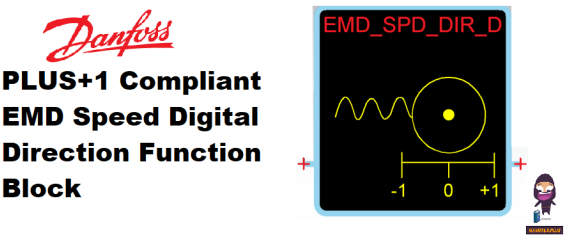

Danfoss PLUS+1 Compliant EMD Speed Digital Direction Function Block User Guide

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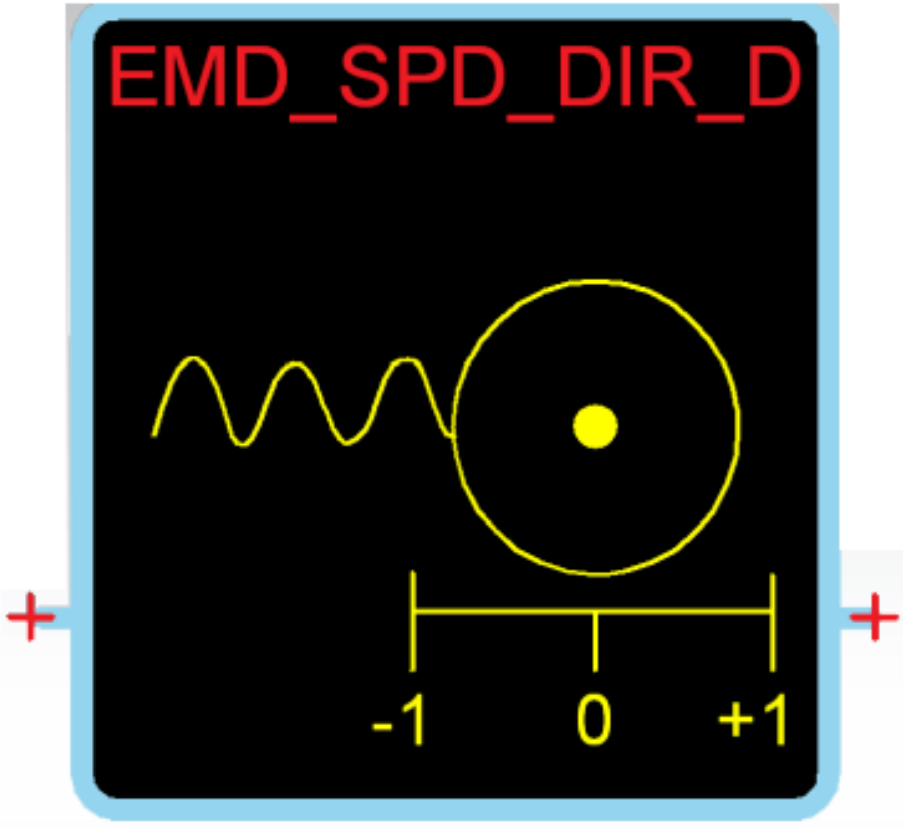
Danfoss PLUS+1 Compliant EMD Speed Digital Direction Function Block



Specifications

- **Product Name:** PLUS+1 Compliant EMD Speed Sensor Digital Direction Function Block
- **Manufacturer:** Danfoss
- **Range of Spd Input:** 1,250 to 10,000,000 (Per U32 Count U16)
- **Range of Dir In Input:** 0 to 5,250 (Volt/Voltage U16)

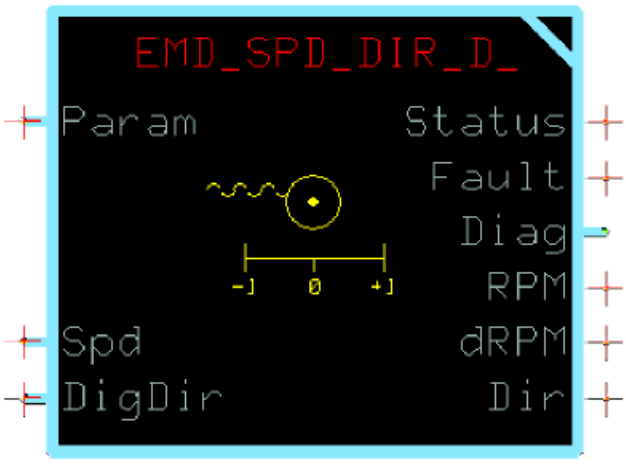
[powersolutions.danfoss.com]

Revision history

Date	Changed	Rev
December 2014		AA

User Manual

EMD_SPD_DIR_D Function Block



Overview
This function block outputs rpm and directional signals based on inputs from an EMD Speed Sensor.

