



Engine Controls

IGNITION | AIR/FUEL RATIO CONTROL

About Gill Instruments

With headquarters in Lymington, UK, Gill Instruments Ltd supply ignition and air/fuel ratio control systems for stationary and mobile gas engines. We have over twenty years of experience in the industry, supplying SMEs and OEMs worldwide.

All of our engine control products have been developed using the very latest technology to provide the user with intelligent, efficient systems that will increase fuel economy, cut emissions and reduce engine wear.

We offer ignition modules, coils, pick-ups, diesel to CNG/LNG conversion kits and air/fuel ratio control systems, as well as CSA® certified complete ignition and air/fuel systems. An overview of the range follows in this brochure, with full specifications located at the rear. Further details, images and datasheets are available on our website: www.gill.co.uk.



UK Headquarters

Gill Instruments Ltd

Saltmarsh Park, 67 Gosport Street,
Lymington, Hants, SO41 9EG, UK


 www.gill.co.uk
 ignition@gill.co.uk
 +44 (0)1590 613500



USA Office

Gill Instruments Ltd

21 Marine Drive, Mexico,
MO 65265, USA

 www.gill.co.uk
 ignition@gill.co.uk
 +1 573-581-9979

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Product Overview

The Gill Engine Control range is flexible enough to offer cost-effective solutions for almost any engine configuration from 1 to 12 cylinders. Our core product range encompasses ignition and air/fuel control systems, as shown in the diagram below.



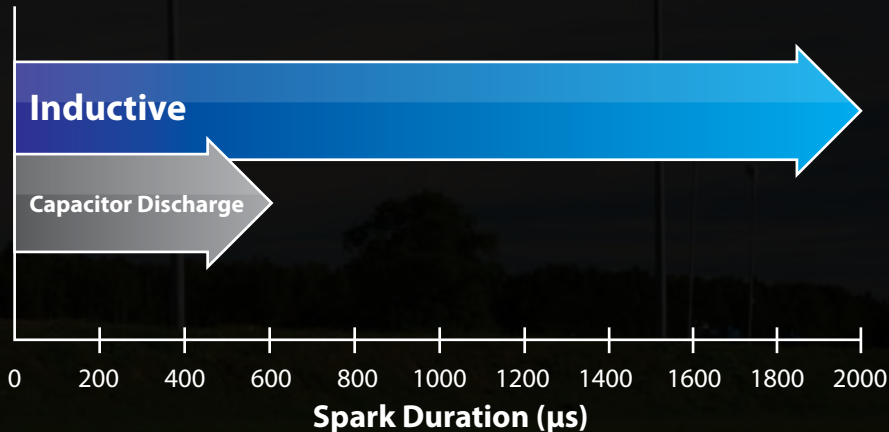


Introduction to Inductive Ignition Technology

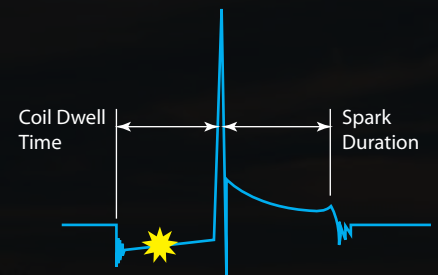
Gill ignition systems use inductive technology to ignite the air/fuel mixture. Inductive coils are generally more efficient than capacitor discharge coils as they provide longer spark duration, ensuring complete combustion, especially on lean burn and turbo charged engines. An inductive ignition coil provides just enough energy to cross the spark gap; the remaining energy from the ignition coil is used to maintain the spark. Capacitor discharge coils release almost all their energy instantaneously, therefore considerably reducing the amount of energy available to maintain the spark.



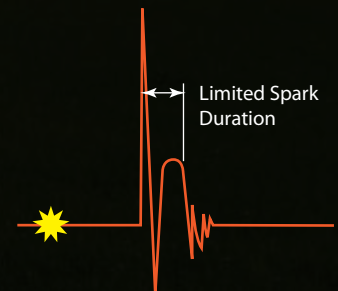
Ignition Coil Spark Duration Comparison



Gill Inductive Ignition



Capacitive Discharge Ignition



An inductive ignition system can produce a spark duration in excess of 2000μs, compared to a maximum of 600 μs in a capacitor system.

