



SIL3 PLe INCREMENTAL ENCODERS

This Installation Guide is a simplified extract from the "Safety User Manual" chapter "4. Installation and start up". It helps the user during the mounting process in order to safely mount and use BEI SENSORS safety encoders in safety system loops. For detailed information consult the Safety User Manual, available upon request.

SAFETY INSTALLATION REQUIREMENTS

⚠ WARNING
Check that the external monitoring is compliant with the safety loop prerequisites.
The safety encoder function requires that the four safety signals (AA/ and BB/ in digital versions or SS/ and CC/ in sine versions) are connected to the safe PLC. Never leave one of these signals unused! They must always be connected and used in the safety loop.
The channel 0 (Z and Z/) is not a part of the safety function! In case Z and Z/ are not used in the application, connect each of them to pull down 3kohms resistors connected to 0V.
Encoder's specifications given in the datasheet or in the "Safety User Manual" must never be exceeded.
In order to avoid the risk of sliding on the mating shaft, use positive locks through a key on both ends for the solid shaft encoder and slots on the hollow shaft encoder.
Never connect the encoder to mains (115V, 220V...!)

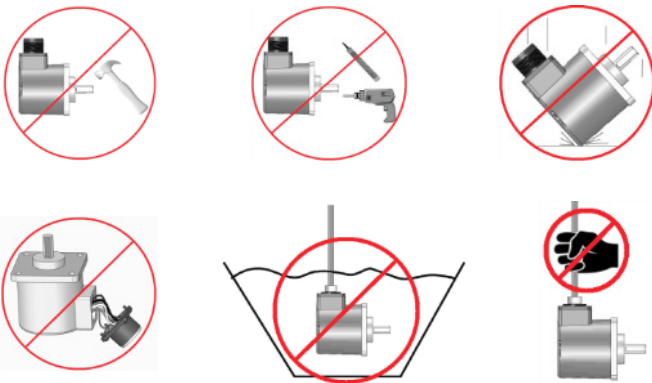
External Safety Loop Prerequisites								
Electrical Encoder Version	Positive lock	Cable break detection	Safe supply voltage with monitoring	Vector length monitoring	Speed comparison	Zero crossing detection	Inverse signal monitoring	Exclusive bit check
2WT	○	○	x ⁽¹⁾	x	x	x		
5WT	○	○		x	x	x		
2G2	○	○	x		x		x	x ⁽¹⁾
5G5	○	○			x		x	x ⁽¹⁾
5G2	○	○			x		x	x ⁽¹⁾

○: Prerequisite for all safety levels.

x: Additional prerequisite for SIL3/PLe.

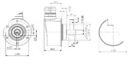
⁽¹⁾: Not needed in case of SIL3/PLe speed without direction.


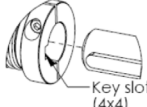
GENERAL MECHANICAL PRECAUTIONS



- Never hard couple encoder to motor shaft. Always use flexible couplings to minimize stress on encoder bearings.
- Avoid installing with shaft upright, liquid may pool and eventually cause internal leaking.
- When mounting the encoder secure the screws with ribbed lock washers and Thread locker Loctite 243 or equivalent.
- For versions with connector, check to ensure there is no connector deformation and that O-ring is in place in the connector housing, otherwise don't use it. It is strongly recommended to orient the cable or connector downward to reduce the possibility of cable damage.
- Ensure that the connector screws are tight to ensure good electrical and mechanical contact to avoid loosening of the connection over time.

MECHANICAL MOUNTING PROCEDURE

DS05	DSU9		
Measure the driving shaft tolerance (H7) and check permissible driving shaft runout:			
User speed (rpm)	< 100	< 1500	< 4000
Permissible Runout (mm)	0.2	0.05	0.02
Recommended torque for the mounting of coupling devices "Stator Coupling" (SC) or "Tether Arm" (TA):			
SC: 1 x M3 (2N.m) + 1 x M4 (2.5N.m) - TA: 3 x M3 or 3 x M4	SC: 2 x M5 (4.5N.m) - TA: 4 x M5		
Encoder's hollow shafts are machined with positive locks. Slide the encoder shaft (with or without reduction sleeve) on the driving shaft and check that the positive locks are in the correct position for proper engagement. 			
When mounting the encoder, avoid compressing or extending the coupling device:			
SC: 2 or 4 x M3 (2N.m) - TA: 3 x M6 (9N.m).	SC: 2 or 4 x M5 (4.5N.m) - TA: 1 x M8 (21N.m).		
Tighten the clamping ring to the torque:			
2N.m +/-10%	4.5N.m +/-10%		

