



In Cell Equipment

In Cell Equipment

Our philosophy of flexibility and simplicity of design helps provide the foundation for our range of modular, ancillary in-cell products to meet the diverse and demanding requirement of modern test facilities. Our in-cell support solutions are designed as part of our turn-key engine and vehicle test cell automation and are also available as stand-alone solutions suitable for use with non CP host test systems.

CP offer a wide range of dynamometers to meet most testing requirements. All CPs dynamometers are custom selected and designed to match a customer requirement, as we understand that a 'one size fit all' solution is not ideal for most customers.

CPs range of ancillary products are designed to accompany and integrate with any existing or new build engine or vehicle test cell installations. CP are able to offer products to provide air inlet and exhaust back pressure valves, engine fluid conditioning solutions, fuel measurement and conditioning solutions as well as mechanical throttle actuation systems.





Dynamometers and Drives

AC and Eddy Current

Introduction

CP Engineering offers a range of dynamometers. CP can supply motoring and absorbing AC Dynamometers or Eddy Current Dynamometers with a wide operating performance and fast response. The range dynamometer caters for the high-speed requirements of petrol engines and the high torque demands of diesel development.

AC Dynamometers

CP are able to offer a vast selection of dynamometer ranging from 15kW to over 1,000kW with bespoke dynamometer designing capabilities to cater for all testing requirements.

Standard AC dynamometer construction includes dynamometer base frames of desired centre height, capable of various mounting arrangements.



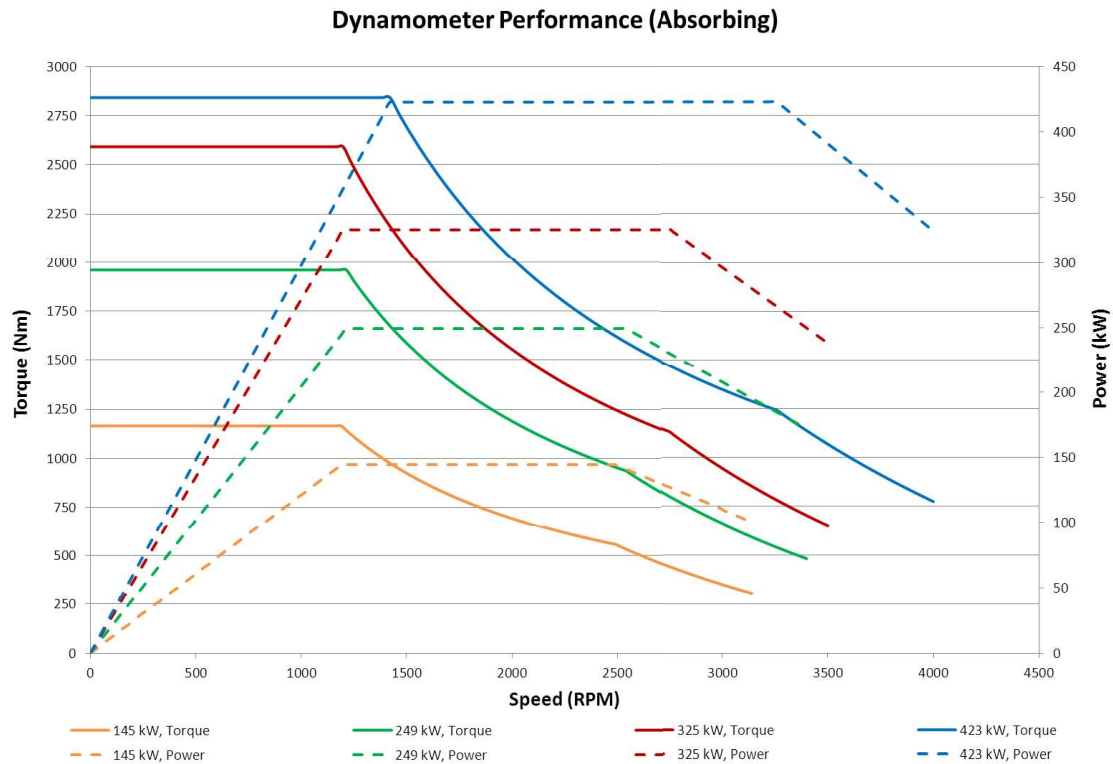
Torque measurement is most commonly from an in line torque flange for high accuracy and speed measurement from an optical encoder. Calibration arms and weights pan are included as standard. Calibration weights can be provided by CP on request. Above is shown a CP 840kW AC dynamometer complete with rotor lock, torque flange with calibration arms and pans.

