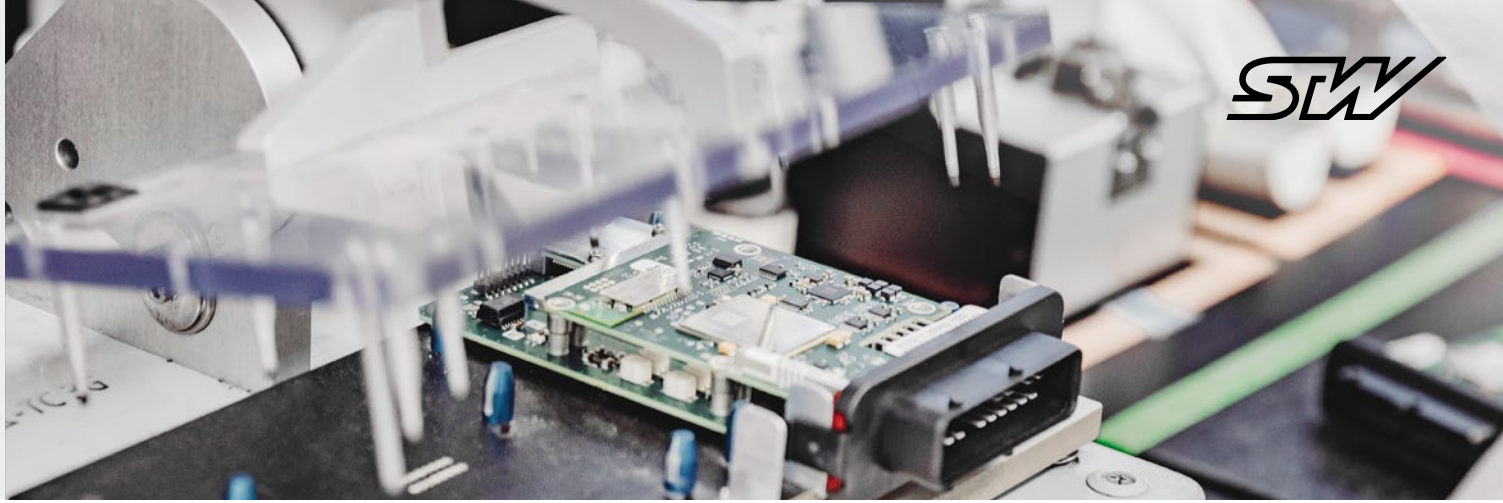

TCG-4

TCG data modules

KEY FEATURES

- Form fit function compatible to TC3G and TC1
- 4G/LTE connectivity
- Embedded Linux for fast and easy development of applications
- Compatible with STWs cloud solutions and all other common cloud platforms
- Compliance with standards for the automotive, agricultural and construction machinery industries.

TECHNICAL DATA

- i.MX 6UL @700 MHz 8 GB Flash / 512 MB RAM
- 4G/3G/2G communication
- GPS / GLONASS / BEIDOU / GALILEO
- WiFi 2.4 GHz / Bluetooth 4.2
- 4 CAN interfaces / 4 Multi-Input / 2 Digital Out
- Ethernet 10/100-Base-T (BroadR-Reach) / USB 2.0

ACCESSORIES

- Mating connector set
- Development box with power supply
- Breakout cable for development purposes
- Antennas for wireless communication interfaces
- Software toolchain under stw-digitalization.com pw: connectivity

