

TECHNICAL DATASHEET

Ex Absolute Encoders AX 70 / 71



Version AX70 - Aluminum



Version AX71 - Stainless Steel

- ATEX certification for gas and dust explosion proof
- Same electrical performance as ACURO industry
- Protection class up to IP67
- Diameter only 70 mm
- Robust design
- Also available with marine grade stainless steel
- Resolution up to 34 Bit (22 Bit ST, 12 Bit MT)
- Applications: enamelling production line, petro chemistry, bottling machines, mixers, silo works, mills
- Interfaces: SSI / BiSS, SSI programmable, Profibus, CANopen, DeviceNet

ACURO®
industry



ATEX



DeviceNet

CANopen



EX-CLASSIFICATION

The absolute shaft encoder line ACURO is available in explosion proof design with explosion proof enclosure under AX70 and AX71 (stainless steel).

The PTB has assured with the **EC-TYPE-Examination Certificate PTB 10 ATEX 1036 X** that the AX70/71 meets the requirements of safety and health according to EN IEC 60079-0:2018+AC:2020; EN 60079-1:2014+AC:2018 and EN 60079-31:2014.

Therefore it is approved in explosive areas, code:

**"Ex II 2 G Ex db IIC T6 Gb and Ex II 2 D Ex tb IIIC T85°C Db" and
"Ex II 2 G Ex db IIC T4 Gb and Ex II 2 D Ex tb IIIC T135°C Db"**

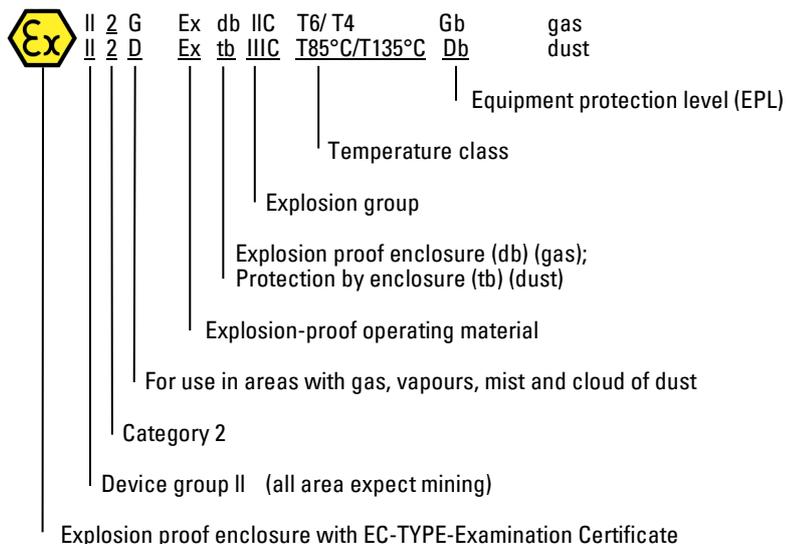
Additionally the encoder is certified according the IECEx standards IEC 60079-0:2017; IEC 60079-1:2014 and IEC 60079-31:2022. Assured according **IECEx PTB 12.0002X** certification.

As well as assured with **ETL 4007103** according UL 60079-0:2009 Ed.5+R:08Dec2009 and UL 60079-1:2015 Ed.7+R:23Jan2020 as well as CSA C22.2#60079-0:2011 Ed.2 and CSA C22.2#60079-1:2011 Ed.2 for the American market, for use in: Class I, Zone 1, AEx d IIC T4 Gb, Ambient Temperature Range: -40°C to +60°C.

And also assured with **CNA-C23-01:2019** according to GB 12476.1-2013; GB 12476.5-2013; GB 3836.1-2010; GB 3836.2-2010 for the Chinese Market.

Marking: Ex d IIC T6/T4 GB; Ex tD A21 IP6X T85°C/T135°C

For applications that require halogen-free cables or customer-specific modifications, special versions can be requested.



