Rockwell Automation

Innovation & Technology Forum

T25 - What's New in PowerFlex® Drives

Petr **DRAHOTA**

Commercial Engineer Power & Components

LISTEN. THINK. SOLVE.®

Enhanced portfolio of PF755T drives

PowerFlex® 755T Drives

Rockwell Automation

PowerFlex® 750-Series Drives

Expanded Solutions – Increased Power Ranges

PowerFlex 753

0.75…270 kW

Speed & Torque Control

6-pulse Drive

PowerFlex 755

0.75…1400 kW

Speed, Torque & Position Control

6-pulse Drive

PowerFlex 755TL

7.5…1400 kW

Speed, Torque & Position Control

Low Harmonic

PowerFlex 755TR

7.5…4500 kW

Speed, Torque & Position Control

Regeneration & Low Harmonic

PowerFlex 755TM

160…4500 kW (AC)
70…4800 kW (DC)

Speed, Torque & Position Control

Common Bus Drive System

PowerFlex 753

- Speed and torque control
- Premier Integration to Rockwell Automation Architecture
- Embedded I/O
- General purpose applications
- DeviceLogix for standalone applications
- Wall mount construction
- Power range:
  - 0.75 to 270 kW @ 400V
  - 1.0 to 350 Hp @ 480 V
  - .5 to 300 Hp @ 600V
  - 5.5 to 250 kW @ 690V

PowerFlex 755

- Speed, torque and position control
- Embedded EtherNet/IP port
- Performance applications
  - Coordinated drive systems applications
  - Positioning applications
  - Torqueprove (lifting)
- DeviceLogix to complement system capabilities
- Use of embedded instructions within RSLogix 5000 (CIP Motion)
- Wall mount and floor mount construction
- Power range
  - 0.75 to 1400 kW @ 400V
  - 1.0 to 2000 Hp @ 480V
  - .5 to 1500 Hp @ 600V
  - 5.5 to 1500 kW @ 690V

PowerFlex 750-Series: PowerFlex 755

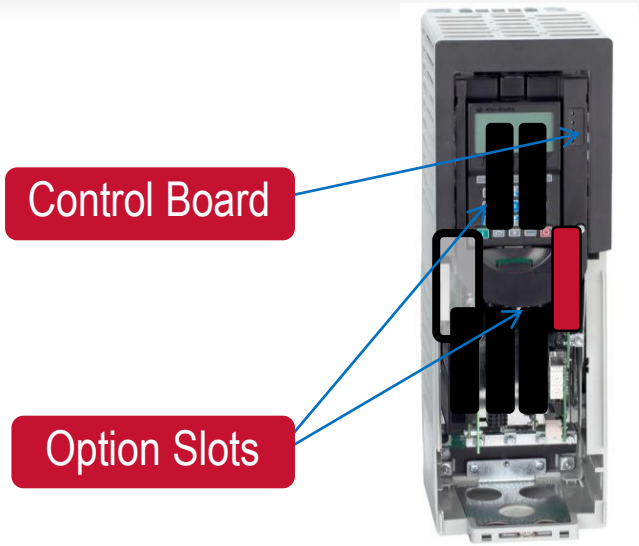
- ***Easy*** to Install & Use
  - Roll Out Design
  - Adjustable Wire Terminations
  - N-1 Operation
  - Remote Mountable Control Chassis
- ***Easy*** to Maintain & Service
  - Modular Design - Low MTTR
  - Replaceable Surge Protectors
- ***Easy*** to Monitor & Diagnose
  - Surge Protector & Fuse Feedback
  - Blower / Fan Feedback
  - Enhanced Sensing
- ***Smart*** Features for Extra Savings
  - Integrated Fusing
  - Built-In EMC Filtering
  - Pre-Engineered Power Option Packages

Best in Class Serviceability, Diagnostics and Maintenance

PowerFlex 750-Series Option Cards

- The PowerFlex 750-Series is unique in that most of the options are common between the PowerFlex 753 and PowerFlex 755
- This commonality helps reduce inventory and spare parts
- Options include:
  - HIM
  - Communications
  - Auxiliary Power
  - I/O
  - Feedback Encoder Interface
  - Safety
- The Option Development Kit provides the tools for 3rd parties to develop application or network specific option card

PowerFlex 750-Series Control and Option slots

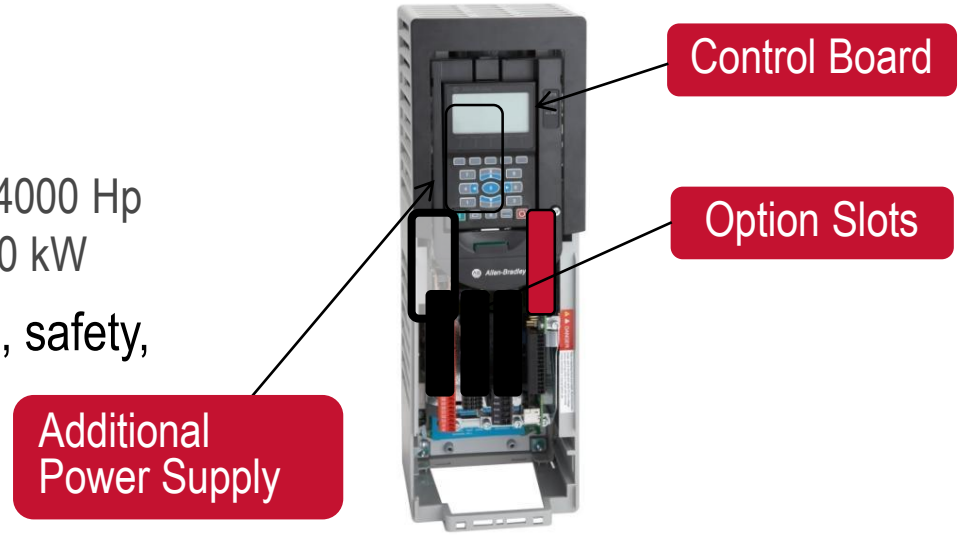


PowerFlex 755

- Power Ratings:
  - 400/480V AC: 0.75…1400 kW / 1.0…2000 Hp
  - 600/690V AC: .5…1500 Hp / 5.5…1500 kW
- 5 option slots for communications, safety, feedback, I/O, and auxiliary power supply
  - 3 option slots for frame 1
- Standard embedded EtherNet/IP port

PowerFlex 753

- Power Ratings:
  - 400/480V: 0.75…270 kW/ 1.0…4000 Hp
  - 600/690V: .5…300 Hp / 5.5…250 kW
- 3 option slots for communications, safety, feedback and additional I/O
- Standard embedded I/O



PowerFlex 755T Drives

Introduced in 2018

PowerFlex 755TL
Low Harmonic Drive

PowerFlex 755TR
Regenerative Drive

PowerFlex 755TM
Drive System

PowerFlex 755T Drive Solutions

PowerFlex 750-Series Foundation

- Commonality with PowerFlex 755 drives
  - Designed for ease of installation and maintenance
  - Premier Integration with Studio 5000 Logix Designer
  - PowerFlex 750-Series control pod architecture
  - Safety, feedback, communications and I/O options
  - Programming tools
  - Predictive diagnostics
- Added features
  - Regenerative and harmonic reduction capability
  - Line disturbance ride through and power factor correc
  - Total***FORCE*** Technology
  - Built-in dual port EtherNet/IP

PowerFlex 755T Drive Solutions

Hardware Design

- Designed for efficient installation and maintenance while optimizing the floor space required
  - Modular design with roll in/out units
  - Wire unit once – power wiring stays connected while unit is rolled out
  - Highly serviceable with access to service areas and eased removal of parts
- Enclosure types to meet environmental requirements: IP21 (Type 1) and IP54 (Type 12)
- Common spares through out PowerFlex 755T drives helps reduce spare part inventory

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 5…7 Hardware Overview

PowerFlex 755TR/TL

Frame 5

Ratings:

7.5-55 kW @ 400/480V
11-55 kW @ 600/690V

Enclosure Types:

IP00 (Open Type)
IP20 (Type 1)*

PowerFlex 755TR/TL/TM

Frame 6

Ratings:

55-132 kW @ 400/480V
55-132 kW @ 600/690V

Enclosure Types:

IP00 (Open Type)
IP20 (Type 1)*

PowerFlex 755TR/TL/TM

Frame 7

Ratings:

132-315 kW @ 400/480V
132-355 kW @ 600/690V

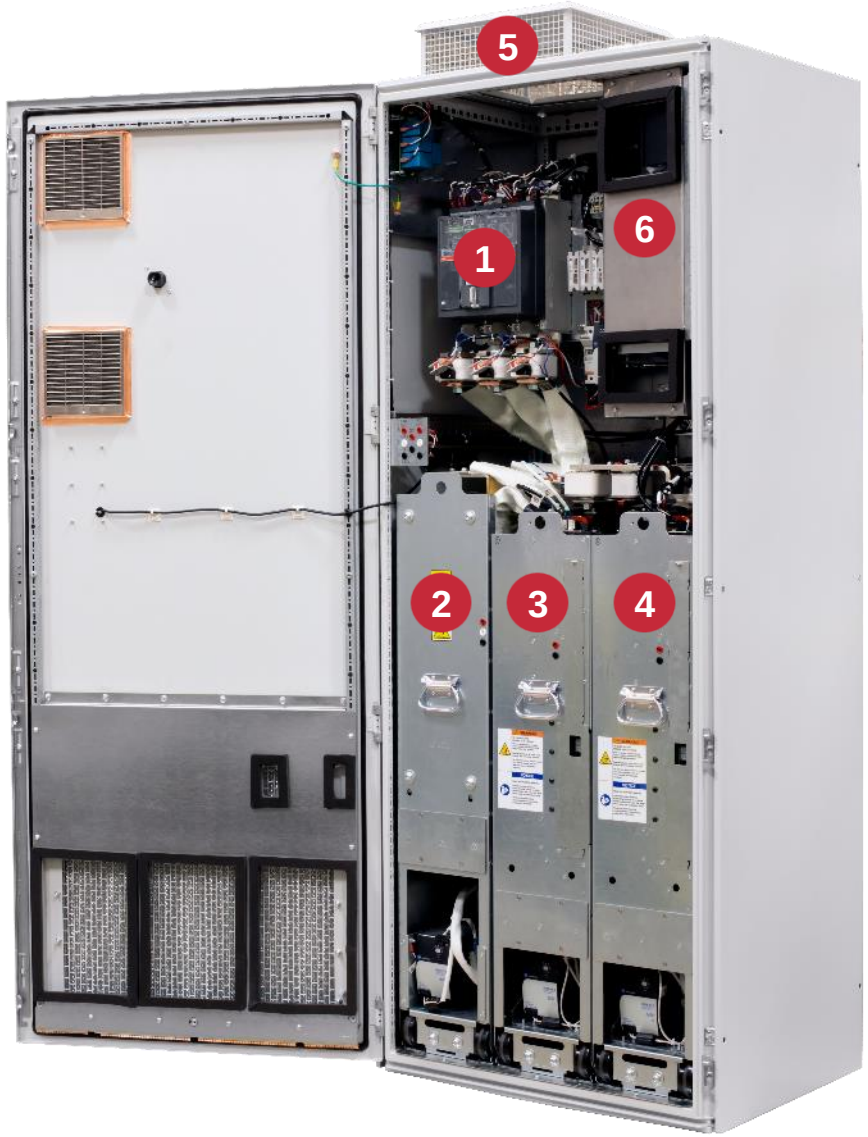
Enclosure Types:

IP00 (Open Type)
IP21 (Type 1)
IP54 (Type 12)

** Can be achieved with installation of conduit box kit*

PowerFlex 750-Series with TotalFORCE® Technology

Design – Frame 7 Example

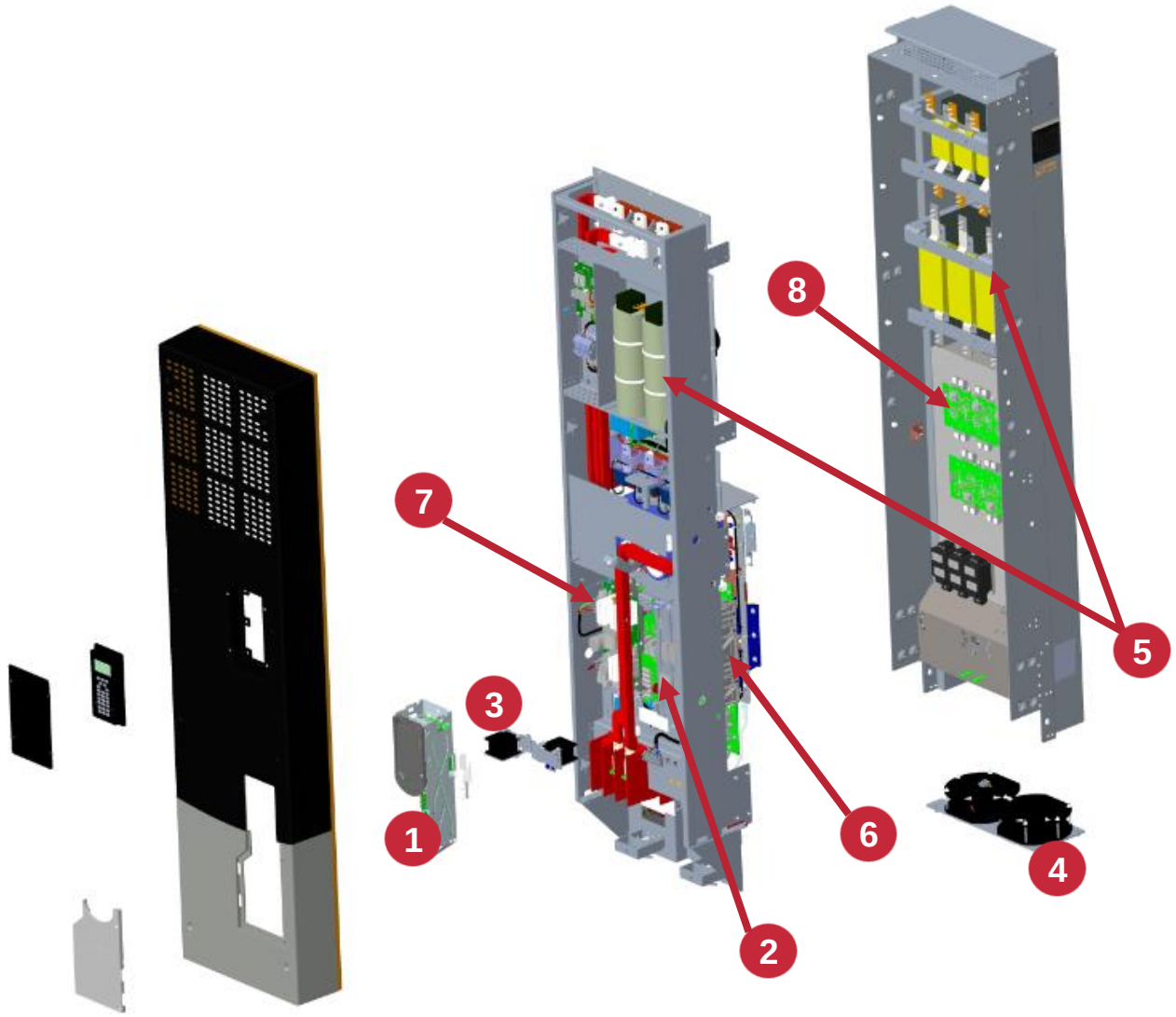


PowerFlex 755TR & 755TL Drives

1. **AC Pre-charge** regulates the input AC current from the incoming power source, greatly reducing stress on the power components during power-up.
2. **LCL filter** is a 230 mm wide module that provides low harmonic capability and minimizes the current distortion into the utility grid.
3. **Line side converter** is a 230 mm wide module that draws energy from the AC line without harmonic distortion and converts it to DC power. In the PowerFlex 755TR, it also provides a means of regeneration back to the AC line.
4. **Motor side inverter** is a 230 mm wide module that controls the voltage and current of the motor.
5. **IP21/IP54 enclosures** provide a choice of packaging options to meet the environmental requirements of your application.
6. **Control pod** contains the control platform that is responsible for motor control, system control and communications. Five option slots allow you to add communications, I/O, safety and feedback.