On MC controllers, this function block receives its:

- Spd input through an MFIn input.
- DigDir input through either a second MFIn input, a DigIn input, or a DigAn input.

On SC controllers, this function block receives its:

- Spd input through an MFIn input.
- DigDir input through either a second MFIn input or a DigAn input.

See:

About Function Block Connections on page 8 for an overview of this function block's connections and signals.

EMD_SPD_DIR_D Function Block

Controller Input Requirements for EMD Function Blocks
The following tables list the controller input requirements for the EMD SPD DIR, EMD SPD DIR A, and EMD SPD DIR D function blocks.

Input Connections—MC Controllers

Function Block	Function Block Input	Controller Input	Comment
EMD SPD DIR	Spd	MFIn	Determines speed via pulse signal from the sensor.
	DirIn	MFIn	Utilizes pull-up/pull-down resistors and voltage to detect open circuit failure of the direction signal.
EMD SPD DIR A	Spd	MFIn	Determines speed via pulse signal from the sensor.
	DirIn	DigAn	Only detects when direction signal voltage is outside the expected ranges but lacks pull-up/pull-down resistors for open circuit detection.
		AnIn	Only detects when direction signal voltage is outside the expected ranges but lacks pull-up/pull-down resistors for open circuit detection.
EMD SPD DIR D	Spd	MFIn	Determines speed via pulse signal from the sensor.
	DigDir	DigIn	Provides no fault detection for the direction signal.
		DigAn	Provides no fault detection for the direction signal.

Input Connections—SC Controllers

Function Block	Function Block Input	Controller Input	Comment
EMD SPD DIR	**Spd**	**MFIn**	Determines speed via pulse signal from the sensor. The controller input must be labeled **Dig/Ana/Freq**.
	DirIn	**MFIn**	Utilizes pull-up/pull-down resistors and voltage to detect open circuit failure of the direction signal.
		DigAn	Utilizes pull-up/pull-down resistors and voltage to detect open circuit failure of the direction signal.

EMD_SPD_DIR_D Function Block

Inputs

- Function Block Inputs

Item	Type	Range	Description
Param	Bus	——	Input for common parameters that can be applied to multiple function blocks. See *About the Param Input* on page 11 for more information.
Spd	Bus	——	Input for a bus with: • **Volt/Voltage**, **Per** (Period), and **Count** signals with the voltage, period, and count output by the **Speed Sensor**. • A **Config** sub-bus with signals that configure the controller input that receives these signals.
Per	U32	1,250 to 10,000,000	The measured period output by the **Speed Sensor**. The function block uses the **Per** signal, **Count** signal, and **Puls/Rev** parameter value to calculate its **RPM** output. 10,000 = 1,000 µs.
Count	U16	0 to 65,535	The measured count per program loop output by the **Speed Sensor**. The function block uses the **Per** signal, **Count** signal, and **Puls/Rev** parameter value to calculate its **RPM** output. 1,000 = 1,000.
Config	Sub-bus	——	Contains the signals that configure this input.
Dir In	Bus	——	Input for a bus with: • A **Voltage/Volt** signal with the voltage output by the **Speed Sensor**, which the block uses to determine direction. • A **Config** sub-bus with signals that configure the controller input that receives this signal.
Volt/Voltage	U16	0 to 5,250	The measured voltage of the direction signal that the **Speed Sensor** outputs, which the block uses to determine direction.
Config	Sub-bus	——	Contains the signals that configure this input.
DigDir	Bus	——	Input for a bus with: • A **DigIn** signal with the bi-level voltage output by the **Speed Sensor**, which the block uses to determine direction. • A **Config** sub-bus with signals that configure the controller input that receives this signal.
DigIn	BOOL	——	Indicates the direction of rotation of the **Speed Sensor**: • T—counterclockwise (CCW). • F—clockwise (CW).
Config	Sub-bus	——	Contains the signals that configure this input.

