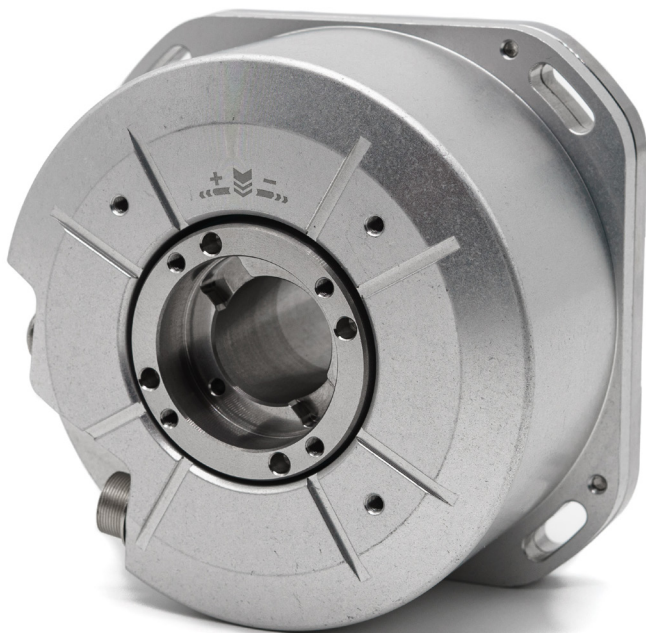


# AK90H

ABSOLUTE OPTICAL ANGLE ENCODER



ENCODER MANUAL

Absolute angle optical encoder AK90H is a high-end device that enables high accuracy angular measurement up to 5". Encoder design with integral bearings, hollow-through shaft and integrated stator coupling makes it ideal for demanding applications such as machine tools.

## COMPLETE DELIVERY SET

DESCRIPTION	QUANTITY, PCS.
<b>Standard:</b>	
Absolute optical angle encoder	1
Operating manual	1
<b>On option:</b>	
Connector: D9, D15, C17, B12	1
Removable cable	1
ORDER SEPARATELY	ORDER CODE
Ring nut	FAAA9RMA01
Fault exclusion washer	FAAA9GMA02
Mounting aid	FAAA9RMA03

## SPECIFICATIONS

SYSTEM SPECIFICATIONS	
Measuring standard	Glass scale with absolute track and incremental track (16 384 lines)
System accuracy <sup>1)</sup>	±5"



## MECHANICAL DATA

Mounting type <sup>1)</sup>	With ring nut (type H)	With shaft clamp (type P)
Shaft <sup>1)</sup>	hollow-through shaft 20 mm	hollow-through shaft 20 mm hollow-through shaft 22 mm
Moment of inertia	80 x 10 <sup>-6</sup> kgm <sup>2</sup>	85 x 10 <sup>-6</sup> kgm <sup>2</sup> (of 20 mm shaft) 80 x 10 <sup>-6</sup> kgm <sup>2</sup> (of 22 mm shaft)
Starting torque	≤ 0.01 Nm	≤ 0.01 Nm
Maximum mechanical speed		≤ 3000 rpm
Vibrations (55 Hz to 2000 Hz)		≤ 200 m/s <sup>2</sup>
Shock (6 ms)		≤ 200 m/s <sup>2</sup>
Operating temperature		0°C - 60°C
Storage temperature		-20°C - 60°C
Ingress Protection (EN 60529)		IP64
Mass (without cable)		~ 1 kg

## ELECTRICAL DATA

Electrical Interface <sup>1)</sup>	SSI	BISS-C
Resolution (positions per turn)	up to 26 bits (67 108 864 positions)	
Clock frequency	≤ 4 MHz	≤ 10 MHz
Calculation time	≤ 5 us	≤ 5 us
Additional output signals	1 Vpp: 16 384 pulses/turn	Optional <sup>2)</sup>
Cutoff frequency of incremental signals (-3 dB)	≥ 200 kHz	≥ 200 kHz

1) Select when ordering.

2) Contact the manufacturer.

## ELECTRICAL SPECIFICATIONS

Electrical connection<sup>1)</sup>:

Version S: standard cable outlet  
Version C: detachable cable outlet

Supply voltage<sup>1)</sup>:

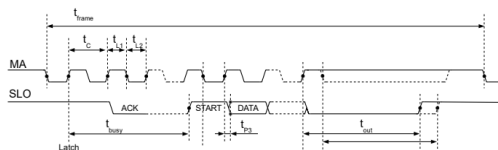
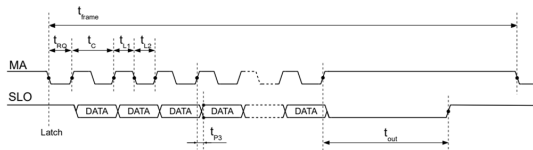
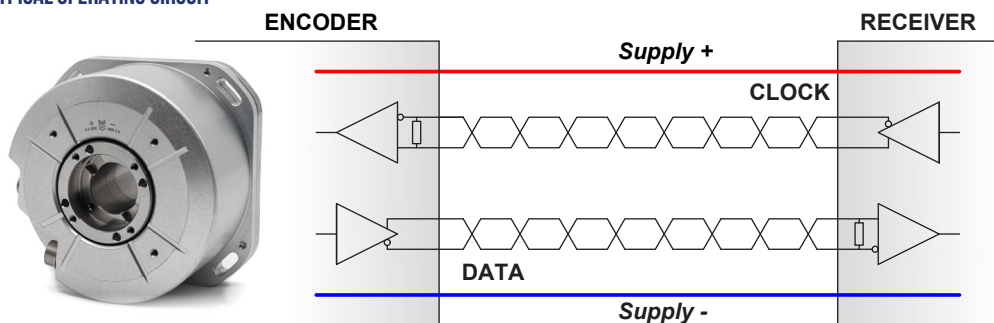
DC 5 V  
DC 10...30 V

Current consumption

Max 200 mA

1) Select when ordering.

## TYPICAL OPERATING CIRCUIT



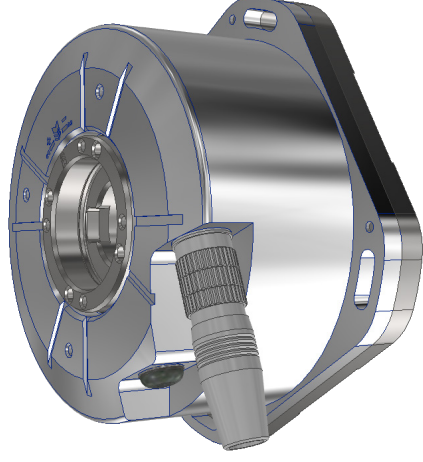
SYMBOL	PARAMETER	MIN	MAX	UNIT
tC	Permissible Clock Period	250		ns
tL1	Clock Signal Hi-Level Duration	125	tout	ns
tL2	Clock Signal Lo-Level Duration	125	tout	ns
tRQ	Request Time	500		ns
tP3	Output Propagation Delay		50	ns
tout	Slave Timeout	20	21	us
tFrame	Permissible Frame Repetition	tout+bit	indefinite	