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frame 6 Example



PowerFlex 755TR & 755TL Drives

1. **Control pod** contains the control platform that is responsible for motor control, system control and communications. Five option slots allow you to add communications, I/O, safety and feedback.
2. **Power Board** is a printed circuit board that contains the main power control and precharge circuits
3. **Stirring Fans** are easily replaceable assemblies used for additional cooling of critical electronic components of the drive
4. **Heatsink Fan Tray** is an easily replaceable sub-assembly used to cool the IGBTs/heatsink assembly
5. **LCL filter** components consisting of the LCL capacitors and inductors which combine to help mitigate line side harmonics
6. **Power Feedback Board** is a printed circuit board that manages the voltage/current sensing in the drive and provides low voltage power to the control pod.
7. **Fan Power Supply Board** is a printed circuit board that provides power to the heatsink and stirring fans.
8. **Heatsink/IGBT/Gate Board** is a subassembly for the drive's switching components and supporting thermal hardware

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 5…7 Hardware Overview

- Fr5/6 products are wall mount
- Fr7 is placed in Rittal TS8 style enclosure

Frame	Enclosure Type	755TL Drive	755TR Drive	755TM Bus Supply	755TM CBI
5	IP00 & IP20 (Open Type & Type 1)	✓	✓	✗	✗
6	IP00 & P20 (Open Type & Type 1)	✓	✓	✓	✗
7	IP21 & IP54 (Type 1 & Type 12)	✓	✓	✓	✗

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 5…7 Hardware Dimensions

Frame	Enclosure Type	H (mm)	W (mm)	D (mm)
5	IP00 (Open Type)	863	344	357
6	IP00 (Open Type	1657	405	361
7	IP21 (Type 1)	2128	800	672.5
7	IP54 (Type 12)	2292	800	717

Frame	Enclosure Type	H (mm)	W (mm)	D (mm)
8	IP20 (Type 1)	2132	1200	676
8	IP54 (Type 12)	2291	1200	721

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 13…15 Power Ratings

PowerFlex 755TR/TM

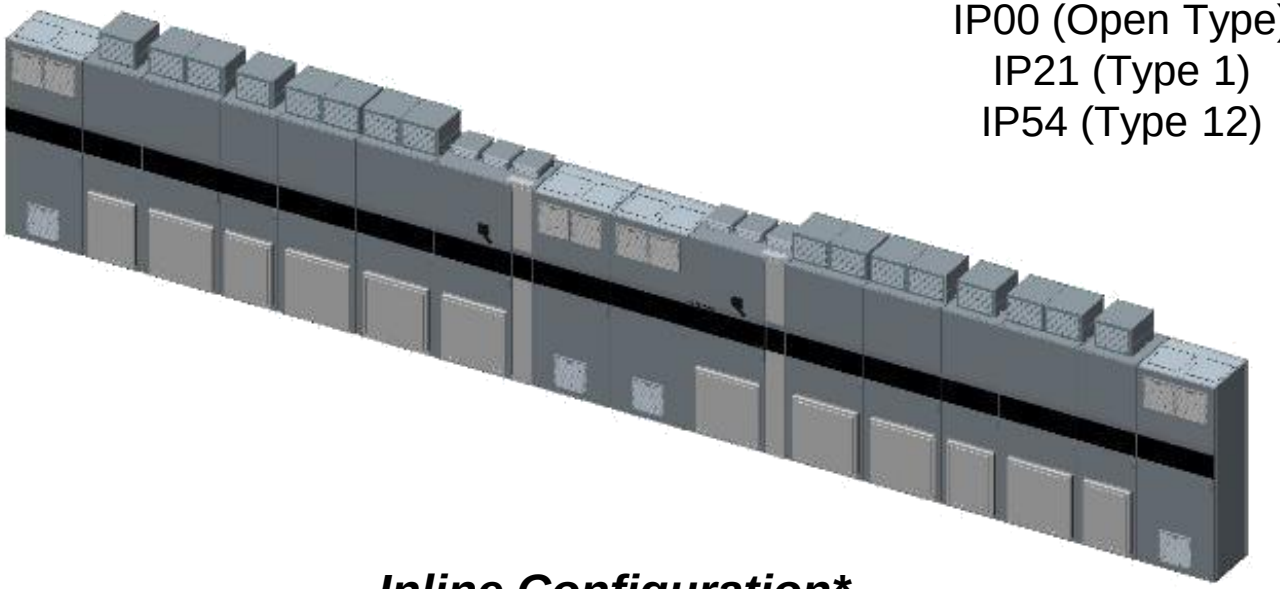
Frame 13…15

Ratings:

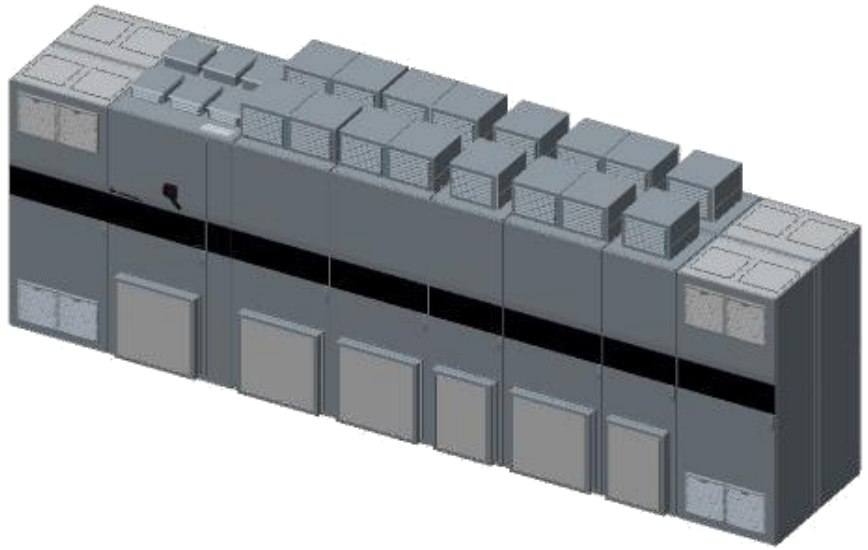
2000-3600 kW @ 400/480V
2300-4500 kW @ 600/690V

Enclosure Types:

IP00 (Open Type)
IP21 (Type 1)
IP54 (Type 12)



Inline Configuration*

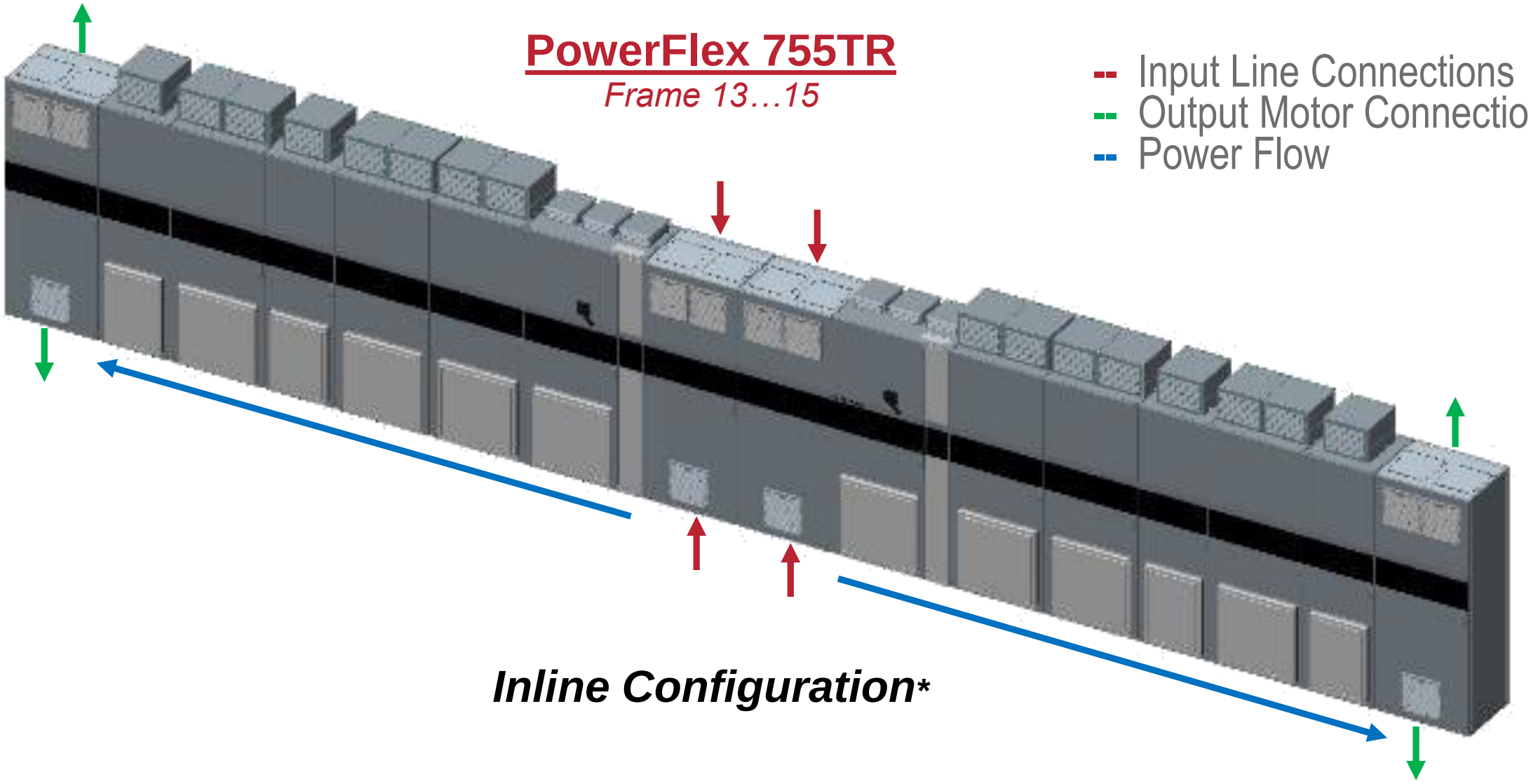


Back-to-Back Configuration*

** Representative image of a PowerFlex 755TR F15*

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 13…15 Power Flow



Inline Configuration*

** Representative image of a PowerFlex 755TR F15*

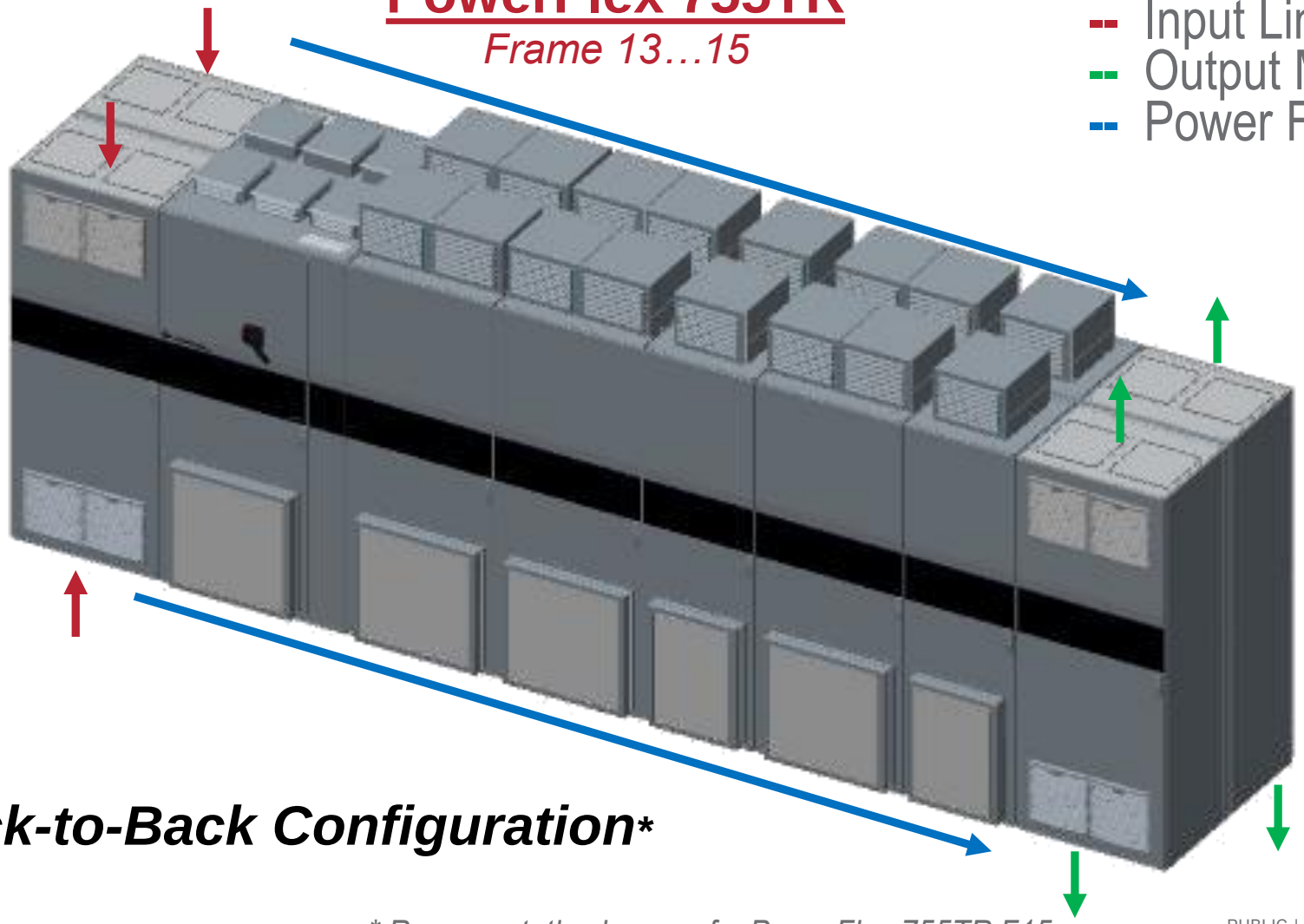
PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 13…15 Power Flow

PowerFlex 755TR

Frame 13…15

- Input Line Connections
- Output Motor Connections
- Power Flow



Back-to-Back Configuration*

** Representative image of a PowerFlex 755TR F15*

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Frames 13…15 Hardware Dimensions

- Dimensions below are for an integrated drive (755TR)

		Inline Configuration			Back-to-Back Configuration		
Frame	**Enclosure Type**	**H (mm)**	**W (mm)**	**D (mm)**	**H (mm)**	**W (mm)**	**D (mm)**
13	IP21 (Type 1)	2133	8000	682	2133	4000	1364
14	IP21 (Type 1)	2133	10800	682	2133	5400	1364
15	IP21 (Type 1)	2133	12400	682	2133	6200	1364

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – Catalog Structure

20G	1	F	3	C	302	L	N	D	XXXXX	–	Cx	–	Px
A		*B*	*C*	*D*	*E*	*F*		*G*			*H*		*I*

- ***I.*** Power Options
  - -P15 – Top Cable Exit; with Wiring Bay *(F8…15)*
  - -P16 – Top Cable Entry; with Wiring Bay *(F10…15)*
  - -P17 – Top Cable Entry; without Wiring Bay *(F8…9)*
  - -P46 – System DC Bus; 4700A *(F8…10)*
  - -P50 – DC Bus Conditioner *(F5…15)*
  - -P51 – Marine Bus Conditioner *(F5…15)*
  - -P60 – Back to Back Configuration *(F13…15)*
- ***H.*** Control Options
  - -C0 – Torque Accuracy Module *(F5…15)*
  - -C1 – Control Transformer; 240V *(F8…15)*
  - -C11 – Single Pod; with Control Bay *(F8…15)*
  - -C12 – Dual Pod; with Control Bay *(F8…15)*