EMD_SPD_DIR_D Function Block

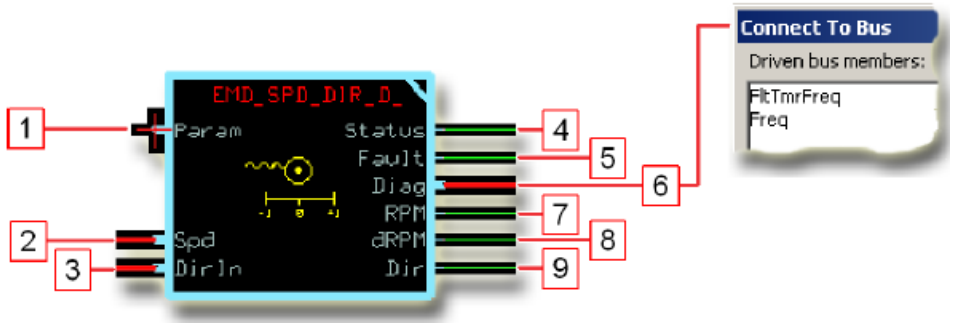
Outputs

- Function Block Outputs

Item	Type	Range	Description
Status	U16	——	Reports the function block's status. This function block uses a non-standard bitwise scheme to report its status and faults. • 0x0000 = Block is OK. • 0x0008 = **Puls/Rev** or **DirLockHz** parameter value is out of range.
Fault	U16	——	Reports the function block's faults. This function block uses a non-standard bitwise scheme to report its status and faults. • 0x0000 = Block is OK. • 0x0001 = **Per** signal in the function block's **Spd** input is too low. • 0x0002 = **Volt/Voltage** signal in the function block's **Spd** input is out of range. • 0x0004 = signal in the function block's **Dir** input is out of range.
Diag	Bus	——	Outputs a bus with **Freq** and **FltTmrFreq** signals that are available for troubleshooting.
Freq	U32	0 to 1,000,000,000	The measured frequency of the Speed Sensor. 100,000 = 10,000 Hz.
FaultTmrFreq	U16	0 to 65,535	When a frequency fault: • Occurs, this output counts up the milliseconds until the function block makes a fault declaration. • Clears, the output counts down the milliseconds until the function clears the fault declaration. 1,000 = 1,000 ms.
RPM	U16	0 to 2,500	Speed sensor revolutions per minute. The function block clamps this output at 2,500. 1 = 1 rpm.
dRPM	U16	0 to 25,000	Speed sensor revolutions per minute x 10 (deciRPM). The function block clamps this output at 25,000.
Dir	S8	-1, 0, +1	The Speed Sensor's direction of rotation. • -1 = Counterclockwise (CCW). • 0 = Neutral. • +1 = Clockwise (CW).

EMD_SPD_DIR_D Function Block

About Function Block Connections



About Function Block Connections

Item	Description
1.	Input for common parameters that can be applied to multiple function blocks.
2.	Input for a bus with: • The voltage, period, and count signals output by the **EMD Speed Sensor**. • A sub-bus with signals that configure the controller input that receives these signals.
3.	Input for a bus with: • The directional signal output by the **EMD Speed Sensor**. • A sub-bus with the signals that configure the controller input that receives these signals.
4.	Reports the status of the function block.
5.	Reports the faults of the function block.
6.	Outputs a bus with **Freq** and **FltTmrFreg** signals that are available for troubleshooting.
7.	Speed sensor revolutions per minute.
8.	Speed sensor revolutions per minute x 10 (deciRPM).
9.	The Speed Sensor's direction of rotation. • -1 = Counterclockwise (CCW). • 0 = Neutral. • +1 = Clockwise (CW).