T6 = Highest permissible surface temperature +85°C
 T4 = Highest permissible surface temperature +135°C
 T3 = Highest permissible surface temperature +200°C

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TECHNICAL DATA
Mechanical (for all interfaces)

Housing diameter	70 mm
Shaft diameter	10 mm (solid shaft)
Flange (Mounting of housing)	Clamping flange, fastening screw thread 3x M6x12
Protection class housing ¹ (EN 60529/ A1:2000-02)	T4: IP65 or IP67 T6: IP65
Protection class shaft ¹ (EN 60529/ A1:2000-02)	T4: IP64 or IP67 T6: IP64
Starting torque typ.	< 1 Ncm
Moment of inertia	ca. 20 gcm ²
Max. shaft load	axial 40 N/ radial 100 N
Vibration resistance (IEC 68-2-6)	100 m/ s ² (10 - 500 Hz)
Shock resistance (IEC 68-2-27)	1000 m/ s ² (6 ms)
Operating temperature	Operating temperature correlating with Ex-requirements, please see following tab showing allowed ambient temperature in relation to different conditions
Storage temperature	-25°C ... +85°C
Material shaft	Stainless Steel
Material housing	Aluminum (AX70); Stainless Steel (AX71)
Weight	AX70: approx. 1,4 kg; AX71: approx. 4,8 kg
Connection	Cable, axial or radial

¹ no standing water allowed at the shaft entrance or cable entrance or at the ball bearing.

Interface	Protection class	Max. speed	Ambient temperature	Temperature class
SSI / BiSS	IP64	1000 rpm	-40 °C ... +60 °C	T6
		10000 rpm	-40 °C ... +40 °C	T6
		10000 rpm	-40 °C ... +60 °C	T4
	IP67	1000 rpm	-40 °C ... +60 °C	T6
		6000 rpm	-40 °C ... +60 °C	T4
		10000 rpm	-40 °C ... +55 °C	T4
Profibus CANopen DeviceNet SSI-P	IP64	1000 rpm	-40 °C ... +60 °C	T6
		6000 rpm	-40 °C ... +50 °C	T6
		10000 rpm	-40 °C ... +60 °C	T4
	IP67	1000 rpm	-40 °C ... +55 °C	T6
		3000 rpm	-40 °C ... +40 °C	T6
		6000 rpm	-40 °C ... +60 °C	T4
		10000 rpm	-40 °C ... +40 °C	T4

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TECHNICAL DATA

Electrical

**Profibus;
CANopen;
DeviceNet**

	Profibus	CANopen	DeviceNet
Supply voltage	DC 10-30 V	DC 10-30 V	DC 10-30 V
Current consumption	220 mA (ST) / 250 mA (MT)	max.250 mA (ST / MT)	220 mA (ST) / 250 mA (MT)
Profile/ Protocol	Profibus DP with encoder profile CLASS C2 (parameterizable)	CANopen according DS 301 with encoder profile DSP 406	DeviceNet according to Rev. 2.0, programmable encoder
Output code	Binary	Binary	Binary
Resolution singleturn	10 - 16 Bit	10 - 16 Bit	10 - 14 Bit
Resolution multiturn	12 Bit	12 Bit	12 Bit
Baud rate	is automatically set within a range of 9.6 Kbit/s through 12Mbit/s	set via bus within a range of 10 to 1000 Kbit/s (Standard setting for baud rate is 800 Kbit/s ex works)	Baud rate is = 500 Kbaud
Bus terminating resistor	External mounting	External mounting	Activated
Device address	Set via Bus	-	-
Node ID	-	Set via Bus	-
MAC-ID	-	-	MAC-ID = 1
Integrated special functions	Speed, Acceleration, Operating time	Speed, Acceleration, rotary axis, Limit values, Operating time	-
Programmable	Resolution, Preset, Direction	Resolution, Preset, Direction	Resolution, Preset, Direction

