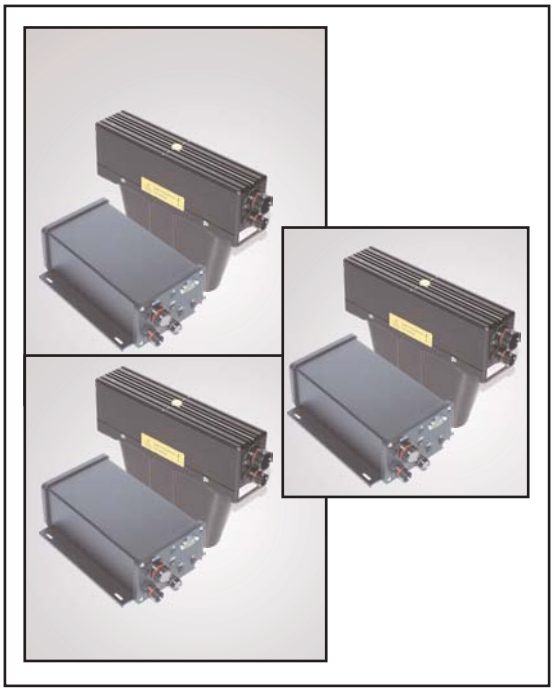
CORRSYS
DATRON
Sensorsysteme GmbH



CORREVIT® PITCH & ROLL™

Non-Contact Optical Sensor System

for

slip-free measurement of vehicle pitch and roll, with longitudinal and transversal dynamics and height measurement at large operating ranges

USER MANUAL

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General Information

Legal Notice

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Revision

D038-50-02-02E 06/03

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Safety Instructions

Please read carefully before operating the equipment.

CORRSYS-DATRON is not responsible for damage that may occur when this system is used in any way other than that for which it is intended.

To assure safe and proper operation, all supplied equipment, components and/or accessories must be carefully transported and stored, as well as professionally installed and operated. Careful maintenance and usage in full accordance with operating instructions is imperative.

CORRSYS-DATRON equipment should be installed and operated only by qualified persons who are familiar with devices of this type.

Local regulations may not permit the operation of motor vehicles on public highways while the equipment is mounted on the exterior of the vehicle.

- Use the equipment only for intended applications. Improper application is not advised.
- Do not modify or change the equipment or its accessories in any way.
- Improper use or mounting of the equipment may affect the safety of the vehicle and/or occupants.
- The equipment must not be mounted and/or operated in any way that may compromise vehicle or and/or occupant safety.
- Equipment must be mounted firmly and securely.
- Use only original equipment, components and/or accessories included in the scope of delivery.
- Do not mount equipment, components and/or accessories near heat sources (e.g. exhaust).
- Do not use defective or damaged equipment, components and/or accessories .
- Always note correct pin assignments and operating voltages when connecting equipment to power supplies, data acquisition/evaluation systems, and/or any other applicable system or component. Equipment may be damaged if not properly connected and/or operated.
- For additional information, please call the CORRSYS-DATRON Hotline: ++49 (6441) 9282-82 or: hotline@corrsys-datron.com

Danger

- Use caution when exchanging sensor lamps – lamps are extremely hot, and may cause injury.
- Do not look into sensor lamps – lamps are extremely bright, and may cause eye injury.
- Sensor head can become very hot and may cause injury if power has been applied to the sensor for extended periods of time. This is especially true if the sensor is used in hot environmental conditions.

Warning

- The sensor and/or sensor components may be damaged if power is applied for extended periods, especially in hot environmental conditions.

- Disconnect power from the sensor if the vehicle is stationary for extended periods.

1. Overview

CORREVIT® PITCH & ROLL™

Non-Contact Optical Sensor System

for

slip-free measurement of vehicle pitch and roll, with longitudinal and transversal dynamics and height measurement at large operating ranges

Article no.:
Pitch & Roll System 11324

The CORREVIT® Pitch & Roll system is comprised of three sensors and a corresponding electronic unit for each. The primary sensor in this advanced measurement system is the CORREVIT® HS-CE, which measures the distance between the vehicle and the road surface, as well as longitudinal speed or vectorial velocity, transverse speed, and calculated drift angle. Two additional CORREVIT® H-CE Sensors, which measure ride height, complete the system.

Measurement values are provided as analog signals, ensuring that the sensor system can be connected to virtually any data acquisition system. Longitudinal, distance, and frequency-modulated signals of the measured angle or transverse speed are also available as digital outputs. CAN outputs for networking and connection to data acquisition are also standard.

Calculation of pitch and roll angle is performed by the HS-CE electronics, operating in conjunction with the two connected H-CE sensors and their associated electronics. Each of the sensors is individually configured with the included CeCalWin Software Package using a PC, connected via standard serial interface.

Features

- Accurate pitch and roll measurement – better than 0.1° angular resolution.
- Extended operating range of 400 mm ±130 mm.
- Velocity range from 0.5 kph to 350 kph.
- Programmable standardized analog and digital signal outputs using the latest processor techniques
- Fast, easy set-up and calibration with the included CeCalWin Software Package.
- Any required measurement quantity available.
- Easy operation, mounting angle correction and direct connection to PC or other evaluation systems.
- Negligible service and maintenance requirements.
- Tested and used under extreme environmental conditions.

