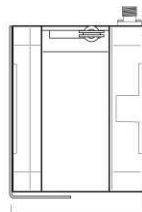


6.4" [164 mm]



4.3" [109 mm]

## SKH

### Cable Actuated Sensor CANOpen Output Signal

Available in both 250 and 400-inch stroke ranges, the SKH linear position sensor is a perfect solution for applications ranging from mobile construction equipment to hydraulic lift tables and anything else in between. The SKH offers compact design, ease of use and the utmost in flexibility. Every unit offers the customer a user-selectable 4-20 mA or 0-10VDC output signal option, an easily adjustable stainless steel mounting bracket for multiple installation options and the ability to change the direction of the electrical connector to accommodate the user's wiring needs.

Our unique electronic circuitry and an extremely durable spring-loaded stainless steel measuring cable deliver an accurate reliable "absolute" position feedback signal over the entire stroke.

#### FEATURES

- Flexibility - Every unit offers linear position up to 400" (10m) providing flexibility to work across a wide range of aerial applications. This off-the-shelf series offers a wide selection of industry standard output signals (4-20mA, 0-10Vdc, CANOpen and J1939 CANbus).
- Ease of use - A compact design, a stainless-steel mounting bracket for multiple installation options and an easily-adjustable measuring cable orientation make this sensor easy to install and manage.
- Superior engineering - TE provides engineering partnership to customize for specific applications. There is also an option to have two sensors elements in the same package with no additional space requirement. This provides fail-safe security for aerial applications.

#### APPLICATIONS

Accurate measurement in customized applications industrial and commercial transportation like:

- Fork lifts
- Telescopic arms
- Boom lifts
- Scissor lifts

**Linear Position to 400 inches (10 m)****Compact Design • Simple To Install****User Adjustable Measuring Cable Orientation****Specifications**

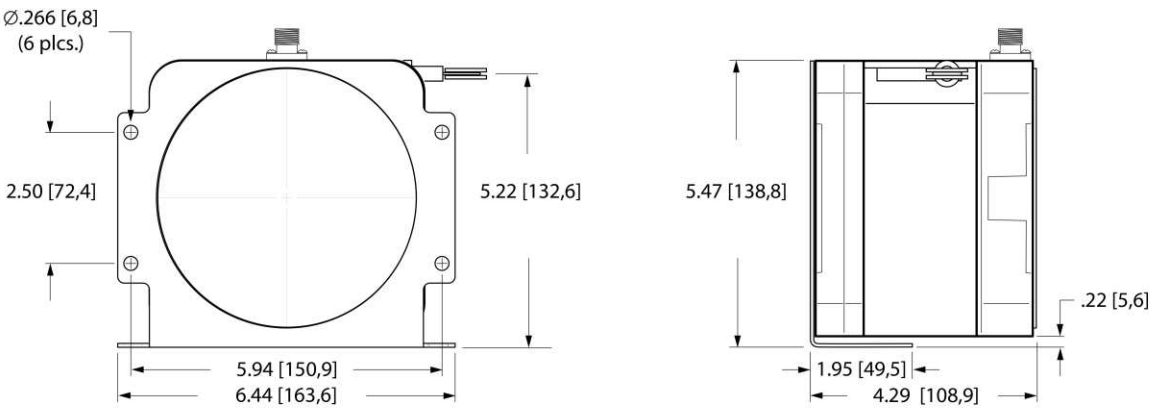
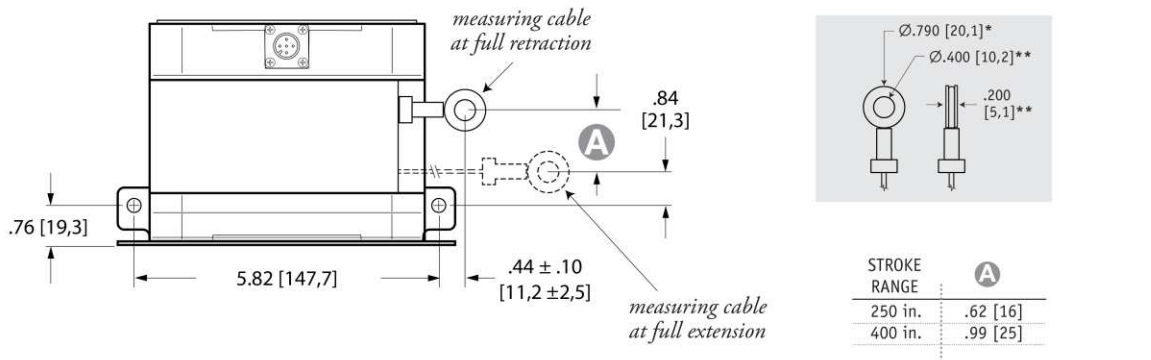
<b>Stroke Range Options</b>	250 inches (6.4 m), 400 inches (10.2 m)
<b>Accuracy</b>	0.35% FS.
<b>Repeatability</b>	0.05% FS.
<b>Resolution</b>	12-bit
<b>Input Voltage</b>	10-36 VDC
<b>Input Current</b>	100 mA, max.
<b>Measuring Cable</b>	0.031-inch dia. bare stainless steel
<b>Maximum Cable Velocity</b>	60 inches per second
<b>Maximum Cable Acceleration</b>	5 g
<b>Measuring Cable Tension</b>	23 oz. (6.4 N) ±40%
<b>Sensor</b>	plastic-hybrid precision potentiometer
<b>Cycle Life</b>	≥ 250,000
<b>Electrical Connection</b>	M12 connector, mating plug included
<b>Enclosure</b>	glass-filled polycarbonate
<b>Environmental</b>	IP67

