CURTISS-WRIGHT

Industrial Division

VTS Series

Tilt Sensors

- **Vibration-tolerant tilt sensor**
- **Thermal compensation**
- **Designed for dynamic applications**
- **Dual-axis – pitch and roll**
- **Dual sensing per axis for error detection**
- **12Vdc or 24Vdc supply**
- **CANopen or J1939 CANbus output**
- **IP67 enclosure**
- **Integrated Deutsch DT04 connector**

The VTS series of vibration-tolerant tilt sensor offers an optimal combination of performance, safety and cost in dynamic applications, such as industrial vehicles.

IMU technology and fast-acting software algorithms filter out disturbances caused by vibration and vehicle motion, to provide output stability without the measurement delays usually associated with heavily damped, alternative sensing methods.

Each measurement axis has two sensing elements, which are constantly compared to ensure correct operation. If an error is detected, the condition is communicated to the host electronics; so allowing a safe situation to be assumed. Each output signal is calibrated to account for thermal drift, ensuring accuracy over the operating temperature range.

Powered from a voltage supply range of 6-48Vdc, the sensor provides output data over CANbus using either CANopen or J1939 protocol.

The sealed design offers exceptional levels of performance with respect to water, dust, shock, vibration and temperature, meaning the sensor is ideal for use in hostile, on- and off-highway vehicle environments. Electrical connection is via an integrated 4-pin Deutsch DT04 connector.

CONTENTS

CONFIGURATION & ORDERING CODES

VTSXXXX-XXX-XXXX-XX-XX-XXXX-XXX

Type	Angle	Electrical Interface	Node ID	Node ID 2	Baud Rate	Frame Rate
VTSXXXX	XXX	XX	XX	XX	XXXX	XXX
2021	010	CJC1	01-F7	NN	0050	020
	015	CNC1			0125	050
	020				0250	100
	030				0500	
	040				1000	
	045					
	050					
	060					
	064					

TYPE

VTS**XXXX**-XXX-XXXX-XX-XX-XXXX-XXX

Code	Description
2021	Dual axis, '02' mechanical installation, single PGN

ANGLE

VTSXXXX-**XXX**-XXXX-XX-XX-XXXX-XXX

Code	Description
010	±10° detection/full-scale output range
015	±15° detection/full-scale output range
020	±20° detection/full-scale output range
030	±30° detection/full-scale output range
040	±40° detection/full-scale output range
045	±45° detection/full-scale output range
050	±50° detection/full-scale output range
060	±60° detection/full-scale output range
064	±64° detection/full-scale output range

ELECTRICAL INTERFACE

VTSXXXX-XXX-**XXXX**-XX-XX-XXXX-XXX

Code	Description
CJC1	J1939 CANbus over Deutsch DT04 compatible 4-way connector
CNC1	CANopen over Deutsch DT04 compatible 4-way connector

Note: No internal termination resistor is fitted

NODE ID (IN HEXADECIMAL)

VTSXXXX-XXX-XXXX-**XX**-XX-XXXX-XXX

Code	Description
01-F7	Factory set between 01 and F7

NODE ID 2 (IN HEXADECIMAL)

VTSXXXX-XXX-XXXX-XX-**XX**-XXXX-XXX

Code	Description
NN	Not selected (all data communication uses the main Node ID)

BAUD RATE

VTSXXXX-XXX-XXXX-XX-XX-**XXXX**-XXX

Code	Description
0050	50 kbit/s
0125	125 kbit/s
0250	250 kbit/s
0500	500 kbit/s
1000	1 Mbit/s