The dwell time in an inductive ignition system can be altered for differing engine applications. To improve combustion of lean mixtures, an increased dwell time will input more energy into the primary coil. Where there is more than enough spark energy to combust the mixture the dwell time can be decreased, reducing spark plug wear.

The high energy and long, programmable spark durations are a considerable advantage since they provide better ignition of lean or non-homogenous air/fuel mixtures. In many cases engines that are unable to meet emission standards with capacitive discharge systems can be brought into compliance with Gill inductive ignition systems.

Advantages of Inductive Ignition

- Longer spark duration, ensuring complete combustion
- Adjustable dwell time
- Increased spark plug life
- Reduction or elimination of mis-fires



Ignition Modules

for Engines up to 12 Cylinders

Gill ignition modules are designed to control normally aspirated, turbo-charged and lean-burn engines running on LPG, natural gas and bio gas. The GS range utilises the latest inductive ignition technology to provide a powerful spark with long duration, enabling complete combustion of low calorific value fuels as well as lean air/fuel mixtures.

The GS range has been specifically designed for the stationary gas engine market, however the igniters are also currently utilised in a wide range of more complex vehicle applications.

Typical Applications

- CHP Engines
- Generator Set Engines
- Compressor Engines
- Commercial Vehicle Engines
- Fork Lift Truck Engines



Features

- Ignition modules for 1 - 12 cylinder engines
- Fully programmable via Windows® based GUI software for:
 - Number of cylinders
 - Ignition point for load, speed, temperature and fuel type
 - Dwell with auto supply voltage compensation for full control of spark energy and duration
- Flexible user security feature
- Configurable for OEM engine timing disc patterns and sensors
- On-board visible status indicator
- Optional advanced spark diagnostics

**SPECIFICATIONS
ON P.13**



GS4: up to 4 cylinders



GS6: up to 6 cylinders



GS8: up to 8 cylinders



GS12: up to 12 cylinders

EH12 Shielded Industrial Ignition System

for Engines up to 12 Cylinders



Class 1, Div. 2,
Groups C and D

The Gill EH12 is a CSA® approved shielded enclosure, housing the GS6, GS8 or GS12 ignition modules. This unit allows easy internal wiring termination negating the need for additional junction boxes.

When used with our range of ignition modules and coils, this system provides highly accurate and extremely powerful inductive ignition, producing spark durations well in excess of any capacitor discharge ignition system.

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Features

- CSA® Certified Class 1, DIV 2, Groups C & D
- Compatible with GS6, GS8 & GS12 Ignition Modules
- Header-type connectors for quick and simple installation
- Controls up to 24 coils on up to 12 cylinder engines (two coils per cylinder)
- Optional remote display
- Optional pick-up interface unit (PIU) for two crank inductive pick-ups and single cam hall pick-up
- Optional advanced spark diagnostics to monitor real-time performance of spark plug voltage and spark duration

The EH12 Ignition System will control normally aspirated or turbo-charged engines running on natural gas, bio gas, LPG and CNG in either lean burn or Stoichiometric air/fuel ratios. The system offers increased flexibility and is proven to lower exhaust emissions, improve engine efficiency, reduce maintenance and decrease operational costs.



Optional Display
See p.11

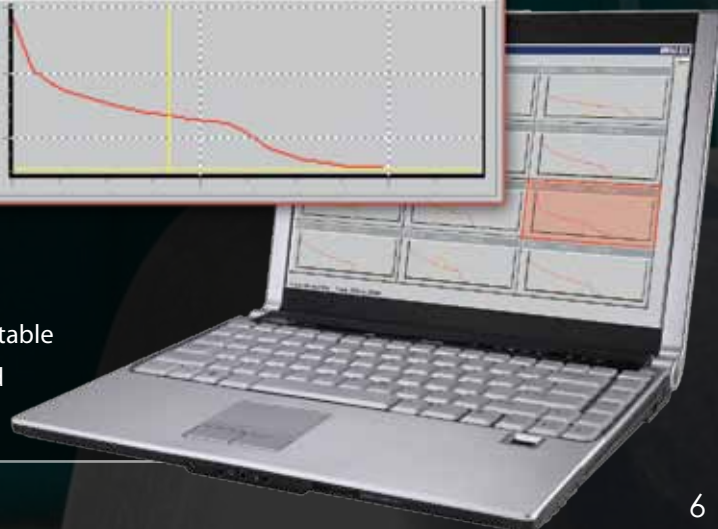
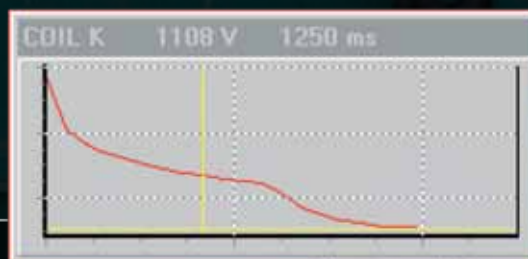
Advanced Spark Diagnostics

