Throttle Installation Guide

Read thoroughly before installing any AT Power products.

Designed and manufactured in-house in the UK.

Safety Information

WARNING!

Please read this guide carefully before installation.

Motorsport or driving activities can be dangerous and can result in serious personal injury or death. Please read all fitting instructions thoroughly before proceeding with installation.

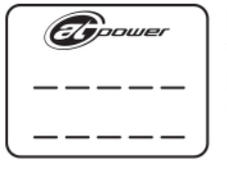
AT Power (part of S-CAN 3D Limited) automotive products are designed for motorsport use only. We accept no responsibility for improper use of our products, and we make no warranty regarding their ability to prevent injury or death. The performance, durability, and safety of this equipment are directly dependent on correct installation, usage, and maintenance. By using this product, the user voluntarily assumes all risks associated with its use.

Installing AT Power products on vehicles subject to manufacturer's warranty may void the manufacturer's warranty and the vehicle's compliance to meet emissions and other transport regulations.

Working on a vehicle involves inherent risks. If you are unsure of what you're doing, please entrust all mechanical and safety-critical tasks to a qualified professional. S-CAN 3D Ltd, accepts no liability for any incorrect installation or misuse of its products.

Please do not dispose of this item in household waste. To help protect the environment and human health from the impact of improper disposal, recycle it responsibly to support the sustainable reuse of materials.

Serial Number(s)



For future access to our product services, please record your serial number(s) here. You can also find them on the product label. Distributors, kindly share this information with your customers. Please retain this manual.

Warranty Disclaimer

S-CAN 3D Ltd.
Unit 10b Bunns Bank Ind Est
Attleborough
Norfolk
NR17 1QD
United Kingdom

Dear Customer,

Thank you for choosing an AT Power product. We hope your order has arrived in the same pristine condition it left our facility. If you notice any transport damage or manufacturing faults, please notify S-CAN 3D Ltd within three business days of delivery.

All AT Power products come with a 12-month manufacturer's warranty from the date of delivery, subject to the parts being installed correctly and run within their specification. Please save this installation manual.

Additionally, we also offer refurbishment services to extend the life of your AT Power products. For more information and to get a quote, please contact us via email.

Please note that S-CAN 3D Ltd is not liable for defects caused by normal wear and tear, intentional damage, negligence, improper conditions, misuse, unauthorised alterations, or any actions or omissions by the Customer, their employees, agents, or any third party. Failure to follow AT Power Throttles' instructions (whether written or oral) will result in the warranty being voided, without exception.

For full terms and conditions, please visit AT Power's website or contact us directly for assistance.

Sincerely,

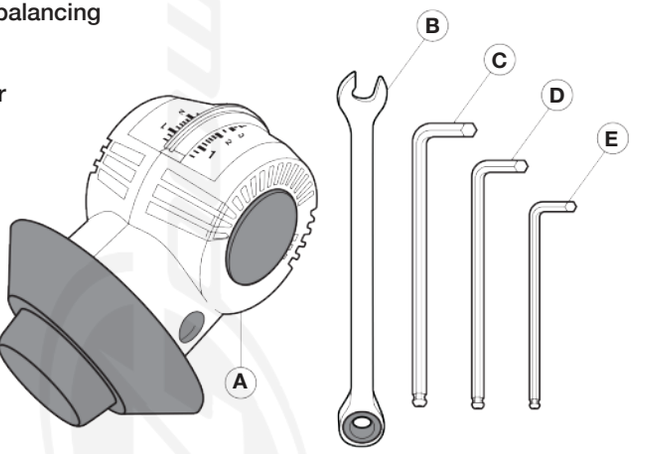
James Senior
Managing Director
S-CAN 3D Ltd.

Contents

Tools Required

The tools required for balancing throttles are:

A. Airflow Syncrometer
B. 8mm Spanner
C. Hex Key 4mm
D. Hex Key 3mm
E. Hex Key 2.5mm



Installation

Each of AT Power's **Direct to Head (DTH) Twin** and **DTH Universal Throttle Bodies** are designed for plug-and-play installation with minimal preassembly, fine-tuning and idle adjustment will still be required however.

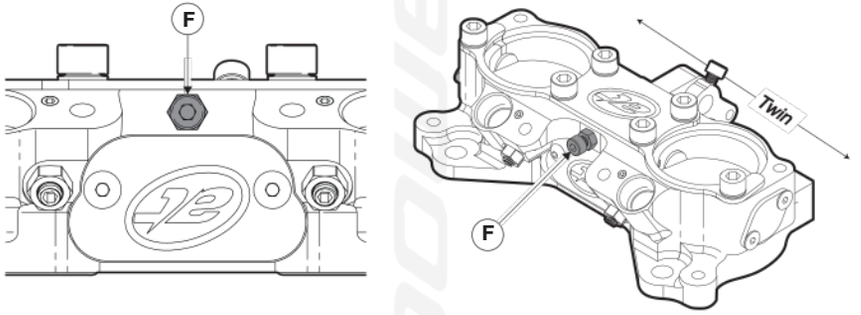
Each throttle is supplied with an O-ring seal for the joint face to either a manifold or the cylinder head. For easier assembly, we recommend applying a small amount of grease in the seal groove to hold the O-ring in place before fitting to the cylinder head or manifold. This will hold the seal in place allowing the throttle to be fitted to the cylinder head or manifold.