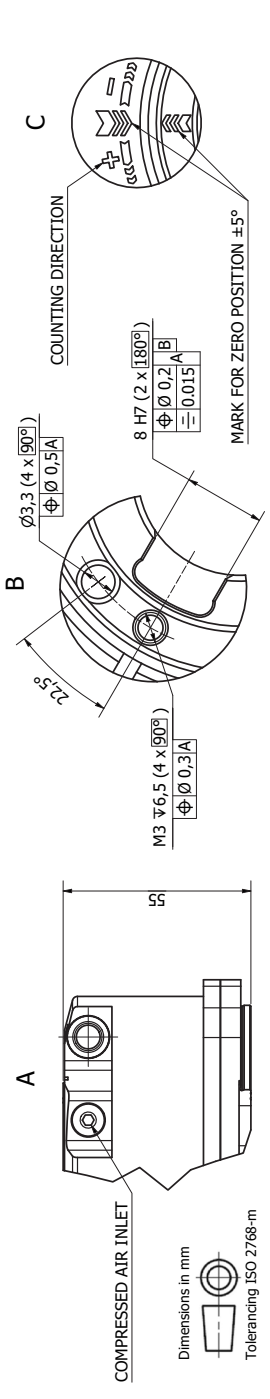
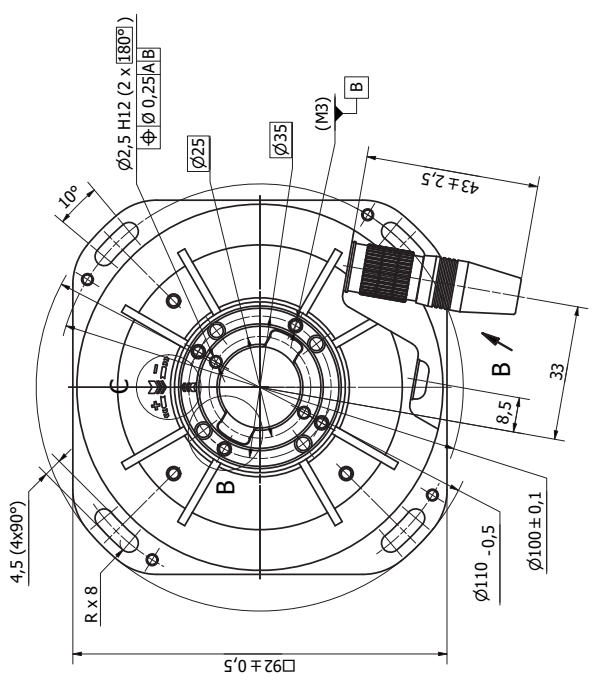
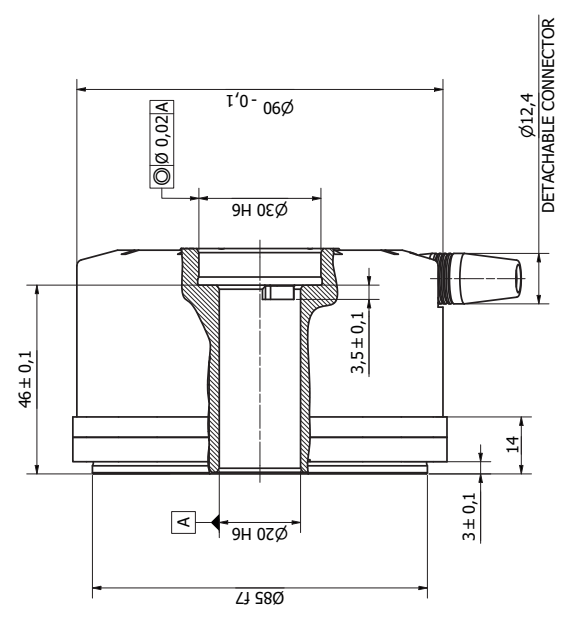
SYMBOL	PARAMETER	MIN	MAX	UNIT
tC	Permissible Clock Period	100		ns
tL1	Clock Signal Hi-Level Duration	40	tout	ns
tL2	Clock Signal Lo-Level Duration	40	tout	ns
tbusy	Minimum Data Output Delay		2tC	
tbusy	Maximum Data Output Delay		400	ns
tP3	Output Propagation Delay		50	ns
tout	Slave Timeout	0.16	21	us
tFrame	Permissible Frame Repetition	tout+bit	indefinite	

# AK90H TYPE H VERSION C

Type H absolute angle encoder is designed to be mounted onto the shaft of the application and be fastened with a ring nut or connected through the front-face threaded holes to the special mounting element. The optional fault exclusion methods could be used for the loosening of the mechanical connection.

Electrical connection outlet (version C) with a detachable cable with quick connector facilitates handling and makes the installation process more simple. It provides a possibility to disconnect the encoder or whole application from the communication cable lines of the facility.



