

Disconnect the motor wires to prevent accidental spin up.

To calibrate the electronic Anti lag valve, the cap must be removed to allow access to the manual override screw. Please note that the valve seat must be in place before calibration.

Using an Allen key remove the 2 top bolts allowing the cap to be removed, and a spacer or shift the cap off to one side and reinsert at least one of the bolts. This prevents the preload in the mechanism separating the housing potentially effecting the calibration accuracy.

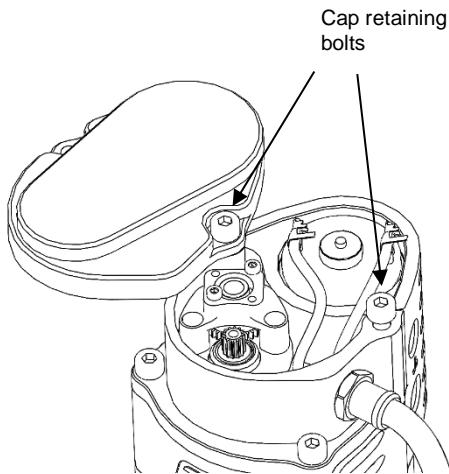


Figure 9 – Top Cap removed for calibration

Carefully move the motor wired allowing access to the manual override below (Figure 12)

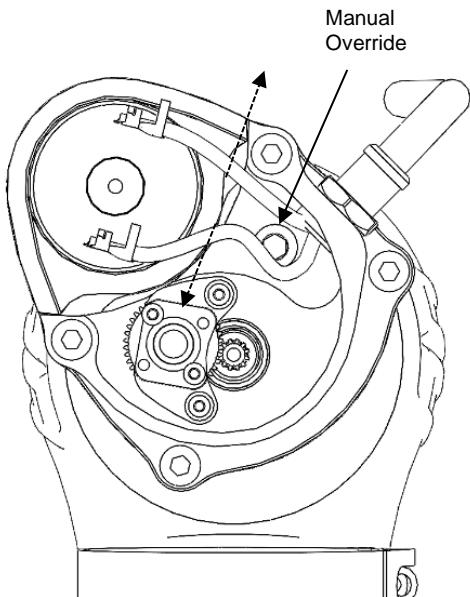


Figure 10 – Manual Override

Using a $\frac{1}{4}$ " 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 valve should be home against the valve seat and will be your 0% position. **Remember to have the valve seat inserted.**

CAUTION!

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

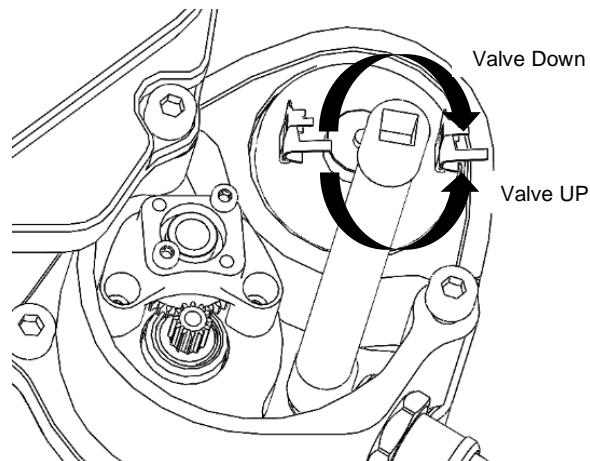


Figure 11 – $\frac{1}{4}$ Drive extension with 5mm socket manually adjusting.

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% valve travel.

Monitor sensor signal voltage to ensure no wrap around occurs throughout the stroke of the 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 anti-lag valve and overloading the system.

NOTE!

Turbosmart recommends allowing additional clearance from the end stops until the Anti lag valve control is tuned to minimise risk of overshoot into end stops at high speeds.

5 Tuning

The anti-lag valve will come calibrated from Turbosmart, the targeted values have been set with regards to the position sensor are 0.5V (completely open) and 4.5V as (completely closed). It's important to note that as the anti-lag valve moves through its range of motion that the 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 Anti lag valve, this is when the Voltage increases from 4.8V up to 5V and jumps through to 0V.

