## Encoder models

# 647
# 648


Mounting instructions

LEINE LINDE

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## Contact

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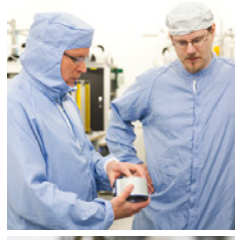
For further contact information, please visit our website at
**www.leinelinde.com**

Leine & Linde AB is a Swedish company dedicated to production of encoders for heavy duty applications. Some of the values offered by Leine & Linde AB are local technical support and possibility of 24 hours express delivery.

On our website **www.leinelinde.com** you can find
- data sheets and other product information
- detailed manuals and software for use with fieldbus encoders.



Before installation please read this manual carefully.
Failure to follow the instructions in this manual will render the ATEX/IECEx certifications **INVALID**.

The following models are fully covered by these mounting instructions:

**ISA 647**
**ISA 648**
**IHA 647**
**IHA 648**

# Contents

# 1

# General information

| General data | |
|---|---|
| Ingress protection class [EN 60 529] | IP66 and IP67 |
| Force (axial/radial) | 50/60 [N] |
| Vibration [IEC 60 068-2-6] | 20 g |
| Shock [IEC 60 068-2-27] | 100 g/11 ms, 200 g/6 ms |
| Material | AISI 316L/EN 1.4404 stainless steel housing, flange and shaft. |
| Atmosphere pressure | 0,8-1,1 bar |

The inductive absolute encoder IXA 64XXXXXXX is intended for use on e.g. synchronous motors in a hazardous area, for measuring speed and position. The enclosure is flameproof and designed for dust ignition protection. Flange, housing, back cover and shaft consist of stainless steel. The housing material has a high resistance to corrosion and therefore suitable in demanding environments such as those common within marine and offshore applications.

The cover of the flameproof enclosure is screwed on by six hexagon socket head cap screws (M4x0,7x50) of stainless steel. These screws, and six other screws of the same type, to fasten the flange to the housing (M4x0,7x14 for clamping flange or M4x0,7x25 for synchro flange), have property class A4-70.

The enclosure (the plastic labels) shall not be subjected to highly efficient charging mechanism (stronger than manual rubbing of the surfaces) to avoid incendive propagating brush discharges.

The encoder requires no service during use and is not repairable. The encoder's lifetime is limited mainly by the bearing grease lifetime.

In case information is needed on the dimensions of the flameproof joints, the manufacturer shall be contacted.

Installation and maintenance related to explosion protection, shall be performed according to applicable national provisions. For European Union, provisions based on Directive 1999/92/EC shall be considered and for European member countries of CENELEC, national standards based on EN 60079-14 and EN 60079-17 shall be considered.

# 2

## Encoder types


**Shafts**

S = Solid shaft
H = Hollow shaft

**Model**

7 = Singleturn 19 bit (SSI 13 bit)
8 = Multiturn 31 bit (SSI 25 bit)

**Shaft size**

XX = 0-99

**Flange**

01 = Synchro flange
02 = Clamping flange

**Electronics**

| Electronics | Supply voltage |
|---|---|
| 10 = 3 x M20 PROFIBUS | 9-30 Vdc |
| 20 = 3 x M20 PROFINET | 9-30 Vdc |
| 30 = 2 x M20 DeviceNet | 9-30 Vdc |
| 40 = 3 x M20 CANopen | 9-30 Vdc |
| 50 = 1 x M20 SSI | 9-30 Vdc |
| 60 = 1 x M20 EnDat | 3.6-14 Vdc |
| 70 = 3 x M20 EtherNet/IP | 9-30 Vdc |

All of the variants within the code key are certified according to ATEX and IECEx. The encoder variants IXA 64XXXXXX are certified for ATEX equipment group II, category 2 G and D (gas and dust), code Ex db IIC T6...T4 and Ex tb IIIC T85°C...T135°C for ATEX and IECEx, and may thus be used in zone 1 (gas) or 21 (dust) with potentially explosive atmospheres.