Sensor-Technik Wiedemann GmbH

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87600 Kaufbeuren

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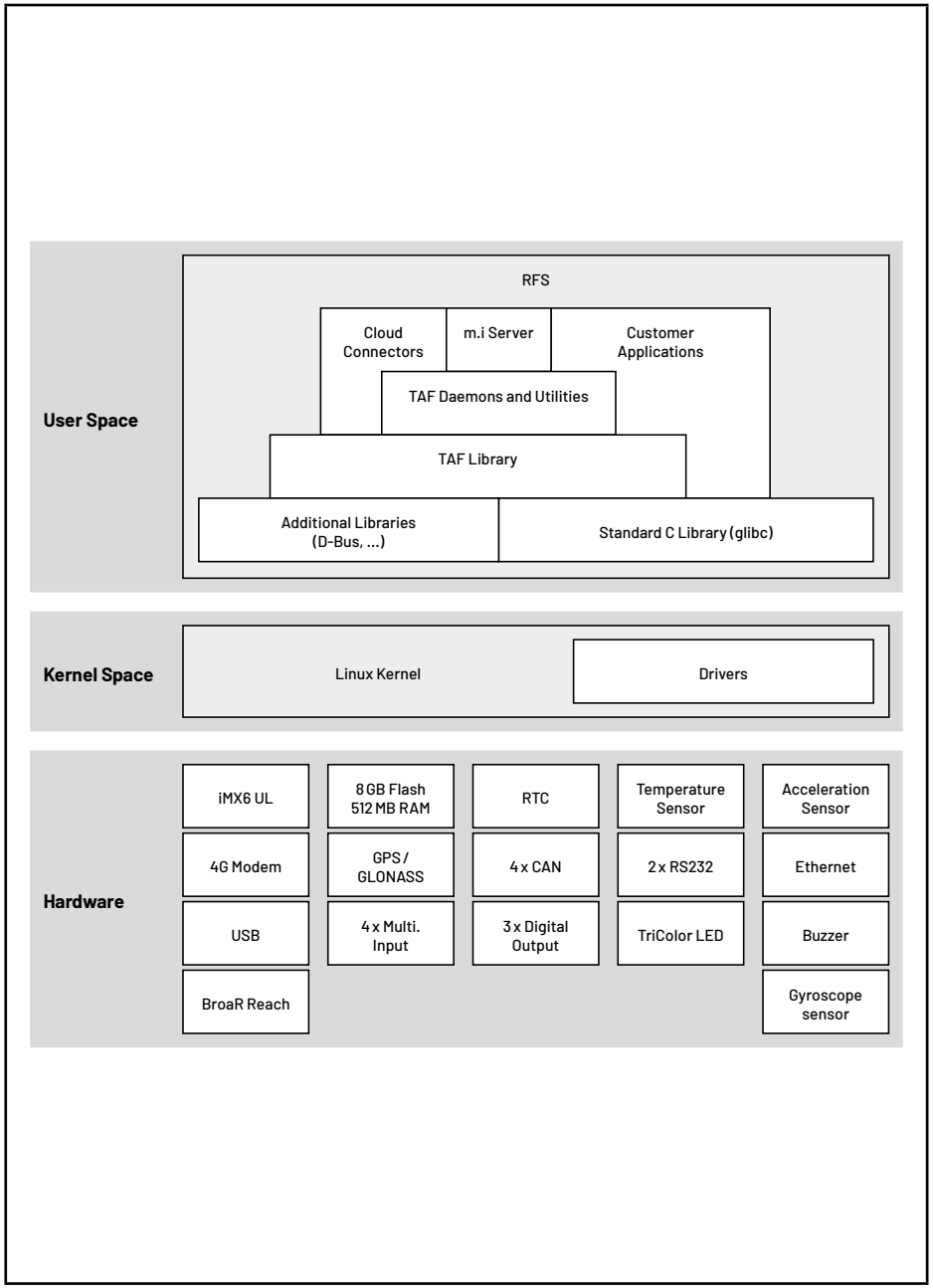
SYSTEM ARCHITECTURE



VARIANTS

TCG-4i-EU	Internal antennas for use in EMEA.
TCG-4e-EU	External SMA connectors for Wi-Fi, cellular and GNSS, for use in EMEA.
TCG-4i-US	Internal antennas for use in North America.
TCG-4e-US	External SMA connectors for Wi-Fi, cellular and GNSS, for use in North America.

TECHNICAL DATA

Software Data

Type	Features
Operation System	Embedded Linux
Buildroot Version	2018.02
Linux Kernel Version	4.19
Programming Language	C/C++, Shell script, Other programming languages available on request
Teleservice Application Framework	A set of daemons and utilities providing connectivity and telematics functionality

Development Package

Type	Features
Documentation	Contains all necessary user documentation and help files for product usage.
Tools	Contains all of STW's tools.
Libaries	Contains STW's library frameworks, which provide beneficial functionality for faster development.
Toolchain	Contains the GCC Linaro Toolchain that allows users to build own application within Linux and Windows.
OPKG Packages	Contains all of STW provided OPK packages. Possibility of individual updates.
Board Support Package	Contains all components, which are necessary to boot up the system. Included components are the bootloader u-boot, the Linux kernel, the device tree for hardware abstraction and the root file system.
BSP Updater	Contains mechanism for updating the board support package (BSP) of the device under Linux and Windows.

System

Type	Features
Power supply	9 ... 32 V DC
Current consumption	Standby < 1 mA (@12 V) Sleep (SMS wakeup) ~ 35 mA (@12 V) Normal operations (typ.) 230 mA (@12 V)
Operating temperature range	-40 °C ... +85 °C / -40 °F ... +122 °F (internal operating temperature) for further information please refer to the user manual of the TCG-4
Dimensions	174 x 117.4 mm (without SMA connectors)
Connector	Tyco, 3 rows, female 29pin

Processor and Memory

Type	Features
Processor	ARM Cortex A7, 32 bit controller, NXP i.MX 6UltraLite, 696 MHz
RAM*[1]	512 MB DDR3L-SDRAM
EEPROM	128 kB (64 kB free to use)
eMMC Memory*[1]	8 GB (4 GB free to use)
RTC	Real time clock with internal gold cap for maintaining time for approx. 7 days and system wakeup function
Security*[2]	TPM2.0 Trusted Platform Module (opt.)