Applications

The CORREVIT® Pitch & Roll System is designed for use in dynamic vehicle testing applications that require highly accurate measurement of the following variables:

- Pitch and roll
- Ride height
- Distance traveled
- Speed
- Longitudinal and transversal speed
- Drift angle

2. Scope of Delivery

Item	Qty.	Description	Part No.
1.	(1)	HS-CE Sensor	
2.	(1)	HS-CE Electronics Box	
3.	(2)	H-CE Sensor	
4.	(2)	H-CE Electronics Box	
5.	(3)	Power Cable	K003-16N-12-2m
6.	(3)	Sensor to Electronics Power Cable	K003-16N-10-5m
7.	(3)	Sensor to Electronics Box Cable	K003-1J2-11-5m
8.	(3)	RS232 Serial Communication Cable	K003-15N-11-2m
9.	(3)	CAN Bus Interface Cable	K003-14N-11-2m
10.	(1)	Signal Output to 5 BNC Adapter Cable	K003-592-11-1m
11.	(3)	Signal Output to 1 BNC Adapter Cable	K008-192-10-1m
12.	(6)	Halogen Lamp, 35 watt, 12V, 8°	
13.	(18)	Bolts (for mounting hardware)	
14.	(6)	Thumb Screws (for mounting hardware)	
15.	(1)	CD-ROM with CeCalWin Software and User Manual	
• *	(1)	Calibration Certificate ISO 9000++	
• *	(1)	Power Distribution Unit	
• *	(1)	CAN Bus Interface Y-Cable	K003-24N-10-4m
• *	(1)	Signal Output to 3 BNC Adapter Cable	K003-392-12-1m
• *	(1)	CAN Termination Resistor Plug	K003-04N-10
• *	(1)	Fuse 6, 3 x 32 - 1 A	
• *	(1)	Fuse 6, 3 x 32 - 10 A	

* In order to keep a clear arrangement, not all items are shown on the photo!

Options/Accessories

- Transport Case
- German Calibration Service Certificate (Livingston / DKD)
- Replacement Halogen Lamp 35 watt, 12V, 8°

About replacement halogen lamps

To assure optimal sensor function, use only original-equipment lamps from CORRSYS-DATRON. These lamps are specially designed and treated to withstand the demands of dynamic vehicle testing.

3. Technical Data

3.1 Specifications

HS-CE Performance Specifications

Speed range:	0.5 ... 350 kph
Height measurement:	1.5 ... 350 kph
Distance resolution:	1.9 mm
Measurement deviation - permissible variation*:	
Working range ±100 mm:	<±0.1%
Working range ±100 mm ... ±130 mm:	<±0.5%
Angle range:	±40°
Angle resolution :	<±0.1°
Working distance and range:	400 ±130 mm
Height measurement resolution:	0.15 mm
Height measurement accuracy**:	±0.5 mm (±0.1% of full scale of the maximum working range - 530 mm)

HS-CE Electronic Connector Output 1

Digital output 1 - distance IVI or V_L:	1 ... 1000 pulses/m
Digital output 2 - switchable:	Output as frequency
- Frequency modulated angle or transv. speed:	f_{center} = 5 kHz
Analog output 1 - magnitude speed IVI or long. speed V_L:	0 ... 10 V
Analog output 2 - transversal speed V_q:	-10 ... +10 V
Analog output 3 - angle b:	-10 ... +10 V

HS-CE Electronic Connector Output 2

Analog output 1 - pitch γ (only by P&R System):	-10 ... +10 V
Analog output 2 - height h:	-10 ... +10 V
Analog output 3 - roll φ (only by P&R System):	-10 ... +10 V

HS-CE / H-CE CAN Bus: CAN V2.0B

H-CE Performance Specifications

Height measurement:	1.5 ... 350 kph
Working distance and range:	400 ± 130 mm
Height measurement resolution:	0.1 mm
Height measurement accuracy**:	±0.5 mm (±0.1% of full scale of the maximum working range -

H-CE Electronic Connector Output

Analog output 2 - height h:	-10 ... +10 V

* with calibration on the test surface
** with calibration on the test surface at 50 kph

3.1 Specifications, continued

Pitch & Roll Angle Function with Complete System (1 HS-CE + 2 H-CE)

Measuring range:	±10°
Resolution:	0.05°
Working distance and range:	400 ±130 mm
Measurement bandwidth (H-Function):	10 Hz ... 50 Hz; (0.5 dB)

Overall System Specifications

Power requirement, per sensor (x3):		11 ... 14.5 V; 80 W (12 V DC)
Power requirement, entire system:		11 ... 14.5 V; 240 W (12 V DC)
Temperature range	Operation:	- 25 ... 50° C
	Storage:	- 40 ... 85° C
	Relative Humidity:	5 ... 80% non condensing
System protection of the sensor:		IP 67
Dimensions of the sensor (l x w x h):		247 x 52 x 171 mm
Weight:		1350 g
Dimensions of the electronics (l x w x h):		212 x 144 x 76 mm
Weight:		1200 g
Shock:		50 g half-sine, 6 ms
Vibration:		10 g, 10 to 150 Hz

A serial interface on each of the sensor electronics enables connection to PC for automatic sensor identification, set-up and function control.

3.2 Pin Assignments

3.2.1 Pin Assignment: HS-CE Electronic Output 1

Cable: 9-Pin D-SUB to 5 BNC (#K003-592-11-1m)

D-SUB	Signal	Measurement Value	BNC
Pin 1	Analog 1	magnitude speed IVI, or longitudinal speed V_L	ANA1
Pin 2	Analog 2	transversal speed Vq	ANA2
Pin 3	Analog 3	angle β	ANA3
Pin 4	Analog GND		
Pin 5	n.c.		
Pin 6	n.c.		
Pin 7	Digital 1	longitudinal distance IVI, or magnitude distance V_L (pulses/m)	DIG1
Pin 8	Digital 2	angle β, or transversal speed Vq (frequency modulated)	DIG2
Pin 9	Digital GND		

3.2.2 Pin Assignment: HS-CE Electronic Output 2

Cable: 9-Pin D-SUB to 3 BNC (#K003-392-12-1m) for P&R system
Cable: 9-Pin D-SUB to 1 BNC (#K008-192-10-1m) for height only

D-SUB	Signal	Measurement Value	BNC
Pin 1	Analog 1	pitch γ (with complete Pitch & Roll System)	ANA1
Pin 2	Analog 2	height h	ANA2
Pin 3	Analog 3	roll φ (with complete Pitch & Roll System)	ANA3
Pin 4	Analog GND		
Pin 5	n.c.		
Pin 6	n.c.		
Pin 7	n.c.		
Pin 8	n.c.		
Pin 9	n.c.		