Real-time Monitoring of HT Lead & Spark Plug Health through PC or IDU10 Display

Available as an optional extra on the GS8 and GS12 ignition modules, Advanced Spark Diagnostics allows the user to remotely monitor the condition of the high tension voltage supplied to the spark plugs.

Features

- Monitor health of HT leads and spark plugs
- Error condition output when value falls outside set limits
- Real-time engine condition data displayed graphically or in a table
- Increase service intervals by only changing spark plugs as and when required.



Inductive Ignition Coils

Gill Ignition Coils are available in several electrical and mechanical configurations. We have a frame mount ignition coil (FM40), designed for small petrol and gas engine applications, surface mount ignition coils (SM60 and CY90) with a higher energy output designed for gas engines and integral coils (IC6 and IC12).



Class 1, Div. 2,
Groups C and D

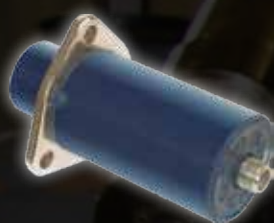
Frame & Surface Mount Coils



FM40



**SM60 A
& SM60 T**



**CY90 F
FLANGE MODEL**



**CY90 T
3-STUD MODEL**



**CY90 S
CSA APPROVED**

Integral Coils



IC6



IC12



**SPECIFICATIONS
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Inductive Engine Position Sensors / Pickups

Our range of inductive ignition pickups is compatible with our engine control systems and has been designed to give reliable performance even in the most demanding applications. We can also supply non-contact linear and rotary position sensors which are designed for use in harsh environments.

**SPECIFICATIONS
ON P.13**



**Standard Ignition
Pickup**



**Push-in Ignition
Pickup**



**Threaded Ignition
Pickup**

Pickup Conversion Kits

Convert your Altronic® III and Altronic® V ignition systems to a fully programmable advanced Gill ignition system. Kits are available to allow these units to use the existing housings and some gear parts and substitute a magnetic pick-up to identify engine position, this single pick-up is then connected to a Gill GS ignition module either mounted on a side bracket or elsewhere on the engine. Additionally, substituting existing CDI coils with Gill inductive ignition coils provides the system benefits as described on page 4.



< A3 Conversion Kit

Application

Converts existing Altronic® III units to a single pickup timing kit



A5 Conversion Kit >

Application

Converts existing Altronic® V units to a single pickup timing kit



Diesel to CNG/LNG Conversion Kits

Ignition Systems for 4 - 6 Cylinder OEM Gas Engines

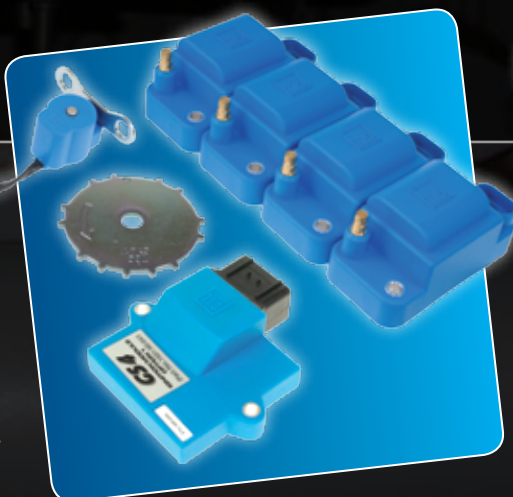
Gill Diesel to CNG/LNG Conversion Kits have been designed for use on compressed natural gas (CNG) or propane (LNG) applications and are ideal for use by OEMs on new gas engines or for conversion of existing diesel engines. All components in the kits have been optimised to work together, producing a very efficient system.