EMD_SPD_DIR_D Function Block

Status and Fault Logic

- Unlike most other PLUS+1 compliant function blocks, this function block uses non-standard status and fault codes.
- Status Logic

Status	Hex*	Binary	Cause	Response	Correction
A parameter is out of range.	0x0008	1000	**Puls/Rev**, **FaultDetTm**, or **DirLockHz** parameter is out of range.	The function block clamps the out-of-range value at either its upper or lower limit.	Get the out-of-range parameter back within its range.

Bit 16 set to 1 identifies a standard Danfoss status or fault code.

- Fault Logic

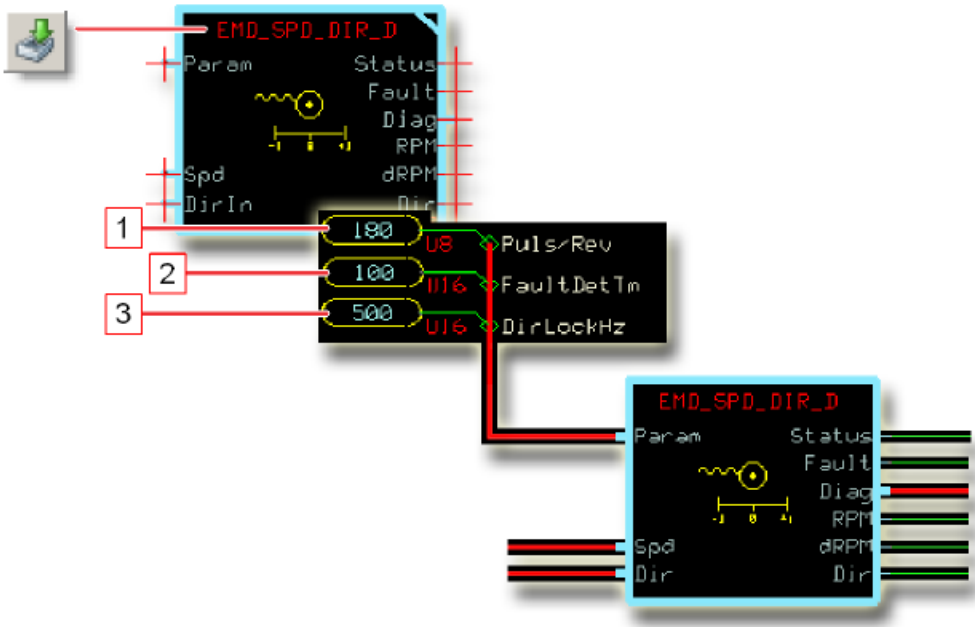
Fault	Hex*	Binary	Cause	Response	Delay†	Latch‡	Correction
Per signal in the function block's **Spd** input is too low.	0x0001	0001	**Per** signal < 1,250 Hz.	The function block outputs its maximum **RPM** and **dRPM** values.	Y	N	Check for hardware issues, such as electrical noise, that can produce an invalid **Per** signal value.
Volt/Voltage signal in the function block's **Spd** input is out of range.	0x0002	0010	**Volt/Voltage** signal is between 1,000 and 2,500 mV and the block receives no pulses from the Speed Sensor.	The function block sets its **RPM** and **dRPM** outputs to 0.	Y	N	Check for hardware issues, such as electrical noise, that can produce an invalid **Volt/ Voltage** signal value.

- Bit 16 set to 1 identifies a standard Danfoss status or fault code.
- A delayed fault is reported if the detected fault condition persists for a specified delay time. A delayed fault cannot be cleared until the fault condition remains undetected for the delay time.
- The function block maintains a latched fault report until the latch releases.

EMD_SPD_DIR_D Function Block

Function Block Parameters

- Enter the top-level page of the EMD_SPD_DIR function block to view and change this function block’s parameters.



- Function Block Parameters

Item	Type	Range	Description
1. Puls/Rev	U8	20–120, 180	Number of pulses per revolution of the Speed Sensor. Refer to the *EMD Speed Sensor Technical Information* (Danfoss part L1017287) for the correct value.
2. FaultDetTm	U16	0–65,535	Sets the time between when the function block detects a: • Fault condition and then makes a fault declaration. • Cleared fault condition and then clears the fault declaration. 1,000 = 1,000 ms.
3. DirLockHz	U16	0–8,000	Sets the frequency above which the function block's **Dir** output locks. Above this frequency, the function block does not report changes in direction. 1,000 = 1,000 Hz.

