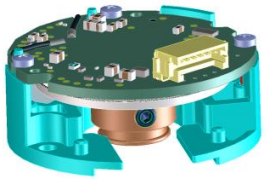
Datasheet

N35ST Series

N35ST Single-Turn Absolute Encoder Module



Description

N35ST series encoder is a high-resolution optical absolute encoder module, which offers up to 23 bits single turn resolution. This absolute encoder series is a module encoder consisting of a patterned disk, a light source, and photosensitive elements to translate the mechanical motion into electrical signals. The single-turn encoder is available with an RS-485 standard compliant communication protocol, supported by a half-duplex differential line transmissions driver, offering good noise immunity for a robust data transmission at 2.5Mbps in harsh industrial applications. Alternatively, the industry standard single-directional Synchronous Serial Interface (SSI) protocol is offered at a data transmission rate of 1MHz.

One of the key advantages of the N35ST series is the low profile module assembly. After assembly, the encoder module is only 16.5mm in overall height. With fast installation and easy one-touch calibration process, the N35ST series is well suited for direct motor assembly into small motors size of 40mm and above. As the product is intended for industrial applications, ESD protection circuitry has been designed to meet the industry standard of IEC-61000-4-2 for class 4 applications.

Features

- Selectable resolution up to 23 bits
- High accuracy: ±300 arc-sec
- Selectable communication protocol: half-duplex RS485, SSI 1 MHz
- Wide operating temperature range: -40 to 105°C
- High response speed up to 12 kRPM
- Compact size: ø35 mm, and height 16.5 mm
- Hassle-free installation with 1 touch calibration

Benefits

- High accuracy ±300 arc-sec (12 bits)
- High precision for position or speed control
- Fast installation and calibration for motor assembly
- Suitable for industrial operating temperature
- Compact size to cater for 40mm motor
- Modular solution for ease of integration into systems
- Cost-effectiveness solution

Applications

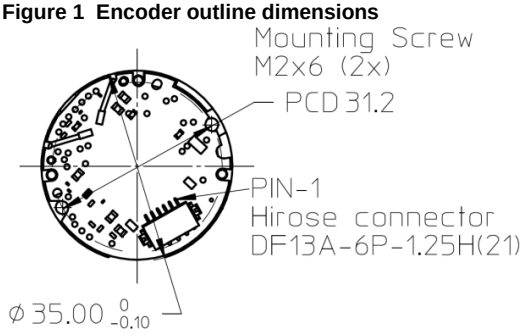
- Servo motor
- Robotic engineering and automation
- Factory & automotive automation
- Specialized equipment

NOTE Our encoders are not recommended for use in safety critical applications. E.g. ABS braking systems, power steering, life support systems and critical care medical equipment. Please contact sales representative if more clarification is needed.

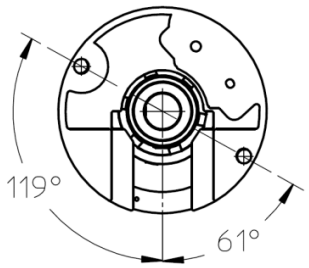
Mechanical Outlines

Standard Blind Hollow Hub Option (Φ D)