TECHNICAL DATA

Electrical

**SSI / BiSS;
SSI programmable**

	SSI / BiSS	SSI programmable
Supply voltage	DC 10-30 V	DC 10-30 V
Current consumption	220 mA (ST) / 250 mA (MT)	max. 250 mA (ST / MT)
Lines/ Drivers	Clock and Data RS422	clock and data RS422
Output code	Binary or Gray	Binary or Gray
Resolution singleturn	10 - 22 Bit	10 - 17 Bit
Resolution multiturn	12 Bit	12 Bit
Programmable (with WIN SSI)	-	Resolution, Code type, Direction, Output format, Warning, Alarm, Preset values
Control input	Direction	Direction, Preset 1, Preset 2
Alarm output	Alarm bit	Alarm bit

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PIN ASSIGNMENT

Profibus; CANopen; DeviceNet

Color	Profibus	CANopen	DeviceNet
yellow	B in	CAN in+	CAN_H
green	A in	CAN in -	CAN_L
pink	B out	CAN out+	CAN_H
grey	A out	CAN out -	CAN_L
blue	GND1 (M5V ¹)	CAN GND in	DRAIN
brown	VCC1 (P5V ¹)	-	-
black	-	CAN GND out	DRAIN out
white 0,5 mm	UB in	UB in	UB in
brown 0,5 mm	0 V in	0 V in	0 V in
Screen	Screen connected to encoder housing		

¹used for power supply for an external bus termination resistor

PIN ASSIGNMENT

SSI / BiSS;
SSI programmable

Color	No.	SSI / BiSS	Color	No.	SSI programmable
white 0.5 mm	6	-	white 0.14 mm	6	RS232 RxD
brown 0.5 mm	5	-	brown 0.14 mm	5	RS232 TxD
green	10	$\overline{\text{Clock}}$	green	10	$\overline{\text{Clock}}$
yellow	9	Clock	yellow	9	Clock
grey	8	$\overline{\text{Data}}$	grey	8	$\overline{\text{Data}}$
pink	7	Data	pink	7	Data
blue	3	$\overline{\text{Direction}}$	blue	3	$\overline{\text{Direction}}$
black	4	0 V signal output	black	4	0 V signal output
red	1	-	red	1	Preset 1
violet	2	-	violet	2	Preset 2
brown 0.14 mm	11	0 V in	brown 0.5 mm	11	0 V in
white 0.14 mm	12	UB in	white 0.5 mm	12	UB in
Screen	Screen connected to the housing		Screen	Screen connected to the housing	

RECOMMENDED DATA TRANSFER RATE WITH SSI

(only SSI)

Lead length	Clock rate
< 50 m	< 400 kHz
< 100 m	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