# 3

## Certification according to ATEX and IECEx

ATEX

**EC-Type examination certificate, including supplement No.1, SP15ATEX3649X.**

Condition for the certificate is specified in Tamb °C and rpm max.

| Certification with temperature class | Tamb °C | Rpm max |
|---|---|---|
| II 2G Ex db IIC T6<br>II 2D Ex tb IIIC T85°C | -40°C...+60°C | 500 |
| II 2G Ex db IIC T6<br>II 2D Ex tb IIIC T85°C | -40°C...+50°C | 1600 |
| II 2G Ex db IIC T6<br>II 2D Ex tb IIIC T85°C | -40°C...+40°C | 3600 |
| II 2G Ex db IIC T5<br>II 2D Ex tb IIIC T100°C | -40°C...+70°C | 900 |
| II 2G Ex db IIC T5<br>II 2D Ex tb IIIC T100°C | -40°C...+60°C | 2000 |
| II 2G Ex db IIC T5<br>II 2D Ex tb IIIC T100°C | -40°C...+50°C | 3600 |
| II 2G Ex db IIC T5<br>II 2D Ex tb IIIC T100°C | -40°C...+40°C | 5100 |
| II 2G Ex db IIC T4<br>II 2D Ex tb IIIC T135°C | -40°C...+70°C | 6000 |

**The encoder IXA 64XXXXXXX conforms to the following standards:**

- EN 60079-0:2012 + A11:2013 (SS-EN 60079-0 ed 4 + SS-EN 60079-0/A11 ed 1)
- EN 60079-1:2014 (SS-EN 60079-1 ed 3)
- EN 60079-31:2014 (SS-EN 60079-31 ed 2)

# IECEx

**Certified according to the table below as per SP 15.0001X.**
Condition for the certificate is specified in Tamb °C and rpm max.

| Certification with temperature class | Tamb °C | Rpm max |
|---|---|---|
| Ex db IIC T6<br>Ex tb IIIC T85°C | -40°C...+60°C | 500 |
| Ex db IIC T6<br>Ex tb IIIC T85°C | -40°C...+50°C | 1600 |
| Ex db IIC T6<br>Ex tb IIIC T85°C | -40°C...+40°C | 3600 |
| Ex db IIC T5<br>Ex tb IIIC T100°C | -40°C...+70°C | 900 |
| Ex db IIC T5<br>Ex tb IIIC T100°C | -40°C...+60°C | 2000 |
| Ex db IIC T5<br>Ex tb IIIC T100°C | -40°C...+50°C | 3600 |
| Ex db IIC T5<br>Ex tb IIIC T100°C | -40°C...+40°C | 5100 |
| Ex db IIC T4<br>Ex tb IIIC T135°C | -40°C...+70°C | 6000 |

**The encoder IXA 64XXXXXXX conforms to the following standards:**
- IEC 60079-0:2011 (ed 6)
- IEC 60079-1:2014 (ed 7)
- IEC 60079-31:2013 (ed 2)

# 4

## Specific conditions for safe use

**The encoders are certified according to the ATEX Directive 2014/34/EU and the IECEx-system. The following special conditions for safe use shall be considered according to the certificates:**

1. The encoder is delivered with or without plastic covers in the threaded holes for cable entries. Such covers shall be replaced. The encoder shall be fitted with certified Ex Equipment cable glands, certified Ex blanking elements (blind plugs) or other equipment certified cable entry devices, in accordance with applicable installation provisions.

2. To be considered (in addition to delay 5 minutes before opening of the enclosure after de-energizing), for encoders type PROFIBUS, PROFINET, DeviceNet, CANopen and EtherNet/IP:
   To avoid possible excessive charged capacitors connected between the encoder circuit and enclosure (earth) when opening the enclosure, all conductors connected to the encoder incl. protective earth shall be short-circuited outside hazardous area before opening the enclosure.