Each dynamometer is matched to a 3-phase AC four quadrant regenerative drive. The drive incorporates filters for high and low order harmonics to prevent cross talk with adjacent equipment. The range of drives is physically compact without sacrificing outright performance.

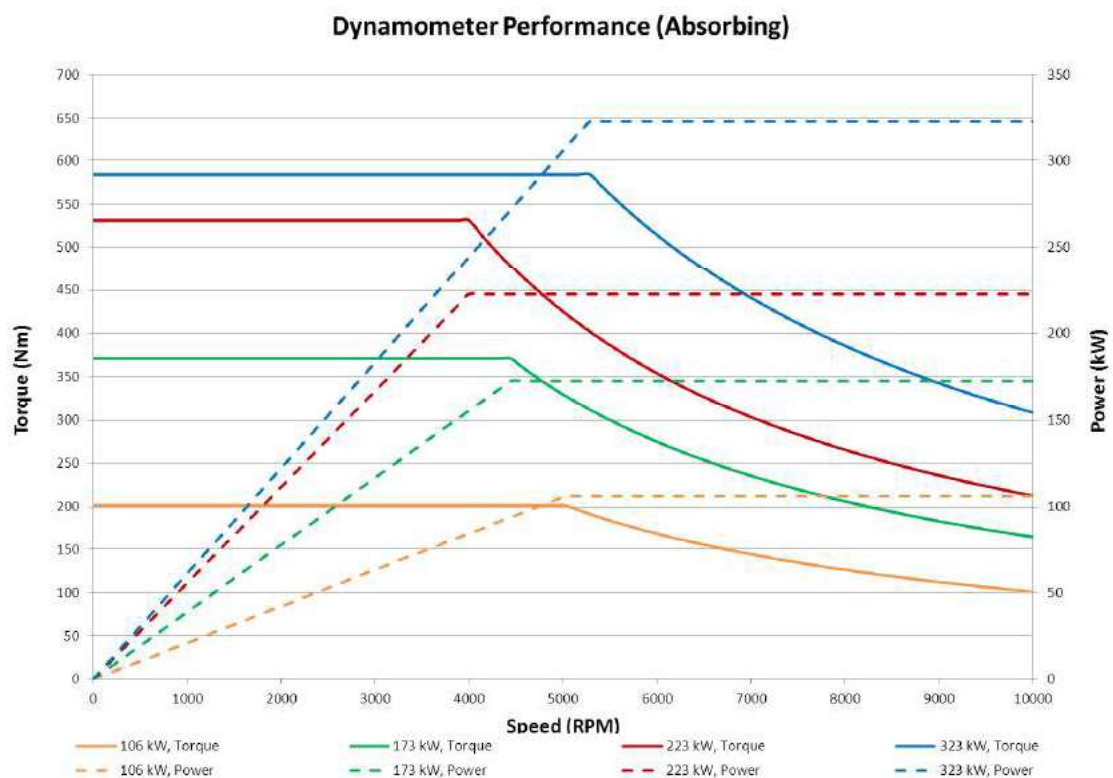
The standard range of dynamometers described in this Data Sheet has been carefully selected to show a range of dynamometers suitable majority needs of the engine testing industry, however CP would be pleased to consider any requirements for special applications. This includes performance enhancements and operational requirements such as water cooled motors, double ended shafts, provision of shaft guarding and drive shafts, palletised dynamometer systems and any other specialist requirements which you might have.

CP treats each customer's specification individually and offers bespoke dynamometer solutions to best suit the requirement.

