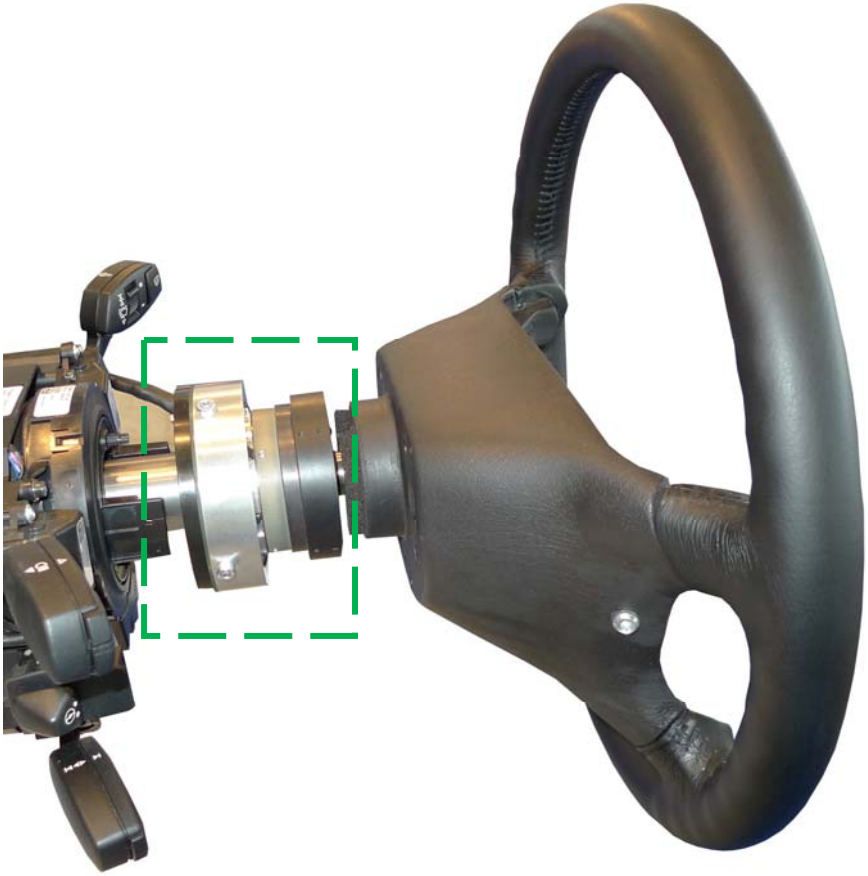
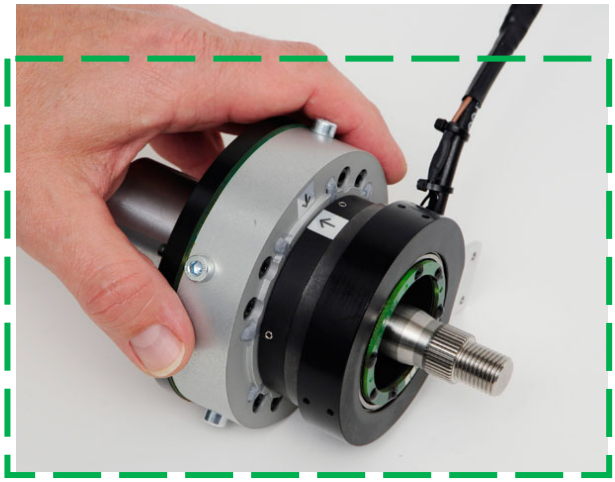
KMT-CLS Steering Effort Sensor for Automobiles and Trucks

