

Encoders without bearing

Absolute encoder, 1 or 2 sensing head

Magnetic sensing, hollow shaft $\varnothing 30$ mm

Singleturn 13...16 bit, additional incremental signals 1024...8192

MHAD 50 - HDmag



MHAD 50 with cable

Features

- Absolute encoder with magnetic sensing and without bearings
- Absolute resolution max. 16 bit singleturn
- Additional incremental signals
- Robust and free from wear
- Protection IP 67
- Large tolerances: axial ± 1 mm, radial max. 1 mm
- Very compact dimensions
- Simple mounting, easy adaptation
- LED functional display

Technical data - electrical ratings (SSI)

Voltage supply	4.5...30 VDC
Consumption w/o load	≤ 50 mA (24 VDC)
Interface	SSI
Function	Singleturn
Steps per turn	≤ 65536 / 16 bit
Sensing method	Magnetic
Absolute accuracy	$\pm 0.3^\circ$ (-40...+85 °C) $\pm 0.25^\circ$ (+20 °C)
Repetition accuracy	0.3°
Code	Gray or binary
Code seque./sense of rot.	Positiv at CW
Additional output signals	Square-wave univ. HTL/RS422
Output circuit	SSI, Clock (frequency 100 kHz...2 MHz)
Interference immunity	DIN EN 61000-6-2
Emitted interference	DIN EN 61000-6-4

Technical data - electrical ratings (square-wave)

Voltage supply	4.75...30 VDC (5 VDC $\pm 5\%$ = Signals) RS422, 10...30 VDC = HTL)
Consumption w/o load	≤ 50 mA (24 VDC)
Resolution (steps/turn)	1024...8192
Phase shift	$90^\circ \pm 10^\circ$
Scan ratio	40...60 %
Sensing method	Magnetic
Output frequency	≤ 300 kHz
Output signals	A+, A-, B+, B-
Interference immunity	DIN EN 61000-6-2
Emitted interference	DIN EN 61000-6-4

Technical data - electrical ratings (CANopen)

Voltage supply	4.5...30 VDC
Consumption w/o load	≤ 50 mA (24 VDC)
Interface	CANopen
Function	Singleturn
Steps per turn	≤ 65536 / 16 bit
Sensing method	Magnetic
Absolute accuracy	$\pm 0.3^\circ$ (-40...+85 °C) $\pm 0.25^\circ$ (+20 °C)
Repetition accuracy	0.3°
Code seque./sense of rot.	Positiv at CW
Additional output signals	Square-wave univ. HTL/RS422
Output circuit	CAN-Bus, LV (3.3 V) compatible ISO11898
Device profile	CANopen / CIA DS-301 V4.02 (Komm.) DS-406 V3.0 (encoder profile) DSP 305 V1.0 (LSS)
Interference immunity	DIN EN 61000-6-2
Emitted interference	DIN EN 61000-6-4

Technical data - mechanical design

Shaft	$\varnothing 30$ mm hollow shaft
Protection DIN EN 60529	IP 67
Operating speed	≤ 6000 rpm
Operating temperature	-40...+85 °C
Resistance	DIN EN 60068-2-6 Vibration 30 g, 10-2000 Hz DIN EN 60068-2-27 Shock 500 g, 6 ms
Axial tolerance	± 1 mm (rotor/head)
Radial tolerance	0.1...1 mm (rotor/head)
Connection	Connector M12 Cable 1 m

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Terminal assignment

CANopen without incremental

with connector M12, 5-pin or cable

Connec.	Core color	Signals	Description
Pin 1	white	Pin1: n.c./0 V	Voltage supply
Pin 2	brown	+Vs	Voltage supply
Pin 3	grey	CAN_GND/0 V	CAN Ground
Pin 4	green	CAN_H	Bus (dominant HIGH)
Pin 5	yellow	CAN_L	Bus (dominant LOW)



Screen: connected to housing
Cable: PUR 4 x 2 x 0.14 mm², 1 m / $\varnothing 3$ mm
Bending rad.: R ≥ 49 mm

CANopen with incremental

with connector M12, 8-pin or cable

Connec.	Core color	Signals	Description
Pin 1	white	CAN_GND/0 V	CAN Ground
Pin 2	brown	+Vs	Voltage supply
Pin 3	green	CAN_H	Bus (dominant HIGH)
Pin 4	yellow	CAN_L	Bus (dominant LOW)
Pin 5	grey	CHA	Incremental
Pin 6	pink	CHA inv.	Incremental
Pin 7	blue	CHB	Incremental
Pin 8	red	CHB inv.	Incremental



Screen: connected to housing
Cable: PUR 4 x 2 x 0.14 mm², 1 m / $\varnothing 3$ mm
Bending rad.: R ≥ 49 mm

Please use cores twisted in pairs (for example data+ / data-) for extension cables of more than 10 m length.

