



## Type SCH94FO

- Hollow Shaft Fiber Optic Encoder - Ø 94 mm
- Dual Output Option (Digital & Fiber Optic)
- Fiber Optic Transmission up to 2,000 meters (~ 1.25 miles)
- No Degradation of Encoder Signal from Electrical Disturbances
- High Encoder Frequency and Low Transmission Delay
- Added Safety by use of two Redundant Fibers
- Built-in Transient Suppression Module

### Description

The SCANCON **SCH94FO** is a heavy-duty incremental encoder offering Fiber Optic output.

The **SCH94FO** incorporates the rugged design features of SCANCON's industry standard SCH94 hollow shaft encoder with the high transmission distance and noise resistant qualities of Fiber Optics.

The result is the industry's first rugged and reliable, dual-output Fiber Optic encoder.

Specifically designed for the Wind Power Industry, the **SCH94FO-SA** can also be used in Industrial applications which require noise-free signal transmission over distances up to 2000 meters.

Utilizing both Fiber Optic cable and a built-in Transient Suppression Module (TSM), the encoder protects against signal disruption by electrical disturbances often encountered during operation of industrial equipment. In addition, the encoder is protected against lightning strikes.

The **SCH94FO-SA** encoder is designed to operate with both a Digital output and a Fiber Optic output. The customer may also choose to use only the Fiber Optic output.

The encoder offers Infrared Light transmission. The Infrared Light option allows for a much longer transmission distance (up to 2,000 meters).

The **SCH94FO-SA** encoder is ideal for those applications requiring safe signal transmission over long distances.

## Electrical Specifications

<b>Code:</b>	Incremental
<b>Resolution:</b>	1 to 12,500 ppr (pulses per revolution)
<b>Supply Voltage:</b>	4.75V to 30V **
<b>Current Consumption: (typical)</b>	250 mA @ V <sub>sup</sub> = 5V 110 mA @ V <sub>sup</sub> = 15V 70 mA @ V <sub>sup</sub> = 30V
<b>Frequency Response:</b>	100 kHz **
<b>Accuracy:</b>	+/- 0.8 arc-min.
<b>Electrical Protection:</b>	Output short circuit, reverse polarity (on some versions only) and transient surge protected through built-in protection module (see TSM details on website)
<b>Noise Immunity:</b>	Tested to EN61000-6-2 : 2005 (industrial environments) and EN 61000-6-3 : 2007 (residential, commercial, and light-industrial environments) for Electromagnetic compatibility (EMC)

## Electrical Specifications – Digital Outputs

<b>Output:</b>	OL7272 Line Driver - HTL, TTL and RS422 compatible
<b>Supply Voltage and Output Specifications for various Output Standards:</b>	TTL: V <sub>sup</sub> = 5V +/- 10% V <sub>high</sub> ≥ 4.3V @ I <sub>out</sub> = -16 mA V <sub>low</sub> ≤ 0.5V @ I <sub>out</sub> = 16 mA  RS422: V <sub>sup</sub> = 5V +/- 10% Min. diff. load (Z <sub>o</sub> ): 100 Ω V <sub>diff</sub> ≥ 2.9V @ Z <sub>o</sub> = 100 Ω V <sub>high</sub> ≥ 3.8V @ Z <sub>o</sub> = 100 Ω V <sub>low</sub> ≤ 0.9V @ Z <sub>o</sub> = 100 Ω  HTL: V <sub>sup</sub> ≥ 9V – 30V V <sub>high</sub> ≥ V <sub>sup</sub> - 1.8V @ I <sub>out</sub> = -20mA V <sub>low</sub> ≤ 0.8V @ I <sub>out</sub> = 20 mA
<b>Output Current:</b>	40 mA max. load per output channel **
<b>Output Format:</b>	Two channel (A, B) quadrature with Index (Z) and complementary (A-, B-, Z-) outputs
<b>Phase Sense:</b>	A leads B clockwise (CW) from the shaft end of the encoder
<b>Index:</b>	Gated with Channels A and B high

## Optical Specifications - Fiber Optic Output

<b>Optical Wavelength:</b>	850 nm (Infrared)
<b>Transmission Distance:</b>	1,000 meters 2,000 meters – Option