User – Manual

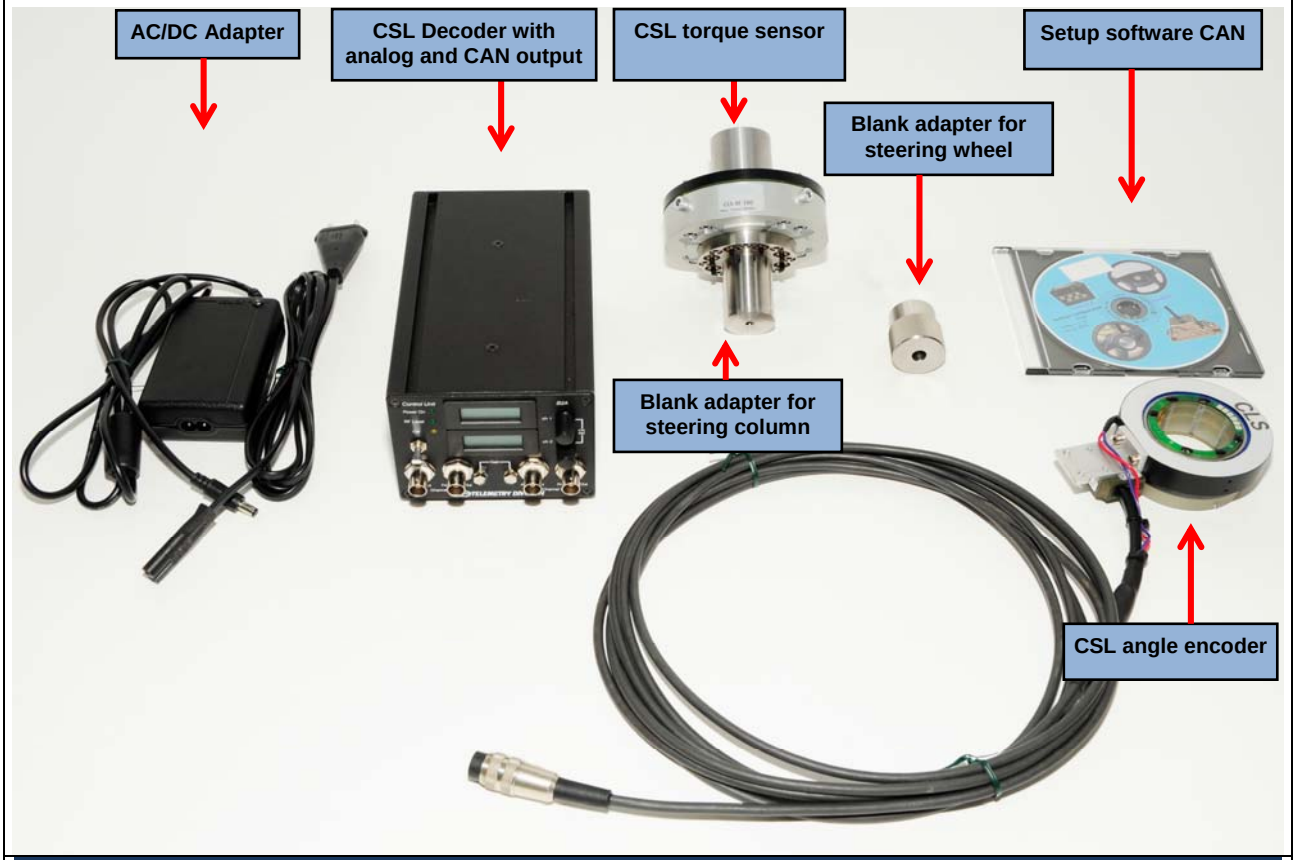




INSTRUCTIONS FOR QUALIFIED PERSONNEL ONLY!

TMS • Telemetrie-Messtechnik Schnorrenberg • Dipl.-Ing. Werner Schnorrenberg
Habichtweg 30, D-51429 Bergisch Gladbach, Tel: 02204-9815-52, Fax: 02204-9815-53, Mobil: 0171-8902387
Bankverbindung: Sparkasse KölnBonn, Kto.-Nr: 1900310663, BLZ: 370 501 98

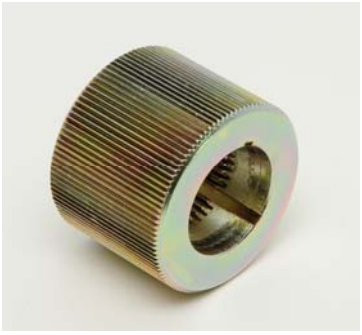
Standard SET with blank adapters



Bank adapters for self-made! (incl. in SET)

Blank adapter for steering column	adapter for steering wheel
	

Customize adapters for steering column and steering wheel <u>on request</u>!!

adapter for steering column	adapter for steering wheel
	
example	example

1 Exclusion of Liability

KMT Kraus Messtechnik GmbH will not be liable for damages resulting from misuse or inappropriate treatment of the CLS, no matter whether such defects occur on the KMT-CLS itself or as consequential damages on other items. Consideration of the following is required in particular:

The KMT-CLS has no MOT approval, i.e. it is not approved for use in public areas.