DTH twin and universal throttles mounted on adaptors and mounting flange plates have been balanced as a set in the fully closed position to ensure uniform vacuum performance.

Direct to Head (DTH) Twin Throttles

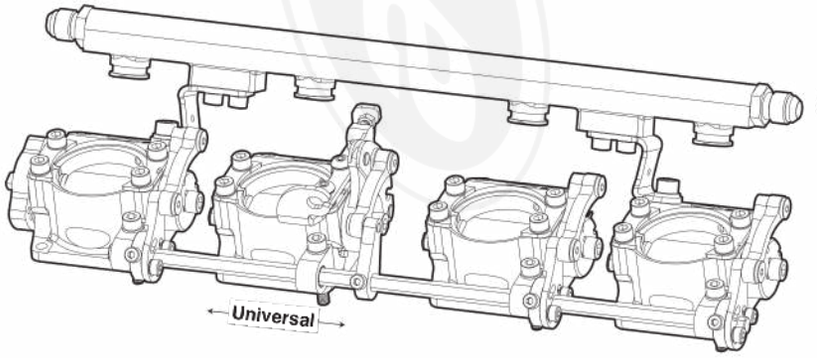
Each twin housing contains a **blade stop (F)** at its center. AT Power sets the throttles at the factory to ensure that each throttle blade is fully closed, with the blade stop positioned to prevent it digging into the throttle bore.

IMPORTANT: Do <u>not</u> adjust the blade stop (F).



Direct to Head (DTH) Universal Throttles

The universal throttles supplied on shipping rails have been individually balanced in the fully closed position to achieve consistent vacuum levels.



Drawings may vary from product

Checking Throttles

After installation, check that the AT Power Throttles open and close smoothly, as they were manufactured to do. If any linkage stiffness is detected, this might be due to the layshaft becoming misaligned.

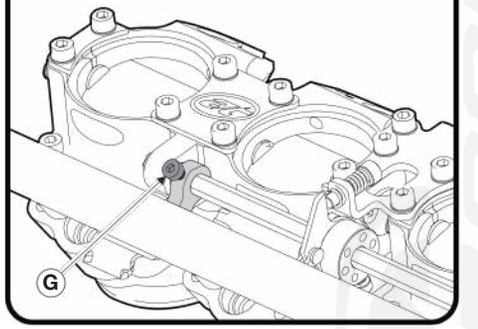
To correct this, loosen all link arm lock screws **(G)**. Then, ensuring the corresponding throttle blade is held closed, tighten each screw to 6–8 Nm. This should relieve the layshaft, eliminate any stiffness in the linkage, and maintain throttle balance.

If this does not resolve your issue, please contact AT Power for assistance.

IMPORTANT: Do not make any additional adjustments beyond those specified.

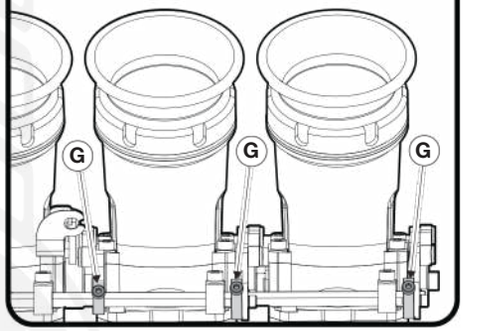
Twin Throttles

1 per twin



Universal Throttles

1 per port



Drawings may vary from product

If your throttles were supplied without a **throttle position sensor (TPS),** ensure one is fitted before mounting the throttles (see **p14-p17** for TPS information). After fitting the throttles onto the cylinder head, connect the TPS to the wiring harness.

Attach the **throttle cable** and remove any slack. Verify that the cable fully opens the throttles and allows them to return to the fully closed position before starting the engine.

For **ECU Calibration** turn on the ignition and calibrate the aftermarket ECU and TPS according to the ECU supplier's instructions.

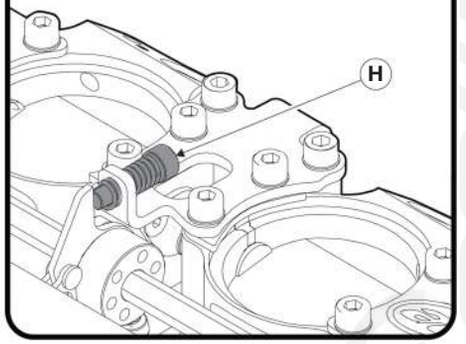
Idle Adjustment

PLEASE NOTE: The throttles are set to 'fully closed' at the factory. Before starting the engine, you may need to open the throttles slightly using the idle adjustment.

Once the ECU has been calibrated on cable pull throttles, start the engine and adjust the idle **(H)** to obtain desired idle rev speed. Twin Throttles have a spring loaded screw for adjustment. Universal Throttles have a locking nut that needs to be loosened before adjusting and tightened after adjustment.

