



MODEL LP35 | LP SERIES

LOW PROFILE EXPLOSION-PROOF / FLAMEPROOF ENCODER

Introduction

For the absolute version Serial Synchronous Interface SSI output provides effective synchronisation in a closed-loop control system. A clock pulse train from a controller is used to shift out sensor data: one bit of position data is transmitted to the controller per clock pulse received by the sensor. Incremental versions provide two channels in quadrature with complements and an index. Resolutions up to 10,000 cpt are available.



Features

- Designed for use in Class I, Div.1 & Zone 1 hazardous areas
- 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 with Conduit Termination
- 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



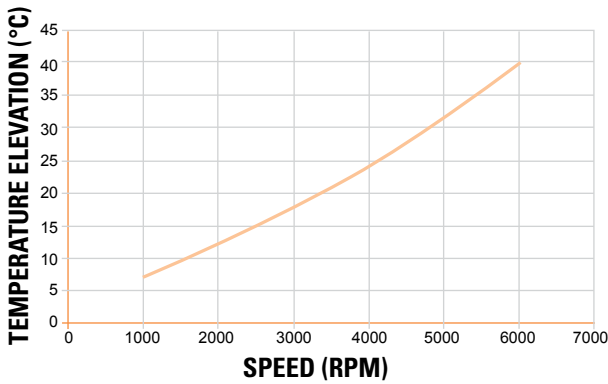
SPECIFICATIONS

Mechanical

Housing Size	124 mm x 156 mm x 52 mm (see dimensional drawings for other configurations)
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 .78" with flat Hollow Shaft w/ Integrated Coupling: 14mm, 20mm, 1/2", 3/4"
Permissible Shaft Loads	Axial: 40 N [9 lbs] Radial: 80 N [18 lbs]
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, deep groove ball bearing
Material	Cover: Hard anodized aluminum Body: Hard anodized aluminum Shaft: AISI 303 stainless steel
Bearing Life L_{10h} (Theoretical Mechanical Lifetime)	$> 18 \cdot 10^9$ turns / 100000 hours
Continuous Max. Speed^(A)	6000 RPM, (Reference Chart 1. Speed vs Temperature)
Shaft Moment of Inertia	$< 130\,000 \text{ g}\cdot\text{mm}^2$ [$18.4 \times 10^{-3} \text{ oz-in}\cdot\text{sec}^2$]
Weight (aprox.)	1.6 kg [56.5 oz]

Chart 1. Speed vs Temperature

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



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	
Supply Current (No Loads)	75mA Typ	
Current Per Channel Pair	40mA max	
Voltage / Output	28/SI: SSI RS485 w/o parity 28/SR: SSI RS485 reinforced w/o parity	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
Short Circuit Proof	28/SI: Yes (except to V+) 28/SR: Yes	28/V: Yes 28/5: Yes (except to Vcl) 28/VR: Yes
Reverse Polarity Tolerant	Yes	
Wiring Fault Tolerant & Overvoltage Prot.	28/SI: No 28/SR: Yes	28/V: No 28/5: No 28/VR: Yes Up to 60Vdc
Frequency Response	Up to 1MHz (28/V and 28/5) Up to 300kHz (28/VR)	
Output Terminations	Enclosed terminal block, with three conduit fitting options: M16, 1/2" NPT, 3/4" NPT	
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

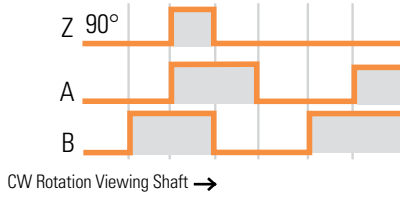
Protection Class (sealing)	IP65	
Temperature Range	Operating	-40°C to +85°C
	Storage	-40°C to +100°C
Mechanical Resistance	Shock	(EN60068-2-27): ≤ 3000m.s ⁻² (during 5 ms, half sine)
	Vibration	(EN60068-2-6): ≤ 200m.s ⁻² (55 ... 2 000 Hz)
Humidity	98% RH without condensation	

