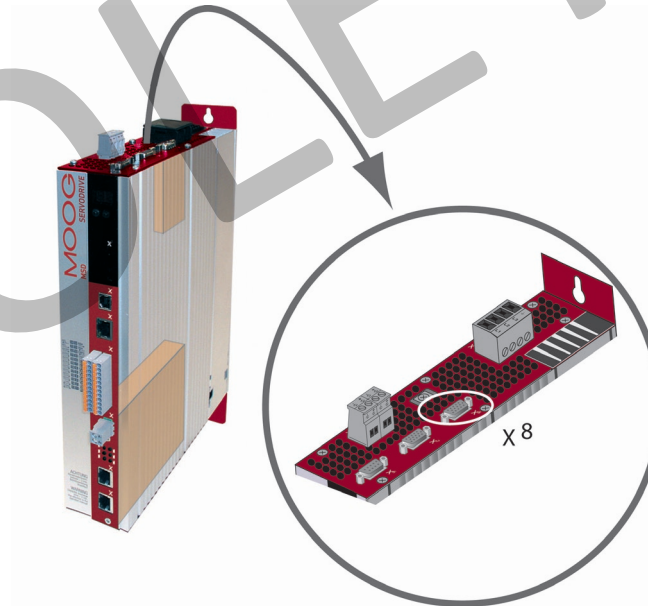# MSD Servo Drive

GdYWIZWU]cb

X 8

Option 2 - Technology

SUZY Tech Optiong

Specification Option 2 - Technology

Safe Tech Options

ID no.: CC23875-001, Rev. 1.1

Date: 04/2023

This document applies to:

Product range	Model (with integrated safety control (FS))	Safe Tech option	Firmware version
MSD Servo Drive Single-Axis System	G392-xxxxxA/B/C G395-xxx-xA/B/C	A = Second safe Sin/Cos encoder B = Second safe SSI encoder C = Second safe axis monitor (Sin/Cos)	From V1.10-40
MSD Servo Drive Multi-Axis System	G393-xxx-xA/B/C G397-xxx-xA/B/C	A = Second safe Sin/Cos encoder B = Second safe SSI encoder C = Second safe axis monitor (Sin/Cos)	From V1.10-40
MSD Servo Drive Compact	Not available	--	--

Note:
This document does not replace the Operation Manual MSD Servo Drive. Please always follow the information given in "Measures for your safety", "Intended use" and "Responsibility" in the Operation Manual. You will find information on mounting, installation and commissioning as well as the assured technical characteristics of the MSD Servo Drive device series in the supplementary documents (Operation Manual, Device Help, Specification MSD Servo Drive Functional Safety FS, etc.).

Subject to technical change without notice.

The content of our documentation was compiled with the greatest care and attention, and is based on the latest information available to us.

We should nevertheless point out that this document cannot always be updated simultaneously with the on-going technical development of our products.

Information and specifications may be subject to change at any time. Please obtain information on the latest version at drives-support@moog.com.

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1 Second safe Sin/Cos encoder

Applies to G392-xxxxx**A**, G393-xxx-x**A**, G395-xxx-x**A**, G397-xxx-x**A**

This Tech option makes it possible to expand the encoder combinations on the MSD Servo Drive with integrated safety control (MSD Servo Drive FS). The additional encoder connection X8 makes it possible to evaluate the following encoder types as monitoring encoders in the integrated safe control.

Connection MSD Servo Drive FS	Sin/Cos and TTL encoder types
X8	Sin/Cos encoder • e.g. Sick Stegmann SKS/SKM 36 TTL encoder • e.g. LENORD+BAUER MiniCODER Note: You will find the technical specifications for the encoder types in the documentation from the encoder manufacturer. It is possible to use any Sin/Cos or TTL encoder types, as long as they comply with the technical specifications (see Table 1.3).