Miscellaneous

Type	Features
Watchdog	Configurable watchdog
Temperature sensor	Measuring range -40 °C to +85 °C / -40 °F ... +122 °F
Acceleration sensor	Measuring ranges +/-2g or +/-4g or +/-8g or +/-16g (configurable) in 3 axis (X, Y, Z) System wakeup function

*[1] More storage available on request
*[2] Under development, available in future releases

TECHNICAL DATA

Miscellaneous

Type	Features
Gyroscope sensor*2	Integrated acceleration (+/-2g or +/-4g or +/-8g or +/-16g) and gyro sensor (±250, ±500, ±1000, and ±2000°/sec) with DSP
Compass module*2	3 axis, ± 50 gauss magnetic dynamic range
Signaling	• Buzzer for audible device information • 1 x multicolor LED: freely programmable • 5 x green LEDs alongside the antenna connectors indicating the status of the wireless interfaces

Communication Interfaces

Type	Quantity	Configuration
4G modem	1	Option 1) EMEA (EU): • 4G: Six-band LTE Cat. 1 (B1/B3/B5/B7/B8/B20) • 3G: Tri-band HSPA+ (B1/B5/B8) • 2G: GSM 900/1800 Option 2) North America (US): • 4G: Tri-band LTE Cat. 1 (B2/B4/B12) • 3G: Tri-band HSPA+ (B2/B4/B5) Option 3) Global: *2 • 4G: LTE Cat. 4 (FDD: B1/2/3/4/5/7/8/12/13/18/19/20/26/28) (TDD: B38/B39/B40/B41) • 3G: B1/2/4/5/6/8/19 • 2G: B2/3/5/8 SIM card options: • 2FF Mini SIM card, can be accessed through a clip at the side of the housing. • Alternative:*2 MFF2 eSIM card, can be placed on the PCB (opt.) SMS - system wakeup function*2

Communication Interfaces

Type	Quantity	Configuration
GNSS	1	Standard) Dedicated GNSS receiver: • Simultaneous GPS / GLONASS with max. 10 Hz update rate, BeiDou, Galileo, SBAS, QZSS • 5 V bias power supply for external, active GNSS antenna, current limited Option) GNSS receiver integrated in cellular modem:*2 • GPS, GLONASS, BeiDou, Galileo, QZSS, 1 Hz update rate
WiFi / Bluetooth	1	IEEE 802.11 b/g/n – 2.4 GHz 64-, 128-, 256-bit WEP, WPA and WPA2.0 TKIP or AES keys Power Class 1 (+18 dBm) IEEE 802.11 s mesh network support *2 Bluetooth 4.2 (Bluetooth Smart ready: Bluetooth Classic & BLE) Power Class 1.5 (+11.7 dBm)
LPWAN*2	1	Option 1) Europa: LoRaWAN (LoRaWAN class A client transceiver) Option 2) USA: LoRaWAN (LoRaWAN class A client transceiver) Option 3) Wireless M-Bus (client transceiver)

*1 More storage available on request
*2 Under development, available in future releases

TECHNICAL DATA

Communication Interfaces

Type	Quantity	Configuration
CAN	4	CAN 2.0 B, high / low-speed, max. 1 Mbps, listen only mode possible
		CAN1 wakeup function (optional)*2
		CAN3 galvanic decoupled (optional)*2
RS232	2	Serial interface with programmable baud rate up to 230400 baud
		2nd serial interface can be RS485 on request*2
Ethernet	1	ETH 1 - 10/100-Base-T Half-/Full-Duplex
BroadR-Reach*2	1	ETH 2 - 100-Base-T1 (BroadR-Reach)
USB	1	USB 2.0

