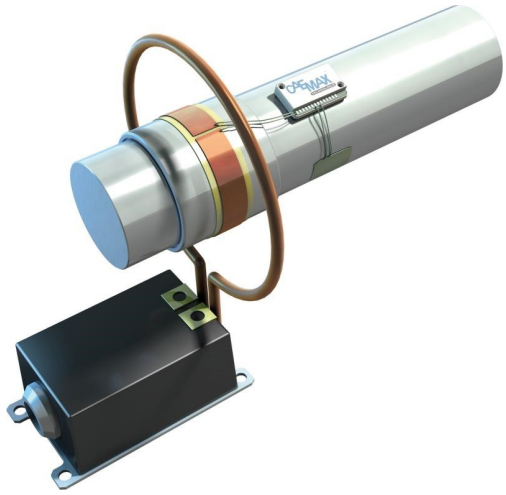
Dx: Digital Multi-Channel Telemetry System



Instrumented shaft with signal conditioning and transmitter unit (SCT) and inductive power supply

Receiver, Control and Interface Unit (RCI)

For measurements with rotating objects, a telemetry system for wireless data transmission from the rotating device to a stationary receiver unit can be essential. With this telemetry system, a variety of measurement tasks can be performed - even with different number of channels and different channel assignment.

Due to the versatile combination of the modular system components, the setup of the whole Dx system is fast and convenient, as required for modern test engineering.

Up to 4 transmitters (SCTs) with several channels each can be operated with one receiver unit (RCI). The conditioned and digitized (16 bit) signals are then transmitted serially in the 868 MHz or 2.4 GHz band and are then available at the receiver as analog signals and CAN messages.

The power supply of the transmitters and data transmission are not coupled: The user can decide the appropriate type of power supply (battery or inductive). The system is available in two variants:

- Dx Standard (868 MHz Band)
- Dx-HT (2.4 GHz Band respectively suited for high temperatures)

Highlights

- Up to six analog inputs per transmitter unit:
  strain gauges, temperatures, analog signals, freely programmable
- Sampling rate up to 4.6 kHz (16 bit) per channel (Dx 868) respectively 5 kHz (Dx-HT)
- Synchronous data collection and processing from up to 4 transmitters (SCTs) with only one receiver unit
- Integrated standard interfaces: Analog, CAN and Ethernet
- Indication of measurement values in engineering units
- No authorization required for radio transmission
- Transmitter housing made of PEEK: heat and impact-resistant
- Plated-through soldering points
- Online monitoring of all measurement values and additional channels:
  transmitter temperature, power supply, signal strength

Dx Transmitter unit (SCT)

Signal conditioning and transmitter unit (SCT)

Signal conditioning and transmitter unit (SCT) in IP67 housing

The Dx SCT contains signal processing and digitization units for up to 6 channels. Those channels can be strain gauges with bridge supply, thermocouples or voltage signals. Further additional channels (temperature, voltage supply, signal strength of the transmitter) are available. The integrated antenna transmits the digitized measurement values to the receiver unit. The devices can be supplied inductively or by battery.

Overview of available variants

Order Code		article number
• H-TEL-CMX-DX-SCT-868	Dx signal conditioning and transmitter unit (SCT); 868 MHz band (863 - 870 MHz)	13600001
• H-TEL-CMX-DX-SCT-HT-2400	Dx signal conditioning and transmitter unit (SCT); High-temperature version up to 125 °C, 2.4 GHz band (2.40 - 2.48 GHz)	13600002
• H-TEL-CMX-DX-SCT-SA-868	Dx signal conditioning and transmitter unit (SCT) in IP67 housing with connection cable and mounting holes; 868 MHz band (863 - 870 MHz)	13600003
• H-TEL-CMX-DX-SCT-SA-2400	Dx signal conditioning and transmitter unit (SCT) in IP67 housing with connection cable and mounting holes; 2.4 GHz band (2.40 - 2.48 GHz)	13600029