3. The enclosure (the labels) shall not be subject to highly efficient charging mechanism (stronger than manual rubbing of the surfaces), to avoid incendive propagating brush discharges.

4. In case information is needed on the dimensions of the flameproof joints, the original manufacturer (holder of this certificate) shall be contacted. According to the standard (clause 11.3 in IEC 60079-1), the property class for the twelve hexagon socket screws by which the cover and flange is fastened to the housing, shall be specified in the certificate; their property class is A4-70.

# 5

## Risk of bodily injury

5.1)

Important before mounting begins:

5.1 Make sure the machine is at a standstill. The product is to be mounted on a rotating part that can cause bodily injury when in motion.

# 6

## Risk of damage to the product

6.1)


6.2)

6.3)

6.4)

6.5)


6.6)


6.7)

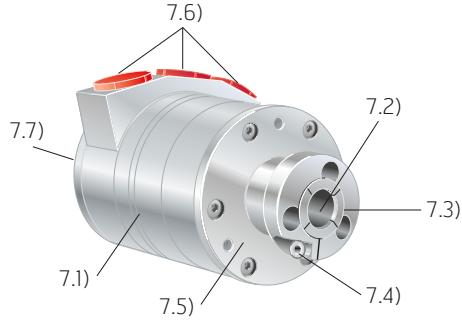
The product is a precision measuring instrument. It should be handled with care, by experienced personnel. The warnings in this chapter apply in the event of effects outside the limit values stated in chapter 1.

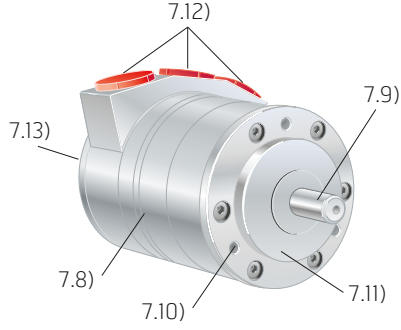
The product may be damaged

6.1 by ESD discharges if the electronics are touched
6.2 if the shaft is exposed to high mechanical forces
6.3 by moisture or chemical fluids (do not install cable pointing upwards)
6.4 if it is exposed to extreme temperatures
6.5 if it is exposed to powerful vibrations or shock
6.6 by short-circuits or an excessively high supply voltage
6.7 by impacts or knocks or other physical damage.

# 7

## Parts of the products



**7.1 Hollow shaft encoder**
7.2 Hollow shaft
7.3 Clamping ring
7.4 Fixing screw
7.5 Flange
7.6 Entries for cable glands*
7.7 Back cover

**7.8 Solid shaft encoder**
7.9 Solid shaft
7.10 Fixing holes
7.11 Flange
7.12 Entries for cable glands*
7.13 Back cover

*Plastic plugs only for shipping. Must be replaced with Ex d and Ex t certified Ex Equipment cable glands or Ex blind plugs.

# 8

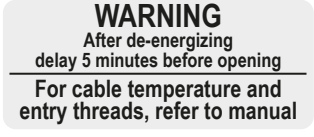
## Information before mounting of encoder

Only skilled/authorized persons are allowed to install the encoder. Information on hazardous areas and the manufacturer datasheets, as well as laws or guidelines applying to the use or the intended purpose are to be followed.

**Mounting of encoder**
To avoid high shock and vibration impacts on the encoder, mounting of the flange according to chapter 10 are to be fulfilled.

Required tools for mounting:
- Hex key T3 for protected earth, PE, internal and external
- Hex key T3 for cover
- Hex key T4 for clamping ring
- Philips screwdriver PH2 for the connecting sockets

**Warning label**



# 9

## Information before mounting of cable

Use **only** Ex d and Ex t certified Ex Equipment cable glands, which shall have correct level of protection and temperature rating according to the table below. Non-used entries to the encoder must be closed with Ex d and Ex t certified Ex Equipment blind plugs, with correct level of protection and temperature rating according to the table below. Cable, Ex d and Ex t certified Ex Equipment cable glands and Ex blind plugs are not included in the certification of the encoder.