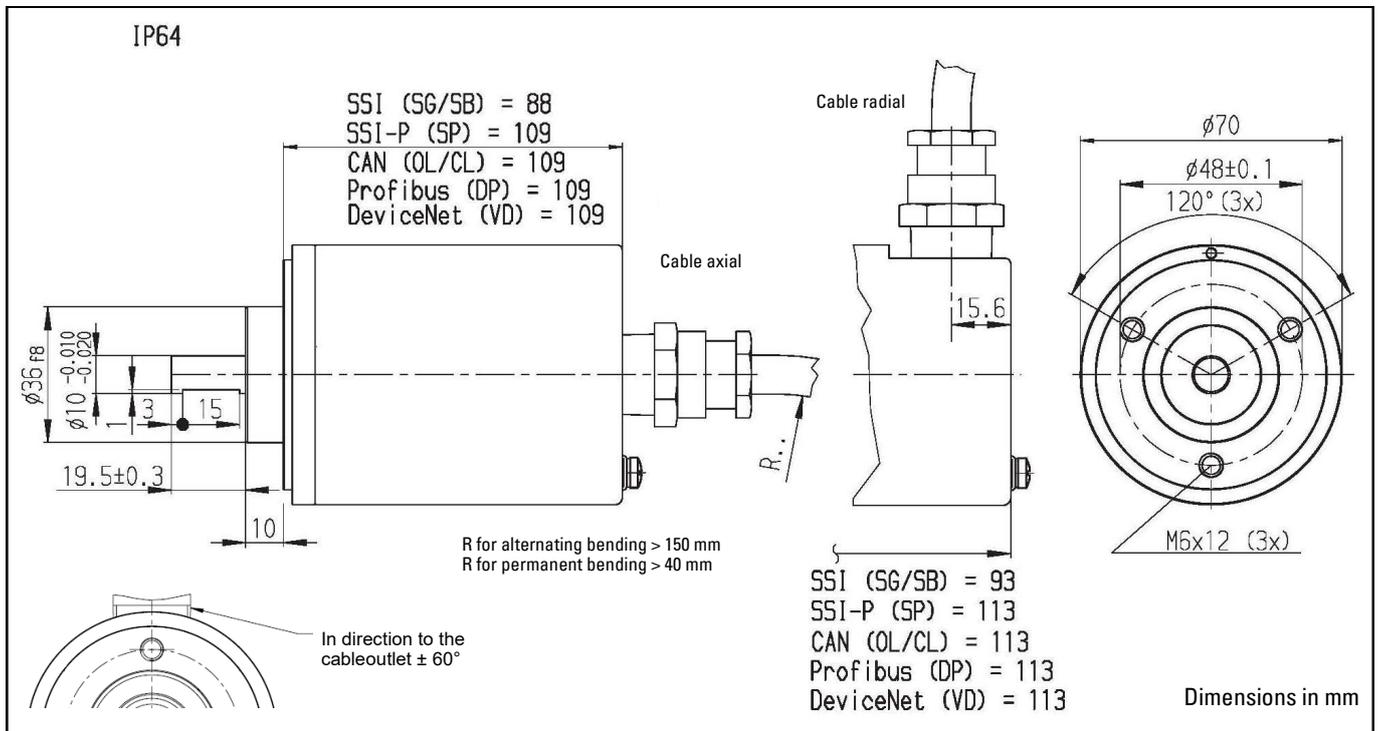
The max. data transfer rate depends on the cable length. For $\overline{\text{clock}}$ /clock and $\overline{\text{data}}$ /data please use twisted pairs. Use shielded cable.

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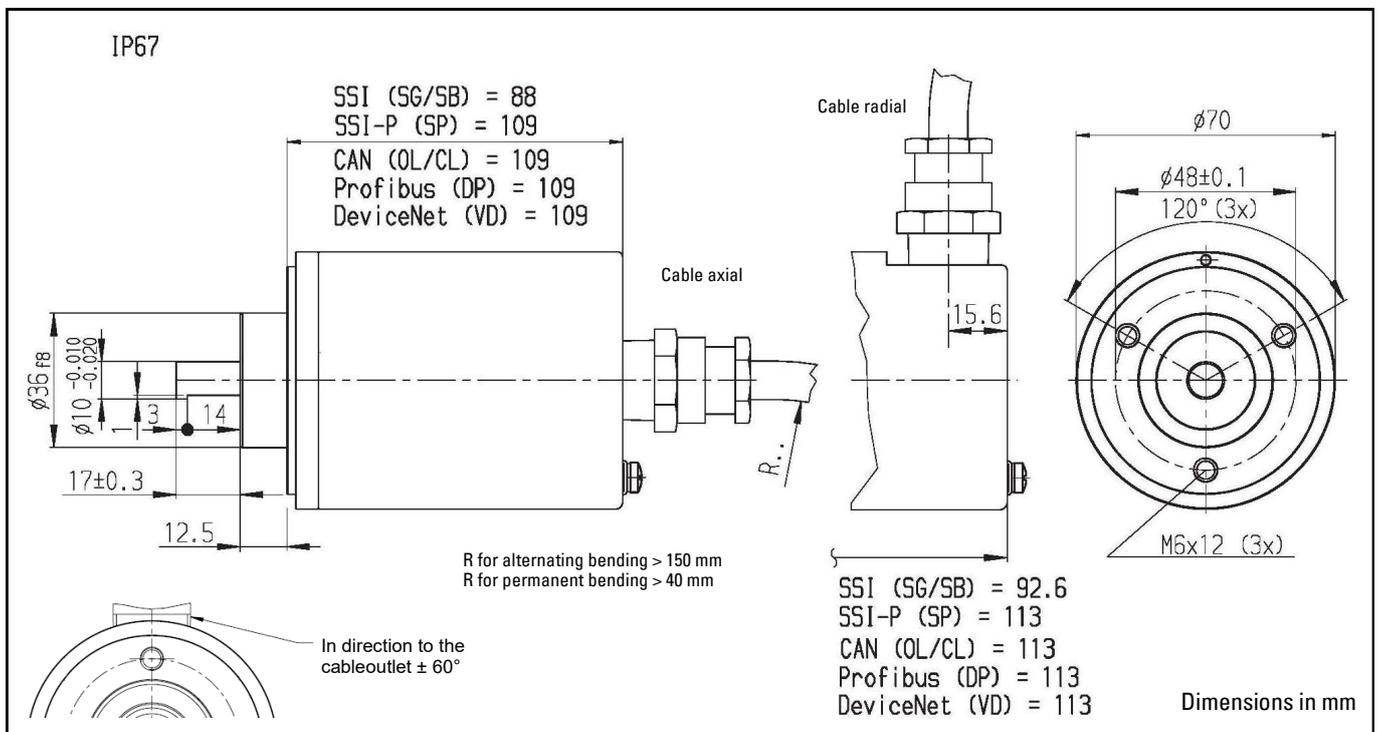
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DIMENSIONED DRAWINGS IP64



