FLEXI PRO Servo Drive

Quick Start Guide

120/240 VAC and 400/480 VAC

Revision 8.1

Firmware Version 1.41.2
DOC-FLEXI PRO-QSG-EN

SEE IT BEFORE IT HAPPENS

MOTOR POWER COMPANY

Revision History

Document Revision	Date	Remarks
8.1	May 2016	Added info and diagrams for EB models. Minor revisions and corrections.
8.0	May 2016	Firmware 1.41.2
7.2	Mar.2015	Firmware 1.15.24
7.1/a/b/c	Jan.2015	Updates and corrections.
7.0	Dec.2014	Firmware 1.15.xx
5.7	Jan.2014	Firmware 1.4.5

Firmware Revision	Software (GUI) Revision
1.41.2	1.41.2

Note: If an earlier firmware revision is installed in your FLEXI PRO drive, contact your Account Manager or Technical Support.

Copyright Notice

Disclaimer

This product documentation was accurate and reliable at the time of its release. Motor Power Company s.r.l. reserves the right to change the specifications of the product described in this manual without notice at any time.

Trademarks

All marks in this manual are the property of their respective owners.

Contact Information

Motor Power Company s.r.l.
Via Leonardo Da Vinci , 4
42024 Castelnovo Sotto
Reggio Emilia - Italia

Tel: +39 0522 682710
Fax: +39 0522 683552

Website: www.motorpowerco.com

Technical Support

If you need assistance with the installation and configuration of the FLEXI PRO drive, contact Motor Power Company Technical Support: info@motorpowerco.it

Contents

1 Introduction

FLEXI PRO Models

The various models in the FLEXI PRO servo drive series are differentiated by means of the communication methods and protocols they use. The following table presents the different models and their distinguishing characteristics.

FLEXI PRO Models - Communication and Protocols

FLEXI PRO Model	Physical Layer	Communication Protocol	Program Language
FLEXI PRO Power Block (PB)*	PWM signals	PWM signals	PMAC (Delta Tau)
FLEXI PRO (AP) Standard FLEXI PRO model.	**Serial** (RS232)	**ASCII** commands	VarCom
	Analog	±10V	
	Pulse Train	AB signals	
FLEXI PRO CAN (AF) A CAN drive, which uses **CANopen** protocol. Referred to as FLEXI PRO CANopen drive.	Serial (USB|RS232)	ASCII commands	VarCom
	Analog	±10V	
	Pulse Train	AB signals	
	CAN	Communication: **CANopen** CANopen – all 1000h objects Manufacturer-Specific: CANopen – all 2000h objects Standard Servo-Drive (Motion): CANopen – all 6000h objects	VarCom CANopen
FLEXI PRO EtherCAT (EC) An EtherCAT drive, which uses **CANopen over EtherCAT (CoE)** protocol.	Serial (USB|RS232)	ASCII commands	VarCom
	Analog	±10V	
	Pulse Train	AB signals	
	Ethernet	Communication: **EtherCAT** Manufacturer-Specific: CANopen – all 2000h objects Standard Servo-Drive (Motion): CANopen – all 6000h objects	VarCom CANopen
FLEXI PRO EtherCAT (EB) An EtherCAT drive, which uses **CANopen over EtherCAT (CoE)** protocol	Serial (USB)	ASCII commands	VarCom
	Analog	±10V	
	Ethernet	Communication: **EtherCAT** Manufacturer-Specific: CANopen – all 2000h objects Standard Servo-Drive (Motion): CANopen – all 6000h objects	VarCom CANopen

***** *Not included in this Quick Start Guide. Refer to the FLEXI PRO User Manual.*

Safety

Only qualified persons may perform the installation procedures. You do not need to be an expert in motion control to install and operate the drive system. However, you must have a basic understanding of electronics, computers, mechanics, and safety practices.

The FLEXI PRO utilizes hazardous voltages.
Be sure the drive is properly grounded.

When connecting the FLEXI PRO to other control equipment, be sure to follow two basic guidelines to prevent damage to the drive:

- The FLEXI PRO must be grounded via the earth ground of the main AC voltage supply.
- Any motion controller, PLC or PC that is connected to the FLEXI PRO must be grounded to the same earth ground as the FLEXI PRO.

Before you install the FLEXI PRO, review the safety instructions in the product documentation. Failure to follow the safety instructions may result in personal injury or equipment damage.

FLEXI PRO Installation Procedure

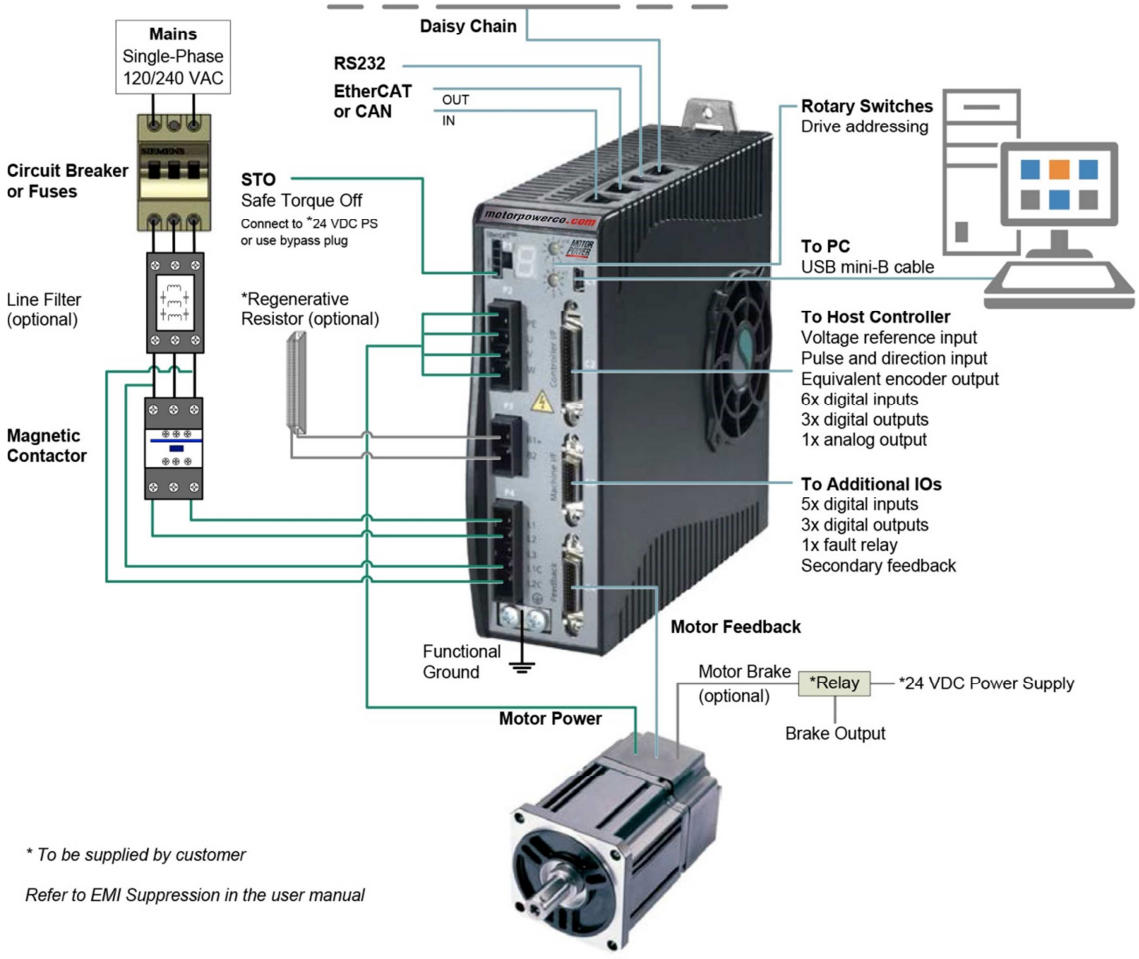
Perform the following steps to install and setup a FLEXI PRO system.

1. Mount the FLEXI PRO.
2. Make all electrical connections:
   - Controller I/Os and/or Machine I/Os
   - Motor feedback
   - Fieldbus devices, if required
   - Safe torque off (STO), or bypass using jumpers
   - Motor
   - Regeneration resistor, if required
   - Motor brake, if required
   - AC input voltage
3. Set the drive address using the rotary switches.
4. Connect the drive to the host computer.
5. Power up the drive and the computer.
6. Install Flexi SUITE software.
7. Using Flexi SUITE, configure and test the drive.

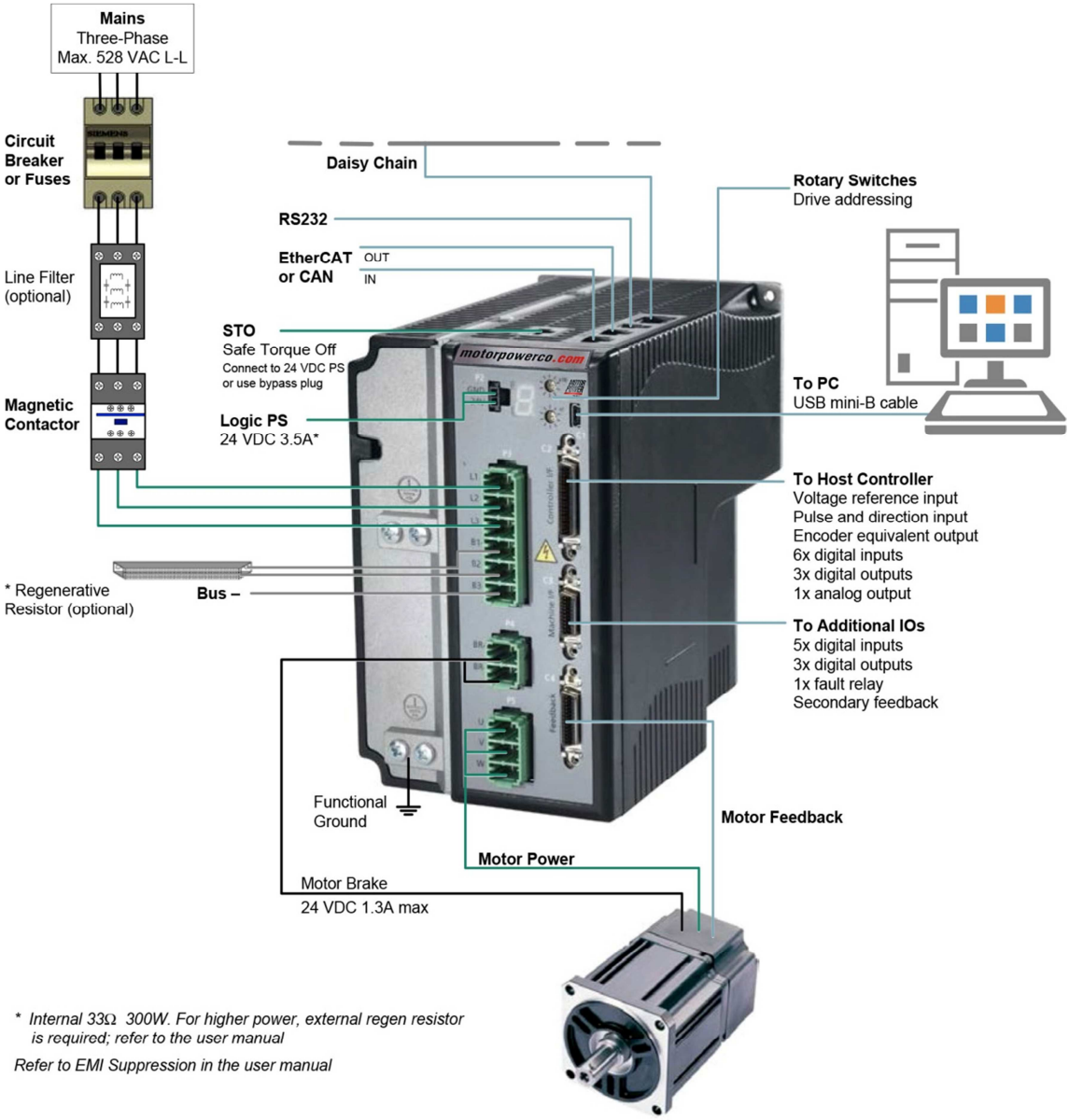
2 Wiring

FLEXI PRO System Wiring

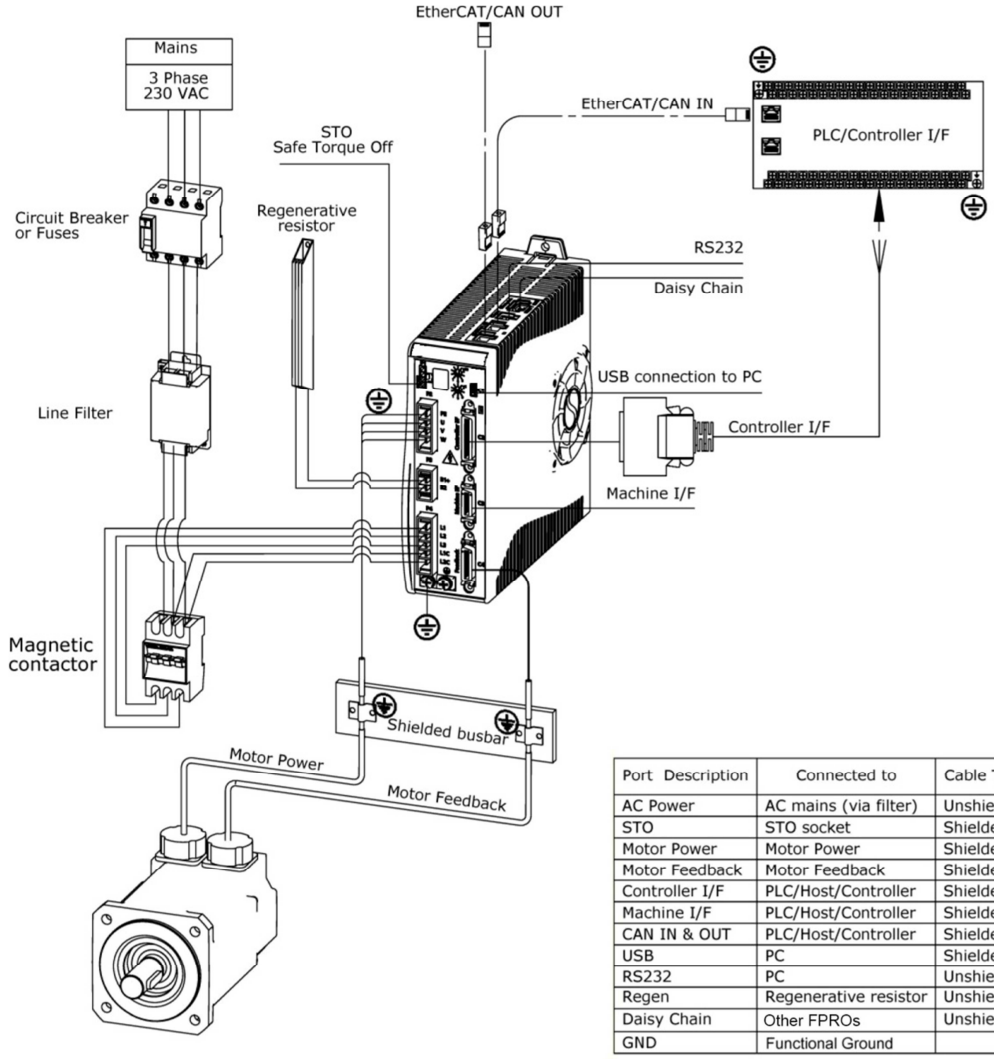
Example of Servo System Wiring, (120/240 VAC) 1-Phase



Example of Servo System Wiring, (400/480 VAC) 3-Phase

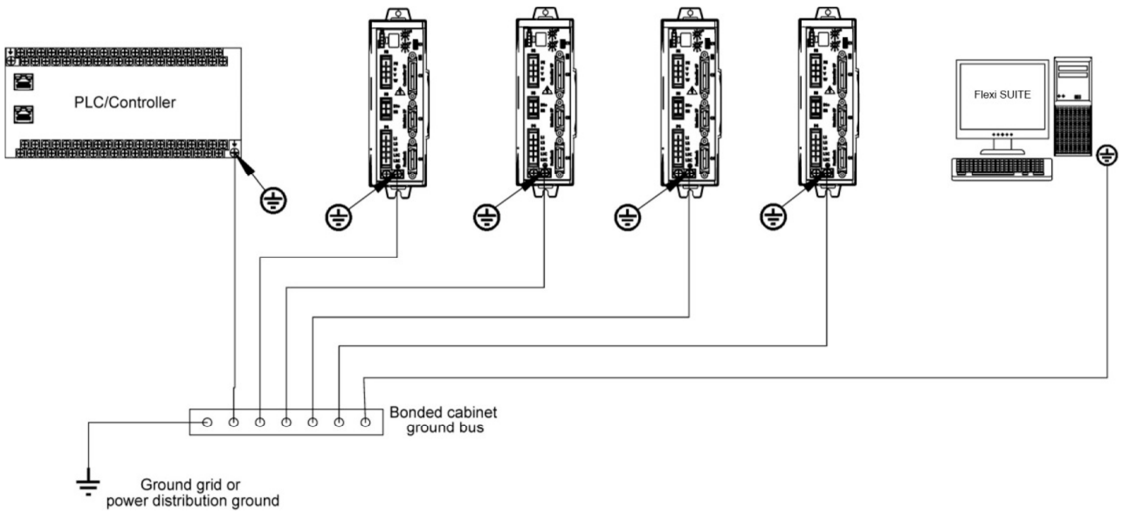


FLEXI PRO Shielding and Bonding



Port Description	Connected to	Cable Type
AC Power	AC mains (via filter)	Unshielded
STO	STO socket	Shielded
Motor Power	Motor Power	Shielded
Motor Feedback	Motor Feedback	Shielded
Controller I/F	PLC/Host/Controller	Shielded
Machine I/F	PLC/Host/Controller	Shielded
CAN IN & OUT	PLC/Host/Controller	Shielded
USB	PC	Shielded
RS232	PC	Unshielded
Regen	Regenerative resistor	Unshielded
Daisy Chain	Other FPROs	Unshielded
GND	Functional Ground	

