

PowerFlex 755 - Integrated Safety with 20-750-S3 card

Objective

This document describes a sample setup of the PowerFlex 755 drive using the Embedded EtherNet port (EENET) with the 20-750-S3 Safety option card in Integrated Safety operation with a GuardLogix Safety Controller.

Description

The PowerFlex 755 drive with the 20-750-S3 safety card offers the option of Integrated Safety, a controller based safety function that is configured within Studio 5000 Logix Designer software to provide the Safe Torque-Off function. This method uses EtherNet/IP to communicate safety information (CIP Safety) and remove the need for discrete safety wiring to the drive. Rated Cat.3 and PLe per ISO 13849-1.



The following software, AOP and firmware versions are required:

- Studio 5000 Logix Designer V30 (and later)
- Drives AOP V4.09 (and later)
- GuardLogix safety controller L7S or L3S firmware V30 or higher
- PowerFlex 755 firmware V13 or higher

Installation

The 20-750-S3 can be connected in the slots 4, 5 and 6 of the PowerFlex 755 drive. The main control board SAFETY jumper must be removed.





Application Note

Setup in Studio5000

These is the hardware of our example setup:

GuardLogix L7S Safety Controller firmware V30.011 1756-EN2TR network card PowerFlex 755 firmware V13.002 20-750-S3 card in Port 6

Setup Steps:

- 1. Open Studio 5000 Logix Designer and create a new project for the L7S controller.
- 2. Add the EN2TR network card to the IO Configuration.
- 3. Add the **PowerFlex 755 EENET** (via Embedded EtherNet port) drive to the EtherNet/IP network.

We can also use the Dual port EtherNet card **20-750-ENETR** but <u>only</u> in **Tap** mode. Select also **PowerFlex 755 EENET** as drive profile type.

4. In the drive properties, select the **General** tab and open the **Module Definition** window.

Click the **Match Drive** button to automatically load the drive information into the **Module Definition** screen, from the online network drive.



5. In the drop down menu for Connection select Standard and Safety.

Connection:	Standard and Safety	Ţ	
Safety Type:	20-750-S3	-	•••
Data Format:	Parameters	Ţ	

6. In Safety Type click the 🛄 button to open the Safety Definition window. Select the 20-750-S3 card Revision, Port and Electronic Keying.

Safety Definition		X
Revision:	1 •	2 •
Port:	6 - 20-750-S3	•
Electronic Keying:	Compatible Module	•
	ОК	Cancel





Application Note

7. Save the project and download. When downloading completes, place the controller in **Run** mode.



8. In the drive properties, select the **Connection** tab and tick the box for **Inhibit Module**.

Ge	eneral	Connection	Safety	Module Info	Port Co	nfig	guration Drive		
	Name		Requested Packet Interval (RPI) (ms)			Connection over EtherNet/IP			
	Safety Output		20.0	÷	Set by Safety Task	Unicast	-		
	Safety	/ Input			10.0	÷	6.0 - 500.0	Unicast	-
	Output		20.0	÷	2.0 - 512.0	Unicast	-		
	Inhibit Module Major Fault On Controller If Connection Fails While in Run Mode								

9. Select the **Safety** tab and click in the **Reset Ownership** button. Click **Yes** in the next window to confirm the reset.

Module Properties: EtherNet_card:0 (PowerFlex 755-EENET 13.002) General Connection Safety Module Info Port Configuration Drive						
Connection Requested Packet Connect Type Interval (RPI) (ms) Time I Safety Input 10 \$ I Safety Output 20 I	on Reaction Max Observed Limit (ms) • • • • • • • • • • • • • • • • • • •					
Reset Ownership • Configuration Signature: ID: ID: d03a_ecd7 Date: 11/10/2016 Time: 2:57:13 PM Status: Inhibited	Studio 5000 Logix Designer ANGER. Reset Ownership should not be performed on a model of two or more controllers are attempting to share this module ownership will result in ownership being granted to the first of that successfully configures the module. To ensure the correct controller assumes ownership, inhibit to on all controllers before confirming the operation. All connections to the module will be broken, and control m Continue with Ownership Reset?	odule currently being used for control. Ile, resetting controller the connection hay be interrupted. Help				

- 10. Select the **Connection** tab and untick the box for **Inhibit Module**.
- 11. Verify that the yellow icon has disappeared and the drive is in the Running status.





