

LP SERIES | MODEL LP35

LOW PROFILE INCREMENTAL OR ABSOLUTE ENCODER



Features

- Low profile package saves space
- Excellent resistance to shock and vibration
- 30mm standard through shaft, PEEK reduction hub available
- High protection level of IP66
- High performance in temperatures from -40°C to $+100^{\circ}\text{C}$
- Resolutions up to 10,000 PPR, incremental or 16 BITS absolute
- Terminal box, M12 or cable output terminations
- Encapsulated electronics
- TTL and HTL electronics
- Reinforced electrical output available on some incremental and absolute models
 - Wiring fault tolerant with terminal box connection
 - Long cable drive capability

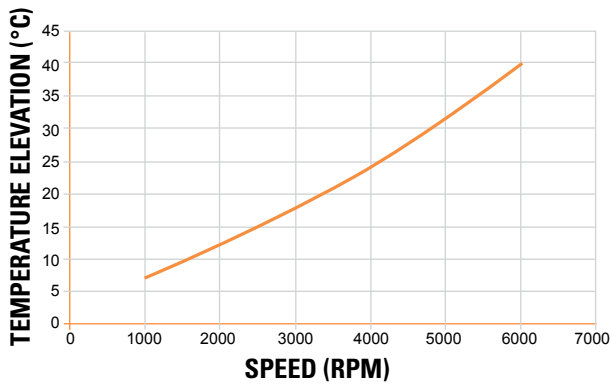
SPECIFICATIONS

Mechanical

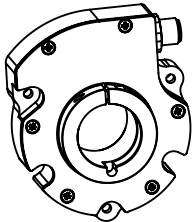
Housing Size	Standard: \varnothing 90mm X 26mm deep Terminal Box: 128mm tall X 116mm wide X 25mm deep. (See dimensional drawings for detail)
Shaft Size	Hollow Shaft: \varnothing 1/2" to \varnothing 1" blind or through Solid Shaft: \varnothing 12 mm x 20 mm with keyway, \varnothing 3/8" x 7/8" with flat Hollow Shaft w/ Integrated Coupling: 14mm, 20mm, 1/2", 3/4"
Permissible Shaft Loads	Axial: 40 N Radial: 80 N
Shaft Runout	Hollow Shaft: 0.1 mm [0.004"] TIR Solid Shaft: 0.02 mm [0.001"] TIR Hollow Shaft w/ Integrated Coupling: N/A
Static/ Dynamic Torque	30 / 300 mN.m [4.2/ 42 oz-in] @ 25°C
Bearings	6807 - Sealed
Material	Cover: Clear anodized aluminum Body: Clear anodized aluminum Shaft: AISI 303 stainless steel
Bearing Life L_{10h} (Theoretical Mechanical Lifetime)	$> 18 \cdot 10^9$ turns / 100000 hours
Continuous Max. Speed	6000 RPM, (Reference Chart 1. Speed vs Temperature)
Shaft Moment of Inertia	$< 84000 \text{ g} \cdot \text{mm}^2 [11.9 \times 10^{-3} \text{ oz} \cdot \text{in}^2 \cdot \text{sec}^2]$
Weight (approx.)	Terminal Box: 790g M12 or cable: 450g

Chart 1. Speed vs Temperature

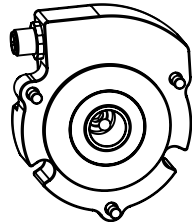
(Temperature on this chart to be added to ambient temperature. Do not exceed maximum temperature on datasheet.)



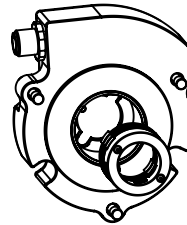
Cable or M12 Connection Shaft Options



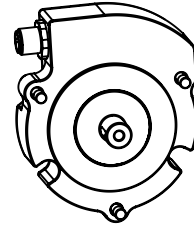
Through Hollow Shaft



Blind Hollow Shaft



Shaft with Integrated coupling



Solid Shaft

Electrical

	Absolute	Incremental
Output Format	SSI compatible (RS422)	Two channels in quadrature + index and complements
Resolution	Up to 16 BITS	Up to 10,000 CPT
Encoder Accuracy	±0.1°	
Supply Voltage Vcl	5-30 Vdc	Cable or M12: 5-30V (28/V) and 4.75-30V (28/5) Terminal Box: 11-30V (28/VR), 5-30V (28/V) and 4.75-30V (28/5)
Supply Current (No Loads)	75mA Typ	Cable or M12: 75mA Terminal Box: 100mA (28/VR), 75mA (28/V and 28/5)
Current Per Channel Pair	40mA max	Cable or M12: 40mA Terminal Box: 60mA (28/VR), 40mA (28/V and 28/5)
Voltage / Output	28/SI: SSI RS485 w/o parity 28/SR: SSI RS485 reinforced w/o parity Terminal Box version only	28/V: Line driver 5-30 V In/Out; PushPull 28/5: Line driver with 5 V (TTL) regulated output 28/VR: Push Pull 11-30V reinforced. Terminal Box version only
Short Circuit Proof	28/SI: Yes (except to V+) 28/SR: Yes	Cable or M12: Yes (28/V) and Yes (except to Vcl) (28/5) Terminal Box: Yes (28/VR), (28/V) and (28/5) except to Vcl
Reverse Polarity Tolerant	Yes	
Wiring Fault Tolerant & Overvoltage Prot.	28/SI: No 28/SR: Yes	Cable or M12: No Terminal Box: Yes Up to 60Vdc (28/VR) and No (28/V and 28/5)
Frequency Response	Cable or M12: Up to 1MHz Terminal Box: Up to 300kHz (28/VR), Up to 1MHz (28/V and 28/5)	
Output Terminations	Cable, M12 or Terminal Box	
EMC	EN 61000-6-2 : 2005, see user manual for details EN 61000-6-4 : 2017 + A1 : 2011, see user manual for details	
Isolation	1000V	