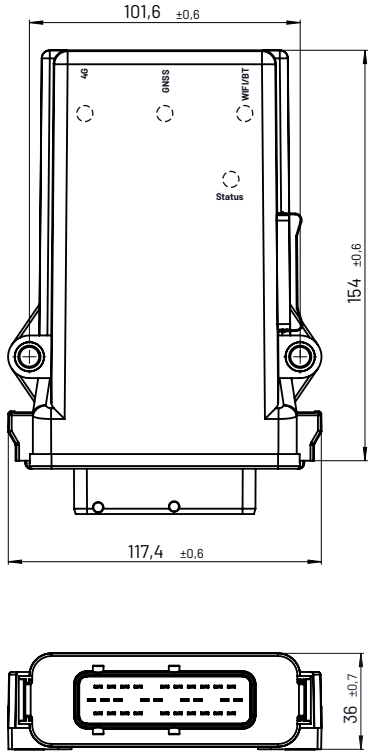
In- / Outputs

Type		
Digital Input	4	Digital Input
Multifunction-Input*2	4	Analog Voltage (0...36 V) / Current Input (0...24 mA) - configurable by software;
		Digital Input
Digital Outputs	2 (3)*2	High side switch, max. 300 mA

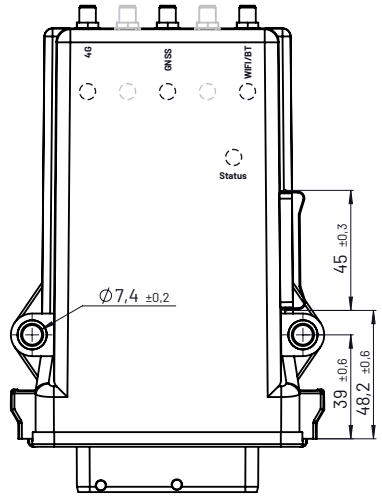
*1 More storage available on request
*2 Under development, available in future releases

TECHNICAL DRAWING

Internal Antenna



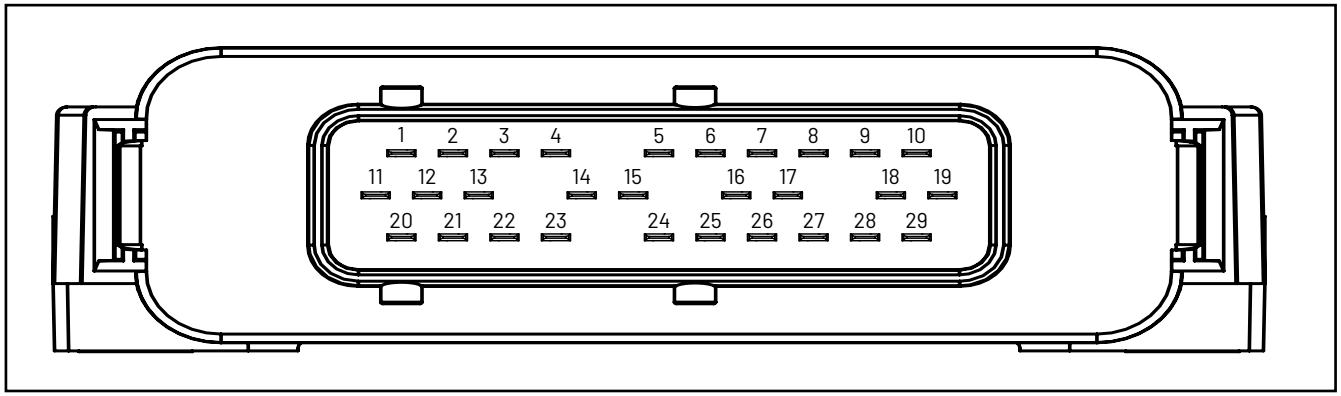
External Antenna



PIN ASSIGNMENT TCG-4

Pin assignment sorted by pin numbers

Pin	Description	Alternative Function
1	Multifunction Input 4	BroadR-Reach Minus
2	Multifunction Input 3	BroadR-Reach
3	RS232_2 RxD	
4	RS232_2 TxD	
5	Digital Output 2	GND for galvanic decoupled CAN 3
6	USB GND	USB on-the-go ID pin
7	Digital Output 1	
8	+UB Power supply (6-32VDC)	
9	GND	
10	Ignition pin / switched power line	
11	CAN3 Low	galvanic decoupled CAN3 Low
12	CAN3 High	galvanic decoupled CAN3 High
13	Multifunction Input 2	Digital Output 3 Ethernet Activation Line Frequency Input 2
14	CAN4 Low	
15	CAN4 High	
16	USB 5V	
17	Multifunction Input 1	Frequency Input 1
18	RS232 RxD	
19	RS232 TxD	
20	CAN1 Low	
21	CAN1 High	
22	CAN2 Low	



Pin	Description	Alternative Function
23	CAN2 High	
24	USB D-	
25	USB D+	
26	ETH Rx-	
27	ETH Rx+	
28	ETH Tx-	
29	ETH Tx+	

QUALIFICATION

The TCG-4 is particularly designed to operate under rough environmental conditions like vibration, temperature, etc., as they are common in the industry of off-highway working machinery. The TCG-4 complies with all well established standards of the industries.