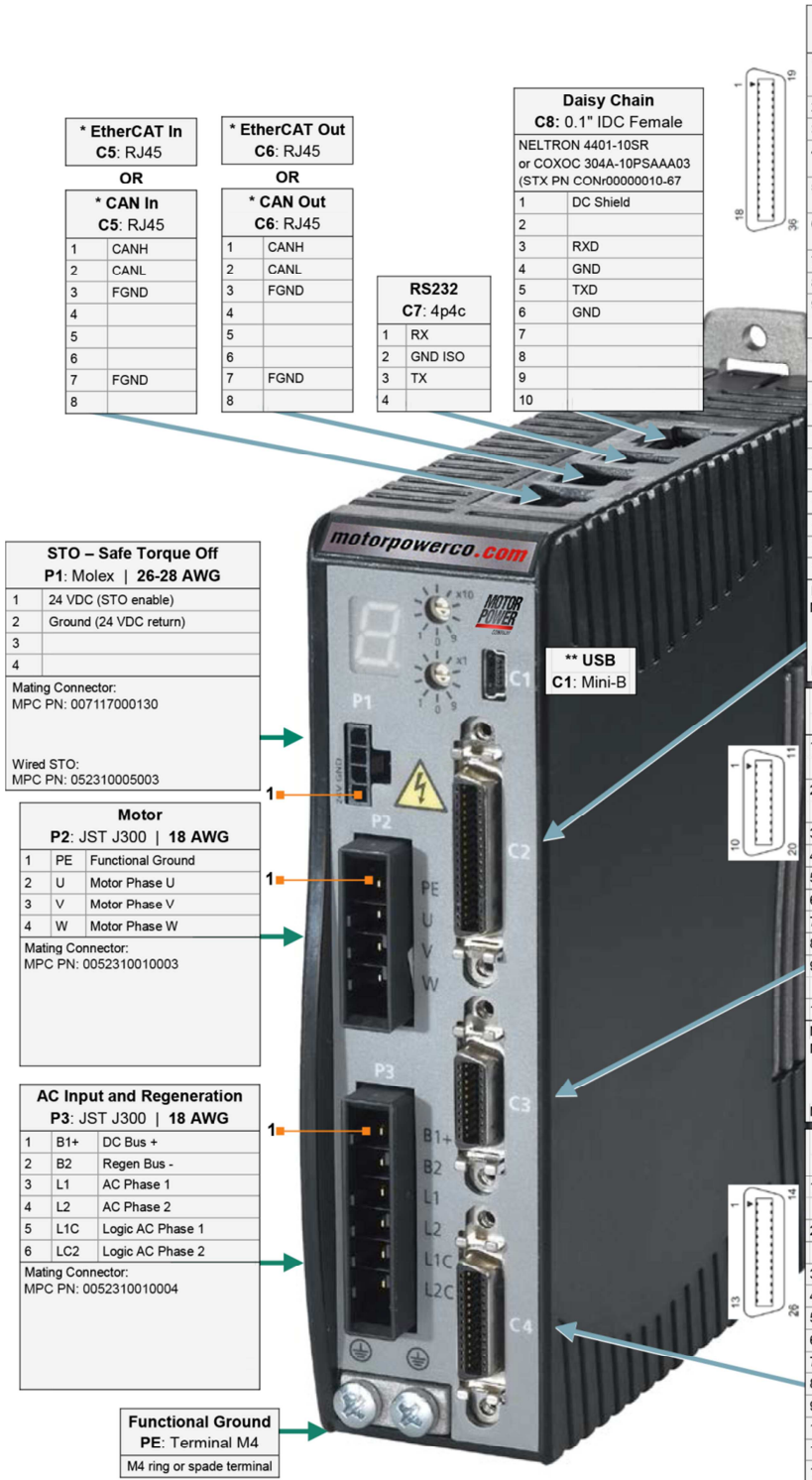
FLEXI PRO Grounding



FLEXI PRO Pin Assignments

FLEXI PRO-1D5/FLEXI PRO-003 (120/240 VAC)

Pin Assignments on FLEXI PRO-1D5/FLEXI PRO-003 – AP/AF/EC Models



*** EtherCAT In**
C5: RJ45

OR

*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45

OR

*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

**** USB**
C1: Mini-B

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

Motor
P2: JST J300 | **18 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
MPC PN: 0052310010003

AC Input and Regeneration
P3: JST J300 | **18 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -
3	L1	AC Phase 1
4	L2	AC Phase 2
5	L1C	Logic AC Phase 1
6	LC2	Logic AC Phase 2

Mating Connector:
MPC PN: 0052310010004

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
MPC PN: 052310008001

Mating Cable MPC PN: 052310005001

Feedback
C4: MDR 26 Plug | **24-28 AWG**

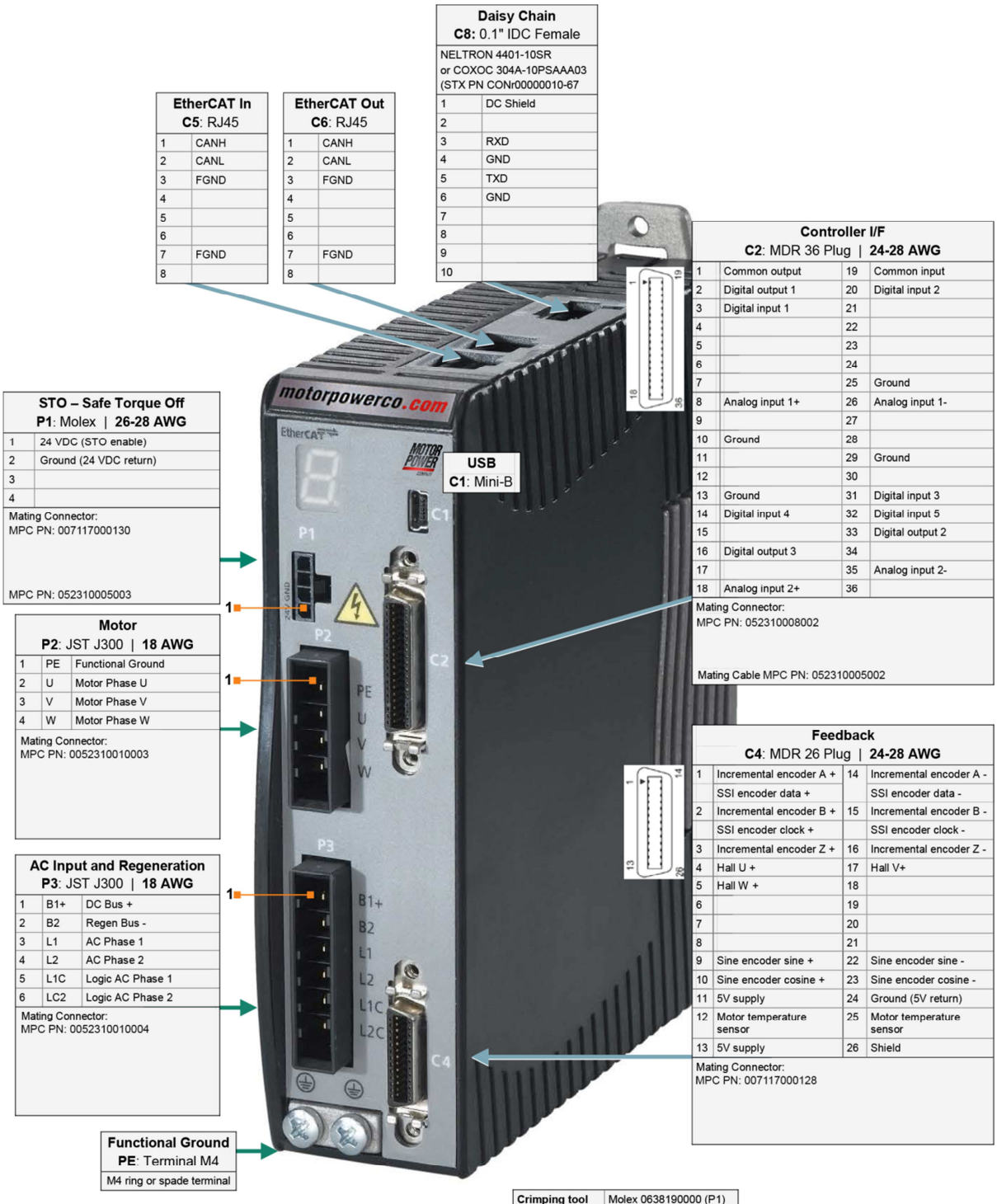
1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
MPC PN: 007117000128

*	*See ordering options*
**	*AF and EC models only*
***	*EC models only*
MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

Crimping tool	Molex 0638190000 (P1) or equivalent
Crimping tool	YRF-880 (P2, P3)
Extraction tool	EJ-JFAJ3 (P2, P3)
Key for spring connector	J-FAT-OT
4/40 insert threads on C2, C3, C4	

Pin Assignments on FLEXI PRO-1D5/FLEXI PRO-003 – EB Models



Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

EtherCAT In
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

MPC PN: 052310005003

Motor
P2: JST J300 | **18 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
MPC PN: 0052310010003

AC Input and Regeneration
P3: JST J300 | **18 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -
3	L1	AC Phase 1
4	L2	AC Phase 2
5	L1C	Logic AC Phase 1
6	LC2	Logic AC Phase 2

Mating Connector:
MPC PN: 0052310010004

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
MPC PN: 007117000128

Functional Ground
PE: Terminal M4

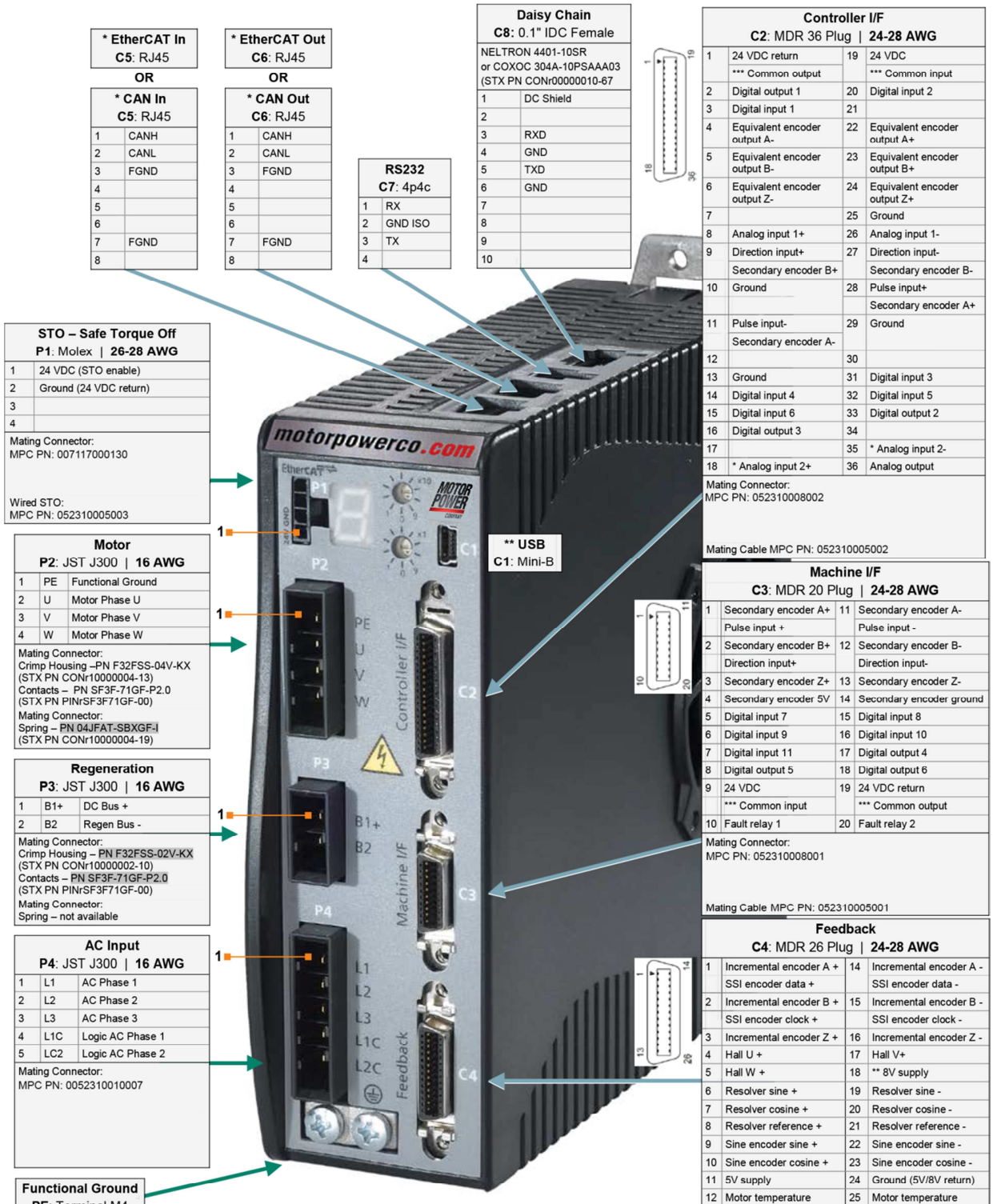
M4 ring or spade terminal

Crimping tool	Molex 0638190000 (P1) or equivalent
Crimping tool	YRF-880 (P2, P3)
Extraction tool	EJ-JFAJ3 (P2, P3)
Key for spring connector	J-FAT-OT
4/40 insert threads on C2, C4	

MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

FLEXI PRO-4D5/FLEXI PRO-006 (120/240 VAC)

Pin Assignments on FLEXI PRO-4D5/FLEXI PRO-006 – AP/AF/EC Models



*** EtherCAT In**
C5: RJ45
OR
*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45
OR
*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female
NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

**** USB**
C1: Mini-B

Motor
P2: JST J300 | **16 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
Crimp Housing –PN F32FSS-04V-KX
(STX PN CONr10000004-13)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – PN 04JFAT-SBXGF-I
(STX PN CONr10000004-19)

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
MPC PN: 052310008001

Mating Cable MPC PN: 052310005001

Regeneration
P3: JST J300 | **16 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -

Mating Connector:
Crimp Housing – PN F32FSS-02V-KX
(STX PN CONr10000002-10)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – not available

AC Input
P4: JST J300 | **16 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	L1C	Logic AC Phase 1
5	LC2	Logic AC Phase 2

Mating Connector:
MPC PN: 0052310010007

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

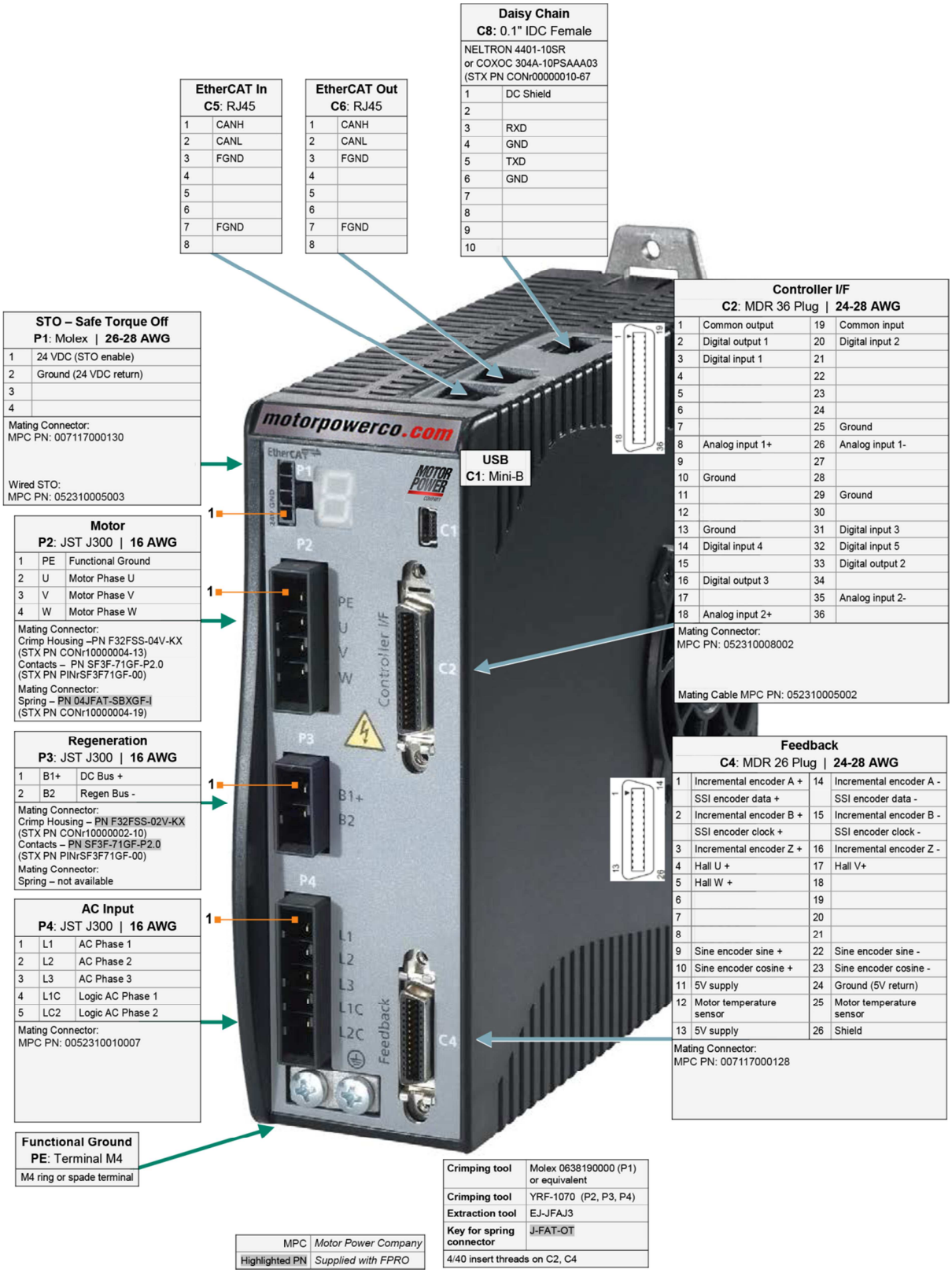
Mating Connector:
MPC PN: 007117000128

Functional Ground
PE: Terminal M4
M4 ring or spade terminal

*	*See ordering options*
**	*AF and EC models only*
***	*EC models only*
MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

