

# Engine HILS

Engine Hardware-in-the-loop | HELIOS

**AND**  
Discover Precision

## Easy to Design environment for HILS verification

A&D's Engine HILS provides hardware and software that reduces the user's burden on ECU testing environment creation and dramatically shortens the development period.

## Six features to shorten development period

- **Direct measurement of injector drive current**  
Measure the injector drive current and obtain injection time. Since the current can be directly measured, an external shunt resistance circuit is unnecessary. In addition, it supports both direct injection and port injection, and can be switched from software.
- **Direct measurement of solenoid current**  
The solenoid current of each actuator can also be measured directly. Furthermore, the software can be set according to each solenoid.
- **External power supply for ECU is unnecessary**  
Supports up to 10 ECU's with one power supply board(VB-SW). In addition, it is possible to monitor current and voltage for each system.
- **Graphical pattern creation**  
Crank · Cam · Knock patterns can be created while displaying the waveform.
- **Easy connection of real loads**  
A load box is provided that can store actual ECU loads. The user can connect the loads to HILS simply by wiring to the terminal blocks in the box. The user can lay out loads of various shapes using the included mounting brackets.
- **Easy altitude simulation**  
An optional negative pressure box can control the pressure on the ECU body. High altitude simulation up to altitude of 6000m can be easily performed.

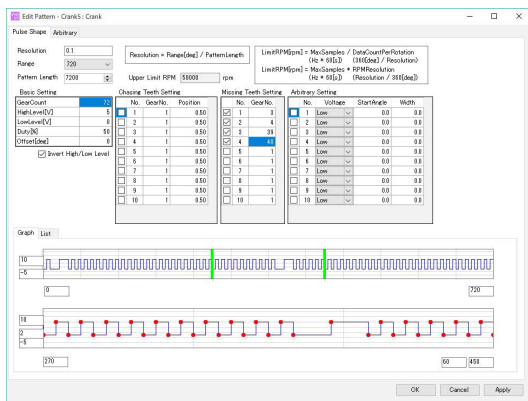
## Highlights:

- Compact
- Measures the injection drive current directly and obtains the injection time
- Direct measurement of solenoid current
- Failure function( short to power/ground, open circuit)
- Self-diagnosis function for all I/O boards
- Built-in power supply in HELIOS chassis for driving ECU (600 W)
- Load box with free load layout (optional)
- Negative pressure box enabling high altitude simulation(optional)
- Multinode configuration with multiple HiLS supports tests requiring high computing requirements.
  - Scenario-based tests
  - High precision model execution
- Working with test bench
  - LabWorX collectively manages test data of bench test and HiLS test



### Output signal pattern creation

Crank · Cam · Knock output signal patterns can be created graphically. It is also possible to import patterns created in csv format.



### Actual loads are stored in Load Box

Actual loads and resistances for the ECU can be stored in the load box which is stored in the HILS rack. The temperature inside the box is monitored, and HiLS can be stopped safely when a temperature abnormality is detected.



### I/O board specifications

| Board     | Channels                  | Description                                                                                                                                     |
|-----------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| ENG-IO    | 4CH: INJ meas             | Injection angle/time measurement, input current range: 0-20A (isolated type), variable threshold, Direct injection/port injection compatible    |
|           | 4CH: IGN meas             | Ignition angle/time measurement, operation Input voltage range: 0 to 36V                                                                        |
|           | 1CH: Crank angle out      | Single-ended AMP output (range: $\pm 10$ V, output current: $\pm 5$ mA)<br>Open collector output (output level: 5V or VB, drive current: 100mA) |
|           | 4CH: Cam angle out        |                                                                                                                                                 |
|           | 4CH: Pulse out            | Single-ended AMP output ( $\pm 10$ V), output current: $\pm 5$ mA                                                                               |
|           | 4CH: Knock sensor out     |                                                                                                                                                 |
| PLS-IO    | 16CH: Pulse voltage meas  | Comparator input (Range: 0-30V, Frequency: $\sim 100$ kHz)/TTL input(Range: 0-5 V, Frequency: $\sim 1$ MHz)                                     |
|           | 16CH: Pulse voltage out   | Push-pull output (range: 0-30V, drive current: $\pm 100$ mA)/CMOS output(range: 0to5 V, drive current: 5mA)                                     |
| ACT-IO    | 12CH: Solenoid meas       | Measurement current range: $\pm 5$ A(isolated type), measurement voltage range: 0-30 V, frequency: 100kHz or less, resolution: 24bits           |
|           | 2CH: Motor meas           | Measurement current range: $\pm 20$ A(isolated type), measurement voltage range: 0-30 V, frequency: 100kHz or less, resolution: 24 bits         |
|           | 2CH: Throttle sensor meas | Measurement voltage range: 0-5V                                                                                                                 |
| SENSOR-IO | 16CH: Analog in           | Single ended input, range: 0-5 V/0-30V/ $\pm 10$ V switchable, filter switchable, resolution: 24bits                                            |
|           | 16CH: Analog out          | Single ended output, range: 0-5V/ $\pm 10$ V switchable, output current: $\pm 5$ mA ( $\pm 100$ mA switchable), resolution: 16bits              |
| COM-IO    | 6CH: CAN/CANFD            | CANFD MAX 4Mbps, terminating resistance switchable                                                                                              |
|           | 2CH: CAN                  | MAX 1Mbps, terminating resistance switchable                                                                                                    |
|           | 4CH: LIN                  | LIN 1.x/2.0/2.1/2.2A, bus voltage switchable                                                                                                    |
|           | 1CH: K-Line               | VB input range: 6-36V, pull-up switchable                                                                                                       |
|           | 2CH: Serial               | RS232-C/RS422/RS485/TTL, terminating resistance switchable(120 $\Omega$ /60 $\Omega$ /none)                                                     |
| VB-SW     | 10CH: VB supply relay     | Mechanical relay 60V/50A $\times$ 1, 60V/20A $\times$ 9, Maximum total current: 50A, voltage/current monitor                                    |
|           | 1CH: Sub battery input    | MAX 30A                                                                                                                                         |

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