DSM5	DSM9
When mounting the encoder on a mechanical frame (bell, bracket...):	
Use at least 3 M3 or 3 M4 screws for a safe assembly. Minimal screwing depth 5mm for M3 and 6mm for M4.	Use at least 3 M6 screws for a safe assembly. Minimal screw depth is 10mm.
<p>Before mounting on the driving shaft, check the shaft alignment to avoid compressing or extending the coupling device. Encoder's solid shafts are machined with a key slot. Use a keyed coupling to secure the rotation transmission. Tighten with the recommended torque from the coupling manufacturer.</p> <div style="display: flex; justify-content: space-around;">   </div>	

GENERAL ELECTRICAL PRECAUTIONS

Cable	<ul style="list-style-type: none"> Respect the cable bending radius. Protect the cables to avoid a cut or damage during operation. Always provide a service loop between encoder and the first cable clamp to avoid cable tension. Never operate with a cable which is totally or partially coiled. 	<table border="1"> <thead> <tr> <th colspan="3">Cable bending radius</th> </tr> <tr> <th>Cable type</th> <th>In static use</th> <th>In dynamic use</th> </tr> </thead> <tbody> <tr> <td>G3</td> <td>30mm</td> <td>Not recommended</td> </tr> <tr> <td>TE</td> <td>60mm</td> <td>60mm</td> </tr> <tr> <td>GP</td> <td>30mm</td> <td>90mm</td> </tr> </tbody> </table>	Cable bending radius			Cable type	In static use	In dynamic use	G3	30mm	Not recommended	TE	60mm	60mm	GP	30mm	90mm	<table border="1"> <thead> <tr> <th colspan="2">Recommended wires sections</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Greater than 0.22mm² for power supply lines</td> <td style="text-align: center;">Lower than 0.22mm² for signals lines</td> </tr> </tbody> </table>	Recommended wires sections		Greater than 0.22mm ² for power supply lines	Lower than 0.22mm ² for signals lines	
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Connection	<ul style="list-style-type: none"> Never connect outputs together or to a potential. In case signals Z and Z/ are not used in the application, connect each of them with 3kohms pull down resistors to 0V. Never use the same cable for driving power (motor power supply, variable frequency drive, etc.) and encoder signals. Separate encoder cables and potentially interfering signal cables with a metal screen grounded and do not let them run parallel. If a metallic connector is assembled by the user on the encoder cable, ensure a 360° shield contact on that connector. When using a shielded pair cable, always connect signals of the same channel to the same twisted pair: A with A/, B with B/ and Z with Z/. 	<table border="1"> <thead> <tr> <th colspan="5">Electrical Operating Area (with BEI Sensors cables)</th> </tr> <tr> <th colspan="2">5V+/-5% Safe Power Supply</th> <th colspan="3">11-30V Power Supply</th> </tr> <tr> <th>2WTN</th> <th>2G29</th> <th>5WTN</th> <th>5G29</th> <th>5G59</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Up to 100m cable.</td> <td> Up to 100m cable. With cables lengths longer than 20m, a "GP" cable/wiring type is recommended in conjunction with a power supply having voltage sensing feedback. </td> <td style="text-align: center;">Up to 100m cable.</td> <td colspan="2"> Up to 100m cable with frequency restrictions. Consult the "Safety User Manual" for detailed information. </td> </tr> </tbody> </table>		Electrical Operating Area (with BEI Sensors cables)					5V+/-5% Safe Power Supply		11-30V Power Supply			2WTN	2G29	5WTN	5G29	5G59	Up to 100m cable.	Up to 100m cable. With cables lengths longer than 20m, a "GP" cable/wiring type is recommended in conjunction with a power supply having voltage sensing feedback.	Up to 100m cable.	Up to 100m cable with frequency restrictions. Consult the "Safety User Manual" for detailed information.	
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Grounding	<ul style="list-style-type: none"> Ensure that encoder's body and cable shield extremity are both connected to same potential grounds. Do not cut nor leave the ground plant unconnected. In the cabinet, connect the encoder cable surrounding screen to the ground plant if available, otherwise to the 0V. To avoid destructive electrostatic discharging shaft phenomena, always ground the encoder housing. 																						

ELECTRICAL MOUNTING PROCEDURE

Verify that all electrical devices are switched off before starting the installation and that you have the mandatory power supply.
Check that you have all the necessary information on wiring connections: refer to the encoder sticker for pin out and/or wire color signal correspondence.
Ensure the electrical connection is in accordance with the standard recommendations governing the use of cables/connectors.
To avoid possible non valid signal detection during the encoder initialization time, the operating power supply voltage of the encoder and of the controller should be switched on and off simultaneously.

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Page 2

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