Environmental

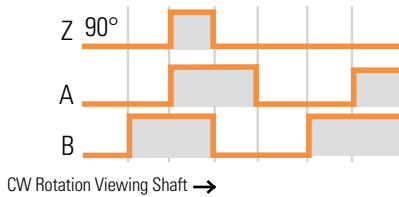
Protection Class (sealing)	IP66	
Temperature Range	Cable or M12: -40°C +100°C Terminal Box: -40°C +85°C (28/VR), -40°C +100°C (28/V and 28/5)	
Mechanical Resistance	Shock	(EN60068-2-27): $\leq 3000\text{m.s}^{-2}$ (5 ms, half sine) (300 G's)
	Vibration	(EN60068-2-6): $\leq 200\text{m.s}^{-2}$ (55 ... 2 000 Hz) (20 G's)
Humidity	98% RH without condensation	

OUTPUT WAVEFORMS

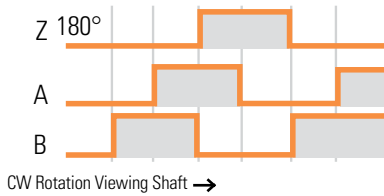
Waveform AA/ BB/ 00/ Channel B before A Clockwise (US convention is A leads B CCW)

Incremental Waveform

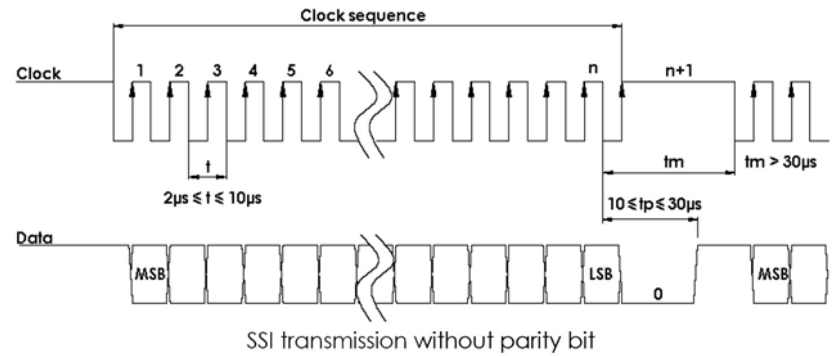
INDEX GATED WITH A & B HIGH (CODE Q28)



INDEX GATED WITH B LOW (CODE Q29)



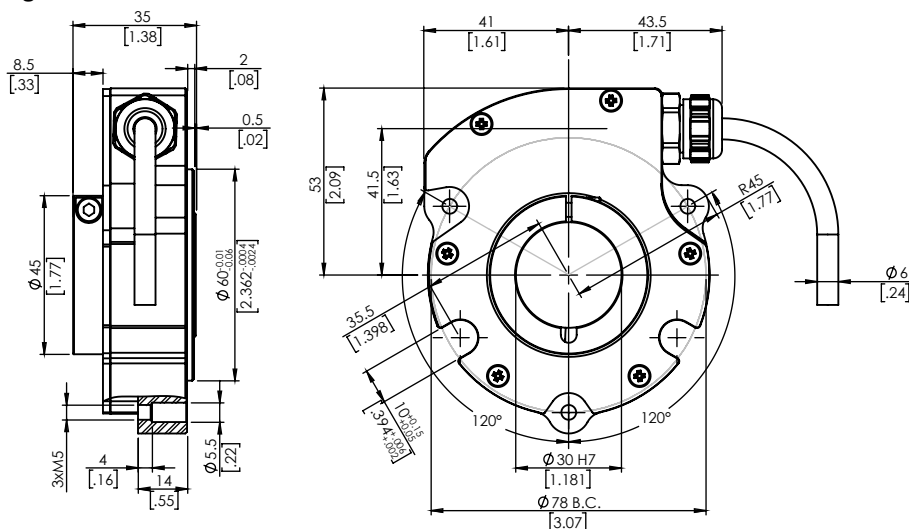
Absolute SSI Waveform



DIMENSIONS(A)

All dimensions are in millimeters [inches]

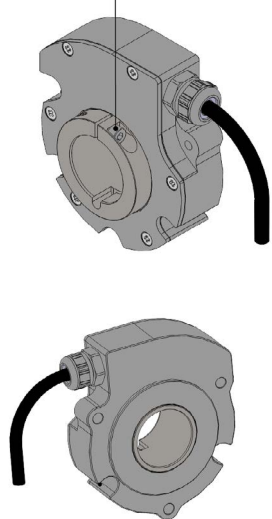
Through hollow shaft



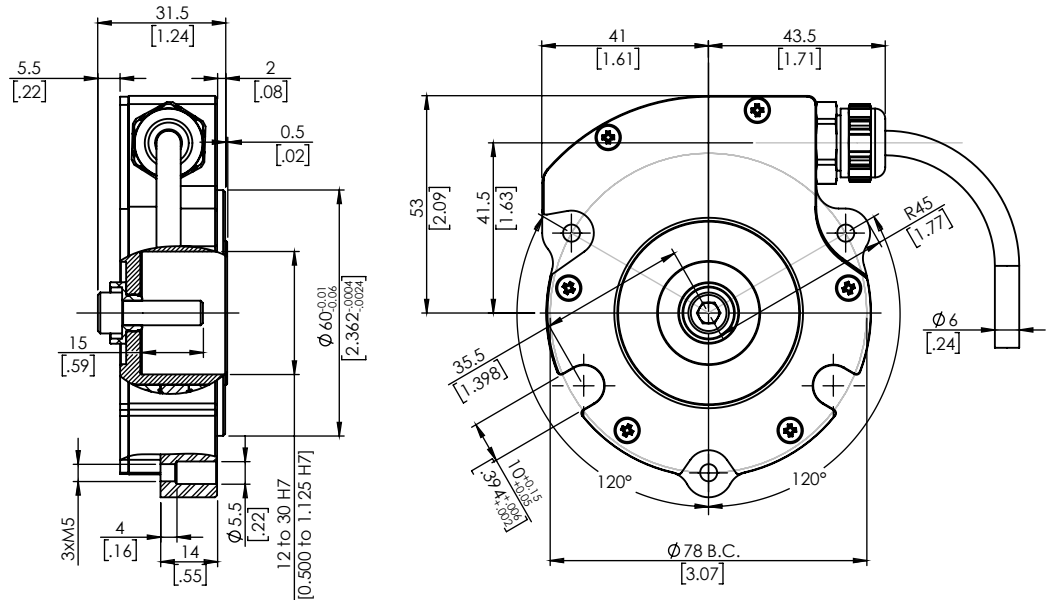
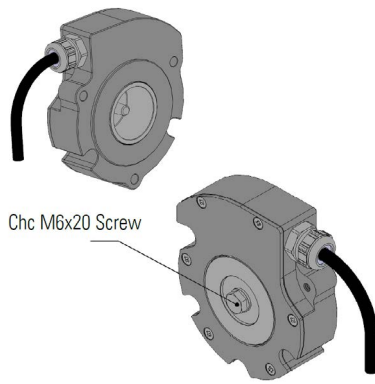
NOTE:

