



## Type SCH98M

- Hollow Shaft Encoder -  $\varnothing$  98 mm
- Hollow Bore –  $\varnothing$  12 mm,  $\varnothing$  16 mm or  $\varnothing$  17 mm cone
- IP Rating IP66
- Paint on Chromital TCP passivation for Offshore Applications
- Built-in Transient Suppression Module and with Support for Long Cables

### Electrical Specifications

<b>Code:</b>	Incremental Magnetic
<b>Resolution:</b>	See table on page 2
<b>Supply Voltage:</b>	5 VDC or 9 – 30 VDC
<b>Current Consumption:</b>	60 mA max. (no load)
<b>Supply Voltage and Output Specifications for various Output Standards:</b>	<p>TTL: <math>V_{sup} = 5\text{ V} \pm 5\%</math> and 5L  <math>V_{high} \geq 4.2\text{ V} @ I_{out} = -16\text{ mA}</math>  <math>V_{low} \leq 0.5\text{ V} @ I_{out} = 16\text{ mA}</math></p> <p>RS422: <math>V_{sup} = 5\text{ V} \pm 5\%</math> and 5L            Min. differential load (<math>Z_o</math>): 100 <math>\Omega</math>  <math>V_{diff} \geq 3.4\text{ V} @ Z_o = 100\ \Omega</math>  <math>V_{high} \geq 4.3\text{ V} @ Z_o = 100\ \Omega</math>  <math>V_{low} \leq 0.9\text{ V} @ Z_o = 100\ \Omega</math></p> <p>HTL &amp; <math>V_{sup} = 9\text{ V to } 30\text{ V}</math>            HCHTL: <math>V_{high} \geq V_{sup} - 1.2\text{ V} @ I_{out} = -20\text{ mA}</math>  <math>V_{low} \leq 1.0\text{ V} @ I_{out} = 20\text{ mA}</math></p>
<b>Output Current:</b>	60 mA max. load per output channel
<b>Output Frequency:</b>	200 kHz max. – Depending on cable length
<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) seen from the shaft end of the encoder
<b>Index:</b>	Gated with Channels A and B high
<b>Max. Cable Length:</b>	MT Output: 100 meter @ 150 kHz 5L Output: 100 meter @ 150 kHz MS Output: 30 meter @ 150 kHz 3MS Output: 200 meter @ 150 kHz
<b>Output:</b>	MT, MS and 5L: iC-DL Line Driver 3MS: OL7272 Line Driver
<b>Electrical Protection:</b>	Output short circuit, reverse polarity and transient surge protected through built-in protection module. Miswiring safe (except 3MS output).
<b>Noise Immunity:</b>	Tested to EN61000-6-2 : 2019 and EN 61000-6-3 : 2007 for Electromagnetic Compatibility (EMC)

### Mechanical Specifications

<b>Material:</b>	Housing: Aluminum Cap: Aluminum Hollow shaft: Stainless Steel (AISI 303)
<b>Weight:</b>	Approx. 900 g. (32 oz)
<b>Bearing Life:</b>	$> 1.9 \times 10^{10}$ revolutions at rated load
<b>Shaft Speed:</b>	3,000 rpm continuous (max.)
<b>Starting Torque:</b>	$< 0.2\text{ Nm}$ (28.3 oz-in) at 25° C
<b>Mass Moment of Inertia:</b>	90 gcm <sup>2</sup> ( $1.3 \times 10^{-3}$ oz-in-sec <sup>2</sup> )
<b>Shaft Loads:</b>	Axial 400 N (90 lbs) max. Radial 800 N (180 lbs) max.

