α S520

APPLICATION

- Non-contacting inductive technology to eliminate wear
- Angle set to customer's requirement
- Durable and reliable
- High accuracy and stability
- Pressure balanced for use to 350 Bar in under water applications

As a leading designer and manufacturer of linear, rotary, tilt and intrinsically safe position sensors, Althen has the expertise to supply a sensor to suit a wide variety of applications. Our S520 is an affordable, durable, high-accuracy rotary sensor designed for arduous underwater applications such as ROVs.

The S520, like all Althen sensors, is supplied with the output calibrated to the angle required by the customer, between 15 and 160 degrees and with full EMC protection built in. The sensor provides a linear output characteristic proportional with the rotation of the input shaft, which has full 360 degree rotational freedom. There is a machined registration mark to identify the calibrated mid point.

Overall performance, repeatability and stability are outstanding over a wide temperature range. The S520 has long service life and environmental resistance with a rugged 316 stainless steel body and shaft. The flange mounting makes the sensor easy to install. There are a range of electrical options. Environmental sealing is to IP68 350Bar

SPECIFICATIONS

Dimensions[1]	
Body diameter	60 mm
Flange Diameter	92 mm
Body Length (to mounting face)	70 mm
Shaft	15 mm Ø 6 mm
Independent Linearity	≤ ± 0.25% FSO @ 20°C - up to 100° travel
Pressure Effects	Output changes with pressure < 1°
Temperature Coefficients	< ± 0.01%/°C Gain & < ± 0.01%FS/°C Offset
Frequency Response	> 10 kHz (-3dB) > 300 Hz (-3dB) 2 wire 4 to 20 mA
Resolution	Infinite
Noise	< 0.02% FSO
Torque	< 20 mNm Static
Environmental Temperature Limits (Non Icing)	
Operating	-4°C to +50°C
Storage	-4°C to +50°C
Sealing	Sealed to 350 Bar
EMC Performance	EN 61000-6-2, EN 61000-6-3
Vibration	IEC 68-2-6: 10 g
Shock	IEC 68-2-29: 40 g
MTBF	350,000 hrs 40°C Gf

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SPECIFICATIONS (CONTINUED)

Drawing List[2]	
S520-11	Sensor Outline

[1] *For full mechanical details see drawings S520-11*
[2] *3D models, step or .igs format, available on request*

HOW ALTHEN'S TECHNOLOGY ELIMINATES WEAR FOR LONGER LIFE

Althen's Inductive technology is a major advance in displacement sensor design. Our displacement transducers have the simplicity of a potentiometer with the life of an LVDT/RVDT.

Our technology combines the best in fundamental inductive principles with advanced micro-electronic integrated circuit technology. An Althen sensor, based on simple inductive coils using Althen's ASIC control technology, directly measures absolute position giving a DC analogue output signal. Because there is no contact between moving electrical components, reliability is high and wear is eliminated for an exceptionally long life.

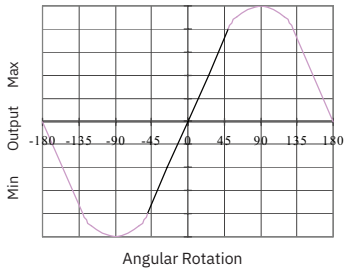
It also overcomes the drawbacks of LVDT technology – bulky coils, poor length-to-stroke ratio and the need for special magnetic materials, no requirement for separate signal conditioning.

We also offer a range of ATEX-qualified intrinsically-safe sensors.

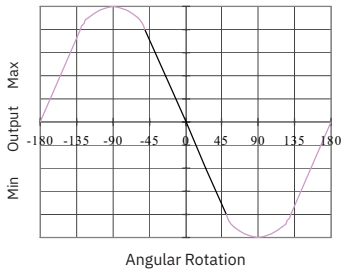
S520	.	a	b	c	d
		Displacement	Output	K50	Z-code