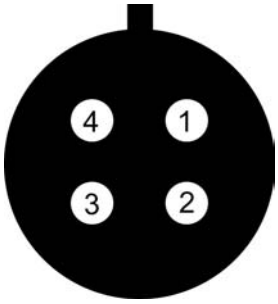
3.2.3 Pin Assignment: H-CE Electronic Output (both units)

Cable: 9-Pin D-SUB to 1 BNC (#K008-192-10-1m)

D-SUB	Signal	Measurement Value	BNC
Pin 1	n.c.		
Pin 2	Analog 2	height h	ANA2
Pin 3	n.c.		
Pin 4	Analog GND		
Pin 5	n.c.		
Pin 6	n.c.		
Pin 7	n.c.		
Pin 8	n.c.		
Pin 9	n.c.		

3.2.4 CAN Bus Outputs (2 connectors)

Cable: 4-pin CAN to 9-pin D-SUB (#K003-14N-11-2m)



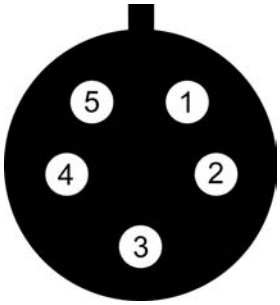
CAN connector	
Pin 1:	CAN High
Pin 2:	CAN Low
Pin 3:	n.c. (do not connect to this pin)
Pin 4:	n.c. (do not connect to this pin)
D-SUB connector	
Pin 7 - CAN High	
Pin 2 - CAN Low	

Pin assignments are the same for on all CAN outputs on the HS-CE and H-CE electronic. Pins are connected in parallel.

NOTE: The HS-CE electronic is not equipped with a termination resistor!
If the HS-CE electronic is not connected two H-CE electronics, plug the supplied 120 Ω termination resistor (#K003-04N-10) into the unused CAN output.

3.2.5 Pin Assignment: PC (RS 232) Outputs

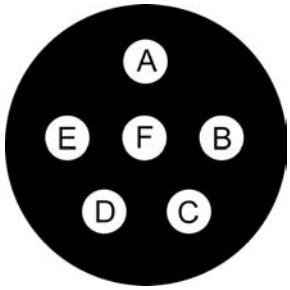
Cable: 5-pin RS-232 to 9-pin D-SUB (#K003-15N-11-2m)



RS-232 connector	
Pin 1:	TXD
Pin 2:	RXD
Pin 3:	Digital GND
Pin 4:	n.c. (do not connect to this pin)
Pin 5:	n.c. (do not connect to this pin)
D-SUB connector	
Pin 2 - TXD	
Pin 3 - RXD	
Pin 5 - Digital GND	

3.2.6 Pin Assignment: Power Connectors

Cable: 6-pin to 2 banana plugs (#K003-16N-12-2m), electronic to power supply
Cable: 6-pin to 6-pin (#K003-16N-10-5m), electronic to sensor



MIL Connector
10 98SN 0207

5-pin MIL connectors	
Pins A, B, C:	Power (+12 V)
Pins D, E, F:	GND (0 V)
Banana plugs	
Red:	Power (+12 V)
Black:	GND (0 V)

3.3 Default Settings for Analog and Digital Outputs

3.3.1 Analog Output Default Settings

HS-CE Electronic Output 1

Analog channel 1	25	$\frac{mV}{kph}$	Magnitude speed |V|
Analog channel 2	100	$\frac{mV}{kph}$	Transverse speed Vq
Analog channel 3	100	$\frac{mV}{°}$	Angle β

HS-CE Electronic Output 2

Analog channel 1	25	$\frac{V}{°}$	Pitch γ (by P+R System)
Analog channel 2	50	$\frac{mV}{mm}$	Height
Analog channel 3	100	$\frac{mV}{°}$	Roll φ (by P+R System)

H-CE Electronic Output

Analog channel 2	100	$\frac{mV}{mm}$	Height

The above settings produce the following values:
100 kph = 2.5 V
200 kph = 5.0 V
300 kph = 7.5 V
400 kph = 10.0 V

With a setting of 25 mV/kph for magnitude speed |V|, a maximum speed of 400 kph can be achieved.

All signals can be used as inputs to all common data acquisition systems.
Should any problems arise, please contact CORRSYS-DATRON.

For analog signal representation of speed, the voltage scale may be changed to between 10 and 500 mV/kph.

Use CeCalWin to change the settings.

3.3.2 Digital Output Default Settings

Calibrated CORREVIT® HS-CE Sensors generate 50% duty cycle pulses on both digital outputs. Digital 1 provides a specified number of digital pulses per meter. Digital 2 supplies a frequency modulated signal for either transversal speed (default 5 kHz ± 100Hz/km/h) or slip angle (default 5 kHz ± 50 Hz/deg).

Digital channel 1	340	$\frac{pulses}{m}$	Longitudinal distance (output as pulses)
Digital channel 2	50	$\frac{Hz}{°}$	Angle (output as frequency)

Use CeCalWin to change the settings.

3.4 Internal Signal Filtering

Signals may be smoothed using a moving average filter, which can be set to different time values.
Note that signal detail and dynamics will decrease as the signal becomes increasingly smooth.