PowerFlex 750-Series with TotalFORCE® Technology

Capability & Feature Summary

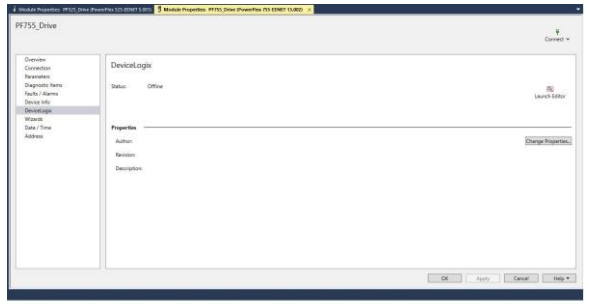
Feature	Commercial Release 1 PF755T (V3.001)	Commercial Release 2 PF755T (V4.001)
Position, Velocity and Torque Control Modes	✓	✓
Induction Motor Control	✓	✓
IPM & SPM Motor Control	✗	✓
DeviceLogix	✗	✓
Predictive Analytics for Maintenance	✓	✓
Adaptive Tuning (4 Auto Tracking Notches)	✗	✓
Load Observer	✓	✓
Bus Observer	✗	✓
Power Feed Forward	✓	✓
Profilers (Velocity & Position)	✗	✓
Anti-Sway	✗	✓
Position & Time Cam	✗	✓
TorqProve	✓	✓
Power-loss Ride-thru/Autorestart	✗	✓
Emergency Override	✓	✓
Variable Voltage Boost	✗	✓
Integrated (CIP) Motion	✗	✗

PowerFlex 750-Series Drives with TotalFORCE® Technology

Design – DeviceLogix Control

DeviceLogix™ provides built-in control capability for local application and supplementary supervisory control

- Enhanced productivity for standalone applications
  - Helps increase performance & reliability by processing logic locally (2 ms scan rate)
  - Powered through 3-phase input power or auxiliary 24V control power
  - Up to 500 instruction blocks can be configured to support industry application requirements
- Simple programming tool
  - Support for function block and ladder programming
  - Added **tag binding** capability for improved programming experience – create tags for any parameter in the drive
  - 16 standard instruction types available (ie: timer, counter, alarm, PID and so forth)



DeviceLogix™

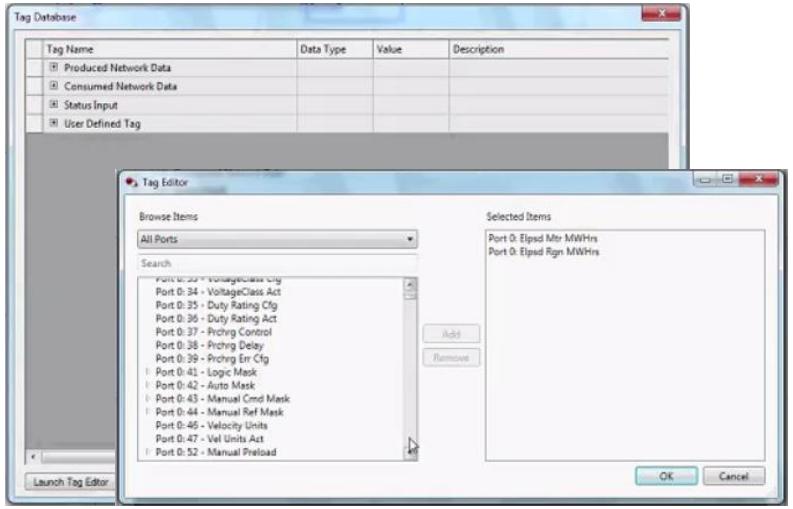
DeviceLogix™ is a tool that can increase productivity!

PowerFlex 750-Series Drives with TotalFORCE® Technology

DeviceLogix Control – Tag Binding

What is Tag Binding and how does it work?

- Enables a seamless programming experience in DeviceLogix for PowerFlex 755T drives and option cards
  - Configurable tag database, similar to Studio 5000
  - Tag editor is used to select any drive parameter needed for programming
  - All tags added to the tag database will show in the DeviceLogix editor workspace for programming
  - Preserves Datalinks capability



	PowerFlex 755T	PowerFlex 755
Scan Rate: *w/ 10 instructions* *w/ 100 instructions*	 2ms 2ms	 2ms 5ms
Memory *(# of instructions)*	500	225
Instruction Blocks	160+	80

PowerFlex 750-Series with TotalFORCE®

Design – AC Motor Support

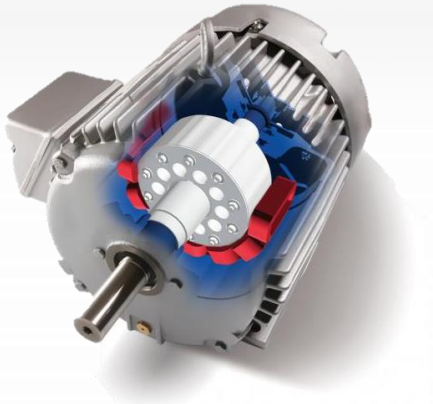
- TotalFORCE helps deliver best in class control performance enabled by:
  - Bandwidth – how well the drive responds to a dynamic reference
  - Disturbance Rejection – a measure of the drives response to a change in the load
  - Velocity Tracking – a measure of how the drive reacts to external forces
- Advanced power control capabilities like regeneration and power factor control provide additional energy savings
- Built-in flexible motor support along with an industry-leading footprint provides a complete drive solution

Why use an induction motor?

- Widely accepted and available
- Flexible offering
- Easy to maintain
- Affordable

Why use a permanent magnet motor?

- Application performance
- Higher efficiency
- Small footprint



Motor control performance and flexibility provide solutions for a broad array of applications and motors!

PowerFlex 750-Series Drives with TotalFORCE®

Design – AC Motor Support *(V4.001)*

	Interior Permanent Magnet (IPM)	Surface Mount Permanent Magnet (SPM)
Closed Loop Control	✓	✓
Open Loop Control	✗	✓
Flux Vector Control	✓	✓
Volts/Hertz Control*	✗	✗
Autotune	✓	✓
Flying Start	✗	✗
Adaptive Control	✓	✓

** SPM & IPM motors can be run in V/Hz control for induction motors with parameter changes*

PowerFlex 750-Series Drives with TotalFORCE® Technology

Operate – Adaptive Control

NEW!

Adaptive Tuning

Helps increase machine reliability and performance

- Monitors drive performance characteristics and adapts if necessary
- Automatically suppresses potentially harmful resonance and vibration conditions
- Can be used to indicate machine wear out over time

Load Observer

Helps reduce startup time by reducing the effort needed for tuning

- Automatically monitors and compensates for load changes
- Compensates for normal machine wear
- Provides consistent dynamic behavior

Bus Observer

Helps increase reliability by reducing the probability of resonance

- Accounts for dynamic DC bus conditions
- Reduce startup time needed for tuning
- Automatically monitors and compensates for line changes

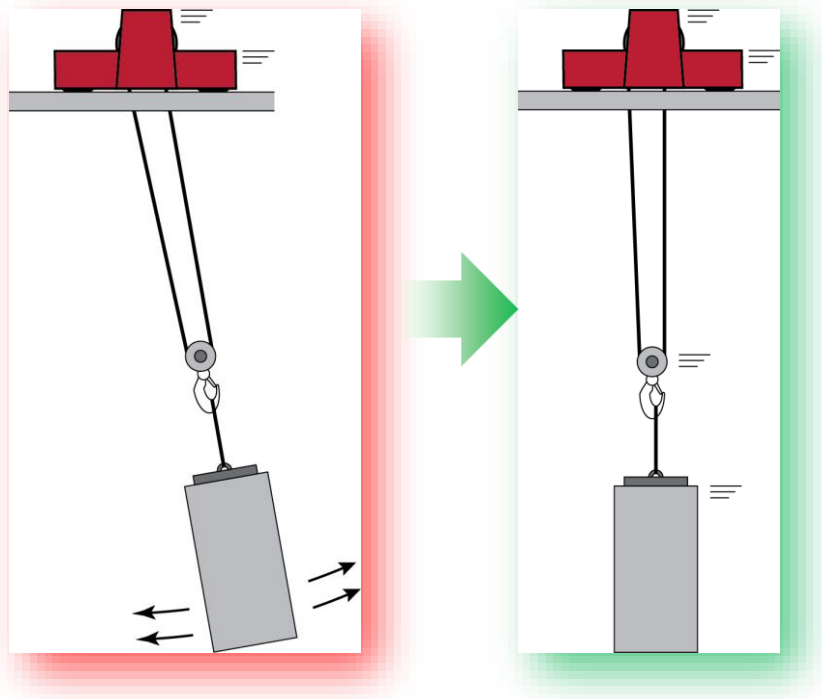
Patented drive analytics help increase performance and decrease commissioning time!

PowerFlex 750-Series with TotalFORCE® Technology

Operate – Anti-sway Technology

Automatically control sway in cranes without the need for auxiliary sensors, external controller or complex programming

- Helps prevent the “pendulum effect” of moving loads
- Built-in drive capability helps increase productivity and machine reliability
  - Decrease handling time by up to 2x
  - Prolongs the life of mechanical components
- Helps provide flexible and safe machine operation
  - Can be used with a manual or automatic operation mode
  - Helps provide a safe environment for personnel and assets



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Energy Pause Capability

PowerFlex® 755T Drives

Rockwell Automation

Energy Pause

- Allows product (drive or bus supply) to go to low energy (Pause) state on command.
- Allows the product to resume normal operation on command.
- In the Pause state, the product consumes less energy.
- Also produces lower levels of sound energy.

Functions and Requirements

Functions

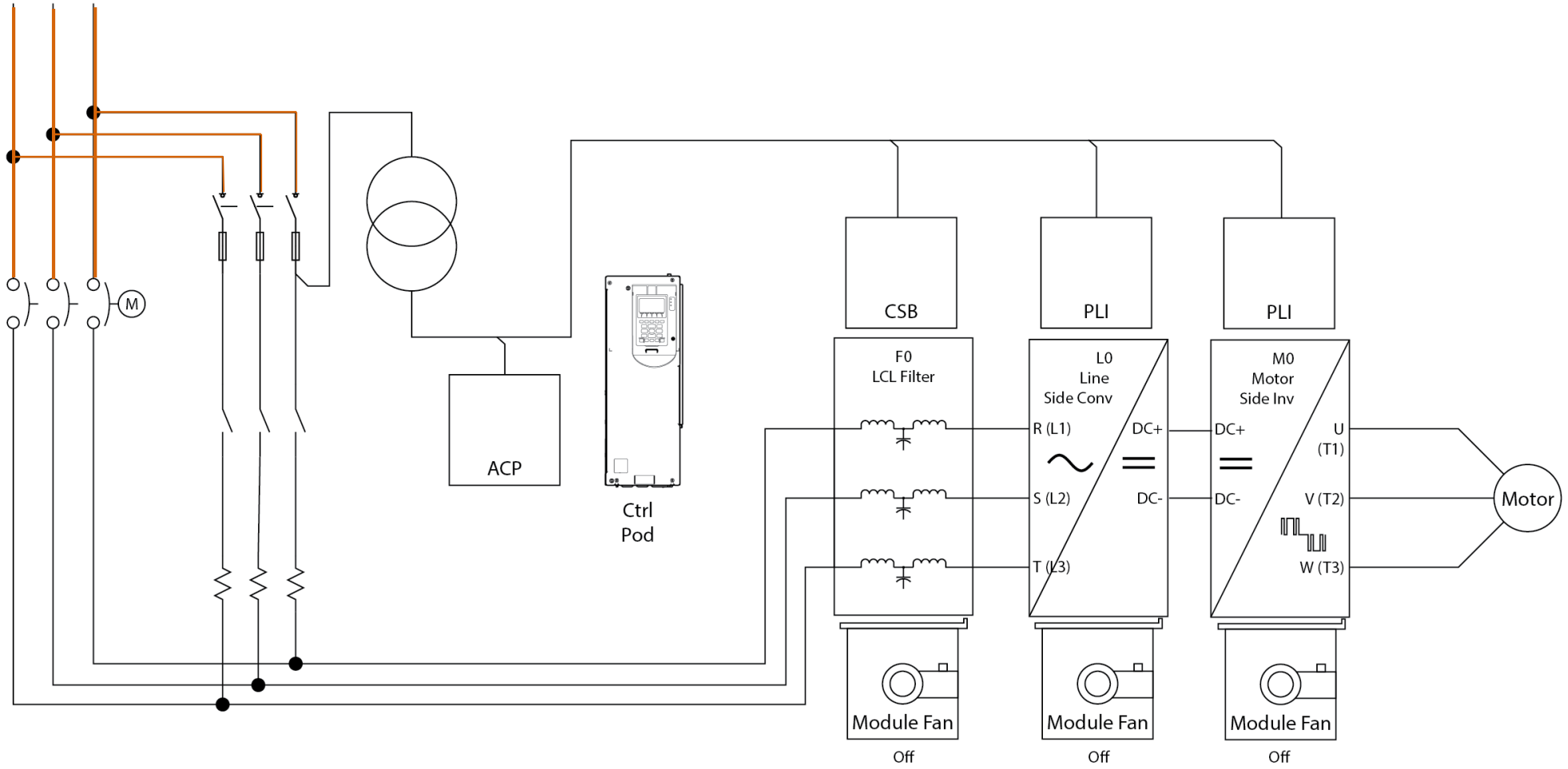
- Disconnects Line Side Converter from three phase AC line
- Puts main fans in low energy states
- Command from network or digital input
- Control for external contactor (for future small drives)