OUTPUT WAVEFORMS

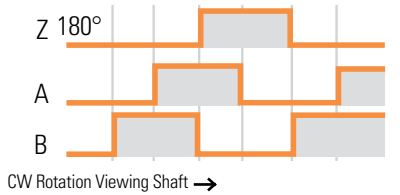
Waveform AA/ BB/ 00/ Channel B before A Clockwise (US convention is A leads B CCW)

Incremental Waveform

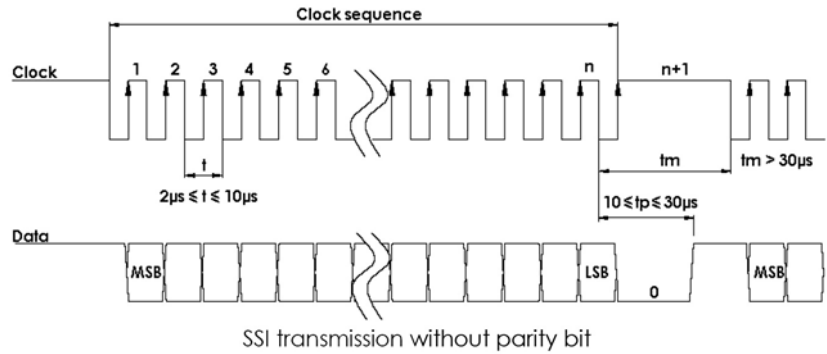
INDEX GATED WITH A & B HIGH (CODE Q28)



INDEX GATED WITH B LOW (CODE Q29)



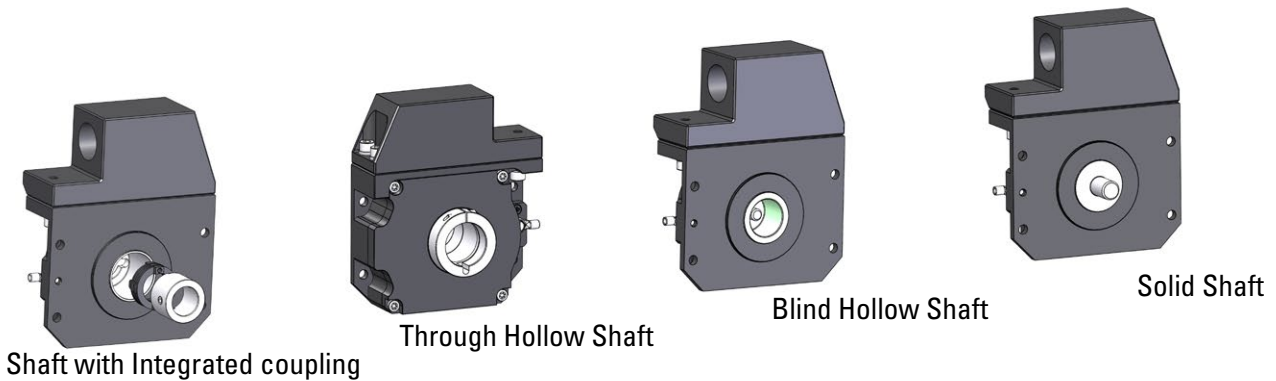
Absolute SSI Waveform



DIMENSIONS ^(A)

All dimensions are in millimeters [inches]
All drawings: For dimensions A-E refer to Table 1