Use appropriate cable according to certified temperature class, pages 10-11. The selected cable shall be rated for a branching point temperature and cable entry temperature according to the table below.

All cables for internal connection including cable for protective earth (PE), shall be within the range of 0,25 $mm^2$ to 4 $mm^2$, and the PE cable area shall be not less than the area for the supply cables.

For mounting of cable glands:
M20x1,5 6g with a minimum screw thread length of 9 mm and a maximum of 16 mm (excluding any washer). Please, refer to the cable gland manufacturer's mounting instructions.

Cable and gland can be included as accessories in the original delivery. Information regarding the complete accessory range can be found at **www.leinelinde.com**.

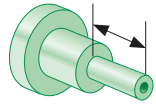
**Branching point and cable entry specification**

| Max Tamb °C | Max rpm | Branching point °C | Cable entry °C |
|---|---|---|---|
| 40 | 5100 | 85 | 75 |
| 50 | 1600 | 80 | 70 |
| 50 | 3600 | 90 | 80 |
| 60 | 500 | 85 | 75 |
| 60 | 2000 | 95 | 85 |
| 70 | 900 | 95 | 85 |
| 70 | 6000 | 115 | 105 |

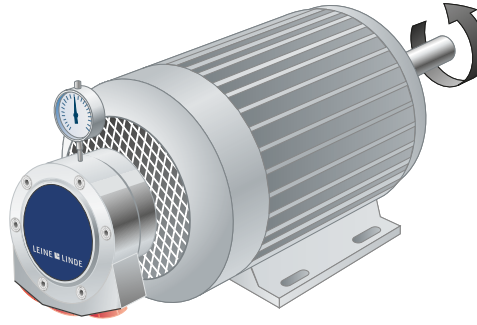
# 10

## Check points for mechanical mounting

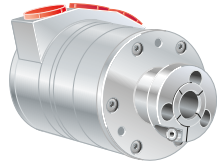
10.1)



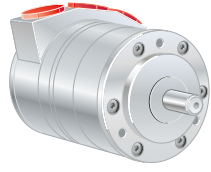
10.2)




10.3)

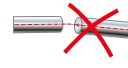


10.4)

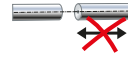


a)

b)



c)



While mounting the encoder, care should be taken to ensure that no axial or radial tension is loaded into the assembly while fastening screws, as this will increase wear and shorten the life span of the encoder bearings. This could also impact the measurement accuracy of the system.

**Hollow shaft**

10.1 Check that the dimensions of the mating shaft match the specifications in the encoder's data sheet.

10.2 Check the encoder's radial offset while slowly rotating the complete assembly. The offset should not exceed 0.1 mm.

10.3 Check that the clamping ring is loose when installing the encoder. Tighten the clamping ring with a torque of 4 Nm before operation.

**Solid shaft**

10.4 Minimise the misalignment between the two mating shafts.

Always try to avoid:
a) radial misalignment
b) angle misalignment
c) axial movement

**Note!** If the encoder is to be rotated when mounted, Ex d and Ex t certified blind plugs must be used.

**Torque bracket**

It is suggested that the encoder is mounted with a torque bracket to withstand movements during operation.

Maximum allowed depth of M5 screw engagement (excluding washer): 4 mm for clamping flange and 9 mm for synchro flange.

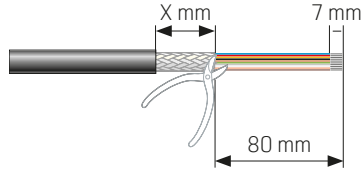
No screws are allowed to be mounted if no torque bracket is used.