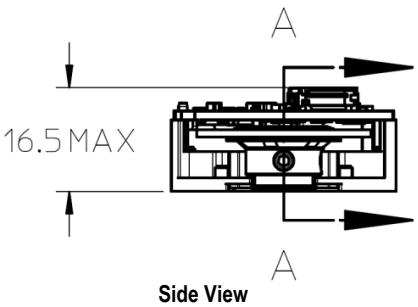
Figure 1 Encoder outline dimensions



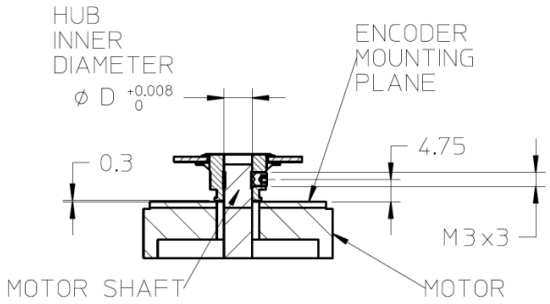
Top View



Bottom View



Side View



Section A-A View

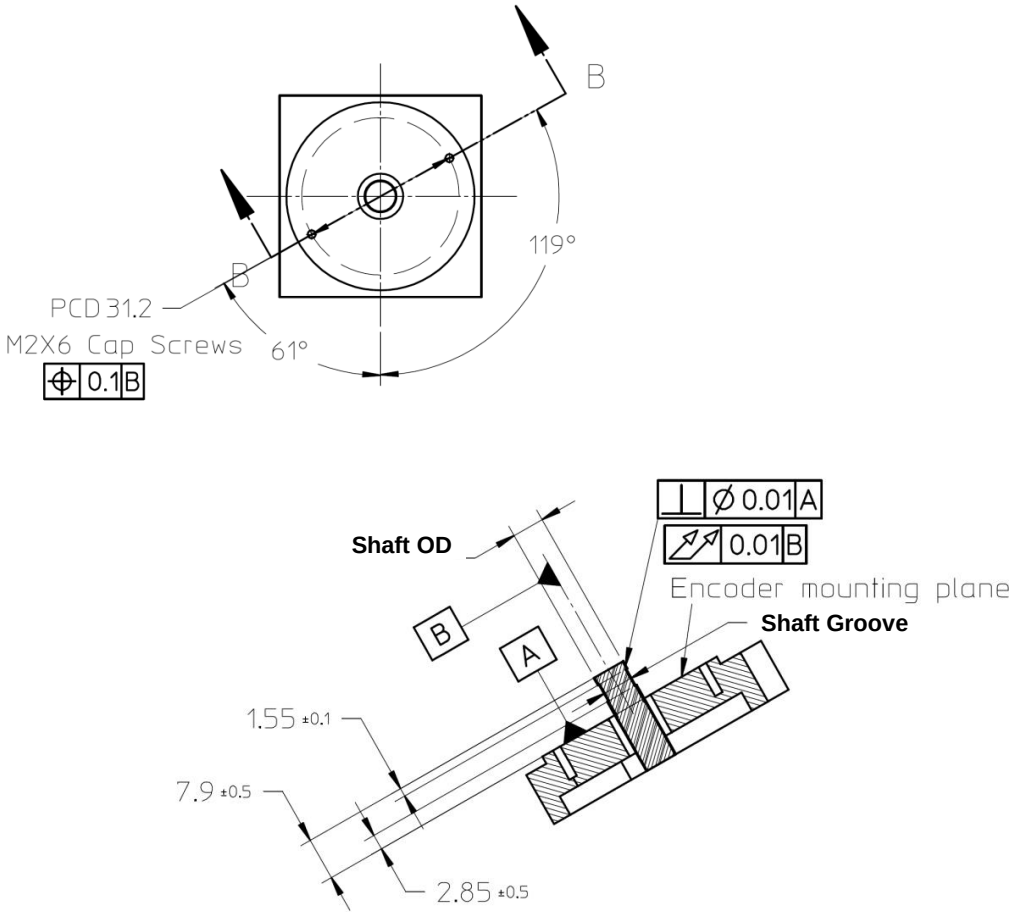
Isometric View

NOTE

1. Dimensions are in millimeters.
2. 3rd Angle Projection.
3. Unless otherwise specified, all tolerances are within ±0.5 mm.
4. Refer to Table 3 for available shaft diameter options.

Recommended Shaft and Mounting Requirements

Figure 2 Recommended customer shaft and motor base



NOTE

1. Dimensions are in millimeters.
2. 3rd Angle Projection.
3. Unless otherwise specified, all tolerances are within ±0.5 mm.
4. Recommended to have a recess on motor mounting surface to prevent encoder shaft interference with motor base.
5. Refer to the Motor Shaft Specifications table for the required shaft OD and groove tolerances.