SHAFT OPTIONS



Shaft with integrated coupling

Through driving sleeve configuration

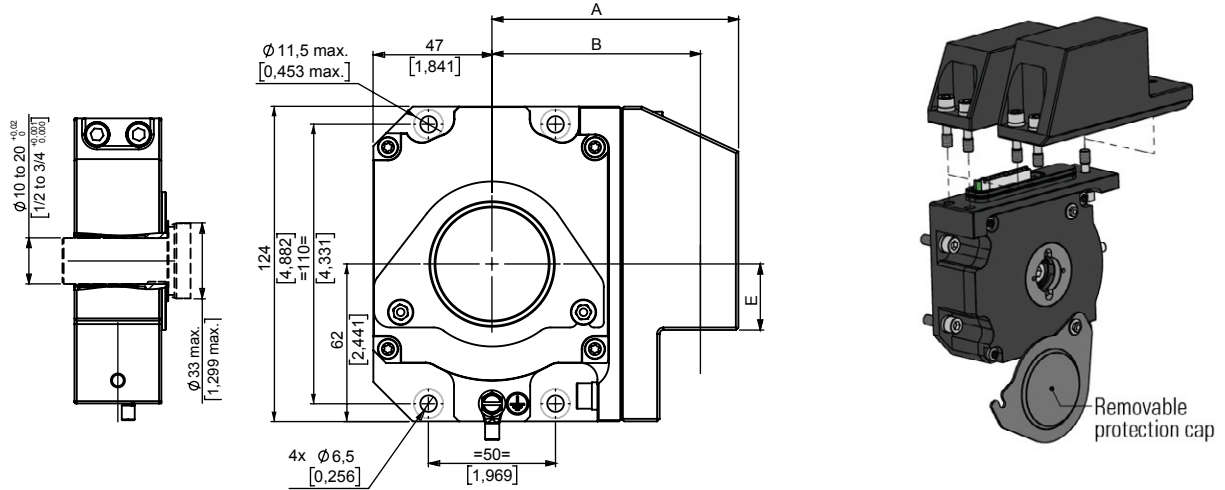
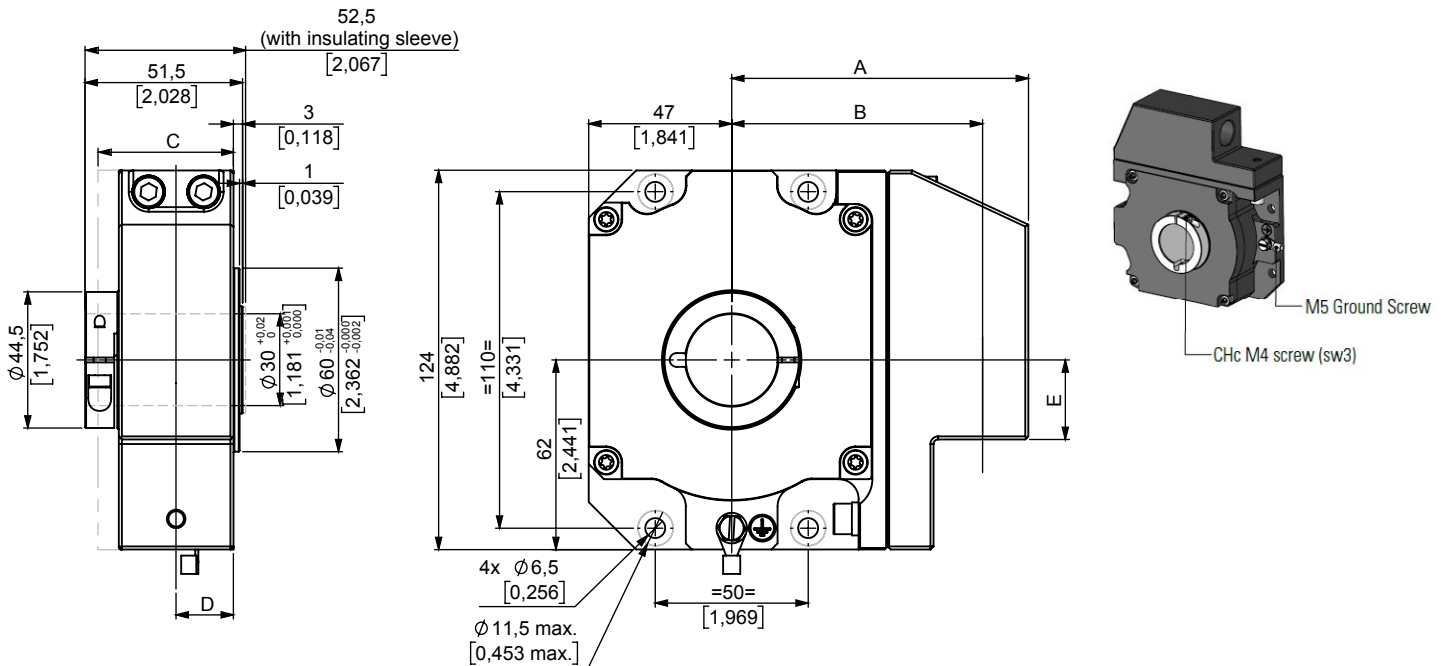


