

1 DESCRIPTION

The stem sensor, based on Hall technology, detects the absolute angular position of a permanent magnet, assembled on a rotating shaft. Quick data acquisition and processing provide accurate angular measurements at high speeds.

Using the set input it is possible to set the zero position, and the direction of the angle incrementation, while the use of the serial communication allows to configure further parameters such as the magnetic field threshold and the limit position angle set by the appropriate application program, this option is useful for the replacement of mechanical microswitches activated when a certain limit angle is reached.

Position is maintained in absence of power supply.



2 ZERO POSITION AND ROTATION DIRECTION CONFIGURATION

By bringing the SET input to a voltage between 12V and 24V the user can configure the starting position or the direction of the angle increasing. The duration of the set pulse causes the options changes (see Figure.1).

After the angle reversing, wait at least 3s before performing a reset point.

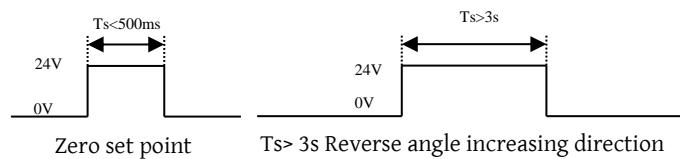


Figura 1 Configuration impulse

3 MEASUREMENT OUTPUTS

3.1 PWM (coding option PW)

This output provides a logic signal proportional to the magnetic angle. The typical frequency of the PWM signal is 240HZ. The minimum duty cycle is equal to 1/130 of the period while the maximum value is equal to 129 / 130 of the period, so the duty cycle varies from 1/130 to 129/130 with a resolution of 12bit.

The angle is calculated by measuring the time of Ton and the time of Toff according to the below formula.

$$angle(in\ deg) = 360 \frac{1}{128} \left(130 \frac{t_{ON}}{t_{ON} + t_{OFF}} - 1 \right)$$

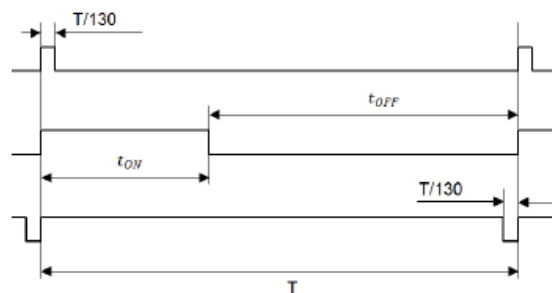


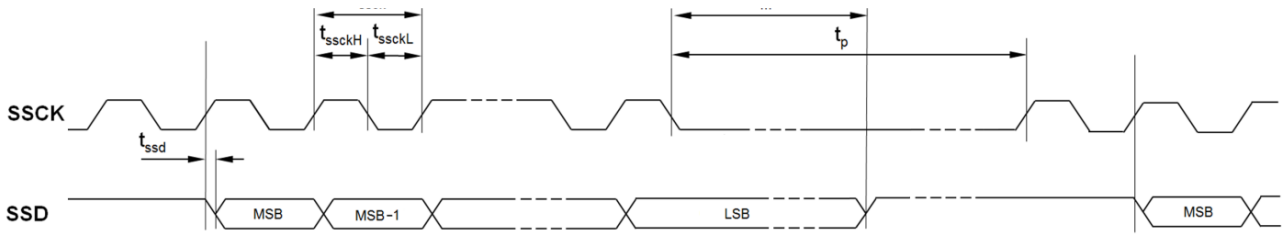
Figura 2 Segnal PWM

Since the absolute PWM frequency can slightly vary depending on the sensor IC temperature, a precise measurement of the angle requires the measurement of both times: Ton and Toff.

The PWM HW output stage is a npn open collector (0-30V) transistor type or alternatively it will be possible to have a "line driver single ended" output at 5V.

3.2 SSI (CODING OPTION SS)

SSI is a 2-wire synchronous serial interface for reading the angle measurement. The sensor in this configuration is a "slave", while the SSI master is an external device that will receive the data.



Parameter	Description	Min	Max	Unit
t_{ssd}			15	ns
t_{ssck}	SSCK period	0.04	16	μ s
t_{ssckL}	Low level of SSCK signal	0.02	8	μ s
t_{ssckH}	High level of SSCK signal	0.02	8	μ s
t_m	Transfer timeout (monoflop time)	25		μ s
t_p	Dead time: SSCK high time for next data reading	40		μ s

Figura 3 SSI Timing

The external reading device must send a clock with a period between 0.04 μ s and 16 μ s with at least 17 pulses. The sensor will start to send data starting from the rising edge of the second clock pulse, transmitting the most significant bit first. The SSI Input/Output stages are 5VDC tolerant.