High Torque AC Dynamometers



High Speed AC Dynamometers



Specification and Performance Data

The dynamometer characteristics for some of the standard dynamometers CP can provide are shown below:

High Torque Dynamometers

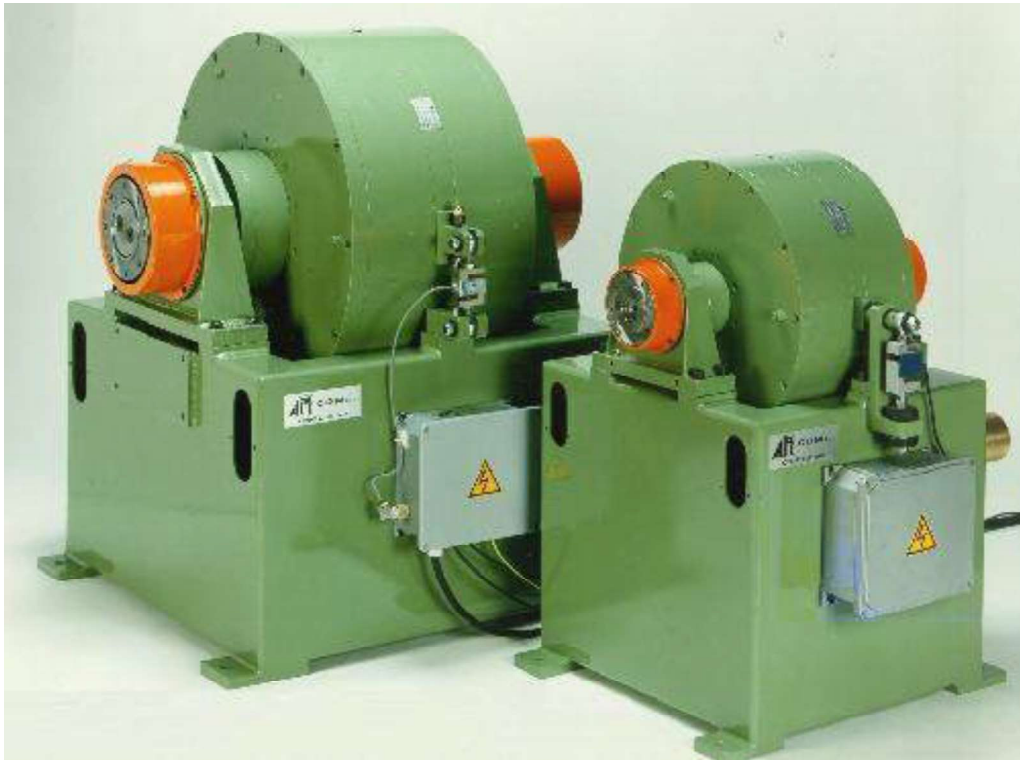
	145kW		249kW		325kW		423kW	
	Base	Max	Base	Max	Base	Max	Base	Max
Speed rpm	1,200	3,150	1,200	3,400	1,200	3,500	1,400	4,000
Absorbing Torque Nm	1,170	305	1,960	480	2,600	650	2,850	770
Absorbing Power kW	145		249		325		423	
Motoring Power kW	137		235		307		399	
Free Accl'n rpm/sec	10,541 up to Base		10,173 up to Base		9,441 up to Base		9,652 up to Base	
Rotor Inertia kg/m ²	1.06		1.84		2.63		2.82	
Current amps	255		430		585		735	

High Speed Dynamometers

	106kW		173kW		223kW		323kW	
	Base	Max	Base	Max	Base	Max	Base	Max
Speed rpm	5,000	10,000	4,500	10,000	4,000	10,000	5,300	10,000
Absorbing Torque Nm	200	100	345	155	500	200	550	290
Absorbing Power kW	106		173		223		323	
Motoring Power kW	100		163		210		305	
Free Accl'n rpm/sec	15,917 up to Base		14,976 up to Base		16,465 up to Base		18,112 up to Base	
Rotor Inertia kg/m ²	0.12		0.22		0.29		0.29	
Current amps	190		290		380		570	

Steady State Dynamometers

CP Engineering can provide a range of eddy-current dynamometers to cater for either high speed or high torque engines up to 700kW. CP Engineering can also provide hydraulic dynamometers up to 2,100kW.



Eddy current and hydraulic dynamometers are controlled by CADET V14 using the respective CP Power Modules. By using these power modules CADET can easily control any dynamometer type.