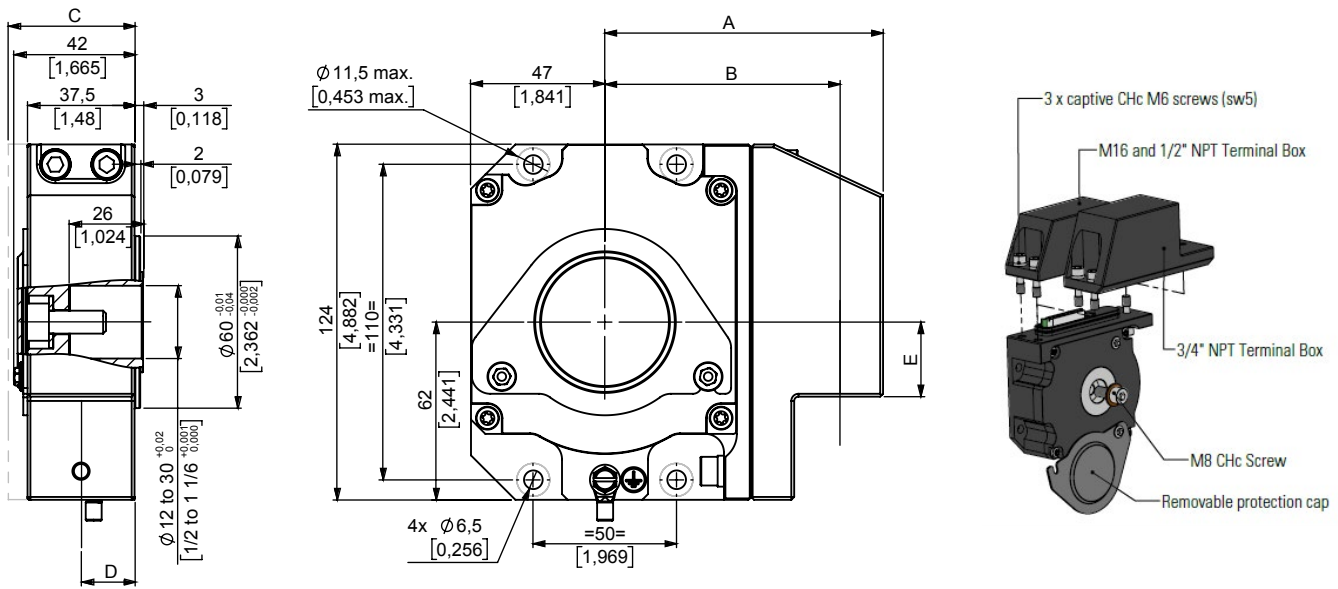
Table 1

	M16 and 1/2" NPT Terminal Box		3/4" NPT Terminal Box	
	mm	in	mm	in
A	97	3.819	109	4.291
B	82	3.228	88.5	3.484
C	37.50	1.437	44	1.732
D	18.25	0.719	22.25	0.876
E	27	0.945	24	0.945