EMD_SPD_DIR_D Function Block

About the Param Input

- Use the Param input to input external parameter values to this function block.

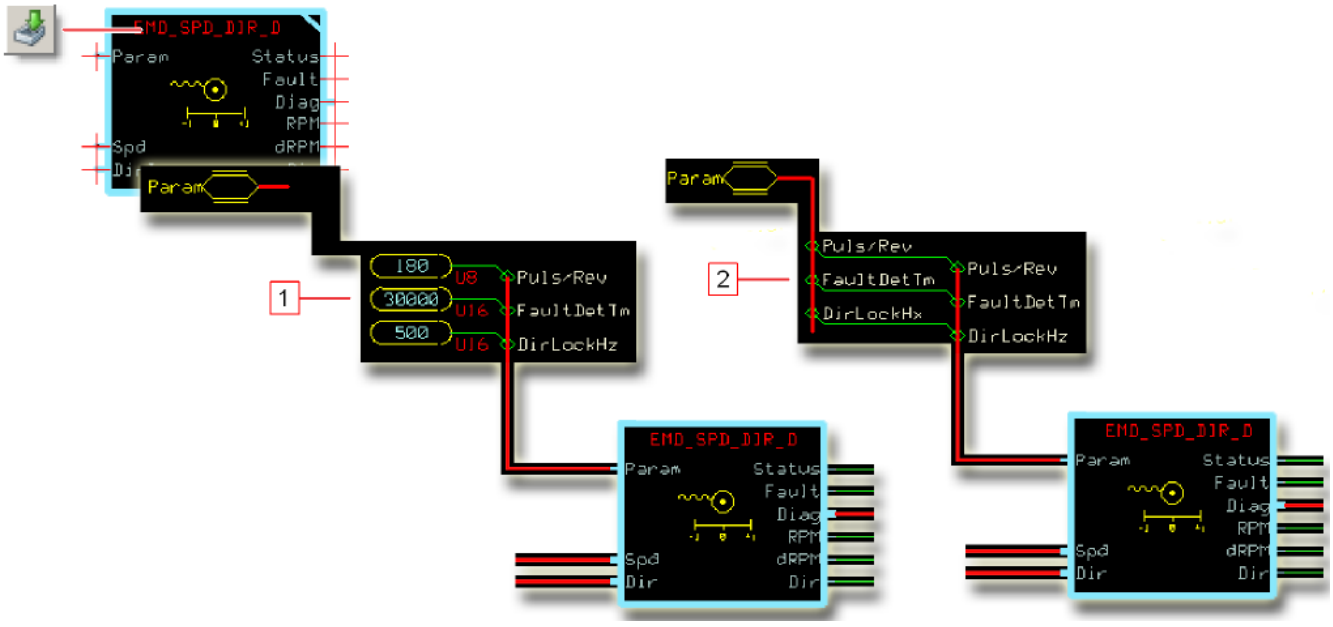


Figure Details

Item	Description
1.	Inside the function block's top-level page before you modify this page to accept common parameters through its **Param** input.
2.	Inside the function block's top level page after you modify this page to accept common parameters through its **Param** input.

Controller Configurations

Inputs on MC and SC controllers require configuration to work with this function block. See:

- MC Controller Configurations
- SC Controller Configurations

MC Controller Configurations

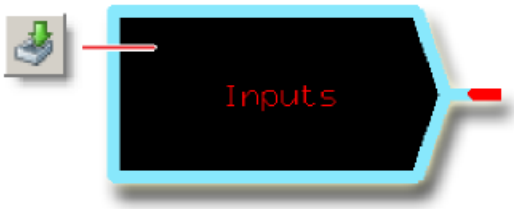
Input Configurations

Function Block Input	Compatible Input Type	Configuration Action
Spd	**MFIn**	Delete the: • **PinConfig0** route. • **PinConfig1** route.
DigDir	**MFIn**	No configuration required.
	DigAn	No configuration required.
	DigIn	Delete the: • **PinConfig** route.