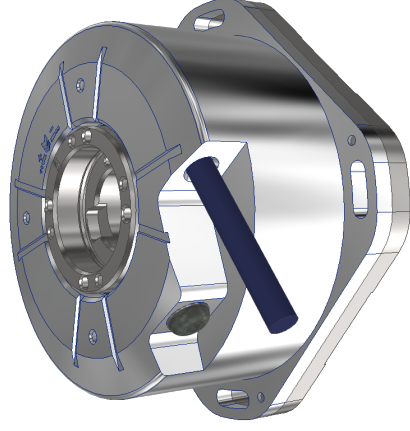


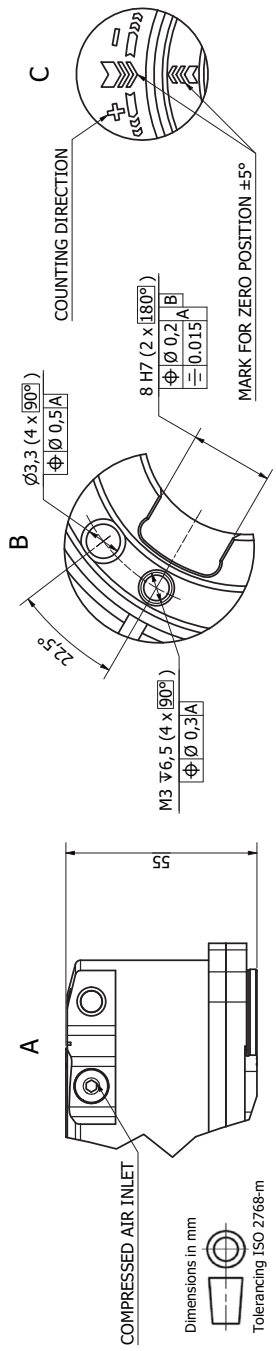
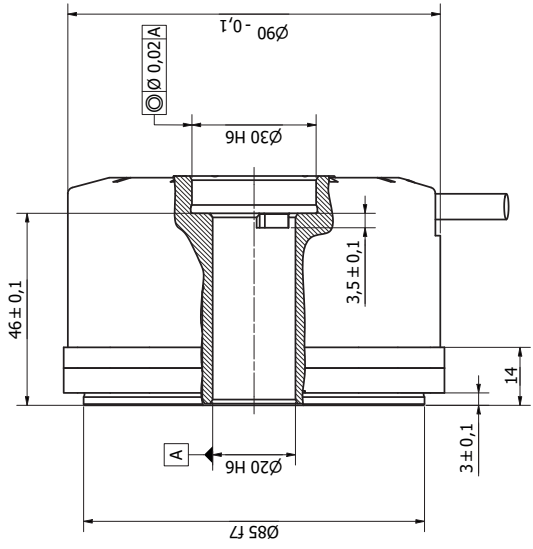
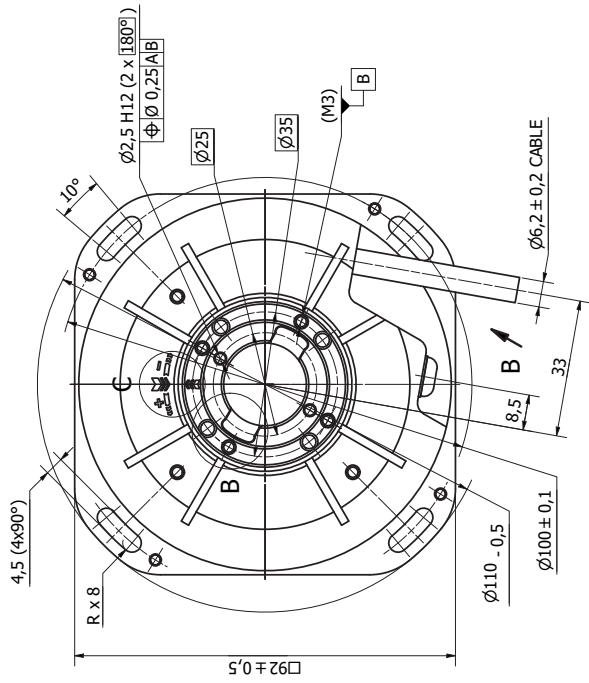
**MECHANICAL DIMENSIONS OF AK90H TYPE H VERSION C**

# AK90H TYPE H VERSION S

Type H absolute angle encoder is designed to be mounted onto the shaft of the application and be fastened with a ring nut or connected through the front-face threaded holes to the special mounting element. The optional fault exclusion methods could be used for the loosening of the mechanical connection.

Electrical encoder output (version S) with integrated cable removes additional connections and makes the encoder more reliable and requires less effort

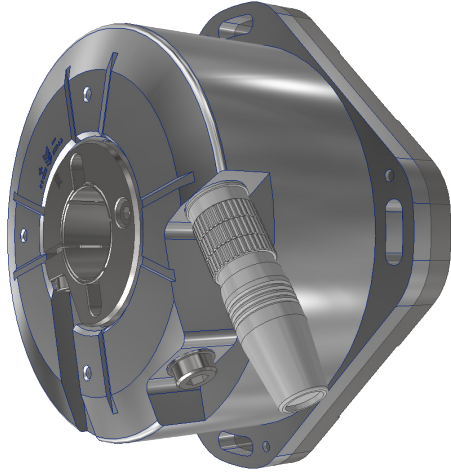




Dimensions in mm  
 Tolerancing ISO 2768-m

## MECHANICAL DIMENSIONS OF AK90H TYPE H VERSION S

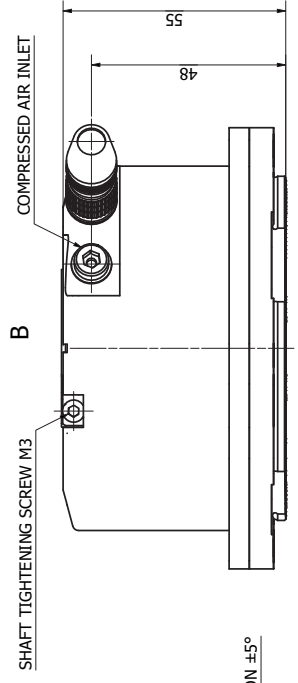
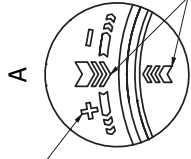
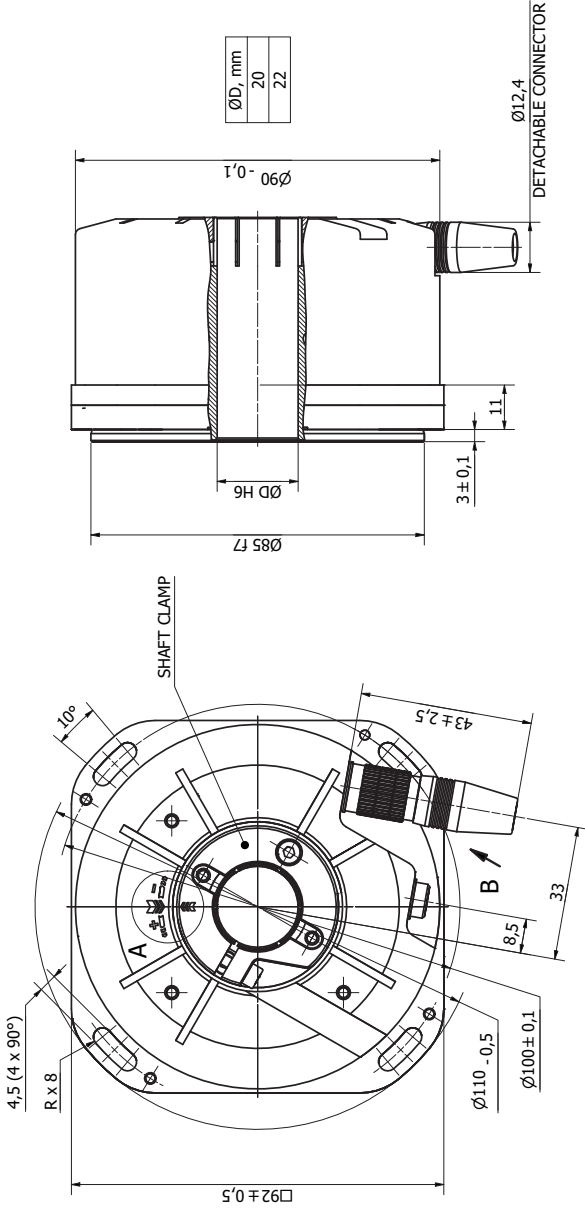
# AK90H TYPE P VERSION C



Mechanical design type P of the encoder is created to facilitate the application requirements as it does not require threaded application shaft. The encoder can be mounted straight onto the shaft and tightened by the clamp integrated in the encoder and requires no additional mounting accessories. The customer has the ability to choose between 20 mm or 22 mm hollow-through shaft options.

Electrical connection outlet (version C) with a detachable cable with quick connector facilitates handling and makes the installation process more simple. It provides a possibility to disconnect the encoder or whole application from the communication cable lines of the facility.