3.4.1 Filter Values for Speed and Slip Angle Output

- 8 ms
- 16 ms
- 32 ms
- 64 ms
- 128 ms (default setting)
- 256 ms
- 508 ms

increased signal detail and dynamics (as well as noise)
minimum signal delay

smoothest signal
maximum signal delay

Use CeCalWin to change filter settings.

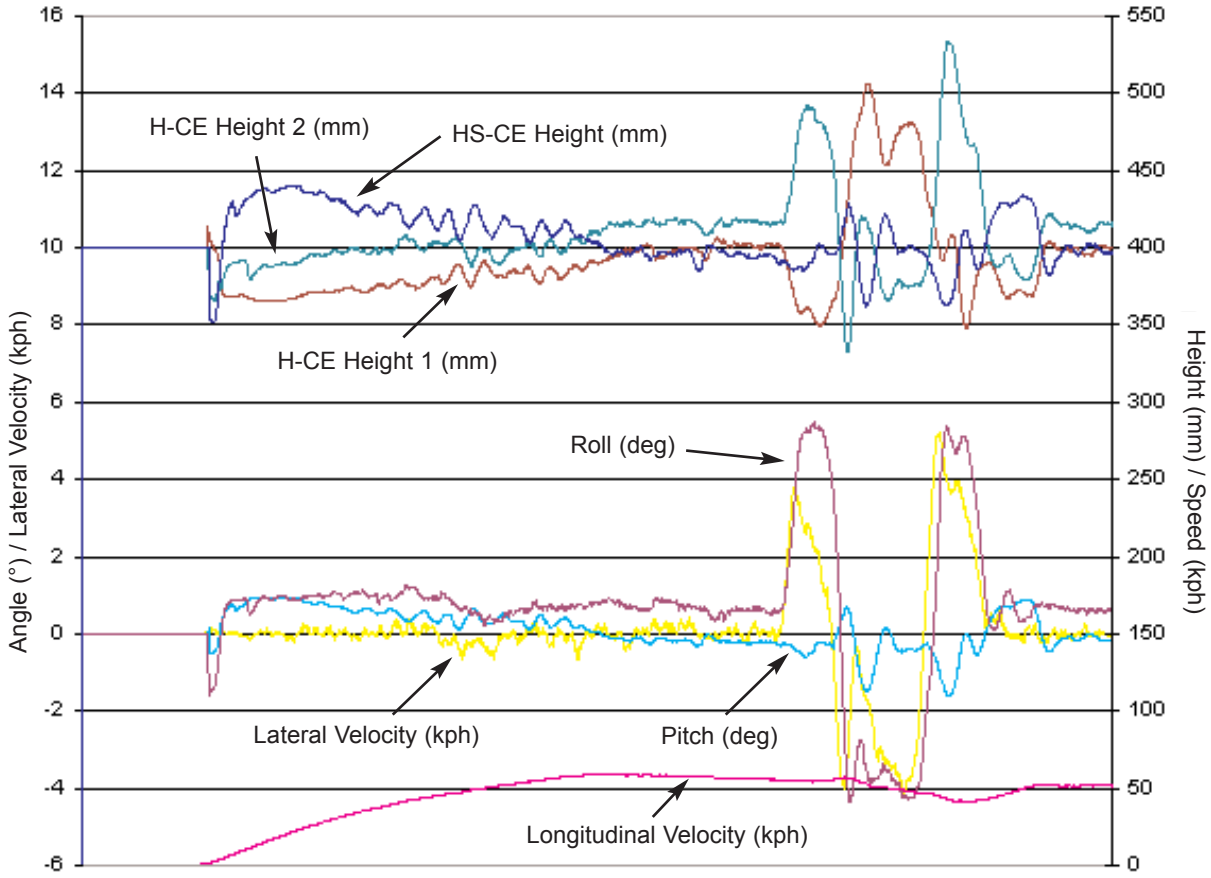
3.4.2 Filter Values for Height Output

The height signal is internally filtered.
Filter time is speed dependent and cannot be adjusted.