Crimping tool	Molex 0638190000 (P1) or equivalent
Crimping tool	YRF-1070 (P2, P3, P4)
Extraction tool	EJ-JFAJ3
Key for spring connector	J-FAT-OT
4/40 insert threads on C2, C3, C4	

Pin Assignments on FLEXI PRO-4D5/FLEXI PRO-006 – EB Models



Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

EtherCAT In
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

USB
C1: Mini-B

Motor
P2: JST J300 | **16 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
Crimp Housing –PN F32FSS-04V-KX
(STX PN CONr10000004-13)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – PN 04JFAT-SBXGF-I
(STX PN CONr10000004-19)

Regeneration
P3: JST J300 | **16 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -

Mating Connector:
Crimp Housing – PN F32FSS-02V-KX
(STX PN CONr10000002-10)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – not available

AC Input
P4: JST J300 | **16 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	L1C	Logic AC Phase 1
5	L2C	Logic AC Phase 2

Mating Connector:
MPC PN: 0052310010007

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

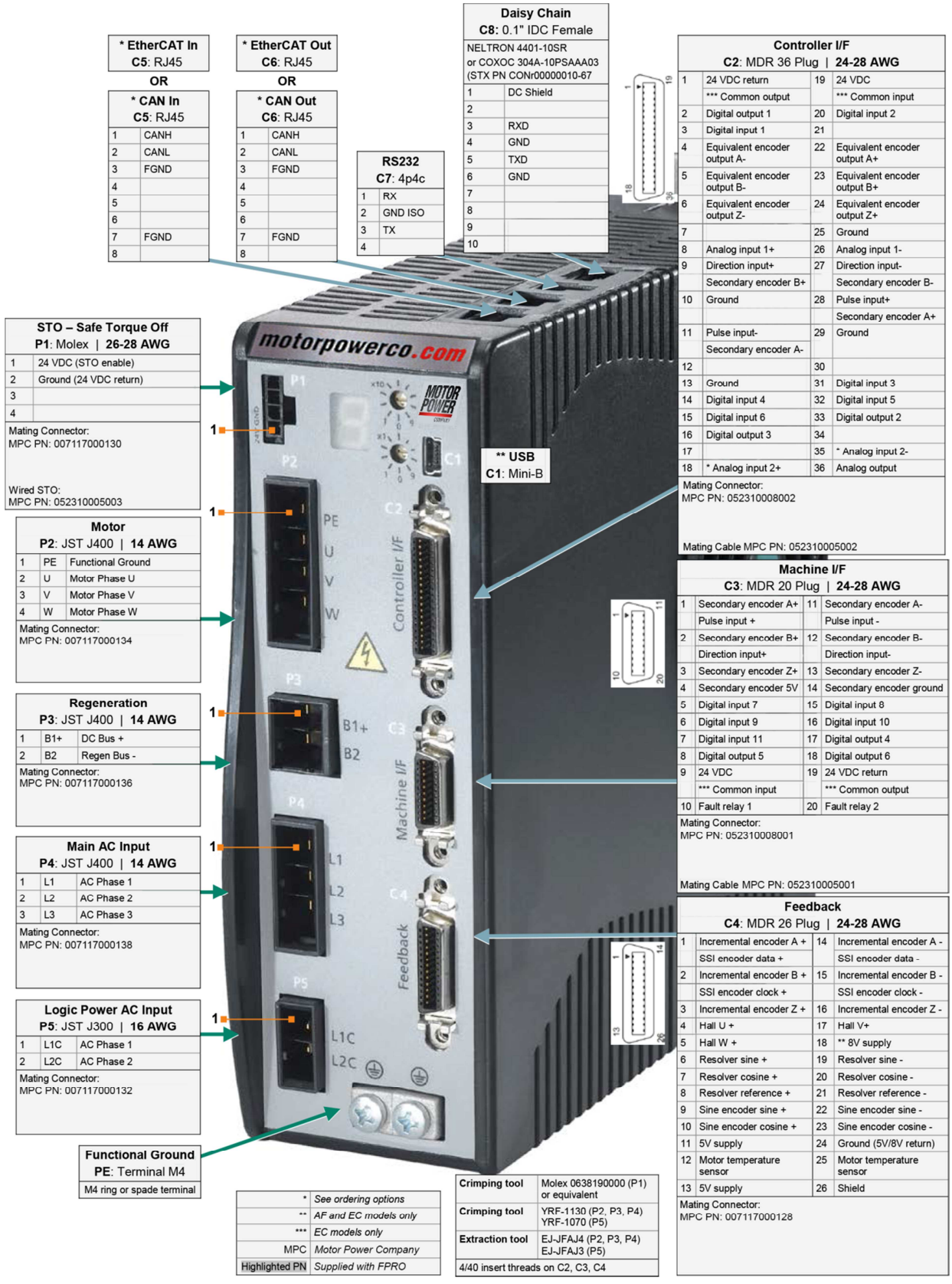
Mating Connector:
MPC PN: 007117000128

Crimping tool	Molex 0638190000 (P1) or equivalent
Crimping tool	YRF-1070 (P2, P3, P4)
Extraction tool	EJ-JFAJ3
Key for spring connector	J-FAT-OT
4/40 insert threads on C2, C4	

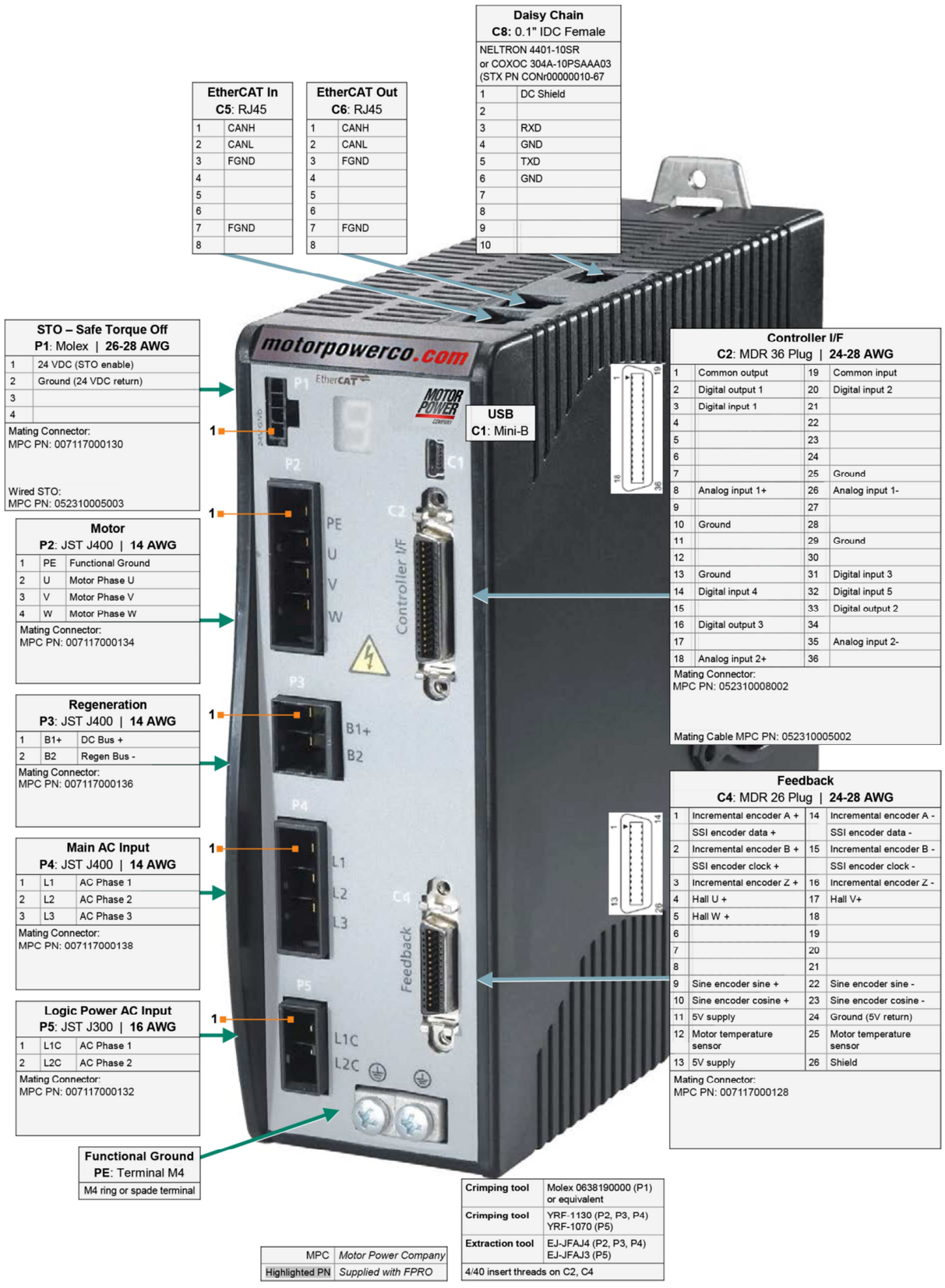
MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

FLEXI PRO-008/FLEXI PRO-010/FLEXI PRO-013 (120/240 VAC)

Pin Assignments on FLEXI PRO-008/FLEXI PRO-010/FLEXI PRO-013 – AP/AF/EC Models



Pin Assignments on FLEXI PRO-008/FLEXI PRO-010/FLEXI PRO-013 – EB Models



Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

EtherCAT In
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

USB
C1: Mini-B

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

Motor
P2: JST J400 | **14 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
MPC PN: 007117000134

Regeneration
P3: JST J400 | **14 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -

Mating Connector:
MPC PN: 007117000136

Main AC Input
P4: JST J400 | **14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3

Mating Connector:
MPC PN: 007117000138

Logic Power AC Input
P5: JST J300 | **16 AWG**

1	L1C	AC Phase 1
2	L2C	AC Phase 2

Mating Connector:
MPC PN: 007117000132

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

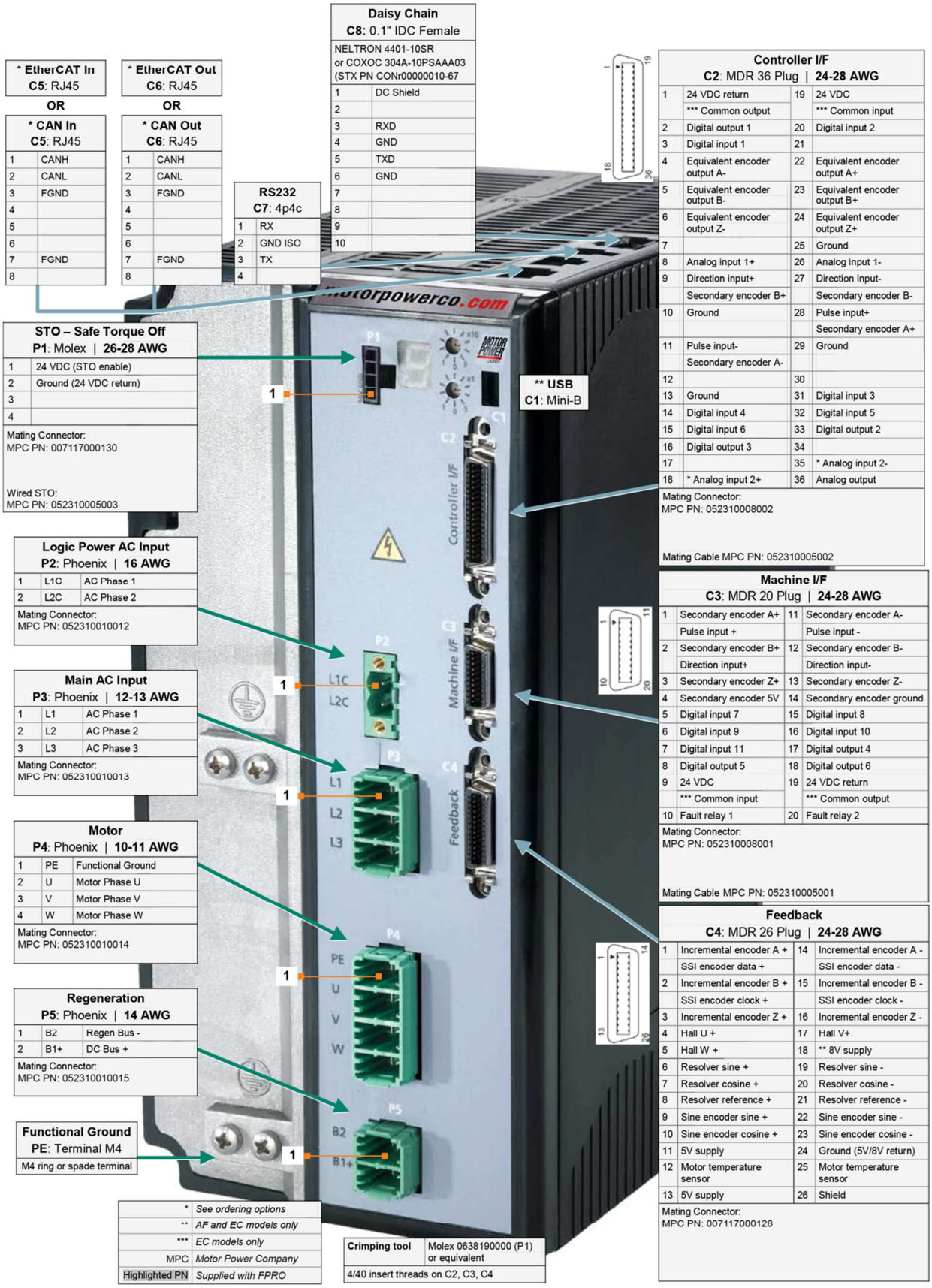
Mating Connector:
MPC PN: 007117000128

Crimping tool	Molex 0638190000 (P1) or equivalent
Crimping tool	YRF-1130 (P2, P3, P4) YRF-1070 (P5)
Extraction tool	EJ-JFAJ4 (P2, P3, P4) EJ-JFAJ3 (P5)
4/40 insert threads on C2, C4	

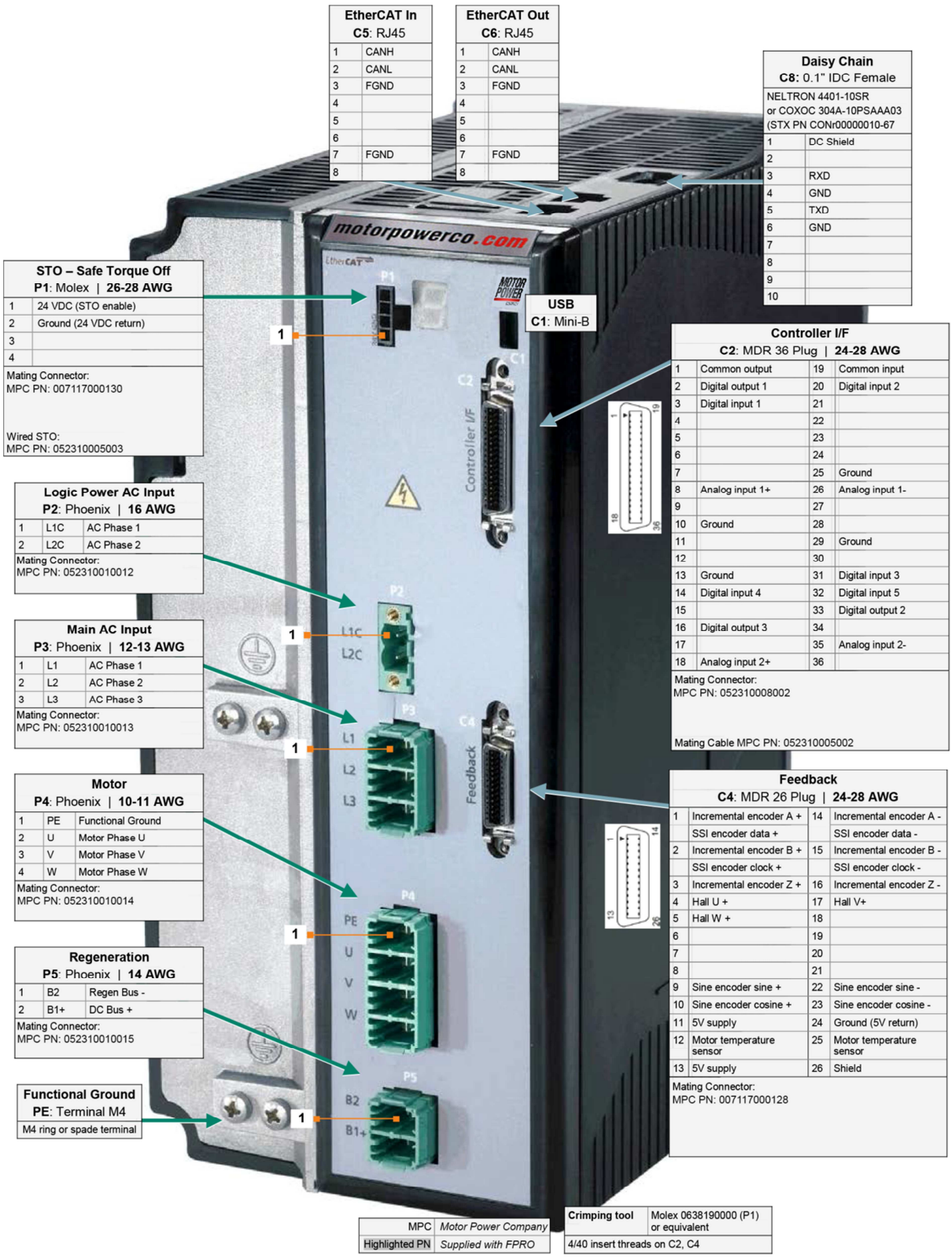
MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

FLEXI PRO-020/FLEXI PRO-024 (120/240 VAC)

Pin Assignments on FLEXI PRO-020/FLEXI PRO-024 – AP/AF/EC Models



Pin Assignments on FLEXI PRO-020/FLEXI PRO-024 – EB Models



EtherCAT In
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

USB
C1: Mini-B

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

Logic Power AC Input
P2: Phoenix | **16 AWG**

1	L1C	AC Phase 1
2	L2C	AC Phase 2

Mating Connector:
MPC PN: 052310010012

Main AC Input
P3: Phoenix | **12-13 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3