Table 1.1   Assignment of connection X8, Sin/Cos / TTL encoder types

1.1 Combination on encoder selection

The following encoder variants can be combined on X7 and X8:

No.	Process encoder (enc. A)	Connection	Monitoring encoder (enc. B)	Connection	Maximum SIL
1	Sin/Cos		TTL		3
2	Sin/Cos		Sin/Cos		3
3	SSI	X7	Sin/Cos	X8	3
4	SSI		TTL		3
5	TTL		TTL		2

Table 1.2   Combination on encoder selection
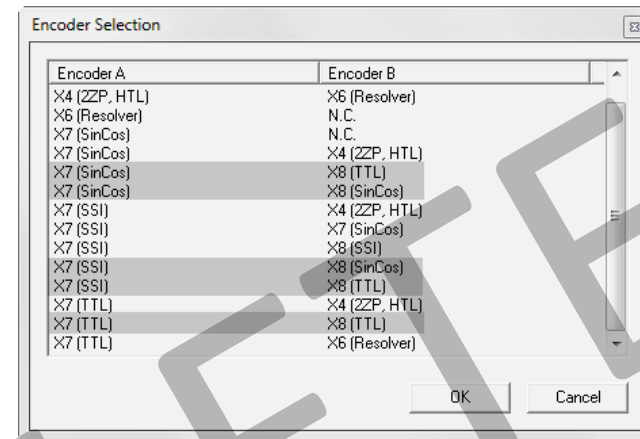
Figure 1.1   Encoder selection Safety PLC

1.2 Technical data, connection X8

MSD Servo Drive FS	TTL	Sin/Cos
Connection X8	• Model with differential voltage input (EIA422-compatible)* • Cable length 15 m maximum • Connector: 15-pin D-SUB, high density, socket • Wave terminating resistor integrated in the device: 120 Ω	
Maximum signal frequency that can be evaluated	400 kHz	
Speed calculation method	Maximum input frequency / resolution (pulses per revolution)	
Signal level	EIA422 (digital signals)	1 V_{pp} (analog signals)
*Pay attention to voltage range!		

Table 1.3   Technical data, X8 for TTL / Sin/Cos

On the additional usage of a monitoring encoder in the form of redundancy for the process encoder, it is possible to increase the Performance Level (PL) or Safety Integrity Level (SIL) for the application. It is a prerequisite for this increase that both encoder systems act on the same axis.

1.2.1   Cable type and laying

The cable type is to be defined as per the information f om the motor/encoder manufacturer. The following conditions are to be noted:

- Only use shielded cables
- Connect shield at both ends
- Connect the differential track signals A, B, R or DATA and CLK using twisted pair cable cores.
- Do not cut the encoder cable, for example to route the signals via terminals in the switch cabinet

NOTE:

A voltage drop in the encoder cable is counteracted by using the Sense wire. In this way it is ensured that the encoder is supplied with the correct voltage. The Sense wire must always be connected!
If the Sin/Cos encoder or TTL encoder used does not provide Sense signals, pins 12 and 13 (+ / -Sense) are to be connected to pins 3 and 8 (+5 V / GND) at the encoder end of the cable.

1.2.2   Pin assignment, input (socket) X8

Connection	Pin	Sin/Cos and TTL	Supply voltage > 5 V DC
X8	1	Track A -	
	2	Track A+	
	3	+ 5 V DC ±5 %, $I_{OUT\,max}$ = 250 mA, monitoring via sensor cable	7-12 V DC (typ. 11 V DC) $I_{OUT\,max}$ = 100 mA
	4	-	
	5	-	
	6	Track B-	After connecting pin 7 and pin 12, there is a voltage of 11.8 V on pin 3!
	7	U_S switch	
	8	GND	
	9	-	
	10	-	
	11	Track B+	
	12	+ Sense wire / U_S switch	
	13	- Sense wire	
	14	-	
	15	-	

