Application Note

Design and evaluation of the Electric Power Steering (EPS)

Industry: Automotive

ScopeCorder DL950

ScopeCorder DL950

Overview

Electric Power Steering (EPS) is a technology that uses an electric motor rather than hydraulic pressure to assist in automobile steering. As the use of electronic control systems for the entire vehicle progresses, EPS systems have been introduced, resulting in lighter weight compared to hydraulic systems, which improves fuel efficiency and provides greater control flexibility by changing the steering force for each vehicle speed.

In addition to EPS, this technology improves vehicle stability by cooperating control of brakes and throttle and supports tandem parking and garage parking by cooperating with Intelligent Parking Assist (IPA).

To evaluate an EPS steering subsystem, it is necessary to continuously record and analyze the steering angle, various sensor outputs, ECU inputs and outputs, etc. in an integrated manner.

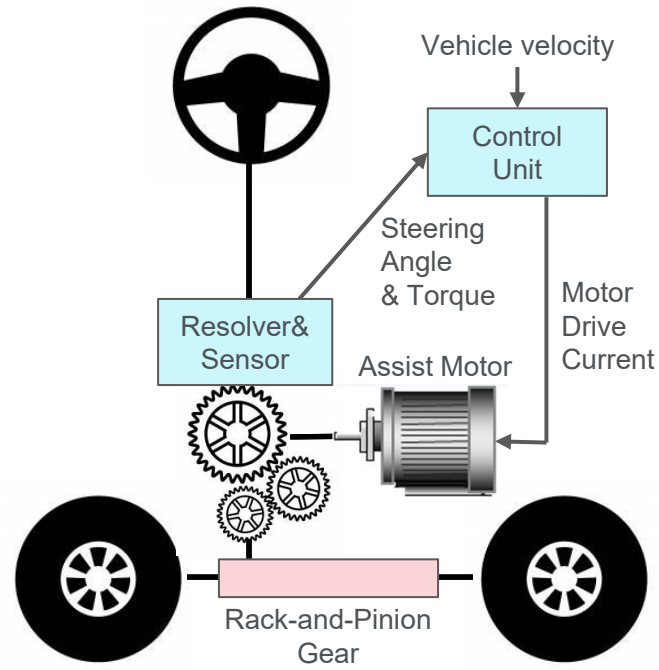
The DL950 ScopeCorder provides the measurement capabilities required by engineers designing and evaluating EPS in a single unit.

Challenge

Torque generated by steering wheel operation is transmitted to torsion bar, rack and pinion gears. These forces are detected by the torque sensor and transmitted to the ECU. ECU applies current (Power assist amount) to assist motor according to torque and vehicle speed.

To develop and evaluate EPS systems, it is necessary to monitor and record a large number of signals, such as sensor (Vehicle speed, torque, torsion, rack axial tension, battery power) signals (often voltage output via amplifier), three-phase motor current, voltage, and rotation amount, as well as power assist amount (CAN data) calculated by ECU. In addition, since continuous recording of about 10 to 20 minutes is required, long memory is also required.

The DL950 can simultaneously record voltage, current, and CAN data over a long period of time using a multi-channel, real-time calculation function to calculate and display torque and steering angle. In addition, it is possible to calculate the rotation angle of the assist motor from the encoder output, and to record vibration and sound at the same time, so that the EPS system can be evaluated in an integrated manner.



Solution

■ Multi-channel simultaneous measurement

Up to 200 MS/s and 10 MS/s isolated modules can be mounted on the main body, enabling simultaneous recording of voltage and current for up to 32 channels.

In addition, up to 5 DL950s can be connected for simultaneous recording up to 160 ch and 10 MS/s.

■ In-Vehicle serial bus monitor

Data of the in-vehicle serial bus of CAN /CAN FD /LIN /SENT between various sensors and ECU can be displayed by trend. Simultaneous recording of vehicle speed, temperature, vibration and motor speed on the data is possible.

■ Real Time Calculation (/G03, /G05 option)

Torque and steering angle can be calculated and displayed simultaneously with measured values in real time from signals from torque sensors, encoders for steering angle detection, and resolvers. You can also trigger using the result of the operation.

* /G05 option include /G03 function

■ Large memory & storage

- **8 G points large memory (/M2 option)**

  Up to 20 s of continuous recording at 200 MS/s

- **512 GB internal SSD (/ST1 option)**

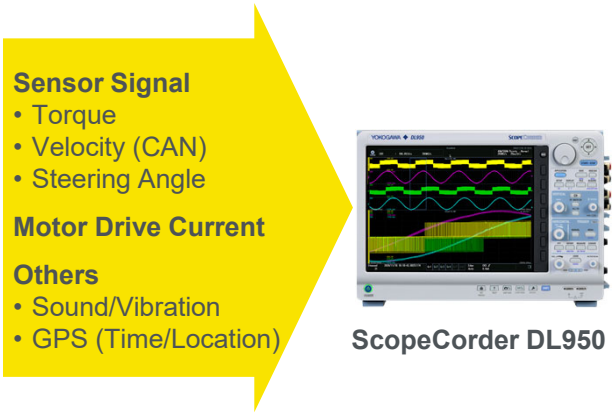
  Up to 5 hours of continuous recording at 2 MS/s

- **Flash Acquisition (/ST2 option)**

  Up to 10 minutes of continuous recording at 20 MS/s

■ Multi-sample

Different sample rates can be set for each channel to reduce the amount of recording data.



ScopeCorder DL950

■ Streaming to a PC

Use IS8000 integrated software to stream measurement data of 8 ch to PC at 20 MS/s via 10 Gbps Ethernet (/C60 option).

■ Memory recorder mode and scope mode

It is equipped with a memory recorder mode that records for a long time by setting a sampling interval and recording time like a recorder, and a scope mode that records a waveform by a trigger like an oscilloscope.

New Module

High-speed 200 MS/s 14 Bit Isolation Module 720212

Number of channels : 2
Max. Sample rate : 200 MS/s
Bandwidth : DC to 40 MHz
Max. Input range : 1000 V (DC+ACpeak)*
ADC Resolution : 14 bit

* In combination with 10:1 or 100:1 probe

4 CH 10 MS/s 16 Bit Isolation Module 720256

Number of channels : 4
Max. Sample rate : 10 MS/s
Bandwidth : DC to 3 MHz
Max. Input range : 600 V (DC+ACpeak)*
ADC Resolution : 16 bit

* In combination with 10:1 or 100:1 probe

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https://tmi.yokogawa.com/ YMI-N-MI-M-E03

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