CHc : Hexagonal Socket head cap screws HC : Hexagonal socket set screws

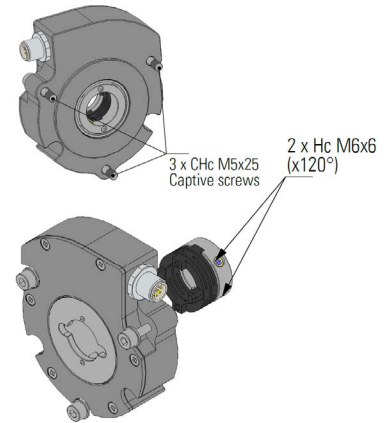
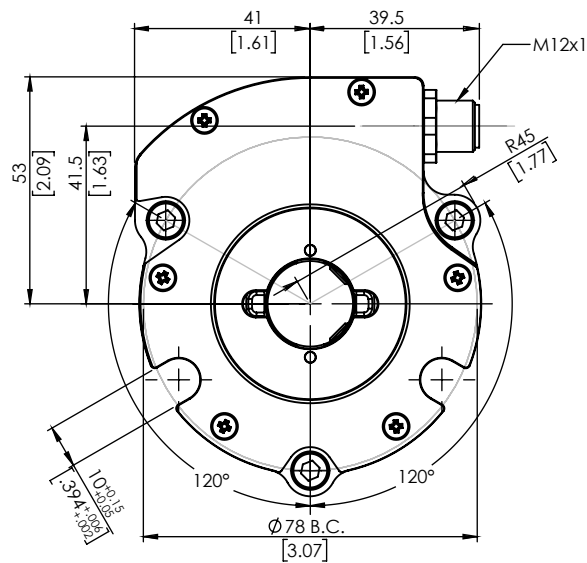
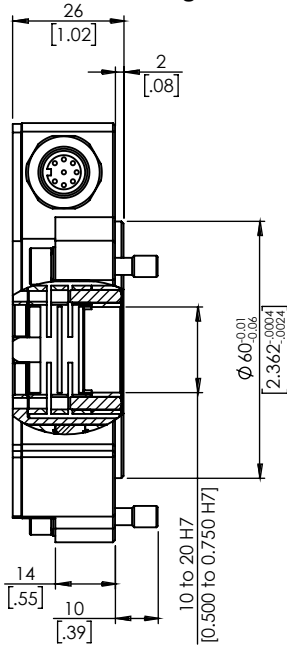
CHc M4 Screw (SW3)



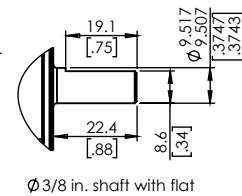
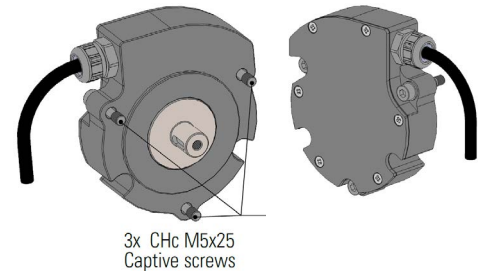
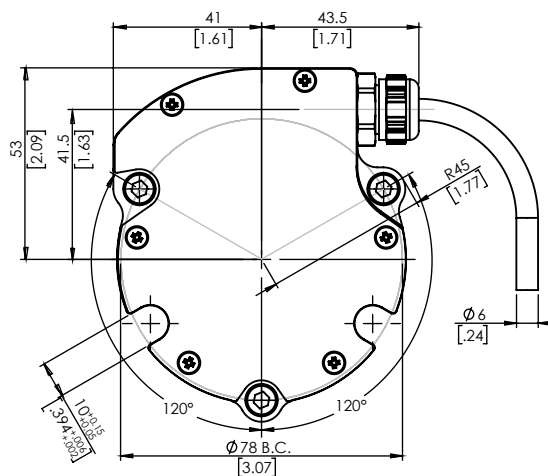
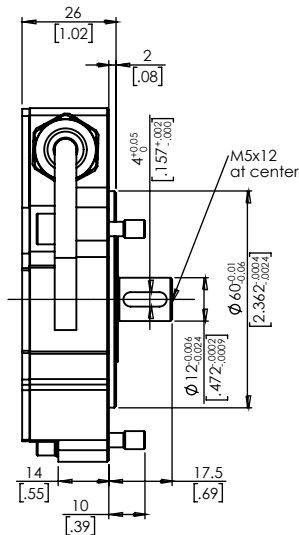
Blind hollow shaft