Product Specifications

Encoder Operating Conditions

Table 1 Recommended operating conditions

Parameter	Symbol	Value			Units	Notes
		Min	Typical	Max		
DC Supply Voltage	VCC	+4.5	+5.0	+5.5	V	
Current Consumption	I_{CC}		80	120	mA	Without load, T_{amb} = 25˚C
Ripple of Supply Voltage				100	mVpp	100kHz
Spikes provided by Supply Voltage				200	mVpp	20MHz
Operating Temperature	T_{op}	-40	+25	+105	°C	Motor temperature
Storage Temperature	$T_{storage}$	-40	+25	+105	°C	
Encoder Shaft Speed				12,000	min^{-1}	Also applicable from stationary
Electrically Permissible Acceleration				$1.0x10^5$	rad/s^2	
Relative Humidity	RH			90	%	T_{amb} = 40°C, IEC61800-2, non-condensing

Mechanical Specifications

Table 2 Motor & System Specifications

Parameter	Value	Units	Notes
System Accuracy	±300	Arc-sec	T_{amb} = 25˚C
Mechanical Permissible Speed	12,000	min-1	
Shaft Radial Play	+/-0.05	mm	
Shaft Axial Play	+/- 0.15	mm	
Codewheel Set Screw Size	M3x3.0		2pcs

Motor Shaft Specifications

Table 3 Motor Shaft Specifications

Shaft OD & Tolerance (mm)			Shaft Groove & Tolerance (mm)		
Nominal	Lower	Upper	Nominal	Lower	Upper
5.0	-0.004	-0.014	4.5	-0.2	+0.2
6.0	-0.004	-0.014	5.5	-0.2	+0.2
6.35	-0.004	-0.014	5.85	-0.2	+0.2

Encoder Specifications

Table 4 Encoder specifications

Parameter	Remarks
Resolution	Single Turn: up to 23 Bits (8388607 counts)
Counting Direction	Increase with clockwise shaft rotation, view from encoder PCB top surface (Figure 3)
User accessible Memory size	5K bits (RS485 option only)

Environmental Specifications

Table 5 Encoder Environmental Specifications

Parameters	Conditions	Specifications
Vibration	Per IEC 60068-2-6	10G; 10~2000Hz
Shock	Per IEC 60068-2-27	6ms; Half Sine; 200G
Discharge of Static Electricity (ESD)	Per IEC 61000-4-2	± 8kV contact discharge, ± 12kV air discharge
Electrical Fast Transient / Burst Immunity	Per IEC 61000-4-4, Capacitive Coupling	± 2 kV / 5 kHz / 15ms
Dielectric Resistance	Leakage <1mA	1000Vac, 1Min
Insulation Resistance	At 1kV	10MΩ

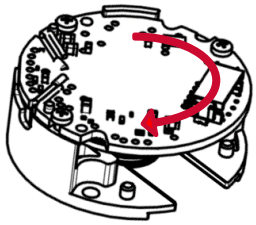


Figure 3 Encoder counting direction

Electrical Connection

Full-Duplex Transceiver (SSI Mode Protocol):