Eddy Current Dynamometers

Model	Power (kW)	Max. Torque (Nm) at (rpm)	Max Speed (rpm)	Inertia (kg.m ²)
W40	40	75 at 2,000	17,000	0.0098
W70	70	150 at 1,600	13,000	0.035
W130	130	400 at 1,100	10,000	0.14
W230	230	750 at 600	7,500	0.53
W400	400	2,000 at 650	5,500	2
W700	700	4,000 at 400	4,000	7.9

Hydraulic Dynamometers

Model	Power (kW)	Max. Torque (Nm) at (rpm)	Max Speed (rpm)	Inertia (kg.m ²)
D230	230	600 at 2,100	13,000	0.02
D400	400	1,300 at 1,500	10,000	0.08
D700	700	3,000 at 1,200	7,500	0.3
D900	900	4,000 at 950	6,500	0.6
D1200	1200	7,500 at 1,000	5,500	1.2
D2100	2100	15,000 at 500	4,000	3.9

Benefits and Features

- Low Inertia
- High Performance to Cost Ratio
- Bespoke design options

Applications

- Emissions Certification Work
- Transient Test Cycles
- Drive Cycles
- Vehicle Simulation Work
- Endurance and Reliability

When operating with CP Engineering's CADET V14 test systems all machines are suitable to generate the dynamic test requirements for Federal and European emissions tests.

Additional Options

- Drive Cabinet for powering the dynamometers
- Drive Shafts
- Shaft Guards
- Dyno Stools
- Load Cells
- In-Line Torque Meters
- Encoders and Toothed Wheels

CP provide suitable AC variable speed 4 quadrant regenerative drives to support any size AC dynamometers.

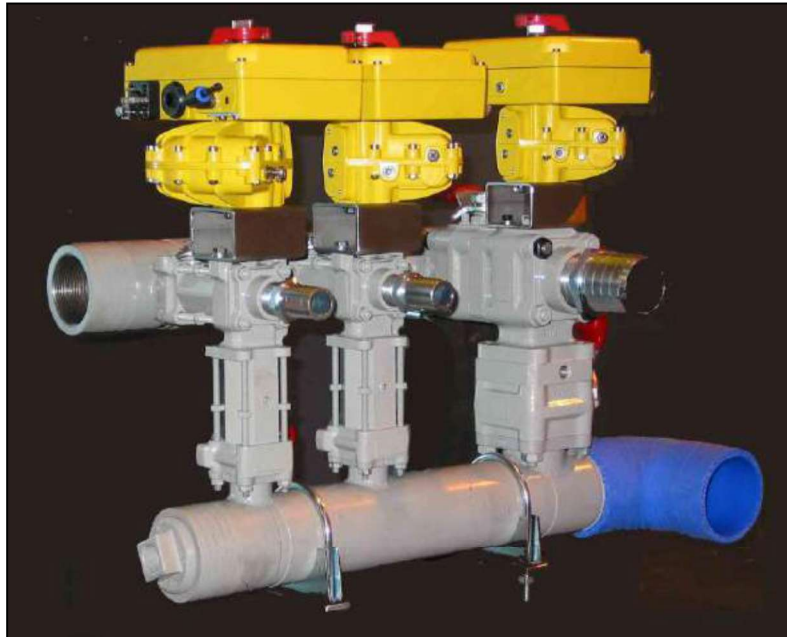
For a full range of AC dynamometers and drives please contact CP Engineering with any specific requirements. CP will provide a range of dynamometer and drive solutions for your specific testing applications.

Customer Responsibilities

The customer should make available or prepare the following services as required:

- 3 Phase Power
- Cooling/Bed Water Supply
- Control System with Safety Monitoring (CADET)

These will be confirmed and discussed during the project phase.



Valve Manifold Assembly

Introduction

The high quality valve manifold assembly is designed to provide for the temperature control of Engine Coolant, Engine Oil and Turbo-Intercooler in engine test applications. The compact module supports the rapid control of test bed coolant flow through three independent cooling circuits, which usually include heat exchangers.



The photo shows a standard assembly of two ¾" and one 1½" cooling circuits.

The flow range/ back pressure of each circuit is pre-set using integral ball valves, in the return circuits, to accommodate heat exchangers with a range of pressure drops.

Benefits and Features

- Only two connections required for feed and return water
- Compact unit reduces clutter in the cell
- Proportioning valves aid accurate flow control
- Cooling of up to four control circuits

Applications

- Engine test work, where air cooling of radiator is not appropriate
- Emissions work to control engine fluids to within allowable limits
- Connect to existing Heat Exchangers for automated PID control

System Description

The module, which supports both hose and screw fittings, requires one feed and one return connection. This approach provides for ease of maintenance, especially when connections are via silicon rubber hose.