\*\* = It is recommended user not to combine max. Value for all 3 parameters

## Mechanical Specifications

<b>Material:</b>	Housing: Aluminum Cap: Aluminum Hollow shaft: Stainless Steel (AISI 303)
<b>Weight:</b>	Encoder: approx. 2300 gr. (81.13 oz)
<b>Bearing Life:</b>	> 1.9 x 10 <sup>10</sup> revolutions at rated load
<b>Shaft Speed:</b>	2,200 rpm max. IP 66 3,000 rpm max. IP 65 - Option
<b>Starting Torque:</b>	< 0.1 Nm (14.16 oz-in) at 25° C
<b>Mass Moment of Inertia:</b>	31 gcm <sup>2</sup> (4.39 x 10 <sup>-4</sup> oz-in-sec <sup>2</sup> )
<b>Shaft Loads:</b>	Axial 200 N (45 lbs) max. Radial 400 N (90 lbs) max.

## Common Specifications with Fiber Optic Receiver

<b>Compatible Fiber Optic Receiver:</b>	DINJB-RX-INC or equivalent
<b>Update Rate:</b>	1.04 million updates / second ~ 0.96 µsec. / update
<b>Transmission Delay:</b>	≤ 3 µsec. Approx. 1 µsec. must be added per 200 meters of fiber optic cable
<b>Optical Fiber Connectors:</b>	Standard ST Insertion loss ≤ 0.7 dB (≤ 0.4 dB recommended)
<b>Recommended Optical Fiber:</b>	62.5 / 125 µm, multimode (TUG 651)

## Environmental Specifications

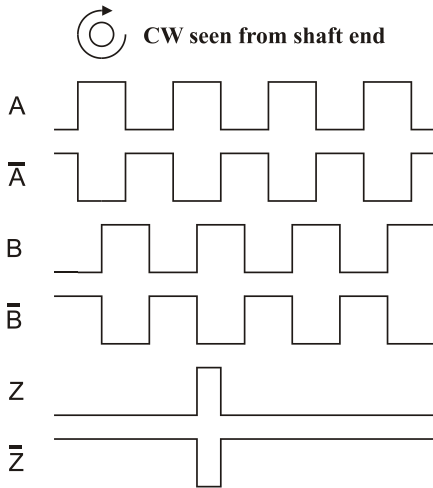
<b>Operating Temperature:</b>	-40° to +85° C
<b>Storage Temperature:</b>	-40° to +85° C
<b>Shock:</b>	100 G / 11 ms
<b>Vibration:</b>	(10-2000 Hz) / 10 G
<b>Bump:</b>	10 G - 16 ms (1000 x 3 axis)
<b>Humidity:</b>	98 % RH without condensation
<b>Enclosure Rating:</b>	IP 66 / Nema 6 (approx.) IP 65 / Nema 4 (approx.) - Option chromitAL TCP passivation
<b>Non-conductive Hollow Bore:</b>	Non-conductive ceramic insert for shaft insulation; up to 2.5 kV

## Connection Options

<b>Cable:</b>	8 leads (0.75 mm <sup>2</sup> , 19 AWG) twisted pairs; shielded; halogen free
<b>Connector:</b>	12-pin M23 connector