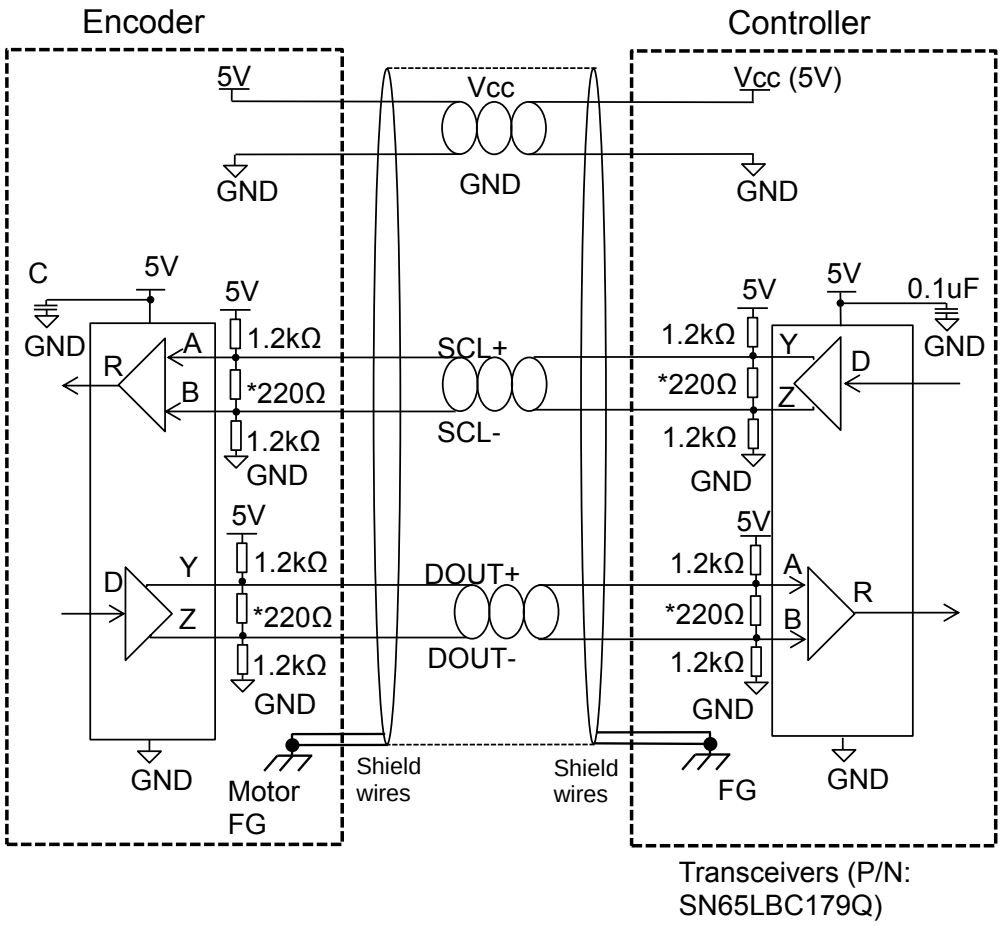


Figure 1. Circuit diagram of full-duplex transceiver

NOTE

1. Termination resistor, *220ohm is recommended but may depend on the characteristic impedance of types of cable used.
2. Recommended Differential Tranceiver P/N: SN65LBC179Q.
3. Recommended to use shielded, twisted pair cable and connect the cable shield to frame ground (FG) in application for enhanced noise immunity in harsh operating conditions.
4. Maximum cable length: 25m.

Half-Duplex Transceiver (RS-485 Half-Duplex Protocol):

