

SIEMENS

Siemens BT300 Application Guide

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TO THE READER

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Chapter 1 - Introduction

Overview

This document explains the details of configuring and wiring the Siemens BT300 HVAC Drive with the most commonly used applications. This is a “living” document. As more use cases are experienced over time, this document will grow to include more of these applications.

Chapter 2, Default Operation, describes the operation of the Siemens BT300 HVAC Drive as it comes from the factory. Once the specific motor data has been entered into the drive parameters, the drive is ready to function.

Chapter 3, Applications, describes several of the most common configurations where the Siemens BT300 HVAC Drive is used. Each application contains four parts:

- **Title** - a description of the scenario where the drive will be used.
- **Sequence of Operation** – important key features included in the application and how they may interact.
- **Parameter Changes** – parameter changes required to cause the drive to operate according to the sequence of operation.
- **Wiring Diagram** – a block wiring diagram of the input and output devices required to cause the drive to operate according to the sequence of operation.

Obviously, the applications presented in this document are not all of the possible scenarios in which the drive can be used. If your configuration requires a different combination or features than what is presented in these applications, feel free to use only the features that are required or to mix the features between applications as needed.

Related Documentation

It is important to become familiar with the following documents when working with the Siemens BT300 HVAC Drive:

- Siemens BT300 HVAC Drive Installation Instructions (DPD01148)
- Siemens BT300 HVAC Drive Application Manual (DPD01149)
- Siemens BT300 I/O Option Board Type “B” User Manual (DPD01158)

For additional information on the products and applications, refer to the following:

- On the intranet (Siemens employees only) at <https://workspace.sbt.siemens.com/content/00001123/default.aspx>
- From the Siemens branch office near you www.siemens.com/sbt or from your system supplier

Part Numbers and Frame Sizes

Example Product Numbers	(1)	B T 3 0 0 - 0 0 1 X 2 - 0 1 X
	(2)	B T 3 0 0 - 0 0 1 5 4 - 1 2 D L
Model		
BT300	VFD only	
Separator		
HP		
	1, 1.5, 2, 3, 5, 7.5, 10, 15 20, 25, 30, 40, 50, 60, 75 100, 125, 150, 200, 250	
	X	No fraction HP
	5	1/2 HP
Voltage		
	2	200 to 240
	4	380 to 480
Separator		
NEMA Enclosure		
	01	Type 1
	12	Type 12
Type		
	X	Drive only
	D	Integral Disconnect Switch (available in Type 12 only)
Options		
	L	LON card installed

Example (1) = 1 HP, 208V Drive in Type 1 enclosure
 (2) = 1.5 HP, 480V Drive in Type 12 enclosure with an integral disconnect switch and LON card.

Frame Sizes and Power Ranges (BT300 Type 1 and Type 12)

Voltage	KW HP	0.75	1.1	1.5	2.2	4	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	
		1	1.5	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200	250	
208V	Frame Size	4				5			6		7			8			9					
480V	Frame Size	4				5			6			7			8		9					

Getting Help

For more information about the Siemens BT300 HVAC Drive operations or for troubleshooting assistance, please contact your local Siemens Industry representative.

Where to Send Comments

Your feedback is important to us. If you have comments about this manual, please submit them to: SBT_technical.editor.us.sbt@siemens.com