Mounting and dismounting of the airbag should be performed by properly skilled staff only.

In case of any kind of overstress (car crash, activation of the airbag, etc.) the KMT-CLS should no longer be used.

Road safety is in the sole responsibility of the user.

Assembly and dismantling of the sensor should be performed by properly skilled staff only.

Inappropriate treatment, misuse or damage of the KMT-CLS leads to immediate expiration of warranty and all guarantee rights granted by KMT Kraus Messtechnik GmbH.

2 Introduction

The KMT-CLS steering effort sensor is a precise telemetry system, which can be used in passenger cars and trucks. It is designed to evaluate the steering torque and steering angle while driving.

Due to years of experience in the field engineers have been able to use all the advantages of modern electronics to build a small transducer, which can be installed between the steering column and the original steering wheel. Therefore it is nearly unnoticed by the driver and the dynamic values of a standard steering wheel are preserved.

A particular feature of this transducer is the ability to feed all electrical signals of the steering wheel through this device, so the functionality of the airbag, LIN-bus and others are preserved.

To guarantee a torque free operation without interferences the transducer has an inbuilt telemetry system.

The compact control unit can be easily integrated inside the passenger cabin.

With several adapters to the steering column it is easy to use the transducer in different types and models of cars without complex mounting procedures.

3 Technical Data

3.1 Transducer Unit

General

Outer diameter:	approx. 100 mm
Height:	approx. 65 mm without adapters
Operational Height:	approx. 96 mm depending on adapters and mounting
Weight:	1.4 kg
Operating temperature:	-20°C...80°C
Power supply:	powered by control unit

Torque Transducer

Sensor type:	temperature compensated strain gauge
Measure range:	±100 Nm or ±200 Nm (determined by order)
Mechanic capacity:	±350 Nm, beyond this range steering is guaranteed by mechanical blocking
Torque direction:	positive torque means clockwise direction
Accuracy:	0.2% FS
Temperature drift:	max 0.004% FS / K
Bandwidth:	0 ... 800 Hz
Test shunt signal:	approx. 80Nm for 10 secs after power on

Angle Encoder

Sensor type:	incremental magnetic encoder
Angle resolution:	0.04° (8800 pulses/360°)

3.2 Control and Receiver Unit

General

Dimensions:	approx. 80mm x 105mm x 185mm
Weight:	1.15 kg
Operating temperature:	-20°C ... 80°C
Power supply:	9 ... 36 VDC

CAN-Bus Interface

Electric type:	ISO/DIN11898 with galvanic isolation
Configuration:	via CAN using CCP-Protocol, the serial number is used for identification
Baud rate:	10kBaud ... 1 MBaud programmable by software
Identifier:	11bit or 29bit programmable
Message configuration	completely programmable
Refresh rate:	max. 5000 Hz, can be divided by factor with software
Zero adjustment for torque and angle:	push-button on the front panel
Torque range:	±100 Nm or ±200 Nm, depending on type
Torque resolution:	16 bit (0.003 Nm or 0.006 Nm)

Angle range:	±1340°
Angle resolution:	16 bit : 0.04° (8800 digits/360°)
Rotational velocity range:	±1000°/sec
Rotational velocity resolution:	16 bit

Analog Outputs

Voltage range:	±10 V
Analog offset trim:	with potentiometer on the front panel
Bandwidth:	0 ... 800 Hz
Torque signal range:	±100 Nm or ±200 Nm, depending on type
Torque signal resolution:	12 bit (0.049 Nm or 0.098 Nm, depending on type)
Angle signal range:	±1000° (= ±10 V)
Angle signal resolution:	0.65°

Frequency Output for Torque Signal

Type:	5 V TTL square wave
Frequency range:	10000 Hz ±5000 Hz
	5000 Hz: = -100 Nm or –200 Nm
	10000 Hz: = 0 Nm
	15000 Hz: = +100 Nm or +200 Nm

Digital Display

Torque display:	±100 Nm or ±200 Nm, direct reading
Torque display resolution:	0.1 Nm
Angle display:	±1000° direct reading
Angle display resolution:	1°

4 Installation

The CLS-transducer system consists of the angle encoder with angle restraint, steering wheel adapter, torque sensor and steering column adapter. The two adapters are vehicle-specific, blank adaptors can be supplied for self machining by the customer.