Mating Connector:
MPC PN: 052310010013

Motor
P4: Phoenix | **10-11 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
MPC PN: 052310010014

Regeneration
P5: Phoenix | **14 AWG**

1	B2	Regen Bus -
2	B1+	DC Bus +

Mating Connector:
MPC PN: 052310010015

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

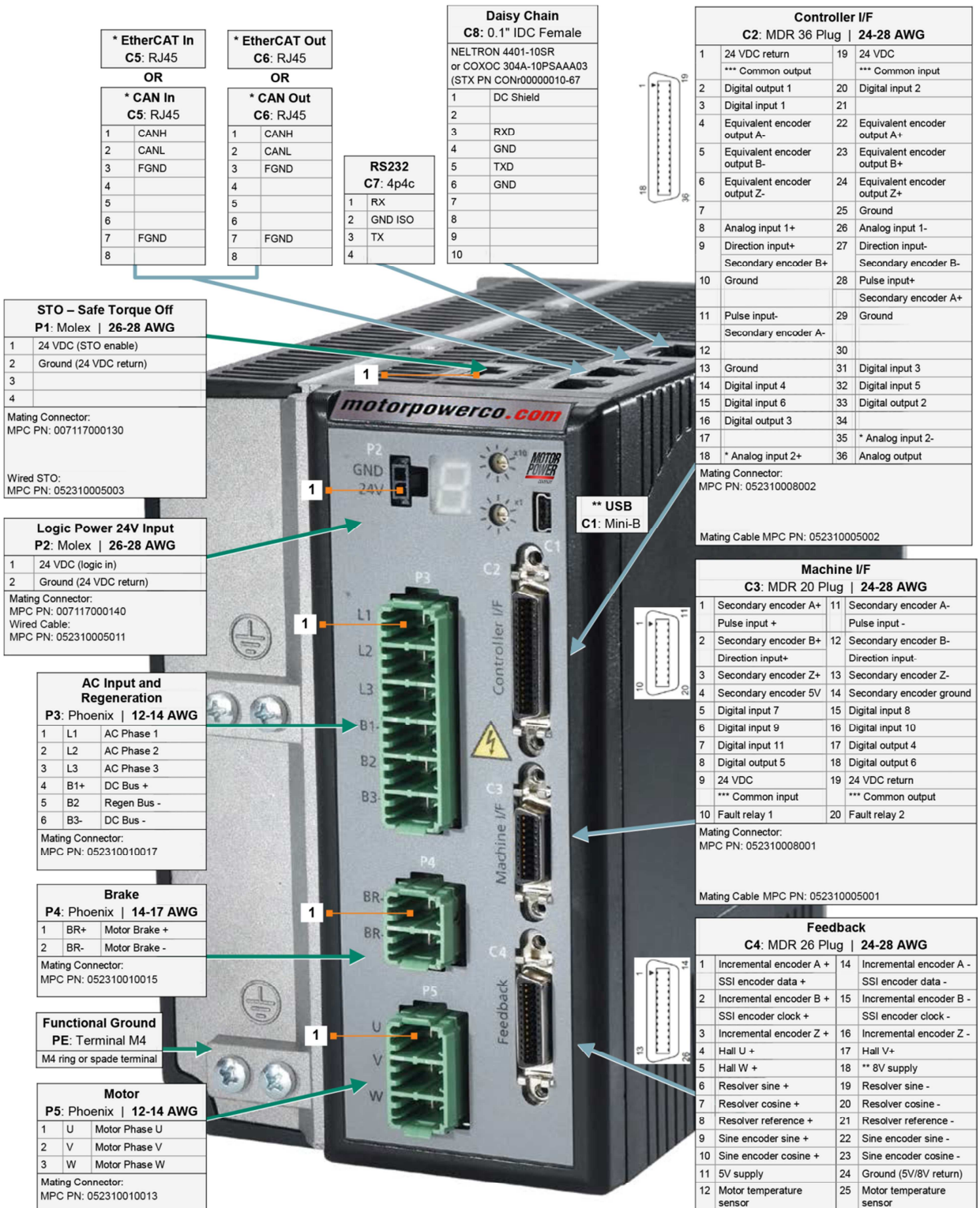
Mating Connector:
MPC PN: 007117000128

MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

Crimping tool	Molex 0638190000 (P1) or equivalent
4/40 insert threads on C2, C4	

FLEXI PRO-003/FLEXI PRO-006 (400/480 VAC)

Pin Assignments on FLEXI PRO-003/FLEXI PRO-006 – AP/AF/EC Models



*** EtherCAT In**
C5: RJ45
OR
*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45
OR
*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female
NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
MPC PN: 052310008002
Mating Cable MPC PN: 052310005002

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
MPC PN: 052310008001
Mating Cable MPC PN: 052310005001

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
MPC PN: 007117000128

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130
Wired STO:
MPC PN: 052310005003

Logic Power 24V Input
P2: Molex | **26-28 AWG**

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector:
MPC PN: 007117000140
Wired Cable:
MPC PN: 052310005011

AC Input and Regeneration
P3: Phoenix | **12-14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
MPC PN: 052310010017

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector:
MPC PN: 052310010015

Functional Ground
PE: Terminal M4
M4 ring or spade terminal

Motor
P5: Phoenix | **12-14 AWG**

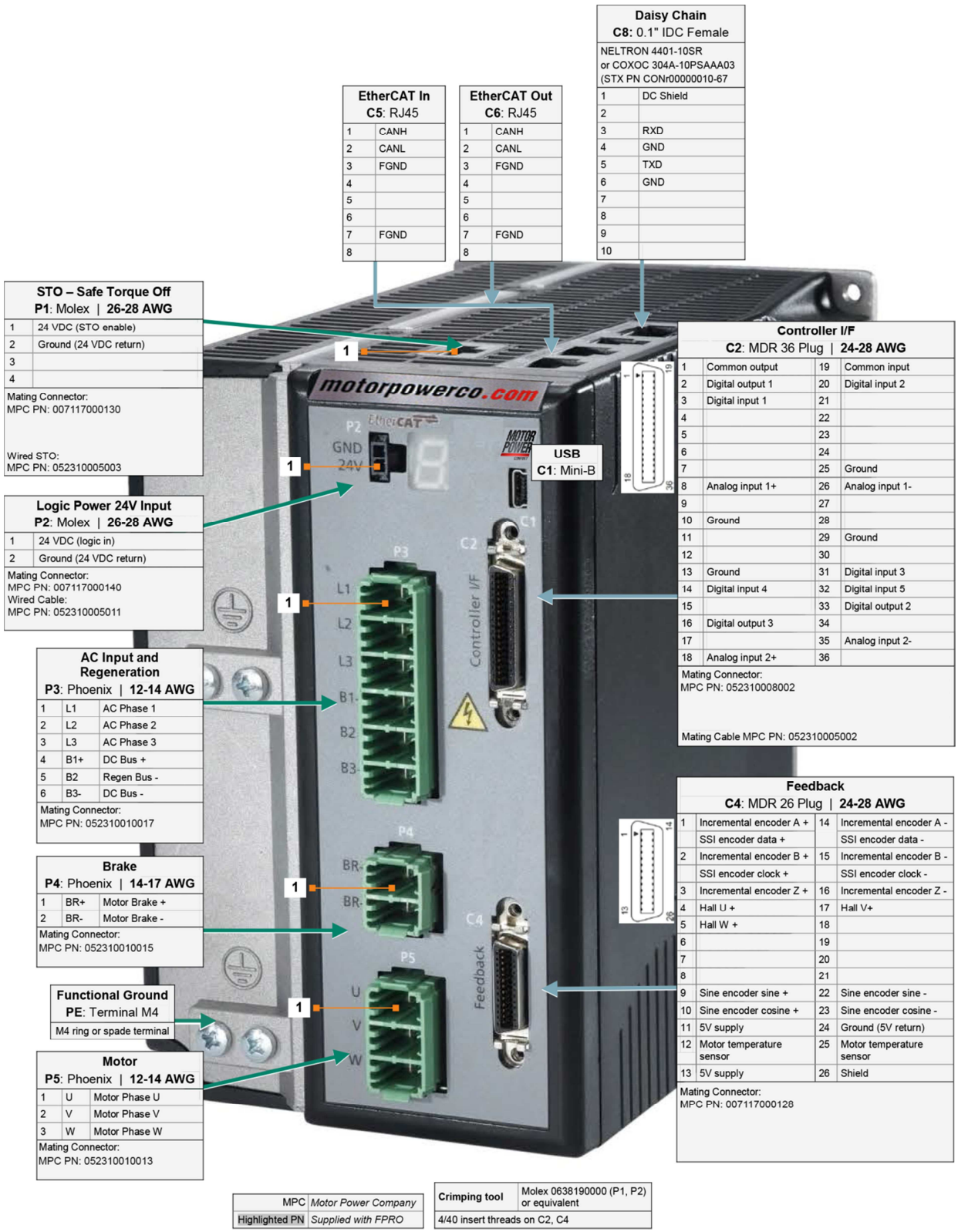
1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
MPC PN: 052310010013

*	*See ordering options*
**	*AF and EC models only*
***	*EC models only*
MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

Crimping tool	Molex 0638190000 (P1, P2) or equivalent
4/40 insert threads on C2, C3, C4	

Pin Assignments on FLEXI PRO-003/FLEXI PRO-006 – EB Models



Daisy Chain
C8: 0.1" IDC Female
NELTRON 4401-10SR or COXOC 304A-10PSAAA03 (STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

EtherCAT In
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

Logic Power 24V Input
P2: Molex | **26-28 AWG**

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector:
MPC PN: 007117000140
Wired Cable:
MPC PN: 052310005011

AC Input and Regeneration
P3: Phoenix | **12-14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
MPC PN: 052310010017

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector:
MPC PN: 052310010015

Functional Ground
PE: Terminal M4
M4 ring or spade terminal

Motor
P5: Phoenix | **12-14 AWG**

1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
MPC PN: 052310010013

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

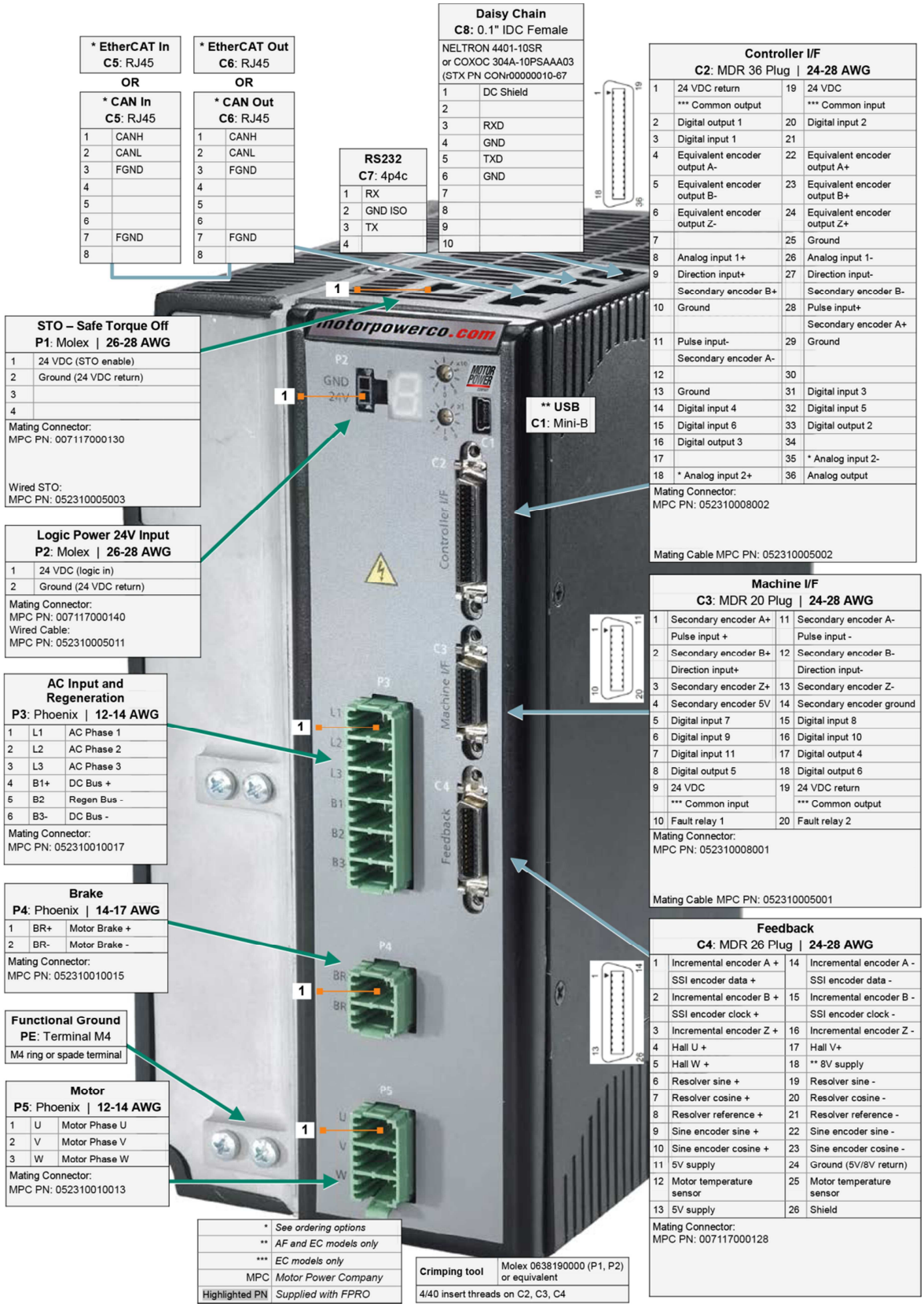
Mating Connector:
MPC PN: 007117000128

MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

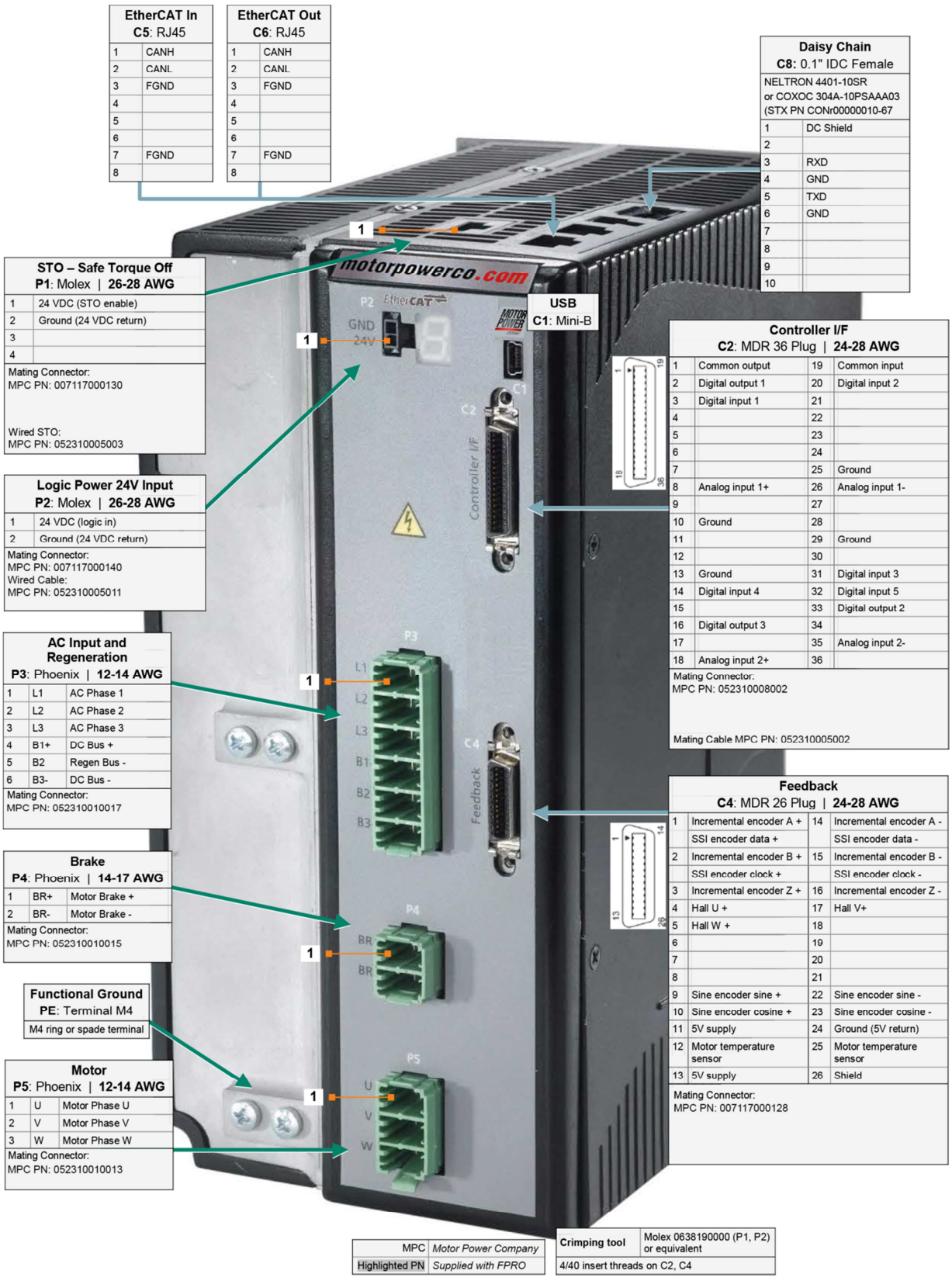
Crimping tool	Molex 0638190000 (P1, P2) or equivalent
4/40 insert threads on C2, C4	

FLEXI PRO-012 (400/480 VAC)

Pin Assignments on FLEXI PRO-012 – AP/AF/EC Models



Pin Assignments on FLEXI PRO-012 – EB Models



EtherCAT In C5: RJ45	
1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out C6: RJ45	
1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

Logic Power 24V Input
P2: Molex | **26-28 AWG**

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector:
MPC PN: 007117000140
Wired Cable:
MPC PN: 052310005011

AC Input and Regeneration
P3: Phoenix | **12-14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
MPC PN: 052310010017