In typical installations the return flow from the three cooling circuits will be via the free end of the manifold return allowing a single point of coupling for the test bed coolant feed and return.

The manifold will operate with a large range of coolant pressure, as the required maximum flow rate may be pre-set using the manual range adjustment valves. This feature ensures that each circuit may be optimised for the required heat dissipation and thus coolant circuits may be pre-set for the engine size and power output in use. This ensures that the control valve operates over its full range of travel

The ability to match the internal return flows with the heat-exchanger circuit by using the integral balance valves ensures that the control valves operate in a linear manner and are therefore well matched to the range of flow control required. The three way control valves respond to 4..20mA position set-points and provide fast and precise positional control, resulting in responsive and precise temperature control. The module is suitable for vertical or horizontal mounting.

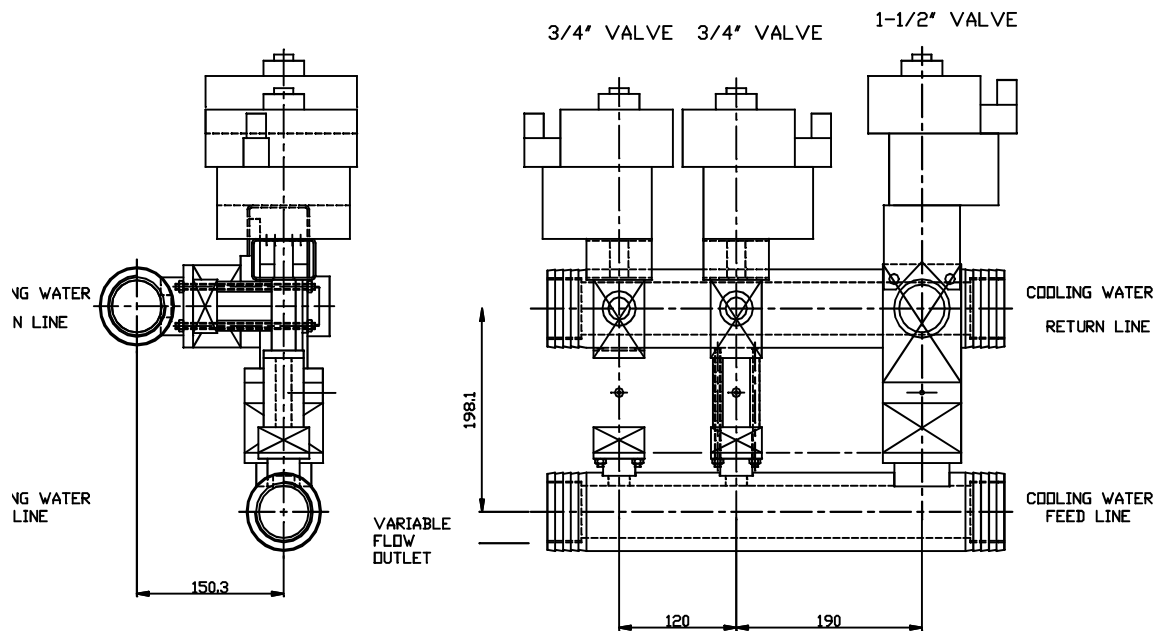
Additional Options

Build into a Cooling Post for complete cooling of the test bed in a stand alone package.

Two, three or four valve systems available, the manifolds are designed for three valves as standard, but can have the ports blanked to reduce initial capability, but allowing expansion later.

Heat exchangers and plumbing can be sized, supplied and or fitted if required, please ask.

General Assembly



Customer Responsibilities

The customer should make available or prepare the following services:

- Clean Air Supply
- Bed or Cooling Water Feed and Return
- Heat Exchangers to Connect to

These will be confirmed and discussed during the project phase.

Specification and Performance Data

Coolant Connections	Qty	Threaded	Hose End
FEED	2	2" BSP internal x 34mm	75mm o.d. x 34mm barbed
RETURN	2	2" BSP internal x 34mm	75mm o.d. x 34mm barbed
Supply Pressure		2...6 Bar depending on the required cooling capacity	

Cooling Circuits	Qty	Threaded	Hose End
Small ¾" BSP	2	¾" BSPP Female	¾" BSPT x 1" Hosetail
Large 1 ½" BSP	1	1 ½" BSPP Female	1 ½" BSPT x 2" Hosetail
Pressure Tapping	3	1/8" BSPP Female – before control valve for range setting.	