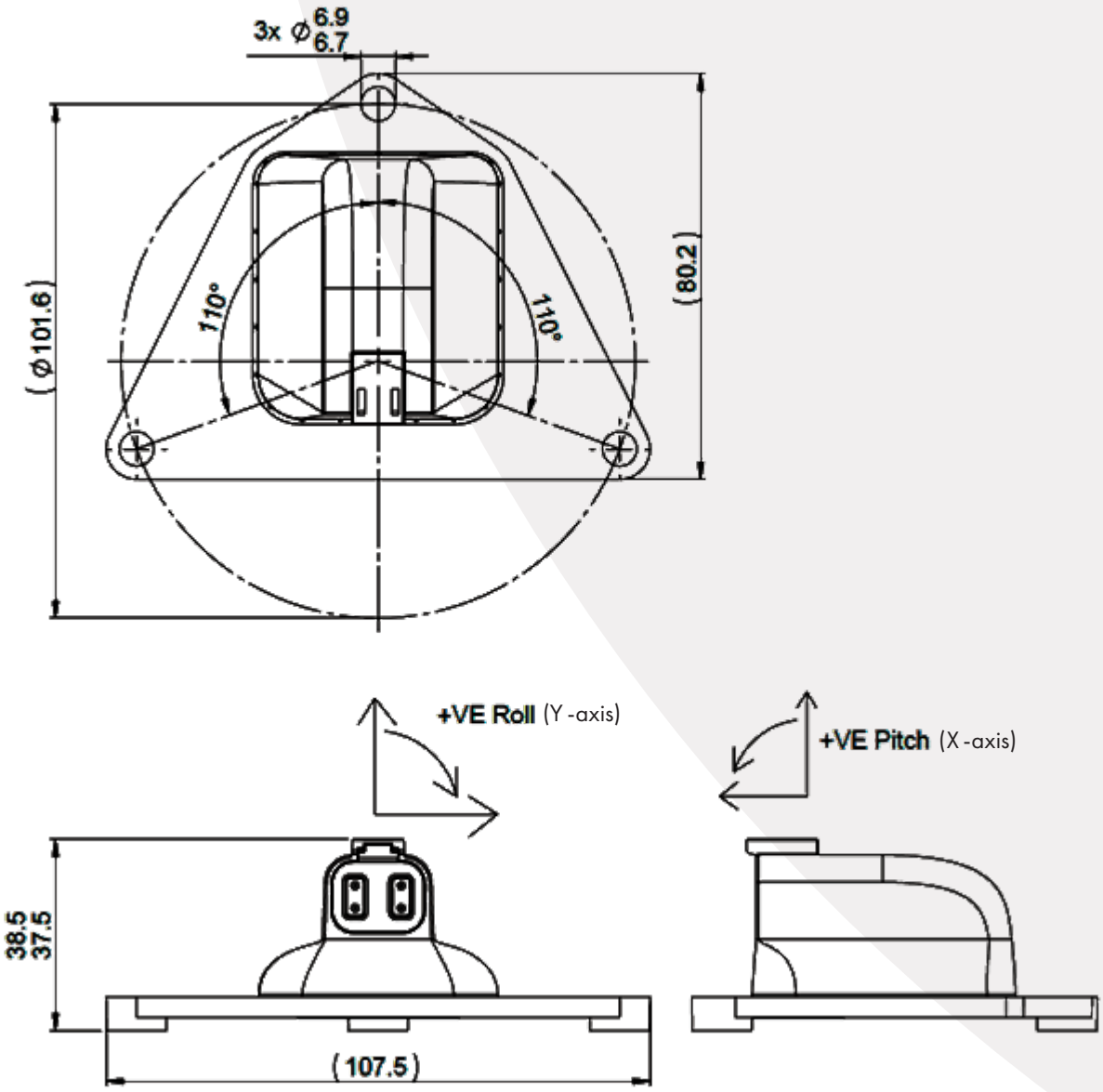
FRAME RATE

VTSXXXX-XXX-XXXX-XX-XX-XXXX-**XXX**

Code	Description
020	20 ms
050	50 ms
100	100 ms

INSTALLATION

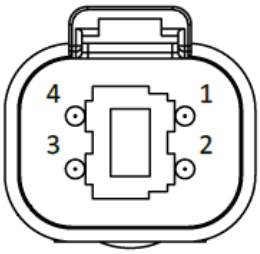
MECHANICAL



The sensor is to be mounted with M6 or ¼ inch socket head cap screws and washers
Recommended tightening torque – 4.5 to 6.5NM
Maximum tightening torque – 10Nm

ELECTRICAL

Integral Deutsch DT04 compatible connector

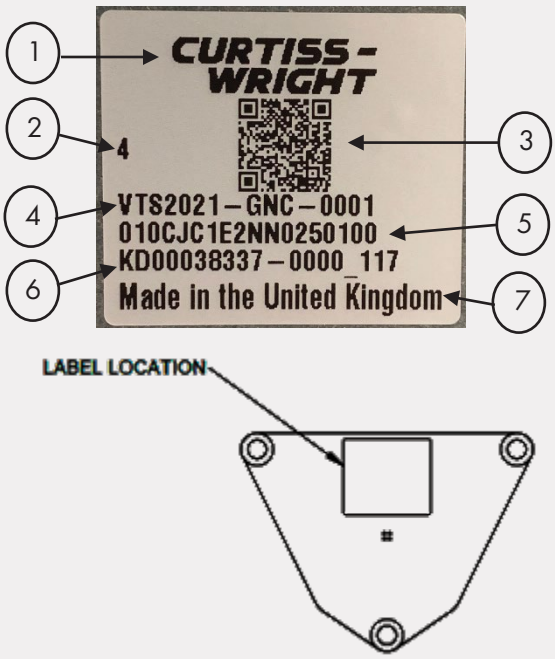


Integral connector with gold contact as per Deutsch part 0460-202-1631

To suit Deutsch Mating Part No: DT06-4S-**** (plug) & 0462-201-1631 (pins)