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector:
MPC PN: 052310010015

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Motor
P5: Phoenix | **12-14 AWG**

1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
MPC PN: 052310010013

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

Feedback
C4: MDR 26 Plug | **24-28 AWG**

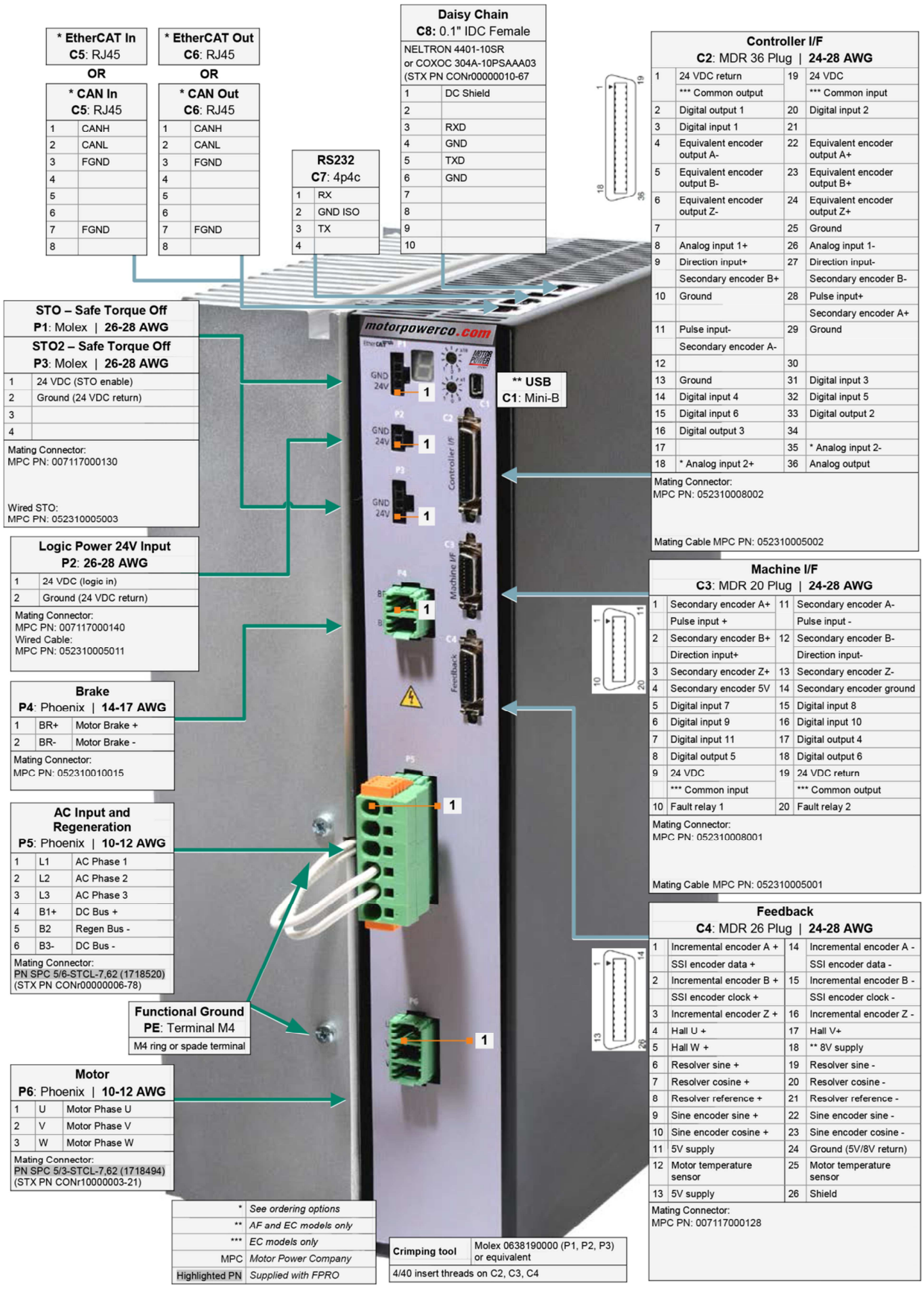
1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
MPC PN: 007117000128

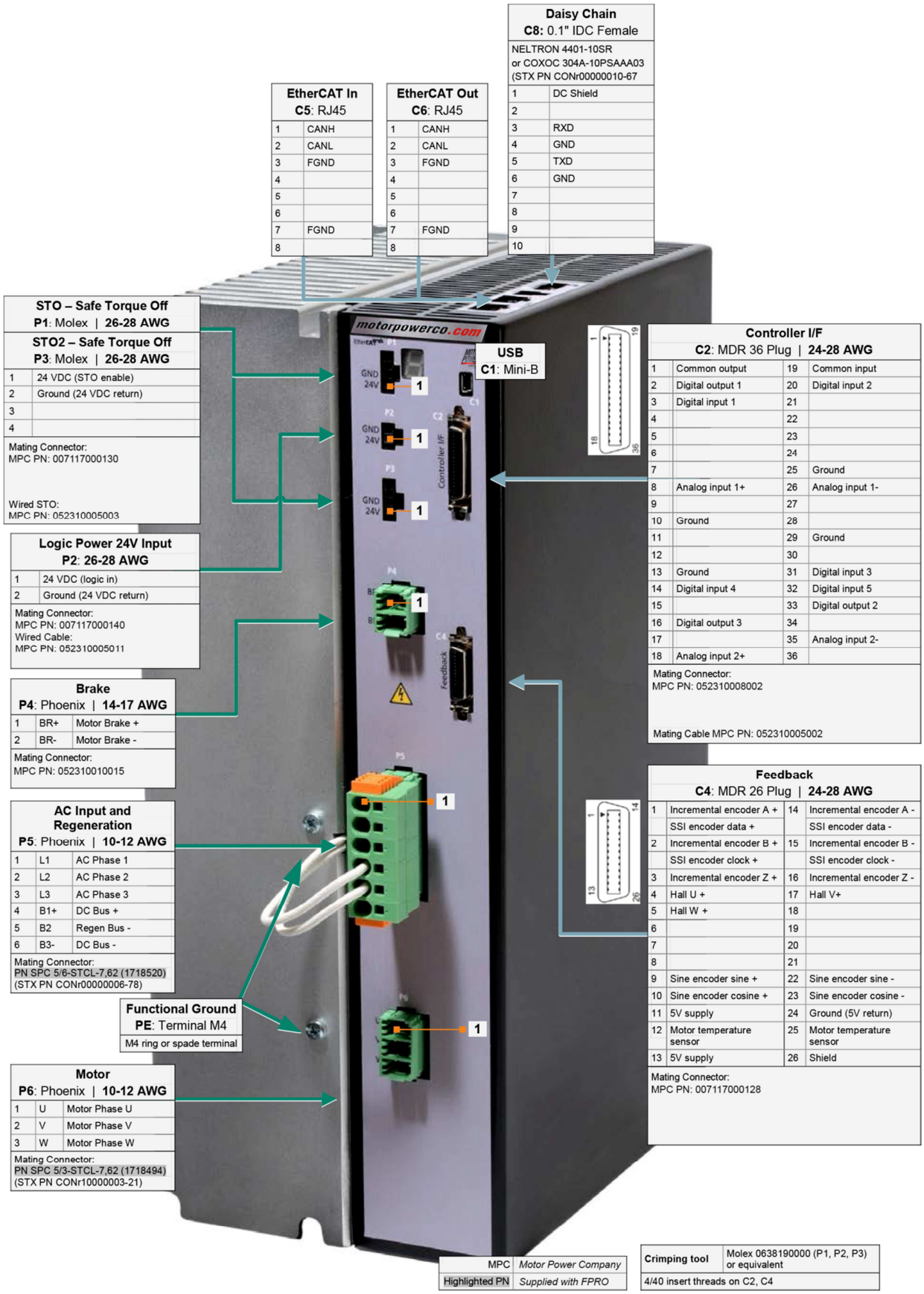
MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

Crimping tool	Molex 0638190000 (P1, P2) or equivalent
4/40 insert threads on C2, C4	

FLEXI PRO-024/FLEXI PRO-030 (400/480 VAC)



Pin Assignments on FLEXI PRO-024/FLEXI PRO-030– EB Models



Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

EtherCAT In
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

EtherCAT Out
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

STO2 – Safe Torque Off
P3: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
MPC PN: 007117000130

Wired STO:
MPC PN: 052310005003

Logic Power 24V Input
P2: 26-28 AWG

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector:
MPC PN: 007117000140
Wired Cable:
MPC PN: 052310005011

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector:
MPC PN: 052310010015

AC Input and Regeneration
P5: Phoenix | **10-12 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
PN SPC 5/6-STCL-7,62 (1718520)
(STX PN CONr00000006-78)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Motor
P6: Phoenix | **10-12 AWG**

1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
PN SPC 5/3-STCL-7,62 (1718494)
(STX PN CONr10000003-21)

USB
C1: Mini-B

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	Common output	19	Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4		22	
5		23	
6		24	
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9		27	
10	Ground	28	
11		29	Ground
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15		33	Digital output 2
16	Digital output 3	34	
17		35	Analog input 2-
18	Analog input 2+	36	

Mating Connector:
MPC PN: 052310008002

Mating Cable MPC PN: 052310005002

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	
6		19	
7		20	
8		21	
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
MPC PN: 007117000128

MPC	*Motor Power Company*
Highlighted PN	*Supplied with FPRO*

Crimping tool	Molex 0638190000 (P1, P2, P3) or equivalent
4/40 insert threads on C2, C4	

3 Control Board

Overview

The control board interfaces vary depending on the specific FLEXI PRO model, as detailed in the following table.

Control Board Interfaces

Function	Interface	AP	AF	EB	EC
USB Communication	**C1**	–	■	■	■
Controller Interface	**C2**	■	■	■	■
Machine Interface	**C3**	■	■	–	■
Motor Feedback	**C4**	■	■	■	■
Fieldbus Devices	**C5 + C6**	–	■	■	■
RS232 Communication	**C7**	■	■	–	■
Daisy Chain	**C8**	■	■	–	■
Drive Address	RotarySwitches	■	■	–	■

Controller Interface

Wire the digital and analog inputs and outputs according to the requirements of your application.

Unused pins must remain unwired.

AP/AF Models

- Outputs are opto-isolated, and can be connected as sink only; outputs are compatible with source inputs.
- Inputs can be connected as source only; inputs are compatible with sink outputs.

EC/EB Models

- Outputs can be connected as either source or sink.
- Inputs can be connected as either as source or sink.

Controller Interface (C2) – AP/AF Models

Pin	Function	Description	Pin	Function	Description
1	24 VDC return	Return of the user-supplied 24 VDC	19	24 VDC	User supplied 24V, for I/O biasing
2	Digital output 1	Opto-isolated programmable digital output. Read using OUT1	20	Digital input 2	Opto-isolated programmable digital input. Read using IN2
3	Digital input 1	Opto-isolated programmable digital input. Read using IN1	21		
4	Equivalent encoder output A-	Low side of the equivalent encoder output signal A (RS422)	22	Equivalent encoder output A+	High side of the equivalent encoder output signal A (RS422)
5	Equivalent encoder output B-	Low side of the equivalent encoder output signal B (RS422)	23	Equivalent encoder output B+	High side of the equivalent encoder output signal B (RS422)
6	Equivalent encoder output Z-	Low side of the equivalent encoder output index (RS422)	24	Equivalent encoder output Z+	High side of the equivalent encoder output index (RS422)
7			25	Ground	Digital ground
8	Analog input 1+	High side of the differential analog command input (±10 VDC)	26	Analog input 1-	Low side of the differential analog command input (±10 VDC)
9	Direction input+	High side of the direction signal (RS422), or High side of the down count signal	27	Direction input-	Low side of the direction signal (RS422), or Low side of the down count signal
	Secondary encoder B+	High side of the Secondary encoder input signal B (RS422)		Secondary encoder B-	Low side of the secondary encoder input signal B (RS422)
10	Ground	Digital ground	28	Pulse input+	High side of the pulse signal (RS422), or High side of the master encoder signal A, or High side of the up count signal
				Secondary encoder A+	High side of the secondary encoder input signal A (RS422)
11	Pulse input-	Low side of the pulse signal (RS422), or Low side of the master encoder signal A, or Low side of the up count signal	29	Ground	Digital ground
	Secondary encoder A-	Low side of the secondary encoder input signal A (RS422)			
12			30		
13	Ground	Digital ground	31	Digital input 3	Opto-isolated programmable digital input. Read using IN3
14	Digital input 4	Opto-isolated programmable digital input. Read using IN4	32	Digital input 5	Fast opto-isolated programmable digital input. Read using IN5
15	Digital input 6	Fast opto-isolated programmable digital input. Read using IN6	33	Digital output 2	Opto-isolated programmable digital output. Read using OUT2
16	Digital output 3	Fast opto-isolated programmable digital output. Read using OUT3	34		
17			35*	Analog input 2-	Low side of the second differential analog input (±10 VDC)
18*	Analog input 2+	High side of the second differential analog input (±10 VDC)	36	Analog output	Analog output, referenced to digital ground (0-10 VDC)

** Optional, see ordering information. Blank cells indicate unused pins; these pins must remain unwired.*

Controller Interface (C2) – EC Model

Pin	Function	Description	Pin	Function	Description
1	Common output		19	Common input	
2	Digital output 1	Opto-isolated programmable digital output. Read using OUT1	20	Digital input 2	Opto-isolated programmable digital input. Read using IN2
3	Digital input 1	Opto-isolated programmable digital input. Read using IN1	21		
4	Equivalent encoder output A-	Low side of the equivalent encoder output signal A (RS422)	22	Equivalent encoder output A+	High side of the equivalent encoder output signal A (RS422)
5	Equivalent encoder output B-	Low side of the equivalent encoder output signal B (RS422)	23	Equivalent encoder output B+	High side of the equivalent encoder output signal B (RS422)
6	Equivalent encoder output Z-	Low side of the equivalent encoder output index (RS422)	24	Equivalent encoder output Z+	High side of the equivalent encoder output index (RS422)
7			25	Ground	Digital ground
8	Analog input 1+	High side of the differential analog command input (±10 VDC)	26	Analog input 1-	Low side of the differential analog command input (±10 VDC)
9	Direction input+	High side of the direction signal (RS422), or High side of the down count signal	27	Direction input-	Low side of the direction signal (RS422), or Low side of the down count signal
	Secondary encoder B+	High side of the Secondary encoder input signal B (RS422)		Secondary encoder B-	Low side of the secondary encoder input signal B (RS422)
10	Ground	Digital ground	28	Pulse input+	High side of the pulse signal (RS422), or High side of the master encoder signal A, or High side of the up count signal
				Secondary encoder A+	High side of the secondary encoder input signal A (RS422)
11	Pulse input-	Low side of the pulse signal (RS422), or Low side of the master encoder signal A, or Low side of the up count signal	29	Ground	Digital ground
	Secondary encoder A-	Low side of the secondary encoder input signal A (RS422)			
12			30		
13	Ground	Digital ground	31	Digital input 3	Opto-isolated programmable digital input. Read using IN3
14	Digital input 4	Opto-isolated programmable digital input. Read using IN4	32	Digital input 5	Fast opto-isolated programmable digital input. Read using IN5
15	Digital input 6	Fast opto-isolated programmable digital input. Read using IN6	33	Digital output 2	Opto-isolated programmable digital output. Read using OUT2
16	Digital output 3	Fast opto-isolated programmable digital output. Read using OUT3	34		
17			35*	Analog input 2-	Low side of the second differential analog input (±10 VDC)
18*	Analog input 2+	High side of the second differential analog input (±10 VDC)	36	Analog output	Analog output, referenced to digital ground (0-10 VDC)

** Optional, see ordering information. Blank cells indicate unused pins; these pins must remain unwired.*

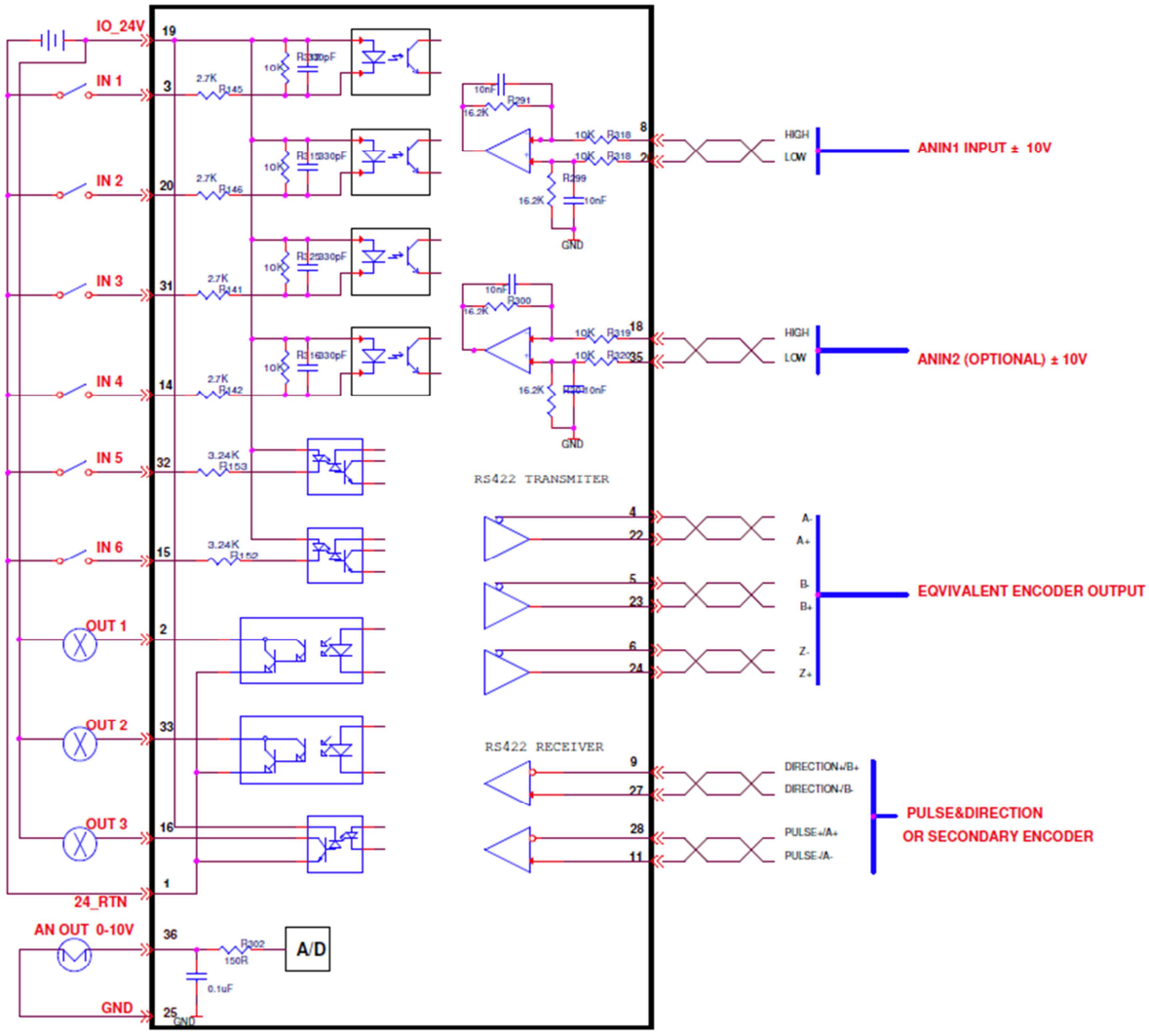
Controller Interface (C2) – EB Model

Pin	Function	Description	Pin	Function	Description
1	Common output		19	Common input	
2	Digital output 1	Opto-isolated programmable digital output. Read using OUT1	20	Digital input 2	Opto-isolated programmable digital input. Read using IN2
3	Digital input 1	Opto-isolated programmable digital input. Read using IN1	21		
4			22		
5			23		
6			24		
7			25	Ground	Digital ground
8	Analog input 1+	High side of the differential analog command input (±10 VDC)	26	Analog input 1-	Low side of the differential analog command input (±10 VDC)
9			27		
10	Ground	Digital ground	28		
11			29	Ground	Digital ground
12			30		
13	Ground	Digital ground	31	Digital input 3	Opto-isolated programmable digital input. Read using IN3
14	Digital input 4	Opto-isolated programmable digital input. Read using IN4	32	Digital input 5	Fast opto-isolated programmable digital input. Read using IN5
			33	Digital output 2	Opto-isolated programmable digital output. Read using OUT2
16	Digital output 3	Opto-isolated programmable digital output. Read using OUT3	34		
17			35	Analog input 2-	Low side of the second differential analog input (±10 VDC)
18	Analog input 2+	High side of the second differential analog input (±10 VDC)	36		