General Data	Qty	Specification
Valves	All	Worcester Valves - Carbon Steel Body, S.S Ball, PTFE Seats
Positioner Specification	All	Kinetrol EP 15 Sealed to IP55
Air Quality	n/a	IMPORTANT – Instrument grade Dry, Dust and Oil Free.
Air Connectors	3	6mm push fit.
Electrical Data	3	Plugs supplied connect 4..20mA 2 wire 8 V Minimum .
Position Control	3	0-90 degrees. Position is indicated by the pointer on the positioner
Paint Finish	n/a	RAL 7030 powder coat -
Mounting	2	Plated steel U clamps
Weight	n/a	49 Kg complete unit
Spares	n/a	Stem seals, face seals and seats are available but not included.
Shipping Dimensions	n/a	275(d) x 480(w) x 490(h)



Cooling Post

Introduction

The Cooling Post Module is designed to enhance the features of the Valve Manifold Assembly. It provides the ideal platform for in-cell cooling applications where a small footprint and ease of adaptability are required. The system is built up with the relevant size of heat exchangers included.

The flow range/ back pressure of each circuit is pre-set using integral ball valves, in the return circuits, to accommodate heat exchangers with a range of pressure drops.

Engine Header Tank style Heat Exchangers are used for cooling the engine water and effectively replace the engine header tank of the cooling system. These are mounted above the top of the engine to replicate the head of the cooling system in normal operation. The header tank is mounted on top of a post which forms part of the CP engine cooling module in conjunction with the Valve Manifold Assembly.



Cooling Post Module with Valve Manifold Assembly
Located at base, Bowman Engine Header tank Heat
Exchanger on top and Oil Heat exchanger at low level.

Benefits and Features

- Only two connections required for feed and return water
- Compact unit reduces clutter in the cell
- Proportioning valves aid accurate flow control
- Cooling of up to four control circuits

Applications

- Engine test work, where air cooling of radiator is not appropriate
- Emissions work to control engine fluids to within allowable limits
- Connect to existing Heat Exchangers for automated PID control

System Description

The Cooling Post requires only one Feed and one Return water line, which reduces the amount of pipework in the test cell. Cooling water feed and return lines can be from either end or indeed opposite ends of the test cell. This is not fixed and can be altered at anytime, so the module can develop with the Test Cell. This unit is effectively a stand for the heat exchangers commonly used on the engine test beds. It combines with the CP Valve Manifold Assembly to provide all the cooling requirements of the bed in a very compact footprint.

The Cooling Post has several options for the mounting format of the Cooling Post. The base can be either a plain base for fixing to the floor of the test cell. A plain base mounted on rails that allows a pallet truck to be used to move the Cooling Post. Or the Cooling Post, as shown in the photo, can have wheels or castors mounted on the base to allow more flexibility for units that need moving frequently.

The cooling water circuits are piped to individual Heat Exchangers mounted on the post, and the supply lines from the engine can be either via quick-fit connectors or traditional threaded couplings. The capacities of the various Bowman Heat Exchangers are sized for your application.

Additional Options

The Valve Manifolds are designed for three valves as standard, but can have the ports blanked to reduce initial capability, whilst allowing expansion later. Heat exchangers and plumbing can be sized for the application, please ask.

Schematic Diagram

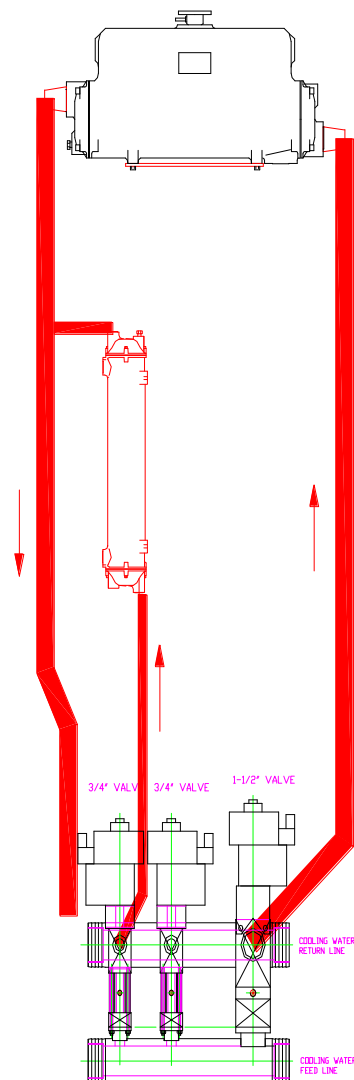
The diagram shows the position of the Header Tank style heat exchanger, the Oil Heat Exchanger and also the Valve Manifold Assembly, at the foot of the Cooling Post. The arrows show the typical flow patterns of the water circuits on the Cooling Post.