**Operating Temperature** -40° to 185° F (-40° to 85° C)

**CANopen Specifications**

<b>Communication Profile</b>	CiA 301 V 4.0.2, CANopen Slave
<b>Device Type</b>	CiA 406 V3.2, Encoder
<b>Vendor ID</b>	0x0002E0, Node ID
<b>1-127 (Adjustable via dipswitch or LSS, default set to 1)</b>	
<b>Baud Rate Options</b>	125K (default), 250K, 500K, 1M
<b>Data Rate</b>	50ms (default)
<b>Error Control</b>	Heartbeat, Emergency Message
<b>PDO</b>	2 TxPDO, 0 RxPDO, no linking, static mapping
<b>PDO Modes</b>	Event / Time triggered, Synch / Asynch
<b>SDO</b>	1 server, 0 client
<b>Position Data</b>	Object Dictionary 6004
<b>Cam Switches</b>	Not Supported

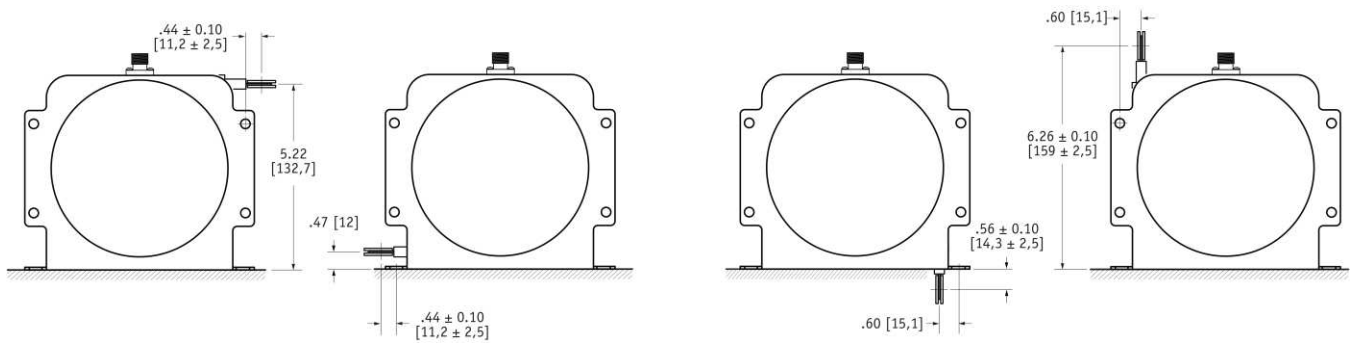
**Outline Drawing**



DIMENSIONS ARE IN INCHES [MM]  
tolerances are 0.04 IN. [1,0 MM] unless otherwise noted.