### Environmental Specifications

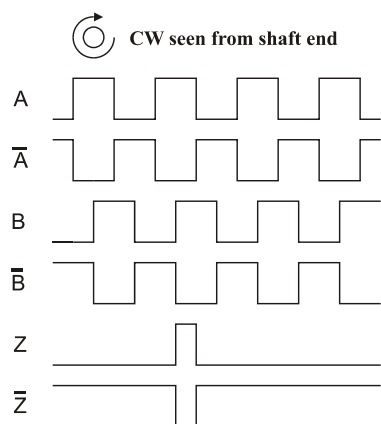
<b>Operating Temperature:</b>	-40° to +105° C for 3MS output -40° to +105° C for terminal block connection (CG1 and CG2) -40° to +115° C for cable and M23 connection (S, CW and CCW)
<b>Storage Temperature:</b>	-40° to +105° C
<b>Shock:</b>	100 G @ 11 ms
<b>Vibration:</b>	10 G @ 10-2000 Hz
<b>Bump:</b>	10 G @ 16 ms (1000 x 3 axis)
<b>Humidity:</b>	98 % RH without condensation
<b>Enclosure Rating:</b>	IP 66 / Nema 6 (approx.)
<b>Surface Treatment</b>	Paint (RAL7045) on Chromital TCP passivation
<b>Shaft Insulation</b>	Hybrid Ball Bearings for shaft insulation up to 2.5 kV

### Connection Options

<b>Cable:</b>	8 leads 0.50 mm <sup>2</sup> (21 AWG) twisted pairs; shielded
<b>Connectors:</b>	2 x 5-lead terminal blocks (inside cap) M20 cable gland (fits cable $\varnothing$ 8 – 14 mm) 12-pin M23 connector 17-pin M23 connector (option)