Controller Configurations

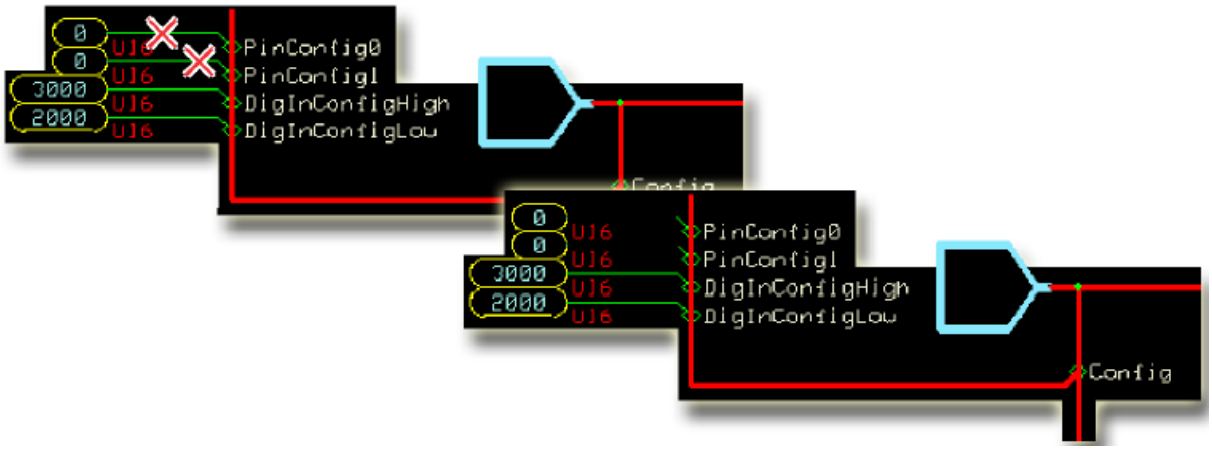
How to Configure an MFIn for the Spd Input

1. In the GUIDE template, enter the Inputs page.



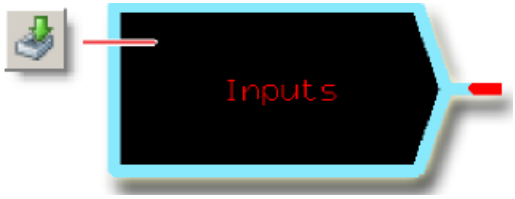
2. Enter the MFIn that receives the input signal.

3. Make the changes that are shown in the following figure.



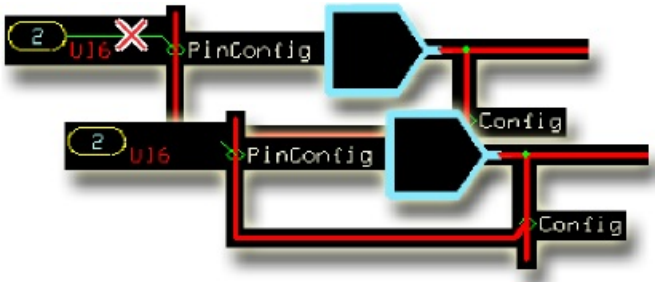
How to Configure a DigIn for the DigDir Input

1. In the GUIDE template, enter the Inputs page.



2. Enter the DigIn page that receives the input signal.

3. Make the changes that are shown in the following figure.



Controller Configurations

SC Controller Configurations

- Input Configurations

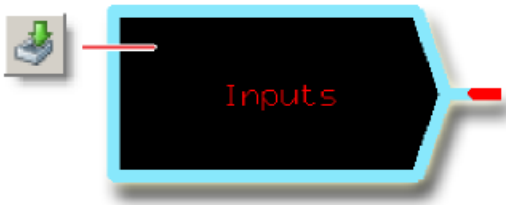
Function Block Input	Compatible Input Type	Configuration Action
Spd	**MFIn**[*]	Delete the: • **Bias** route. • **Range** route. • **Input Mode** route.[†]
DigDir	**DigAn**	Delete the: • **Bias** route. • **Range** route.
	MFIn	Delete the: • **Bias** route. • **Range** route.

- The MFIn that you use must be labeled Dig/Ana/Freq.

- † If present.