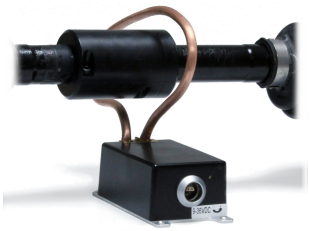
Optional accessories

Power supply components

• Batteries	Batteries for the SCT supply	upon request
• H-TEL-CMX-DX-SR	Ring Stator; inductive power supply via freely shapeable ring antenna	13600004
• H-TEL-CMX-DX-SR-HT	High-temperature version up to 125°C; inductive power supply via freely shapeable ring antenna	13600090
• H-TEL-CMX-DX-FS	Fixed Stator; inductive power supply via inductive head; IP 67; incl. 5 m connection cable	13600023

As data transmission and energy supply are separate with the Dx system, the ring stator can be mounted at any place along the axle. Due to a DC/DC converter integrated in the SCT transmitter, consistency of power supply is provided.

Included in delivery is a 1 m copper pipe and a supply cable to banana plug for supply via an RCI. Alternative supply via any 9..32 VDC source.



- H-ZUB-CMX-TEL-KIT Secondary coil installation kit 13600005

  As counter part for the ring stator a secondary induction coil has to be installed to the rotating shaft.

  Included accessories: isolation tape, mu metal, copper band

Housings to integrate SCTs

- H-TEL-CMX-DX-D1RI Shaft-mounted housing; inductive powered 13600006

  This type of housing consisting of 2 half shells to integrate one SCT transmitter unit, including secondary coil (inductive powered). Shaft diameter needed upon ordering; up to 50 mm shaft diameter possible (housings for diameter > 50 mm on request).

- H-TEL-CMX-DX-D1AI Shaft-end mounted housing; inductive power 13600014

  Shaft-end mounted housing to integrate one SCT transmitter unit; including secondary coil (inductive powered).

- H-TEL-CMX-DX-D1AB Shaft-end mounted housing; Li-Ion battery 13600007

  Shaft-end mounted housing to integrate one SCT transmitter unit and Li-Ion battery for mounting on mounting adaptor for wheels (upon request, not included in delivery)

- H-TEL-CMX-DX-D1RB Shaft-mounted housing; Li-Ion battery 13600013

  Shaft-mount-type housing consisting of **2 half shells** to integrate one SCT transmitter unit, Li-Ion battery. Shaft diameter needed upon ordering; up to 50 mm diameter possible (housings for diameter > 50 mm on request).

  Included accessories: Li-Ion battery, protective cover for LEMO, LEMO plug, power adaptor with LEMO plug and a tube with sealant

Further component

- H-TEL-CMX-DX-AP Configuration & testing panel for SCT 13600022

  With the Dx connection panel, developed for convenient testing, the SCTs can be tested and programmed very quickly - without soldering.

- H-TEL-CMX-DX-BrTmp-6-2400 13600022

  Dx-BrakeTemp, wheel telemetry brake temperature, 2.4 GHz
  Housing with SCT for wheel mounting for connection of 6 temperature sensors
  ○ Dx-BrakeTemp, Easy assembly
  ○ Housing made of high-quality plastic (POM)
  ○ Integrated LiIon battery supply, incl. charging electronics and activation plug
  ○ Waterproof (IP67)
  additional antennas and one Receiver, Control and Interface unit (RCI) are needed

Optional service

- SERV/CHECK-ADJ-SCT-RPM Service check, calibration and adjustment 150000526
  Includes maintenance according to the service interval plan as specified by the manufacturer, complete function test, calibration and adjustment of Dx-Speed-System. Scope of delivery: On site calibration certificate with measurement values (pdf)

- SERV/CHECK-ADJ-SCT-ANALOG Service-Check, calibration and adjustment of 150000569
  measured variables: strain gauge and analog signals of one Signal Conditioning and Transmitter unit (SCT). Includes maintenance according to the service interval plan as specified by the manufacturer and a complete function test, calibration, adjustment and function test of one Signal Conditioning and Transmitter unit (SCT)

- SERV/CHECK-ADJ-SCT-TEMP Service-Check, calibration and adjustment of 150000570
  measured variable temperature of one Signal Conditioning and Transmitter unit (SCT). Includes maintenance according to the service interval plan as specified by the manufacturer and a complete function test, calibration, adjustment and function test of one Signal Conditioning and Transmitter unit (SCT)

- D-TEL-CMX-APP-1CH Strain gauge application on shaft 13600028
  Flat rate for equipping one shaft with strain gauges and signal conditioning and transmitter unit (SCT) for torque measurement, without calibration (without housing, without SCT).

