



# KV Series ECU Specification

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## Table of Contents

1.0 General.....	3
2.0 Injection .....	4
3.0 Ignition .....	5
4.0 Digital Input.....	6
5.0 Auxiliary Outputs.....	7
6.0 Analog Inputs .....	9
7.0 Crank and Sync Sensor Inputs.....	10
8.0 Knock Control.....	11
9.0 Lambda Control.....	12
10.0 Analog Voltage Output.....	13
11.0 Voltage Supply Outputs .....	14
12.0 Voltage Supply Inputs .....	15
13.0 Dedicated Functions .....	16

## 1.0 General

### Power Supply

- Operating Voltage: 6.0 to 22.0 Volts DC (ECU shutdowns at 24.0V)
- Operating Current: 350mA at 14.0V (excluding sensor and load currents)
- Reverse Battery Protection via External Fuse
- “Smart” Battery Transient Protection

### Operating Temperature

- ECU Internal Temperature Operating Range: -30 to 110°C (-22 to 230°F)

### Physical

- Enclosure Size 134 mm x 162 mm x 27 mm
- Weight KV Series: 0.73kg
- Connector system: Super Seal waterproof connector with gold plated contacts
  - 2x 34 pin Key 1 & 2 and 2x 26 pin Key 1 & 2

### Internal

- Dual 100MHz Processors
- 500Mb DDR RAM (0.5Gb)
- Up to 32MB permanent memory storage for ECU logging and Oscilloscope Function
- Up to x10 channel Oscilloscope function
  - Sampling at 500k samples/second
  - Includes Crank and Cam sensors inputs
  - Includes Digital Inputs 1-8
- On-Board Barometric Pressure Sensor.
  - Range 40 - 115.0 kPa
- 3-Axis Accelerometer
  - 16 Bit Resolution
  - $\pm 2g/\pm 4g/\pm 8g$  dynamically selectable full-scale
  - Output Data Rate 500Hz

### Communications

- Ethernet 100Mbps. High Speed communications channels used for tuning and uploading ECU log files.
- 2x CAN nodes/ 6 Channels per node

## 2.0 Injection

The ECU can control both modes of injection: Saturated and Peak & Hold.

### Peak and Hold - Up to 16x channels

When using low impedance injectors (< 5 Ohms) the ECU uses a switch mode current limiting technique to minimise heat dissipation in the Injector. This gives better injector control and helps maximize injector life by lower its operating temperature.

- Independently configurable Peak and Hold currents up to 16 cylinders
- Max Peak current 8A
- Max Hold current 4A
- Current limited to 10A.
- Flyback Voltage Clamp: 70V.

### Saturated

Required when injector resistance is greater than 5 Ohms.

- 6A Continuous , 10A Limit.
- Flyback Voltage Clamp: 70V.

### Auxiliary Fuel Mode

Unassigned Fuel channels can be used to switch or modulate resistive and inductive loads.

- Sink continuous current 6A, current limit 10A.
- Flyback voltage clamp: 70V.
- Maximum Frequency: 5kHz

### Protection

- Over current / Short to Battery protection
- Electrostatic discharge (ESD) protection

## 3.0 Ignition

### Ignition Control - Up to 12x channels

- Up to 12 Channels Sequential/Wasted Ignition or 6 Leading/6 Trailing Ignition.
- Independent switchable pull-up resistor control on channels 1 to 8.
- Adjustable source current; 35mA at 5V or 70mA at 8.2V for high current mode.

### Auxiliary Ignition Mode

Unassigned Ignition channels can be used to switch or modulate resistive and inductive loads.

- Sink continuous current 1A, current limit 3.0A.
- Flyback voltage clamp: 40V.
- Maximum Frequency: 5kHz

### Protection

- Over current / Short to Battery protection
- Electrostatic discharge (ESD) protection

## 4.0 Digital Input

### Digital Inputs Overview - Up to 14x channels

Application: Switch to 0V, Switch to VBatt, logic signal, Magnetic or Hall effect frequency based signals.