Integrated Safe Torque-Off functionality

- 1. The PowerFlex 755 drive should display "Not Enabled".
- 2. Go to the Controller tags and locate the drive safety input and safety output tags. Notice that the **TorqueDisabled** and **ResetRequired** bits in the input are high "1".

- Drive:SI	{}	{}	
-Drive:SI.ConnectionFaulted	0		Decimal
Drive:SI.ConnectionStatus	2#0000_0000_0000_0000		Binary
-Drive:SI.ResetRequired	1		Decimal
-Drive:SI.RunMode	1		Decimal
-Drive:SI.SafetyFault	0		Decimal
	2#1000_0001		Binary
Drive:SI.TorqueDisabled	1		Decimal

3. Set the **SafeTorqueOff** bit in the output to 1. This bit needs to be energized in order to allow torque.

-	Drive:SO	{}	{}	
		2#0000_0001		Binary
	-Drive:SO.Reset	0		Decimal
	Drive:SO.SafeTorqueOff	1		Decimal

The Reset bit is not required. See below auto reset timing diagram using network Safe Torque-Off.

_	I		
Drv:S0.SafeTorqueOff	Disable Torque		Permit Torque
Drv:SO.Reset	I	Reset Not Requ	ired

4. Notice that the TorqueDisabled and ResetRequired bits goes low "0".

- Drive:SI	{}	{}	
-Drive:SI.ConnectionFaulted	0		Decimal
	2#0000_0000_0000_0000		Binary
-Drive:SI.ResetRequired	0		Decimal
-Drive:SI.RunMode	1		Decimal
-Drive:SI.SafetyFault	0		Decimal
	2#0000_0000		Binary
-Drive:SI.TorqueDisabled	0		Decimal

- 5. Now the PowerFlex 755 drive should display "Stopped".
- 6. Go to the Controller tags and locate the drive input and output tags. Notice that the **Ready** bit in the input is high **"1"**. You can now start and stop the drive.





Sample safety code

The following code is an example for a category 0 stop (coast). We use a **Dual Channel Input Stop (DCS)** instruction to monitor a dual-input safety device like an E-stop, light curtain or a safety gate.

The drive **STO** output is energized if both input channels are high (1), there are no faults, there is a valid connection, and there is a falling edge on the reset bit.

When the two inputs channels goes to low (0), the **DCS** instruction output bit (O1) goes to low (0) and drive **STO** output immediately goes to low (0) as well.

	DCS-		•
	Dual Channel Input Sto	D	
	DCS	Safety_1	(01)
	Safety Function E	MERGENCY STOP	4
	Input Type EQUIVALE	NT - ACTIVE HIGH	(FP)
	Discrepancy Time (Ms	ec) 100	
	Restart Type	MANUAL	
	Cold Start Type	AUTOMATIC	
	Channel A	ChannelA	
		1 📢	-
	Channel B	ChannelB	
		1 📢	-
	Input Status	Input_Status	
		1 🗧	-
	Reset	Safety_Reset	
		1 🗧	-
			J
Safety_1.01 Drive:SI.RunMode Drive:SI.ConnectionFaulted Drive:SI.SafetyFault		Drive:SO.SafeT	orqueOff
<u></u>		()	

ISO 13849-1 stipulates that instruction reset functions must occur on falling edge signals. To comply with this requirement, a **One Shot Falling (OSF)** instruction is used on the reset rung. Then, the **OSF** instruction output bit is used as the reset bit for the **DCS** instruction.

reset	OSF One Shot Falling Storage Bit store1 -(SB) Output Bit Reset_FallingEdge -(OB)
Reset_FallingEdge ESTOP	Safety_Reset





Application Note

Resources

PowerFlex 755 Integrated Safety - Safe Torque Off Option Module User Manual

http://literature.rockwellautomation.com/idc/groups/literature/documents/um/750-um004_-en-p.pdf