Customer Responsibilities

The customer should make available or prepare the following services:

- Clean Air Supply
- Bed or Cooling Water Feed and Return
- Connection pipes to the Engine Circuits

These will be confirmed and discussed during the project phase.



Specification and Performance Data

Coolant Connections	Qty	Threaded	Hose End
FEED	2	2" BSP internal x 34mm	75mm o.d. x 34mm barbed
RETURN	2	2" BSP internal x 34mm	75mm o.d. x 34mm barbed
Supply Pressure		2...6 Bar depending on the required cooling capacity	

Cooling Circuits	Qty	Threaded	Hose End
Small ¾" BSP	2	¾" BSPP Female	¾" BSPT x 1" Hosetail
Large 1 ½" BSP	1	1 ½" BSPP Female	1 ½" BSPT x 2" Hosetail
Pressure Tapping	3	1/8" BSPP Female – before control valve for range setting.	

General Data	Qty	Specification
Valves	All	Worchester Valves - Carbon Steel Body, S.S Ball, PTFE Seats
Positioner Specification	All	Kinetrol EP 15 Sealed to IP55
Air Quality	n/a	IMPORTANT – Instrument grade Dry, Dust and Oil Free.
Air Connectors	3	6mm push fit.
Electrical Data	3	Plugs supplied connect 4..20mA 2 wire 8 V Minimum .
Position Control	3	0-90 degrees. Position is indicated by the pointer on the positioner
Paint Finish	n/a	RAL 7030 powder coat -
Mounting	n/a	Floor Bolts or Castors
Weight	n/a	80 Kg complete unit
Spares	n/a	Stem seals, face seals and seats are available but not included.
Shipping Dimensions	n/a	600(d) x 600(w) x 1700(h)



Throttle Actuator – AT12

Introduction

The AT12 is an enclosed DC motor driven Throttle Actuator that forms part of the CP Dynamometer and Throttle control system. The actuator provides performance suitable for applications ranging from small two stroke engines up to heavy diesels and racing engines.



Benefits and Features

- o Fast Acting
- o Compact Unit
- o Operates in any Plane
- o Easily Adaptable to Various Throttle Systems

Applications

- o Actuation of Throttle Systems Petrol Engines
- o Actuation of Governors
- o Motorcycle twist grips, with adaptor
- o Emissions Work
- o Research and Development work

System Description

Position feedback is provided by the internally mounted servo potentiometer. The direct coupling of the potentiometer to the output shaft ensures accuracy. The unit is simple to install with one electrical connector, and simple attachment of the throttle cable. Throttle cables are available separately with various fittings. The AT12 can be mounted in any plane.

With more engines moving to 'Fly By Wire' throttle control, the AT12 can also be used to control the vehicles throttle pedal potentiometer directly. Adaptation plates can be made for your particular application if necessary.

Additional Options

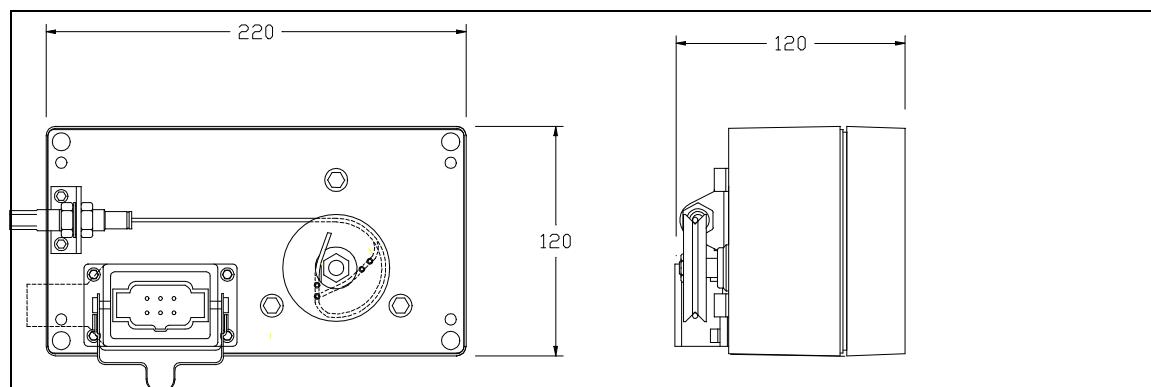
The Throttle Actuator can be adapted to operate on fly-by-wire type installations. This in the most simplistic manner utilises the AT12 actuator and a special bracket to effectively drive the throttle pedal and its integrated potentiometer directly.