## Output Waveform

## Disk Resolutions (pulses per revolution)

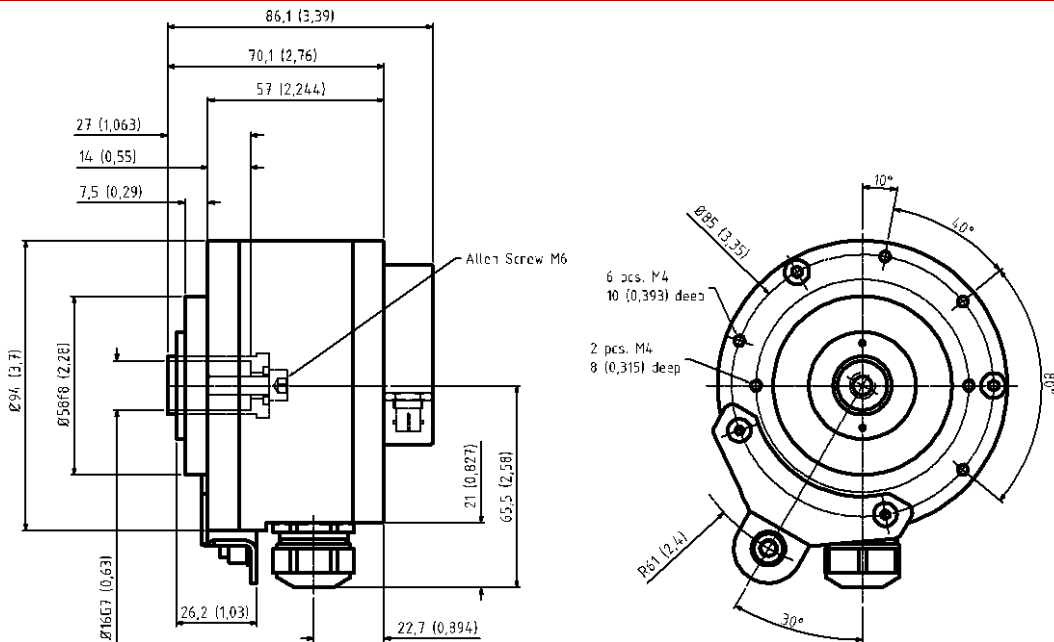


746	1024	2048	2500	3072
4096				

**Other options on request**  
 Pulses per revolution,  
 min. 1 – max. 12.500

**Channel tolerance**             $180\text{ e}^\circ \pm 36\text{ e}^\circ$   
**Phase difference tolerance**    $90\text{ e}^\circ \pm 18\text{ e}^\circ$   
**Z channel tolerance**             $90\text{ e}^\circ \pm 18\text{ e}^\circ$

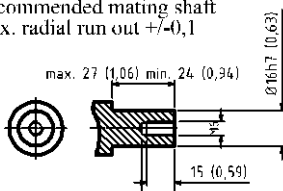
## Mechanical Dimensions

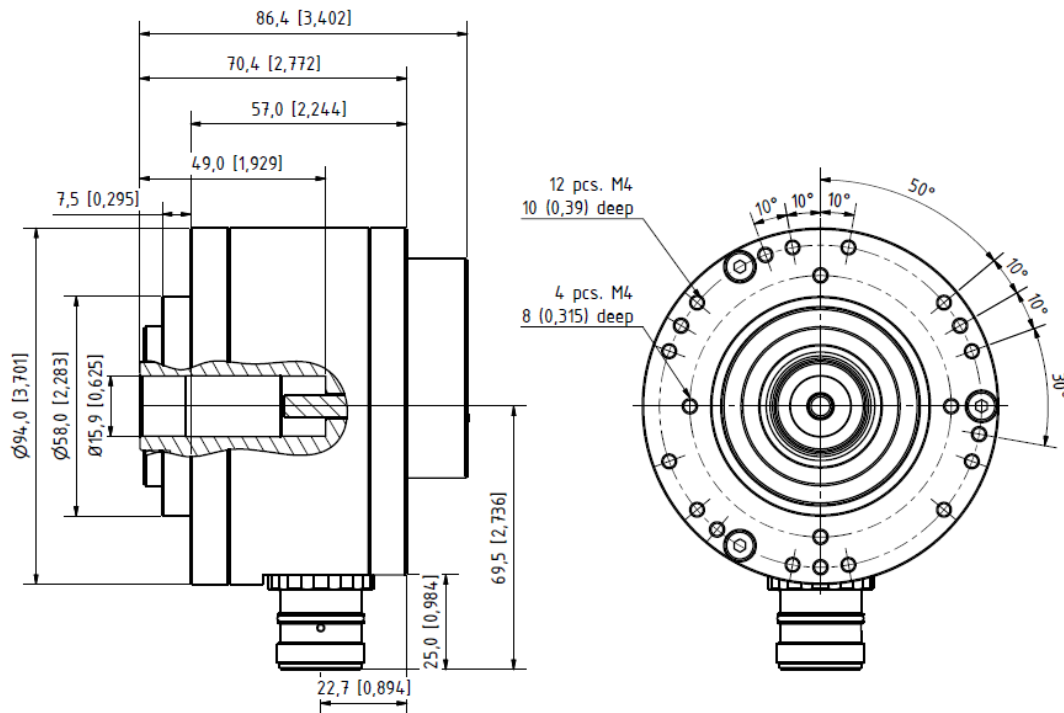


Recommended mating shaft  
 Max. radial run out  $\pm 0.1$

Standard Cable Gland

mm (inches)