## Output waveform

## Standard Disk Resolutions (pulses per revolution)

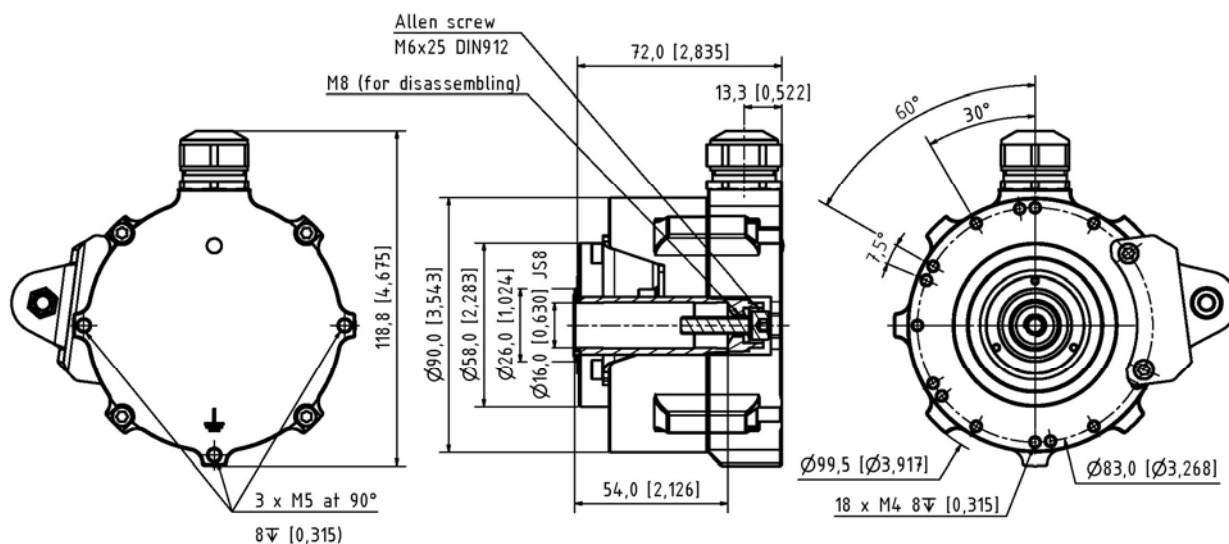


50	500	512	746	800
1000	1024	1250	1600	2000
2048	2500	3072	4096	8192

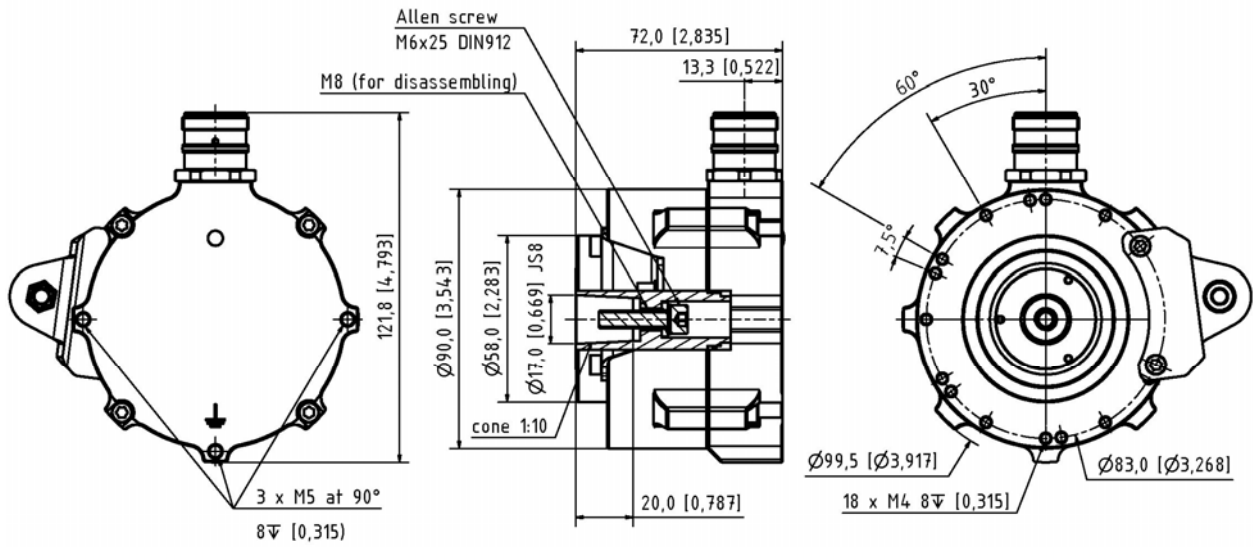
Any Resolution from 1 to 10,000 is available and may be ordered

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



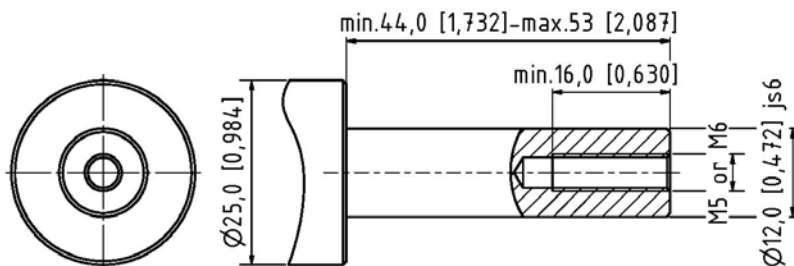
Cylinder Shaft  $\varnothing 16\text{ mm}$  – Cable Gland



Cone Shaft  $\varnothing$  17 mm – M23 Connector

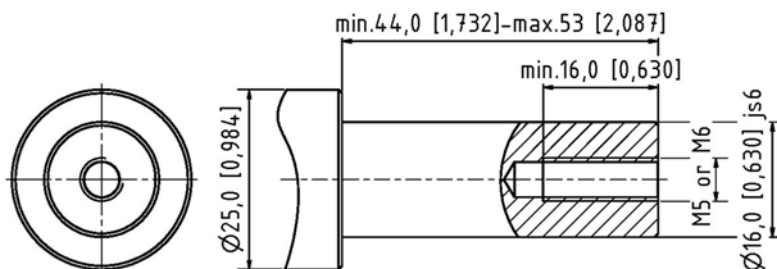
## Recommended Mating Shaft

Max radial run out, all shafts +/- 0.1 mm



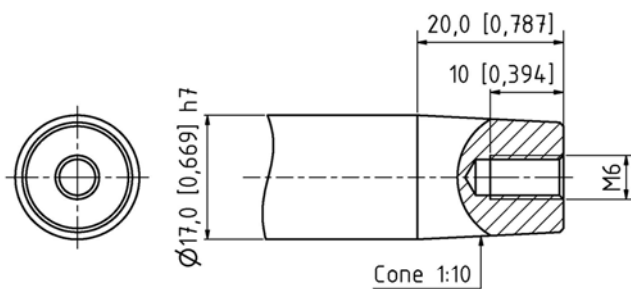
Cylindrical Shaft  $\varnothing$  12 mm

mm (inches)



Cylindrical Shaft  $\text{Ø} 16$  mm

mm (inches)



Conical Shaft  $\text{Ø} 17$  mm

mm (inches)