Required for Use

- 24V auxiliary power

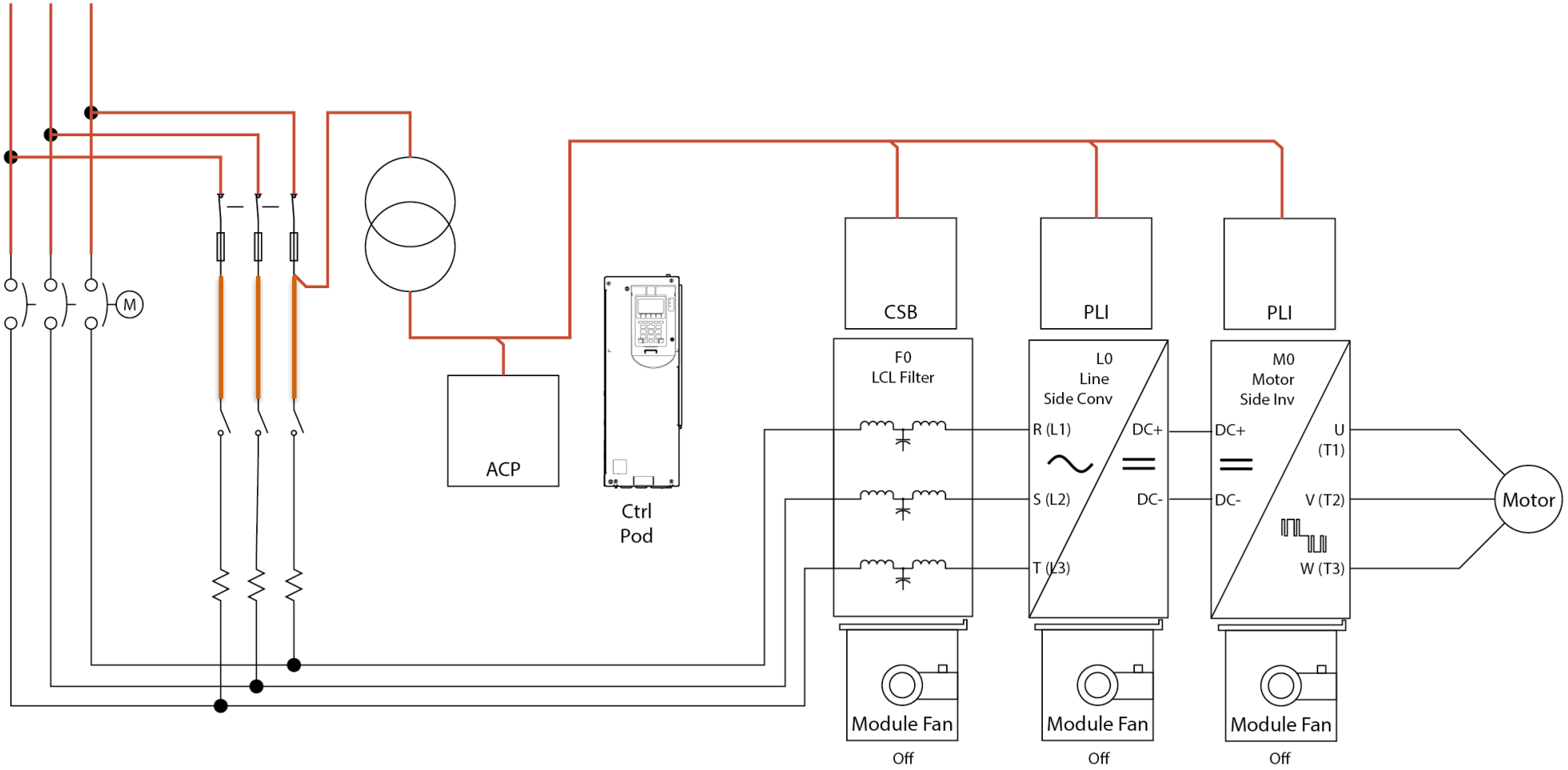
Disconnecting from AC Source

How Product Energizes (Step 0)



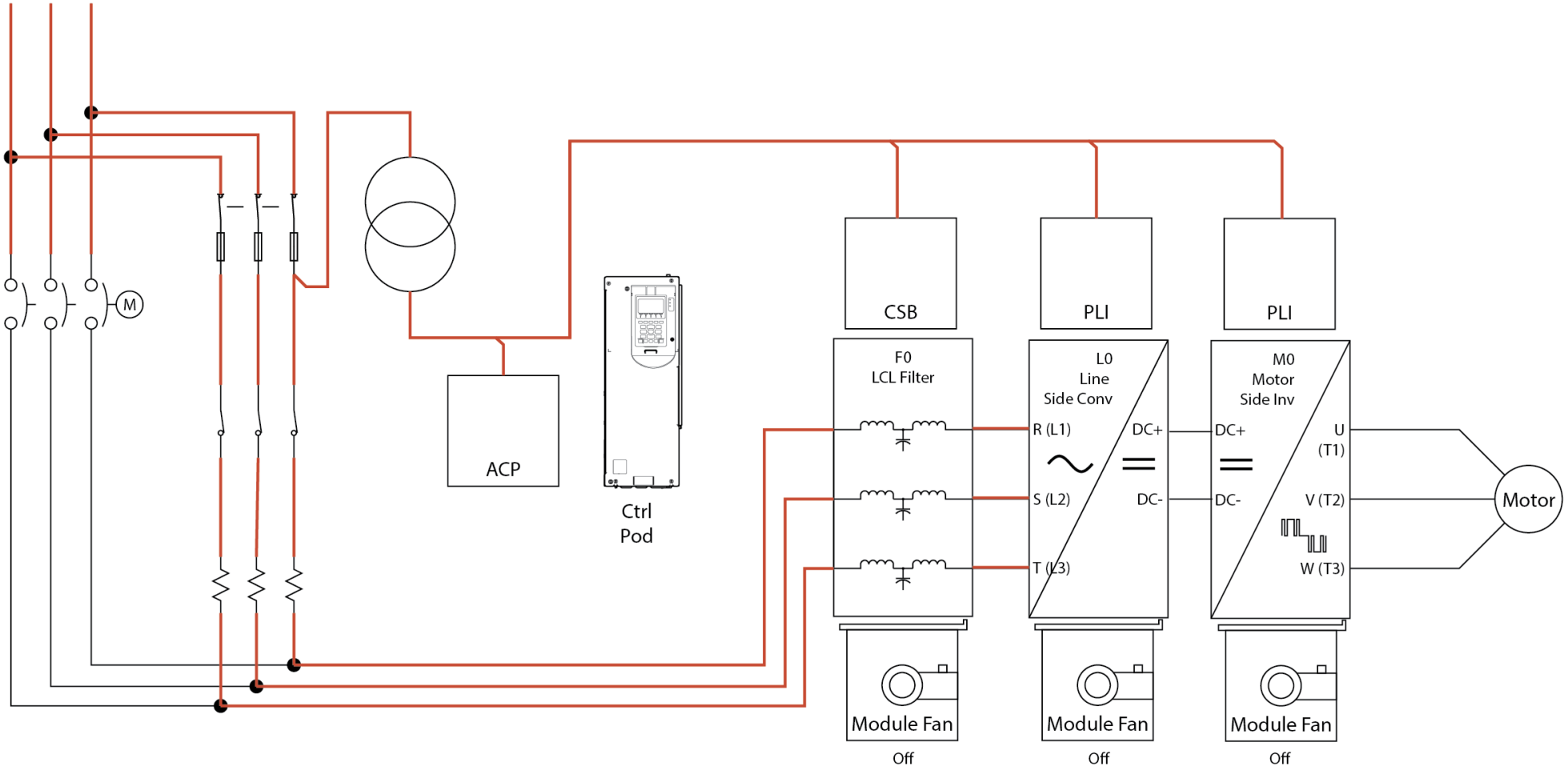
Disconnecting from AC Source

How Product Energizes (Step 1)



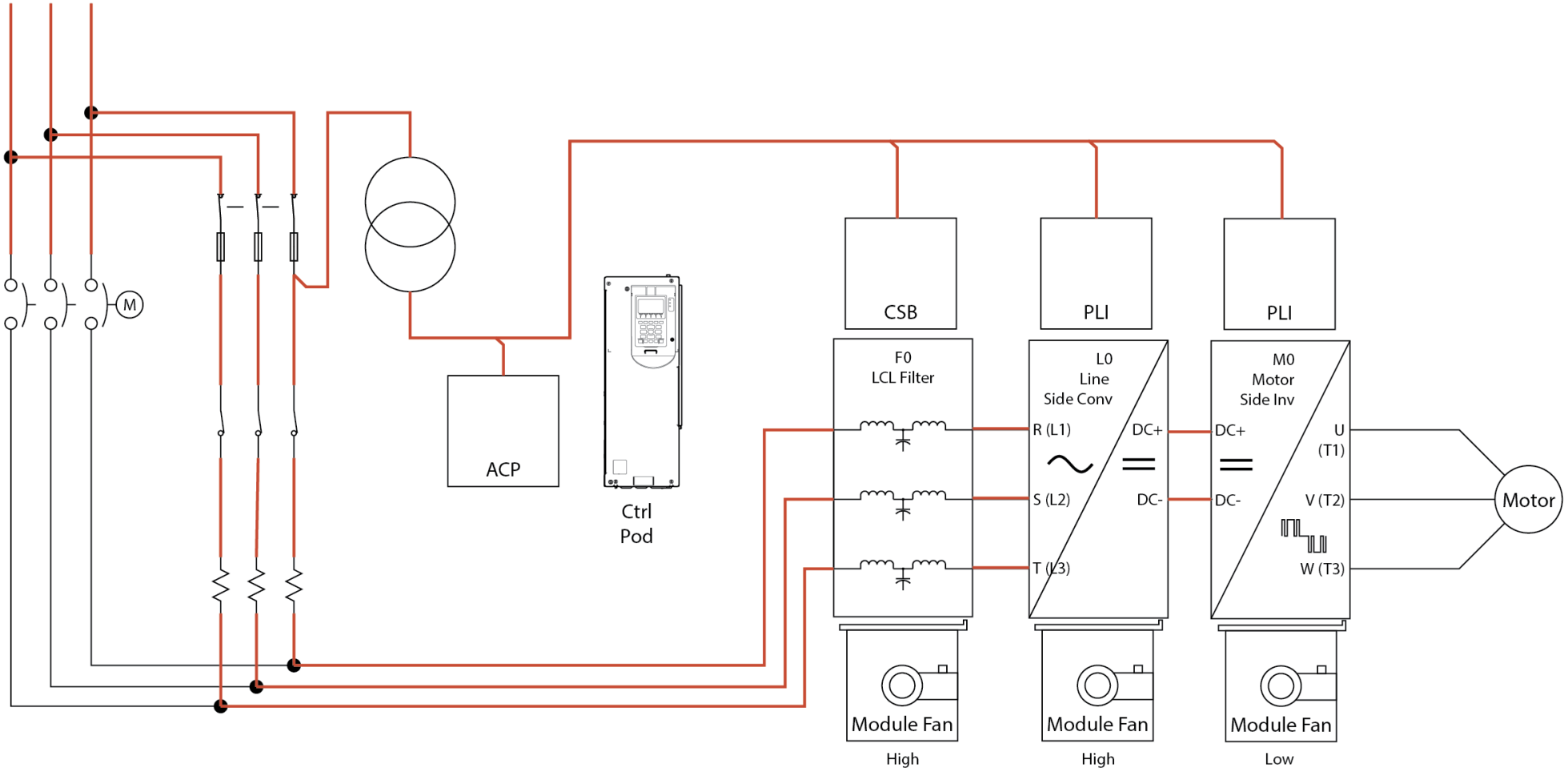
Disconnecting from AC Source

How Product Energizes (Step 2)



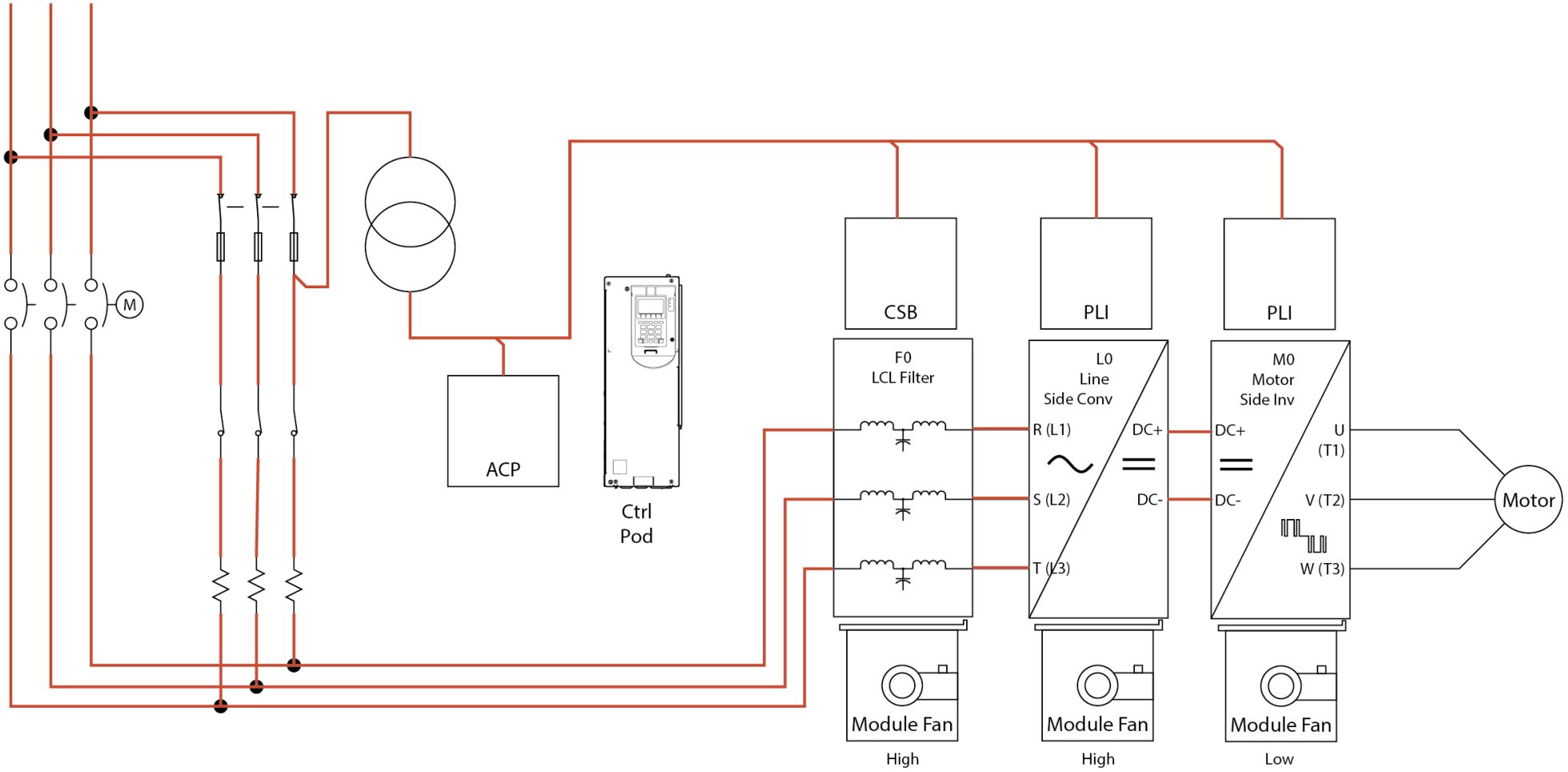
Disconnecting from AC Source

How Product Energizes (Step 3)