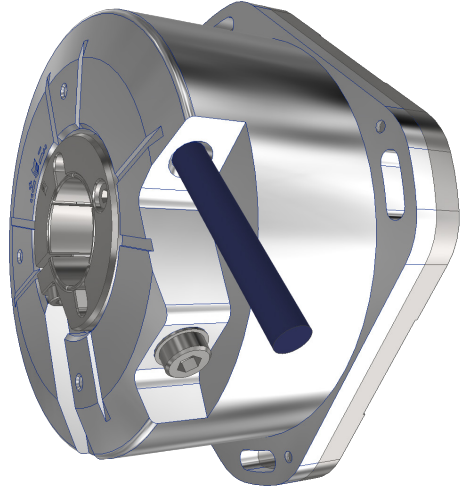


Dimensions in mm  
 Tolerancing ISO 2768-m

MARK FOR ZERO POSITION  $\pm 5^\circ$

**MECHANICAL DIMENSIONS OF AK90H TYPE P VERSION C**

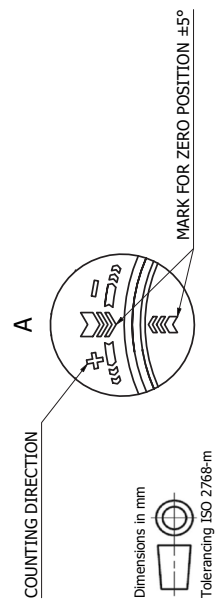
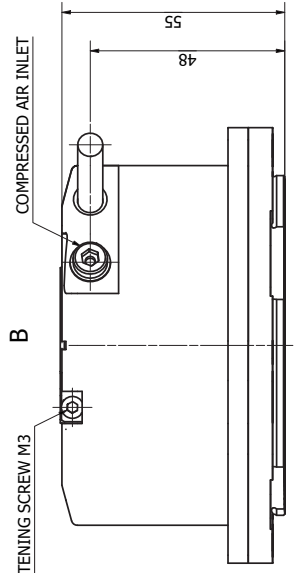
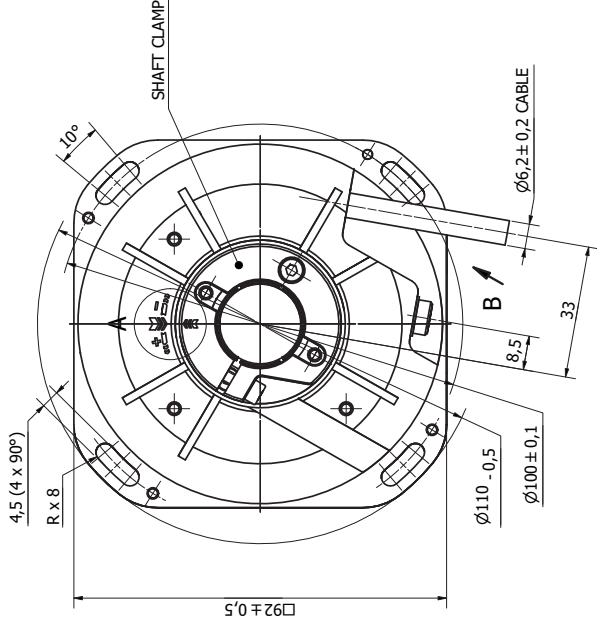
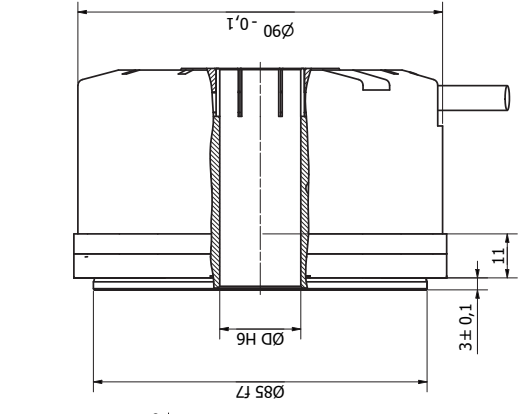
# AK90H TYPE P VERSION S



Mechanical design type P of the encoder is created to facilitate the application requirements as it does not require threaded application shaft. The encoder can be mounted straight onto the shaft and tightened by the clamp integrated in the encoder and requires no additional mounting accessories. The customer has the ability to choose between 20 mm or 22 mm hollow-through shaft options.

Electrical encoder output (version S) with integrated cable removes additional connections and makes the encoder more reliable and requires less effort

$\varnothing D$ , mm
20
22



**MECHANICAL DIMENSIONS OF AK90H TYPE P VERSION C**

# STORAGE AND HANDLING

IMPORTANT: the encoder is a precision device and requires appropriate means of storage and handling



Device transportation, handling and integration procedures must be performed in accordance with ESD requirements in order to avoid damage to the circuit. Do NOT touch electric circuits, connectors, wires or optical sensors without suitable ESD protection.

Do NOT use any unnecessary tools, handle carefully to avoid damage to the location faces when unpacking and installing.

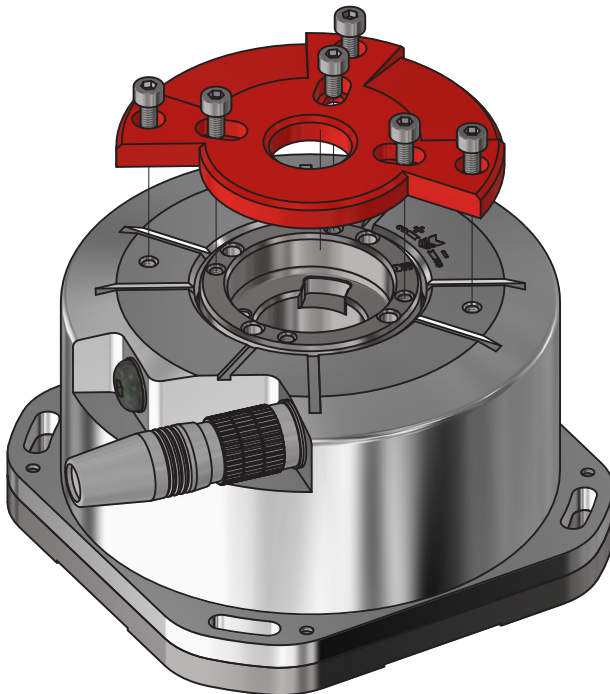


Make sure that the power supply is turned OFF before connecting the encoder.

# INSTRUCTIONS FOR MOUNTING

Warning! The encoder is precision device and requires careful handling and keeping of described below mounting order.

1. The base surfaces of object must be prepared according to drawing requirements (see drawings in the following pages). Special attention must be taken to shaft surface  $\text{ØDg7}$ , radial and axial motion of shaft. The shaft surface must be without tears and sharp edges.
2. Unpack encoder and make sure that it does not have outside damages, dents, shock traces.
3. Unscrew five (type P) or six (type H) screws M3 and remove transportation flange, thus releasing the coupling of encoder.