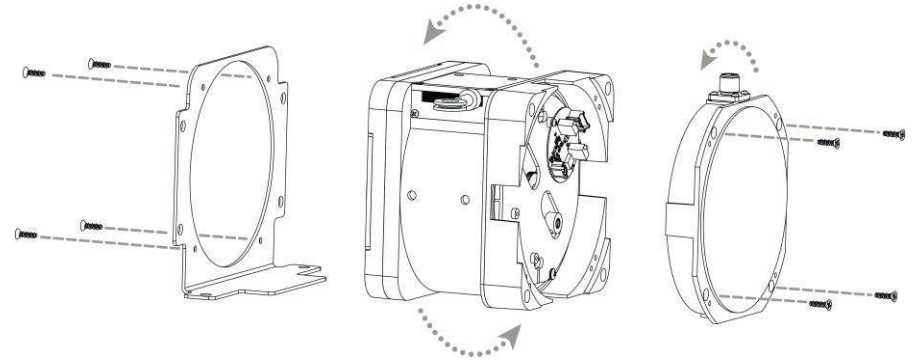
\* tolerance = +.005 -0.001 [+0,1 -0,0]  
\*\* tolerance = +.005 -0.005 [+0,1 -0,1]

**Mounting Options**

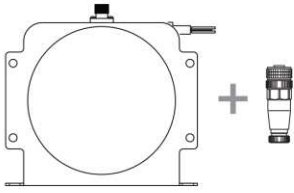


**To change cable exit direction:**  
simply remove the 4 bracket mounting screws and rotate sensor body to desired direction.

**To change electrical connector orientation:** remove the 4 rear screws and carefully remove the rear cover and rotate cover.



Ordering Information



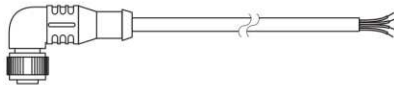
Part Number	full stroke range	accuracy	max. acceleration	measuring cable tension (± 40%)
<b>SKH-250-4</b>	250 in (6.4 m)	.35%	5 g	23 oz. (6,4 N)
<b>SKH-400-4</b>	400 in (10.2 m)	.35%	5 g	23 oz. (6,4N)

includes mounting bracket & mating connector.

Optional Cordsets



Part Number	length	wire size	connector
<b>9036810-0030</b>	13 ft (4 m)	22 AWG (.34mm <sup>2</sup> )	straight 5-pin M12

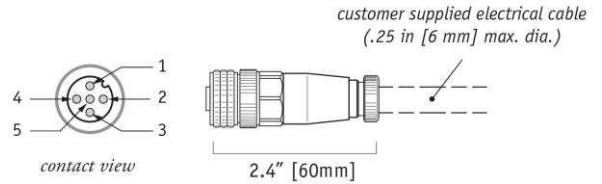


<b>9036810-0031</b>	13 ft (4 m)	22 AWG (.34mm <sup>2</sup> )	90° 5-pin M12
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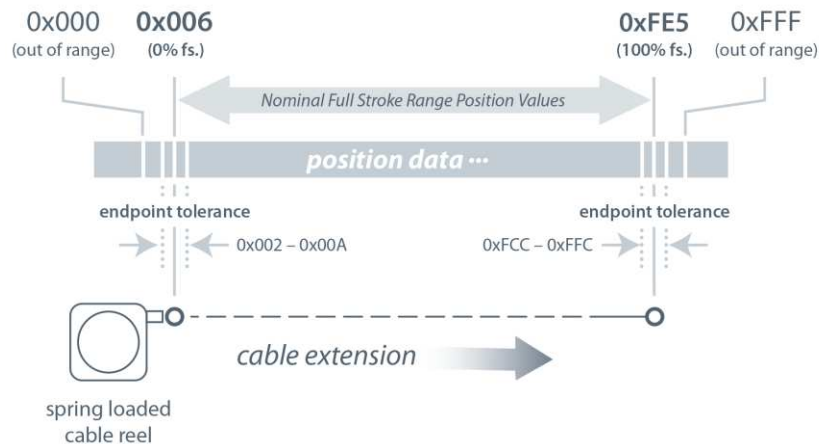
Electrical Connection