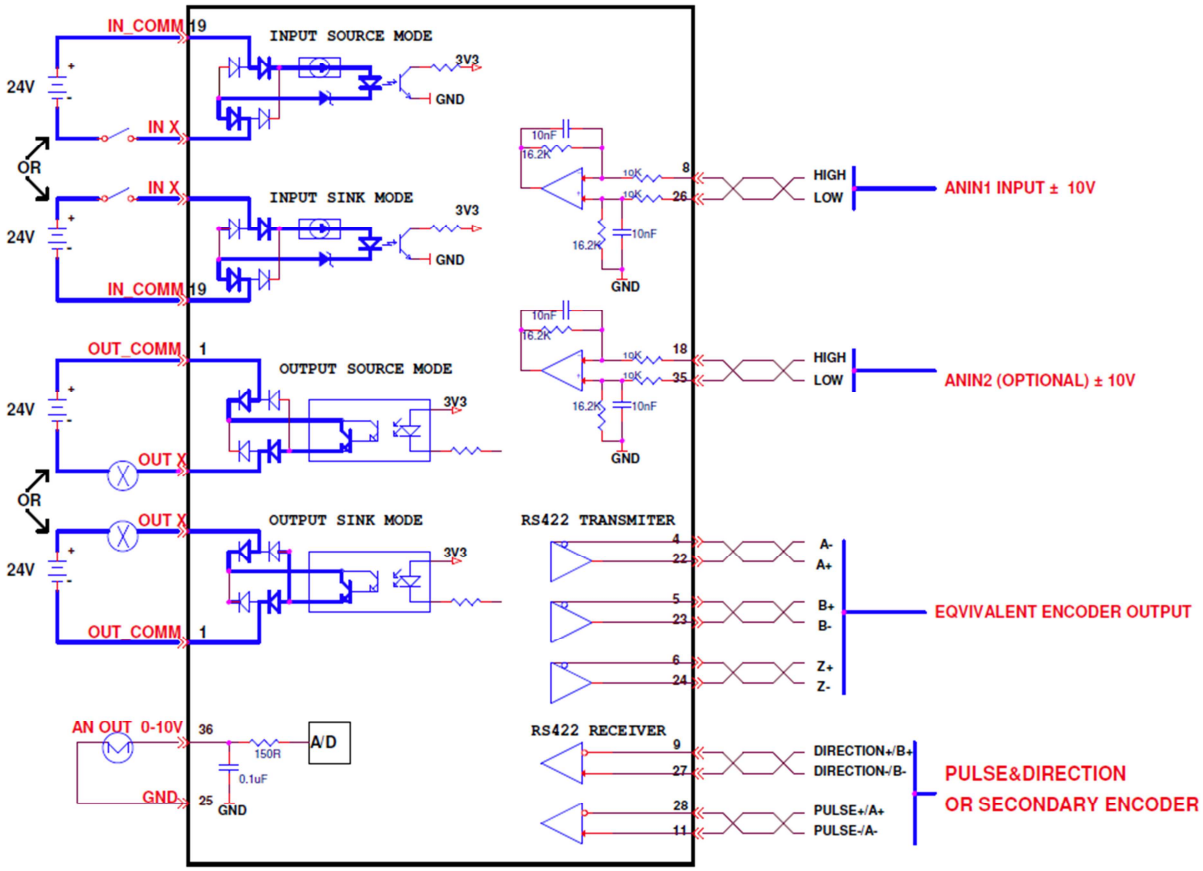
Blank cells indicate unused pins; these pins must remain unwired.

Controller Interface Wiring

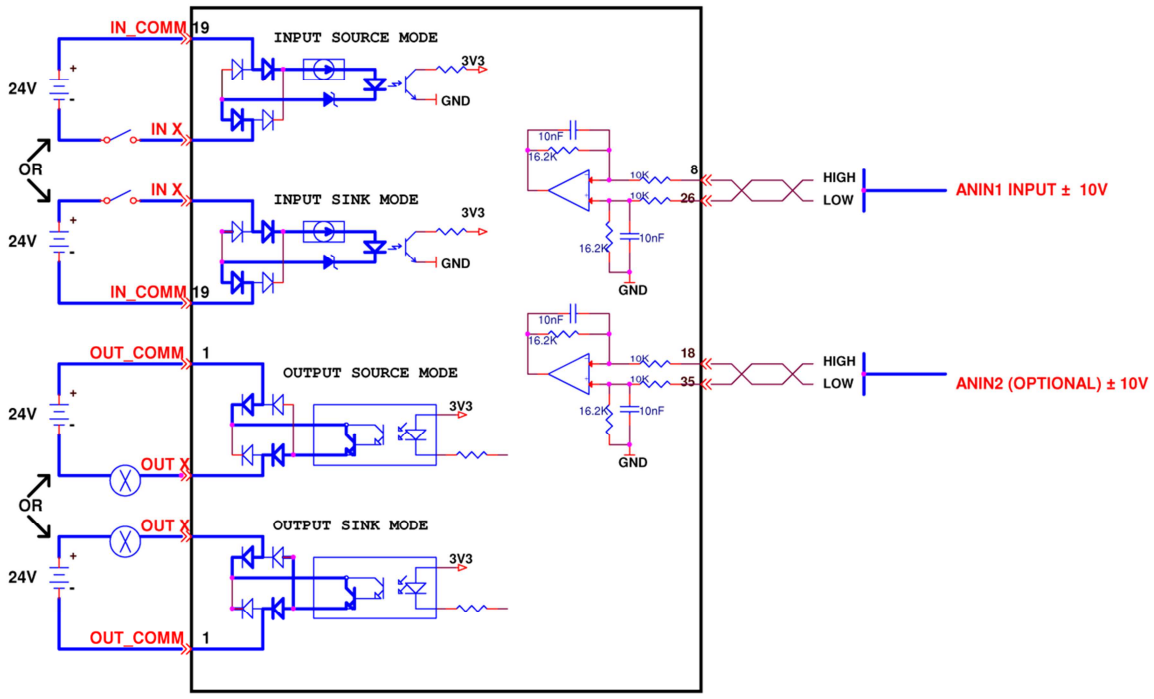
Controller Interface Wiring – AP/AF Models



Controller Interface Wiring – EC Models



Controller Interface Wiring – EB Models



Machine Interface

Note: EB model does not have a Machine Interface.

Wire the machine inputs and outputs according to the requirements of your application.

AP/AF Models

- Outputs are opto-isolated, and can be connected as sink only; outputs are compatible with source inputs.
- Inputs can be connected as source only; inputs are compatible with sink outputs.

EC/EB Models

- Outputs can be connected as either source or sink.
- Inputs can be connected as either as source or sink.

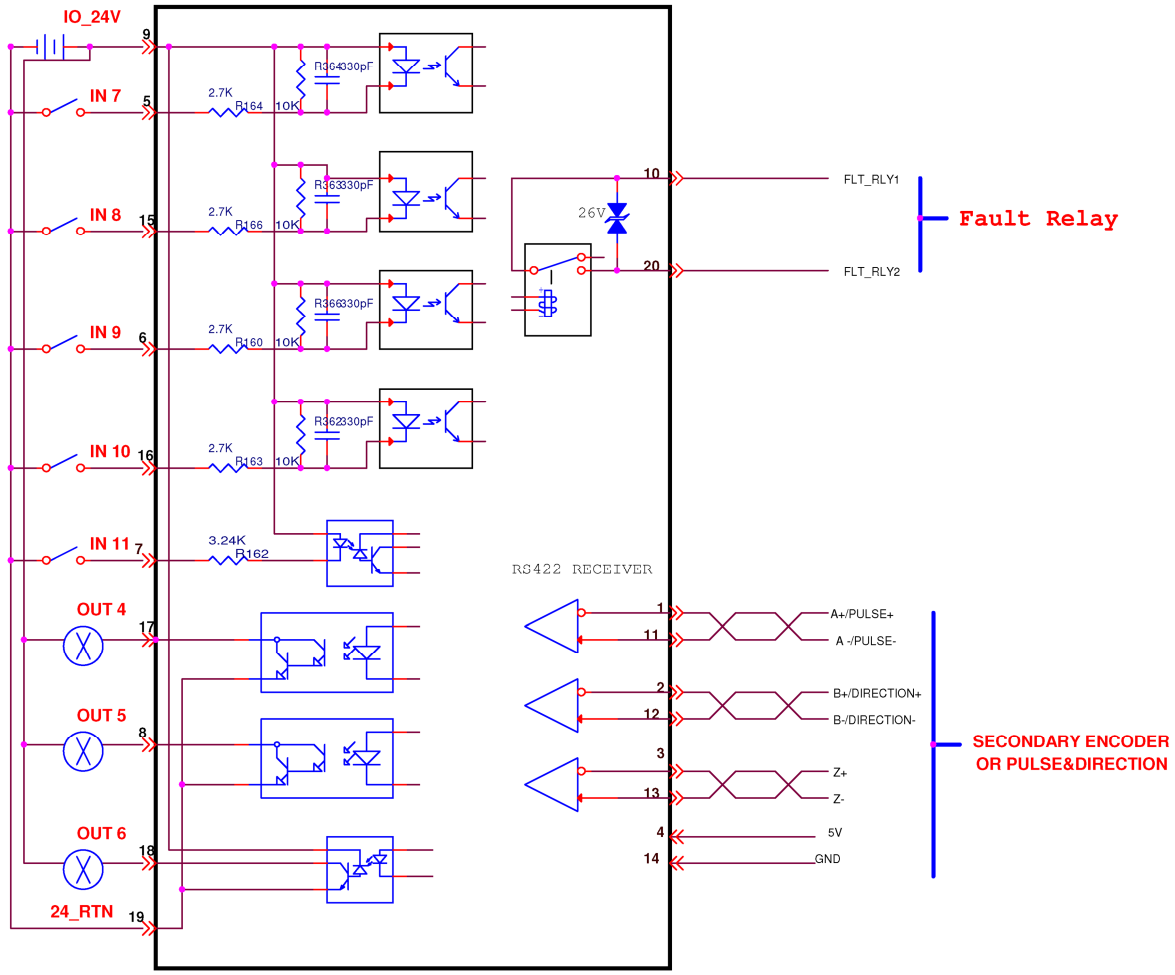
Machine Interface (C3)

Pin	Function	Description	Pin	Function	Description
1	Secondary encoder A+	High side of the secondary encoder input signal A (RS422)	11	Secondary encoder A-	Low side of the secondary encoder input signal A (RS422)
	Pulse input+	High side of the pulse signal		Pulse input-	Low side of the pulse signal
2	Secondary encoder B+	High side of the Secondary encoder input signal B (RS422)	12	Secondary encoder B-	Low side of the secondary encoder input signal B (RS422)
	Direction input+	High side of the direction signal		Direction input-	Low side of the direction signal
3	Secondary encoder Z+	High side of the secondary encoder input index (RS422)	13	Secondary encoder Z-	Low side of the secondary encoder input index (RS422)
4	Secondary encoder 5V	5 VDC supply for the secondary encoder	14	Secondary encoder ground	Ground of the 5 VDC supply for the secondary encoder.
5	Digital input 7	Opto-isolated programmable digital input. Read using IN7	15	Digital input 8	Opto-isolated programmable digital input. Read using IN8
6	Digital input 9	Opto-isolated programmable digital input. Read using IN9	16	Digital input 10	Opto-isolated programmable digital input. Read using IN10
7	Digital input 11	Fast opto-isolated programmable digital input. Read using IN11	17	Digital output 4	Opto-isolated programmable digital output. Read using OUT4
8	Digital output 5	Opto-isolated programmable digital output. Read using OUT5	18	Digital output 6	Fast opto-isolated programmable digital output. Read using OUT6

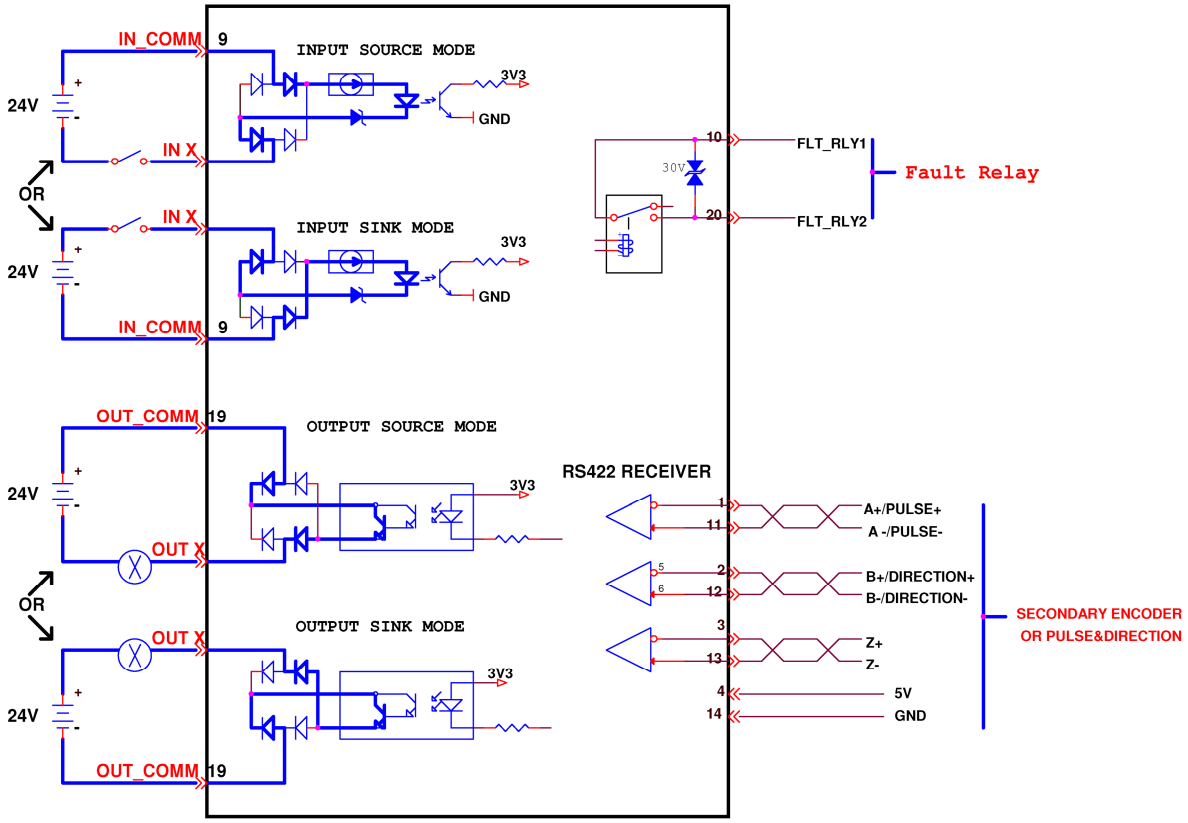
Pin	Function	Description	Pin	Function	Description
9	24 VDC	**AP/AF** Models: User supplied 24V, for I/O biasing	19	24 VDC return	**AP/AF** Models: Return of the user-supplied 24 VDC
	Common input	**EC** Models		Common output	**EC** Models
10	Fault relay 1	Terminal 1 of the dry contact fault relay	20	Fault relay 2	Terminal 2 of the dry contact fault relay

Machine Interface Wiring

Machine Interface Wiring – AP/AF Models



Machine Interface Wiring – EC Models



Motor Feedback

Wire the motor feedback interface according to the type of feedback device to be used in your application. Refer to the guidelines following the pinout table below.

Pins 1, 2, 14 and 15 have dual functionality.

Pin 25 for the motor temperature sensor is connected internally in the drive to FLEXI PRO ground.

Unused pins must remain unwired.