Pin	Function
1	Vsupply
2	GND (0V)
3	CANL
4	CANH

LABELLING DETAIL



Example for illustration only. Detail displayed will be dependent on individual units.

1	Curtiss-Wright Logo
2	Curtiss-Wright internal reference only
3	2D QR Barcode comprising of: CW Part Number Batch and Serial Number Unique ID (decimal integer, 21 bit range) Product String
4	CW Part Number (e.g. VTS2021-GNC-0001)
5	Batch and Serial Number (e.g. KD00038337_0000_117)
6	Product String (e.g. 010CJC1E2NN0250100)
7	Manufacturing Location (e.g. United Kingdom)

SPECIFICATIONS

All values recorded at room temperature of 23°C, unless otherwise stated

ELECTRICAL

SUPPLY VOLTAGE	6-48Vdc
SUPPLY CURRENT	<40mA at 12Vdc
COLD START LOW VOLTAGE	5.3V supply
SUPPLY REVERSE POLARITY PROTECTION	Up to -48Vdc
SHORT-CIRCUIT PROTECTION	Yes, all connections to all connections
OVER-VOLTAGE PROTECTION	Up to 60Vdc at ambient temperature
POWER-ON SETTLEMENT	<500ms

OUTPUTS

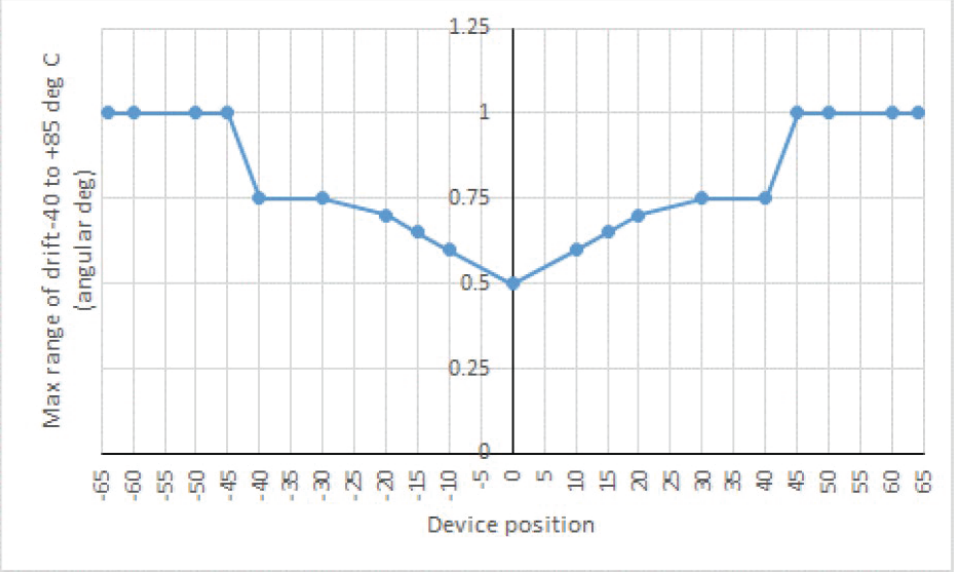
FULL SCALE RANGE	As per selected configuration
RESOLUTION	J1939: 16 bit output, 0.002° per bit CANopen: devices up to and including ±30° range, 0.001° per bit CANopen: devices above ±30° range, 0.01° per bit
OUTPUT NOISE	±2 bits
REPEATING ACCURACY	±2 bits
DEBOUNCE	Internal error checking uses a 1s period to prevent nuisance trips under high shock environments

LINEARITY

RANGE	Linearity (% of Full Scale Range)
±10°	<±2%
±15°	<±1.91%
±20°	<±1.91%
±30°	<±1.80%
±40°	<±1.72%
±45°	<±1.65%
±50°	<±1.60%
±60°	<±1.47%
±64°	<±1.42%