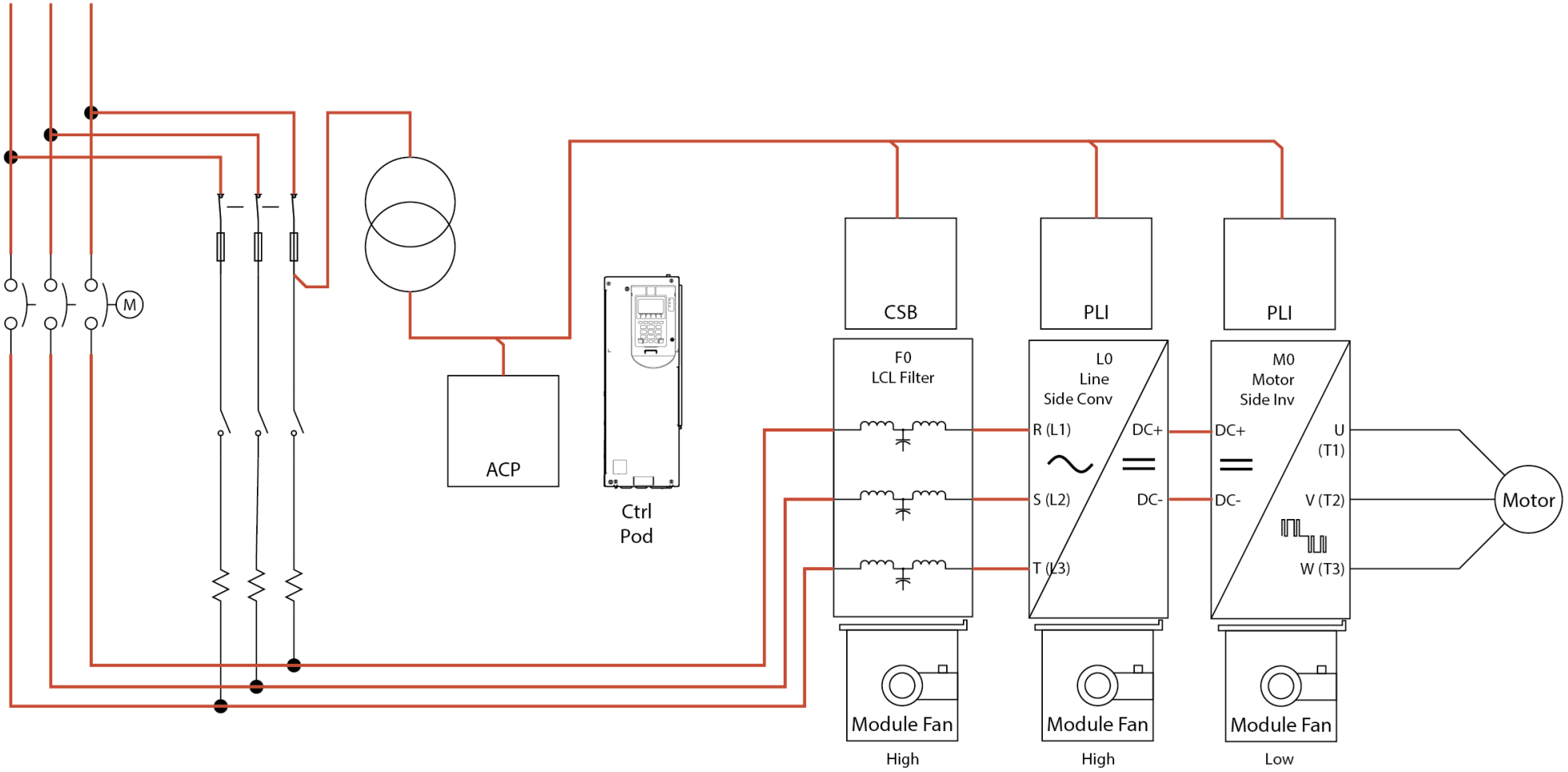
Disconnecting from AC Source

How Product Energizes (Step 4)



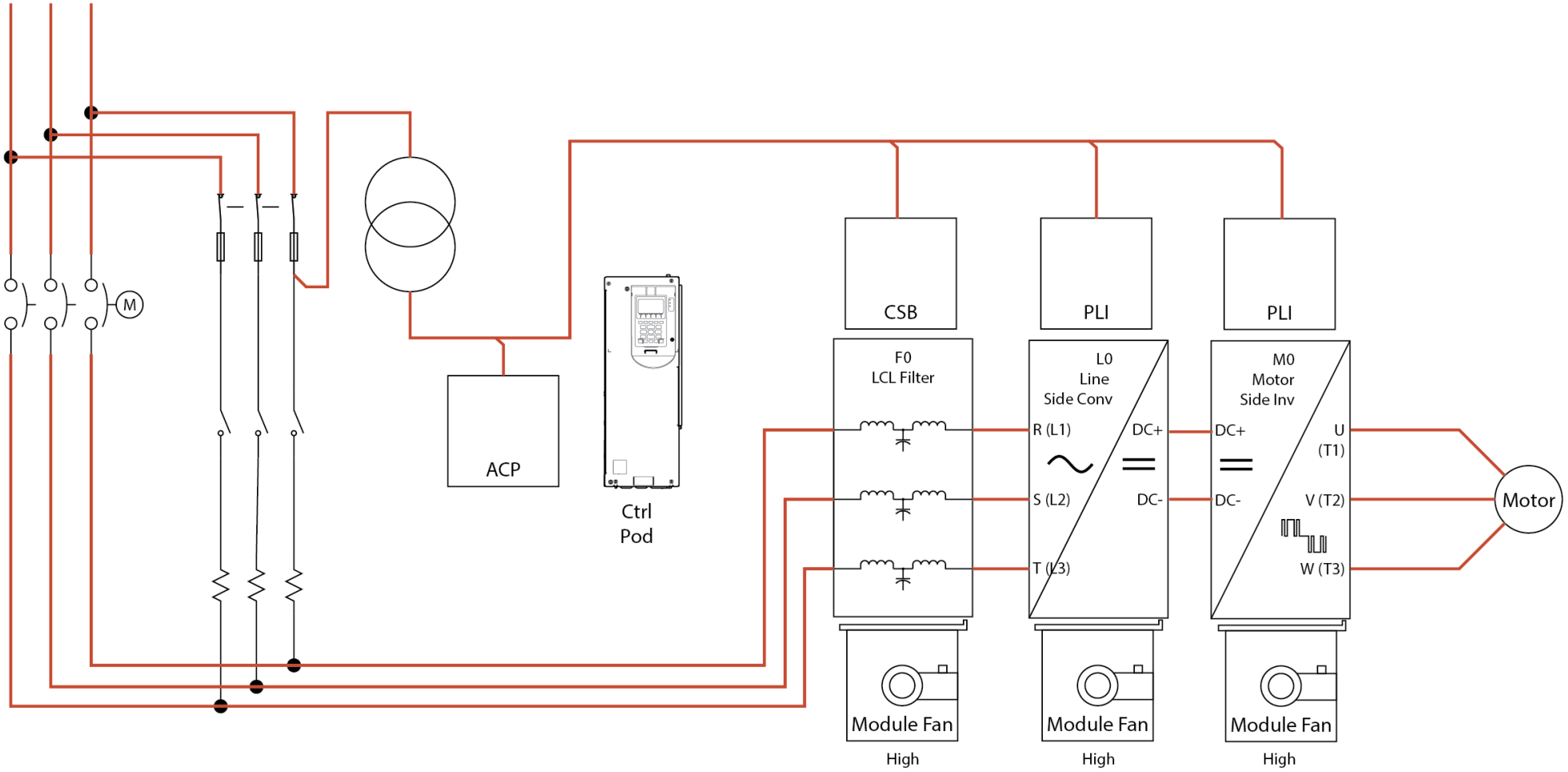
Disconnecting from AC Source

How Product Energizes (Step 5)



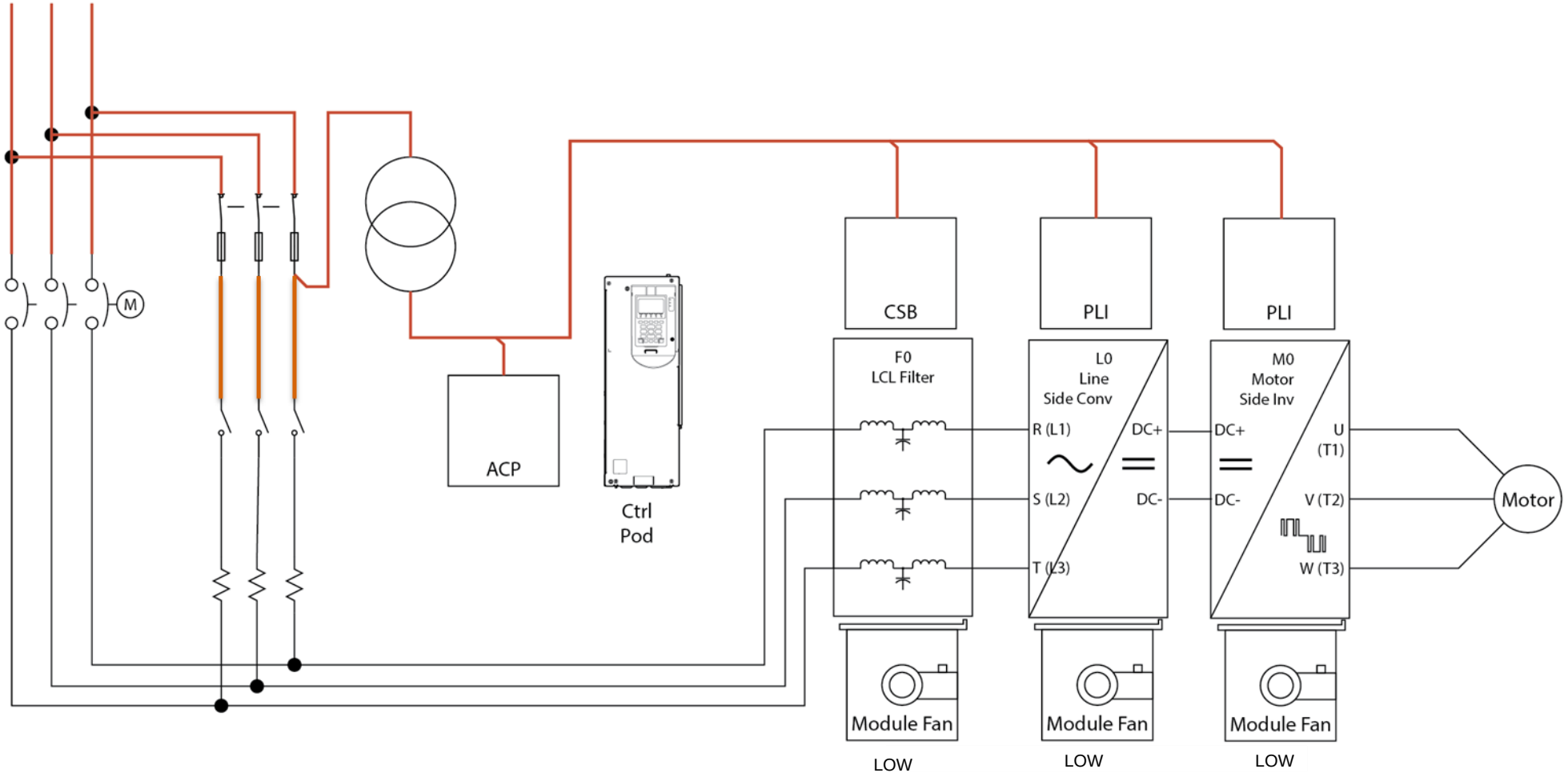
Disconnecting from AC Source

How Product Energizes (Running)



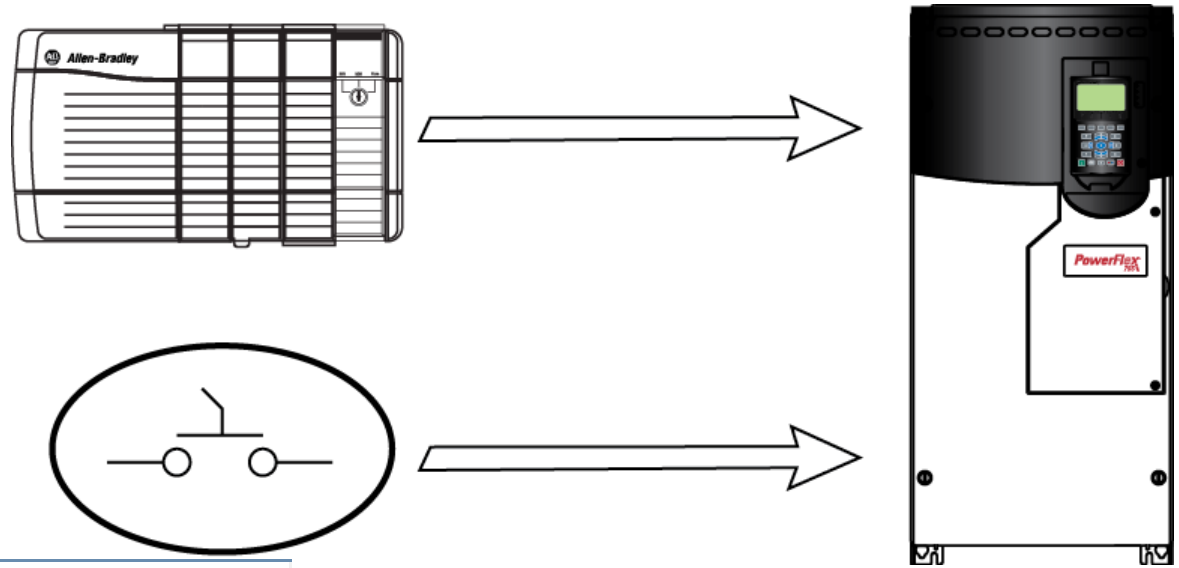
Disconnecting from AC Source

Executing Energy Pause



Command from Network or Digital Input

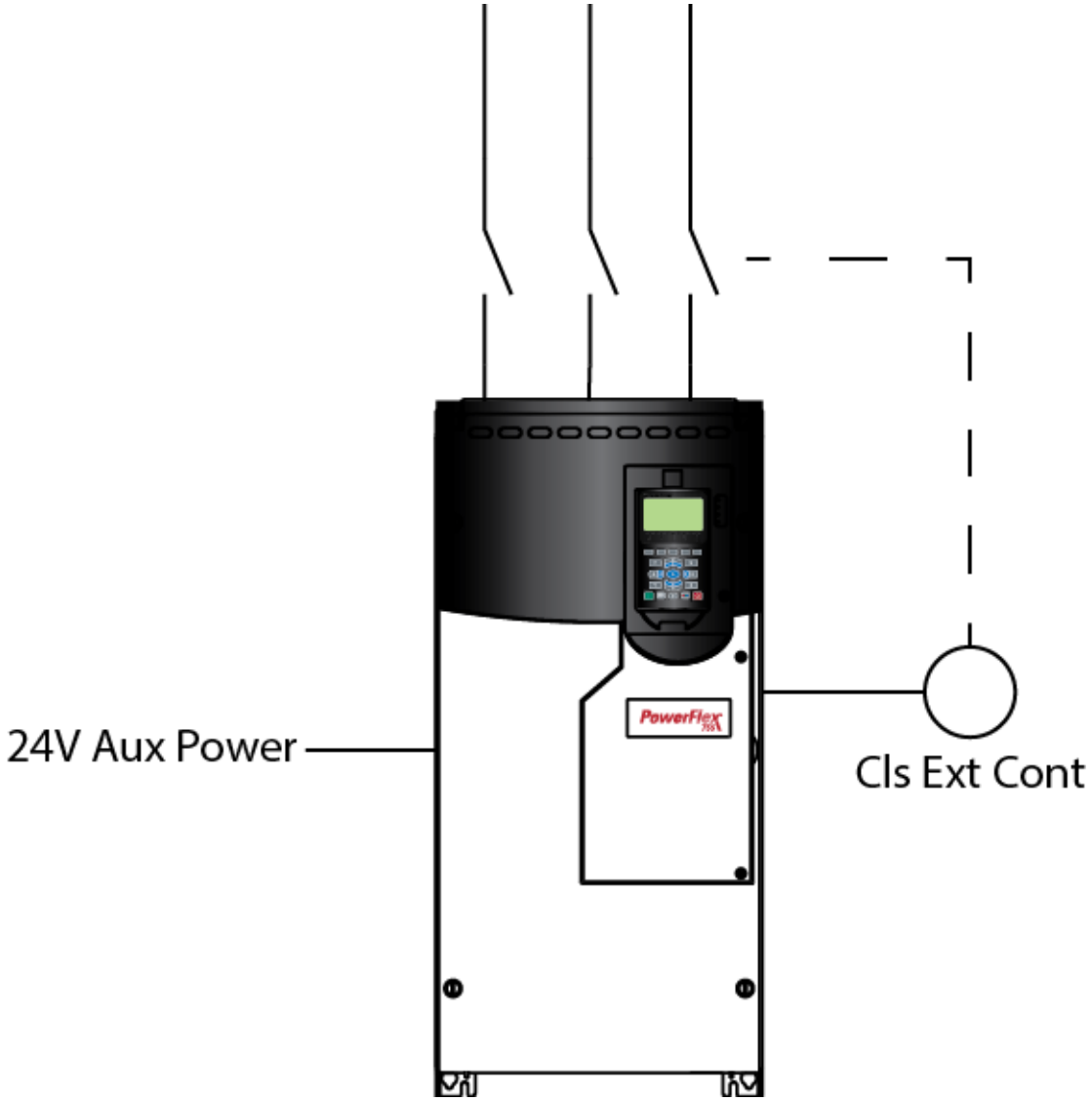
- Logic Command
  - Bit 21 ‘Energy Pause’
    - Set for Energy Pause command
    - Clear for Energy Resume command
- Parameter 0:135 [DI Energy Pause]
  - Close (energize) the signal to command an Energy Pause
  - Open (de-energize) to command an Energy Resume