Output Signal	field installable connector		optional cordset	
	pin	pin - color	pin	color
n/c	1	1 - brown	1	brown
10..36 Vdc	2	2 - white	2	white
common	3	3 - blue	3	blue
CAN - High	4	4 - black	4	black
CAN - Low	5	5 - green/yellow	5	green/yellow

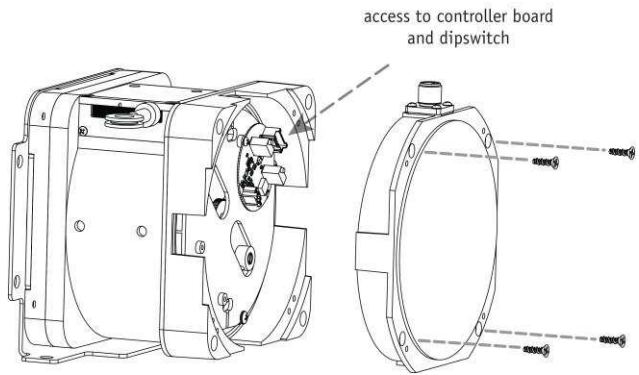
Field Installable Connector



Position Data Overview



### Internal Controller Board



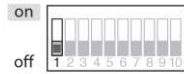
Status LED - Indicates Operating Condition of the Potentiometer

green	red	
on	flash	emergency message (high)
off	flash	buffer (high)
on	off	normal operating range
flash	off	buffer (low)
flash	on	emergency message (low)

#### LSS, Baud Rate and Node ID settings:

LSS, Baud Rate and Node ID settings are set via dip switch found on the internal controller board. To gain access to the controller board, remove the 4 cover attaching screws and carefully separate the sensor cover from the main body. Be careful not to damage the small gage wires that connect the potentiometer to the controller board mounted directly to the rear cover.

Follow the instructions below for desired settings and reinstall sensor cover.



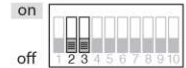
#### LSS Settings:

IF DIP Switch 1 is set to “on” position, then LSS will be functional and uses the contents of EEPROM including Node ID and Baud Rate. If DIP Switch 1 is set to “off” position, then DIP switches will override information in EEPROM including the Node ID and Baud Rate.

LSS options	LSS settings	SW1
}	disabled	off
	enabled	on

#### BAUD Rate:

If DIP Switch 1 is set to “off” then BAUD rate is set via DIP switch 2 and 3 as shown:



transmission rate options	baud rate	SW2	SW3
}	125 kbps	off	off
	250 kbps	on	off
	500 kbps	off	on
	1 Mbps	on	on



#### Node ID:

If DIP Switch 1 is set to “off” then the Node ID is set via DIP switches 4 – 10 as shown below. The DIP switch settings are binary starting with switch number 4 (=20) and ending with switch number 10 (=26).

node ID options	node ID	SW4	SW5	SW6	SW7	SW8	SW9	SW10
}	Dec.	(2 <sup>0</sup> )	(2 <sup>1</sup> )	(2 <sup>2</sup> )	(2 <sup>3</sup> )	(2 <sup>4</sup> )	(2 <sup>5</sup> )	(2 <sup>6</sup> )
	Hex							
	1	0x01	on	off	off	off	off	off
	2	0x02	off	on	off	off	off	off
	3	0x03	on	on	off	off	off	off
	...	...	...	...	...	...	...	...
126	0x7E	off	on	on	on	on	on	
127	0x7F	on	on	on	on	on	on	

The Node ID is equal to the binary setting.

## Manufacturer Objects

Index	Sub-Index	Name	Default	Comment
2000		Raw Position Value		This is the averaged, non-scaled value from the encoder.
2001		Emergency Buffer Distance	0.1	Emergency Message is sent when the output of the sensing potentiometer is outside its calibrated range by more than 0.1% of the sensors full measurement range (Emergency Buffer). This allows for non-repeatability of sensor and customers application. This object allows user ability to change buffer size along with transmission of Emergency Message, Manufacturer specific bit in error register set, and error added to error list.