a Displacement		**Value**
Factory set to any angle from 0-16° (±8°) to 0-160° (±80°) (e.g. 0-54°)		**54**
b Output		
Supply V_{dc} (tolerance)	**Output**	**Code**
+5V (4.5 - 5.5V)	0.5 - 4.5V (ratiometric with supply)	**A**
±15V nom. (±9 - 28V)	±5V	**B**
+24V nom. (13 - 28V)	0.5 - 9.5V	**C**
±15V nom. (±13.5 - 28V)	±10V	**D**
+24V nom. (18 - 28V)	4 - 20mA (2 wire)	**E**
+24V nom. (13 - 28V)	4 - 20mA (3 wire Sink)	**F**
+24V nom. (9 - 28V)	0.5 - 4.5V	**G**
+24V nom. (13 - 28V)	4 - 20mA (3 wire Source)	**H**
Supply Current: 'A' 10mA nominal, 12mA max. 'B', 'D' & 'G' 12mA nominal, 15mA max. 'E' 26mA max. 'F' & 'H' 32mA nominal, 35mA max.		
c Connections		**Code**
Connector radial IP68 350 Bar Wet mate 4 pin MC BH-4-M		**K50**
Supplied with an over-moulded MC IL-4-F connector with 0.5 m, 4-core 20 AWG (0.5mm²) EPDM cable assembly, and locking collar as standard.		
d Z-code (optional)		**Code**
≤± 0.1% FSO @20°C Independent Linearity 0 - 16° min. to 0 - 100° max.		**Z650**

Output Characteristic - Standard



Output Characteristic - Reverse option



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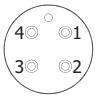
INSTALLATION INFORMATION

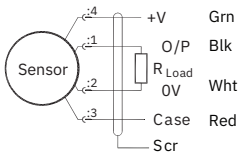
Output Option	Output Description	Supply Voltage: V_s (tolerance)	Load resistance: (include leads for 4 to 20mA O/Ps)
A	0.5 - 4.5V (ratiometric with supply)	+5V (4.5 - 5.5V)	≥ 5kΩ
B	±5V	±15V nom. (±9 - 28V)	≥ 5kΩ
C	0.5 - 9.5V	+24V nom. (13 - 28V)	≥ 5kΩ
D	±10V	±15V nom. (±13.5 - 28V)	≥ 5kΩ
E	4 - 20mA 2 wire Current Loop	+24V nom. (18 - 28V)	≈ 0 - 300Ω max. @24V ~ 1.2 to 6V across 300Ω {RL max. = (V_s - 18) / 20^{-3}}
F	4 - 20mA 3 wire Sink	+24V nom. (13 - 28V)	≈ 0 - 950Ω max. @24V ~ 3.8 to 19V across 950Ω {RL max. = (V_s - 5) / 20^{-3}}
G	0.5 - 4.5V	+24V nom. (9 - 28V)	≥ 5kΩ
H	4 - 20mA 3 wire Source	+24V nom. (13 - 28V)	≈ 0 - 300Ω max. ~ 1.2 to 6V across 300Ω

Connector Pinout Layout:

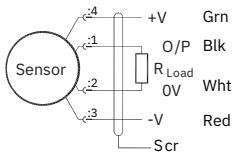
MC BH 4 M (face view)



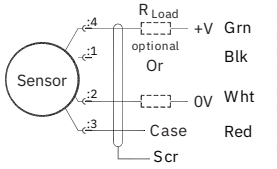
'A', 'C' , 'G' & 'H'



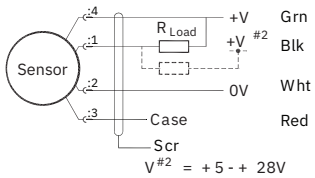
'B' & 'D'



'E'



'F'



MECHANICAL MOUNTING

Flange mounted - see drawing S520-11. The sensor should be mounted with minimal axial and radial loading on the shaft for optimum life. It is recommended that the shaft is coupled to the drive using a flexible coupling. Tests indicate that life in excess of 16 million cycles can be achieved with 1kg side and end load.

N.b. cable free end must be appropriately terminated to prevent water ingress into the cable. See page 2 for connector handling instructions.

Warning Do not tamper with any of the case screws; the oil fill will be compromised.