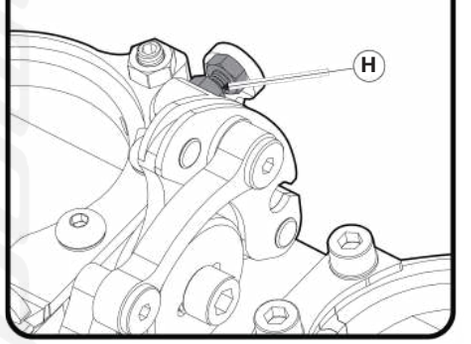
Twin Throttles

Adjust screw



Universal Throttles

Loosen/tighten nut



Drawings may vary from product

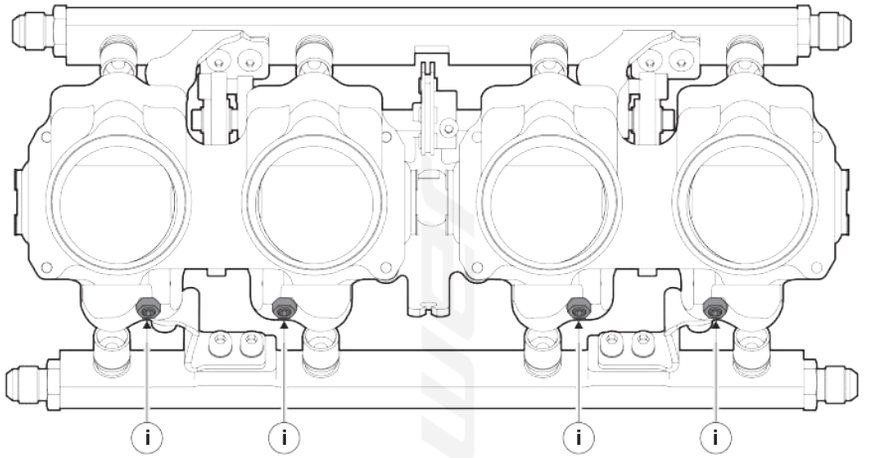
Balancing

After idle adjustment, balance the throttles by using an Airflow Synchrometer **(p5)** to check airflow across each throttle port. As a general guide, aim for a Synchrometer reading of 2–4 kg/h, though this may vary depending on the engine.

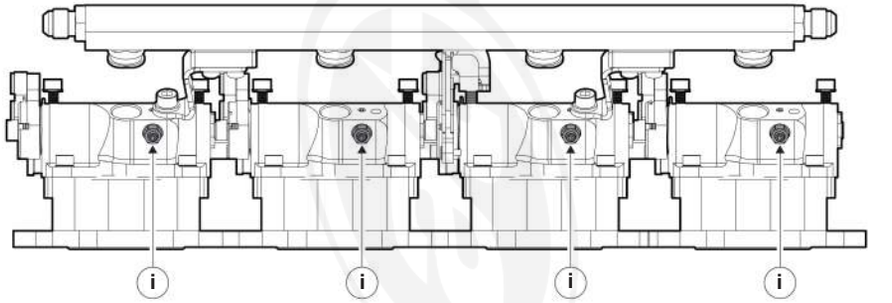
If balancing is needed, with the Airflow Synchrometer on the inlet port, loosen the nut and adjust the apropriate balancing screw **(i)** until desired flowrate is achieved, then re-tighten balancing nuts.

Note: Clockwise reduces the air bypass, anti-clockwise increases the air bypass.

Twin Throttles: Balancing Valves



Universal Throttles: Balancing Valves



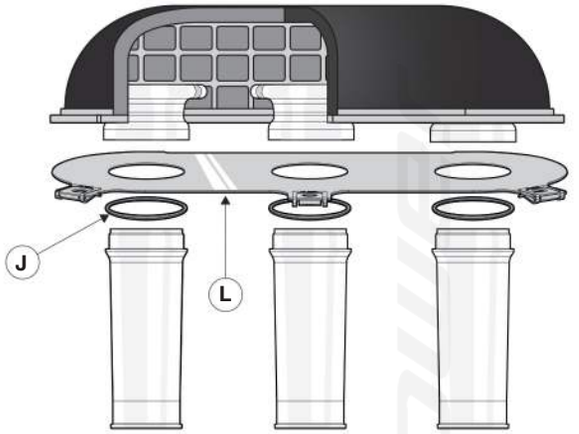
Drawings may vary from product

If you encounter any issues setting up your throttles, please contact us before continuing.

Throttle Ram Pipe (Trumpet) Fitment

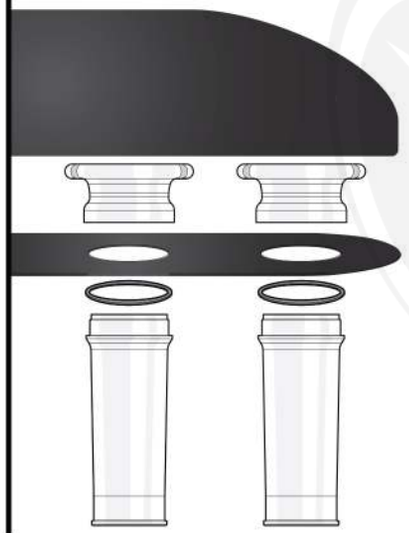
Megaflow Air Filters

For air filters with an aluminum backplate, place one ram pipe washer on the top of each extension, below the backplate **(J)**. Using the AT Power ram pipe torque tool **(K)**, secure the ram pipes at 12-14 Nm.