Table 1.4   Assignment of connection X8, Sin/Cos / TTL encoder types

2 Second safe SSI encoder

Applies to G392-xxxxx**B**, G393-xxx-x**B**, G395-xxx-x**B**, G397-xxx-x**B**

This Tech option makes it possible to connect a second SSI encoder to the MSD Servo Drive with integrated safety control (MSD Servo Drive FS). The additional encoder connection X8 makes it possible to evaluate the following encoder types as monitoring encoders in the integrated safe control.
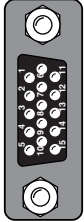
Connection MSD Servo Drive FS	SSI encoder type
X8	Note: It is possible to use any SSI encoder types, as long as they comply with the technical specifications (see Table 2.3).

Table 2.1   Connection X8, SSI encoder

2.1 Combination on encoder selection

The following encoder variants can be combined on X7 and X8:

No.	Process encoder (enc. A)	Connection	Monitoring encoder (enc. B)	Connection	Maximum SIL
1	SSi	X7	SSi	X8	3

Table 2.2   Combination on encoder selection
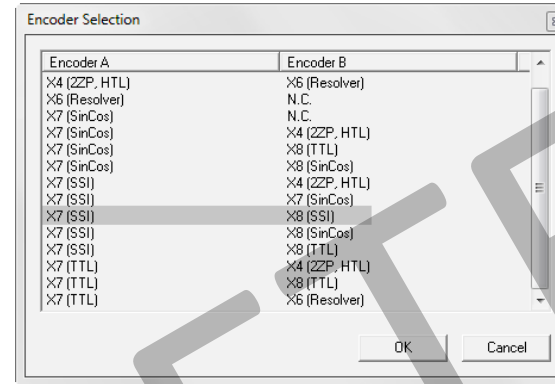
Figure 2.1   Encoder selection Safety PLC

2.2 Technical data

MSD Servo Drive FS	SSI		
Connection X8	· Model with differential voltage input (EIA422-compatible)* · Cable length 15 m maximum · Connector: 15-pin D-SUB, high density, socket · Wave terminating resistor integrated in the device: 120 Ω		
Code	Binary or Gray		
	Total	**Singleturn**	**Multiturn**
Resolution	24 bits	12 bits	12 bits
	24 bits	10 bits	14 bits
	25 bits	13 bits	12 bits
	The resolutions approved are stated in the table. If a different resolution is required, please send an appropriate request to Moog		
Power supply	4.75 V DC to 5 V DC 7 V DC to 12 V DC		
*Pay attention to voltage range!			

Table 2.3   Technical data, X8 for SSI encoder

Second safe SSI encoder

2.2.1   Cable types and laying

The cable type is to be defined as per the information from the motor/encoder manufacturer. The following conditions are to be noted:

- Only use shielded cables
- Connect shield at both ends
- Connect the differential track signals A, B, R or DATA and CLK using twisted pair cable cores.
- Do not cut the encoder cable, for example to route the signals via terminals in the switch cabinet.

2.2.2   Pin assignment, input (socket) X8

Connection	Pin	Function SSI encoder
X8	1	-
	2	-
	3	-
	4	Data +
	5	Data -
	6	-
	7	-
	8	GND
	9	-
	10	-
	11	-
	12	+ Sense wire
	13	- Sense wire
	14	CLK+
	15	CLK-

Table 2.4   Terminal assignment X8 for SSI encoder

NOTE:

The Tech option does **not** include a supply of power for the SSI encoder connected to X8. The power must be supplied externally (for example by means of the power supply from X7, using an appropriate encoder cable).

To establish a potential reference, it is nevertheless necessary to connect the GND (pin 8) on interface X8 to the GND for the power supply.