Chapter 2 - Default Operation

Sequence of Operation

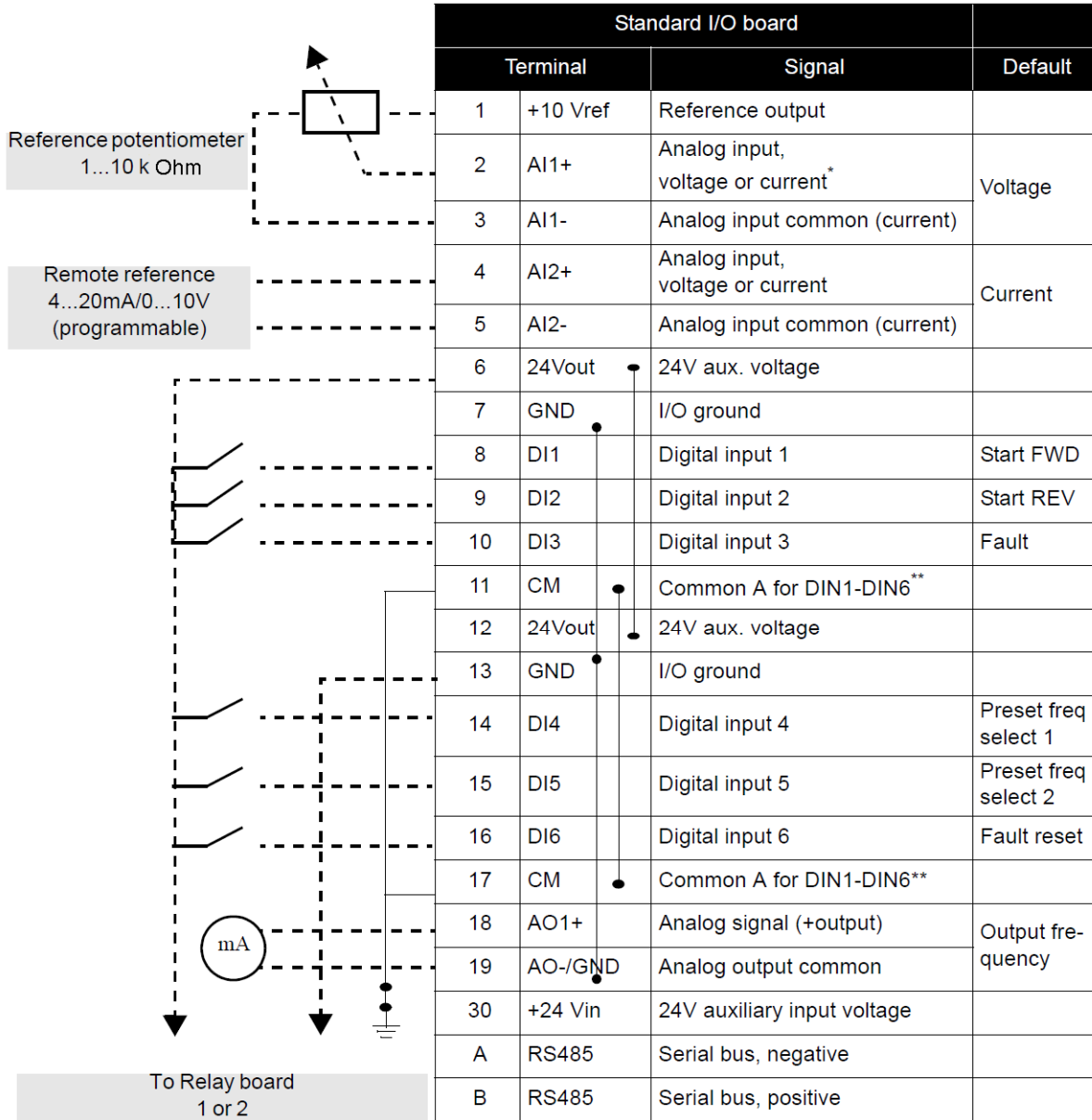
1. Run/Stop command comes from Digital Input 1 (Forward) or Digital Input 2 (Reverse). When DI1 is ON, the motor starts and runs forward. When DI2 is ON, the motor starts and runs in reverse. If both DIs are turned On, the first DI which turns ON controls the motor. The second DI to turn ON has no effect until the first turns OFF. Then the motor spins in the other direction.
2. Motor speed is controlled using Analog Input 1 (0 to 10 Vdc) and/or Analog Input 1 (4-20 mA) (AI1 + AI2).
3. Motor Operating activates Digital Output 1.
4. Faults activate Digital Output 2.