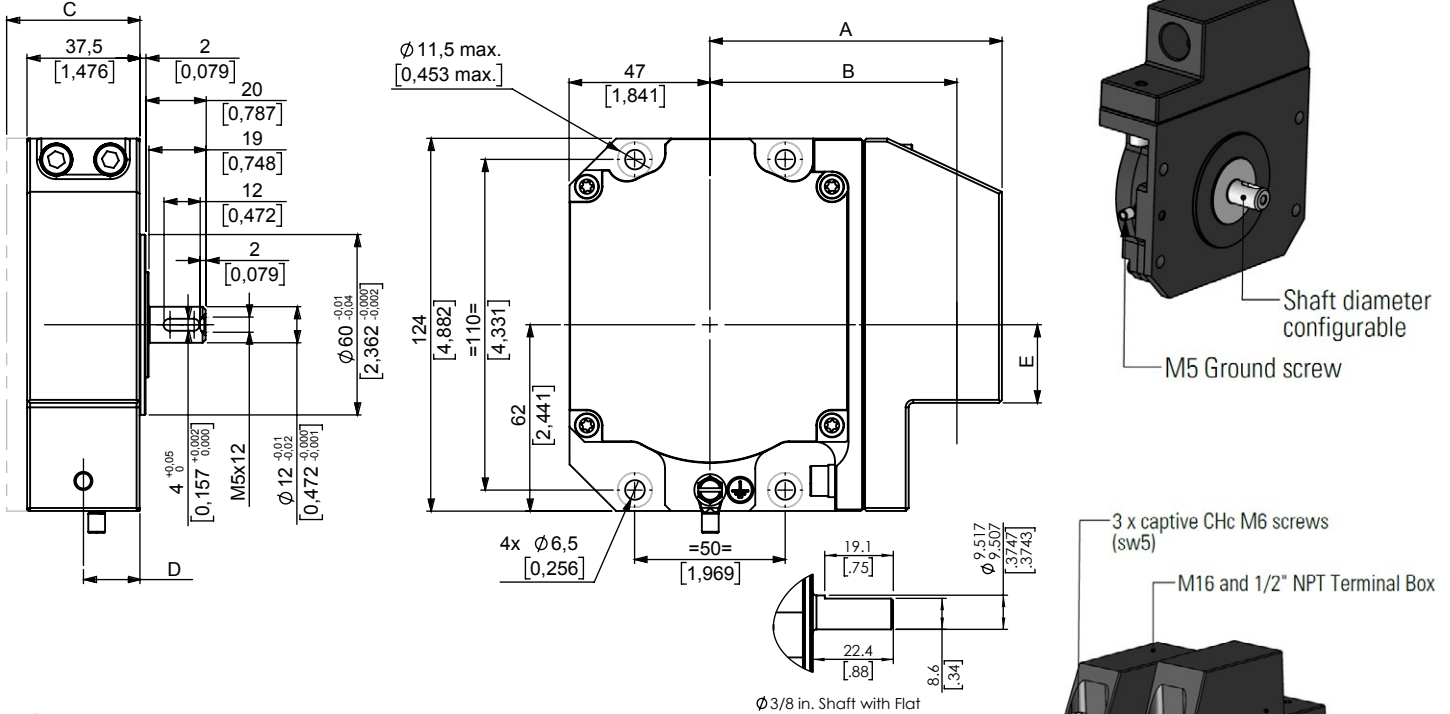
Through hollow shaft



Blind hollow shaft



Solid shaft



TERMINATIONS

Absolute Terminal Box Connection

-	+	Clk+	Clk-	Data+	Data-	Reset	NC	Ground
1	2	3	4	5	6	7	8	9

Incremental Terminal Box Connection

-	+	A	B	Z	A/	B/	Z/	Ground
1	2	3	4	5	6	7	8	9



