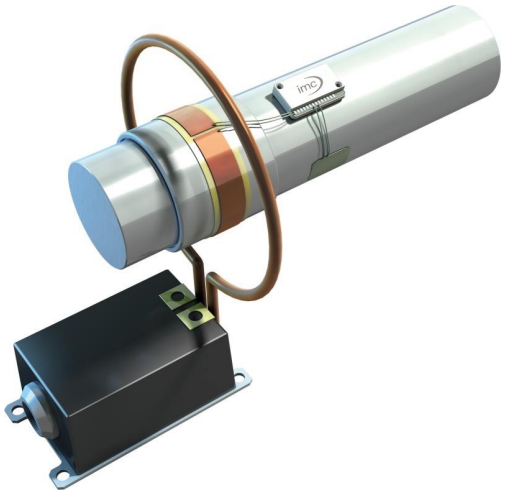
Dx: Digital Multi-Channel Telemetry System



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 (SCT):
  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 Dx SCT variants

Dx Transmitter unit (SCT)	[x = 868]	**HT variant** [x = HT-2400]	
Order Code	article no.	article no.	properties
H-TEL-CMX-DX-SCT-x	13600001	13600002	Dx Telemetry Measure & Transmit module
H-TEL-CMX-DX-SCT-SCREW	13600076		Option: adapter holder with screw clamp for SCT (H-TEL-CMX-DX-SCT-x) upgrade for screw clamp to SCT (not available for thermocouple variants)
H-TEL-CMX-DX-SCT-x-3TK	13600100	13600103	variant with 3x thermocouple type K
H-TEL-CMX-DX-SCT-x-3TJ	13600101	13600104	variant with 3x thermocouple type J
H-TEL-CMX-DX-SCT-x-3SG	13600102	13600105	variant with 3x inputs for strain gauge
H-TEL-CMX-DX-SCT-SA-x	13600003	13600029	variant in a IP67 housing

Optional accessories

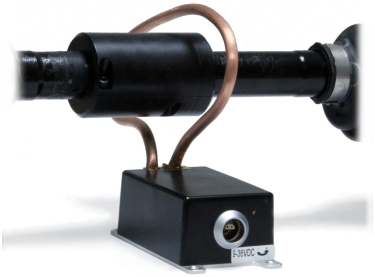
Komponenten zur Spannungsversorgung			
Order Code	868 variant	HT variant [1]	properties
H-TEL-CMX-DX-SR[-HT]	13600004	13600090	**Ring stator**; inductive power supply via freely shapeable ring antenna
H-TEL-CMX-DX-SRG[-HT]	13600075	13600093	**Ring stator XL**; inductive power supply via freely shapeable ring antenna

1 HT variant: extended temperature range up to 125°C

Optional accessories

Order Code		article no.
H-TEL-CMX-DX-FS	Fixed Stator; inductive power supply via inductive head; IP 67; incl. 5 m connection cable	13600023

Ringstator (H-TEL-CMX-DX-SR)
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	Installation kit for the secondary coil for diameters up to 300 mm	13600005

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

Included accessories:
- Isolation tape,
- 200 cm mu metal shielding foil,
- copper band etc.

H-ZUB-CMX-TEL-KIT Spezial	Installation kit for the secondary coil XL for diameters up to 600 mm	13600040
H-ZUB-CMX-TEL-SKG	Traction chain for inductive power supply of Dx-SCT transmitter units on large diameters: - Includes housing for 1x Dx-SCT and 1x Dx-OVP module each - Expandable with max. 3 additional housings - Length 3.5 m, other lengths on request - For diameters up to 1000 mm, others on request - Minimum diameter 500 mm - Without Dx-OVP module (13600084), must be ordered separately - Without Dx-SCT, ring stator (XL), external antennas (min. 2 pieces), must be ordered separately	13600000
H-ZUB-CMX-TEL-SKG-AH	Additional housing for the traction chain 13600000	13600112
H-TEL-CMX-DX-OVP	Over voltage protection, see separate data sheet (TD): TD_imc_Dx-OVP.pdf	13600084
H-TEL-CMX-DX-SCT-SOLDER	Special solder for thermocouples: silver-containing special soft solder for soldering thermocouples, 125 g, diameter 0.8 mm, RoHS compliant	13600106
H-TEL-CMX-DX-AP	Connection panel for configuring and testing Dx transmitter units (SCTs) and sensors without soldering	13600022