Drill sensor hole through the backplate *if* required **(L)**.

Air Box



When using an air box, place one ram pipe washer on the top of each extension, below the backplate.

To prevent cross-threading ensure the inner surface of the backplate is smooth, flat, and of even thickness.

For air box installations subject to excessive vibration or shock loads, additional support brackets are recommended.

PICK YOUR TYPE

No Air Filter or Air Box

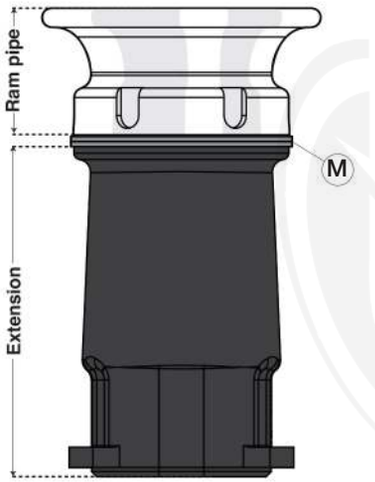
Fit two ram pipe trumpet washers together if no air filter or air box is required. For 3D printed extensions below, sandwich two aluminium ram pipe washers together **(M).** For Aluminium extensions, use two plastic ram pipe washer **(N).**

When fitting the ram pipe, ensure threads align correctly and the clamping surface is smooth and flat.

The torque setting should be 12—14 Nm.

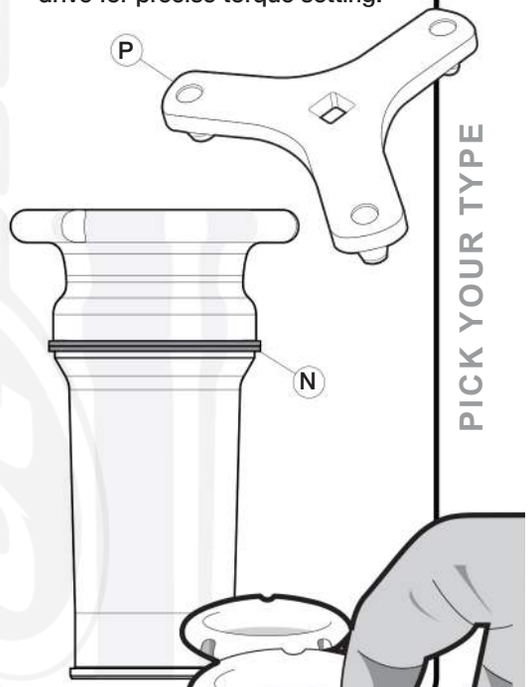
3D Printed Extensions

Use a C-spanner **(O)** for tightening 3D-printed extensions.



Aluminium Extensions

For aluminum extensions, use AT Power's ram pipe tool **(P)**, with a 3/8" drive for precise torque setting.



Drawings may vary from product

PICK YOUR TYPE

Throttle Drive By Wire (DBW) Actuator

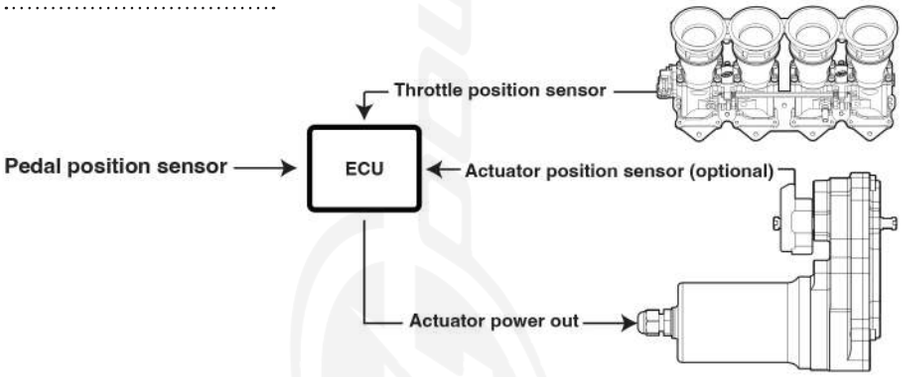
IMPORTANT: Do not drive the throttles or actuators forcefully into their mechanical stops. Complete and verify proper tuning before usage. If the system has not been calibrated before ignition, immediate failure is likely. Contact your ECU supplier for guidance.

Our DTH throttles do not support limp home mode.