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

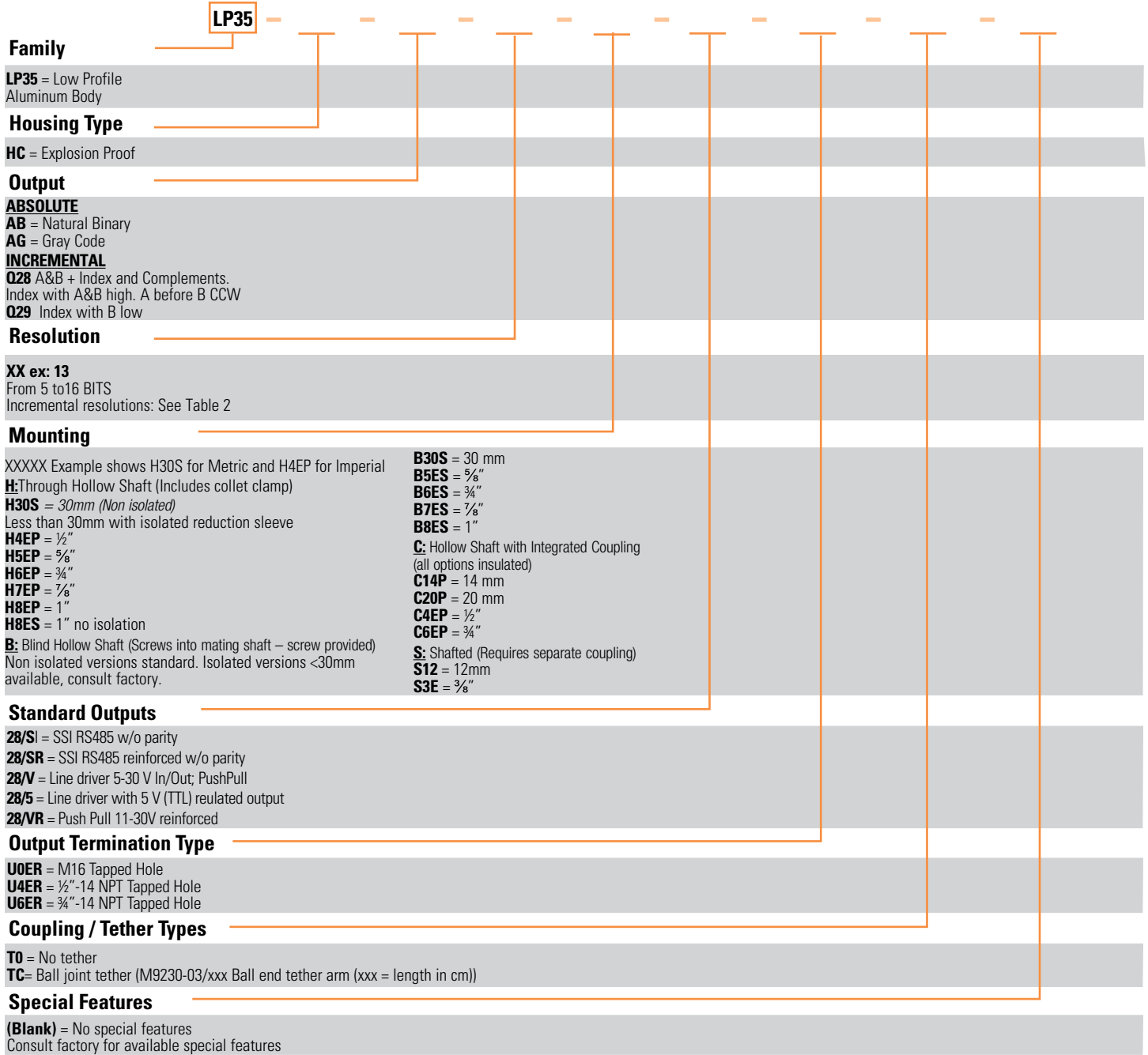
BITS	5	6	7	8	9	10	11	12	13	14	15	16
Counts	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536

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-HC-AB-13-H30S-28/SI-U0ER-T0)