The supply voltage used is monitored and must be connected to the connections (Sense+/pin 12 and Sense-/pin 13) for this purpose.
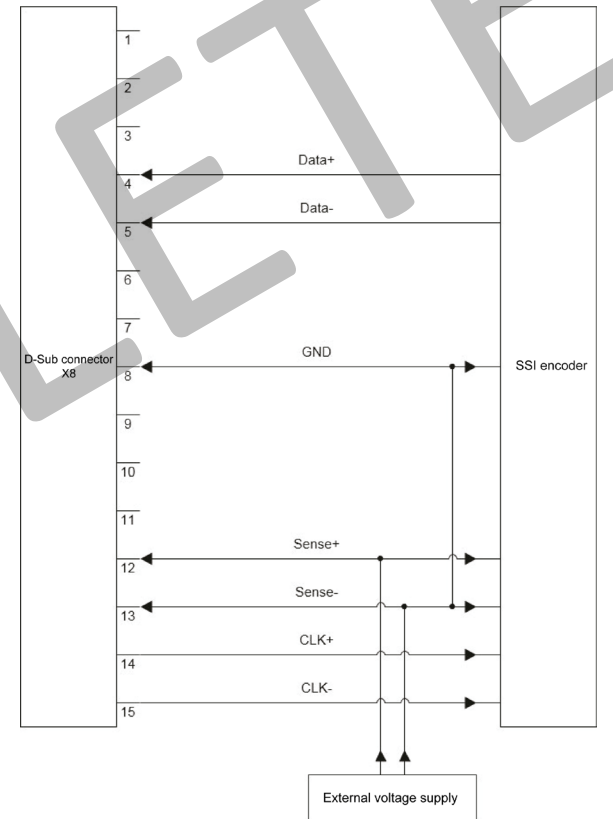

Figure 2.2   Example ext. power supply to SSI encoder

3 Second safe axis monitor

Applies to G392-xxxxxC, G393-xxx-xC, G395-xxx-xC, G397-xxx-xC

Sin/Cos encoders are designed as optical encoders and meet the highest requirements on accuracy. They output 2 sinusoidal signals A and B offset by 90° that are sampled using analog-digital converters. The signal periods are counted and the direction of rotation and counting direction are given by the phase position of the signals A and B.

Using this Tech option it is possible to monitor a second axis if this axis has a safe Sin/Cos encoder. The additional encoder interface X8 therefore makes it possible to read a Sin/Cos encoder on an external axis that is evaluated with the aid of the safety control implemented in the MSD Servo Drive FS.
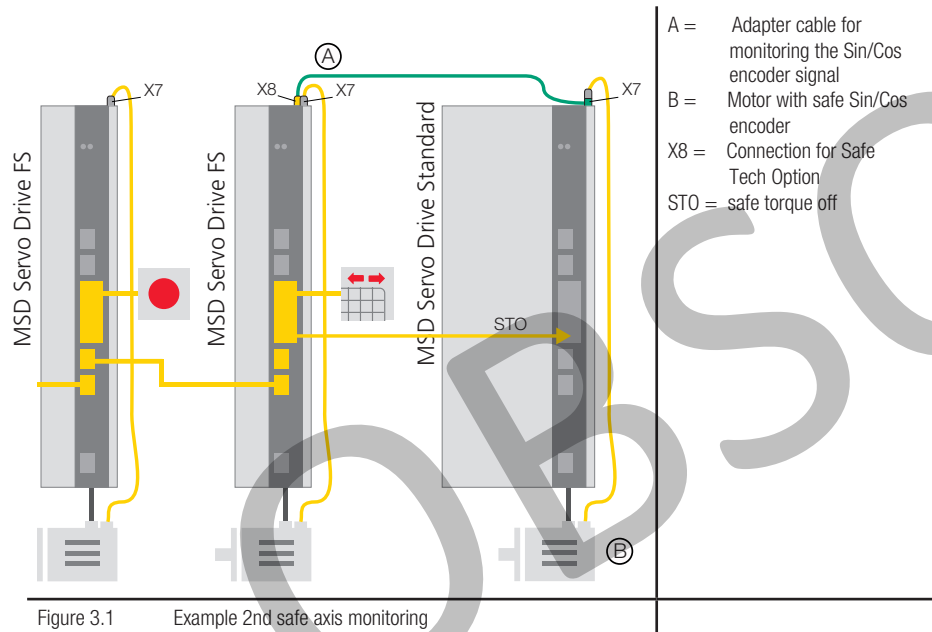