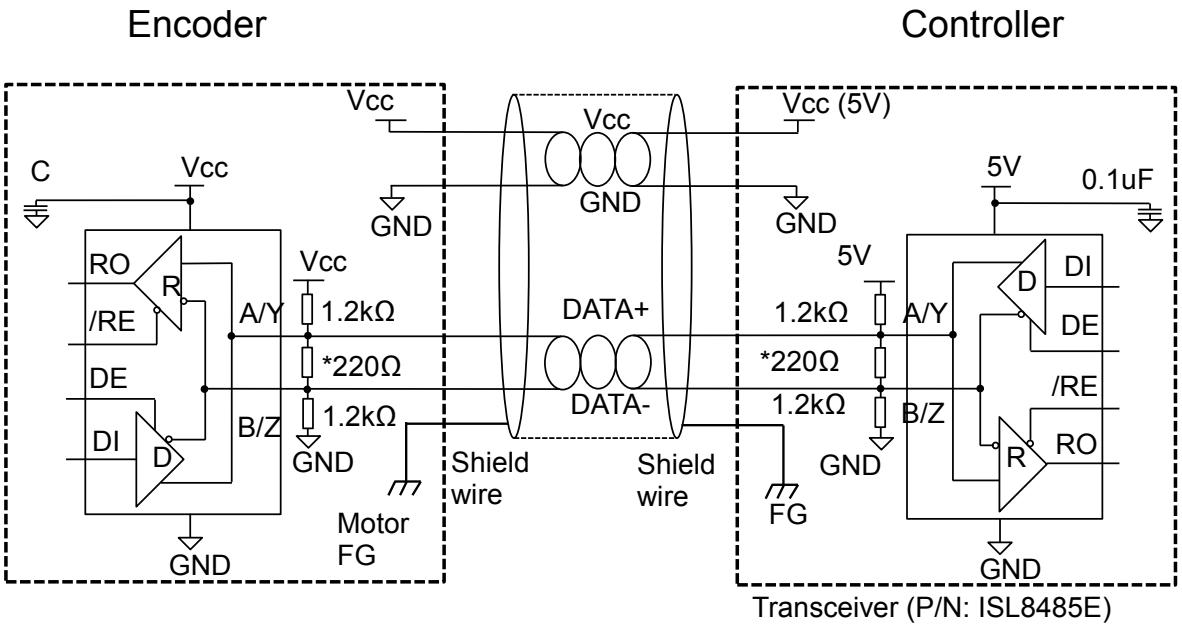


Figure 2. Circuit diagram of half-duplex transceiver

NOTE

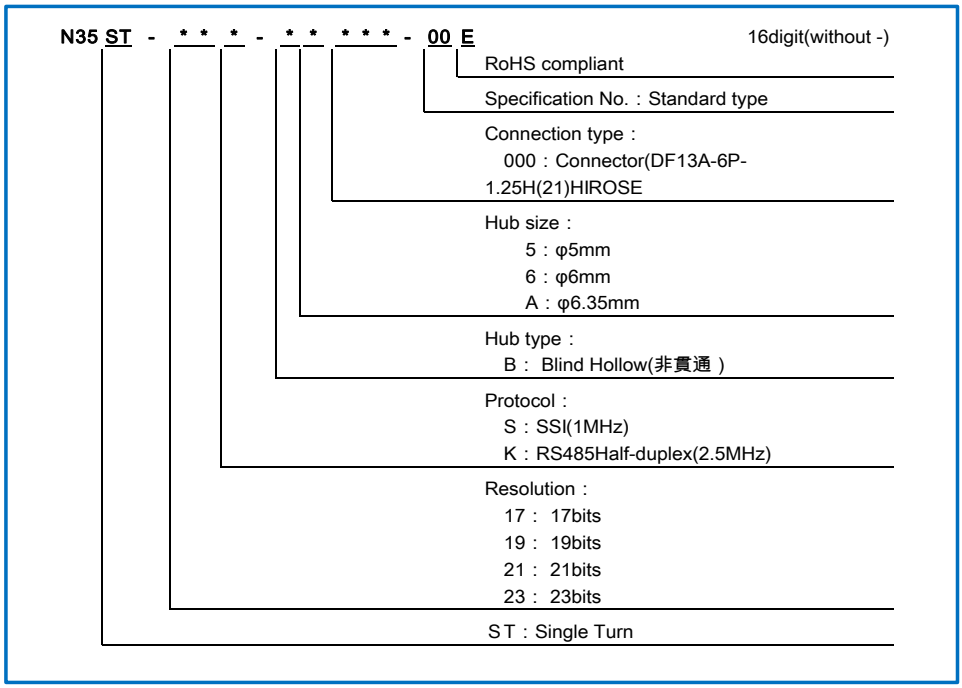
1. Termination resistor, *220ohm is recommended but may depend on the characteristic impedance of types of cable used.
2. Recommended Differential Tranceiver P/N: ISL8485E.
3. Recommended to use shielded, twisted pair cable and connect the cable shield to frame ground (FG) in application for enhanced noise immunity in harsh operating conditions.
4. Maximum cable length: 25m.