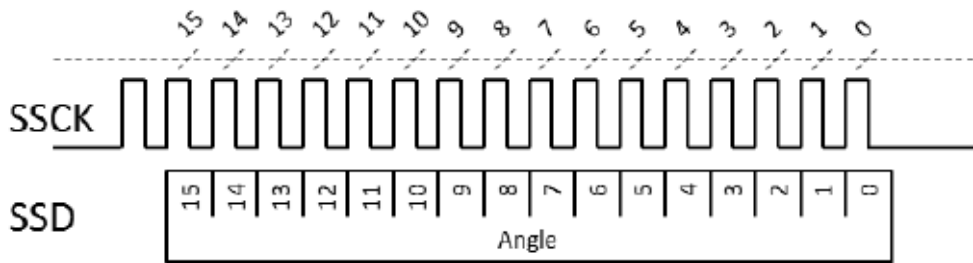


Figura 4 SSI Message

3.3 RS485 (CODING OPTION RS)

KSA01 in this configuration uses a RS485 type half-duplex serial interface as output, compatible with the MODBUSRTU protocol. In this case the sensor will respond to commands sent by the master according to the protocol described in the following paragraph.

3.3.1 Port Setup

Function	Value
Baud rate	19.200Kbit/s
Stop Bit	8
Data bit	pari
Parity	1
Stop Bit	No

3.3.2 Protocoll

The first byte is the start frame composed of the sensor address, 0xA and the number of bytes transmitted, for example: 0xA2 → A = address, 2 = 2 bytes transmitted

3.3.2.1 Command request to the sensor

Measure request			
Byte N°	Command	Code	Description
0	Start frame	0xA2	High nibble: sensor address (A) Low nibble: number of sent bytes (2)
1	command	0xB1	Sensor measure: clockwise increasing measurement as per factory configuration

Complementary measure request			
Byte N°	Command	Code	Description
0	Start frame	0xA2	High nibble: sensor address (A) Low nibble: number of sent bytes (2)
1	command	0xB4	Sensor measure: clockwise decreasing measurement complementary to the previous measure (0x1FFF-mis)

Request zero set -up			
Byte N°	Command	Code	Description
0	Start frame	0xA2	High nibble: sensor address (A) Low nibble: number of sent bytes (2)
1	command	0xB5	Set-up zero point

Increasing angle inversion request			
Byte N°	Command	Code	Description
0	Start frame	0xA2	High nibble: sensor address (A) Low nibble: number of sent bytes (2)
1	command	0xB6	Increasing angle inversion

Actual increasing angle request			
Byte N°	Command	Code	Description
0	Start frame	0xA2	High nibble: sensor address (A) Low nibble: number of sent bytes (2)
1	command	0xB7	Actual increasing angle set

3.3.2.2 Sensor answers

Measure answer			
Byte N°	Command	Code	Description
0	Start frame	0xA3	High nibble: sensor address (A) Low nibble: number of sent bytes (3)
1	Measure High byte	0x??	Measure 0...8190 (0...0x1FFF)
2	Measure low byte	0x??	

Direction answer			
Byte N°	Command	Code	Description
0	Start frame	0xA2	High nibble: sensor address (A) Low nibble: number of sent bytes (2)
1	Direction	0x??	0x00 clockwise angle increase direction (seen from the rotation shaft side) 0x80 counterclockwise angle increase direction (seen from the rotation shaft side)

3.4 Limit position angle output (coding option SW)

An open collector transistor output is activated when a specific angle is reached.
This option is useful for replacing mechanical switches activated when a certain limit angle is reached