Motor Feedback Interface (C4)

Pin	Function	Pin	Function
1	Incremental encoder A +	14	Incremental encoder A -
	Serial encoder data +		Serial encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	Serial encoder clock +		Serial encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	**AF/EC Models:** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Feedback Wiring

The following tables present suggestions for the most common feedback variations. Refer to the drive's *User Manual* for additional information. If your motor feedback does not match any of the following, contact technical support.

Use the Flexi SUITE **Motor Setup** procedure and the **Feedback** screens to define motor feedback type, resolution, and other parameters.

sensAR Encoder A

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
11		+5 VDC
24		0 VDC
26		Shield

BiSS-C Encoder

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data + (SLO+)
14		Serial Data - (SLO-)
2	Twisted Pair	Serial Clock + (MA+)
15		Serial Clock - (MA-)
11		+5 VDC
24		0 VDC
26		Shield

Incremental Encoder A Quad B, Index Pulse and Halls

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Incremental Encoder A+
14		Incremental Encoder A-
2	Twisted Pair	Incremental Encoder B+
15		Incremental Encoder B-
3	Twisted Pair	Incremental Encoder Z+
16		Incremental Encoder Z-
4		Hall U
17		Hall V
5		Hall W
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Single-Ended Halls

Pin #	Twisted Pair	Signal Description
4		Hall U
17		Hall V
5		Hall W
11		+5 VDC
24		0 VDC
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
26		Shield

Incremental Encoder A Quad B, Index Pulse and Differential Halls

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Incremental Encoder A+
14		Incremental Encoder A-
2	Twisted Pair	Incremental Encoder B+
15		Incremental Encoder B-
9		Hall U+
22		Hall U-
10		Hall V+
23		Hall V-
3		Hall W+
16		Hall W-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Differential Halls Only

Pin #	Twisted Pair	Signal Description
9		Hall U+
22		Hall U-
10		Hall V+
23		Hall V-
3		Hall W+
16		Hall W-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Tamagawa Incremental

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Incremental Encoder A+ / Hall U+
14		Incremental Encoder A- / Hall U-
2	Twisted Pair	Incremental Encoder B+ / Hall V+
15		Incremental Encoder B- / Hall V-
3	Twisted Pair	Incremental Encoder Z+ / Hall W+
16		Incremental Encoder Z- / Hall W-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Sine Encoder

Pin #	Twisted Pair	Signal Description
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5VDC
24		0VDC
26		Shield

Wiring – Sine Encoder with Halls

Pin #	Twisted Pair	Signal Description
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
4		Hall U
17		Hall V
5		Hall W
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Sine Encoder with Index

Pin #	Twisted Pair	Signal Description
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
3	Twisted Pair	Sine Encoder Z+
16		Sine Encoder Z-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Sine Encoder with Index and Halls

Pin #	Twisted Pair	Signal Description
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
3	Twisted Pair	Sine Encoder Z+
16		Sine Encoder Z-
4		Hall U
17		Hall V
5		Hall W
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Sick 5V (HIPERFACE Protocol and Sine Signal)

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

Sick 8V (HIPERFACE Protocol and Sine Signal)

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
18		+8 VDC
24		0 VDC
26		Shield

HEIDENHAIN (EnDat 2.x Communication Only)

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
2	Twisted Pair	Serial Clock +
15		Serial Clock -
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
11		+5 VDC
24		0 VDC
26		Shield

HEIDENHAIN (EnDat 2.x with Sine/Cosine)

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
2	Twisted Pair	Serial Clock +
15		Serial Clock -
9	Twisted Pair	Sine Encoder Sine+
22		Sine Encoder Sine-
10	Twisted Pair	Sine Encoder Cosine+
23		Sine Encoder Cosine-
11		+5 VDC
24		0 VDC
26		Shield

Nikon / Tamagawa | Incremental 17-bit | Single Turn

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
11		+5 VDC
24		0 VDC
26		Shield

Nikon / Tamagawa | Incremental 17-bit | Multi-Turn

Pin #	Twisted Pair	Signal Description
1	Twisted Pair	Serial Data +
14		Serial Data -
11		+5 VDC
24		0 VDC
26		Shield
		Battery Voltage
		Battery Ground

Resolver

Pin #	Twisted Pair	Signal Description
6	Twisted Pair	Resolver Sine +
19		Resolver Sine -
7	Twisted Pair	Resolver Cosine +
20		Resolver Cosine -
8	Twisted Pair	Resolver Reference +
21		Resolver Reference -
12	Twisted Pair	Motor Temperature Sensor
25		Motor Temperature Sensor
24	Ground	Optional: Internal shield of each twisted pair (sine, cosine, reference)
26		Cable Shield

Fieldbus Devices

Interfaces **C5** and **C6** are standard RJ45 ports that serve as transmitter (Tx) and receiver (Rx) for drives operating on EtherCAT or CANopen networks.

Refer to the drive's *EtherCAT and CANopen Reference Manua*l.

Host Computer

The FLEXI PRO can be connected to the host computer through either one of two serial interfaces:

- **USB Interface (C1)**. Use a USB 2.0 A to Mini-B cable.
- **RS232 Interface (C7)**. Use a 4p4c plug.

RS232 Interface (C7)

All FLEXI PRO 120/240 VAC Models	Pin	Pin Label	Function
C7	1	RX	Receive
	2	GND ISO	Ground
	3	TX	Transmit
	4		Unused

Daisy Chain

The FLEXI PRO can be addressed and controlled on a daisy-chained RS232 line.

In a daisy-chain RS232 configuration, all drives must be daisy-chained through the **C8** connector. Each drive must have a unique address to enable its identification on the network.

Daisy Chain Interface (C8)

All FLEXI PRO 120/240 VAC Models	Pin	Function
C8	1	DC Shield
	2	Unused
	3	RXD
	4	GND
	5	TXD
	6	GND
	7-10	Unused

Drive Address Switches

Two rotary switches are used to set the drive address for both CAN and serial communication.

Each switch has 10 positions:

- The upper switch positions are set as tens: 10, 20, 30 … 90
- The lower switch positions are set as ones: 0, 1, 2 … 9

Each drive on the network must have a unique address.

If two or more drives are connected to the network, address 0 cannot be used.

A single drive may have the address 0

4 Power Board 120/240 VAC

Make sure the main voltage rating matches the drive specification. Applying incorrect voltage may cause drive failure.
Do not apply power until all hardware connections are complete.

Safe Torque Off (STO)

Safe torque off (STO) is a safety function that prevents the drive from delivering power to the motor, which can generate torque.

STO Enable and STO Return must be connected to enable FLEXI PRO operation. The STO Enable signal voltage must be 24 VDC.

If the application does not require STO control, jumper pin 4 to pin 1, and pin 3 to pin 2, to bypass the STO.

STO Interface (P1)

All FLEXI PRO 120/240 VAC Models	Pin	Pin Label	Function
P1	1	24V	STO Enable
	2	GND	STO Return
	3		24V Return, provided by the drive for use with emergency stop circuit
	4		24V Supply, provided by the drive for use with emergency stop circuit

Motor

Motor Interface (P2) (P4*)

All FLEXI PRO 120/240 VAC Models	Pin	Pin Label	Function
P2 P4*	1	PE	Functional ground (motor housing)
	2	U	Motor Phase U
	3	V	Motor Phase V
	4	W	Motor Phase W

***** Exception: **P4** on FLEXI PRO-020/024, 120/240 VAC

Regeneration Resistor

If the application requires a regeneration (regen) resistor, connect the regen resistor between terminals B1+ and B2.

Regen Interface (P3) (P5)

FLEXI PRO-1D5, FLEXI PRO -003 FLEXI PRO -4D5, FLEXI PRO -006 FLEXI PRO -008, FLEXI PRO -010 FLEXI PRO -013	Pin	Pin Label	Function
P3	1	B1+	DC bus +
	2	B2	Regen bus -
FLEXI PRO -020, FLEXI PRO -024	**Pin**	**Pin Label**	**Function**
P5	1	B2	Regen bus -
	2	B1+	DC bus +

Regen and **AC Input Voltage** are combined on one interface on FLEXI PRO-1D5 and FLEXI PRO-003, 120/240 VAC.

AC Input

The AC Input interfaces vary among FLEXI PRO 120/240 VAC models.

- FLEXI PRO-1D5 and FLEXI PRO-003: One interface (**P3**) for bus power and logic power.
- FLEXI PRO-4D5 and FLEXI PRO-006: One interface (**P4**) for bus power and logic power.
- FLEXI PRO-008, FLEXI PRO-010 and FLEXI PRO-013: One interface (**P4**) for bus power; one interface (**P5**) for logic power.
- FLEXI PRO-020/024: One interface (**P3**) for bus power; one interface (**P2**) for logic power.

Make the following connections:

1. Connect the AC input voltage ground wire to the PE terminal, located on the FLEXI PRO front panel. Use an M4 ring or spade terminal.
2. Connect L1, L2 and L3 (for bus power):
   - If the main voltage is from a single-phase source, connect line and neutral to L1 and L2.
   - If the main voltage is from a three-phase source, connect the phases to L1, L2 and L3.
3. Connect L1C and L2C (for logic power):
   - If the main voltage is from a single-phase source, connect line and neutral to L1C and L2C.

- If the main voltage is from a three-phase source, connect any two phases to L1C and L2C.

Prevent inrush surge:

Bus Power (L1-L2-L3): After switching on bus power, wait 1 minute before switching on again, regardless of time in Off state.

Logic Power (L1C-L2C): After switching off logic power, wait 1 minute before switching on again.

AC Input Interface (P3, P4, P5)

FLEXI PRO-1D5 FLEXI PRO-003	Pin	Pin Label	Function
P3	3	L1	AC Phase 1
	4	L2	AC Phase 2
	5	L1C	Logic AC Phase 1
	6	LC2	Logic AC Neutral
FLEXI PRO-4D5 FLEXI PRO-006	**Pin**	**Pin Label**	**Function**
P4	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
	4	L1C	Logic AC Phase 1
	5	LC2	Logic AC Neutral
FLEXI PRO-008 FLEXI PRO-010 FLEXI PRO-013	**Pin**	**Pin Label**	**Function**
P4	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
P5	1	L1C	Logic AC Phase 1
	2	LC2	Logic AC Neutral
FLEXI PRO-020 FLEXI PRO-024	**Pin**	**Pin Label**	**Function**
P3	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
P2	1	L1C	Logic AC Phase 1
	2	LC2	Logic AC Neutral

AC Input Voltage and **Regen** are combined on one interface on FLEXI PRO-1D5 and FLEXI PRO-003, 120/240 VAC.

5 Power Board 400/480 VAC

Make sure the main voltage rating matches the drive specification. Applying incorrect voltage may cause drive failure.

Do not apply power until all hardware connections are complete.

Safe Torque Off (STO)

Safe torque off (STO) is a safety function that prevents the drive from delivering power to the motor, which can generate torque.

STO Enable and STO Return must be connected to enable FLEXI PRO operation. The STO Enable signal voltage must be 24 VDC.

If the application does not require STO control, jumper pin 4 to pin 1, and pin 3 to pin 2, to bypass the STO.

STO Interface (P1) (P3*)

All FLEXI PRO 400/480 VAC Models	Pin	Pin Label	Function
P1 P3*	1	24V	STO Enable
	2	GND	24 VDC Return
	3		
	4		

* Two **STO** interfaces on FLEXI PRO-24 and FLEXI PRO-30, 400/480 VAC.

Logic Power 24V Input

This interface is used to connect an external power supply (24V 3.15A max.) that provides the logic voltage to the control board and to the motor brake circuit.

Prevent inrush surge:

Logic Power (L1C-L2C): After switching Logic Power Off, wait 1 minute before switching On again.

Logic Power 24V Interface (P2)

All FLEXI PRO 400/480 VAC Models	Pin	Pin Label	Function
P2	1	24V	Logic In
	2	GND	24 VDC Return

AC Input and Regeneration Resistor

AC Input and **Regen Resistor** are combined on one connector on the FLEXI PRO 400/480 VAC models.

1. Connect the AC input voltage ground wire to the PE terminal, located on the FLEXI PRO front panel. Use an M4 ring or spade terminal.
2. Connect L1, L2 and L3 (for bus power)
3. If the application requires a regeneration (regen) resistor, connect the regen resistor between terminals B1+ and B2.

Prevent inrush surge:

Bus Power (L1-L2-L3): After switching Bus Power On, wait 1 minute before switching On again, regardless of time in Off state.

AC Input and Regeneration Resistor Interface (P3) (P5)

All FLEXI PRO 400/480 VAC Models	Pin	Pin Label	Function
P3 **P5**	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
	4	B1+	DC Bus +
	5	B2	Regen Bus
	6	B3-	DC Bus -

P3 on FLEXI PRO-003/FLEXI PRO-006/FLEXI PRO-012, 400/480 VAC.

P5 on FLEXI PRO-024/FLEXI PRO-030, 400/480 VAC.

Brake

This interface is the power output for the electric motor brake system.

Brake Interface (P4)

All FLEXI PRO 400/480 VAC Models	Pin	Pin Label	Function
P4	1	BR+	Motor Brake +
	2	BR-	Motor Brake -

Motor

Motor Interface (P5)

All FLEXI PRO 400/480 VAC Models	Pin	Pin Label	Function
P5	1	U	Motor Phase U
	2	V	Motor Phase V
	3	W	Motor Phase W

6 Software

Flexi SUITE Installation

Use Flexi SUITE software to configure the drive for your application.

1. Install Flexi SUITE on the host computer.
2. When installation is complete, start Flexi SUITE.

Power Up

1. After completing the hardware connections, turn on power to the drive.
2. The first time the drive is connected to the host computer on the USB port, Windows detects the device and displays a **Found New Hardware** wizard.

   Browse to and select the \Motor Power Company\FlexiSUITE**Drivers** folder. The wizard will automatically select and install the driver file.
3. Look at the 7-segment display on the FLEXI PRO front panel.

   Upon initial power up, the status display shows a flashing **e**, indicating that drive parameters are not yet configured. This fault will be cleared once the drive is configured.

Drive Configuration

1. In Flexi SUITE, select the **Motor Setup** wizard from the navigation menu.

   Follow the prompts to configure the FLEXI PRO for your particular motor.
2. When Motor Setup is complete, use the Flexi SUITE **Autotuning** wizard to optimize drive parameters for your particular application.

7 Drive Status (7-Segment Display)

The 7-segment display provides indications of drive status, such as operation modes, drive enable status, and fault conditions.

7-Segment Display Codes

Code	Light	Type	Name	Description	Action Required
-5		Fault	Motor Setup Failed	Motor Setup procedure failed (MOTORSETUPST will show the reason)	Check phase and motor wiring. Make sure to choose the correct feedback type, and follow the hints in MOTORSETUPST.
-1		Fault	Not Configured	Drive configuration required.	Set drive parameters and execute CONFIG.
_	Flash	Fault	Realtime Overload Fault	CPU has exceeded its computational limit. Realtime execution takes longer than 31.25 µs.	Contact technical support.
_	Steady	Warning	Realtime Overload Warning	Drive has detected that CPU is close to its computational limit.	
≡	Flash	Fault	Watchdog Fault	Generally occurs due to an unforeseen circumstance. The drive is inoperable until power is cycled.	Contact technical support.
0 | 0.		Mode	Operation Mode 0	Serial Velocity. Drive disabled | enabled.	
1 | 1.		Mode	Operation Mode 1	Analog Velocity. Drive disabled | enabled.	
2 | 2.		Mode	Operation Mode 2	Serial Current Drive disabled | enabled.	
3 | 3.		Mode	Operation Mode 3	Analog Current. Drive disabled | enabled.	
4 | 4.		Mode	Operation Mode 4	Gearing. Drive disabled | enabled.	
8 | 8.		Mode	Operation Mode 8	Profile Position Drive disabled | enabled.	
8.		Mode	Hardware Ember Switch Activated	All segments light up when the Hardware Ember switch is pressed, which sets the drive to serial communication Boot-Up Mode.	
A4		Fault	CAN Supply Fault	A problem with the internal voltage supply for the CAN bus.	The drive probably needs repair. Contact technical support.
At1		Mode	Motor Setup in Progress	Motor initialization routine is being executed.	
b	Flash	Fault	Drive Locked	Security code and key do not match. Fatal fault; drive cannot be operated.	Contact technical support.
b	Steady	Warning	Tamagawa Battery Low-Voltage	Battery voltage is nearing fault level. Relevant only for Tamagawa encoder.	Prepare to replace battery soon.

Code	Light	Type	Name	Description	Action Required
b1		Fault	PLL (phase-locked loop) Synchronization Failed	Controller synchronization signal is missing or not stable. The fault is detected only when synchronization is enabled by SYNCSOURCE command.	Check if controller provide synchronization signal. Check the cable connection and wiring.
c	Steady	Warning	Regen Resistor Overload	Regeneration resistor is overloaded.	
C1		Fault	CAN Heartbeat Lost	Drive detected disconnection between CAN master and drive.	Reconnect master and slave, and power cycle the drive.
e	Flash	Fault	Parameter Memory Checksum Failure	The non-volatile memory used to store drive parameters is empty or the data is corrupted. May occur during power off if SAVE operation has not completed.	Reconfigure the drive, or download the parameter set, and save the parameters. If problem persists, contact technical support.
E	Steady	Mode	Ember Mode	Firmware is being updated in the drive.	
E	Flash	Fault	Failure Writing to Flash Memory	An internal problem accessing the flash memory. Fatal fault; drive cannot be operated.	Contact technical support.
e101		Fault	FPGA Config Fail	The code for the FPGA did not load. Fatal fault; drive cannot be operated.	Contact technical support.
e105		Fault	Self Test Fail	The power-up self test failed. Fatal fault; drive cannot be operated.	Contact technical support.
e106		Fault	Control EEPROM Fault	A problem accessing the EEPROM on the control board. Fatal fault; drive cannot be operated.	Contact technical support.
e107		Fault	Power EEPROM Fault	A problem accessing the EEPROM on the power board. Fatal fault; drive cannot be operated.	Contact technical support.
e108		Fault	Vbus Measure Circuit Fail	A failure occurred in the circuit that measures bus voltage.	Reset faults. If the fault persists, the drive probably needs repair. Contact technical support.
e109		Fault	Current-Sensors Offset Out-of-Range	The calculated offsets for the current sensors are out of range.	Reset faults. If the fault persists, the drive probably needs repair. Contact technical support.
e120		Fault	FPGA Version Mismatch	FPGA version does not match the firmware version	Update either the FPGA version or drive version
e121		Fault	Internal Error	Internal error due to an endless while loop or a numerical issue	Contact technical support.
e123		Fault	Motor Plate Read Failed	Motor type nameplate data cannot be read.	Reconnect the feedback device. Make sure the motor type nameplate data is present.
e124		Fault	SAVE and Power Cycle Required	Parameter was changed, and requires SAVE and power cycle to take effect.	SAVE and then cycle power to the drive.
e125		Fault	Fieldbus Version Mismatch	EtherCAT - the MicroBlaze version does not match the version specified by drive.	Make sure the correct version has been downloaded to the drive.
e126		Fault	ESI Version Mismatch	EtherCAT - the ESI version does not match the version specified by drive.	Make sure the correct version has been downloaded to the drive.

