TT Electronics
Contactless EPS
Sensors Evolution

Sensor and Test June 2019
Let’s start with a couple of questions...

Please raise your hand to answer «yes» to the 2 following questions

WHO DRIVES A CAR?

WHO LIKES TO DRIVE A CAR?
Which factors make you feeling good (or bad) driving a car?

- LOW VIBRATIONS?
- NICE SOUND?
- POWERFUL ENGINE?
- PERFORMING HANDLING?
- GOOD VISIBILITY?
Sensors in a Vehicle

All of our cars and most other vehicles have many sensors on board. Some of them are:
What’s an EPS (Electrical Power Steering) Sensor?
And why it is so important?

More than 90% of the force acting on a vehicle pass through the wheels

Mounted on the steering column is able to measure:
Torque
Steering Angle
How do they work and what do they measure?

**TORQUE**

**ANGLE**

![Typical Torque Outputs Diagram]

- **Relative Rotation Between Position Rotor & Torque Rotor (Degrees)**
- **% of Input Voltage**

![Typical Position Outputs Diagram]

- **Output (° of Rot)**
- **Angle of Position Rotor & CW Direction**

![Diagram of Torsion Bar, Output Shaft, and Input Shaft]
EPS success story lasting more than 20 years → Technology Evolution

More than 20,000,000 of sensors installed worldwide

Contacting (potentiometer) torque and multi-turn angular position sensor (TAS)

Non-contacting (magnetic) torque only sensor (TOS)

Non-contacting (magnetic) torque and angular sensor (TAS)

MT-4 family Non-contacting (magnetic) torque LOW COST sensor (TOS)
Performance Specifications

• Linearity
• Position - ±1.5% (of the applied voltage, over 180°)
• Torque - ±3% optional to ±1.5%
• Micro-gradient
• ±0.34% over 2 degrees
• Temperature rating
• -40°C to 85°C (consult factory for higher temperatures)
• Life
• One million sensor cycles while temperature cycling
Contacting EPS
Performance Specifications

- Linearity: ±3% (2% is available)
- Hysteresis: 0.8% maximum
- Operating temperature range: -40°C to 85°C (consult factory for higher temperatures)
- Rotation life: 10 million rotations
- Supply voltage: 5V ±0.5V
- Ratiometric output
Contactless EPS TOS (Torque Only Sensor)
Performance Specifications

- Linearity: ±3% (2% is available)
- Hysteresis: 0.8% maximum
- Operating temperature range: -40°C to 85°C (consult factory for higher temperatures)
- Rotation life: 10 million rotations
- Supply voltage: 5V ±0.5V
- Ratiometric output
Performance Specifications

- Linearity: ±3%
- Hysteresis: 1.3% maximum
- Operating temperature range: -40°C to 85°C (consult factory for higher temperatures)
- Rotation life: 10 million rotations
- Supply voltage: 5V ±0.5V
- Ratiometric output
- LOW COST
MT-4 Market Applications
Some examples...but more to come
Advantages for New and Existing Vehicles

**SAFETY**
- Vehicle dynamic control for existing vehicles
- Steering feedbacks for drive-by-wire steerings
- Unmanned vehicles safety related controls

**COMFORT**
- NVH improvements (Noise and Vibration Harsness)
- Customized steering feedbacks

**HANDLING**
- Improved driveability features
- Optimized power consumption for servo-motors
QUESTIONS?
OUR PURPOSE

To solve our customers’ toughest electronics challenges by engineering smarter solutions together.

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