Shaft with integrated coupling

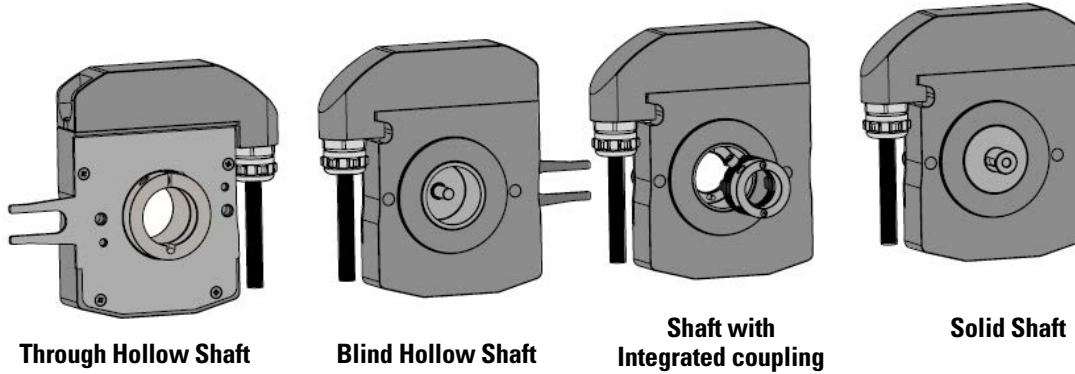


Solid shaft

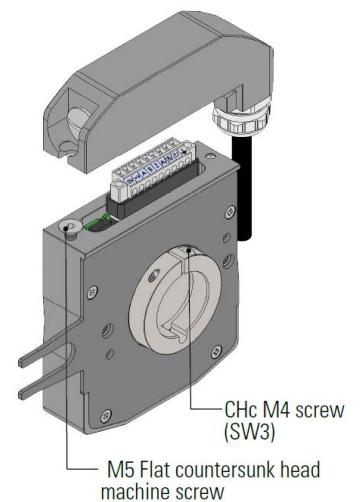
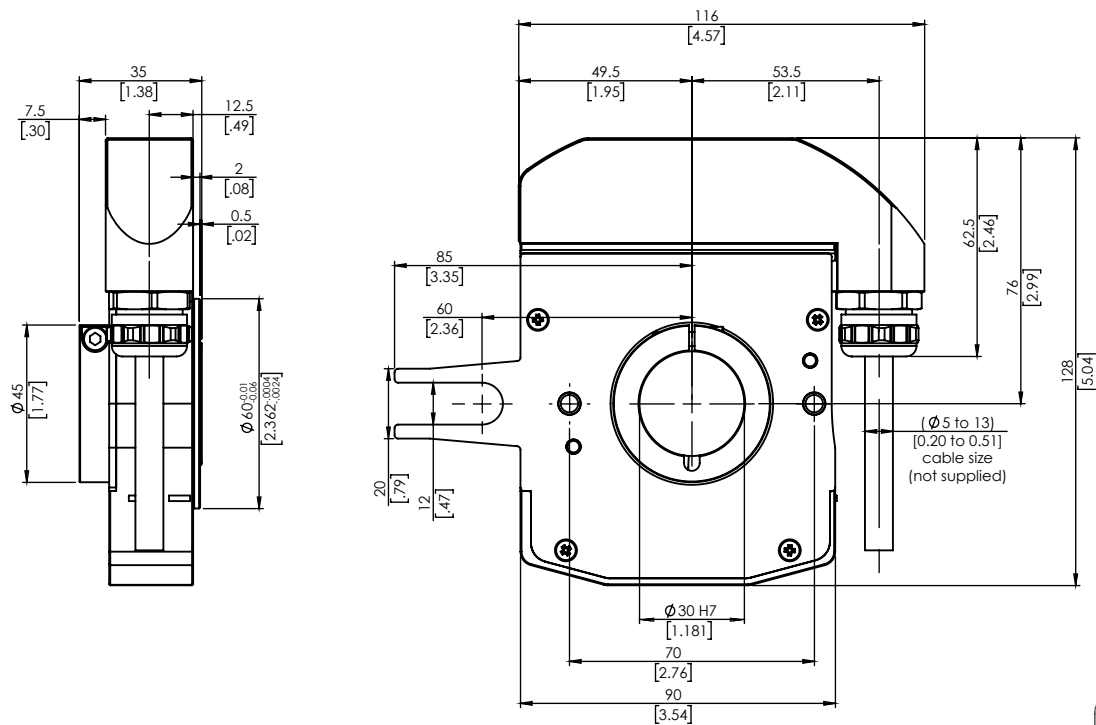




TERMINAL BOX SHAFT OPTIONS



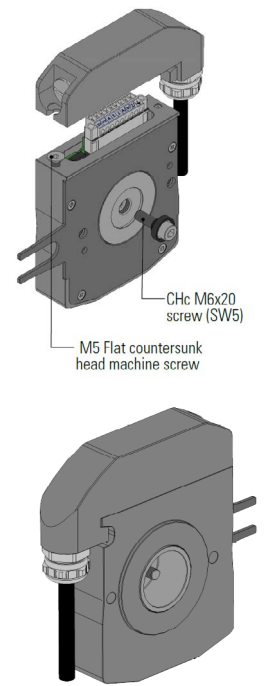
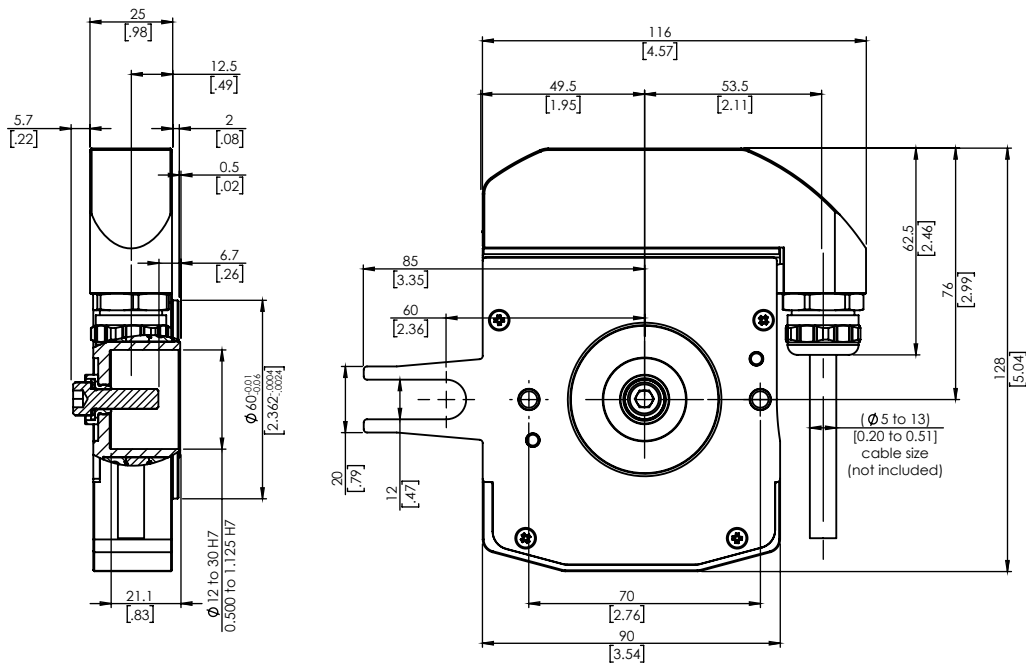
Through hollow shaft