AGENCY APPROVALS & CERTIFICATIONS

UL ^{US}
LISTED Class I, Group C & D

IEC **IECEx**
Ex db IIB T4 Gb

Kcs
2017-031591-01

CE 2004/108/CE

CENELEC
II 2 G Ex db IIB T4 Gb

DEMKO 16 ATEX 1691X
IECEX UL 16.0064X

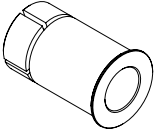
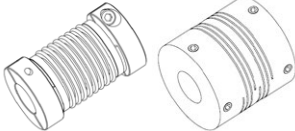
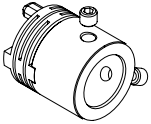
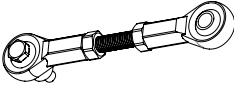
These commodities, technology or software if exported from the United States must be in accordance with the Bureau of Industry and Security, Export Administration regulations. Diversion contrary to U.S. Law is prohibited.

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 as defined by your part number selection.

<p>Bore Reduction Sleeve</p> 	<p>9418/EE6 = 3/4 in. bore 9418/EE8 = 1 in. bore 9418.E20 = 20 mm</p>	<p>Flexible Couplings</p> 	<p>Bellows Type 9404/S/12-12 = for use with a 12mm shaft</p> <p>Triple Beam Type 39074-12-12 = for use with a 3/8" shaft</p>
<p>Integrated Coupling Kit (includes flex, hub and set screws)</p> 	<p>M9410/010-E3 = 3/8 in. M9410/010-E4 = 1/2 in. M9410/010-E5 = 5/8 in. M9410/010-E6 = 3/4 in. M9410/010-11 = 10 mm M9410/010-12 = 12 mm M9410/010-14 = 14 mm M9410/010-20 = 20 mm</p>	<p>Ball End Tether</p> 	<p>M9230-03/XXX (XXX=Center-to-center nominal distance in mm)</p>

CONTROL DRAWINGS

Accompanying the spec is a control drawing. This is specific for the Explosion Proof products from the LP35 family and consist of Installation Requirements, Special Conditions of Operation and a Certificate of Conformity. In these documents, the LP series models are referred to as HH_X and AH_X. Despite the difference in nomenclature, these are the same product specified under the LP35 nomenclature. Both the LP35 and the HH_X or AH_X model numbers will appear on the label of the finished product.

Sensata Technologies, Inc. ("Sensata") data sheets are solely intended to assist designers ("Buyers") who are developing systems that incorporate Sensata products (also referred to herein as "components"). Buyer understands and agrees that Buyer remains responsible for using its independent analysis, evaluation and judgment in designing Buyer's systems and products. Sensata data sheets have been created using standard laboratory conditions and engineering practices. Sensata has not conducted any testing other than that specifically described in the published documentation for a particular data sheet. Sensata may make corrections, enhancements, improvements and other changes to its data sheets or components without notice.

Buyers are authorized to use Sensata data sheets with the Sensata component(s) identified in each particular data sheet. HOWEVER, NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER SENSATA INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY THIRD PARTY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT, IS GRANTED HEREIN. SENSATA DATA SHEETS ARE PROVIDED "AS IS". SENSATA MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO THE DATA SHEETS OR USE OF THE DATA SHEETS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ACCURACY OR COMPLETENESS. SENSATA DISCLAIMS ANY WARRANTY OF TITLE AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT, QUIET POSSESSION, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS WITH REGARD TO SENSATA DATA SHEETS OR USE THEREOF.

All products are sold subject to Sensata's terms and conditions of sale supplied at www.sensata.com SENSATA ASSUMES NO LIABILITY FOR APPLICATIONS ASSISTANCE OR THE DESIGN OF BUYERS' PRODUCTS. BUYER ACKNOWLEDGES AND AGREES THAT IT IS SOLELY RESPONSIBLE FOR COMPLIANCE WITH ALL LEGAL, REGULATORY AND SAFETY-RELATED REQUIREMENTS CONCERNING ITS PRODUCTS, AND ANY USE OF SENSATA COMPONENTS IN ITS APPLICATIONS, NOTWITHSTANDING ANY APPLICATIONS-RELATED INFORMATION OR SUPPORT THAT MAY BE PROVIDED BY SENSATA.