Port	#	Name	Value
0	135	DI Energy Pause	Port 4: Dig In Sts.Ir

Control for External Contactor
(for future small drives)

- Parameter 0:59 [Energy Status]
  - Bit 16 'Cls Ext Cont'
  - Connect to a digital output that controls a pilot coil for an external contactor that disconnects the drive from the AC source



LISTEN. THINK. SOLVE.®

Firmware FRN 14.002

PowerFlex® 750 Drives

Rockwell Automation

Firmware Version 14.002

PowerFlex® 750-Series Drives

New Features

- Unfiltered Feedbacks
- Home to Torque
- Auto Clear Fault
- Emergency Override

PowerFlex 753 and PowerFlex 755 Drives

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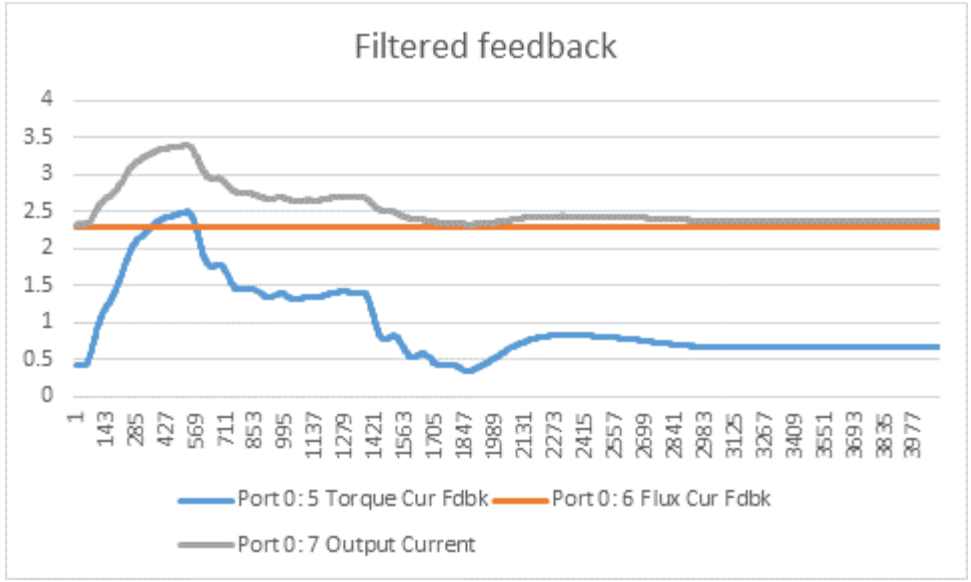
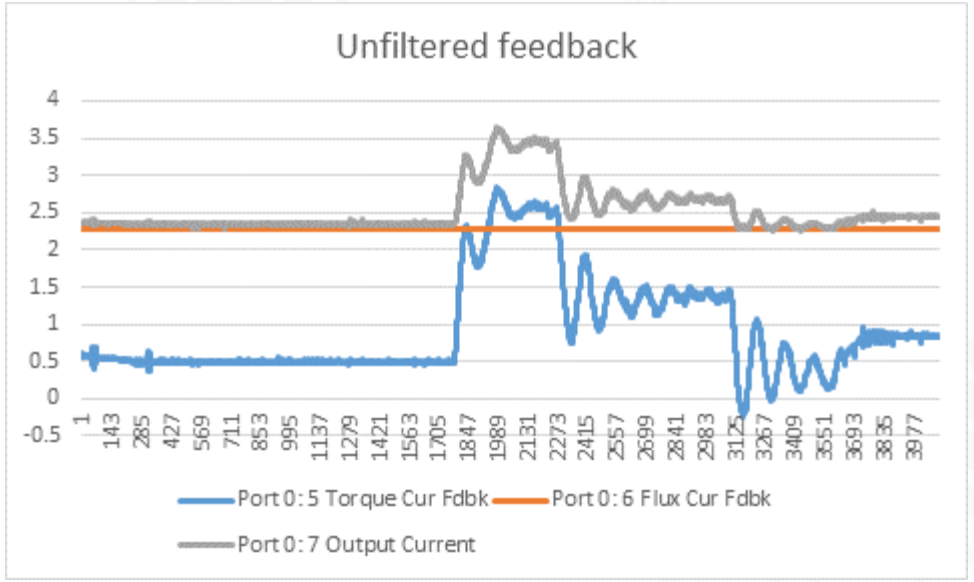
PowerFlex 750-Series Drives Firmware Version 14.002

Unfiltered Feedbacks (Drive Data)

Unfiltered feedbacks added for key motor data





This functionality adds additional application flexibility and troubleshooting functionality

PowerFlex 750-Series Drives Firmware Version 14.002

Unfiltered Feedbacks (Drive Data)

303	**Fdbk Filter Cfg** Feedback Filter Configuration	RW	16-bit Integer

Configures the filtering on the following parameters. With the bit off the current filtering is used. With the bit on the unfiltered feedback will be used for the parameter.

Options	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	UnFltFlxCurr	UnFltTrqCurr	UnFltOutCurr	UnFltDcBus V
Default	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

0 = Condition False
1 = Condition True

Bit 0 - UnFltDcBus V
Bit 1 - UnFltOutCurr
Bit 2 - UnFltTrqCurr
Bit 3 - UnFltFlxCurr

PowerFlex 750-Series Drives Firmware Version 14.002

Home to Torque – New Feature

Provides Homing Function Using a Torque Reference

- Similar to homing with a limit switch or homing at a hard stop
- With or without an encoder
- Positioning applications for all type of industries

Home to Torque can eliminate the need for a limit switch and reduces electrical wiring

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PowerFlex 750-Series Drives Firmware Version 14.002

Home to Torque – New Feature

Activation – bit 8 in P731 Homing Control

739	**Home Trq Thresh** Home Torque Threshold Sets the minimum torque level needed to detect the hard stop during a Home to Torque sequence. The drive's output torque must exceed the specified Home Torque Threshold for the specified Home Torque Time. The units for Home Torque Threshold are expressed as a percentage of the operative Torque Limit, which during the homing sequence is set to the Home Torque Limit of the controller.	Units: Default: Min/Max:	% 15.00 0.00 / 100.00
740	**Home Trq Time** Home Torque Time Sets the minimum amount of time needed for the drive's output torque to exceed the specified Home Torque Threshold to detect the hard stop during a Home to Torque sequence. Zero will disable the home to torque sequence.	Units: Default: Min/Max:	Secs 1.0 0.0 / 10.0

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PowerFlex 750-Series Drives Firmware Version 14.002

Auto Clear Faults – New Feature

The Ability to Automatically Clear Faults is added

Existing Feature

Auto Restart

Drive in active mode, automatically performs a fault reset followed by a start attempt without intervention

New Feature in V14

Auto Clear Faults

Drive in inactive mode, automatically performs fault reset and get ready to restart

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PowerFlex 750-Series Drives Firmware Version 14.002

Auto Resettable Faults - Auto Restart vs Auto Clear

- Table 1 lists the resettable faults for Auto Restart feature
- Table 1 and Table 2 list the resettable faults for the new Auto Clear feature

Table 1

MCB, Auto Restart/Clear Faults	
2	Auxiliary Input
3	Power Loss
4	UnderVoltage
5	OverVoltage
7	Motor Overload
8	Heatsink OvrTemp
9	Trnsistr OvrTemp
12	HW OverCurrent
13	Ground Fault
25	OverSpeed Limit
35	IPM OverCurrent
36	SW OverCurrent
61	Shear Pin 1
62	Shear Pin 2
64	Drive OverLoad
138	Precharge Open

Table 2

IO Option Cards, Clear Faults	
1	Analog In Loss
2	Motor PTC Trip
Inverter, Clear Faults	
110	Ix Bus Overvolt
111	Ix Ground Fault
112	Ix IGBT OvrTemp
113	Ix HS OvrTemp
120	Ix PLI OvrTemp
121	Ix PSBrd OvrTemp
Converter, Clear Faults	
111	Cx SCR OvrTemp
112	Cx HS OvrTemp
115	Cx Line Dip
135	Cx Ground Fault
138	Cx Brd OvrTemp
160	Cx Command Stop
162	Cx Line Loss

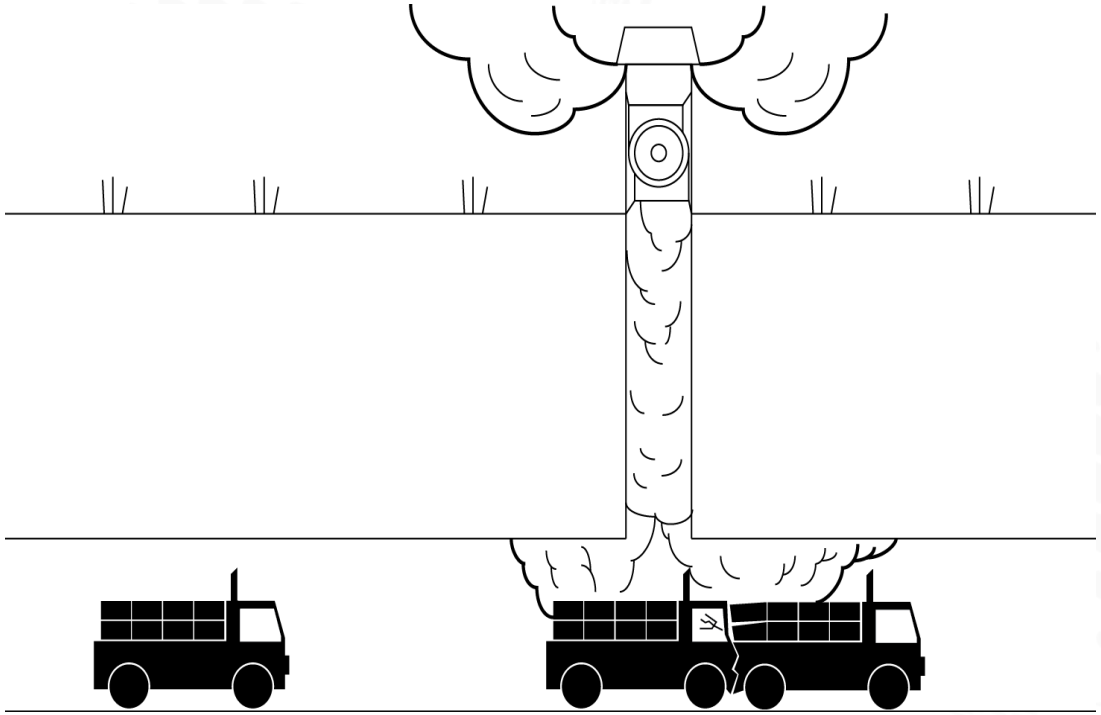
PowerFlex 750-Series Drives Firmware Version 14.002

Emergency Override

Override of Faults Functionality for PowerFlex 750-Series Drives

Examples of customer use case:

- Applications have emergency modes
- Consequences for stoppage
- Customer does not want drive to stop, even for faults



Customer will forego warranty to use Emergency Override

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20-750-S4 Integrated Safety

PowerFlex® 750/755T Drives

Rockwell Automation

20-750-S4 Integrated Safety Functions Option Module

Overview of Safety Offerings

PowerFlex® 755 and 755T Drives offer a variety of safety options to meet the needs of your application

20-750-S

Safe Torque Off

Hardwired

20-750-S1

Safe Speed Monitor

Hardwired

20-750-S3

Integrated Safety-STO

Hardwired and Networked

- I/O mode in V13.002
- I/O mode and NEW CIP mode in V14.002

NEW 20-750-S4

Integrated safety functions option

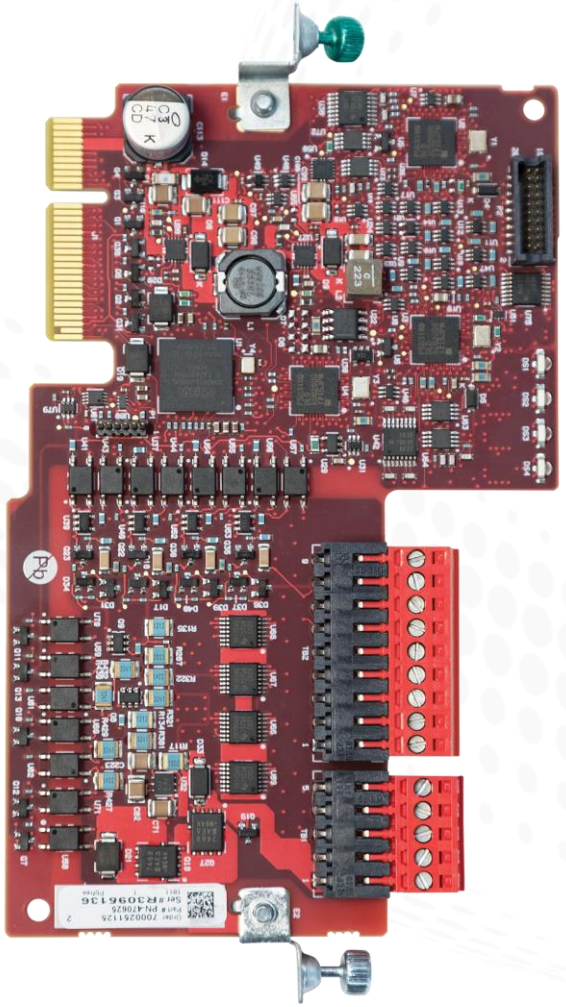
ETH/IP only

- I/O mode and CIP mode in V14.002

- S3 and S4 option modules are not compatible with PowerFlex 753 drives
- S3 or S4 module must be installed in port 6 on PowerFlex 755 drives for CIP motion. CIP motion is not available on PowerFlex 755T drives at initial release

20-750-S4 Integrated Safety Functions Option Module

Benefits



Benefits of controller-based safety

- A single GuardLogix® controller for both safety and standard control
- Single software environment – Studio 5000 Logix Designer® platform
- Visibility to all machine events enables a quick response to allow the machine to return to full production
- Safety and standard control operate via a single EtherNet/IP network
- Helps simplify your machine design and minimize equipment redundancies
- Fewer components mean smaller panel enclosures, which help reduce machine footprint
- Safety option card can be added to a PowerFlex 755 or 755T drive at any time

20-750-S4 Integrated Safety Functions Option Module

Characteristics

Key elements of the integrated safety functions option module

- Designed for the PowerFlex 755 and 755T AC drives
- Safety instructions are based on IEC 61800-5-2
  - STO – Safe Torque Off
  - SSI – Safe Stop 1
  - SBC – Safe Brake Control
  - SLC – Safely-limited Speed
  - SDI Safe Direction
  - SLP Safely-Limited Position
  - SS2 Safe Stop 2
  - SOS Safe Operational Stop
- Use as part of an integrated safety system that includes a **GuardLogix® 5580ES controller** or **Compact GuardLogix 5380ES** controller for safety ratings up to and including SIL CL3 and PLe Cat 4
- Both VFD and servo drive solutions are applied in the same way for a simplified, common user experience.
  - PowerFlex 755 and PowerFlex 755T AC drives with integrated safety functions option module
  - Kinetix® 5700 servo drive with integrated safety

EUROPEAN STANDARD **EN 61800-5-2**
NORME EUROPÉENNE
EUROPÄISCHE NORM October 2007

ICS 29.200; 13.110

English version

Adjustable speed electrical power drive systems - Part 5-2: Safety requirements - Functional
(IEC 61800-5-2:2007)