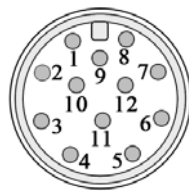
Recommended mating Shaft  
 Max. radial run out  $\pm 0,1$



MM (inches)

## Output Terminations

M23 Connector		Power only
Pin	Channel	Channel
1	B -	N/C
2	N/C	N/C
3	Z	N/C
4	Z -	N/C
5	A	N/C
6	A -	N/C
7	N/C	N/C
8	B	N/C
9	N/C	N/C
10	GND	GND
11	N/C	N/C
12	Vsup	Vsup



Channel	Standard Cable	
	Standard Output	Differential Output
Channel	Wire Color	Wire Color
A	Pink	Pink
A -	Gray*	Gray
B	Green	Green
B -	Yellow*	Yellow
Z	White	White
Z -	Brown*	Brown
Vsup	Red	Red
GND	Blue	Blue

\* Gray, Yellow, and Brown are internally connected to Circuit Ground

GND = Circuit Ground

Connect Cable Shield to mating Connector Housing

GND = Circuit Ground

## Power Cable

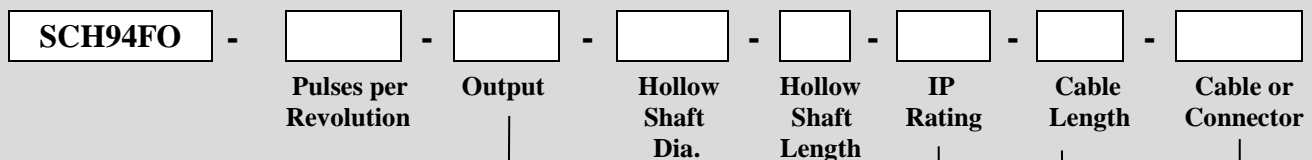
For applications where the Fiber Optic Only (FTI or FSI) Output option is chosen, the customer may choose to use the M23 connector or a Power Only Cable to supply power to the encoder.

The M23 connector Power/Ground pin-out is shown above.

The Power Only Cable terminates in a “pigtail” with a Brown wire for Vsup and a White wire for Ground.

## Ordering Code

**Example: SCH94FO – 3072 – MSI – 17 – 20 – 66 – P02 – S**



IP 65	<b>65</b>
IP 66	<b>66</b>

HTL, TTL & RS422	4.75V to 30V *	+ Fiber Optic (Infrared Light)	<b>MTI</b>
HTL (only)	9V to 30V	+ Fiber Optic (Infrared Light)	<b>MSI</b>
Fiber Optic Only (Infrared Light)	4.75V to 30V *		<b>FTI</b>
Fiber Optic Only (Infrared Light)	9V to 30V		<b>FSI</b>

\* Not Reverse Polarity Protected

Standard cable	(1 meter is standard)	<b>01</b>
Standard cable	(specify cable length)	<b>XX</b>
Power Only cable *	(specify cable length)	<b>PXX</b>
No cable	(M23 Connector option)	<b>00</b>

\* For use with Fiber Optic Only outputs

12 mm x 27 mm	<b>12 - 27</b>
12 mm x 54 mm	<b>12 - 54</b>
5/8 inches x 49 mm	<b>5/8 - 49</b>
16 mm x 27 mm	<b>16 - 27</b>
16 mm x 54 mm	<b>16 - 54</b>
17 mm x 20 mm (1:10 cone shape)	<b>17 - 20</b>

<b>Cable</b>	
Side (radial) takeout	<b>S</b>
<b>Connector</b>	
M23 12-pin clockwise pins	<b>CW</b>
M23 12-pin counterclockwise pins	<b>CCW</b>

Other options on request:  
Please contact Scancon A/S