- Input Analog Voltage Range: 0 -20.0V
- Input Frequency Range: 0 - 30kHz (Available on DI 1- 8)
- Filter time constant = 12us
- Input Impedance.
  - DI 1- 8: 39k Ohms to ground.
  - DI 9 -14: 70k Ohms to ground.
- Switchable Pull-up resistor on all channels
  - 4k7 to 9.0V.
- “True” Zero crossing detection on magnetic based signals
- Independent programmable arming thresholds from 0.1V to 15.0V on frequency based inputs. Resolution = 0.1V.
- Programmable trigger edge(s).
- Maximum input signal amplitude +/-100V.

### Analog Voltage Input Mode

When not used as frequency or switched inputs these channels can be used to measure analog signals. All Channels have over voltage protection.

#### DI 1- 8

- Input Analog Voltage Range: 0 - 20.0V
- 4.88mV resolution (10 bit effective resolution)
- Maximum usable Analog Input Voltage: 20.0V
- Input Impedance = 39k Ohms to ground.

#### DI 9- 14

- Input Analog Voltage Range: 0 - 20.0V
- 20.0mV resolution
- Maximum usable Analog Input Voltage: 20.0V
- Input Impedance = 70k Ohms to ground.

## 5.0 Auxiliary Outputs

The ECU contains 3 different types of auxiliary outputs. These drives are suitable for controlling relays, resistive and inductive loads, stepper motors, DC servo motors and electronic throttles. Auxiliary channels 1-8 can be selected as Low or High Side Control on most models. Auxiliary channels 9-16 are Half Bridge Drivers.

### Low Side Driver - Up to 16x Channels

- Auxiliary 1-4:
  - Continuous current 3A
  - Modulated peak current 5A
  - 8A Limit
- Auxiliary 5-8:
  - Continuous current 2A
  - Modulated peak current 3.5A
  - 5A Limit
- Auxiliary 9-12: Half bridge (see below)
- Auxiliary 13-16: Half bridge (see below)
- Maximum Frequency: 15kHz

#### Protection

- Over current / Short to Battery/Thermal overload protection
- Electrostatic discharge (ESD) protection
- Reverse Battery Protection
- Flyback Voltage Clamp Aux 1-8: ECU Supply Pin D1.
- Flyback Voltage Clamp Aux 9-12: Aux9-12 Supply Pin D20.
- Flyback Voltage Clamp Aux 13-16: Aux13-16 Supply Pin D2.

### High Side Driver - Up to 8x Channels

- Auxiliary 1-8: Source Continuous current 4A, 9A Limit
- Maximum Frequency: 15kHz

#### Protection

- Over current / Short to Battery protection/Thermal overload protection
- Electrostatic discharge (ESD) protection
- Reverse Battery Protection
- Flyback Voltage Clamp: ECU Supply Pin D1.

### Half Bridge Driver - 4x Channels (Aux 9 - 12)

- Sink or Source Continuous current 5A, 8A Limit.
- Maximum Frequency: 15kHz

#### Protection

- Over current / Short to Battery protection Thermal overload protection
- Electrostatic discharge (ESD) protection
- Reverse Battery Protection
- Flyback Voltage Clamp. Aux 9-12 Supply pin D20.

### Half Bridge Driver - 4x Channels (Aux 13 - 16)

- Sink or Source Continuous current 15A, 40A Limit.
- Maximum Frequency: 15kHz

#### Protection

- Over current / Short to Battery protection Thermal overload protection
- Electrostatic discharge (ESD) protection
- Reverse Battery Protection
- Flyback Voltage Clamp. Aux 13-16 Supply pin D2



## 6.0 Analog Inputs

All analog inputs are sampled using 12bit ADCs. They are suitable for sensors that have an output voltage, potentiometers and temperature sensors. All analog inputs can also be used as switched inputs with ON/OFF levels programmable from 0.0 - 5.0V.