A = Adapter cable for monitoring the Sin/Cos encoder signal

B = Motor with safe Sin/Cos encoder

X8 = Connection for Safe Tech Option

STO = safe torque off

Figure 3.1   Example 2nd safe axis monitoring

Note:
The prerequisites for the safe monitoring of the second axis are that the axis has a Sin/Cos encoder with safety-related approval and that is installed appropriately for safety.
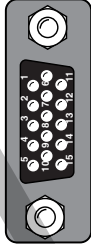
3.1 Encoder selection

Connection MSD Servo Drive FS	Sin/Cos encoder type
X8	Sin/Cos encoder · e.g. Sick Stegmann SKS/SKM 36 Note: You will find the technical specifications for the encoder types in the documentation from the encoder manufacturer.

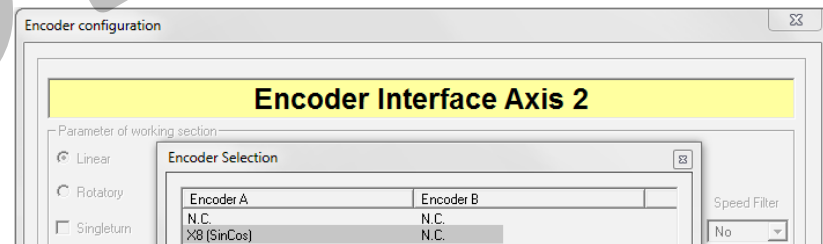Table 3.1   Assignment of connection X8, Sin/Cos / TTL encoder types

Figure 3.2   Encoder selection Safety PLC

3.2   Technical data, interface (X8)

MSD Servo Drive FS	Sin/Cos
Interface X8	• Differential voltage input EIA422-compatible* • Maximum cable length: 15 m (between the monitored drive axis and the option connection) • Connector: 15-pin D-SUB, high density, socket • Wave terminating resistor not integrated in the device!
Maximum signal frequency that can be evaluated	400 kHz
Speed calculation method	Maximum input frequency / resolution (pulses per
Signal level	revolution) 1 V_{pp} (analog signals)
*Pay attention to voltage range!	

Table 3.2   Sin/Cos encoder input on X8

3.2.1   Cable type and laying

The cable type is to be defined as per the information f om the motor/encoder manufacturer. The following conditions are to be noted:

- Only use shielded cables
- Connect shield at both ends
- Connect the differential track signals A, B, R or DATA and CLK using twisted pair cable cores.
- Do not cut the encoder cable, for example to route the signals via terminals in the switch cabinet

3.2.2   Pin assignment, input (socket) X8

Connection	Pin	Sin/Cos encoder function
X8	1	Track A-
	2	Track A+
	3	-
	4	-
	5	-
	6	Track B-
	7	-
	8	GND
	9	-
	10	-
	11	Track B+
	12	+ Sense wire
	13	- Sense wire
	14	-
	15	-

Table 3.3   Terminal assignment X8 for Sin/Cos encoder

NOTE:

The Tech Option does not include a power supply for the Sin/Cos encoder connected to X8. The power must be supplied by the axis which is monitored. To establish a potential reference, it is nevertheless necessary to connect the GND (pin 8) on interface X8 to the GND for the power supply.

The supply voltage used is monitored and must be connected to the Sense contacts (Sense+/pin 12 and Sense-/pin 13) for this purpose.

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The contents of our documentation have been compiled with greatest care and in compliance with our present status of information.

Nevertheless we would like to point out that this document cannot always be updated parallel to the technical further development of our products.

Information and specifications may be changed at any time. For information on the latest version please refer to drives-support@moog.com.

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