Mailing Address: Sensata Technologies, Inc., 529 Pleasant Street, Attleboro, MA 02703, USA.

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

SPECIAL CONDITIONS FOR SAFE USE:

The gaps of the different flame paths are less than the values specified in the tables of the IEC 60079-1 standard. The width of the different flameproof joints are superior to these specified in tables of IEC 60079-1 standard. See Document 08329-001 for construction details.

ASSEMBLY CAUTION/WARNING:

**Keep terminal cover closed and cable gland secured while in presence of hazardous atmosphere.
Open all circuits to this product prior to removal of terminal block cover.**

Electrical installation shall use standard EN/IEC 60079-14 and/or NEC Class 2 circuit specifications. UL certified installations require the use of a sealing fitting certified to 60079-0 Ex d IIB within 18 in. (46 cm) of the encoder. Terminal block covers are marked near the threaded hole with the basic thread size to aid with selection of fittings or glands. Conductor insulation must be rated for at least 105°C ambient temperature. External case ground connection is provided by means of a screw and ring type terminal which accepts up to 10 AWG (5.26 mm²) size conductor.

The customer shall use our products according to our specifications and to the manners of the profession. BEI Sensors will not be responsible for any defect resulting from improper installation or from operating outside of the specification limits of the product. Malfunctions caused by excessive shocks, bad electric supply, under or over voltage, the environmental conditions outside of the design specifications, are not covered by warranty. The encoder doesn't require any maintenance. There are no user serviceable parts inside. Any defective encoder shall be returned to the nearest BEI Sensors facility for evaluation and repair/replacement. A high integrity case ground connection must be made at or near the encoder installation location.

See LP35 User Manual (Doc. No. XXX) for installation details and Specification Document (no. 2000/008 or 2000/009) for product details not otherwise indicated on this document.

EU Declaration of Conformity

1. We, BEI Sensors, certify that **Models HH_X and AH_X** all resolutions, channel and output type options are explosion proof and flame proof as noted on the UL, IECEX and DEMKO certificates cited below.
2. With the following marking: II 2 G Ex db IIB T4 Gb
3. Designed and manufactured to comply with these directives:
ATEX : 2014/34/EU and CEM : 2014/30/EU
4. Complies with these standards:
ATEX: EN60079-0:2012+A11:2013, EN60079-1:2014,
IECEX: IEC60079-0:2011+IS1 2013, IEC60079-1:2014
5. As detailed in EC type examination certificates:
DEMKO 16 ATEX 1691X rev.0 and **IECEX UL 16.0064X Issue 0**
Product Quality Assurance Notification: **LCIE 03 ATEX Q8060**
Product Quality Assurance Report: **FR/LCI/QAR08 0002**
6. **EMC:** The following standards were also investigated for this certification: NFC 23-520, NFC 23-539, EN 50081-1, EN 55022 classe B, EN 55014, EN 61000-6-2, CEI 61000-4-2, CEI 61000-4-3, CEI61000-4-4, CEI 61000-4-5, CEI 61000-4-6, CEI 61000-4-8, CEI61000-4-11
7. The notified organization responsible for the follow-up of the **ATEX** directive is (Assessed by):
LCIE, B.P.8, F92260 Fontenay-aux-Roses - Identification number: 0081
8. The company in charge of certification **CEM** is: LCIE BUREAU VERITAS, Aire de la Thur 68840 Pulversheim

UL Declaration of Conformity

Part number **Model HH_X and AH_X** model for use in Class I, Group C & D

UL 1203 Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations
C22.2 No. 30-M1986 - Explosion-Proof Enclosures for Use in Class I Hazardous Locations
UL Certificate No. 201609XX-E78446
UL Report No. E78446-XXX
Issue date:

The notified organization responsible for the follow-up inspections for this **UL listing** is (Assessed by):
UL International (France) SA
Espace Technologique de Saint-Aubin, Immeuble Explorer
Route de l'Orme des Merisiers - F-91190 SAINT AUBIN:
Identification number: 675