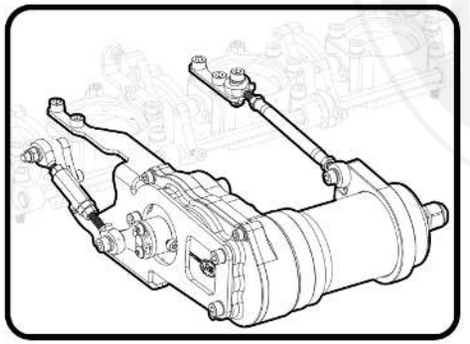
The AT Power Electronic Throttle Actuator delivers a fast and responsive Drive-By-Wire solution (DBW) for both twin and universal throttle systems.

All key components, except the electric motor, are designed, developed, and manufactured by AT Power. The actuator features a DC motor with reduction gearing for maximum torque and operational speed, supporting a 110° sweep in both directions.

Set Up and Calibration:



AT Power offers multiple installation options:



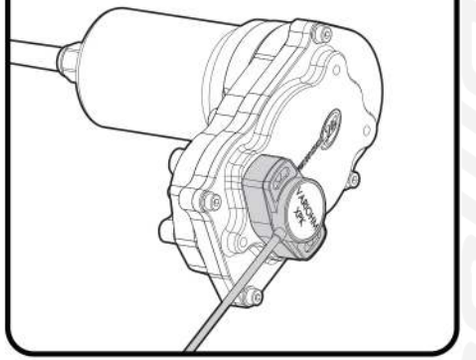
Standard Mount

The linkage is driven from the underside of AT Power throttles, with the actuator mountable on the opposite side if needed. The supplied linkage assembly is designed for AT Power throttles, allowing 360° rotational positioning and precise adjustment.

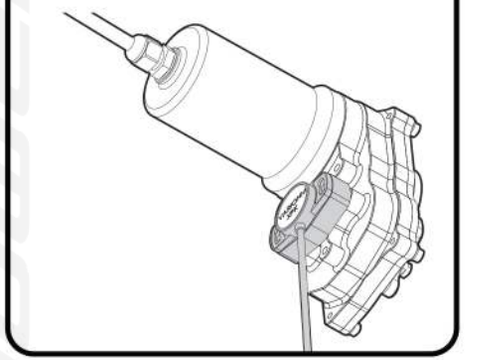
Optional Actuator Position Sensor

AT Power provides a dual, fully redundant, contactless TPS (Throttle Position Sensor) that is customisable to suit individual requirements. The TPS can be mounted on either side of the actuator as shown below. The linkage assembly is then installed on the opposite side.

TPS Outside Housing



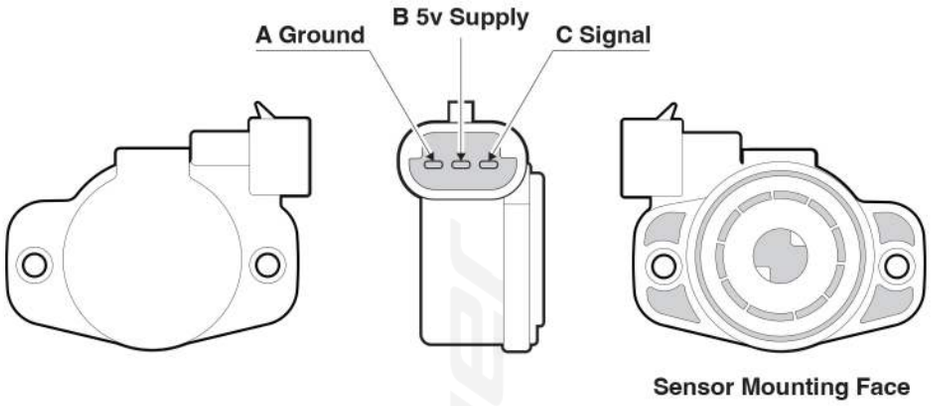
TPS Inside Housing



The adjustable idle stop should be set to define the fully closed position, while the ECU should be calibrated to provide electronic soft stops for both fully open and fully closed positions.

If you require a TPS or additional TPS units, please contact us and provide your serial number for further assistance.

TPS: Magneti Marelli Type (PF1C/PF2C)



Throttle Position Sensor

- Sealed, Spring Return Rotor
- Tin Plated Terminals

Available Rotation Ordering Information:

- 101-130-00013 – Output D-shaft drive orientation is **anti-clockwise** when viewed from the sensor's mounting face.
- 101-130-00014 – Output D-shaft drive orientation is **clockwise** when viewed from the sensor's mounting face.

Electrical/Mechanical Specification

Total Resistance (Rt)	1.2KΩ ±30%
Linearity	±3.0% (absolute)
Rotation Max	110° Mechanical 107° Typ. Electrical
Hysteresis	≤1.0% Applied Voltage
Electrical Limit	16 VDC Maximum
Typ. Voltage	5-10VDC
Max Power Rating	0.08 Watts
Torque - Start of Rotation	>0.020Nm
Torque - End of Rotation	<0.120Nm
Stop Strength	0.6Nm