**REMOVING OF TRANSPORTATION FLANGE**

# MOUNTING AK90H TYPE H

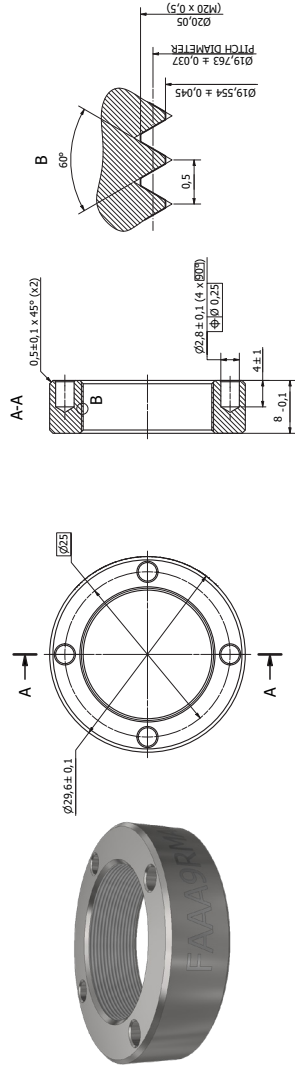
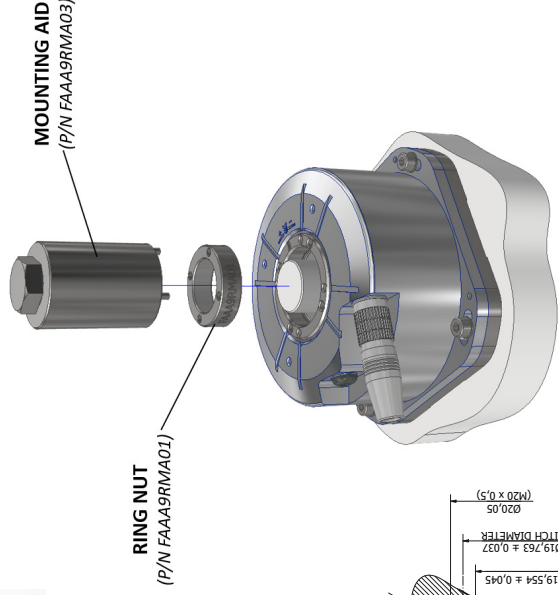
## SHAFT COUPLING WITH RING NUT

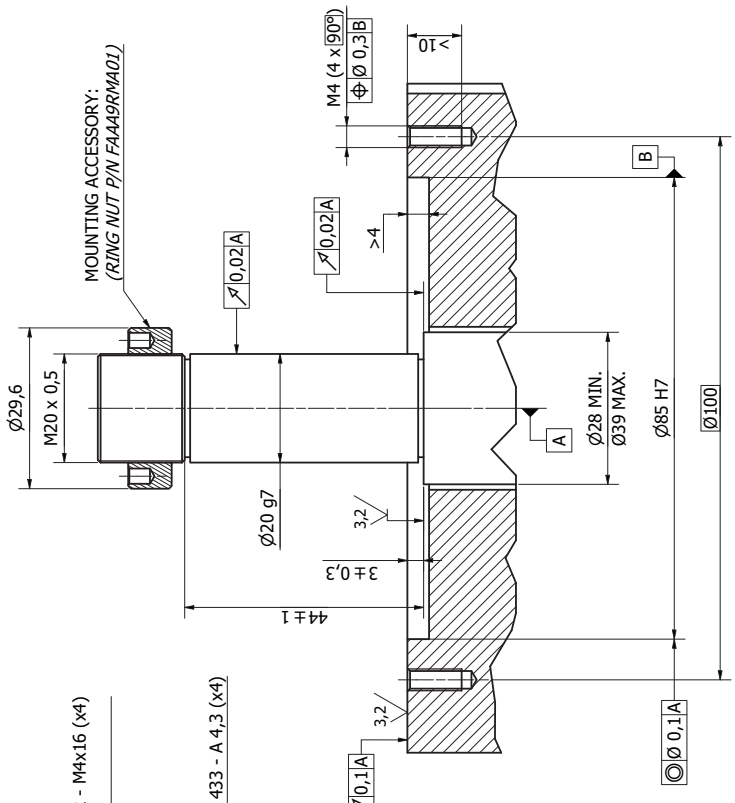
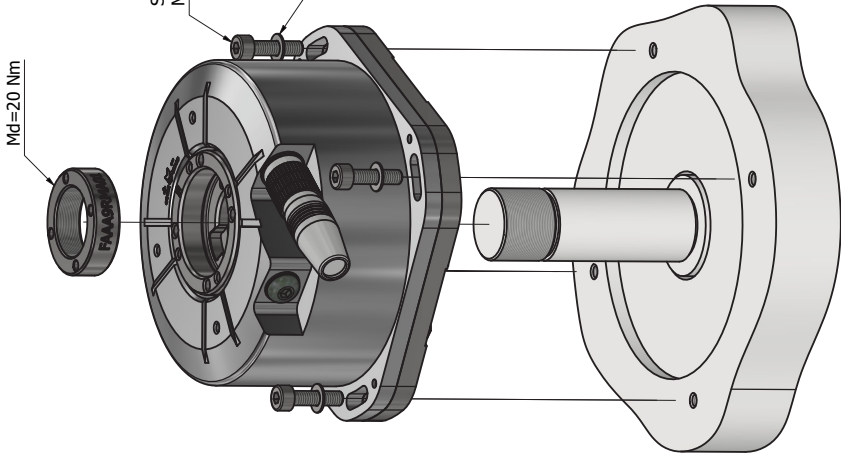
4. Mounting procedure must be performed according to the drawing below.

4.1. Mount encoder on an object shaft. The object shaft  $\varnothing 20$  g7 must penetrate the hole  $\varnothing 20$  H6 of the encoder without a wedge and without making scratches on the cylindrical shaft surface.

4.2. Fix the stator of the encoder by means of four M4 screws.

4.3. Tighten the shaft of object by screwing the ring nut (not included in the delivery set). The ring nut can be easily tightened by using the mounting aid accessory.