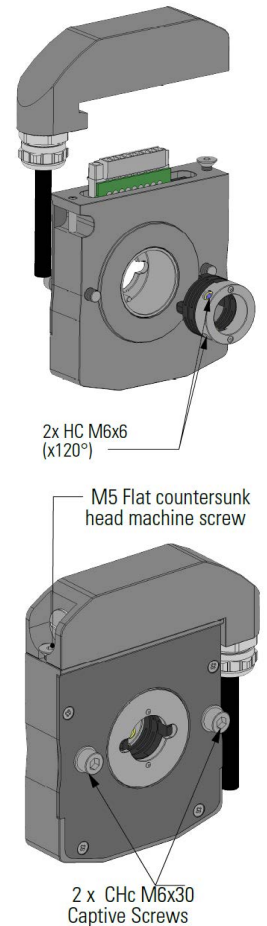
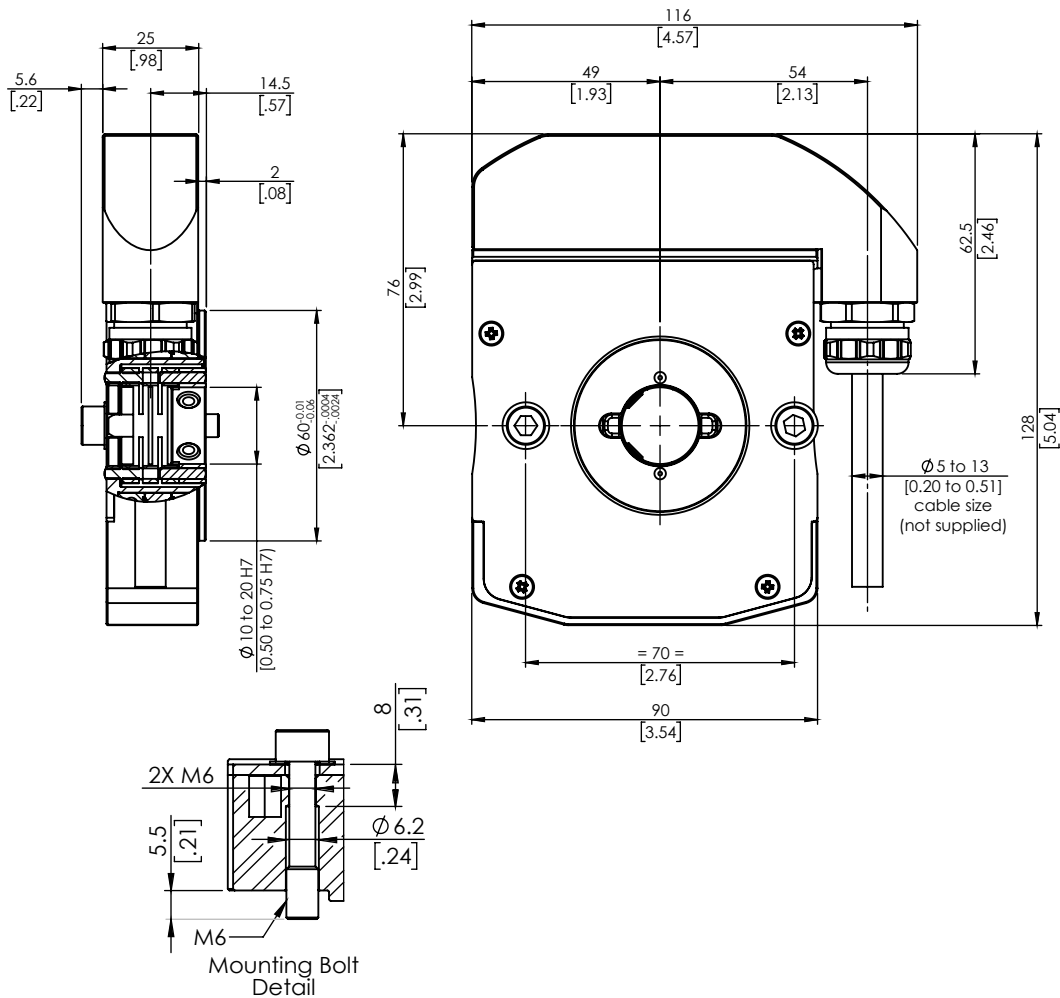
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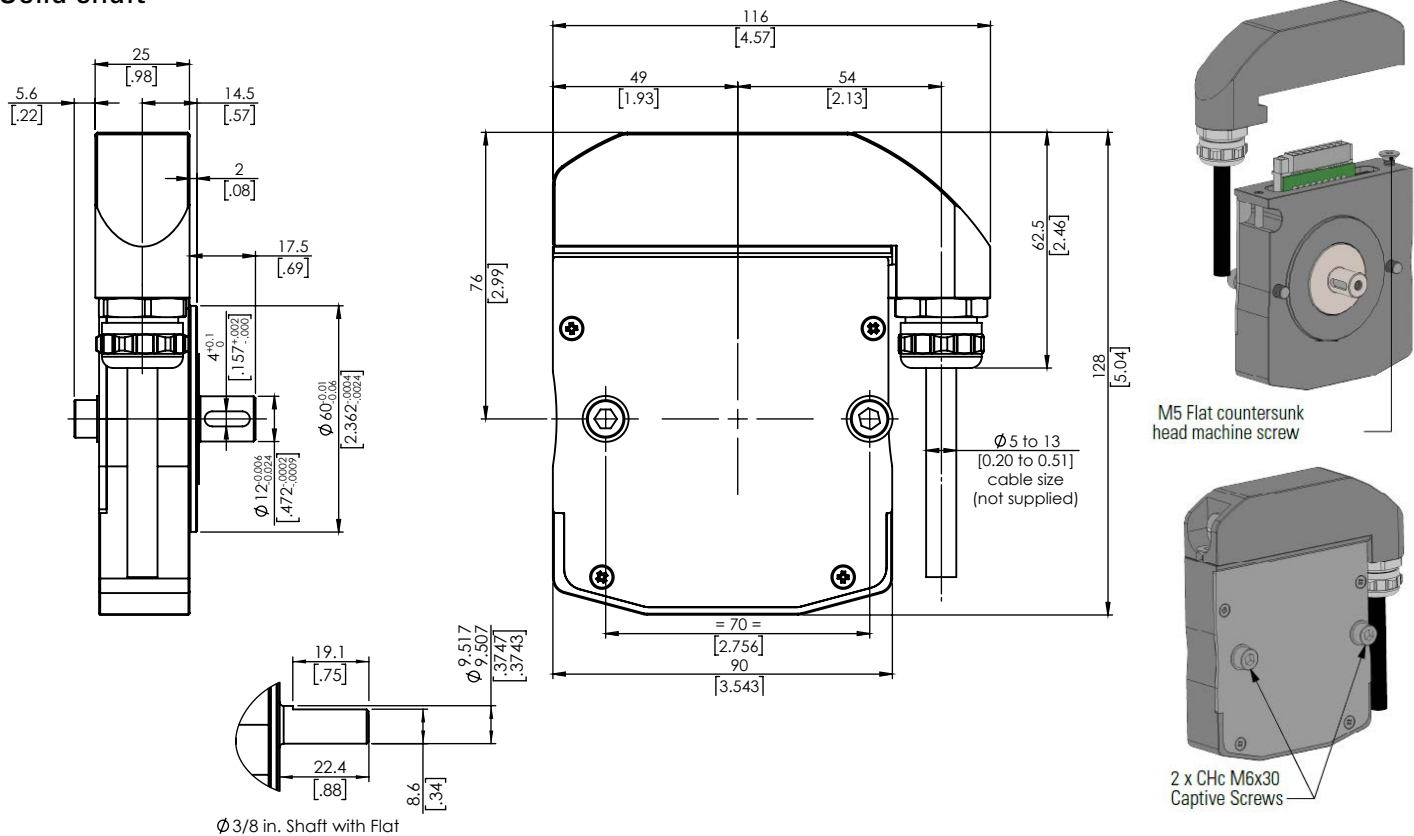
Blind hollow shaft