DIMENSIONED DRAWINGS IP67



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ORDERING INFORMATION SSI / BiSS

Type	Resolution ¹	Supply voltage	Flange, Protection, Shaft	Interface	Connection ⁵
<input type="checkbox"/> / <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AX70 Aluminum AX71 Stainless steel	0010 10 Bit ST 0012 12 Bit ST 0013 13 Bit ST 0014 14 Bit ST 0017 17 Bit ST 0019 19 Bit ST 0022 22 Bit ST 0360 360 Increments ST ² 0720 720 Increments ST ³ 1212 12 Bit MT+12 Bit ST 1213 12 Bit MT+13 Bit ST 1214 12 Bit MT+14 Bit ST 1217 12 Bit MT+17 Bit ST 1219 12 Bit MT+19 Bit ST 1222 12 Bit MT+22 Bit ST	E DC 10 - 30 V	K.42 Clamping, IP64, 10 mm K.72 Clamping, IP67, 10 mm ⁴	SG SSI Gray SB SSI Binary BI BiSS-B BE BiSS-C	A-F0 Cable axial, 5m B-F0 Cable radial, 5m

¹ When resolution > 14 Bit: max. clock frequency 178 kHz

² with Offset 76 (value range 76...435)

³ with Offset 152 (value range 152...871)

⁴ Dust explosion-proof certification (D) only for IP67

⁵ If longer cables are required, please see additional ordering information on page 8

ORDERING INFORMATION SSI programmable

Type	Resolution	Supply voltage	Flange, Protection, Shaft	Interface	Connection ²
<input type="checkbox"/> / <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AX70* Aluminum AX71 Stainless steel	0010 10 Bit ST 0012 12 Bit ST 0013 13 Bit ST 0014 14 Bit ST 0017 17 Bit ST 1212 12 Bit MT+12 Bit ST 1213 12 Bit MT+13 Bit ST 1214 12 Bit MT+14 Bit ST 1217 12 Bit MT+17 Bit ST higher resolutions on request	E DC 10 - 30 V	K.42 Clamping, IP64, 10 mm K.72 Clamping, IP67, 10 mm ¹	SP SSI programmable	A-F0 Cable axial, 5m B-F0 Cable radial, 5m

¹ Dust explosion-proof certification (D) only for IP67

² If longer cables are required, please see additional ordering information on page 8