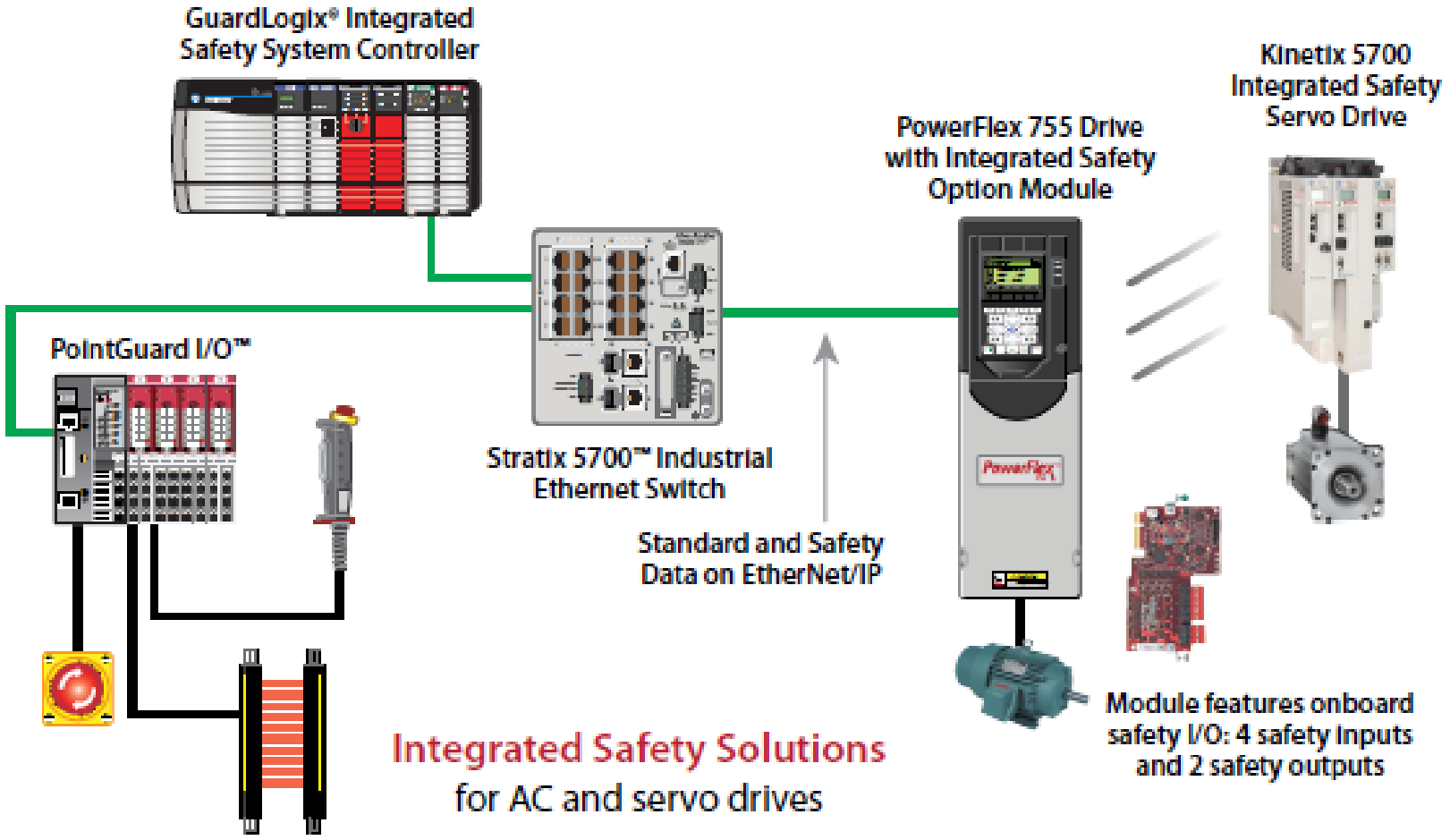
Entraînements électriques de puissance à vitesse variable - Partie 5-2: Exigences de sécurité - Fonctionnalité (CEI 61800-5-2:2007)

Elektrische Leistungsantriebssysteme mit einstellbarer Drehzahl - Teil 5-2: Anforderungen an die Sicherheit - Funktionale Sicherheit (IEC 61800-5-2:2007)

20-750-S4 Integrated Safety Functions Option Module

Functionality

Safety Application Example



20-750-S4 Integrated Safety Functions Option Module

Functionality

Description	Integrated Safety Functions Option Module
SIL rating	**SIL CL3, PLe Cat 4**
Ethernet port on card	**No** – communication crosses backplane through embedded Ethernet port on drive
Use with DLR	**Yes** – 20-750-ENETR dual-port EtherNet/IP option module in Tap mode
Mode	PowerFlex 755 Standard I/O and Integrated CIP Motion modes available at initial release PowerFlex 755T Standard I/O mode only at initial release (CIP Motion Operation TBD)
Ports	Module to be installed in ports **4, 5 and 6** of the PowerFlex 755 and 755T for IO mode Module to be installed in port 6 only for CIP motion mode
Safety Function Execution	Safety Task running in safety controller
Reaction Time	Varies depending on RPI and Safety Task time (typically <100 ms)

20-750-S4 Integrated Safety Functions Option Module

Functionality

Onboard Safety I/O	**(4) Safety inputs** and **(2) Safety outputs** for general-purpose safety use Safety outputs are also used for SBC
Drive compatibility	PowerFlex **755**, **755TL, 755TR, 755TM** Drives (not compatible with PowerFlex 753)
Firmware compatibility	PowerFlex 755 firmware **v14.002 (or later)** PowerFlex 755T firmware **v4.001 (or later)**
AOP compatibility	For PowerFlex 755, AOP version **5.03 (or later)** For PowerFlex 755T, AOP **version 5.04 (or later)**
Studio 5000® compatibility	Studio 5000® version **V31 (or later)**
Controller compatibility	Compact GuardLogix **5380 or GuardLogix 5580 safety controllers only**
Connected Component Workbench (CCW) Software compatibility	**Studio 5000 Logix Designer only** – no additional software required. CCW can monitor only
ADC	**Yes** - configures S4 drive-side (Host) configuration for safe stopping actions

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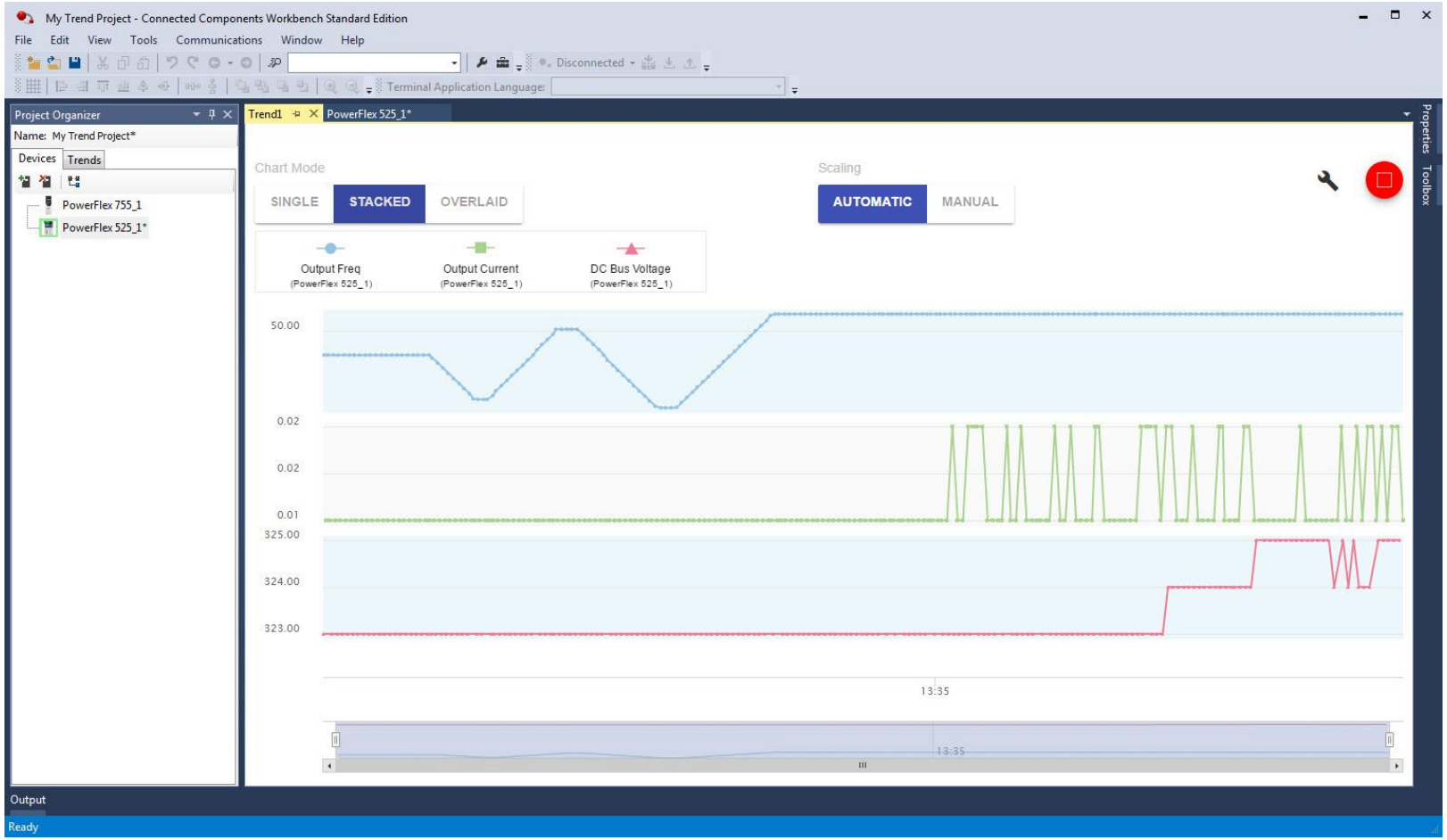
CCW Trending

PowerFlex® General

Rockwell Automation

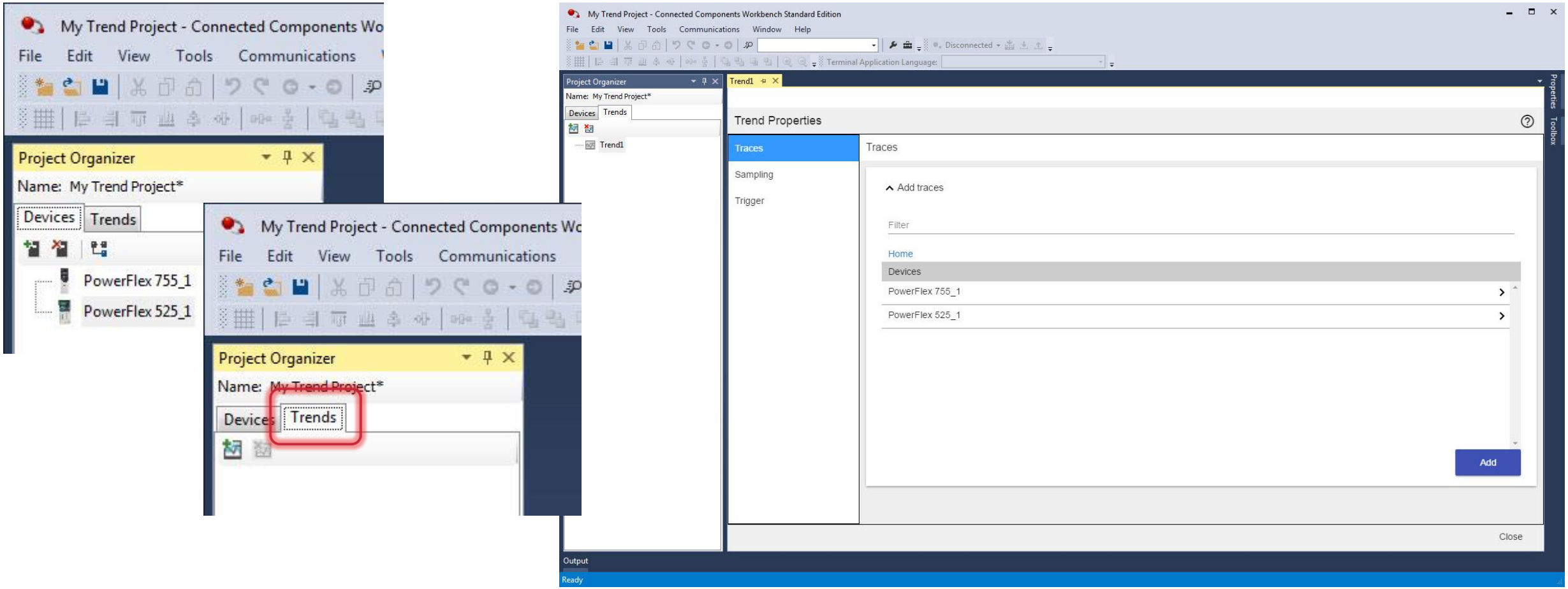
CCW Trending

- Separate update to CCW R11 (required), similar to what was done for the initial PF755T release
- Initial support is for drives and other power products that support DSI or DPI
- Standard with R12 release (~April'19)
- Available in Standard (free) version