Shaft with integrated coupling

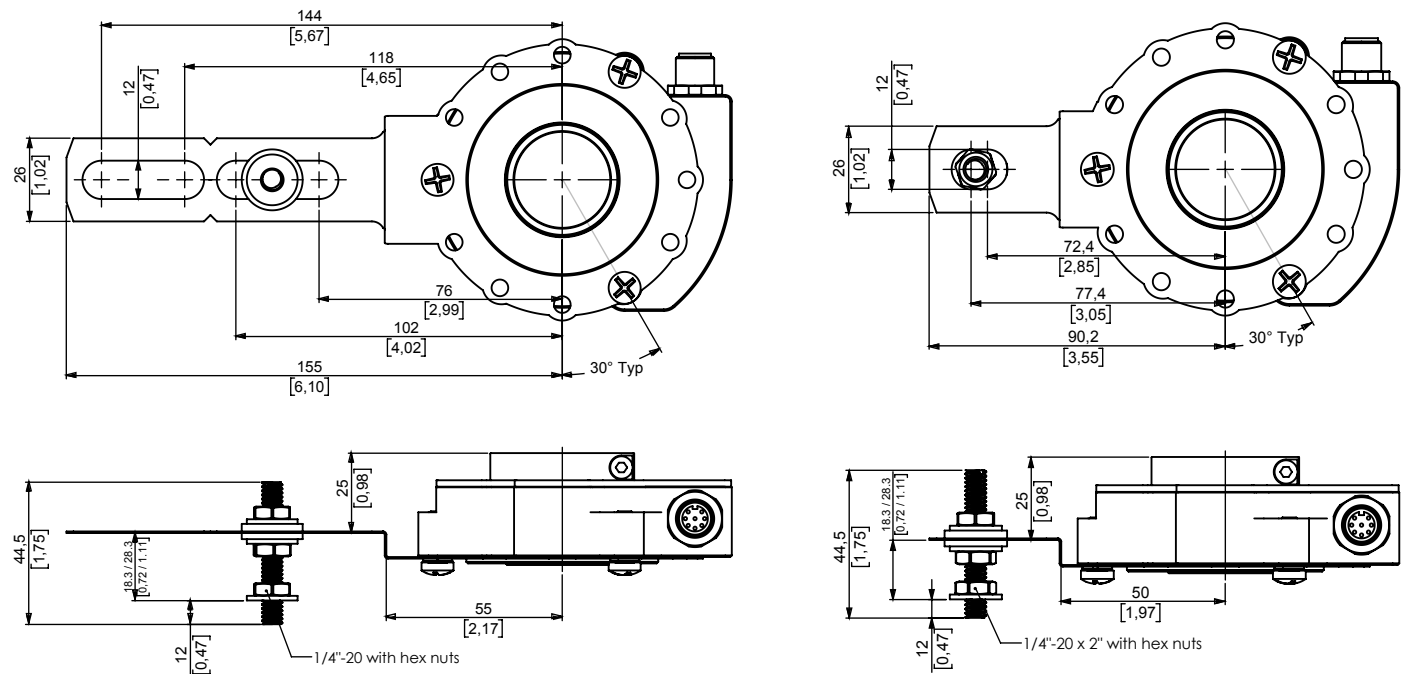


Solid shaft



TETHER OPTIONS FOR STANDARD CABLE OR M12 CONNECTOR

Other options available, consult factory. Tethers come with all the hardware shown.