Kits Include

- Ignition Module (GS4 or GS6 - see p.5)
- Ignition Coils (SM60A - see p.7)
- Timing Disc
- Pick-up
- Wiring Harness

**SPECIFICATIONS
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GS4 Ignition Kit
for 4 cylinder engines



GS6 Ignition Kit
for 6 cylinder engines

Air/Fuel Ratio Control

One Controller for Lean Burn and Stoichiometric Engines

The Gill air/fuel ratio control system provides cost effective emissions control for gaseous fuelled engines used in demanding industrial applications. The system is designed to accurately control the air/fuel ratio of stoichiometric engines fitted with a three way catalytic converter, and lean burn engines with or without a cat.

- ✓ **Automatically controls optimum air/fuel ratio**
- ✓ **Reduces engine emissions**
- ✓ **Prolongs catalyst life**
- ✓ **Improves engine efficiency**
- ✓ **No need for constant manual engine tuning**

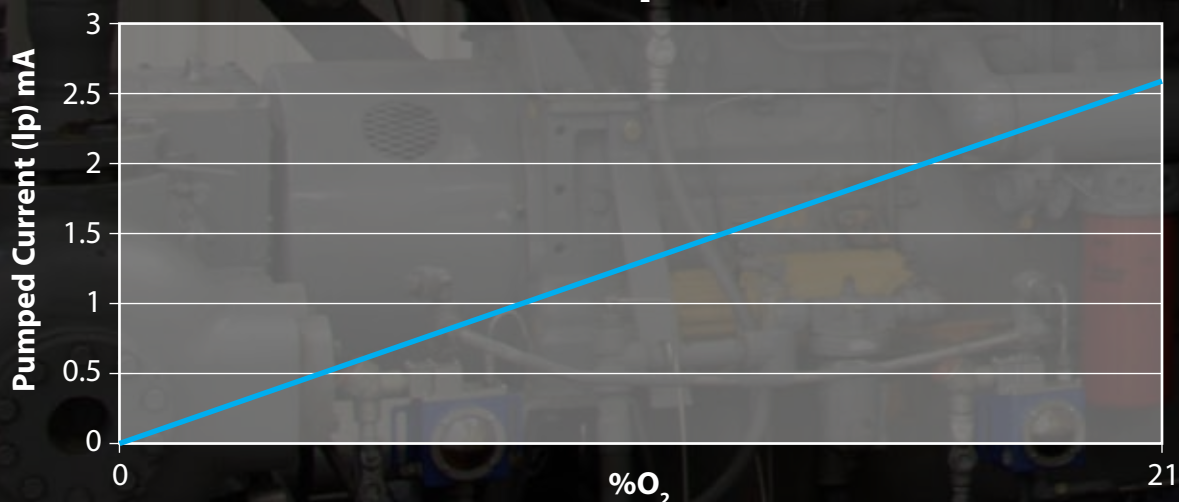
Typical Applications

- CHP Engines
- Generator Set Engines
- Compressor Engines
- Commercial Vehicle Engines
- Fork Lift Truck Engines



The Gill AF120 system uses a wide band oxygen sensor (UEGO) that provides a consistent linear output, in relation to percentage of oxygen in an engine's exhaust. This provides accurate measurement from very fuel rich air/fuel mixtures up to 21% Oxygen concentration (Atmospheric concentration) – see graph below. This sensor can be used in both stoichiometric and lean burn configurations and allows the use of proportional control systems.

Pump Current (Ip) vs %O₂ for a UEGO type sensor



As the UEGO sensor provides such an accurate measurement of the oxygen concentration, for example when an engine experiences a change in load, the AF120 system is able to measure the change in O₂ and make adjustments to the valve position accordingly leading to a faster and more accurate response to load steps. Engines using the Gill AF120 system have shown that the system is capable of keeping an engine's emissions below strict requirements, such as those in California, for over six months, without the operator making changes to the engine - a major improvement over older narrow band systems.