Code	Light	Type	Name	Description	Action Required
e127		Fault	Output Over-Current Detected	Over-current detected on one of the digital outputs. This fault disables the drive.	Verify correct wiring of the digital outputs. Make sure the output circuit is not shorted.
e129		Fault	Feedback Type Auto-Detection Failed	Feedback type auto-detection failed to identify the type of feedback device. This fault disables the drive.	Verify the connection. Manually configure the actual type of feedback.
e130		Fault	EnDat Excessive Resolution	EnDat high resolution feedback cannot be handled by the drive. This fault disables the drive.	
e131		Fault	MOTORNAME/MTP Data Mismatch	Drive may have been configured previously for another, different motor. This fault disables the drive.	Clear MOTORNAME and clear faults. Perform tuning with parameters for the connected motor.
F	Steady	Warning	Foldback	Drive fold current dropped below the drive fold current warning threshold (MIFOLDWTHRESH). Or, motor fold current dropped below the motor fold current warning threshold (IFOLDWTHRESH).	Check the drive-motor sizing. This warning can occur if the drive or the motor is under-sized (under-powered) for the application.
F1		Fault	Drive Foldback	Drive fold current dropped below the drive fold current fault threshold (MIFOLDFTHRESH).	Check motor-drive sizing. This fault can occur if the drive is under-sized (under-powered) for the application. Check that the commutation angle is correct (i.e., commutation is balanced). Check MIFOLDFTHRESH and MIFOLDWTHRESH values
F2		Fault	Motor Foldback	Motor fold current dropped below the motor fold current fault threshold. (IFOLDFTHRESH).	Check the drive-motor sizing. This fault can occur if the motor is under-sized (under-powered) for the application. Check IFOLDFTHRESH and IFOLDWTHRESH values.
F2H		Fault	Pulse Train Frequency Too High	The external pulse train frequency has exceeded the maximum specified input frequency.	Reduce the frequency of the gearing pulses commanded from the controller.
F3		Fault	Stall Fault	A stall fault occurred because the motor was in a stalled state for too long; that is, [I > MICONT] and [I > 0.9 ILIM] and [V < STALLVEL] for [time > STALLTIME].	Remove the stall condition, and take care to prevent stall conditions.
Fb1		Fault	Fieldbus – Target position exceeds velocity limit	A target position command from controller was rejected because it would cause the motor to exceed the velocity limit.	Enable the drive and send valid position commands.
Fb3		Fault	EtherCAT – Cable disconnected	The connection between controller and drive was removed.	Reestablish the connection between controller and drive.
Fb4		Fault	Fieldbus Target Command Lost	The fieldbus controller has not sent a target command in 3 consecutive instances.	Clear the fault and allow the controller to send new commands.

Code	Light	Type	Name	Description	Action Required
Fb7		Fault	CAN is in Bus-Off State	The drive has disconnected from the CAN bus due to communication errors, and is no longer sending/receiving communication packets.	Check CAN cabling, and verify the CAN network is functioning properly.
Fb8		Fault	EtherCAT Packet Loss	EtherCAT packets have been lost.	Make sure the EtherCAT master (controller) sends the packets within the time defined (by the master).
Fb9		Fault	Fieldbus - Drive Active but not in Operational State	Drive was enabled and in an operational state upon receiving a command to move to a lower state of communication.	Make sure the controller does not switch to a lower state of communication while the drive is enabled.
H	Flash	Fault	Motor Over-Temperature	Either the motor has overheated, or the drive is not set up correctly for the motor temperature sensor.	Check that the drive is configured properly (using THERMODE, THERMTYPE, THERMTHRESH and THERMTIME), and that the motor temperature sensor is properly connected to the drive if needed. If the drive is configured and wired properly, check whether the motor is under-sized for the application.
H	Steady	Warning	Motor Over-Temperature	Motor is overheated.	
J	Flash	Fault	Velocity Over-Speed Exceeded	Actual velocity exceeded 1.2 times the velocity limit. The velocity limit is set using VLIM.	Check that VLIM is set to match the application requirements. Using velocity loop tuning, check for excessive overshoot.
J1		Fault	Exceeded Maximum Position Error	The position error (PE) has exceeded the position error limit (PEMAX)	Change drive tuning to improve position tracking, or increase PEMAX to allow a greater position error.
J2		Fault	Exceeded Maximum Velocity Error	The velocity error (VE) has exceeded the velocity error limit (VEMAX)	Change drive tuning to improve velocity tracking, or increase VEMAX to allow a greater velocity error.
J3		Fault	Excessive PE Value	The position error (PE) has reached the software numerical limit.	Check tuning.
J4		Fault	Motor Runaway Condition Detected	The motor moves in negative direction although the commanded current is positive. Commutation is incorrect. (Algebraic signs of actual current, acceleration and velocity do not match.)	Correct MPHASE setting. Activate and improve the phase find process.
J5		Fault	Secondary Feedback Position Mismatch	Position deviation between motor and load is too great.	Increase SFBPETHRESH, SFBPETIME, SFBPEMAX, or improve position tuning.
L1		Warning	Hardware positive limit switch is open	Positive hardware limit switch is activated.	
L2		Warning	Hardware negative limit switch is open	Negative hardware limit switch is activated.	
L3		Warning	Hardware positive and negative limit switches are open	Positive and negative hardware limit switches are both activated.	

Code	Light	Type	Name	Description	Action Required
L4		Warning	Software positive limit switch is tripped	Positive software limit switch is activated. PFB > POSLIMPOS and POSLIMMODE = 1	
L5		Warning	Software negative limit switch is tripped	Negative software limit switch is activated. PFB < POSLIMNEG and POSLIMMODE = 1	
L6		Warning	Software limit switches are tripped	Positive and negative software limit switches are activated. PFB > POSLIMPOS and PFB < POSLIMNEG and POSLIMMODE = 1	
n	Flash	Fault	STO Fault	The STO signal is not connected when drive enabled.	Check that the STO connector (P1) is wired correctly.
n	Steady	Warning	STO	The STO signal is not connected when drive disabled.	Check that the STO connector (P1) is wired correctly.
n1		Fault	Regen Over- Current	The preset current limit for regen current has been exceeded.	Increase the value of the regen resistor.
n3		Fault	Emergency Stop Issued	The input defined as emergency stop has been activated.	Turn off the specific input.
n43		Fault	Invalid Gain Table Data	The condition LMJRGT1 < LMJRGT2 <LMJRGT3 has not been met.	Modify and correct the gain tables.
n45		Fault	Power Brake Fault	A fault occurred on the power brake.	Replace the motor brake.
o	Flash	Fault	Over-Voltage	The bus voltage exceeded the maximum value.	Check whether a regen resistor is required for the application.
o	Steady	Warning	Bus AC Supply Line Disconnected	At least one phase of the main power for the bus supply is not connected.	
o15		Fault	Plus 15V Out of Range	The internal +15 V supply is out of range.	The drive probably needs repair. Contact technical support.
o-15		Fault	Minus 15V Out of Range	The internal -15 V supply is out of range.	The drive probably needs repair. Contact technical support.
o5		Fault	5V Out of Range	5V is low or powering off.	May occur during power off. If occurs otherwise, contact technical support.
o6		Fault	Logic AC Power Failure	The main power for the logic supply is off.	No action required. This is a normal response when logic power is turned off.
o7		Fault	Bus AC Supply Line Disconnect	At least one phase of the main power for the bus supply is not connected.	Check the connection of the bus AC supply. Make sure the supply is on.
o8		Fault	Regen Resistor Overload	The regen resistor load exceeds its allowed power.	Check whether the regen resistor properties are suited to the application.
o9		Fault	Digital Output Over-Current	Over-current at the digital output has been detected. This fault disables the drive.	Check the digital output connections.

Code	Light	Type	Name	Description	Action Required
P		Fault	Over-Current	Over-current at the drive output has been detected. The drive allows this fault to occur up to 3 times in succession. After 3 faults, the drive forces a delay of 1 minute before it can be reenabled.	Check for a short circuit on the motor connection. Check for excessive overshoot in the current loop.
P2		Fault	Unstable Current Loop	An unexpected high current overshoot has been detected	Check and modify current controller settings.
P3		Fault	High IQ Current Detected	The detected IQ current is greater than 120% of ILIM. This fault disables the drive.	Check and modify current controller settings.
r	Steady	Warning	Offset and/or Gain Adjustment Values Detected After SININIT	Significant offset and/or gain adjustment values were detected after SININIT. The values that trigger this warning are half the value of those used to declare a fault. Although the system may continue to function, these values indicate the existence of a problem, which may worsen over time.	Check the encoder and associated hardware. These values suggest some degradation in either electronics (e.g., encoder, drive) or wiring (e.g., increased wire resistance, increased leakage between wires). The problem must be analyzed and repaired.
r10		Fault	Sine Feedback Communication Fail	Communication problem between the drive and EnDat/HIPERFACE encoder.	Check that the data and clock signals to the EnDat or HIPERFACE encoder are connected properly. The cable must be shielded.
r14		Fault	Sine Encoder Quadrature Fault	Mismatch between calculated and actual encoder quadrature information.	Check the feedback device wiring. Check that the correct encoder type (MENCTYPE) is selected.
r15		Fault	Sin/Cos Calibration Invalid	The sine/cosine calibration parameters are out of range. This fault is related to resolver and sine encoder feedback.	Re-execute the sine/cosine calibration process.
r16		Fault	Feedback 5V Over-Current	The current supplied by the drive on the 5V primary encoder supply has exceeded the preset current limit. The drive allows this fault to occur up to 3 times in succession. After 3 faults, the drive forces a delay of 1 minute before it can be reenabled.	The FLEXI PRO can source a maximum current of 250 mA to the primary encoder. Check for a short-circuit on the encoder. Check if the encoder is drawing more than the current limit.
r17		Fault	Secondary Feedback Index Break	Secondary encoder index line not connected.	Check whether the drive is configured for working with the index signal on the secondary encoder, and check if the index signal is connected.
r18		Fault	Secondary Feedback A/B Line Break	One of the secondary feedback signals is not connected.	Check that all signals from the secondary encoder are properly connected to the drive.
r19		Fault	Secondary Feedback 5V Over-Current	The preset current limit for current supplied by the drive on the 5 V secondary encoder supply has been exceeded.	The FLEXI PRO can source a maximum current of 250 mA to the secondary encoder. Check for a short-circuit at the encoder. Check if the encoder is drawing more than the current limit.

Code	Light	Type	Name	Description	Action Required
r20		Fault	Feedback Communication Error	Communication with the feedback device did not initialize correctly.	Check that the feedback device is wired correctly. Check that the correct encoder type (MENCTYPE) is selected.
r21		Fault	Nikon Encoder Operational Fault	Communication with the Nikon MAR-A40A feedback device did not initialize correctly.	Check that the feedback device is wired correctly. Check that the correct encoder type (MENCTYPE) is selected.
r23		Fault	Phase Find Failed	Commutation initialization has failed. This fault occurs in systems that do not have commutation information (e.g., Hall signals) in the motor feedback device.	Check whether the motor feedback type and the phase-finding parameters are set correctly for the application.
r24		Fault	Tamagawa Init Failed	The initialization process with the Tamagawa feedback device has failed.	Check that the wiring to the encoder is correct.
r25		Fault	Pulse & Direction Input Line Break	One of the Pulse & Direction signals is not connected.	Check that all signals to the P&D inputs are properly connected to the drive.
r26		Fault	Tamagawa Abs Operational Fault	Several faults are indicated by the feedback device and include one or more of the following: battery low/error, over-speed, counting error, multi-turn error	Check the battery voltage and feedback wiring. Make sure the motor did not move at a high velocity during encoder initialization.
r27		Fault	Motor Phases Disconnected	One of the motor phases is disconnected. The current of one of the motor phases is effectively zero for more than 160 electrical degrees while the current command is greater than 100.	Check the wiring of the motor phases.
r28		Fault	Resolver Initialization Failed	The drive could not detect the proper gain setting or sampling point for the sine/cosine signals.	Check resolver wiring and gain value.
r29		Fault	Absolute Encoder Battery Low-Voltage	An error bit indicating a battery problem was detected in data from the drive.	Replace battery, then reset drive. If battery is replaced while drive is on, position information is retained.
r32		Fault	Endat2X Feedback Fault	CRC error occurred while drive was communicating with EnDat encoder. Also caused by EnDat encoder setting Alarm bit/s to indicate an encoder problem. This fault disables the drive.	Reset the encoder including encoder power off.
r33		Fault	Custom Absolute Encoder Internal Faults	Several possible issues are indicated by this feedback device fault: battery low or error; over-speed; counting error; multiturn error.	Check the battery voltage and feedback wiring. Make sure the motor did not move at a high velocity during encoder initialization.
r34		Fault	PFB Off Checksum Invalid	The calculated checksum of the PFB backup data does not match the expected checksum.	If required by the application, home the machine.
r35		Fault	PFB Off Data Mismatch	Multi-turn data of the PFB cannot be restored due to axis movement.	If required by the application, home the machine.
r36		Fault	No PFB Off Data	PFB backup memory is empty.	If required by the application, home the machine.

Code	Light	Type	Name	Description	Action Required
r37		Fault	Encoder Phase Error	In normal incremental encoder operation, quadrature inputs A and B are 90 degrees out of phase. The phase error occurs when edge transition is detected simultaneously on the A and B signals.	Set MENCAQBFILT to 0 to remove the filter on A and B signals. If problem persists, it may be due to a faulty encoder.
r38		Fault	Differential Halls Line Break	Line break in differential Hall sensors.	Make sure HALLSTYPE matches the Hall sensors in use (single-ended or differential). Check whether all signals from the differential Hall sensors are properly connected to the drive.
r39		Fault	AqB Commutation Fault	Loss of commutation/encoder counts for AqB encoder. The index signal serves as a reference position for detecting loss of commutation/pulses. The AqB encoder counter is compared at different index positions. Between index position captures the count must be exactly MENCRESx4 (or 0 counts if moved back to same index location).	If a fault occurs shortly after motion begins, check MENCRES settings. If a fault occurs after some time it is likely due to EMI noise. Improve the installation. Make sure ground is connected. Make sure shield is connected on feedback and motor cables.
r4		Fault	A/B Line Break	One of the primary feedback signals is not connected. This fault occurs in incremental encoder, resolver and sine encoder feedback types.	Check whether all signals from the primary feedback device are properly connected to the drive.
r40		Fault	ServoSense Encoder Fault	The drive has detected an internal fault on the ServoSense encoder through communication.	Use command SRVSNSINFO to identify the fault.
r41		Fault	Sankyo Absolute Encoder Fault	One or more faults are indicated by the feedback device, including: battery low or error, over-speed, counting error, multi-turn error.	Check the battery voltage and feedback wiring. Make sure the motor did not move at a high velocity during encoder initialization.
r42		Fault	BiSS-C Encoder Indicates Internal Fault	This fault disables the drive.	Refer to the BiSS-C encoder manufacturer specific documentation.
r43		Fault	HIPERFACE Data Error	This fault disables the drive.	Enter the command HSAVE 1.
r5		Fault	Index Line Break	Encoder index line is not connected.	Check that the drive is configured for working with the index signal (using MENCTYPE), and check if the index signal is connected.
r6		Fault	Invalid Halls	The drive has detected either 000 or 111 state on the Hall feedback signals.	Check that the Hall signals are all properly connected. While turning the motor, read the Halls state (using HALLS) to see which signal is not connected. If the feedback type is Tamagawa, check that the feedback wiring is correct

Code	Light	Type	Name	Description	Action Required
r8		Fault	A/B Out of Range	Feedback analog signal is out of range. This fault is related to resolver and sine encoder feedback. The drive checks that the amplitudes of the sine and cosine signals are correct, based on the calculation sin2 + cos2 = 1	Check the amplitudes of the sine and cosine signals.
r9		Fault	Encoder Simul Frequency Too High	The computed equivalent encoder output frequency exceeds the upper limit for this signal, which is 4 MHz.	Check the parameters used for setting up the equivalent encoder output. If using a sine encoder, check the ENCOUTRES parameter settings.
S1		Warning	Cannot Use SFBTYPE 1 with Analog OPMODE	Cannot use the specified type of secondary feedback with analog operation modes (i.e., OPMODE 1, OPMODE 3)	
t	Steady	Warning	Over-Temperature	The temperature on the power board and/or on the control board and/or the power module (IPM) has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t1		Fault	Power Stage Over-Temperature	The temperature on the power board has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t2		Fault	Power Module Over-Temperature	The temperature inside the integrated power module has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t3		Fault	Control Board Over-Temperature	The temperature on the control board has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t4		Fault	Temperature Sensor Failure	Temperature sensor malfunction.	Cycle power. If problem persists, contact technical support.
u	Flash	Fault	Under-Voltage	The bus voltage is below the minimum value.	Check that the main AC voltage supply is connected to the drive and is switched on. The under-voltage limit can be read with the UVTHRESH command.
u	Steady	Warning	Under-Voltage	The bus voltage is below the minimum value.	Check that the main AC voltage supply is connected to the drive and is switched on. Verify that the setting of UVMODE is correct.

FLEXI PRO Servo Drive
Quick Start Guide

SEE IT BEFORE IT HAPPENS

MOTOR POWER COMPANY

Motor Power Company s.r.l.
Via Leonardo Da Vinci , 4
42024 Castelnovo Sotto
Reggio Emilia - Italia
Tel: +39 0522 682710
Fax: +39 0522 683552
info@motorpowerco.it
www.motorpowerco.com