- D-TEL-CMX-APP-1CH-KAL Strain gauge application and calibration 13600080
  Flat rate for equipping one component with strain gauges and SCT
  (signal conditioning and transmitter unit) for torque measurement,
  (without housing, without SCT)
  Torque calibration up to 5,000 Nm with calibration certificate and calibration log according to VDI/VDE 2646 8-step or continuous calibration left and right; two mounting positions
  (Attention: onetime additional charges for the adaptor will apply)

- SERV/ADJ-10000-SHAFT Calibration and adjustment up to 150000502
  10.000 Nm for a strain gauge and SCT equipped shaft. Includes Torque calibration and adjustment up to 10.000 Nm for a shaft equipped with strain gauges and SCT (signal conditioning and transmitter unit). Scope of delivery: On site calibration certificate with measurement values (pdf, meets requirements of DIN 51309 and ISO 17025)

Dx Receiver unit (RCI)

Here, up to 4 transmitter units are synchronized and all measurement data are brought together. Due to two receiver antennas working in parallel (diversity mode) a high level of noise immunity is reached. For data output, 6 freely programmable analog outputs and a CAN interface are available.

Overview of available variants

Order Code		article number
• H-TEL-CMX-DX-RCI-868	Receiver, Control and Interface unit (RCI) 868 MHz band (863 - 870 MHz) for 1360001, 1360003	13600010
• H-TEL-CMX-DX-RCI-HT-2400	Receiver, Control and Interface unit (RCI) 2.4 GHz band (2.40 - 2.48 GHz) for 1360002, 1360029	13600009

Included accessories

- Ethernet cable, Two telemetry antennas
- AC/DC power supply, SD card (≥2 GB) an a Manual (on CD)

Optional accessories

Antennas and satellite receivers as replacement for standard telemetry antennas

• TELE/CMX-DX-ANT-5m-868	Dx flat antenna 868 MHz band incl. 5 m cable, passive	13600008
• H-TEL-CMX-DX-ANT-10m-868	Dx flat antenna 868 MHz band incl. cable 10 m, passive Note: longer cable has more transmisson loss	13600018
• H-TEL-CMX-DX-ANT-5m-2400	Dx flat antenna 2.4 GHz band incl. 5 m cable, passive	13600024
• H-ZUB-CMX-DX-SYS-CASE	Transport case for a complete Dx telemetry wheel up to 4x Dx wheel transmitters, 1x Dx-RCI, antennas and accessories	13600123

At hardly accessible measurement sites where the receiver can not be placed next to the transmitters, our water-proof (IP67) antennas, designed for outdoor application, may be helpful. Thus, distances of up to 10 m between receiver and transmitter can be spanned. (Note: you need two antennas for a diversity-mode)

• H-TEL-CMX-DX-ANT-SPG-5m-868	Dx antenna 868 MHz band for mounting on a vehicle exterior mirror incl. 5 m cable	13600017
• H-TEL-CMX-DX-ANT-SPG-5m-2400	Dx antenna 2.4 GHz band for mounting on a vehicle exterior mirror incl. 5 m cable	13600026

The passive vehicle antennas are attached to the wing mirrors of the vehicle by an elastic haltering system. (Note: you need two antennas for a diversity-mode)

- H-TEL-CMX-DX-ANT-RSU-10m-868 — Satellite receiver 868 MHz band including signal amplifier (RSU); flat-antenna type with attached cable 10 m (digital transmission), other cable lengths upon request — 13600019
- H-TEL-CMX-DX-ANT-RSU-10m-2400 — Satellite receiver 2.4 GHz band including signal amplifier (RSU); flat-antenna type with attached cable 10 m (digital transmission), other cable lengths upon request (only diversity-operation = 2 pieces necessary) — 13600020

With bad transmission conditions due to reflections, shadowing etc., the standard antennas can be replaced by up to four satellite receivers.