4 TECHNICAL DATA

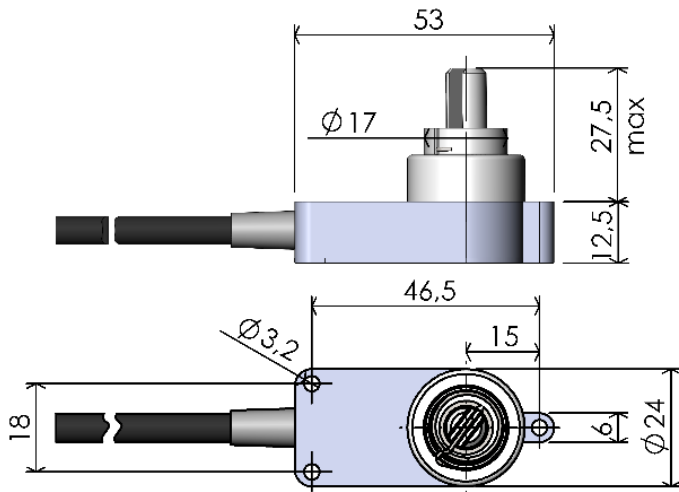
Technical Data	
Power supply	9-30VDC
Maximum current consumption without load (Vsupply30V)	20mA
Open collector output (angle PWM, or fixed limit angle)	NPN, Vmax 30VDC, IMAX=30mA
Line driver PWM/SSI Outputs	Vmax 5VDC
SET Input (active high)	Vmax=24V, I=10mA
Measurement Accuracy	+/- 0.5 Degree
PWM resolution	12 bit
PWM frequency	240Hz +/-10%
IP protection	IP67
Dimension	See below drawing
Operative temperature	0°C + 55°C
Store temperature	-40°C + 105°C

5 CONNECTIONS

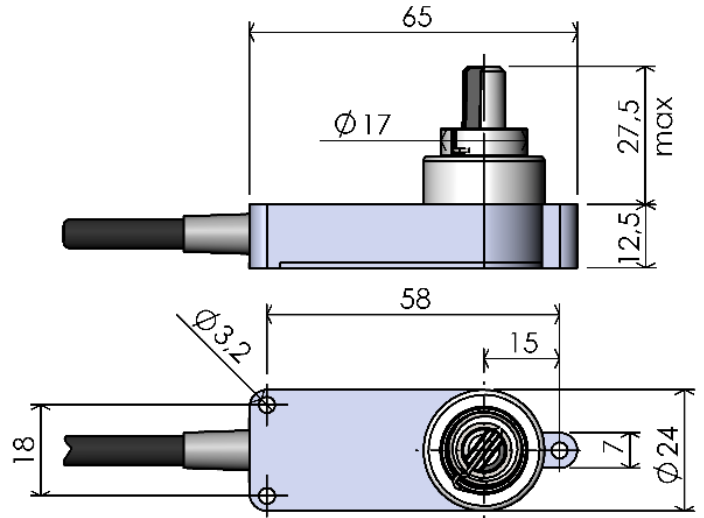
COLOR	TYPE	FUNCTION	VOLTAGE RATING [V]	CURRENT RATING [mA]
CONNECTION ANGULAR MEASUREMENT KSA1PW				
Blu	Power supply	Negative DC Power supply (0V)	0	
Brown	Power supply	Positive DC Power supply (Vsup)	10÷30	50mA
Black	Transistor output Open collector npn	PWM angle measurement	Vsup – 1V (PWM)	0.03
White	Optoisolated input	Start and direction angle config	0- Vsup	0.01
CONNECTION ANGULAR MEASUREMENT KSA01SS				
Black	Power supply	Negative DC Power supply (0V)	0	
Red	Power supply	Positive DC Power supply (Vsup)	10÷30	50mA
Green	Digital out	Dato trasmesso SSD	5V (SSI)	0.03
White	Optoisolated input	Start and direction angle config	0- Vsup	0.01
Brown	Optoisolated input	Clock SSCK	5V	0.01
CONNECTION KSA01RS485				
Blu	Power supply	Negative DC Power supply (0V)	0	
Brown	Power supply	Positive DC Power supply (Vsup)	10÷30	50mA
Black	RS485 NETB	Channel B serial RS485	(from -7.5V to 12.5V)	
White	RS485 NETA	Channel A serial RS485	(from -7.5V to 12.5V)	
CONNECTION ANGULAR MEASUREMENT KSA01SW				
Blu	Power supply	Negative DC Power supply (0V)	0	
Brown	Power supply	Positive DC Power supply (Vsup)	10÷30	50mA
Black	Transistor output Open collector npn	Predefined angle switch	Vsup – 1V	0.03
White	Optoisolated input	Start and direction angle config	0- Vsup	0.01