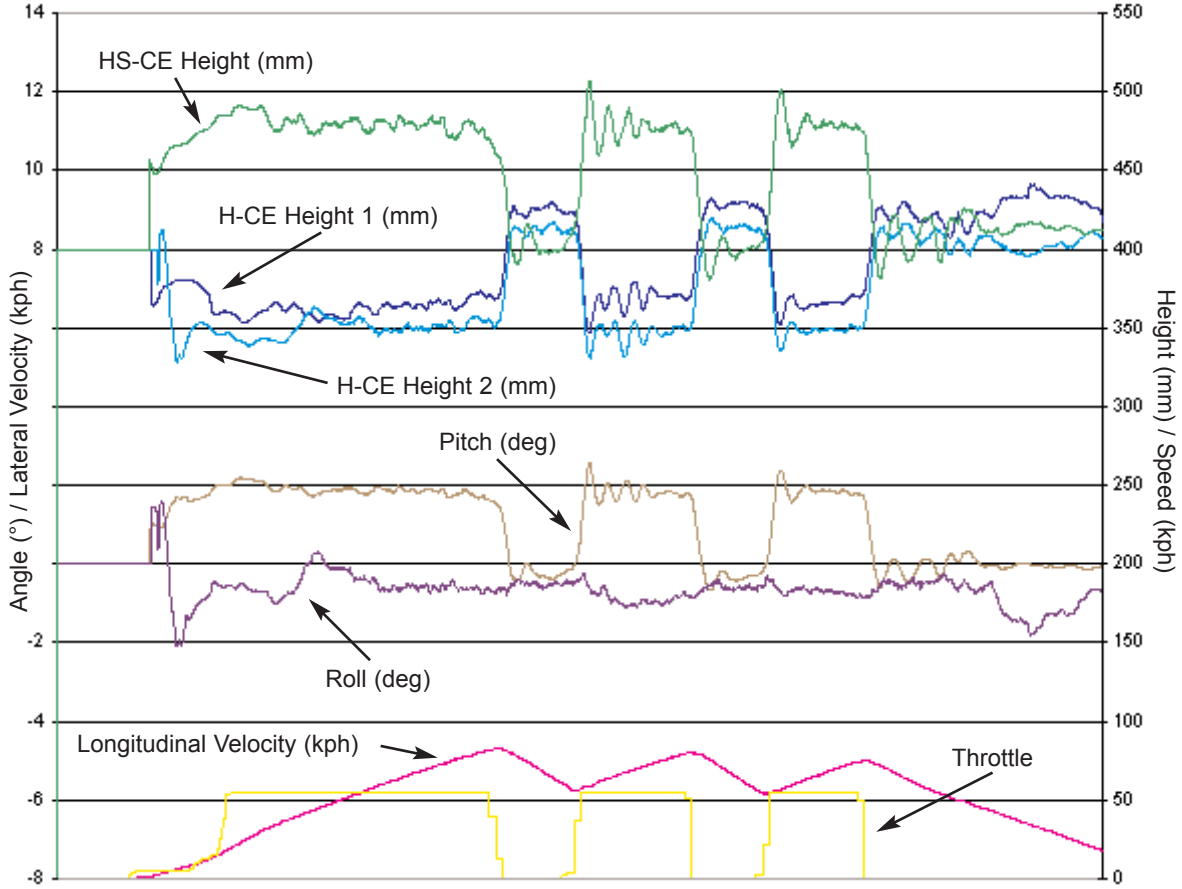
Speed Range [kph]	f_{3db} [Hz]
v < 3	1.5
v < 20	2
v < 31	5
v < 37.5	7.5
v < 43	10
v < 50	12.5
v < 100	15
v > 100	30

3.6 Typical Data Plots

High-speed lane change



Vehicle Pitch with Acceleration



4. Set-up and Connection

4.1 Mounting the Sensor System on the Vehicle

Three sensors comprise the CORREVIT® Pitch & Roll Measurement System:

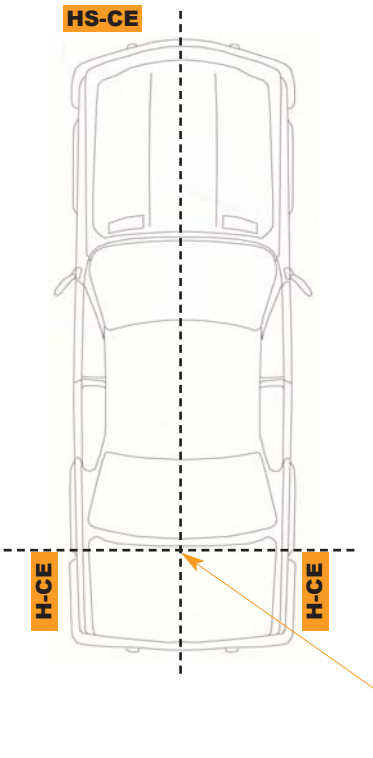
(1) HS-CE Sensor + (1) Electronic Box

(2) H-CE Sensors + (2) Electronic Boxes

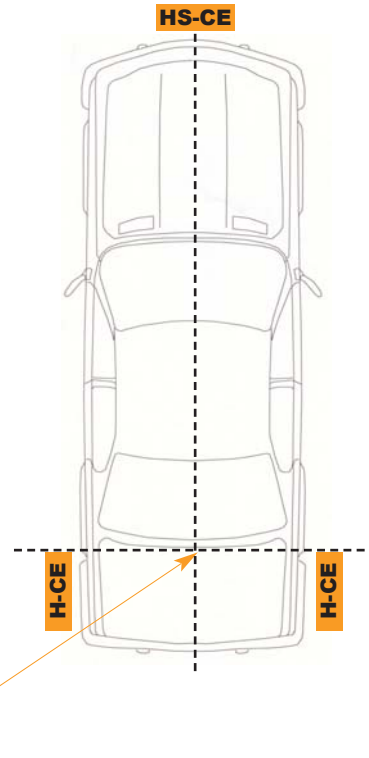
4.1.1. Sensor Configurations

Each sensor should be mounted on the vehicle as shown below, using the CORRSYS-DATRON Suction Mounting System or other CORRSYS-DATRON mounting hardware, as appropriate to the demands of your application:

L configuration



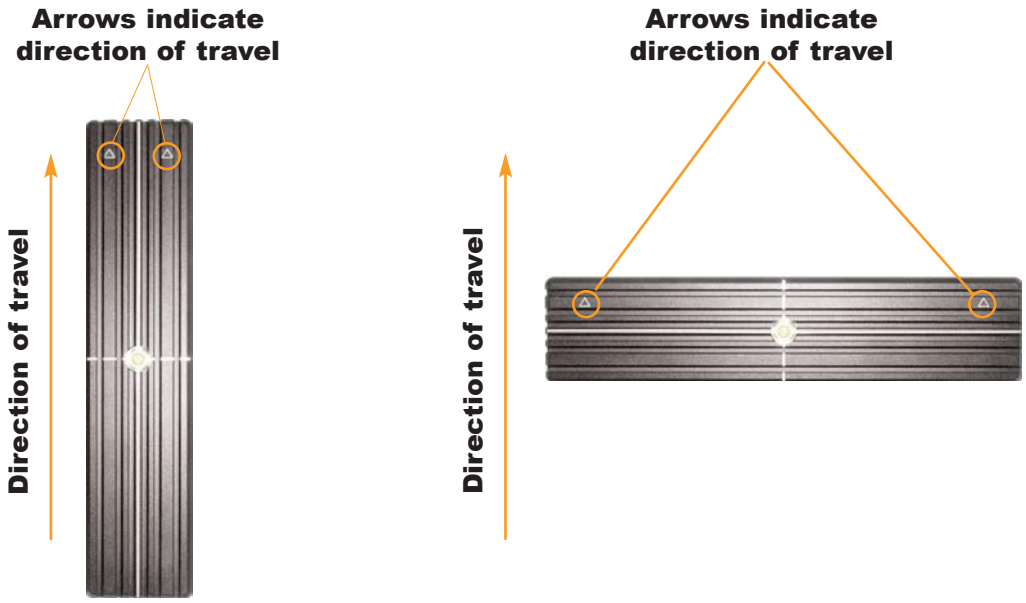
T configuration



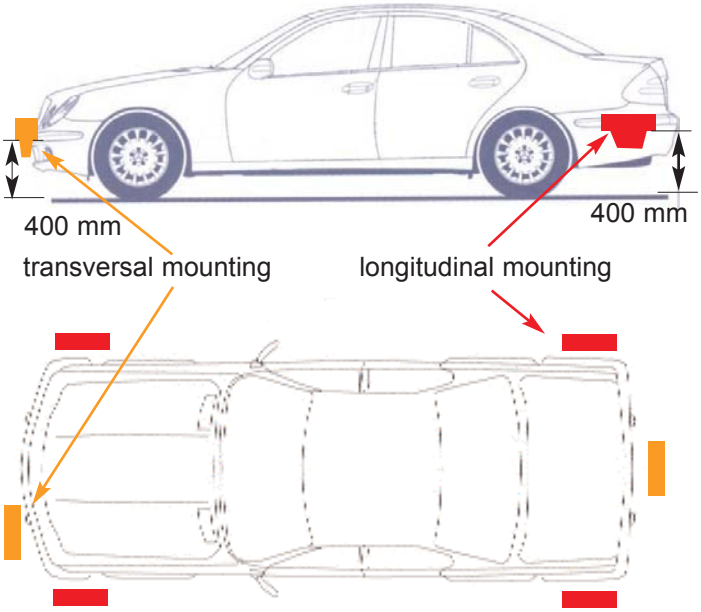
H-CE Sensors must be precisely aligned and equidistant from the center of the vehicle!

4.1.2 Sensor orientation

All sensors must be mounted in the orientation indicated by the arrows imprinted on the top of each sensor (sensors may be ordered with either longitudinal or transversal orientation). Care should be taken to assure that the plane of the sensor orientation is closely aligned to the direction of travel.



4.1.3 Mounting options



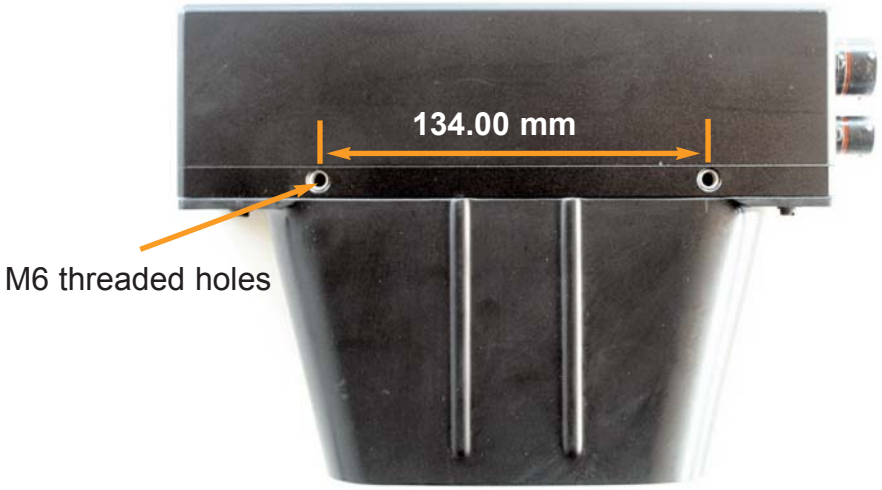
The mounting distance from the lower surface of the sensor body (not including the spray guard) to the road surface must be 400 mm.

Notice:
In wet or snowy conditions, do not mount sensors directly behind the rear wheels. This will help to prevent measurement anomalies that can be caused by spray and/or blowing snow.

4.1.4 Alternate mounting options

CORREVIT® H-CE Sensors may also be mounted on the vehicle using the CORRSYS-DATRON Profiled Bar Mounting, shown below. This mounting option is suitable for both L and T configurations.

4.1.5 Sensor mounting jig



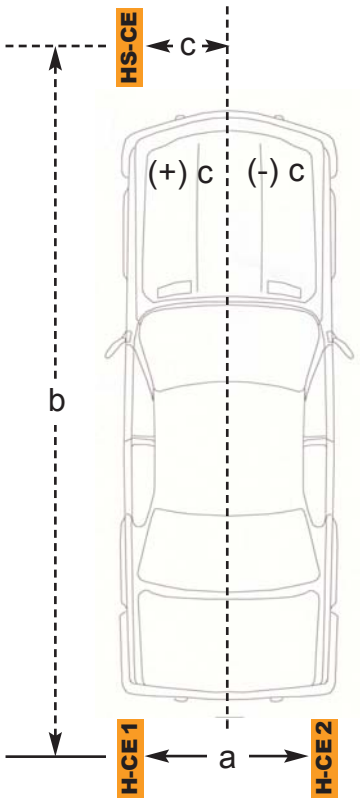
Caution:
For proper sensor mounting, use only M6 screws with a maximum thread engagement depth of 10 mm. The use of screws with thread engagement depths of greater than 10 mm can damage the sensor housing and will void the warranty!