Position Sensor	Target Voltage	Duty Cycle
100%	0.20-0.60V	~16%
0%	4.40-4.80V	~84%

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

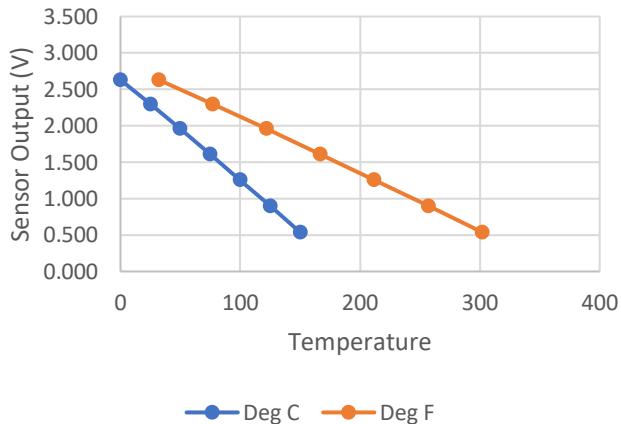
Driving the valve to 100% will cause increased wear on components such as the electronic motor as it tries to force the valve to completely open.

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

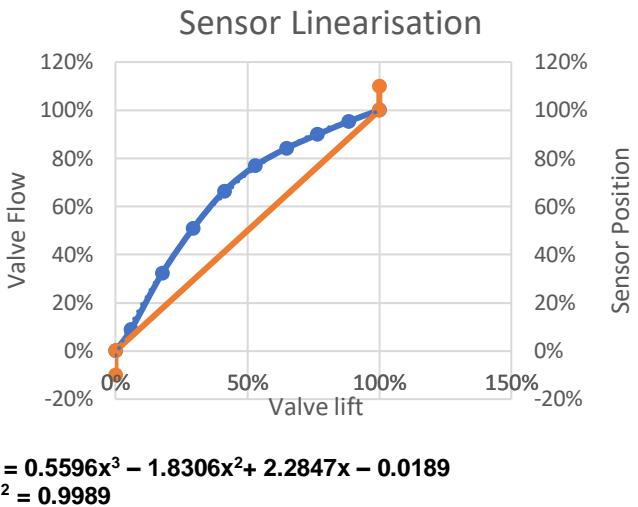
PLEASE NOTE When driving the electronic actuator, the current should be limit to **no more** than 20 amps at a period of 1 second and 5 amps for more than 5 seconds.

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



6 Sensor Linearisation

Due to the nature of the poppet 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 valve position with valve flow. A 3rd order polynomial is provided to relate sensor position to flow. Note due to the design of the anti-lag valve, the 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.



Tuning Strategies

CAUTION!

- Tuning your antilag valve should be done by a professional
- Antilag valve is for race applications only
- The use of antilag creates excessive heat in the exhaust manifold and can shorten the life of turbo, exhaust manifold and related systems

1 Activation and Shut Down

Criteria should be established within the ECU to control the antilag valve, a minimum throttle percentage and delay to arm the system with arming achieved when throttle is released with an active time limit set.

It is a good idea to have limits set up to shut down the antilag system if too much heat is being produced. Exhaust temperature sensors and engine temp should be monitored and allowed to deactivate the system if bordering dangerous levels.

Outputs should be set up to open the valve when enabled.

NOTE!

For best results, any bypass valves in the system should be forced closed when in enabled to ensure compressor charge is distributed into the exhaust manifold via the ALV.

2 Tuning

Each engine and set up will require different parameters to achieve the desired results. Typically, a combination of ignition retard, ignition cut, and fuel trim can be used to increase and decrease the effectiveness of the system.

ADVANCED FEATURES ON THE GEN V ANTI LAG VALVE

1 Re-Orientation of the Actuator

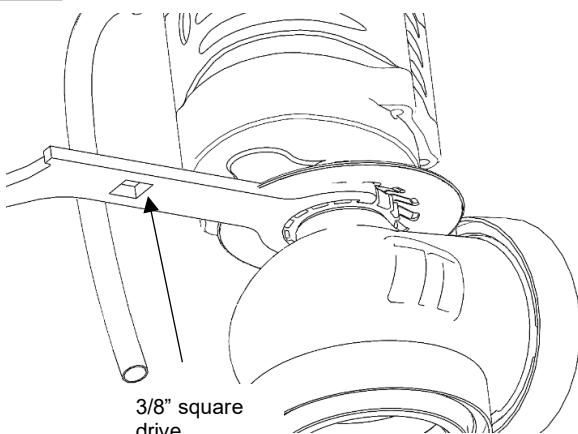


Figure 12 – Collar Tool

Turbosmart provide the Gen V Anti lag valve in a set orientation, in some applications it may be advantages to clock the actuator to allow clearance for fittings and wiring.

Locate the slave collar between the electronic actuator and the body underneath the heatshield. A tab on the heatshield will be folded down into a groove on this collar. Using a flat blade screwdriver, pry this tab out of the groove allowing the collar to be loosened.

Using the small end of the supplied collar tool undo the slave collar 1 complete revolution (anti-clockwise as viewed from the bottom). One tab on the heatshield at the back of the anti-lag valve is folded up to locate on the actuator, rotate the actuator to desired location ensuring the folded tab aligns with a groove in the bottom of the actuator. It is possible to fold down this tab and use another if the actuator cannot be positioned correctly on the original tab.