AF120 Air/Fuel Control Module

The AF120 control module can be used within a variety of control systems. In the carburettor bypass configuration the Gill AF120 fuel valve can be utilised. Alternatively the module can be used to control fuel pressure regulator systems and systems requiring turbo waste gate control.

Features

- Outputs to stepper or current controlled bypass valves.
- Fast start up due to heating of UEGO sensor.
- Programmable via easy to use Windows based GUI
- Controls Lambda value to set-point by means of proportional, integral control loop
- Programmable valve start position and offset
- Programmable load map
- The 4-20 mA output can drive pneumatic control valves on engines fitted with turbo waste gate.



**SPECIFICATIONS
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< AF120 Air/Fuel Valve

The AF120 fuel valve has been specifically designed to operate with the AF120 control module for medium sized engines where a fuel bypass system can be utilised. Using a stepper motor with over two hundred steps provides absolute precision around the set point.

Oxygen Sensor >

The wide band oxygen sensor is placed into the exhaust line just prior to the 3 way catalyst. This particular sensor is robust against gas poisoning and can be fitted through an M18 x 1.5 flange on the exhaust pipe.



EH12 Shielded Air/Fuel Control System

The Gill EH12 is a CSA® approved shielded enclosure, housing the AF120 Air/Fuel Ratio Control Module. This unit allows easy internal wiring termination negating the need for additional junction boxes.

Features

- CSA® Certified Class 1, DIV 2, Groups C & D
- Compatible with AF120 Air/Fuel Control Module
- Optional remote display
- Header-type connectors for quick and simple installation



**Class 1, Div. 2,
Groups C and D**



Optional Display
See p.11

**SPECIFICATIONS
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IDU10 Digital Display

Compact Display for Air/Fuel or Ignition Control

The IDU10 Display is designed for use with Gill ignition and air/fuel control systems (factory configured for the application type). The unit is available in both panel-mount and surface-mount configurations, with a robust case sealed to IP65 and clear, intuitive menu structure.



Ignition Control

The IDU10 Display is compatible with Gill GS8 and GS12 Ignition Modules and can be used as a remote unit with the EH12 shielded protective enclosure. The unit offers users comprehensive display and control functions including:

- Engine RPM and ignition angle
- Coil diagnostics (if optional spark diagnostics fitted to the ignition module)
- Allows engine timing adjustment via PIN lockable keypad
- Status flags

Air/Fuel Control

The IDU10 Display is compatible with the Gill AF120 Air/Fuel Control Module and can be used as a remote unit with the EH12 shielded protective enclosure. The unit offers users comprehensive display and control functions including:

- Lambda (mA)
- Lambda Heater Resistance (Ohms)
- Valve Position (% open)
- Allows Setpoint (mA) adjustment via PIN lockable keypad
- Status Flags

**SPECIFICATIONS
ON P.14**



**Class 1, Div. 2,
Groups C and D**

When used with the EH12 shielded enclosure, the IDU10 display is CSA® Certified to Class 1, Div. 2, Groups C and D.

Control Panel Mount Unit



Surface Mount Unit



TION
 SURE
 ESSURE
 ESSURE
 OIL PRESSURE
 Y WATER TEMP
 WATER TEMPERATURE
 TION
 NO-FLOW
 SURE
 E PRESSURE
 GE PRESSURE
 ESSURE
 TION
 TEMPERATURE CYL. #1
 MPERATURE CYL. #2
 MPERATURE CYL. #3
 MPERATURE CYL. #4
 PERATURE
 OIL TEMPERATURE
 BBER LEVEL
 E SCRUBBER LEVEL
 GE SCRUBBER LEVEL
 T WATER LEVEL
 LEVEL



SSOR OIL
 RATURE



ENGINE JACKET WATER TEMP.



ENGINE TURBO AFTERWATER TEMP.