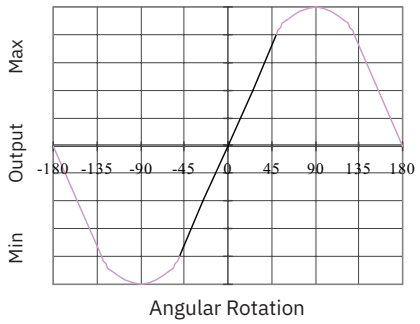
INCORRECT CONNECTION PROTECTION LEVELS

A	**Not protected** – the sensor is **not** protected against either reverse polarity or over-voltage. The risk of damage should be minimal where the supply current is limited to less than 50mA.
B & D	Supply leads diode protected. Output must not be taken outside ± 12V.
C & G	Supply leads diode protected. Output must not be taken outside 0 to 12V.
E, F & H	Protected against any misconnection within the rated voltage.

OUTPUT CHARACTERISTIC

The sensor has full rotational freedom and two sectors, 180° apart, over which linear response can be achieved. At the mid point of the calibrated range the output signal will be half full scale deflection, and the flat on the shaft is aligned with the registration mark in the base of the sensor. In the calibrated range the output increases as the shaft is rotated in an anti-clockwise direction viewed from the shaft. The calibrated output is factory set to be between 15° and 160°.

Standard Output Characteristic



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CONNECTOR MATING INSTRUCTIONS

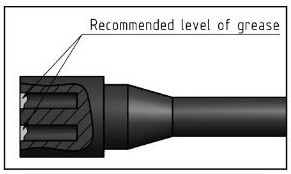
Handling

- Always apply grease mating
- Disconnect by pulling straight, not at an angle
- Do not pull on the cable and avoid sharp bends at cable entry
- When using bulkhead connector, ensure that there are no angular load
- Do not over-tighten the bulkhead nuts
- Connectors should not be exposed to extended periods of heat or direct sunlight. If a connector becomes very dry, it should be soaked in fresh water before use

Cleaning

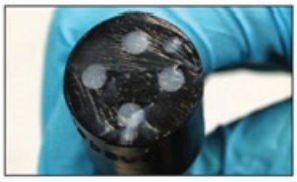
- General cleaning to remove any accumulated sand or mud on a connector should be performed using spray based contact cleaner (isopropyl alcohol)
- New grease must be applied again prior to mating

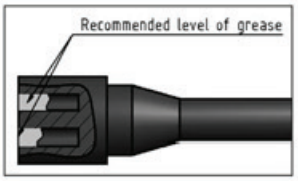
GREASING AND MATING ABOVE WATER (DRY MATE)



- Connectors must be greased with Molykote 44 Medium before every mating
- A layer of grease corresponding to approximately 1/10 of the socket depth should be applied to the female connector
- The inner edge of all the sockets should be completely covered, and a transparent layer of grease left visible on the face of the connector
- After greasing, fully mate the male and female connector in order to secure optimal distribution of grease on pins and in sockets
- To confirm that the grease has been sufficiently applied, de- mate and check for grease on every male min. Then re-mate the connector

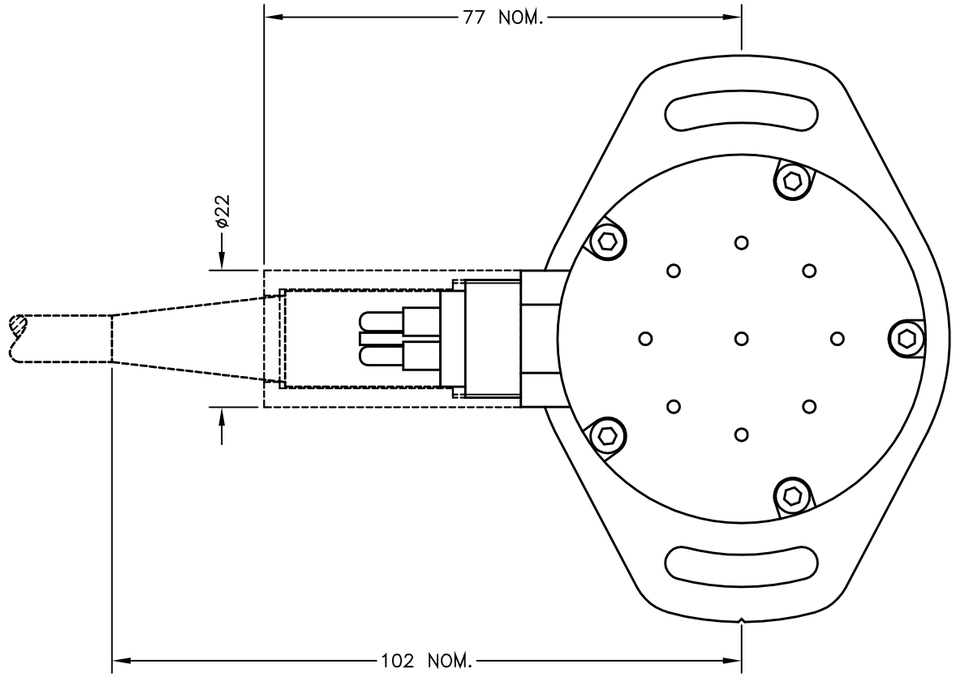
GREASING AND MATING ABOVE WATER (WET MATE)