4.2 Determining Geometric Dimensions

In order to accurately measure pitch and roll values, three dimensions (a, b, c) must be determined prior to testing.

To measure dimensions a, b, c:

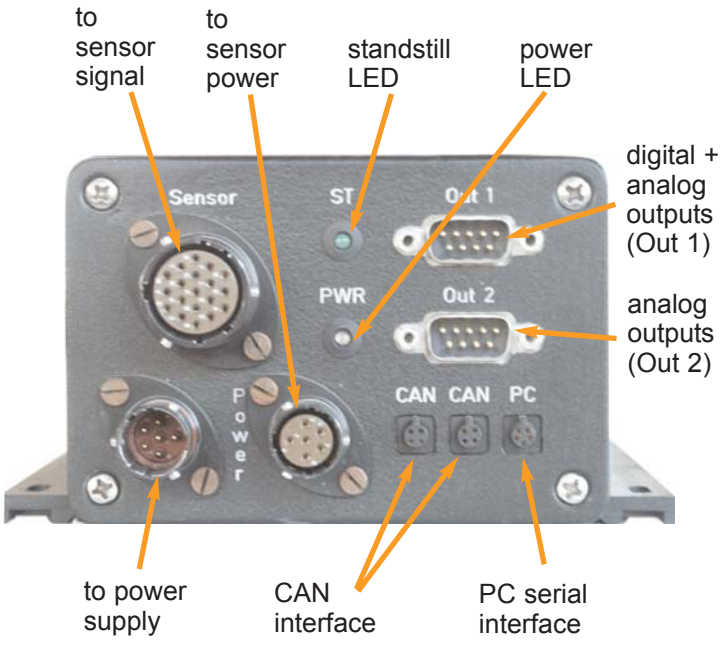
1. Park the vehicle on a flat, level surface so that the vehicle body is as near as possible to being absolutely level.
2. Hold a plumb line at the center of the mounted sensor, as indicated by the markings at the top of the sensor housing.
3. Allow the plumb weight to hang freely from the sensor with the plumb nearly touching the paved surface.
4. Mark a point on the pavement directly below the plumb weight.
5. Repeat steps 2. through 4. for each mounted sensor.
6. Hang the plumb line from the center of the vehicle and mark the point directly below the plumb weight, as above. This step should be completed at both the front and rear of the vehicle.
7. Move the vehicle far enough to gain simultaneous access to all of the marked points, then measure dimensions a, b, and c, as illustrated below.
8. Note that value “c” will be a positive number if the sensor is mounted to the left of the longitudinal axis, and a negative number if to the right.
9. Record each dimension. These measured values be required for use in setting up the sensors using the supplied CeCalWin Software package.



4.3 Connecting the Sensor System

HS-CE / H-CE Connections

Sensor Electronic Connections



NOTE:
H-CE Electronics do not include Out 2 and have only one CAN connector!

Reverse polarity protection
The electronic unit is equipped with reverse polarity protection. In the event that polarity is inverted, the unit will not be damaged but the power LED will illuminate red! Immediately disconnect power from the unit and correct the power supply connection.

1. Connect each of the three sensors (1 HS-CE + 2 H-CE) to their respective electronics units:

   NOTE: For easier connection, connect power cables to sensors before connecting signal cables.

   a) Connect the power input on the sensor to the power output on the electronic with 6-pin to 6-pin cable #K003-16N-10-5m.

   b) Connect signal output on the sensor to the signal input on the electronic with cable #K003-1J2-11-5m.

2. Connect the electronics to data acquisition.

   a) Connect HS-CE electronic output (Out 1) to data acquisition with 9-Pin D-SUB to 5 BNC cable #K003-592-11-1m.

   b) Connect HS-CE electronic output (Out 2) to data acquisition with 9-Pin D-SUB to 3 BNC cable #K003-392-12-1m (for complete Pitch & Roll System).

   NOTE: When using electronic output 2 to send a height signal only (H-CE Sensors are not used in this case), use 9-Pin D-SUB to 1 BNC cable #K008-192-10-1m.

   c) Connect the H-CE electronic output (both units) to data acquisition with 9-Pin D-SUB to 1 BNC cable #K003-192-10-1m.

   d) Connect (1) HS-CE CAN connector to the CAN connector on each of the 2 H-CE electronics with 4-pin CAN to (2) 4-pin CAN Y-cable #K003-24N-14-4m

   NOTE: The HS-CE electronics is not equipped with a termination resistor!
   If the HS-CE electronic is not connected to two H-CE electronics, plug the supplied 120 Ω termination resistor (#K003-04N-10) into the unused CAN output.

   e) Connect (1) HS-CE CAN connector to data acquisition with 4-pin CAN to 9-pin D-SUB cable #K003-14N-11-2m

3. Connect the power cables from each of the electronics boxes to a CORRSYS-DATRON power distribution unit with cable #K003-16N-12-2m (6-pin to 2 banana plugs).

4. Be sure that the individual switches on each power output circuit on the power distribution box are in the "OFF" position.

5. Start the vehicle engine and carefully connect the power distribution unit to the vehicle power supply.

6. Switch the power circuits on, **one at a time**, to send power to the sensor electronics boxes.

7. The Pitch & Roll System is now ready for set-up and calibration using CeCalWin Software. Connect the RS (RS 232) PC output on the electronic to a PC operating CeCalWin (see **Using the CeCalWin Software Package** for complete details). Each sensor should be set-up individually. Use the 5-pin RS-232 to 9-pin D-SUB serial communication cable (#K003-15N-11-2m) to make the connection between electronic and PC.