Connector Pin Output Assignments

Pinout	Description (RS485 Protocol)	Description (SSI Protocol)
1	GND, Ground	GND, Ground
2	VCC, Encoder Supply	VCC, Encoder Supply
3	Data -	DOUT-
4	Data +	DOUT+
5	NA	SCL-
6	NA	SCL+

Ordering Information

Encoder Part Numbers



NOTE Refer to the factory for sample order and lead time.

Abbreviation /Term	Meaning

Definitions of Terms

Arc-sec / Arc-second	Angular measurement where 1 mechanical degree (°) is 60 arc-minutes, 1 arc-minute = 60 arc-seconds
ASIC	Application Specific Integrated Circuit
CRC	Cyclic redundancy check, Checksum
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMC	Electromagnetic Compatibility
FG	Frame Ground
IC	Integrated Circuit
min^{-1}	Rotational speed in revolution per min
PCB	Printed circuit board
RPM	Revolution per Minute, angular rotational speed of motor or encoder shaft
sec / s	Second, a time unit
ST	Single turn
MT	Multi turn
tbd	To be defined / determined

Headquarter Switzerland:
Pewatron AG
Thurgauerstrasse 66
CH-8050 Zurich
Phone +41 44 877 35 00
info@pewatron.com

Office Germany:
Pewatron Deutschland GmbH
Edisonstraße 16
D-85716 Unterschleißheim
Phone +49 89 374 288 87 00
info.de@pewatron.com

PEWATRON
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We are here for you. Addresses and Contacts.

Sales Germany & Austria

Geometrical sensors
Other products

Kurt Stritzelberger
Phone +49 89 374 288 87 22
kurt.stritzelberger@pewatron.com

Pressure sensors
Other products

Gerhard Vetter
Phone +49 89 374 288 87 26
gerhard.vetter@pewatron.com

Gas sensors and modules

Peter Felder
Phone +41 44 877 35 05
peter.felder@pewatron.com

Sales Switzerland & Liechtenstein

Postcode 3000 – 9999

Basil Frei
Phone +41 44 877 35 18
basil.frei@pewatron.com

Postcode 1000 – 2999

Christian Mohrenstecher
Phone +41 76 444 57 93
christian.mohrenstecher@pewatron.com

Sales International Key Accounts

Peter Felder
Phone +41 44 877 35 05
peter.felder@pewatron.com

Sales Other Countries / Product Management

Pressure Sensors
Load Cells

Philipp Kistler
Phone +41 44 877 35 03
philipp.kistler@pewatron.com

Power supplies

Sebastiano Leggio
Phone +41 44 877 35 06
sebastiano.leggio@pewatron.com

Drive technology
CH Postcode 5000 – 9999 / DE

Roman Homa
Phone +41 76 444 00 86
roman.homa@pewatron.com

Gas sensors
Gas sensor modules

Dr. Thomas Clausen
Phone +41 44 877 35 13
thomas.clausen@pewatron.com

Linear position sensors
Angle sensors

Eric Letsch
Phone +41 44 877 35 14
eric.letsch@pewatron.com

Drive technology
CH Postcode 1000 – 4999 / AT / IT / FR

Christian Mohrenstecher
Phone +41 76 444 57 93
christian.mohrenstecher@pewatron.com

Flow / Level / Medical products

Dr. Adriano Pittarelli
Phone +49 89 374 288 87 67
adriano.pittarelli@pewatron.com

Accelerometers
Sensor elements

Christoph Kleye
Phone +49 89 374 288 87 61
christoph.kleye@pewatron.com

Harald Thomas
Phone +49 89 374 288 87 23
harald.thomas@pewatron.com