- H-TEL-CMX-DX-RSU-YCAB — Y-cable for connection of 2 RSUs to one RCI satellite port — 13600021

Further components

- H-TEL-CMX-DX-FRAME2 — Mounting frame for one receiver unit — 13500239

Mounting frame for one receiver unit
Optionally with protection cap for thumbwheel.

- H-ZUB-CMX-DX-CAS — Carrying case for Dx Telemetry System — 13500236

The case can be used to carry:

- 1 RCI unit
- AC/DC power adaptor
- 4 SCTs
- 2 ring stators
- Antennas
- Connection cables

Optional service

- SERV/CHECK-ADJ-RCI-ALL — Service check, calibration and adjustment of one Receiver, Control and Interface unit (RCI). Includes maintenance according to the service interval plan as specified by the manufacturer, complete function test, calibration and adjustment of analog outputs of one Receiver, Control and Interface unit (RCI). Scope of delivery: On site calibration certificate with measurement values (pdf). Not relevant when using only the CAN outputs of the receiver — 150000503

Technical Specs - Dx Transmitter unit (SCT)

Inputs for voltage signals in mV-range: 2 differential inputs or 4 single-end inputs		
Parameter	**Value**	**Remarks**
Measurement modes	full bridges half bridges thermocouple type J, K	up to 2 inputs up to 4 inputs up to 2 differential inputs (recommended) or up to 4 single-ended inputs
Input ranges Input voltages	±0.244 mV/V to ±1000 mV/V ±1 mV to ±4096 mV	13 measurement ranges adjustable
Resolution	16 bit	
Accuracy	0.01% to 0.025% full scale	
Bridge supply	4.096 V (max. 40 mA)	short circuit proof; max. 2 full or 4 half bridges with 350 Ω max. 1 full or 2 half bridges with 120 Ω
Antialiasing filter	Butterworth-characteristics 6th order, cut-off frequency 1/5 of sampling rate	

Inputs for voltage signals in V-range: 1 differential input and one single-ended input		
Parameter	**Value**	**Remarks**
Measurement mode	voltage measurement	one differential input and one single-ended input
Input range	±0.011 V to ±45.056 V	13 measurement ranges adjustable
Resolution	16 bit	
Accuracy	0.01% full scale	
Antialiasing filter	Butterworth-characteristics 6th order, cut-off frequency 1/5 of sampling rate	

Additional channels		
Parameter	**Value**	**Remarks**
Voltage supply of SCT	measurement range 6 to 41.5 V	resolution 10 mV
Temperature of SCT	measurement range -30 °C to 100 °C measurement range -30 °C to 150 °C	resolution 0.034 °C Dx standard Dx HT

General		
Power supply	inductive supply with ring stator or battery supply 8 V to 39 V	
Power consumption	<0.6 W	
Temperature range	-40 °C to +85 °C -40 °C to +125 °C	Dx standard Dx HT
Data transmission	data packages with error detection	
Transmission frequency	868 MHz 2.4 GHz	Dx standard Dx HT
Transmission power	max. +10 dBm	
Material of housing	PEEK	

General		
Power supply	inductive supply with ring stator or battery supply 8 V to 39 V	
Dimensions	45 x 25 x 10 mm	
Weight	approx. 14 g	

Technical Specs - Dx Receiver unit (RCI)

Parameter	Value	Remarks
Power supply	9 to 36 V DC	
Power consumption	<5 W	
CAN output	CAN 2.0b, standard-and extended-identifiers, freely programmable up to max. 1 MBaud	according to ISO 11898, electrically isolated
Analog output	6 BNC-sockets	freely assignable to any signal, output max. ±10 V
Ethernet interface	10/100 Mbit for parametrization via web browser	
Autozero	remote controlled	optional
Transceiver	2 independent receivers operating in diversity mode	
Signal strength measurement of each SCT	-99 dB to -10 dB	resolution 8 bit
Synchronisation	synchronized sampling of 4 SCTs	
Temperature range	-20°C to +65°C	
Display	2.83 inch color display, 320 x 240 px	
Dimensions	170 x 130 x 53 mm	
Weight	approx. 0.8 kg	

