

CLSx - Steering Effort Sensor



The innovative steering effort sensor CLS^x sets new standards in size of the housing as well as in resolution and accuracy of measurement values. The sensor is placed between steering column and original steering wheel of the vehicle.

The CLS^x captures precisely the parameters torque, steering angle and steering velocity. Additionally, it also acquires acceleration in the center of the steering column (x, y and z direction) as well as rotational acceleration.

Measurement data are digitized for a highly fail-safe data transfer, with a resolution of 16 bits (internally: 24 bits). Together with its innovative, ultra slim sensor body design, this leads to an unprecedented precision of torque measurement of 0.1% FS.

Highlights

- Ultra slim sensor body design for seamless integration with minimal extension of steering column
- The original steering wheel can still be used
- Steering torque range ± 100 Nm or ± 200 Nm (up to ± 250 Nm as option)
- Measuring angle range $\pm 1440^\circ$
- Steering velocity range $\pm 2048^\circ/\text{sec}$
- Acceleration in x, y, z direction
- Rotational acceleration

For data output and parametrization, the receiver and control unit offers both analog and digital interfaces (CAN, Ethernet). At the 7.2 cm (2.83") color display (320 x 240 px) integrated in the control unit, all measurement values are displayed in physical dimensions.

The CLS^x steering sensor is particularly suitable for use in driving dynamics tests such as:

- ISO 4148 Steady-state skidpad
- ISO 7975 Circular braking
- ISO 7401 Steering angle jump or steer reverse
- ISO 3888 ISO lane change test (Moose-Test)
- ISO 7401 Sinus Wedel test
- ISO 17288 Steering pendulums
- ECE-R 79 Steering systems
- NHTSA Fishhook-Test (Rollover Resistance)

Overview of the available variants

| Order Code | | article number |
|-----------------------|---|----------------|
| H-SEN-CMX-CLSx100-ACC | CLS ^x Steering Effort Sensor 100 Nm with acceleration sensor | 13800006 |
| H-SEN-CMX-CLSx200-ACC | CLS ^x Steering Effort Sensor 200 Nm with acceleration sensor | 13800007 |



Included accessories

- Transportation case,
- Calibration certificate with test equipment,
- Remote control for autozero including remote cable,
- Ethernet cable,
- Receive unit,
- SD card ≥ 2 GB,
- Power adaptor,
- 8 screws for each: steering wheel adaptor and the steering column adaptor,
- tool for pulling of the sensor,
- data carrier with manual,
- Mounting unit for the angle encoder bracket to a fix zero position.



Optional accessories

| | | |
|---------------------------|---|----------|
| • H-SEN-CMX-CLS-REF | Reference Mark for zero position CLS ^x Option Reference Mark for permanent storage of the zero position Only available with new order, no refit possible | 13800003 |
| • H-ZUB-CMX-CLS-ADP-LR-R | Steering wheel adaptor for CLS ^x ; blank without specific toothing; for manufacturing the specific toothing by yourself | 13800008 |
| • H-ZUB-CMX-CLS-ADP-LR-ST | Steering wheel adaptor for CLS ^x ; with matched toothing for known vehicles, only possible after confirmation of an existing adaptor for the car | 13800016 |
| • H-ZUB-CMX-CLS-ADP-LR-SP | Steering wheel adaptor for CLS ^x ; with new adaption for a matched toothing; technical specification of your steering wheel (drawings, example etc.) is to be provided by the customer for the development | 13800004 |
| • H-ZUB-CMX-CLS-ADP-LS-R | Steering column adaptor for CLS ^x ; blank without special toothing; for manufacturing the special toothing by yourself | 13800010 |
| • H-ZUB-CMX-CLS-ADP-LS-ST | Steering column adaptor for CLS ^x ; with matched toothing for known vehicles, only possible after confirmation of an existing adaptor for the car | 13800011 |
| • H-ZUB-CMX-CLS-ADP-LS-SP | Steering column adaptor for CLS ^x ; with new adaption for a matched toothing; technical specification of your steering column (drawings, example etc.) is to be provided by the customer for the development | 13800005 |



Optional accessories

- | | | |
|-------------------------|---|----------|
| • H-ZUB-CMX-CLS-ESP | ESP Upgrade for steering wheel adaptor | 13800009 |
| • H-ZUB-CMX-CLS-ESP-NEW | ESP Upgrade for steering wheel adaptor, new design | 13800000 |
| • H-ZUB-CMX-CLS-Momo | Sports steering wheel Ø 350 mm incl. steering wheel adaptor | 13800012 |

Only possible after confirmation of an existing adaptor for the car.



Further components

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|----------------------|--------------------------------------|----------|
| • H-TEL-CMX-DX-FRAME | Mounting frame for one receiver unit | 13500239 |
|----------------------|--------------------------------------|----------|

Mounting frame for one receiver unit.

Optionally with protection cap for thumbwheel.



Technical Specs

| Steering Torque | | |
|--|---|--|
| Parameter | Value | Remarks |
| Measuring principle | temperature compensated strain gauge application | |
| Measurement range | $\pm 100 \text{ Nm} / \pm 200 \text{ Nm}$ | others upon request, e.g. $\pm 250 \text{ Nm}$ |
| Accuracy | 0.1% FS | |
| Bandwidth | 800 Hz | sampling rate 5 kHz |
| Filter cut-off frequency | 0.034 Hz | |
| Steering Angle | | |
| Measuring principle | incremental angle encoder | |
| Measurement range | $\pm 1440^\circ$ | |
| Accuracy | 0.045 ° | |
| Bandwidth | 800 Hz | sampling rate 5 kHz |
| Filter cut-off frequency | 0.034 Hz | |
| Steering velocity range (angular velocity) | | |
| Parameter | Value | Remarks |
| Measuring principle | Calculated from angle | |
| Measurement range | $\pm 2048^\circ/\text{s}$ | |
| Bandwidth | 800 Hz | sampling rate 5 kHz |
| Filter cut-off frequency | 0.034 Hz | |
| Acceleration | | |
| Acceleration x, y and z | in the center of the steering column, measurement range up to 5 g in x, y and z direction | |
| Accuracy of x, y and z acceleration | 0.1% FS | |
| Rotational acceleration | measurement range $\pm 10000^\circ/\text{sec}^2$ | |
| Accuracy of rotational acceleration | 0.2% FS | |
| Bandwidth | 800 Hz | sampling rate 5 kHz |
| Filter cut-off frequency | 0.034 Hz | |



| General Data | | |
|---|---|---|
| Parameter | Value | Remarks |
| Resolution of all CLS ^x signal channels | 16 bit | |
| Sensor height | approx. 30 mm | w/o adaptors |
| Sensor weight | approx. 0.6 kg | w/o adaptors |
| Cable length | 5 m | length from sensor to control unit |
| Power consumption | approx. 8.5 W | at 12 V DC |
| Overload | >100% of the measurement range | |
| Mech. breaking torque | >500 Nm | |
| Adaption | special adaption sets for any car or truck manufacturer available | individual adaptor for steering wheel and steering column |
| Moment of inertia sensor steering wheel or column adaptor | approx. 3200 g cm ² typ. approx. 500 g cm ² | |
| Working temperature steering effort sensor control unit | -20 °C to +80 °C -20 °C to +65 °C | |
| Control Unit | | |
| Power supply | 9 to 36 V DC | |
| CAN-Output | freely configurable | |
| Analog output | freely configurable, output range max. ±10 V | |
| Auto zero | with push-button for torque and angle at the panel or by remote control | |