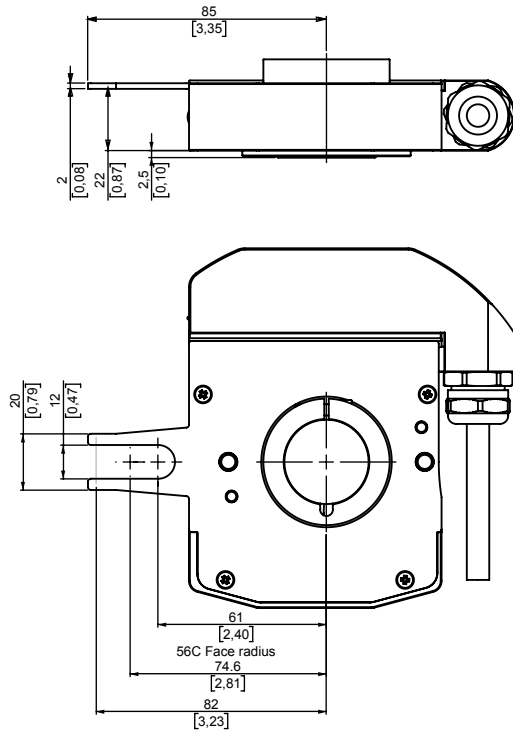


T2- Long tether arm with 1/4"-20 adj. hardware – M9445/053-02

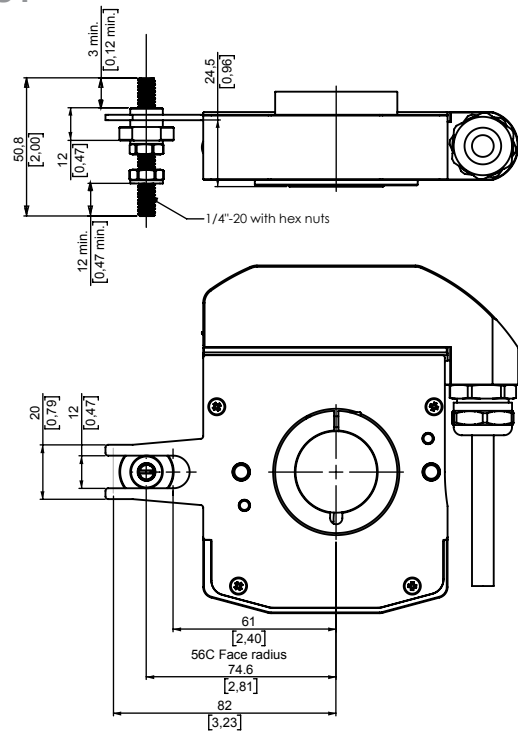
T3-Short tether arm with 1/4"-20 adj. hardware (fits 56C) – M9445/058-02



TETHER OPTIONS FOR TERMINAL BOX OUTPUT



T4- Standard Fork is provided for all blind or through hollow shaft versions



T5- M9445/059-02 Standard Fork + 56C Face Pin



TERMINATIONS

Connection Incremental

Termination	Connection Ordering Code	Description	-	+	A	B	Z	A/	B/	Z/	Case Ground
M12	M12	EUR M12 - 8 pins	1	2	3	4	5	6	7	8	Connector Body
Standard Cable	SG	PVC Jacket	BLK	RED	YEL	BLU	ORN	WHT/YEL	WHT/BLU	WHT/ORN	GRN
Terminal Box	T	Terminal box - 9 pins	1	2	3	4	5	6	7	8	9

Other cable types available- Consult factory

Connection Absolute SSI

Termination	Connection Ordering Code	Description	-	+	Clk+	Clk-	Data+	Data-	Reset	NC	Case Ground
M12	M12	EUR M12 - 8 pins	1	2	3	4	5	6	7	N/A	Connector Body
Standard Cable	SG	PVC Jacket	BLK	RED	BLU	WHT/BLU	YEL	WHT/YEL	ORN	N/A	GRN
Terminal Box	T	Terminal box - 9 pins	1	2	3	4	5	6	7	8	9



STANDARD RESOLUTIONS

Incremental

32	64	100	128	250	256	360	500	512
600	720	1000	1024	1200	1250	1440	1500	2000
2048	2500	2880	3600	4096	5000	7200	8192	10000

Absolute

BITS	5	6	7	8	9	10	11	12	13	14	15	16
Counts	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536

For non-standard and resolutions above 10000 PPR, please contact factory



ORDERING OPTIONS - NORTH AMERICAN LP35 MODELS

Use this diagram, working from left to right to construct your model number (Example : LP35-S-Q28-02048-H30S-28/V-SGXXX-T0)

Family	Housing Type	Output	Resolution	Mounting	Standard Outputs	Output Termination Type	Coupling / Tether Types	Special Features	
LP35: Low Profile 90mm (3.5") body size	S = Standard	INCREMENTAL ABZC Q28 = Index with A&B High Q29 = Index gated with Neg B ABSOLUTE AB = Natural Binary AG = Gray Code	INCREMENTAL See standard resolution list, ex: 01024 ABSOLUTE See standard resolution list, ex: 12	XXXXX Example shows H30S for Metric and H4EP for Imperial H: Through Hollow Shaft (Includes collet clamp) 30S = 30mm (Non isolated) Less than 30mm with isolated reduction sleeve H4EP = 1/2" H5EP = 5/8" H6EP = 3/4" H7EP = 7/8" H8EP = 1" H8ES = 1" no isolation B: Blind Hollow Shaft (Screws into mating shaft – screw provided) Non isolated versions standard. Isolated versions <30mm available, consult factory.	B30S = 30 mm B5ES = 5/8" B6ES = 3/4" B7ES = 7/8" B8ES = 1" C: Hollow Shaft with Integrated Coupling (all options insulated) C14P = 14 mm C20P = 20 mm C4EP = 1/2" C6EP = 3/4" S: Shafted (Requires separate coupling) S12 = 12mm S3E = 3/8"	INCREMENTAL 28/V = Standard line driver 5-30V In / Out / PushPull 28/5 = Standard Line Driver with 5 volt (TTL) regulated output 28/VR = Push Pull 11-30V reinforced (only T version) Note: All versions are short-circuit protected. Reinforced electronics are short circuit and overvoltage protected ABSOLUTE 28/SI : SSI RS485 w/o parity 28/SR : SSI RS485 reinforced w/o parity Terminal Box version only	BOX T = Terminal Box with cable gland. ⁽¹⁾ STANDARD CABLE SGXXX = Cable gland seal. PVC jacket and US standard color code. SQPHHH = Polyurethane with EU Color Code (Not UL listed); STEHHH = Silicone with EU color code (Not UL listed); XXX=cable length in inches up to 120" in 6 inch increments; HHH = cable length in dm up to 100 dm in 5 dm increments CONNECTOR SM12 : European standard connector with EU color code SG18C18 : US- MS3102R18-1P on end of 18" cable SGS18C12 : US- MS3112E12-10P on end of 18" cable	S VERSION T0 = No tether = STD T2 = Long Tether Kit (56C) T3 = Short Tether Kit BOX VERSION T4 = Standard Fork is provided for all LP35-TB with blind or through hollow shaft T5 = M9445/059-01 Standard Fork + 56C Face hardware Other Tether arms may be ordered separately (Ex: Ball joint Tether M9230-04/XXX) consult with factory	Special Features