Housing variant for integrating SCTs

Housing variants consisting of 2 half-shells for installing the telemetry measurement and transmission module (SCT); the axle diameter must be specified when ordering.

Axle diameter:	up to 70 mm		up to 150 mm (-XL)		Features
Power supply:	inductive	Li-ion battery	inductive	Li-ion battery	
Order Code H-TEL-CMX-DX-x	x = D1RI **13600006**	x = D1RB **13600013**	x = D1RI-XL **13600086**	x = D1RB-XL **13600099**	Housing made of high-quality plastic (POM): **IP67**
H-TEL-CMX-DX-x	x = D1RI-RP **13600074** 7.200 RPM max.	--	x = D1RI-RP-CAP [2] **13600035** 7.200 RPM max.	x = D1RB-RP **13600081**	Housing manufactured using 3D printing
Included in delivery:		battery and charger		battery and charger	

Order Code		article no.
H-TEL-CMX-DX-UNIBATT-RP	Universal housing for attaching the battery pack to the shaft, e.g., with pipe clamps: Housing for special battery packs, manufactured using 3D printing, including charger, including cable (open end)	13600042
H-TEL-CMX-DX-UNISCT-RP	Universal housing for SCT; for attaching the SCTs to the shaft, 3D printing process, and connectors for connecting the special battery pack	13600043

Accessories for the housings		
Order Code		article no.
H-TEL-CMX-DX-ACCUPack	Rechargeable Li-ion battery pack with protective circuit: Capacity 2600 mAh, output voltage: 11.1 VDC, weight: approx. 150 g, incl. charger 110-240 VAC/50-60 Hz	13600044
H-TEL-CMX-DX-RPM	Option for precise RPM measurements, accuracy of 0.5%, 7,200 RPM max.	13600111

2 includes integrated capacitor battery

Dx antennas

Two antennas are required (diversity operation) for one receiver, control, and interface unit (RCI).

Dx antennas			
Order Code for	868 variant [3]	2400 variant [4]	Feature
H-TEL-CMX-DX-ANT-SPG-5m-x	13600017	13600026	for mounting on the vehicle's exterior mirror, incl. 5 m cable
H-TEL-CMX-DX-ANT-5m-x	13600008	13600024	Dx flat antenna incl. 5 m cable, passive
H-TEL-CMX-DX-ANT-5m-2400-ET	--	13600107	Dx flat antenna 2.4 GHz band incl. 5 m cable, passive, ET: for extended temperature range -40 ... 125 °C, material: PEEK
H-TEL-CMX-DX-ANT-10m-x	13600018	--	Dx flat antenna incl. 10 m cable, passive
H-TEL-CMX-DX-ANT-RSU-10m-x	13600019	13600020	satellite receiver including signal amplifier (RSU), flat antenna incl. 10 m cable (digital transmission)
H-CAB-CMX-DX-RSU	13600094		extension of the antenna cable of the RSU satellite receiver, per meter
H-TEL-CMX-DX-RSU-YCAB	13600021		Y-cable for connecting 2 RSUs to an RCI satellite connection

3 868 variant: 868 MHz bandwidth, for the complete order code: x = 868 applies
4 2400 variant: 2.4 GHz bandwidth, for the complete order code: x = 2400 applies

Dx Receiver unit (RCI)

The receiver unit synchronizes up to 4 transmitter units and collects measurement data. Two parallel receiving antennas (diversity mode) provide maximum interference immunity. Six programmable analog outputs and a CAN interface are available for data output.