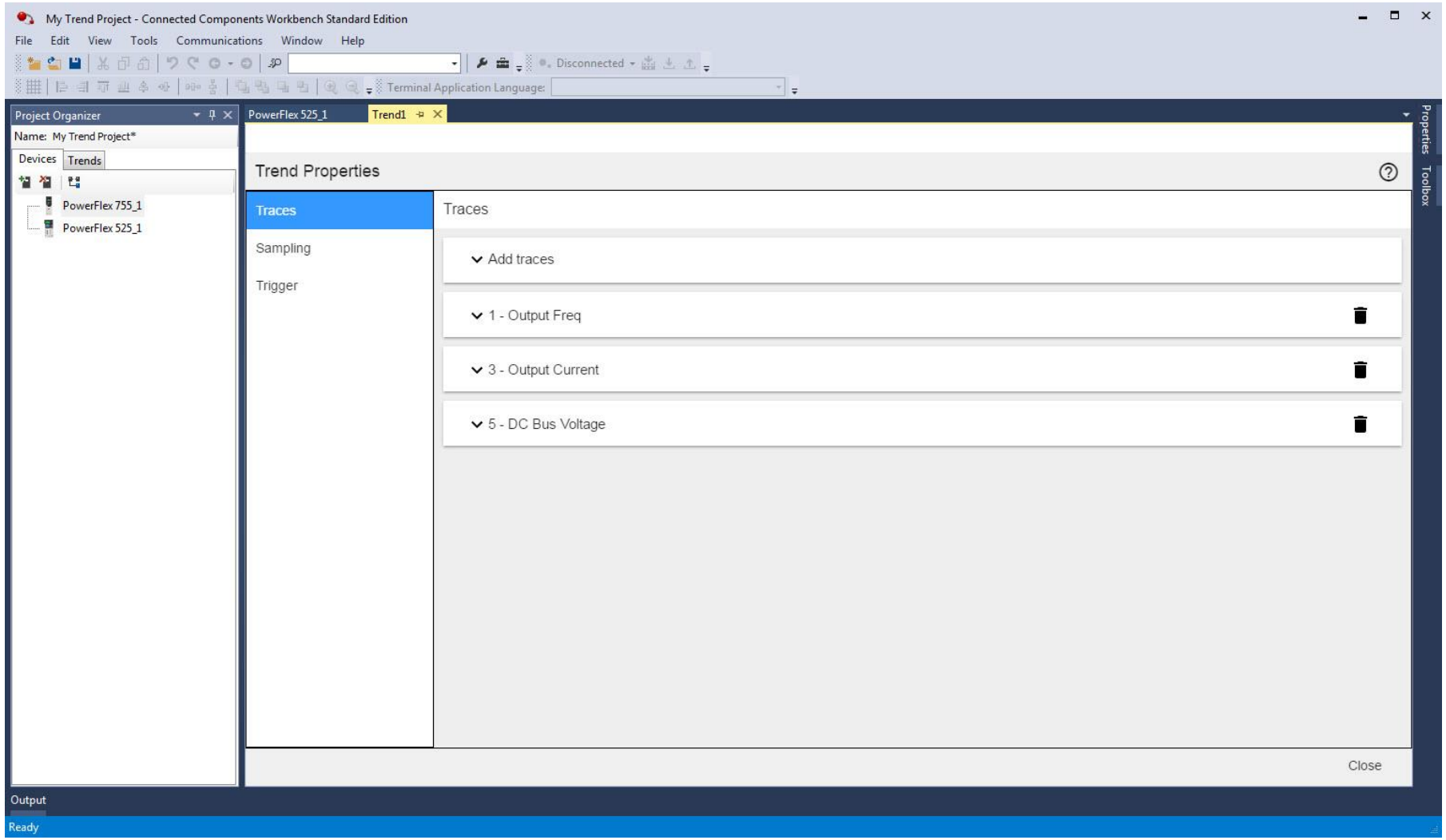
CCW Trending

- Adding a new trend & traces



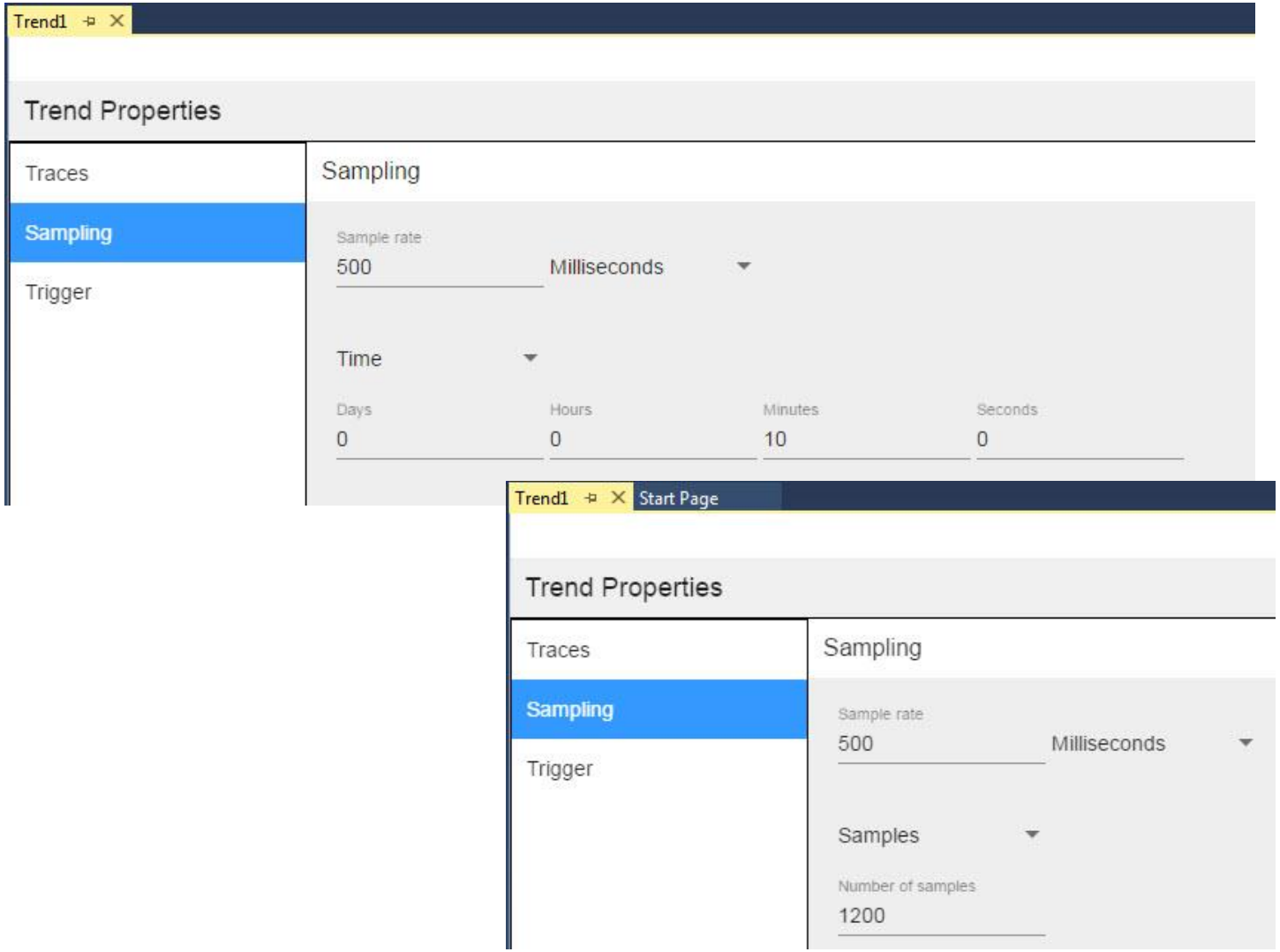
CCW Trending

- Traces
  - Targeting to trend up to 32 data points and display up to 16 at one time



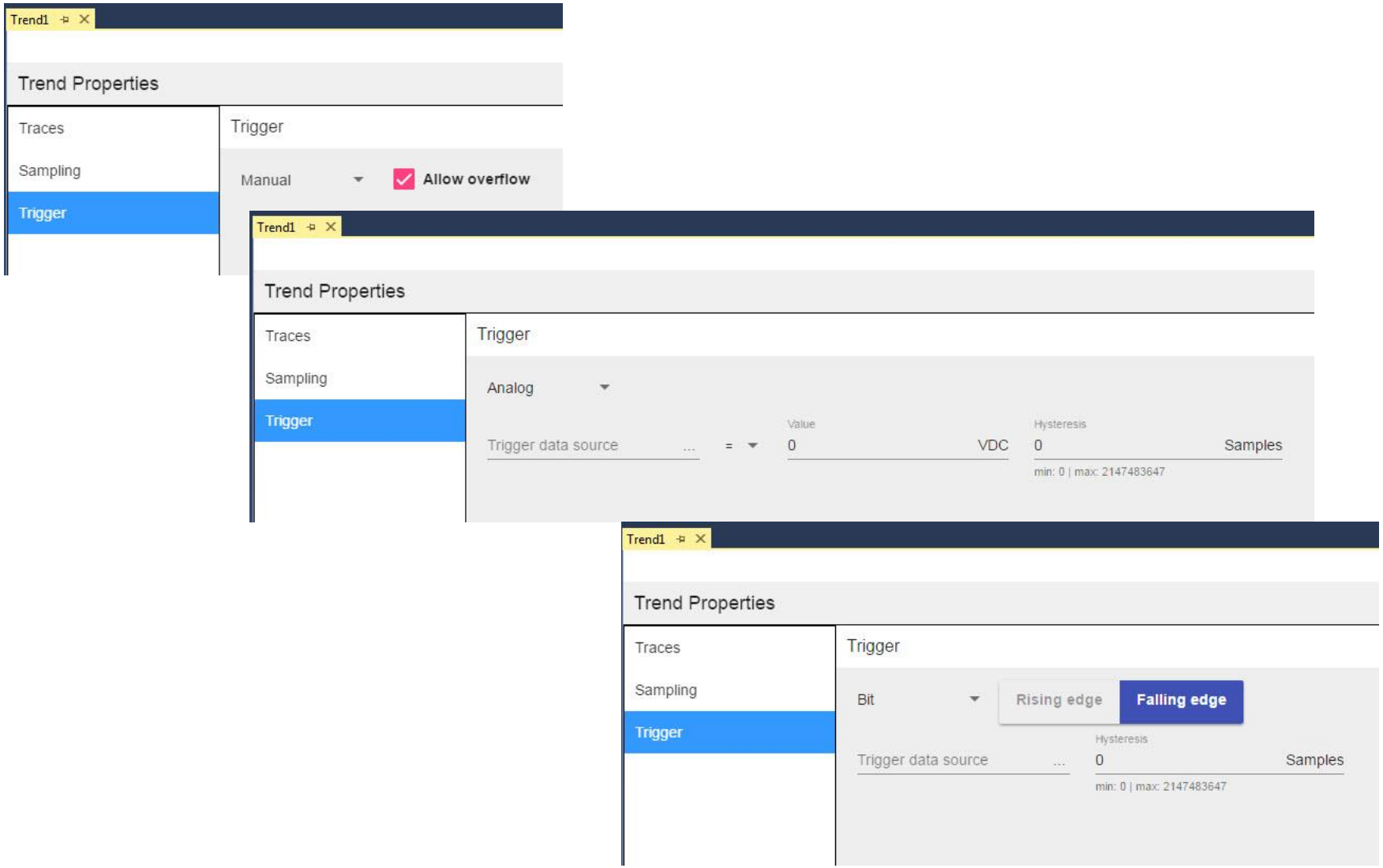
CCW Trending

- Sampling
  - Time or Sample based
  - FTLinx communications so performance similar to DriveExecutive



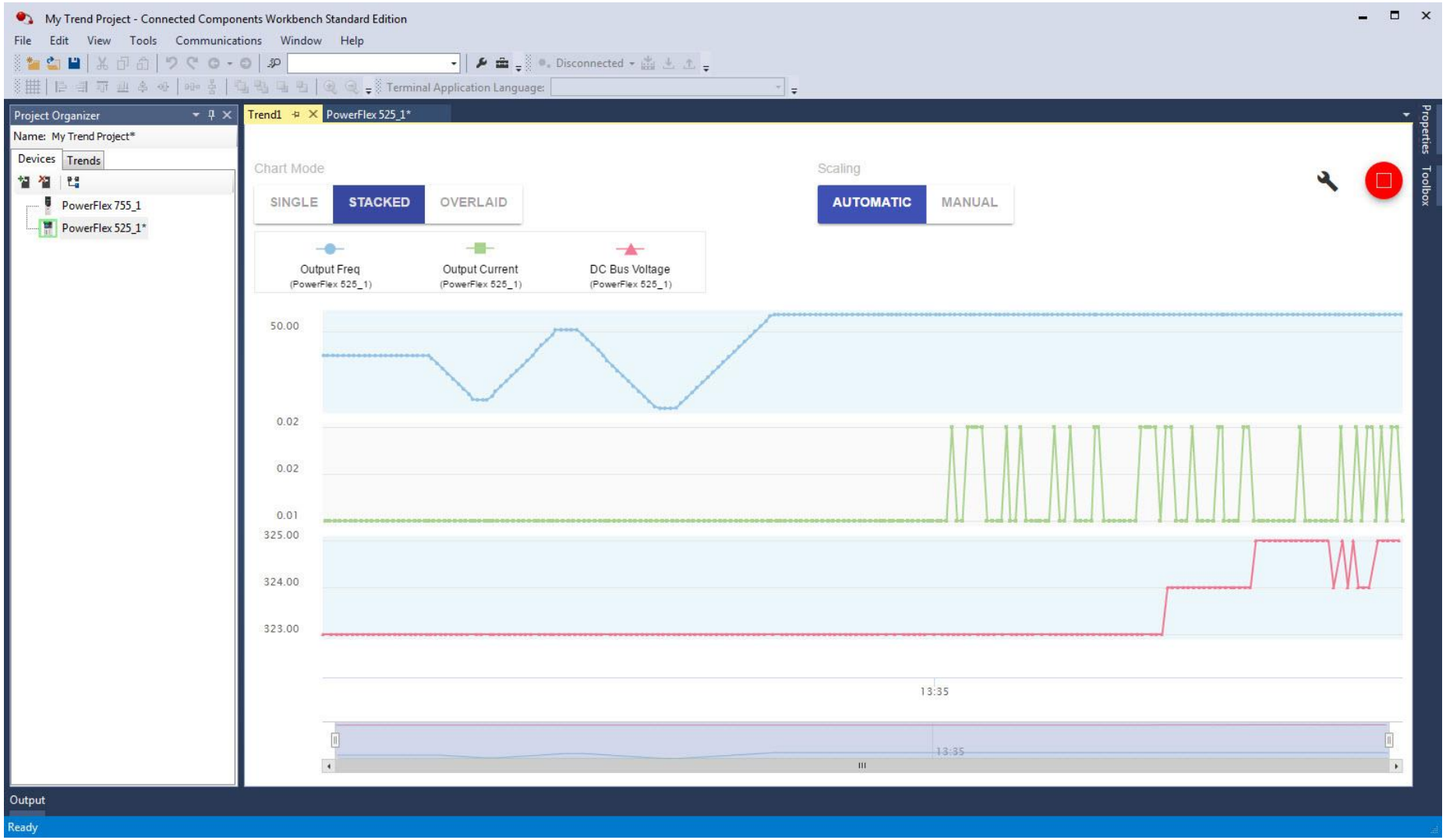
CCW Trending

- Triggers
  - Manual
  - Analog
  - Bit
- Pre / Post Sampling



CCW Trending

- Display



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PowerFlex 520

Rockwell Automation

Compact Market Product Positioning

Three Product Lines

Connected Components → **Mid-Range Offering**

Value ↑ / **Performance / Functionality** →

PowerFlex 527
- Integrated Motion
- 30 Hp
- Communication: Embedded Dual Port Ethernet/IP
- Safety: Embedded Safe Torque Off SIL3/PIe for both hardwired and Integrated Network Safety
- Motor control Option: V/Hz, SVC, Closed Loop Velocity Vector, Permanent Magnet Motor*
- Incremental Encoder Option
- Removable terminal blocks
- Programmed via integrated motion instructions

PowerFlex 525
- 30 Hp
- Standard USB connectivity
- Comms: Embedded DSI + Single port EtherNet/IP
- Comms Options: Dual port EtherNet/IP with DLR, DeviceNet, Profibus
- Safety: Embedded Safe Torque Off SIL2/PLd
- Motor Control options: V/Hz, SVC, Economizer SVC, Closed Loop Velocity Vector, Permanent Magnet Motor
- Incremental Encoder Option
- AppView & CustomView Application Configuration
- CCW Programming Software

PowerFlex 523
- 30 Hp
- Standard USB connectivity
- Comms: Embedded DSI
- Comm Options: DeviceNet, Dual port EtherNet/IP with DLR, Profibus
- Motor Control options: V/Hz, SVC, Economizer SVC
- AppView & CustomView Application Configuration
- CCW Programming Software

PowerFlex 520 Series: Common Attributes

Innovative Design		Simplified Configuration	
• Modularity design • Common Power Module	• Smallest clearance requirement • Zero-stack • Extreme ambient temperatures	• Simplified programming • QuickView HIM	• Seamless integration into Logix with add-on profiles for Studio 5000

PowerFlex 520-Series AC Drives

- The **next generation** of Allen-Bradley PowerFlex compact drives
- Provides **ultimate flexibility** for stand alone to integrated applications
- **Features are unmatched** in the market place today with a **wide range** of motor control and many standard features
- Installation flexibility and simplified configuration
- Designed to help customers
  - **save money**
  - **maximize system performance**
  - **reduce time to design**
  - **deliver machines**

- Power range: 0.4…22 kW / (0.5…30 HP)
- Voltage range from 100 to 600V

PowerFlex 520-Series AC Drives

The Next Generation of Powerful Performance. Flexible Control.

COMPACT EASY TO USE INNOVATIVE DESIGN

PowerFlex 523

PowerFlex 525

PowerFlex 527

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Thank you

Contact me via LinkedIn! – **Petr Drahota**