5. Troubleshooting

When troubleshooting the CORREVIT® Pitch & Roll System, begin by checking the following:

Cables and power supply

- Check all connections to determine that each is complete and that the system is connected to a power supply that provides voltage output within the specified range.
- Check to determine that the correct cables have been used for all connections.
- The following problems can be caused by incorrect or incomplete cable connections and/or connection to incorrect power supply voltage:
  - Output signals are not available to data acquisition and/or connected PC.
  - A sensor will not go out of standstill mode after vehicle motion.
  - Velocity and angle outputs appear to be correct, but the height signal seems incorrect or is not available.

Status LED's on sensor electronic boxes

- If all connections are correct and no faults are present, the "PWR" (power) LED on the sensor electronic will be illuminated orange. If the "PWR" LED is red, a fault is indicated. Additionally, the green "ST" (standstill) LED will be illuminated if all connections are correct and no faults are present.
- If the "PWR" LED is red and the green "ST" LED is not illuminated, polarity has been reversed and must be corrected.
- If the "PWR" LED is orange and the green "ST" LED is not illuminated, cables may have been connected incorrectly. Check and reconnect cables as necessary.

Lamps

Check to be sure that both lamps are illuminated in each of the three sensors that comprise the Pitch & Roll System. Check and replace lamps as necessary. Also be sure that connections and supply voltage are correct.

Sensor orientation

- Each sensor is delivered with a user-specified operating orientation, which is indicated by arrows located on the top surface of the sensor housing. Sensors must be mounted with the arrows pointing in the direction of travel.
- Incorrect sensor orientation will cause all output signals to be incorrect.
- The height signal will not be correct when the vehicle is moving in reverse.

Operating range

If one or more sensor(s) is mounted out of the recommended height range (standoff distance), it may not go out of standstill mode with vehicle motion, and no measurement signals will be output. Check and correct mounting as necessary.

Sensor lens

The sensor lens (located on the underside of the sensor housing) may occasionally become dirty, preventing proper operation. Check and clean the sensor lens regularly.

Software

- If one or more output signals appear to be incorrect, sensor(s) may have been set-up incorrectly via CeCalWin Software. Check all relevant settings in CeCalWin:
  - All analog voltage settings must be within range and (within each channel) should be the same for every sensor, as well as for data acquisition system to which they are connected.
  - All digital pulse and resolution settings must be set within range and (within each channel) should be the same for every sensor, as well as for data acquisition system to which they are connected.
  - Check all offset values and recalibrate sensor(s) as necessary.
- If no output signals are available and all connections are correct, use the CeCalWin Test Function to determine that all components are fully operational. See Section 6, **Using the CeCalWin Software Package** for complete details.
- CeDapWin, an additional software package available from CORRSYS-DATRON, enables real-time monitoring of height, speed and other relevant signals. CeDapWin can be useful for diagnostic purposes when used in conjunction with CeCalWin. Contact your CORRSYS-DATRON sales office for details about obtaining CeDapWin.

Environmental conditions

The sensor may occasionally interpret heavy spray from snow or water as part of the road or track surface, producing unexplained spikes in the output signals and/or other anomalous measurement artifacts. Sensors should be mounted away from the heaviest spray areas, especially directly behind the rear wheels.

EMC interference

If the sensor starts to send output signals without vehicle motion, triggering may have been caused by excessive EMC interference from the test vehicle. To correct this condition, reset the sensor by disconnecting from power and then re-connecting, or by switching power off and then back on at the power distribution box. If the condition persists, disconnect all three sensors from vehicle ground and isolate them at all mounting points.

If none of the above recommendations provides a solution, you may wish to contact CORRSYS-DATRON. Before doing so, please be ready to supply the following:

- A .ccw file saved from CeCalWin software to serve as an example of the problem or fault condition.
- A list of all which outputs that appear to be problematic, i.e. analog, digital, CAN, RS-232.
- The serial numbers of all relevant components.

Troubleshooting CAN with the CORREVIT® Pitch & Roll System

Problem: There are no messages on the CAN-bus
Check to be sure that:
- the electronic has power
- data acquisition is connected to the HS-CE sensor electronic
- the correct send mode is selected
- the data acquisition system and all sensor electronics use the same settings for baud rate, CAN identifiers and identifier types
- if you use CANalyser or a data acquisition system with an acceptance filter, be sure the messages from the Pitch & Roll System are not disabled

Problem: Data received via the CAN bus appear to be incorrect
Please be sure that:
- the data acquisition system uses Intel data format for communication via CAN-bus
- the data acquisition system and all sensor electronics use the same settings for the type of measured value (signed or unsigned, number of bits)

For more information about data types and how they apply to the Pitch & Roll System, see the **CAN Protocol** document located in the Appendix of this manual.

CORRSYS-DATRON recommends that the .dbc file option be used to avoid problems with false data types or bit lengths. Sensor-specific .dbc files are available for download at www.corrsys-datron.com, or may also be obtained by contacting the CORRSYS-DATRON application department directly.

Problem: No height information is available on the CAN-bus from one or both H-CE sensors.
Please be sure that:
- both H-CE electronics have power
- both H-CE electronics are connected to the HS-CE sensor electronic
- the two H-CE sensors do not use the same CAN identifiers
- the data acquisition system uses the same settings as the H-CE sensors

Problem: Pitch and/or roll angle are always displayed as –20°
This means that one or both of the H-CE Sensors is not connected with the HS-CE Sensor.
Diagnostic guidelines are as follows:
- Pitch angle = –20°, no height information is being received from H-CE1
- Roll angle = –20°, no height information is being received from H-CE 2
- Both pitch and roll angle = –20°, no height information is being received from either H-CE Sensors

Also be sure that:
- all sensors have power
- both H-CE Sensors are connected with the HS-CE Sensor
- The checkbox, "HS-CE System (in connection with 2 H-CE) is selected in the CeCalWin CAN tab.