For more information regarding torque brackets, please visit **www.leinelinde.com**.

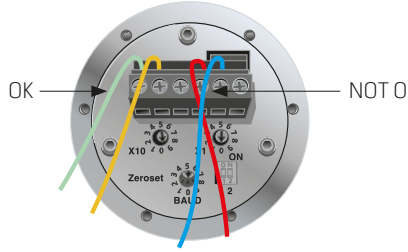
# 11

## Mounting of cable

11.1)




11.2)



Step 1. The encoder must be disconnected from the power supply and other cables connected to the encoder before installation or replacement.
Step 2. Remove the back cover and remove the terminal strip.
Step 3. Strip the cable according to the cable gland manufacturer's instruction and strip the wires according to illustration 11.1.
Step 4. Mount the cable glands to the encoder.
Step 5. Mount the cables for protective earth, PE, with both the internal and the external earth connector screws, see drawing on page 32. Use suitable crimping tool for the external PE connector. Connect the wires according to instructions on page 30 in this manual. Make sure to insulate any unused wire. Tighten torque is 0.5 Nm.
Step 6. Connect the terminal strip to the encoder and make sure all wires are mounted correct according to illustration 11.2.
Step 7. Mount the encoder back cover with a tightening torque of 3 Nm.
Step 8. Connect the cables from the encoder to the power supply.

**Dismounting of the encoder**
The disconnection and voltage check has to be done **outside** the hazardous area.
Step 1. Disconnect power supply and other cables connected to the encoder. Make sure that no voltage exists between +EV, 0V and PE due to the capacitances in the encoder, by short-circuit all conductors from the encoder.
Step 2. After de-energizing delay 5 minutes before opening.
Step 3. Follow the above instructions no. 2 and no. 5.

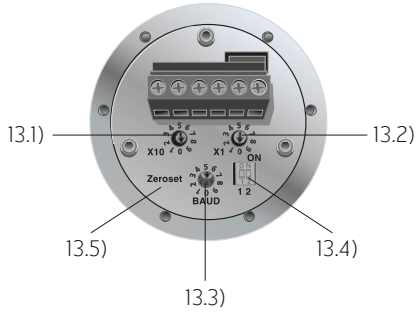
# 12

## Power supply information

| Electrical data | Current consumption | Power supply |
|---|---|---|
| PROFIBUS | 95 mA at 24 Vdc | 9-30 Vdc |
| PROFINET | 100 mA at 24 Vdc | 9-30 Vdc |
| CANopen | 90 mA at 24 Vdc | 9-30 Vdc |
| DeviceNet | 90 mA at 24 Vdc | 9-30 Vdc |
| EnDat | 100 mA at 5 Vdc | 3.6-14 Vdc |
| SSI | 30 mA at 24 Vdc | 9-30 Vdc |
| EtherNet/IP | 100 mA at 24 Vdc | 9-30 Vdc |

# 13

## Bus settings



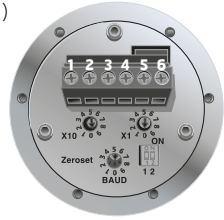
13.1 Set a unique node address for the unit, within the range 00-99.
13.2 Set a unique node address for the unit, within the range 00-99.
13.3 Set baud rate (only CANopen).
13.4 Set bus termination on or off (only CANopen and PROFIBUS).
13.5 Zeroset pushbutton (only CANopen and DeviceNet).

For information and manuals regarding the encoder interfaces (PROFIBUS, PROFINET, DeviceNet etc), please refer to separate manuals at **www.leinelinde.com**.