The max. possible **sampling rate** of the system depends on the following parameters:

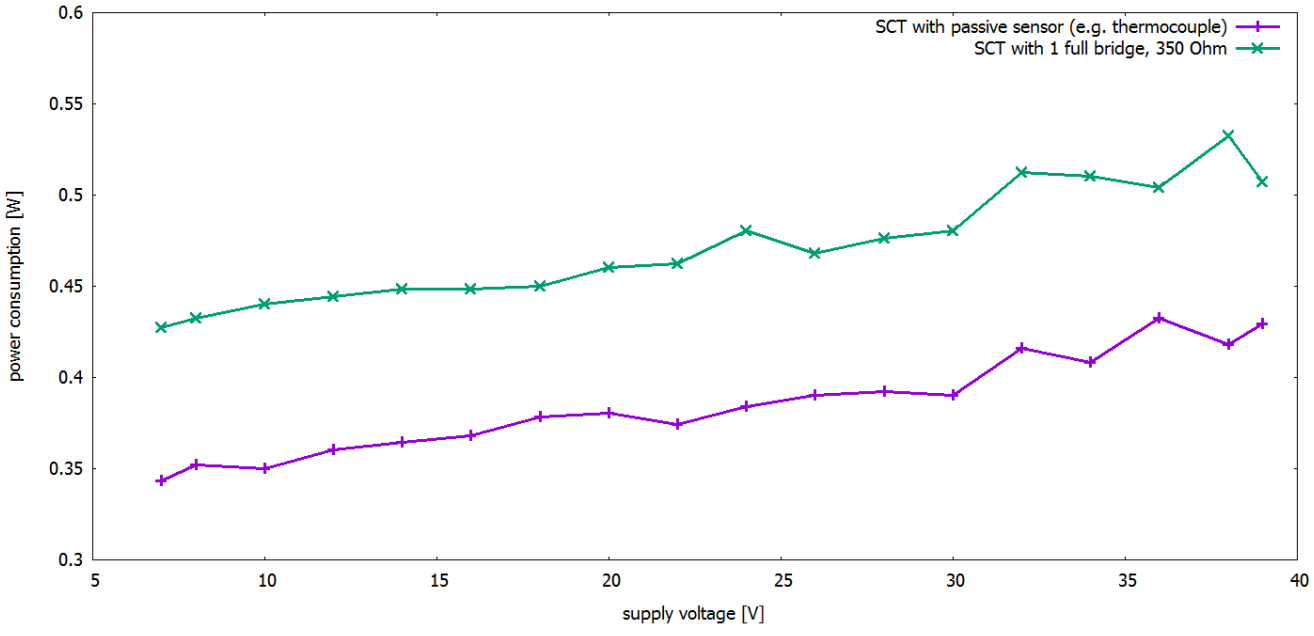
- number of SCTs
- max. number of channels per SCT.

The sampling rate is assigned to each channel of a Dx system. The additional channels *Reference Temp*, *RF_Level* and *Supply Voltage* will be sampled with 25 Hz and will have no influence on the total aggregate sampling rate.

Sampling rates for the complete system (receiver with multiple transmitters)			
Number of		**max. sampling rate per channel [Hz]**	
SCTs	**channels/SCT**	**Dx standard**	**Dx-HT**
1	1	4600	5000
	2	2400	2400
	3	1600	1600
	4	1200	1200
	5	800	800
	6	800	800
2	1	3400	4000
	2	1800	2000
	3	1200	1200
	4	800	1000
	5	600	800
	6	600	600
3 or 4	1	1000	1200
	2	400	600
	3	200	400
	4	200	200
	5	200	200

Power Consumption of the transmitter unit (SCT)

The power consumption of the SCT is, among other, mainly depends on the sensors connected (active / passive, strain gauge impedance), as well as from the used supply. A minimal voltage of 7 V is necessary to operate the SCTs.



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imc ACADEMY - Training center

The safe handling of measurement devices requires a good knowledge of the system. At our training center, experienced specialists are here to share their knowledge.

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