From left: Encoder, steering wheel adapter, screw, CLS-sensor, steering column adapter

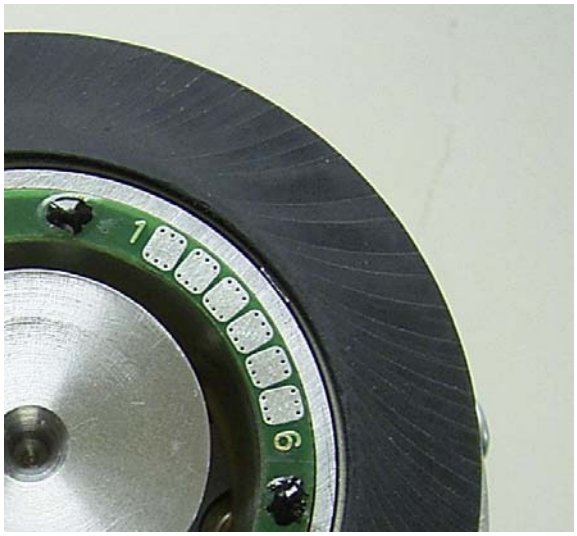
4.1 Assembly steps:

1. Dismantle standard steering wheel and prepare the steering wheel wiring. IMPORTANT: Work on the airbag system should only be carried out by skilled personnel.
2. Insert the steering column adapter on the steering column.
3. Mount the CLS-sensor to the column and tighten it with the central screw.
4. Attach the steering wheel adapter on the CLS-sensor and fix it with 8 screws.
5. Place the encoder over the adapter and push it on the sensor, then fix it with grub screws. IMPORTANT: Note arrows on the encoder and KMT-CLS sensor must be lined up when mounting.
6. Fix the angle restraint from the Encoder to a non rotating part of the vehicle.
7. Mount the standard steering wheel on the adapter and screw it according to the car manufacturer's instructions.

4.2 Steering wheel wiring

The original steering wheel must be dismounted and its cable connections must be unplugged.

The best way to reinstall the wiring of the steering wheel is to solder cable adapters to the transducer.



Soldering pads on the upper side

soldering pads on the bottom side

To maintain complete functionality of the steering wheel it is necessary to reconnect all the signals for power, LIN-bus and airbag. Therefore the sensor has 6 identical soldering pads, which can be used in either way. Each line has a continuous current rating of 4 Amps. Pay attention to ensure identical pinning on the top and bottom side.

4.3 Assembly of the steering column adapter

Insert the vehicle-specific steering column adapter over the toothing of the steering column. The assembly may vary slightly, depending on the car manufacturer.

Assembly of the steering column adapter

4.4 Assembly of the sensor

Now plug the CLS-Sensor on the adapter of the steering column. The angular position is arbitrary. Fix the sensor with the central screw to the steering column. The car manufacturer's instruction should be followed, especially regarding the fastening torque and screw locking.

Assembly of the sensor

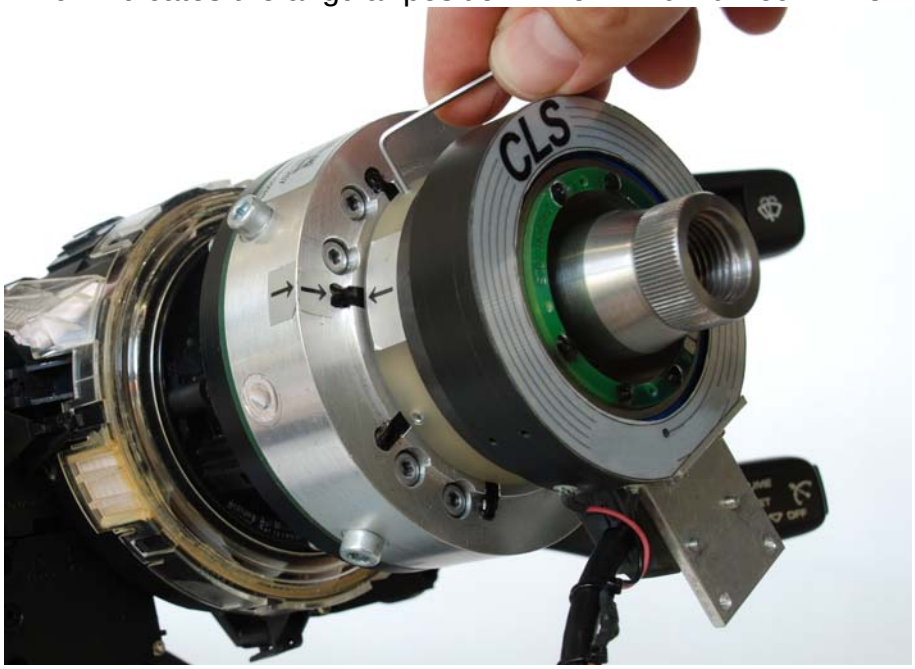
4.5 Assembly of the steering wheel adapter