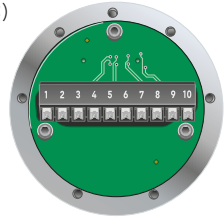
# 14

## Terminal pinning

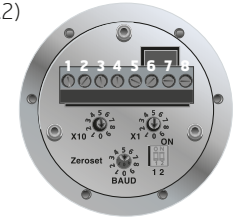
14.1)




14.3)




14.2)




14.4)

| PROFIBUS DP | |
|---|---|
| **Function** | **Terminal** |
| +E Volt | 1 |
| 0 Volt | 2 |
| B** (Bus in) | 3 |
| A* (Bus in) | 4 |
| B** (Bus out) | 5 |
| A* (Bus out) | 6 |

*A terminals are connected
**B terminals are connected

| CANopen, DeviceNet | |
|---|---|
| **Function** | **Terminal** |
| +E Volt | 1 |
| 0 Volt | 2 |
| CAN_H | 3 |
| CAN_L | 4 |
| CAN_GND | 5 |
| CAN_GND | 6 |
| CAN_L | 7 |
| CAN_H | 8 |

| PROFINET, EtherNet/IP | |
|---|---|
| **Function** | **Pin** |
| +E Volt | 1 |
| 0 Volt | 2 |
| TX+_1 | 3 |
| TX-_1 | 4 |
| RX+_1 | 5 |
| RX-_1 | 6 |
| TX+_2 | 7 |
| TX-_2 | 8 |
| RX+_2 | 9 |
| RX-_2 | 10 |

| SSI, EnDat 2.2 | |
|---|---|
| **Function** | **Terminal, 6 screws** |
| A | 1 |
| A/ | 2 |
| B | 3 |
| B/ | 4 |
| Not used | 5 |
| Not used | 6 |

| SSI, EnDat 2.2 | |
|---|---|
| **Function** | **Terminal, 8 screws** |
| 0 Volt | 1 |
| 0 Volt sense | 2 |
| +E Volt | 3 |
| +E Volt sense | 4 |
| Data | 5 |
| Data inv. | 6 |
| Clock | 7 |
| Clock inv. | 8 |

The terminal has either 6 or 8 screw contacts depending on the encoder interface.

14.1 Terminal with 6 screws:
PROFIBUS DP

14.2 Terminal with 8 screws:
CANopen
DeviceNet
SSI*
EnDat*

14.3 Terminal with 10 screws:
PROFINET
EtherNet/IP

**14.4 Pinning configuration**
The interfaces are available with cable gland entry. The configuration file for each interface is to be downloaded from www.leinelinde.com/Products/Downloads.

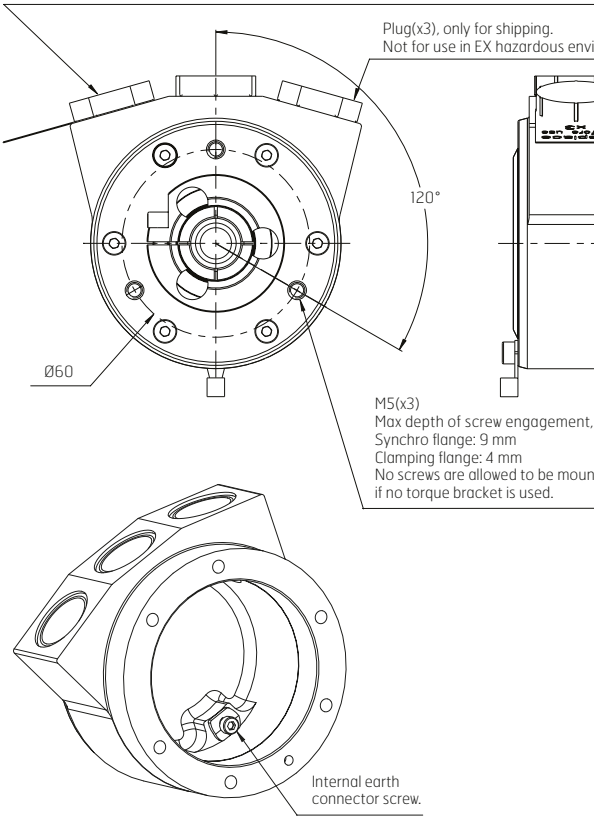
* SSI and EnDat 2.2 have an additional screw terminal of 6 screw contacts for the incremental signal output 1 Vpp.