6 MECANICAL DRAWING

KSA - INDUSTRIAL VERSION

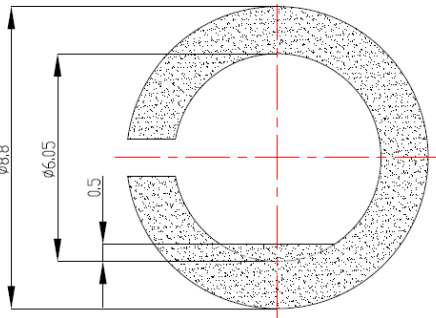


KSA- AUTOMOTIVE VERSION

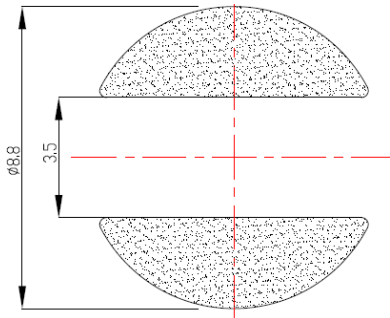


SHAFTS MECANICAL DIMENSION

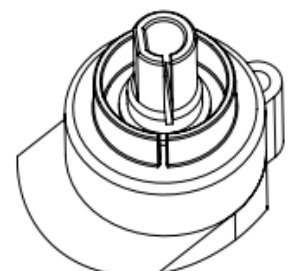
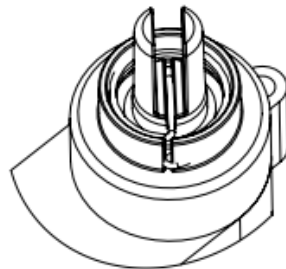
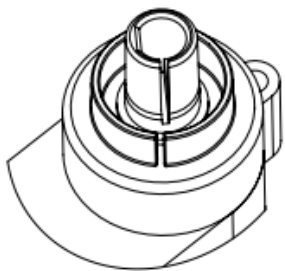
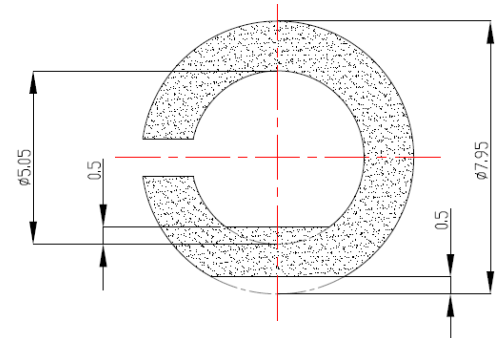
FEMALE SHAFT Φ 6mm



FORK SHAFT



FEMALE SHAFT Φ 5mm
MALE SHAFT Φ 8mm



7 SENSOR CODING

Codifica sensori angolari analogici / Angular sensor coding

KSA - 1 - x - xx - Qx - x - xxx - x - xxx - x - x

KSA serie 1 = digitale

KSA serie 1 = digital

Tipo di albero

A = Femmina, ϕ 6mm ; B = Forcella

C = Maschio, ϕ 8mm - Femmina, ϕ 5mm

Shaft type

A = Female, ϕ 6mm ; B = Fork

C = Male, ϕ 8mm - Female, ϕ 5mm

Tipo di uscita

PW = PWM; SS = SSI; SW = interruttore angolo limite; RS=RS485

Cx = Personalizzazione x

Output type

PW = PWM; SS = SSI; SW = Angle limit switch; RS=RS485

Cx = Customization x

Tipologia di cavo:

QT = Cavo quadripolare UL, guaina esterna nera; PO = Cavo pentapolare UL, guaina esterna nera

Type of cable:

QT = Quadripolar UL, external black; PO = Pentapolar UL, external black

Caratteristiche speciali:

P = Cavo con puntalini, x = Eventuali altre connessioni;

Special Features:

P = Cable with end-sleeves; x = Any other connection;

Lunghezza cavo in cm o cavo con connettore costampato

Length of cable in cm or cable with connector

A = Automotive, I = Industriale;

A = Automotive; I = Industrial;

Opzioni misura angolare

060= 60 gradi ; 100= 100 gradi ; 180= 180 gradi ; 360= 360 gradi

Angular measurement options

060= 60 degree ; 100= 100 degree ; 180= 180 degree ; 360= 360 degree

M = Set zero a metà dinamica del segnale di uscita, I = Set zero a inizio dinamica del segnale di uscita;

M = Set zero to the middle output signal dynamic; I = Set zero to the initial output signal dynamic ;

Tensione Alimentazione

2=20VDC-30VDC ; 1=12 VDC

Supply voltage

2=20VDC-30VDC ; 1=12VDC

ESEMPIO: **KSA1BSSQTP196A100I1**=sensore con albero a forcella, uscita SSI, lunghezza cavo 196cm, range automotive, misura angolare massima 100 gradi, set zero a inizio dinamica, tensione alimentazione 12VDC

EXAMPLE: **KSA2BSSQTP196A100I1**=fork shaft, SSI output, cable length 196cm, automotive range, maximum angular measurement 100°, zero set at the beginning, supply voltage 12VDC