**AK90H TYPE H MOUNTING: SHAFT COUPLING WITH RING NUT**

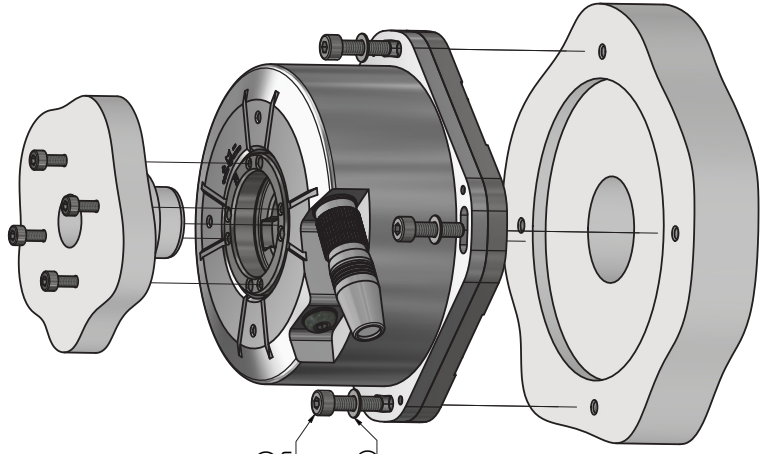
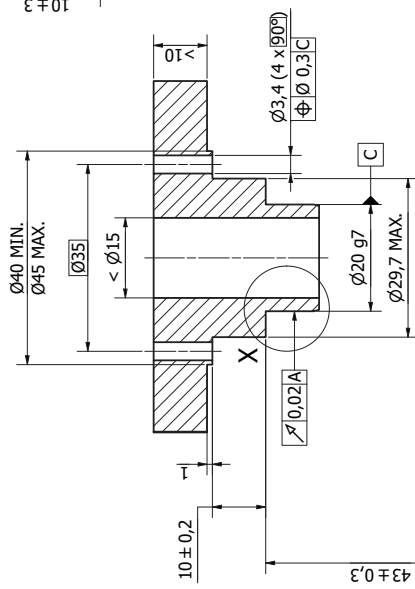
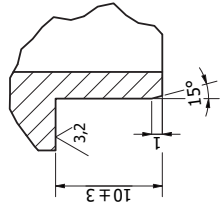
# MOUNTING AK90H TYPE H

## FRONT-FACE SHAFT COUPLING

4. Mounting procedure must be performed according to the drawing below.
  - 4.1. Insert the encoder into the mounting place of the application via an encoder flange and centering collar Ø87 f7.
  - 4.2. Fix the stator of the encoder by means of four M4 screws.
  - 4.3. Connect the hollow shaft through the front-face threaded holes by means of special mounting element of the application. Use the inside hole Ø20 H6 and plane surface of the hollow shaft of the front-face shaft coupling.

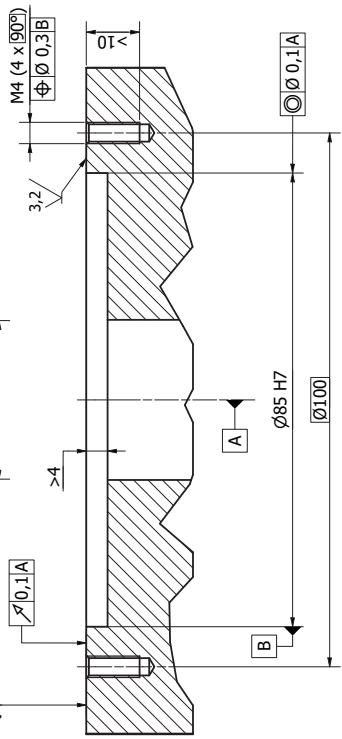


X



SCREW DIN 912 - M4x16 (x4)  
Md=2,5 Nm

WASHER DIN 433 - A 4,3 (x4)