ERSTAGE
 SSURE



2nd INTERSTAGE PRESSURE



Product Specifications

Ignition Modules

GS4

Number of Cylinders	1-4 (programmable)
Ignition Point	Fully programmable for engine speed, load, temperature and fuel type
Timing Maps	Typically 10, programmable to 6,000 RPM
Ignition / Fuel Rev Limits	Fully programmable to 6,000 RPM
Spark Energy / Duration	Full user control via selectable dwell time with automatic supply voltage compensation
Temperature Mapping	Option
Inputs	TPS or MAP sensors for load, thermistor for temperature mapping
Outputs	On-board visible status indicator Optional: Fuel valve drive, Tacho / Speed signal
Communications	RS232 for programming via Windows® based GUI
Power Supply	12V or 24VDC
Environmental	-40 ° C to + 90 ° C, Sealed to IP67
Connection	AMP Econoseal 18-way



GS6

Number of Cylinders	1-6 (programmable)
Ignition Point	Fully programmable for engine speed, load, temperature and fuel type
Timing Maps	Typically 10, programmable to 6,000 RPM
Ignition / Fuel Rev Limits	Fully programmable to 6,000 RPM
Spark Energy / Duration	Full user control via selectable dwell time with automatic supply voltage compensation
Temperature Mapping	Option
Inputs	TPS or MAP sensors for load, thermistor for temperature mapping
Outputs	On-board visible status indicator Optional: Fuel valve drive, Tacho / Speed signal
Communications	RS232 for programming via Windows® based GUI
Power Supply	12V or 24VDC
Environmental	-40 ° C to + 90 ° C, Sealed to IP67
Connection	AMP Econoseal 18-way
Certification	CSA® Certified Class 1, Div. 2, Groups C and D when installed in the EH12 shielded enclosure



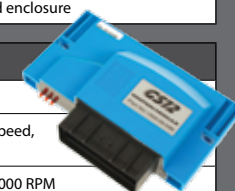
GS8

Number of Cylinders	1-8 (programmable)
Ignition Point	Fully programmable for engine speed, load, temperature and fuel type
Timing Maps	Typically 10, programmable to 4,000 RPM
Ignition / Fuel Rev Limits	Fully programmable to 4,000 RPM
Spark Energy / Duration	Full user control via selectable dwell time with automatic supply voltage compensation
Advanced Spark Diagnostics	Option
Inputs	TPS or MAP sensors for load, thermistor for temperature mapping. Ignition inhibit / enable switch
Outputs	On-board visible status indicators Optional: Fuel valve drive, Tacho / Speed signal
Communications	RS232 for programming via Windows® based GUI
Power Supply	12V or 24VDC
Environmental	-40 ° C to + 90 ° C, Sealed to IP67
Connection	AMP Econoseal 36-way
Certification	CSA® Certified Class 1, Div. 2, Groups C and D when installed in the EH12 shielded enclosure



GS12

Number of Cylinders	1-12 (programmable)
Ignition Point	Fully programmable for engine speed, load, temperature and fuel type
Timing Maps	Typically 10, programmable to 4,000 RPM
Ignition / Fuel Rev Limits	Fully programmable to 4,000 RPM
Spark Energy / Duration	Full user control via selectable dwell time with automatic supply voltage compensation
Advanced Spark Diagnostics	Option
Inputs	TPS or MAP sensors for load, thermistor for temperature mapping. Ignition inhibit / enable switch
Outputs	On-board visible status indicators Optional: Fuel valve drive, Tacho / Speed signal
Communications	RS232 for programming via Windows® based GUI
Power Supply	12V or 24VDC
Environmental	-40 ° C to + 90 ° C, Sealed to IP67
Connection	AMP Econoseal 36-way
Certification	CSA® Certified Class 1, Div. 2, Groups C and D when installed in the EH12 shielded enclosure



Inductive Pickups / Engine Position Sensors

Standard, Push-in & Threaded Ignition Pickups

Resistance (nominal)	575 ohms	Max Speed	10,000 teeth/second
Working Gap	Standard Pickup: 2mm nominal (with Gill timing disc) Push-in Pickup: 0.75mm nominal (with Gill timing disc) Threaded Pickup: 0.75mm nominal (with Gill timing disc)	Connection	AMP Econoseal 'J' Series
		Other	Threaded Version: 5/8-18 or M12x75 thread



CSA Certified Enclosure

EH12 Enclosure - CSA® Certified Class 1, Div. 2, Groups C and D

Options	Ignition: for housing Gill GS6, GS8 or GS12 Ignition Modules Air/Fuel: for housing Gill AF120 Air/Fuel Ratio Control Module	Communication	RS232 available through a gland or on the MS connectors mounted on the side of the enclosure
Connections	via 1/2" and 3/4" conduit glands	Environmental	-40 ° C to + 90 ° C, Sealed to IP65
Power Supply	Rated for 10-30VDC, 100W Max	Size	254mm (10") x 304mm (12") x 122mm (5") (W x H x D)