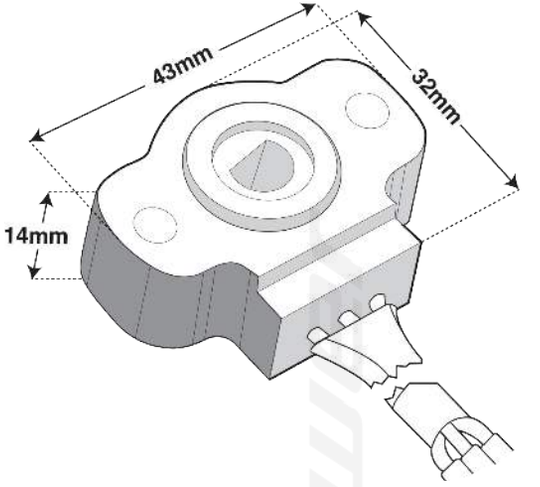
Durability/Environmental Specification

Mechanical Cycling	1 x 10° Full Strokes 0.5 x 10° Half Strokes 4 x 10° Dither Strokes
Standard Vibration:	24 hrs; 3 Planes; 33 - 600Hz; 3 - 25g
Thermal Shock:	100 Cycles, -40° to 140°
Temp Range (Operating & Storage)	-30°to 125° C
Salt Spray:	250hrs
Humidity:	96hrs, 93% RH at 40°C

Resistant to gasoline, engine oil, brake fluid & antifreeze

The specifications shown on these pages have been met on existing production tooled units. However, it does not constitute a warranty that the product will meet the above specifications in your application.

Wabash RPS Rotary Position Sensor 971-0002



Pin information

1 Green - Signal
2 Black - Ground
3 Red - 5v Supply

Mechanical Specification

Rotation	128° ±2°
Spring Torque	Min Return - 6 Nmm Max Wind up - 120 Nmm
Mechanical End Stop Strength	680Nmm Min
Fixing Torque (M4 & Washer)	2Nm Maximum
Lead Wire Version 971 - 0002	16/0.2, 0.5 mm CSA 1.8 mm OD Pull Strength: 10kg Max (all 3 wires)

Electrical Specification

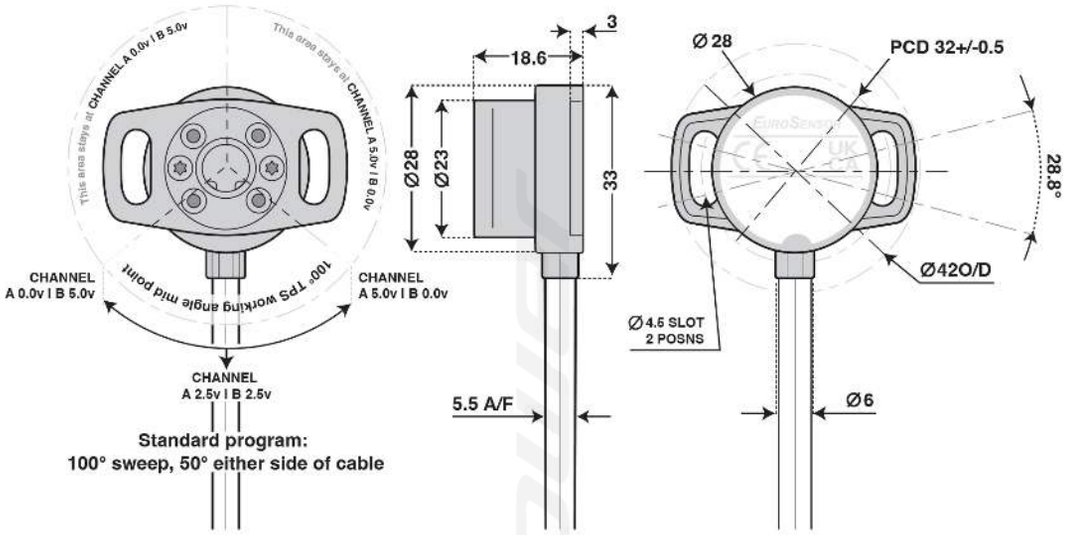
Track Resistance (Rt)	5KΩ ±20% @ 20°C ±10°C
Linearity (Independent)	±2%
Index Point	3% ±2% @ -Low End Stop
Output Gradient	0.973%/° Max 0.873%/° Min
Power Rating	I Watt @ 40°C Derated to Zero @ 135°C
Temperature Coefficient	±600ppm/°C
Insulation Resistance	1000MΩ Min 500V DC
Maximum Voltage	13.5V DC

Performance & Environment

Rotation Life (- 40° - +130°C)	5,000,000 Full Cycles 10,800,000 Dither Cycles (2°)
Functional Temperature Range	-40°C to +85°C Wire Version -40°C to +155°C Connector Version
Mechanical Shock (Handling)	Im Drop onto Concrete Floor
Mechanical Shock (Bump)	1000 40 g 11 ms Shocks (3 axis)
Vibration (Sinusoidal)	10 - 57 Hz @ 1 mm Displacement 57 - 100 Hz @ 10g 100 - 500 Hz @ 27g
Sealing	IP 5X (dust)
Pressure Wash	90 Bar 0.5-0.6 m 5-6 Seconds
Humidity	40°C 96% RH 504 Hours
Chemical Resistance	Screen Wash, Gearbox Oil Brake Fluid Dot 4 Isoctane/Toluene (70/30) +15% Methanol Engine Cleaning Agent, Engine Coolant Antigel Fluid, Electrolyte Density 1285 Kg/m3 (Sulphuric Acid H2S04)

Variohm Euro: XPD D-Shaft Programmable sensor

As supplied by us.