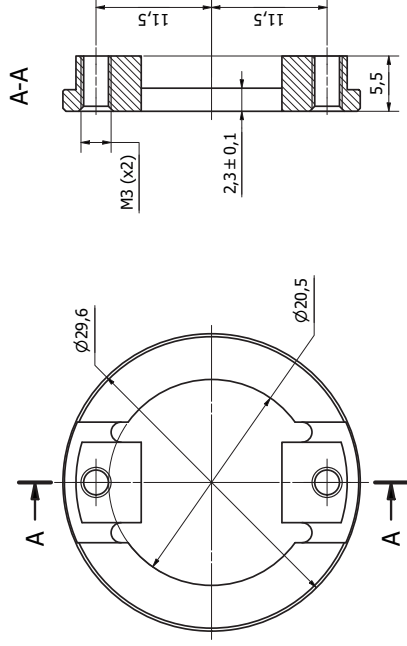
**AK90 TYPE H: MOUNTING FRONT-FACE SHAFT COUPLING**

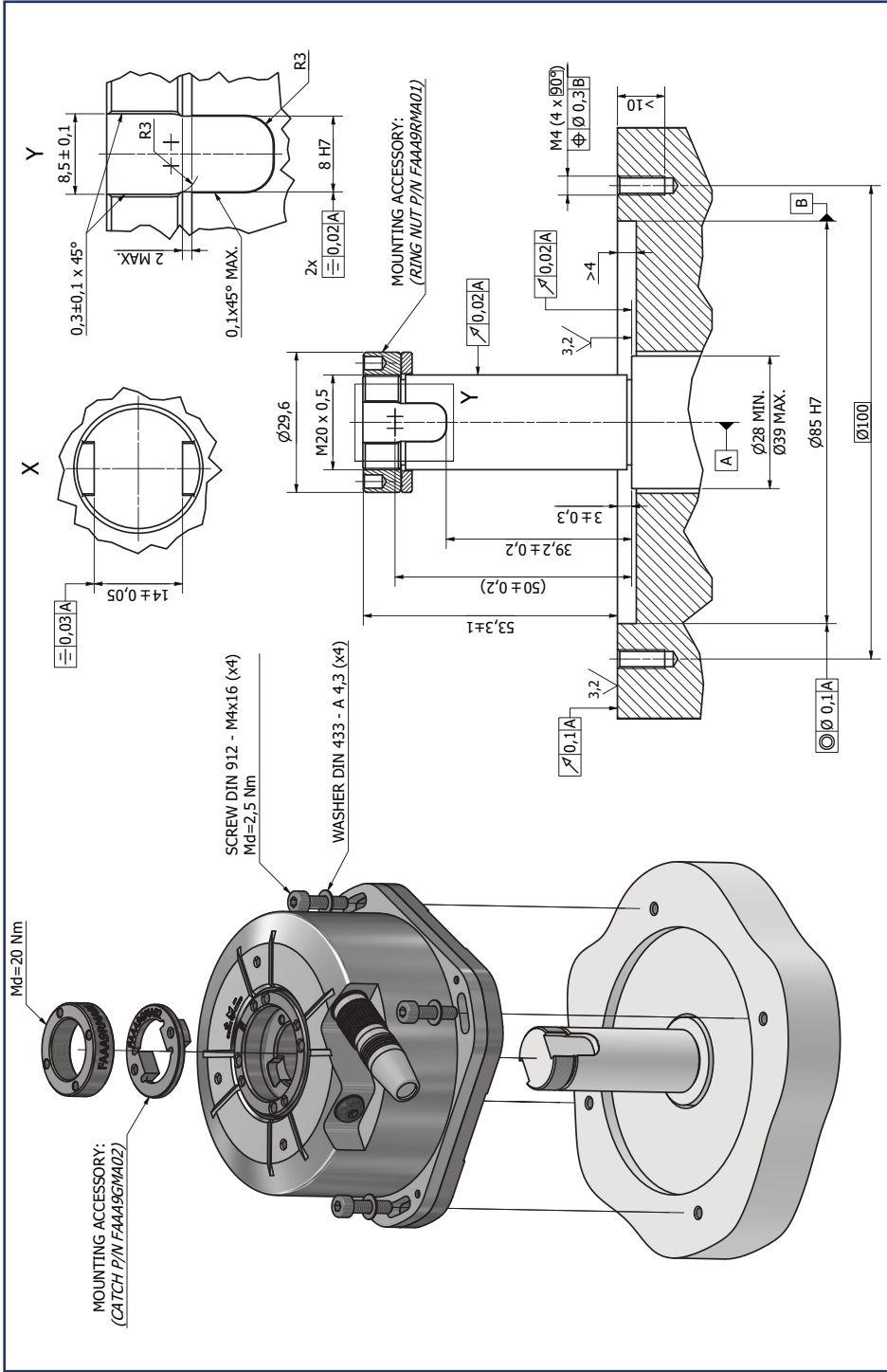
# MOUNTING AK90H TYPE H

## SHAFT COUPLING WITH RING NUT AND MECHANICAL FAULT EXCLUSION WASHER

4. Mounting procedure must be performed according to the drawing below.

- 4.1. Mount encoder on the object shaft. The object shaft  $\text{Ø}20\text{ g7}$  must penetrate the hole  $\text{Ø}20\text{ H6}$  of the encoder without a wedge and without making scratches on the cylindrical shaft surface.
- 4.2. Fix the stator of the encoder by means of four M4 screws.
- 4.3. Align the special milled features of the encoder and application shafts.
- 4.4. Insert fault exclusion washer into its place. Correctly attached washer has contact with shafts of both the encoder and the application, and restricts the relative motion between them.
- 4.5. Tighten the shaft of object by screwing the ring nut (not included in the delivery set). The ring nut can be easily tightened by using the mounting aid accessory.





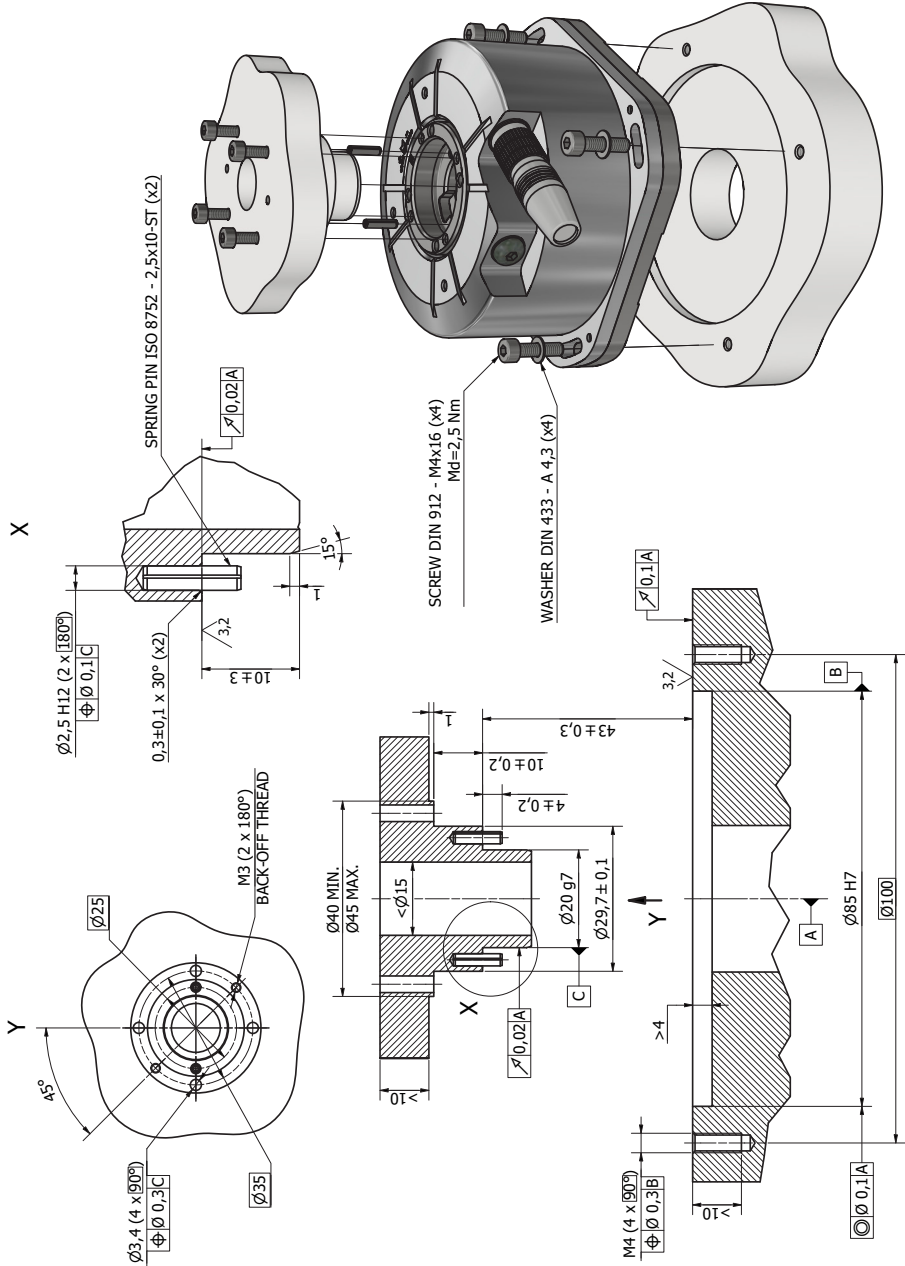
**AK90H TYPE H MOUNTING: SHAFT COUPLING WITH RING NUT AND MECHANICAL FAULT EXCLUSION WASHER**

# MOUNTING AK90H TYPE H

## FRONT-FACE SHAFT COUPLING WITH MECHANICAL FAULT EXCLUSION PINS


4. Mounting procedure must be performed according to the drawing below.
- 4.1. Insert the encoder into the mounting place of the application via an encoder flange and centering collar Ø87 f7.
- 4.2. Fix the stator of the encoder by means of four M4 screws.
- 4.3. Connect the hollow shaft through the front-face threaded holes by means of special mounting element of the application. Use the inside hole Ø20 H6 and plane surface of the hollow shaft of the front-face shaft coupling.