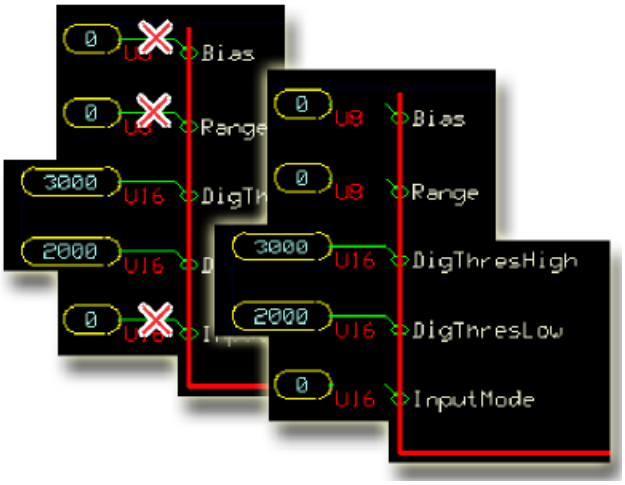
How to Configure an MFIn for the Spd Input

1. In the GUIDE template, enter the Inputs page.



2. Enter the MFIn that receives the input signal.

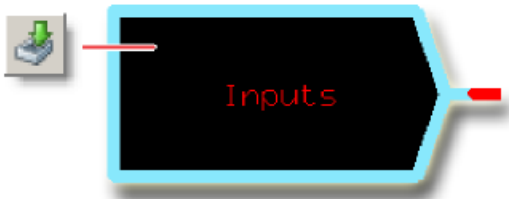
3. Make the changes that are shown in the following figure.



Controller Configurations

How to Configure a MFIn for the DigDir Input

1. In the GUIDE template, enter the Inputs page.



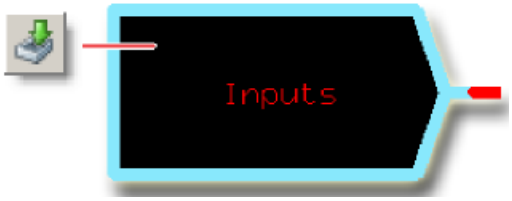
2. Enter the MFIn that receives the input signal.

3. Make the changes that are shown in the following figure.

Controller Configurations

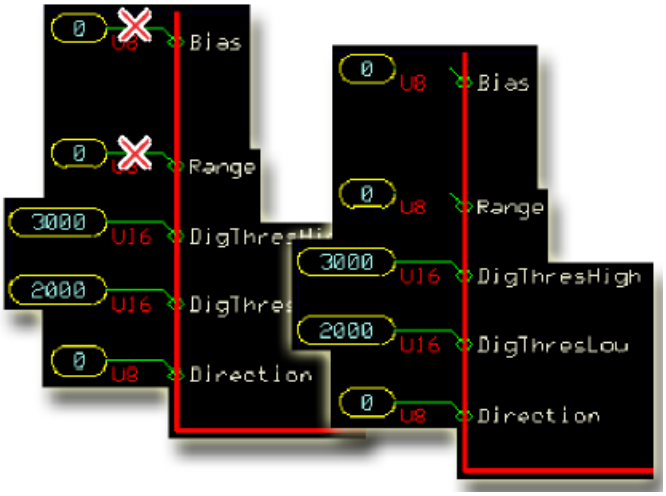
How to Configure a DigAn for the DigDir Input

1. In the GUIDE template, enter the Inputs page.



2. Enter the DigAn that receives the input signal.
3.

Make the changes that are shown in the following figure.



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FAQs

Q: What are the voltage ranges for the Dir In input?
A: The voltage range for Dir In input is 0 to 5,250 (Volt/Voltage U16).

Q: How is RPM calculated by the function block?
A: RPM output is calculated using the Per signal, Count signal, and Puls/Rev parameter value received from the Speed Sensor input.

Documents / Resources

	Danfoss PLUS+1 Compliant EMD Speed Digital Direction Function Block [pdf] User Guide PLUS 1 Compliant EMD Speed Digital Direction Function Block, PLUS 1, Compliant EMD Speed Digital Direction Function Block, EMD Speed Digital Direction Function Block, Direction Function Block, Function Block, Block

References

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