Ignition Coils

FM40

Primary resistance	0.75 ohms nominal
Primary inductance	3.5mH
Peak current	7.5A
Typical Spark Duration	750µs
Spark energy	>40mJ
Secondary voltage	30kV max
LT Connections	6.35mm spade terminals or Deutsch connector (LT polarity must be observed)
HT Connections:	SAE Post



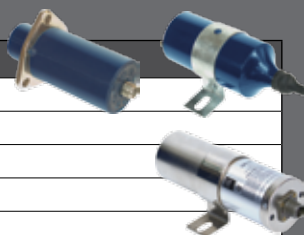
SM60 T, SM60 A

Primary resistance	0.5 ohms nominal
Primary inductance	2.5mH
Peak current	10.5A
Typical Spark Duration	1000µs
Spark energy	>60mJ
Secondary voltage	35kV max
LT Connections	SM60 T: Screw Terminal SM60 A: AMP Superseal Connector (LT Polarity must be observed)
HT Connections:	SAE Post



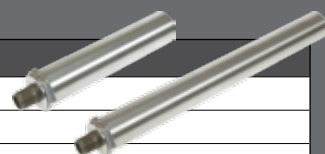
CY90 T, CY90 F, CY90 S

Primary resistance	0.7 ohms nominal
Primary inductance	5.0mH
Peak current	15.0A
Typical Spark Duration	2000µs
Spark energy	>100mJ
Secondary voltage	35kV max
LT Connections	CY90 T: Screw Terminal CY90 F, CY90 S: 3-pin MS Connector (LT Polarity must be observed)



IC6, IC12 Integral Coils

Primary resistance	0.5 ohms nominal
Peak current	10.0A
Typical Spark Duration	1000µs
Spark energy	>60mJ
Secondary voltage	29kV max
LT Connections	3-pin MS Connector
Size	IC6: 1.25" x 7.4" (32mm x 188mm) IC12: 1.25" x 11.3" (32mm x 287mm)



Air/Fuel Ratio Control Module

AF120 Air/Fuel Ratio Control Module

Inputs	Throttle position or MAP sensor for load mapping Wideband UEGO sensor for exhaust oxygen measurements Additional sensor inputs for more rigorous applications	Certification	CSA® Certified Class 1, Div. 2, Groups C and D when installed in the EH12 shielded enclosure
Outputs	AF120 fuel valve, or 4 - 20 mA controlled valve.	Environmental	-40 ° C to + 90 ° C, Sealed to IP67
Communications	RS232 for programming via Windows® based GUI	Supply Voltage	12 - 24VDC



Air/Fuel Valve

AF120 Air/Fuel Valve

Inputs	Voltage input stepper motor with over 200 steps driven from the AF120 air/fuel ratio control module	Connection	Gas input and output connections via 3/8 NPT thread
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Digital Display

IDU10 Display

Options	IDU10 Control Panel Mount IDU10 Surface Mount	Certification	CSA® Certified Class 1, Div 2, Groups C & D when connected to the EH12 shielded enclosure
Supply Voltage	Rated 10 - 30 VDC	Display Screen	Backlit LCD 50mm x 25mm (L x H)
Communications	RS232	Size	Control Panel Mount: 94mm x 148mm x 34mm (H x W x D) Surface Mount: 94mm x 148mm x 57mm (H x W x D)
Connector	Phoenix header via 1/2" conduit gland	Environmental	-40 ° C to + 90 ° C, Sealed to IP65



Complete Product Datasheets & Specifications Available Online:

www.gill.co.uk

Specifications may be subject to change without prior notice



UK Headquarters

Gill Instruments Ltd

Saltmarsh Park, 67 Gosport Street,
Lymington, Hants, SO41 9EG, UK



www.gill.co.uk



ignition@gill.co.uk



+44 (0)1590 613500



USA Office

Gill Instruments Ltd

21 Marine Drive, Mexico,
MO 65265, USA



www.gill.co.uk



ignition@gill.co.uk



+1 573-581-9979

Distributor