Ex d and Ex t certified blind plug **MUST** be used in entries where no cable gland is used.

# 15

## Dimensions

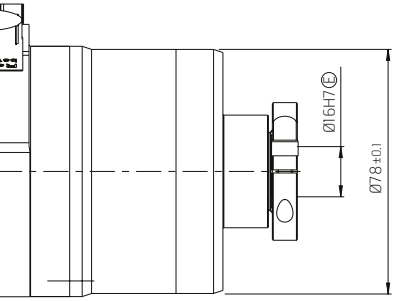
Use Ex d and Ex t certified cable gland M20x1.5 6g for direct entry (allowed thread depth:
and cable with appropriate temp rating for given temp class.
Unused entry, use Ex d and Ex t certified blind plug.




*Please refer to page 21 for more detailed information.

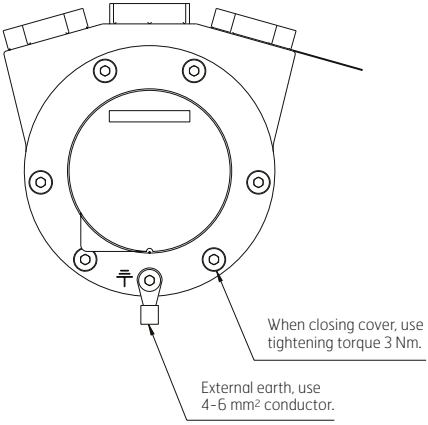
9-16 mm*),

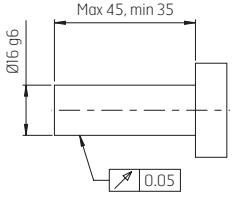
ronments.




excl. washer

ted




Recommended mating shaft.

# 16

## Declaration of Conformity

LEINE LINDE

# EU - Declaration of Conformity

Leine&Linde AB
Västerportsvägen 20
SE-645 42 Strängnäs, SWEDEN
T. +46-(0)152-265 00, info@leinelinde.se, www.leinelinde.com

**IXA 64X series encoders for explosive environments**

The above mentioned products are in conformity with the provision of the following directives of the European Commission:
EMC Directive 2014/30/EU, ATEX Directive 2014/34/EU and RoHS 2 Directive 2011/65/EU with amendment 2015/863/EU.

The equipment complies with the directives by meeting the following harmonized standards:

**EN 61000-6-2:2005** Generic immunity standard: Industrial environment

**EN 61000-6-4:2007/A1:2011** Generic emission standard: Industrial environment

**EN 60079-1:2014** Equipment protection by flameproof enclosure 'd'

**EN 60079-31:2014** Equipment dust ignition protection by enclosure 't'

Other technical specifications:
**EN 60079-0:2012/A11:2013** – This standard (used for certification) has been compared with **EN IEC 60079-0:2018 + AC:2020-02** (currently harmonized) and no major/substantial technical changes have occurred which are applicable to this equipment.

**EN IEC 63000:2018** Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EC-Type examination certificate, including supplement No.1, **SP15ATEX3649X**

Strängnäs, 2024-01-09

Lars-Albert Ahlström
*R&D Manager*

This declaration certifies that this product complies with the above directives. It is not, however, a guarantee of quality. Please comply with the safety instruction and instructions in the accompanying product documentation.
TIS Doc. No: 1427450_02_A_01

The declaration document can be downloaded from **www.leinelinde.com**.

Products from Leine&Linde are usually components in larger systems. These applications require the system as a whole to be tested, and do not depend on the component specifications only.

Instructions in these mounting instructions apply to products from Leine&Linde, not for the system as a whole. If products are used in a way for which they are not intended, this is at the user's own risk.