NOTE: ⁽¹⁾"T" Code changes the form from approximately 90mm (3.5") round to a rectangle that is approximately 128mm (5") high by 116mm wide (4.5")



AGENCY APPROVALS & CERTIFICATIONS



2004 / 108 / CE



Proc. Cont. Eq.
E477663

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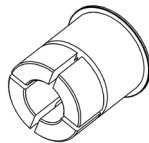

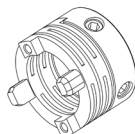
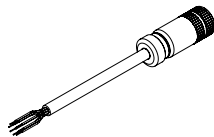
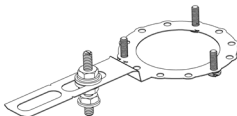
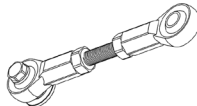
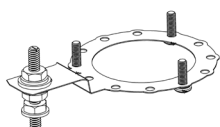
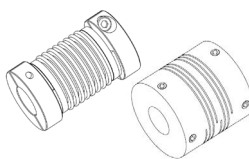
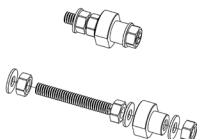
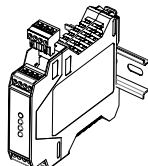
GENERAL NOTES

^[A] For detailed installation instructions and recommend screw torques refer to the User's Manual



ACCESSORIES

The following accessories are included with your LP series encoder and defined by your part number selection.

<div>Bore Reduction Sleeve</div> <div></div>	<div>9418/HXX series: range is from ½" through 1" in 1/8 inch increments</div>	<div>Key for 12mm slot</div> <div></div>	<div>9435/006 = 4X4X12 mm key</div>																		
<div>Integrated Coupling Kit (includes flex, hub and set screws)</div> <div></div>	<div>M9410/009-14 = 14 mm M9410/009-20 = 20 mm M9410/009-E3 =1/4 in. M9410/009-E4 = 1/2 in. M9410/009-E5 = 5/8 in. M9410/009-E6 = 1 in.</div>	<div>Cable Assemblies</div> <div></div>	<table><tr><th>Length</th><th>Model Number</th><th>Part Number</th></tr><tr><td>0.5m</td><td>9416/111-8230/200-GM-005</td><td>RAL-005-002</td></tr><tr><td>1m</td><td>9416/111-8230/200-GM-010</td><td>RAL-010-012</td></tr><tr><td>2m</td><td>9416/111-8230/200-GM-020</td><td>RAL-020-035</td></tr><tr><td>5m</td><td>9416/111-8230/200-GM-050</td><td>RAL-050-045</td></tr><tr><td>10m</td><td>9416/111-8230/200-GM-100</td><td>RAL-100-047</td></tr></table>	Length	Model Number	Part Number	0.5m	9416/111-8230/200-GM-005	RAL-005-002	1m	9416/111-8230/200-GM-010	RAL-010-012	2m	9416/111-8230/200-GM-020	RAL-020-035	5m	9416/111-8230/200-GM-050	RAL-050-045	10m	9416/111-8230/200-GM-100	RAL-100-047
Length	Model Number	Part Number																			
0.5m	9416/111-8230/200-GM-005	RAL-005-002																			
1m	9416/111-8230/200-GM-010	RAL-010-012																			
2m	9416/111-8230/200-GM-020	RAL-020-035																			
5m	9416/111-8230/200-GM-050	RAL-050-045																			
10m	9416/111-8230/200-GM-100	RAL-100-047																			
<div>Long Tether Arm Kit</div> <div></div>	<div>M9445/053 = long tether, M8x1 rod M9445/053-01 = long tether, 3/8"-16 rod M9445/053-02 = long tether, 1/4"-20 rod</div>	<div>Ball End Tether</div> <div></div>	<div>M9230-04/XXX</div>																		
<div>Short Tether Arm Kit</div> <div></div>	<div>M9455/058 = short tether, M8x1 rod M9455/058-01 = short tether, 3/8"-16 rod M9445/058-02 = short tether, 1/4"-20 rod</div>	<div>Flexible Couplings</div> <div></div>	<div>Bellows Type 9404/S/12-12 = for use with a 12mm shaft Triple Beam Type 39074-12-12 = for use with a 3/8" shaft</div>																		
<div>Tether Pin Kit</div> <div></div>	<div>M9445/059 = M10x1.5 rod and hardware M9445/059-01 = 3/8"-16 rod and hardware M9445/059-02 = 1/4"-20 rod and hardware</div>	<div>Intrinsic Safety Barrier</div> <div></div>	<div>This galvanically isolated barrier provides both power and signal isolation for an incremental encoder. With differential line driver outputs, it can carry signals up to 500 feet with a bandwidth of up to 250 kHz. For detailed ordering options, refer to accessory specification sheet.</div>																		

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CONTACT US

Americas

+1 (800) 350 2727 – Option 1
sales.beisensors@sensata.com

Europe, Middle East & Africa

+33 (3) 88 20 8080
position-info.eu@sensata.com

Asia Pacific

sales.isasia@list.sensata.com
China +86 (21) 2306 1500
Japan +81 (45) 277 7117
Korea +82 (31) 601 2004
India +91 (80) 67920890
Rest of Asia +886 (2) 27602006
ext 2808