THERMAL DRIFT

DEVICE POSITION	Thermal Drift
HORIZONTAL (0°)	<0.5°
±10°	<0.6°
±15°	<0.65°
±20°	<0.7°
±30°	<0.75°
±40°	<0.75°
±45°	<1°
±50°	<1°
±60°	<1°
±64°	<1°



DATA FORMAT

PARAMETER GROUP NUMBER	61459 (0x00F013)
TRANSMISSION REPETITION (FRAME) RATE	Configured by product string (in ms)
DATA LENGTH	8
EXTENDED DATA PAGE	0
DATA PAGE	0
PDU FORMAT	240
PDU SPECIFIC	19
PGN SUPPORTING INFORMATION	See PGN 61459 Specification
DEFAULT PRIORITY	3

PGN 61459 BYTE NUMBER (J1939 STANDARD)	Data
1	Pitch (X-axis) value (LSB)
2	Pitch (X-axis) value (MSB)
3	Roll (Y-axis) value (LSB)
4	Roll (Y-axis) value (MSB)
5	Pitch Rate (LSB)
6	Pitch Rate (MSB)
7	Bits 1 & 2 | Pitch Angle Figure of Merit (SPN 3323) Bits 3 & 4 | Roll Angle Figure of Merit (SPN 3324) Bits 5 & 6 | Pitch Rate Figure of Merit (SPN 3325) Bits 7 & 8 | Pitch and Roll Compensated (SPN 3326)
8	Roll and Pitch Measurement Latency (SPN 3327)

CIA410 DEVICE PROFILE FOR INCLINOMETER (CANOPEN STANDARD)	Data
0	Longitudinal (X-axis) inclination value (LSB)
1	Longitudinal (X-axis) inclination value (MSB)
2	Lateral (Y-axis) inclination value (LSB)
3	Lateral (Y-axis) inclination value (MSB)
4	Temperature
5	Not used
6	Not used
7	Not used

EMC DATA

RF IMMUNITY	ISO 11452-2, 100V/m, 80-3000MHz frequency range, 80%AM, 1kHz sine
POWER FREQUENCY FIELD IMMUNITY	EN61000-4-8, 30A/m, 50 and 60Hz
CONDUCTED IMMUNITY	ISO 11452-4, 100mA, 10kHz-400MHz frequency range, 80%AM, 1kHz sine
ELECTROSTATIC DISCHARGE	ISO10605, ±15kV contact, ±25kV air discharge
RADIATED EMISSIONS	CISPR 25, 30 – 300MHz and 300 – 1000MHz
TRANSIENT PROTECTION	ISO7637-2, pulses 1-5

MECHANICAL

MAXIMUM OPERATING SPEED	250°/s maximum rate of change of tilt that can be detected
WEIGHT	<150g

ENVIRONMENTAL

OPERATING TEMPERATURE RANGE	-40°C to 85°C in accordance with BS EN 60068-2-14
STORAGE TEMPERATURE RANGE	-50°C to 90°C in accordance with BS EN 60068-2-1 and BS EN 60068-2-2
THERMAL SHOCK	--40°C to 85°C in accordance with BS EN 60068-2-14
SEALING	Sensor body IP69K, IP67 Deutsch connector IP67 when fully mated
VIBRATION	BS EN 60068-2-64, 14.7gn rms, 20-2000Hz random
SHOCK	BS EN 60068-2-27, 50g, 11ms, 3 shocks per axis (9 total)
DROP TEST	1m drop onto concrete
MTTF d	> 385 years
SALT SPRAY	EN 60068-2-52 test Kb severity 2 (48 hrs)
CHEMICAL RESISTANCE	Hydraulic oil, diesel fuel, gasoline/petrol, ethylene glycol, hydrochloric acid, phosphoric acid, isopropyl alcohol, ether, calcium chloride, magnesium chloride, potassium chloride, sodium hydroxide, calcium hydroxide, ammonium hydroxide, AdBlue, herbicide, fertilizer, urea nitrogen, insect repellant
HUMIDITY	EN60068-2-30 (65°C, 93%RH)

IMPORTANT INFORMATION

Whilst Curtiss-Wright Industrial Division has designed this sensor to meet a range of applications it is the responsibility of the customer to ensure it meets their specific requirement.

Curtiss-Wright Industrial Division makes no warranty or representation in respect of product fitness or suitability for any particular design application, environment, or otherwise, except as may subsequently be agreed in contract for the sale and purchase of products. Customers should therefore satisfy themselves of the actual performance requirements and subsequently the product's suitability for any particular design application and the environment in which the product is to be used.

Continual research and development may require change to products and specification without prior notification.

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