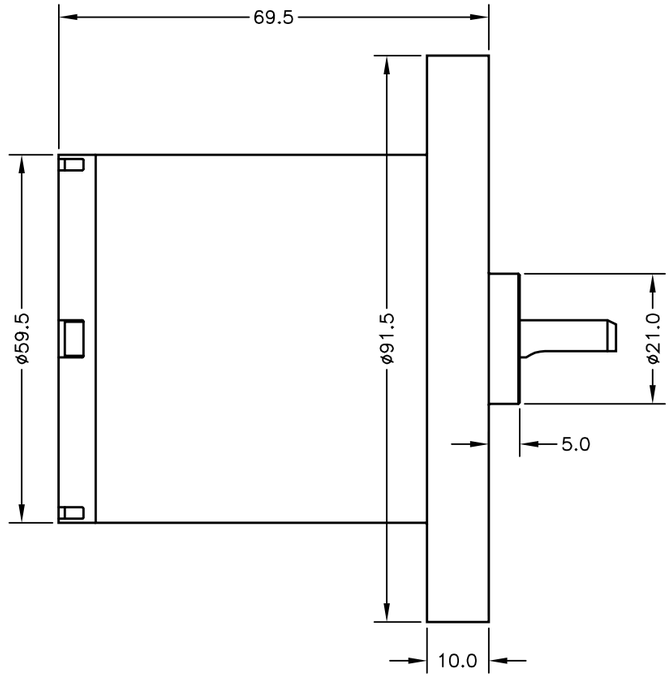


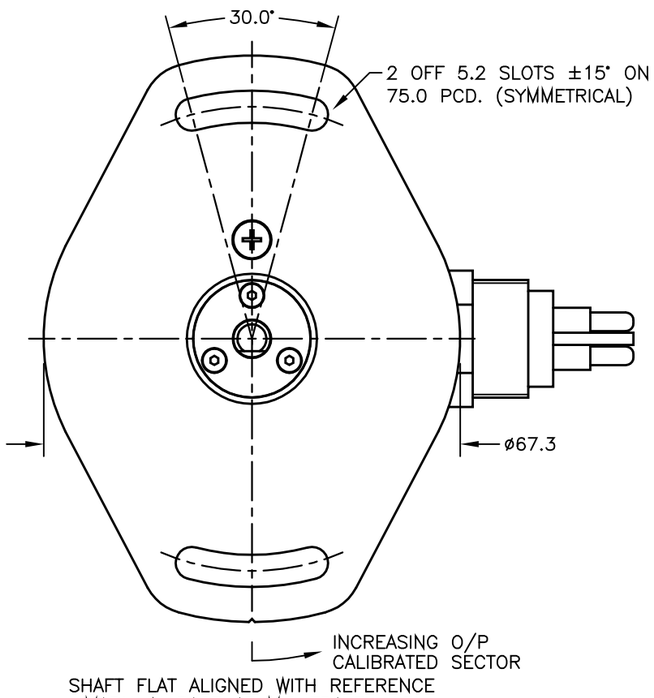


- Connectors must be greased with Molykote 44 Medium before every mating
- A layer of grease corresponding to approximately 1/3 of the socket depth should be applied to the female connector
- All sockets should be completely sealed, and a transparent layer of grease left visible on the face of the connector
- After greasing, fully mate the male and female connector and remove any excess grease from the connector joint

CONNECTORS; WETMATE, 4–POLE.
BULKHEAD: MC–BH–4–M–SS, STAINLESS STEEL/MOLDED NEOPRENE, SEALING; 340 BAR OPEN FACE, 600 BAR MATED.
IN–LINE: MC–IL–4–F, MOLDED NEOPRENE WITH CABLE. LOCKING SLEEVE; MCDLS–F, DELRIN.