Mechanical Specification

Typical Life Cycle	>50 million movements (restriction by mechanics)
Torque	< 0.1 Ncm
Measuring Range	360° redundant, signal 1 cw, signal 2 ccw
Housing	High grade temperature resistant plastic
D-Shaft	Nylon 66

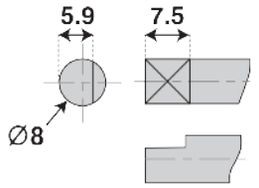
Electrical Specification

Supply Voltage	5V+/- 0.5V
Output Signal	Ratiometric 5%...95% of supply (+/-25mv of specified electrical output range for both start & end voltage)
Independent Linearity	+/- 0.5% of each signal range
Isolation Resistance	200 MΩ (500 VDC, 1 bar, 2s)
Cable Type	Raychem Spec 55, 24 AWG; Sleeving - Raychem DR25

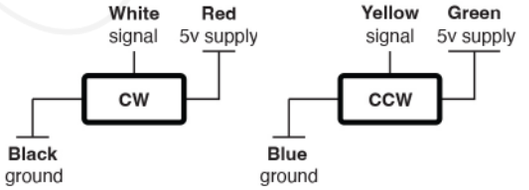
Environmental Specification

Operating Temperature	-40* C to +125° C (Short term 150° C)
Vibration	5...2000 Hz; Amax = 0.75 mm; amax = 20g to IEC 60068-2-6
IP Rating	IP68 (minimum)

Mating 8mm D-Shaft detail

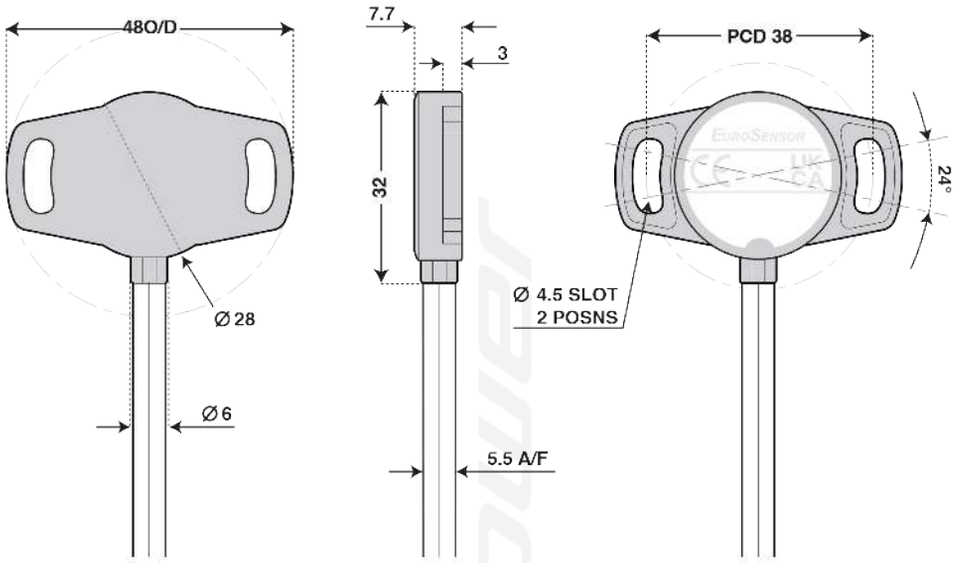


Pin and Wiring Information



Variohm Euro: XPK Puck Type Programmable sensor

Orientation programmed per order, specific to application.



Mechanical Specification

Typical Life Cycle	In excess of 100 million cycles
Measuring Range	360° redundant, signal 1 cw, signal 2 ccw
Housing	High grade temperature resistant plastic

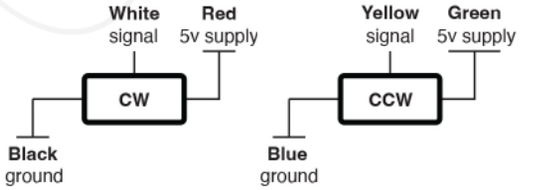
Environmental Specification

Operating Temperature	-40* C to +125° C (Short term 150° C)
Vibration	5...2000 Hz; Amax = 0.75 mm; amax = 20g to IEC 60068-2-6
IP rating	IP68 (minimum)

Electrical Specification

Supply Voltage	5V+/- 0.5V
Output Signal	Ratio metric 5%..95% of supply (+/-25mv of specified electrical output range for both start & end voltage)
Independent Linearity	+/- 0.5% of each signal range
Sample Rate (Fast Mode)	5 kHz
System Propagation Delay (Fast Mode)	600µs
Isolation Resistance	200 MΩ (500 VDC, 1 bar, 2s)
Cable Type	Raychem Spec 55, 24 AWG; Sleeving - Raychem DR25

Pin and Wiring Information



Fuel Rail

IMPORTANT: Do not remove the fuel rail end fittings (Q), as this may cause damage. To change the fittings please contact us with your serial number so we can advise you.