Overview of the available Dx RCI variants

Dx Receiver (RCI)	[x = 868]	**HT variant** [x = HT-2400]	
Order Code	article no.	article no.	properties
H-TEL-CMX-DX-RCI-x	13600010	13600009	Telemetry receiver (RCI) for the corresponding SCT variant 2

Included accessories

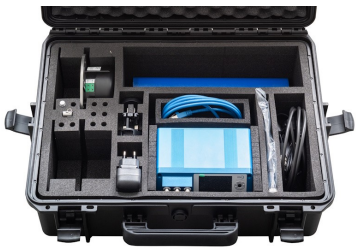
- Ethernet cable
- Two telemetry antennas
- AC/DC power supply
- SD card (≥2 GB) and
- a Manual (on CD)

Optional accessories for both Dx RCI variants

- H-ZUB-CMX-DX-SYS-CASE

  Carrying case for Dx Telemetry System (article no. 13600123)

  The case can be used to carry:
  - 1 RCI unit
  - AC/DC power adaptor
  - 4 SCTs
  - Antennas
  - Connection cables



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	
Dimensions	45 x 25 x 10 mm	

General		
Power supply	inductive supply with ring stator or battery supply 8 V to 39 V	
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:

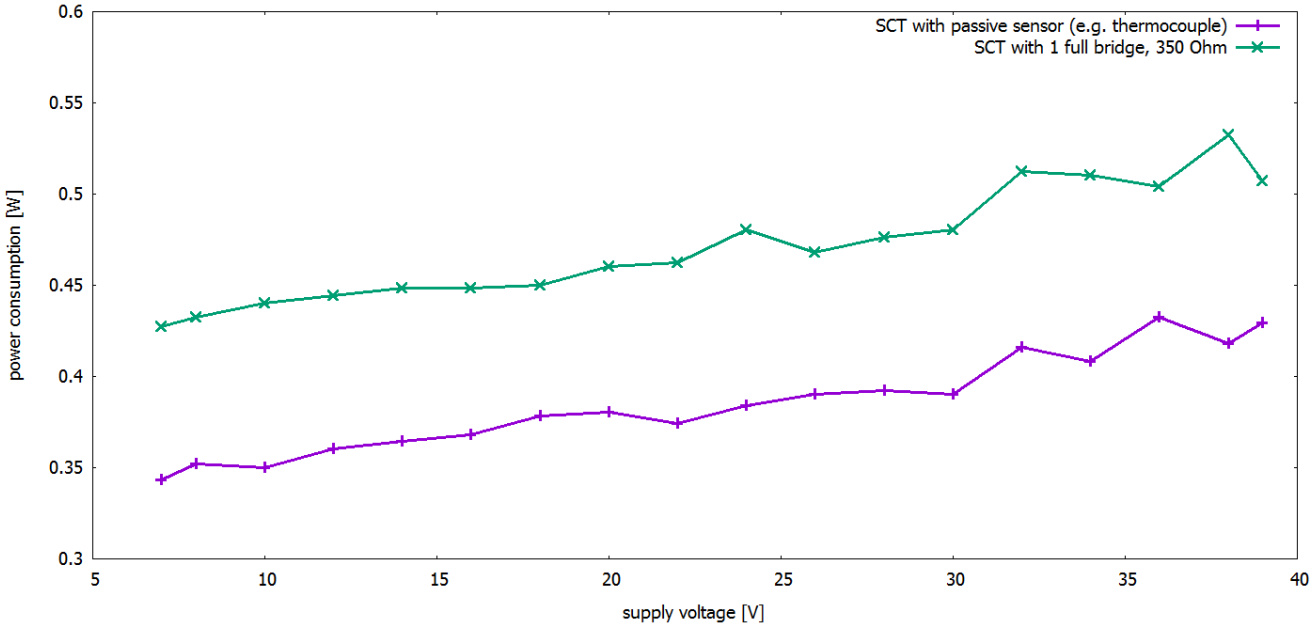
- number of SCTs
- max. number of channels per SCT.

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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