SHAFT FLAT ALIGNED WITH REFERENCE MARK IN BASE AT MID TRAVEL ±5°

ELECTRICAL OPTIONS/ SPECIFICATIONS

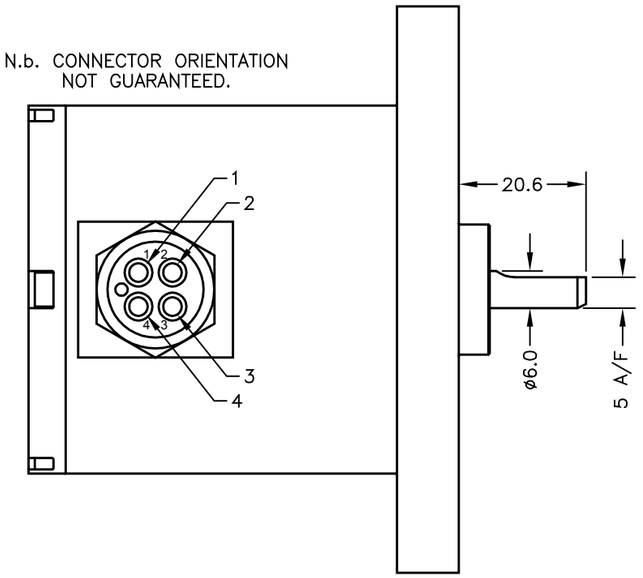
OUTPUT OPTION	OUTPUT	SUPPLY	
A	0.5 TO 4.5V RATIOMETRIC	5V	STANDARD
B	±5V	±15V	BUFFERED
C	0.5 TO 9.5V	24V	
D	±10V	±15V	
G	0.5 TO 4.5V	24V	
	SUPPLY CURRENT 12mA TYP. 20mA MAX.		
E	4 TO 20mA 2–WIRE	24V	
F	4 TO 20mA 3–WIRE SINK	24V	
H	4 TO 20mA 3–WIRE SOURCE	24V	

SINK VERSION OUTPUT COMPLIANCE 5–28V
SOURCE VERSION DRIVE 300Ω MAX TO 0V

MATING CONNECTOR SUPPLIED WITH 50cm MOULDED CABLE AS STANDARD.
4–CORE SCREENED: 0.5mm², ø7.5mm MAX. JACKET / CORE INSULATION: EPDM.
CONNECTIONS:–

1	BLACK	OUTPUT
2	WHITE	0V
3	RED	BODY (OPTIONS: A, C, E–H) –Ve (OPTIONS: B OR D)
4	GREEN	+Ve
	SCREEN	NOT CONNECTED TO SENSOR

RANGE OF DISPLACEMENT FROM 0–15° TO 0–160° e.g. 76°, IN INCREMENTS OF 1°.
BODY MATERIAL:– STAINLESS STEEL 316.



A	FIRST ISSUE.	PDM
B	DISP. FROM 15° WAS 16° - RAN1146	PDM
C	CABLE COLOURS CORECTED - RAN1190	PDM
D	RANGE NOTE AMENDED ~ RAN1200	PDM

CE

MAXIMUM WORKING DEPTH: 3500 METRES 350 BAR. WHERE THE FREE END OF THE CABLE IS TO BE TERMINATED IN A SUBMERGED POSITION, ADEQUATE SEALING MUST BE PROVIDED TO PROTECT CONNECTIONS.

SENSOR IS OIL FILLED AND PRESSURE BALANCED. PRESSURE SENSITIVITY <1%FS TO 350 BAR

DRAWINGS NOT TO BE CHANGED WITHOUT REFERENCE TO THE CHANGE PROCEDURE.
CHANGES TO PARTS USED IN INTRINSICALLY SAFE PRODUCT MUST BE APPROVED BY THE AUTHORISED PERSON

A	27/10/16		CHECKED BY	X ±0.4
B	12/12/16		RDS	X.X ±0.2
C	14/06/17			X.XX ±0.1
D	12/09/17			DIMS mm
		DESCRIPTION		
		S520 350 BAR SUBMERSIBLE ROTARY SENSOR		
SCALE 10mm		DRAWING NUMBER S520-11		REV D
				SHEET 1 OF 1