- o Pull Bowden Style Cables
- o Cable End Fittings
- o Longer Connection Looms
- o Power Module (OM22)
- o Adaption for Motorcycle Throttle Actuation

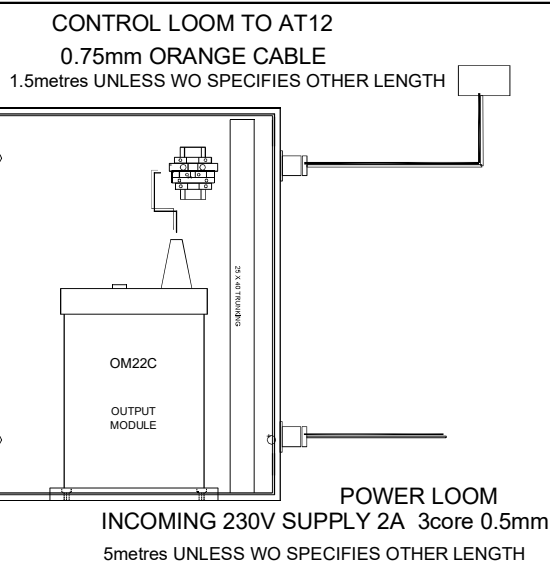
Technical Details

- o Permanent Magnet DC Motor
- o Worm Reduction Gearbox
- o Servo Potentiometer
- o IP55 Die-Cast Enclosure
- o Splash-proof 6-pin Connector
- o 150 N Pull Capability
- o Maximum Useful Range 130mm (300degrees)
- o Maximum range with OM22 drive electronics - 92mm (210degrees)
- o Response time for typical application 120 msec.
- o 0-180 Deg in 250 milliseconds
- o Total Weight 3kg
- o 1.5 meter pull cable as standard

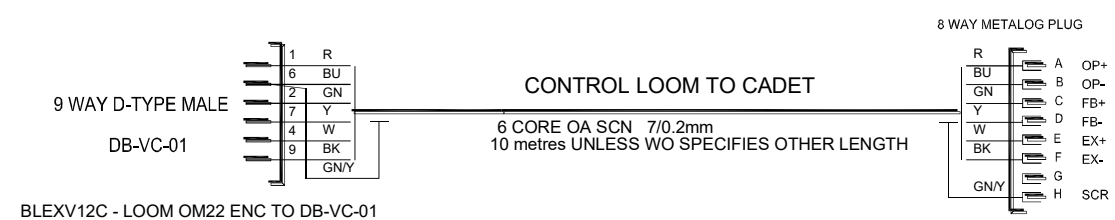
Schematic Diagram



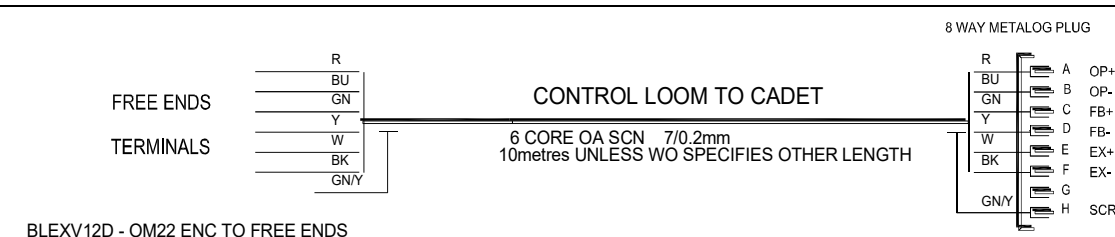
Actuator Unit



OM22 Power Module in Enclosure



CADET Loom



Free Ends Loom



Exhaust Back Pressure Valve

EBPV