Afterwards the steering wheel adapter will be mounted on the sensor body and screwed with eight M4x14 12.9 cheese head screws with a fastening torque of 3Nm.
For disassembling there are 4 threads for the ejection screws. Open the 8 screws, than eject the adapter with the 4 ejection screws.

Assembly of the steering wheel adapter

4.6 Assembly of the encoder

Place the encoder over the adapter and push it on the sensor by taking note of the arrow which indicates the angular position. Then fix it with four M2.5x4 grub screws.



Assembly of the encoder

4.7 Assembly of the restrain

Fix the restraint from the Encoder to a fixed part of the vehicle. This connection should be very firm to achieve the correct angular accuracy.

Assembly of the steering wheel

Steering wheel mounted

4.8 Assembly of the steering wheel

Mount the standard steering wheel on the KMT-CLS transducer assembly. This operation should be carried out according to the car manufacturer's instructions. IMPORTANT: Work on the airbag should only be performed by skilled personnel.

5 Connections and Startup

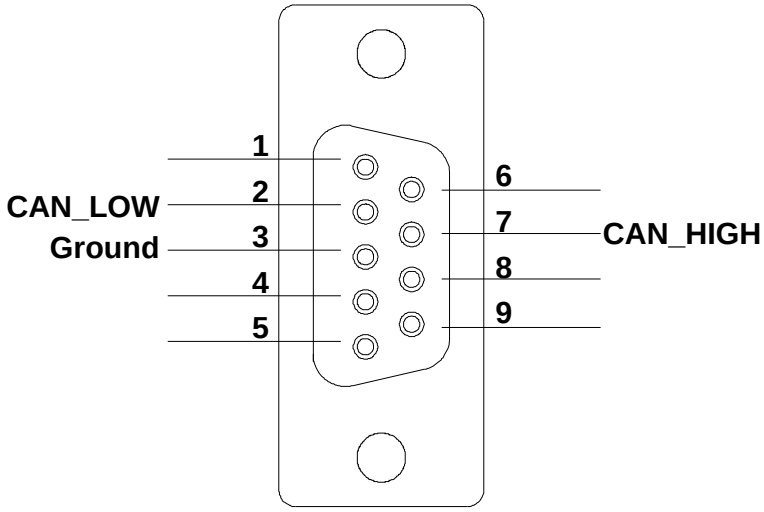
The cable of the transducer must be connected to the socket on the rear panel of the control unit.

To power the complete system there are two 4mm banana sockets on the rear panel. They must be connected to the on-board electrical system or another suitable power supply. The power supply included in the package can be used for testing in laboratory or in test rigs.

After power up of the control unit, an automatic shunt in the sensor will be activated. It produces a test signal of about 80 Nm, which holds for about 10 seconds. This is a simple functional test of the torque channel.
With the push-button 'CAL' on the front panel the user can release an auto zero procedure for the torque and the angle channel → Attention: Only active with CAN interface!
For the Analog Offset please use the potentiometer!

The complete configuration of the CAN interface is done with the software **NetModconfig**, which is included in the package.

6 Connector for CAN Bus



D-Sub 9-pins female connector at the rear panel

Attention ! If the CAN output is connected to an end of a CAN line, it must be terminated by an external 120 ohms resistor, located between CAN-High and CAN-Low line.