## Device Profile Area

Index	Sub-Index	Name	Default	Comment
6000		Operating Parameters	0X0000	
6004		Position Value	0	Counts proportional to measuring cable extension. Nominal values are 0x006 with cable fully retracted and 0xFE5 with cable fully extended. Format of data in CAN message is little endian – least significant byte pair first. Therefore 0x008 would be shown as “08 00” and 0xFE5 would be shown as “E5 0F”
6400		Area State Register		SubNumber= 2 (indicates underflow or overflow per CiA406)
	0	Highest Subindex	0x01	
	1	Work Area State Channel 1	0	
6401		Work Area Low Limit		The averaged, non-scaled (raw) encoder data below which the encoder is out of range.
	0	Highest Subindex	0x01	
	1	Work Area Low Limit Channel1	0x024	
6402		Work Area High Limit		The averaged, non-scaled (raw) encoder data above which the encoder is out of range.
	0	Highest Subindex	0x01	
	1	Work Area High Limit Channel 1	0xF4E	
6500		Operating Status	0x0000	
6501		Measuring Step	1	Position Measuring Step. Can be set by user to convert Position Value (Object 6004) to measurement units (inches, mm). Default is set to 1.

## Communication Area Profile

Index	Sub-Index	Name	Default	Comment
1000		Device Type	0X00080196	Device Profile 406
1001		Error Register	0	Manufacturer Specific Error bit 7 is set when sensor is outside of calibrated range and cleared when back in range.
1003		Pre-Defined Error Field		SubNumber= 9 (lists last eight Emergency Messages)
	0	Number of Errors	0	
	1	Standard Error Field 1		
	2	Standard Error Field 2		
	3	Standard Error Field 3		
	4	Standard Error Field 4		
	5	Standard Error Field 5		
	6	Standard Error Field 6		
	7	Standard Error Field 7		
	8	Standard Error Field 8		
1005		SYNC COB-ID	0x80	
1010		Store Parameters		SubNumber=2
1010	0	Highest Subindex	0x01	Only "Save All Parameters" feature supported
	1	Save All Parameters		Write "save" or "evsa" to save parameters to EEPROM. They are automatically loaded on power up/reset. Saves the value of all R/W object dictionary entries.
1014		Emergency COB-ID	\$NodeID + 0x80	COB-ID Emergency Message
1015		Emergency Inhibit Time	0	Multiple of 100us. Minimum time between transmissions of emergency messages.
1017		Producer Heartbeat Time	0	Multiples of 1ms. Time between transmission of heartbeat messages. 0 = disabled
1018		Identity Object		
	0	Number of Entries	4	
	1	Vendor Id	0x2E0	
	2	Product Code	0x10D	Celesco Reference # 604269
	3	Revision Number	0x1	
	4	Serial Number	0xFFFFFFFF	
1800		Tx PDO Comm. Parameter		PDO1
	0	Number of Entries	5	
	1	COB-ID	\$NodeID + 0x108	COB-ID used by PDO1
	2	Transmission Type	254	PDO1 Tx Type: 0 = on Sync Message. 254 = Asynchronous Tx

## Communication Area Profile (cont.)

3	Inhibit Time	0	Multiple of 100us. Minimum time between transmissions of the PDO
5	Event Timer	0x32	If non-zero then transmits the PDO periodically. This value is a multiple of 1ms.
1801	Tx PDO Comm. Parameter		PDO2
0	Number of Entries	5	
1	COB-ID	\$NodeID + 0x280	COB-ID used by PDO2
2	Transmission Type	0	PDO2 Tx Type: 0 = on Sync Message. 254 = Asynchronous Tx
3	Inhibit Time	0	Multiple of 100us. Minimum time between transmissions of the PDO
5	Event Timer	0	If non-zero then transmits the PDO periodically. This value is a multiple of 1ms.
1A00	Tx PDO Mapping Parameter		Subnumber = 2
0	Number of Entries	1	
1	PDO Mapping Entry	0x60040020	Mapping Parameter
1A01	Tx PDO Mapping Parameter		Subnumber = 2
0	Number of Entries	1	
1	PDO Mapping Entry	0x60040020	Mapping Parameter

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