CAUTION!

Turbosmart does NOT recommend altering to position of the actuator once the Anti lag valve has been used.

It is recommended that the electronic actuator be clocked without a valve seat installed to prevent damage to the valve.

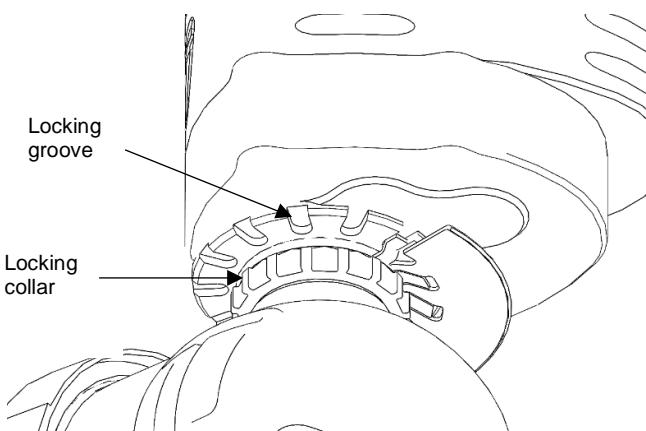


Figure 13 – Collar and Locking tabs

Tighten the collar using a torque wrench on the 3/8" square drive provided in the collar tool perpendicular to the length of the tool to **30N.m (22ft/lbs)**. Fold down a tab onto the slave collar to prevent the collar from coming loose during use.

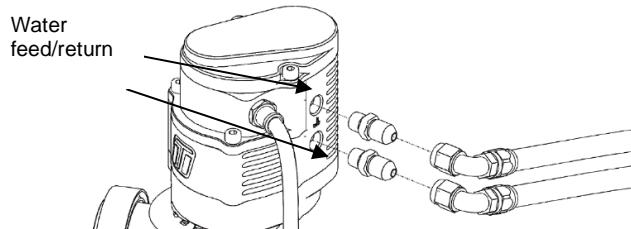


Figure 14 – Water Lines

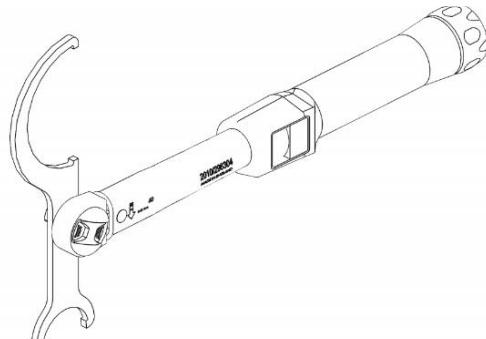


Figure 15 – Collar Tool and Torque Wrench

2 Water Cooling

Turbosmart's Gen V anti lag valve is equipped with water cooling ports to keep the anti-lag valve 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.

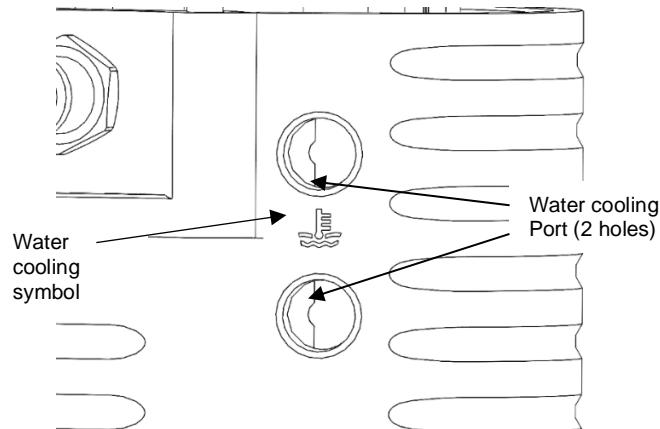


Figure 16 – Water Cooling Ports

Fit water-cooling port fittings Prior to mounting the anti-lag valve, 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 anti-lag valve. 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.

TROUBLESHOOTING

- Antilag valve not actuating - Confirm continuity of wiring, manually adjust valve position, and feel for binding.
 - Poor antilag valve actuation – Ensure wiring is correct, check for dirt and smooth operation by manual over-ride, ECU that is driving the valve may not be set up correctly.
 - Wraparound of signal on position sensor – Turbosmart Pre “time” every sensor, contact Turbosmart if this occurs.
 - Antilag valve seized – Remove cap and manually move valve feeling for resistance.
 - Antilag valve moves but sensor not reading – Check connections.
 - Failing the above, submit a technical request to tech@turbosmart.com.au with information of your engine configuration and photos of installation.
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