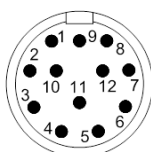
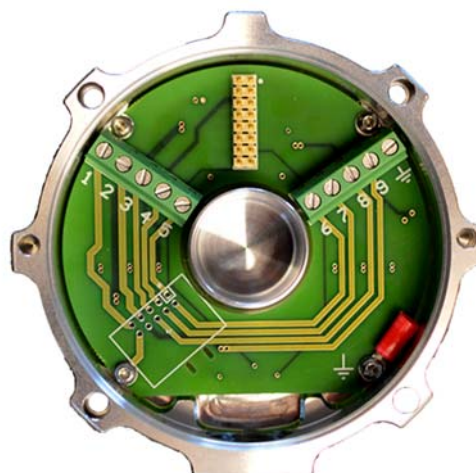
## Connection

### Removable End Cap

Position	Terminal Block	
	Standard Output	Differential Output
	Channel	Channel
1	Vsup	Vsup
2	GND	GND
3	Z	Z
4	*	Z-
5	B	B
6	*	B-
7	A	A
8	*	A-
9	Error	Error
10	Shield	Shield

\* Do not attach any wires to terminal block  
 GND = Circuit Ground  
 Use Terminal block or Red Cable Shoe for Shield Connection

2 pcs: Terminal blocks



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

Connect Cable Shield to mating Connector Housing

GND = Circuit Ground

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
Error	Violet	Violet
Not Used	Black	Black

Wires in red box are not normally present. Contact factory for information.

\* Gray, Yellow, and Brown must not be connected but isolated to prevent short circuit.

GND = Circuit Ground

**Status LED/Error Output**

The SCH98M is equipped with a Status LED and an Error Output. The Error Output is low (connected to GND) when activated and floating when not activated. The electrical specifications for the Error Output are:

Output Type:	Open Collector – NPN type
Pull Down Current:	1 A max.
Voltage over Output:	40 V max.

The Status LED can emit three colours, green, orange and red. The meaning of the different colours is:

**LED is not lit:** The encoder is either unpowered, mis-wired or has a severe internal failure.

**LED is green:** The encoder is operational. No errors conditions are detected. The Error Output is not activated.

**LED is orange:** The internal adjustment of the encoder is out of range. The Error Output is activated. The encoder may work, but most likely with reduced accuracy. The encoder cannot be adjusted on site but must be sent to factory for adjustment.

**LED is red:** The internal output circuitry is overheated and has gone into thermal shutdown. The outputs are disconnected, and the Error Output is activated. The reason can be short-circuiting of outputs or mis-wiring. The outputs will automatically reconnect when the outputs cool down. The result of this will be that the LED will slowly oscillate between red and green as the outputs warm up, cool down, warm up etc. until the fault condition has been removed. This condition will not harm the encoder but is an indication of that the encoder has not been wired correctly.

## Ordering Code

Example: SCH98M – 1024 – 3MS – 16 – 54 – 66 – 00 – CG1

SCH98M -  -  -  -  -  -  -  -

1                      2                      3a                      3b                      4                      5                      6

### 1: Pulses per Revolution

See table on page 2

### 2: Output

HCHTL - 9-30 V supply/9-30 V output – Long cables \*)..... **3MS**

HTL - 9-30 V supply/9-30 V output .....**MS**

TTL and RS422 - 5 V supply/5 V output.....**MT**

TTL and RS422 - 9-30 V supply/5 V output.....**5L**

\*) Not miswiring safe

### 3a and b: Hollow Shaft

12 mm x 54 mm .....**12 - 54**

16 mm x 54 mm .....**16 - 54**

17 mm x 20 mm Cone.....**17 - 20**

### 4: IP Rating

IP66.....**66**

### 5: Cable length

Standard - 1 meter.....**01**

Specify cable length.....**XX**

No Cable - Cable Gland or Connector.....**00**

### 6: Cable, Cable Gland, Connector

#### Cable

Side (radial) takeout.....**S**

#### Cable Gland (Terminal Block - no cable)

ø8 to ø11 mm cable.....**CG1**

ø11 to ø14 mm cable ....**CG2**

#### M23 12-pin Connector

Clockwise pins.....**CW**

Counter clockwise pins **CCW**