### Analog Voltage Inputs - Up to 16x Channels

- Input Analog Voltage Range: 0.0 -5.0V
- 100k ohms input resistance to ground
- 1st order 100Hz Low pass filter.
- 1.22 mV resolution

### Analog Temperature Inputs - Available on 6 channels

- Configurable pull-up control on Analog Channels 7 -12
- Input Analog Voltage Range: 0.0 -5.0V
- 1.0k ohm input resistance to 5.0V and 100k Ohms to 0.0V
- 1st order 100Hz Low pass filter.
- 1.22 mV resolution

## 7.0 Crank and Sync Sensor Inputs

- Two Independent channels with Magnetic, Hall effect and Logic options
- Maximum signal amplitude +/-100V
- Input Resistance = 39k Ohms to ground
- Switchable Pull-up resistor = 4k7 Ohm to 5.0 V
- "True" Zero crossing detection on magnetic based signals
- Programmable Independent arming thresholds from 0.1V to 15.0V on all signals. 12 Bit Solution.

## 8.0 Knock Control

- 2 Independent channels.
- Using Bosch, Digital Knock Integrated Circuit Technology
- Selectable Frequency from 5 - 15kHz
- Selectable Bandwidth form 300Hz - 5kHz
- Programmable digital filter coefficients.
- Selectable gain control.
- Selectable Filter Window (Hamming, Blackman)
- Bank selectable Knock Control.

## 9.0 Lambda Control

- 2 independent channels supporting Bosch LSU4.9 sensors
- Using Bosch, Integrated circuit technology for sensor control.
- Closed Loop heater temperature control for precise lambda measurement.
- Lambda Range: 0.650 ~  $\infty$

## 10.0 Analog Voltage Output

- Resolution is 4.88mV (10 bit)
- Output voltage range 0 - 5.0V
- Output driving current 100mA
- Output impedance 22 Ohms

## 11.0 Voltage Supply Outputs

### 5V Engine Supply

- Continuous current: 0.25 Amps
- Accuracy: +/- 0.5% at 20 °C
- Short circuit, Thermal overload protection.

### 5V Auxiliary Supply

- Continuous current: 0.25 Amps
- Accuracy: +/- 0.5% at 20 °C
- Short circuit, Thermal overload protection.

### 8V CAS

- Continuous current: 0.4 Amps
- Accuracy: +/- 0.5% at 20 °C
- Short circuit, Thermal overload protection.

## 12.0 Voltage Supply Inputs

### ECU Supply

- Main ECU Power Supply
- Power Supply for Auxiliary Channels 1- 8 High Side Drivers
- Operating Range 6.0V - 22.0V

### Aux 9-12 Supply

- Power Supply for Auxiliary 9-12 Half Bridge Drivers
  - Connect to ECU Power Supply in non DBW application
  - Connect to DBW Relay output in DBW application

### Aux 13-16 Supply

- Power Supply for Auxiliary 13-16 Half Bridge Drivers
  - Connect to ECU Power Supply in non DBW application
  - Connect to DBW Relay output in DBW application (allows up to 4 channels of DBW)

### Flyback Supply

- ECU supply for Injector Channels when Peak & Hold mode is active.
- ECU supply for Auxiliary Channels 1-8
- Aux 9-12 supply for Auxiliary Channels 9-12
- Aux 13-16 supply for Auxiliary Channels 13-16

## 13.0 Dedicated Functions

### Dedicated EFI Relay Control

- Provides a relay ground, 100mA Limit
- Short circuit, Thermal overload protection.

### Dedicated Ignition Switch

- Used to control Main EFI Relay circuit.
- Input Analog Voltage Range: 0 - 20.0V
- 100k ohms input resistance to ground
- Adjustable ON/OFF thresholds. Resolution = 0.1V.