SSI without incremental

with connector M12, 8-pin or cable

Connec.	Core color	Signals	Description
Pin 1	white	0 V	Voltage supply
Pin 2	brown	+Vs	Voltage supply
Pin 3	green	Clock+	Clock signal
Pin 4	yellow	Clock-	Clock signal
Pin 5	grey	Data+	Data signal
Pin 6	pink	Data-	Data signal
Pin 7	blue	Zero	Zero setting
Pin 8	red	DIR	Rotating direction



Screen: connected to housing
Cable: PUR 4 x 2 x 0.14 mm², 1 m / $\varnothing 3$ mm
Bending rad.: R ≥ 49 mm

SSI with incremental

with connector M12, 12-pin or cable

Connec.	Core color	Signals	Description
Pin 1	brown	+Vs	Voltage supply
Pin 2	blue	Zero	Zero setting
Pin 3	white	0 V	Voltage supply
Pin 4	green	Clock+	Clock signal
Pin 5	pink	Data-	Data signal
Pin 6	yellow	Clock-	Clock signal
Pin 7	black	CHA	Incremental
Pin 8	grey	Data+	Data signal
Pin 9	red	DIR	Rotating direction
Pin 10	violet	CHA inv.	Incremental
Pin 11	grey/pink	CHB	Incremental
Pin 12	red/blue	CHB inv.	Incremental



Screen: connected to housing
Cable: PUR 6 x 2 x 0.14 mm², 1 m / $\varnothing 6$ mm
Bending rad.: R ≥ 57 mm

Please use cores twisted in pairs (for example data+ / data-) for extension cables of more than 10 m length.

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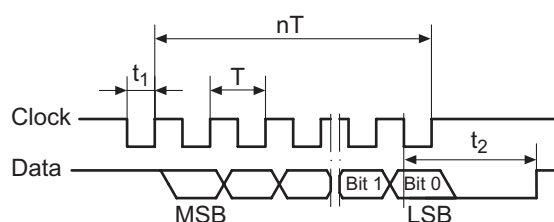
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Terminal significance

+Vs	Encoder supply voltage.
0 V	Encoder ground connection relating to +Vs.
Data+	Positive, serial data output of differential linedriver.
Data-	Negative, serial data output of differential linedriver.
Clock+	Positive SSI clock input. Clock+ together with Clock- forms a current loop.
Clock-	Negative SSI clock input. Clock- together with Clock+ forms a current loop.
Zero	Input for setting a zero point anywhere within the encoder resolution. The zero setting operation is triggered by a High impulse after the rotation direction selection (DIR). Connect to 0 V after setting operation for maximum interference immunity. Pulse duration >100 ms Level HIGH >0.7 x (+Vs) Level LOW <0.3 x (+Vs) (4.5 V \leq (+Vs) \leq 30 V)
DIR	UP/DOWN counting direction input. This input is standard on High. DIR HIGH means ascending output data with clockwise shaft rotation when looking at flange. Level HIGH >0.7 x (+Vs) Level LOW <0.3 x (+Vs) (4.5 V \leq (+Vs) \leq 30 V)
DATAVALID	Diagnostic output upon request.

Data transfer



$$T = 0.5 \dots 10 \mu\text{s}$$

$$t_1 = 0.25 \dots 5 \mu\text{s}$$

$$t_2 \leq 30 \mu\text{s}$$

Clock frequency (f) max. 2 MHz

LED functional display

SSI

LED	Description
Green*	<ul style="list-style-type: none"> Voltage supply is present Encoder is operational
Red	Error / possible causes <ul style="list-style-type: none"> Rotor not present, not correctly mounted or damaged Mounting tolerances not respected Internal error Out of operating temperature

CANopen

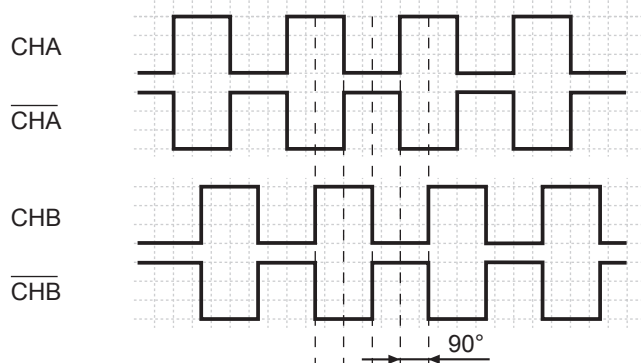
LED	Description
Green* **	<ul style="list-style-type: none"> Voltage supply is present Encoder is in the OPERATIONAL state
Red	Error / possible causes <ul style="list-style-type: none"> Rotor not present, not correctly mounted or damaged Mounting tolerances not respected Internal error Out of operating temperature
Green flickering**	<ul style="list-style-type: none"> AutoBaud/LSS Auto Baudrate detection in progress or LSS services in progress
Green single flash**	<ul style="list-style-type: none"> The device is in the STOPPED state
Green blinking**	<ul style="list-style-type: none"> The device is in the PREOPERATIONAL state

* While the hole rotation the LED must be green

** CAN RUN LED according to CiA DR-303-3

Output signals

Version with additional square wave signals HTL or RS422 at rotating direction cw



Subject to modification in technic and design. Errors and omissions excepted.