* AX70 not available with connection code "B"

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ORDERING INFORMATION Profibus

Type	Resolution	Supply voltage	Flange, Protection, Shaft	Interface	Connection ²
<input type="checkbox"/> / <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AX70 * Aluminum AX71 Stainless steel	0010 10 Bit ST 0012 12 Bit ST 0013 13 Bit ST 0014 14 Bit ST 0016 16 Bit ST 1212 12 Bit MT+12 Bit ST 1213 12 Bit MT+13 Bit ST 1214 12 Bit MT+14 Bit ST 1216 12 Bit MT+16 Bit ST	E DC 10 - 30 V	K.42 Clamping, IP64, 10 mm K.72 Clamping, IP67, 10 mm ¹	DP Profibus	A-F0 Cable axial, 5m B-F0 Cable radial, 5m

¹ Dust explosion-proof certification (D) only for IP67

² If longer cables are required, please see additional ordering information on page 8

* AX70 not available with connection code "B"

ORDERING INFORMATION CANopen

Type	Resolution	Supply voltage	Flange, Protection, Shaft	Interface	Connection ²
<input type="checkbox"/> / <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AX70 * Aluminum AX71 Stainless steel	0010 10 Bit ST 0012 12 Bit ST 0013 13 Bit ST 0014 14 Bit ST 0016 16 Bit ST 1212 12 Bit MT+12 Bit ST 1213 12 Bit MT+13 Bit ST 1214 12 Bit MT+14 Bit ST	E DC 10 - 30 V	K.42 Clamping, IP64, 10 mm K.72 Clamping, IP67, 10 mm ¹	OL CANopen	A-F0 Cable axial, 5m B-F0 Cable radial, 5m

¹ Dust explosion-proof certification (D) only for IP67

² If longer cables are required, please see additional ordering information on page 8

* AX70 not available with connection code "B"

ORDERING INFORMATION DeviceNet

Type	Resolution	Supply voltage	Flange, Protection, Shaft	Interface	Connection ²
<input type="checkbox"/> / <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AX70 * Aluminum AX71 Stainless steel	0010 10 Bit ST 0012 12 Bit ST 0013 13 Bit ST 0014 14 Bit ST 0016 16 Bit ST 1212 12 Bit MT+12 Bit ST 1213 12 Bit MT+13 Bit ST 1214 12 Bit MT+14 Bit ST	E DC 10 - 30 V	K.42 Clamping, IP64, 10 mm K.72 Clamping, IP67, 10 mm ¹	VD DeviceNet	A-F0 Cable axial, 5m B-F0 Cable radial, 5m

¹ Dust explosion-proof certification (D) only for IP67

² If longer cables are required, please see additional ordering information on page 8

* AX70 not available with connection code "B"

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ORDERING INFORMATION Selection of cable length

(for all interfaces)

Versions with cable outlet (connection A, B, E or F) are available with various lengths of cable. To order your desired cable length, please add the respective code to the end of your ordering code. Further cable lengths on request.

Code	Cable length
-F0 / without code	5 m
-K0	10 m
-P0	15 m
-U0	20 m
-V0	25 m
-W0	30 m
-X0	40 m
-Y0	50 m

ACCESSORIES

TECHNICAL MANUAL

SOFTWARE

SSI programmable

Technical Manual German	2 565 287 (or homepage)
Technical Manual English	2 565 289 (or homepage)
Software Win SSI as download from our homepage	www.hengstler.de

Profibus

GSD-file as download from our homepage	www.hengstler.de
Technical Manual German	2 565 090 (or homepage)
Technical Manual English	2 565 255 (or homepage)

CANopen

EDS-file as download from our homepage	www.hengstler.de
Technical Manual German	2 565 250 (or homepage)
Technical Manual English	2 565 392 (or homepage)

DeviceNet

EDS-file as download from our homepage	www.hengstler.de
Technical Manual German	2 565 094 (or homepage)
Technical Manual English	2 565 256 (or homepage)

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