Fuel Injectors

IWP048 Fuel Injector
5 Hole – Cone Spray, Fuel Injector

Technical Data

Max Fuel Pressure	500 kPa
Flow (Fully Open at 3 Bar)	215 cc/min – 2.45g/s

IWP043 Fuel Injector
4 Hole – Cone Spray, Fuel Injector

Technical Data

Max Fuel Pressure	500 kPa
Flow (At 3 Bar)	329 cc/min – 3.75 g/s
Flow (At 4 Bar)	377 cc/min – 4.30 g/s
Flow (At 5 Bar)	421 cc/min – 4.80 g/s

IWP189 Fuel Injector
12 Hole – Cone Spray, Fuel Injector

Technical Data

Max Fuel Pressure	500 kPa
Flow (Fully Open at 3 Bar)	510 cc/min – 5.8 g/s

IWP162 Fuel Injector
5 Hole – Cone Spray, Fuel Injector

Technical Data

Max Fuel Pressure	500 kPa
Flow (At 3 Bar)	377 cc/min – 4.30 g/s

IWP023 Fuel Injector
Single Hole – Cone Spray, Fuel Injector

Technical Data

Max Fuel Pressure	500 kPa
Flow (At 3 Bar)	158 cc/min – 1.8 g/s

IWP069 Fuel Injector
Single Hole – Cone Spray, Fuel Injector

Technical Data

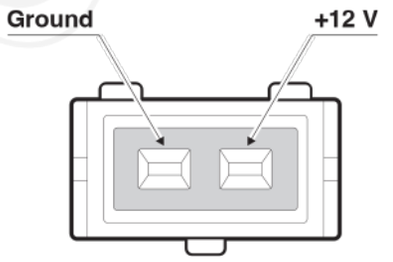
Max Fuel Pressure	500 kPa
Flow (At 3 Bar)	491 cc/min – 5.60 g/s
Flow (At 4 Bar)	563 cc/min – 6.42 g/s
Flow (At 5 Bar)	629 cc/min – 7.17 g/s

IWP006 Fuel Injector
4 Hole – Twin Spray, Fuel Injector

Technical Data

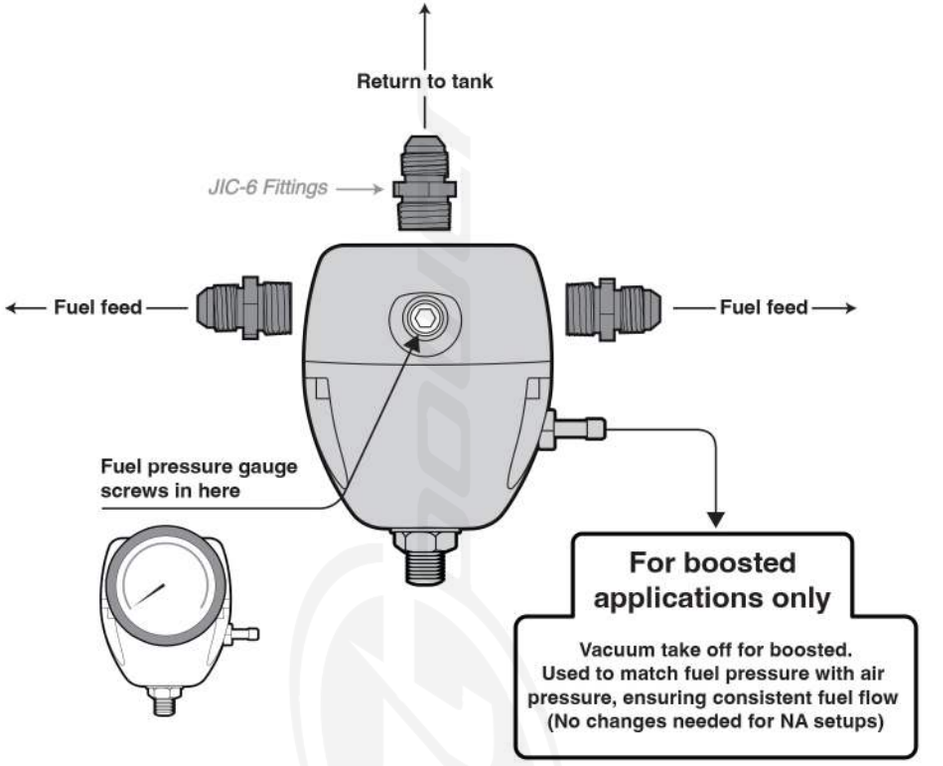
Max Fuel Pressure	500 kPa
Flow (At 3 Bar)	26 cc/min – 2.58 g/s

Pin Information



Fuel Pressure Regulator Configuration

SKU: 509-103-00001



Tag us in your engine build!

Connect via WhatsApp

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Tel: +44 1953 875800 **info@atpowerthrottles.com**

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Attleborough, Norfolk, NR17 1QD, United Kingdom