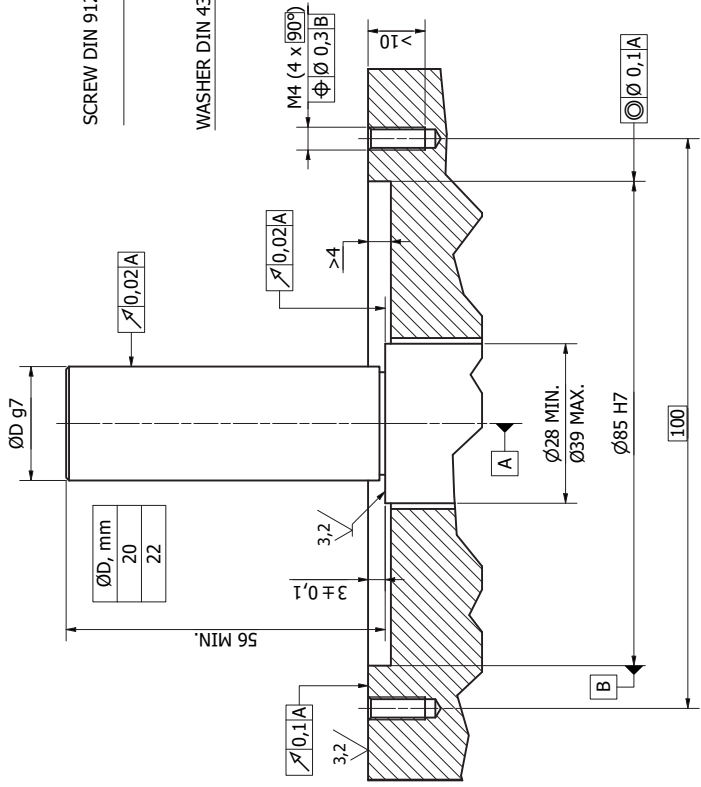
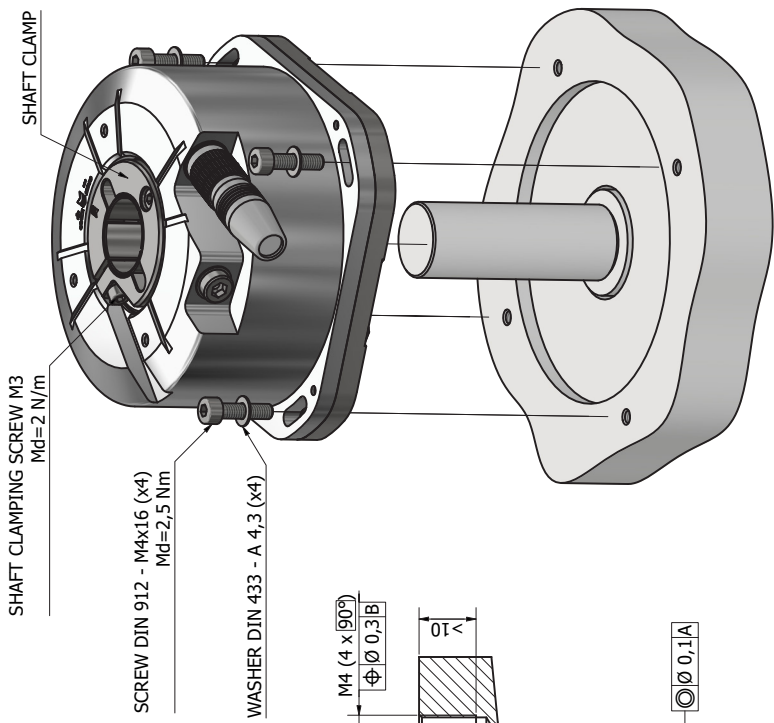
# AK90H TYPE H MOUNTING: FRONT-FACE SHAFT COUPLING WITH MECHANICAL FAULT EXCLUSION PINS



# MOUNTING AK90H TYPE P

## SHAFT COUPLING WITH CLAMP

- 
4. Mounting procedure must be performed according to the drawing below.
  - 4.1. Release the shaft clamp unscrewing by 2-3 turns the screw M3 of the clamp.
  - 4.2. Mount the encoder on the object shaft carefully. The shaft of object  $\text{ØD g7}$  must penetrate a hole  $\text{ØD H6}$  without a wedge and without making scratches on the shaft surface.
  - 4.3. Fix the stator of the encoder by means of four screws M4.
  - 4.4. Fix the shaft of object by tightening the screw M3 of the clamp.



AK90H TYPE P MOUNTING: SHAFT COUPLING WITH CLAMP

# ELECTRICAL CONNECTION



ROUND CONNECTOR C17T, MALE



FLAT CONNECTOR D9/D15, MALE



ROUND CONNECTOR B12, MALE

## ROUND CONNECTOR C17T, MALE

### SSI + 1Vpp INTERFACE

Signal	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-	+5V	0V	Sensor +5V	Sensor 0V	Shield
Color of cable wire	Pink	Grey	White	Brown	Green	Yellow	Blue - Red	Brown - Green	Red	Blue	Black	Violet	Connector housing
C17T	15	16	12	13	14	17	8	9	7	10	1	4	11

### BISS C INTERFACE

Signal	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-	+5V	0V	Sensor +5V	Sensor 0V	Shield
Color of cable wire	Pink	Grey	White	Brown	Green	Yellow	Blue - Red	Brown - Green	Red	Blue	Black	Violet	Connector housing
C17T	-	-	-	-	14	17	8	9	7	10	1	4	11

## FLAT CONNECTOR D9/D15, MALE

### SSI + 1Vpp INTERFACE

Signal	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-	+5V	0V	Sensor +5V	Sensor 0V	Shield
Color of cable wire	Pink	Grey	White	Brown	Green	Yellow	Blue - Red	Brown - Green	Red	Blue	Black	Violet	Connector housing
D9	-	-	-	-	7	8	2	3	4	6	-	-	-
D15 (3 rows)	1	2	3	4	5	6	7	8	9	11	10	12	-

### BISS C INTERFACE

Signal	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-	+5V	0V	Sensor +5V	Sensor 0V	Shield
Color of cable wire	Pink	Grey	White	Brown	Green	Yellow	Blue - Red	Brown - Green	Red	Blue	Black	Violet	Connector housing
D9	-	-	-	-	7	8	2	3	4	6	-	-	-
D15 (3 rows)	1	2	3	4	5	6	7	8	9	11	10	12	-

## ROUND CONNECTOR B12, MALE

### SSI + 1Vpp INTERFACE

Signal	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-	+5V	0V	Sensor +5V	Sensor 0V	Shield
Color of cable wire	Pink	Grey	White	Brown	Green	Yellow	Blue - Red	Brown - Green	Red	Blue	Black	Violet	Connector housing
B12	E	D	G	F	K	A	C	L	J	B	-	-	M



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## MORE INFORMATION



You can find more information about Precizika Metrology encoder products on the official website: [precizika.com/products](https://precizika.com/products)

For more information about optical glass grating products refer to: [precisionportal.eu](https://precisionportal.eu)







# WARRANTY

The warranty term is 12 months from the day of encoder shipping.

The Manufacturer warrants within the warranty term to replace or repair faulty encoder free of charge on conditions that installation, operation and storage rules have been observed by Customer.

The Manufacturer warranty does not cover faulty encoder if encoder was installed improperly, not following Operating Instruction requirements, if during encoder operation mechanical and electrical parameters exceeded permissible values and if Customer individually repaired and disassembled the encoder.

The Manufacturer declines any responsibility for damages to people or properties deriving from the use of encoder, including any loss of profit or any other direct, indirect or incidental loss.



[WWW.PRECIZIKA.COM](http://WWW.PRECIZIKA.COM)



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