Parameter Changes

Part. No.	Value	Parameter Function	Function Selection	Document Reference (DPD01149)
P6.5.1	OK	Reset Factory Defaults		Sect. 2.2.6.1
	Yes	Startup Wizard	Enter appropriate data	Sect. 1.1
M1		Quick Setup	Enter appropriate motor data	Sect. 3.3
Default I/O Parameter settings				
P3.5.1.1	DigIN SlotA.1	Ctrl Signal 1 A	DI1 Default Function	Sect. 3.5.7.1
P3.5.1.2	DigIN SlotA.2	Ctrl Signal 2 A	DI2 Default Function	Sect. 3.5.7.1
P3.5.1.7	DigIN SlotA.3	Ext Fault Close	DI3 Default Function	Sect. 3.5.7.1
P3.5.1.15	DigIN SlotA.4	Preset Freq Sel0	DI4 Default Function	Sect. 3.5.7.1
P3.5.1.16	DigIN SlotA.5	Preset Freq Sel1	DI5 Default Function	Sect. 3.5.7.1
P3.5.1.9	DigIN SlotA.6	Fault Reset Close	DI6 Default Function	Sect. 3.5.7.1
P3.5.2.1	AnIN SlotA.1	AI1 Signal Sel	AI1 Default location	Sect. 3.5.7.2
P3.5.2.3	0-10v/0-20 mA	AI1 Signal Range	AI1 Default Range (0-10V)*	Sect. 3.5.7.2
P3.5.2.7	AnIN SlotA.2	AI2 Signal Sel	AI2 Default location	Sect. 3.5.7.2
P3.5.2.9	2-10v/4-20 mA	AI2 Signal Range	AI1 Default Range (4-20 mA)*	Sect. 3.5.7.2
P3.5.3.2.1	Run	RO1 Function	DO1 Default Function	Sect. 3.5.7.3
P3.5.3.2.4	Fault	RO2 Function	DO2 Default Function	Sect. 3.5.7.3
P3.5.3.2.7	Ready	RO3 Function	DO3 Default Function	Sect. 3.5.7.3
P3.5.4.1.1	O/P Freq	AO1 Function	AO1 Default Function	Sect. 3.5.7.5
P3.5.4.1.3	0 mA/0V	AO1 Min Signal	AO1 Default Range (0-20 mA)*	Sect. 3.5.7.5

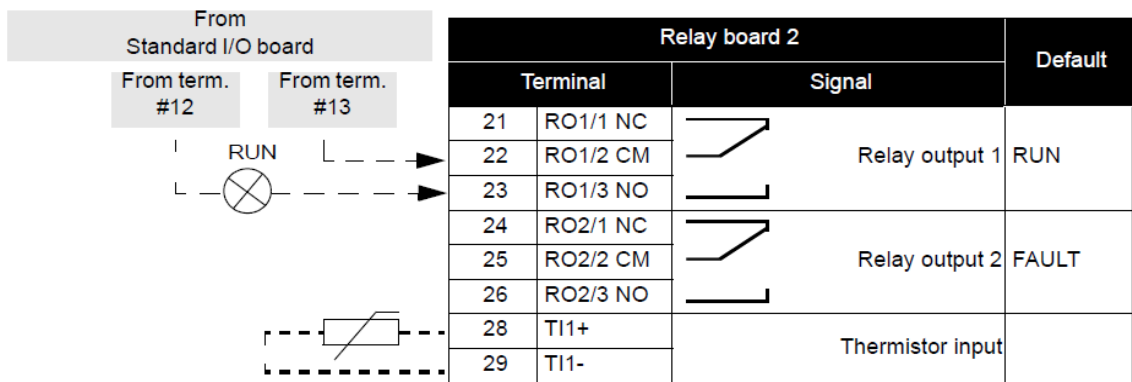
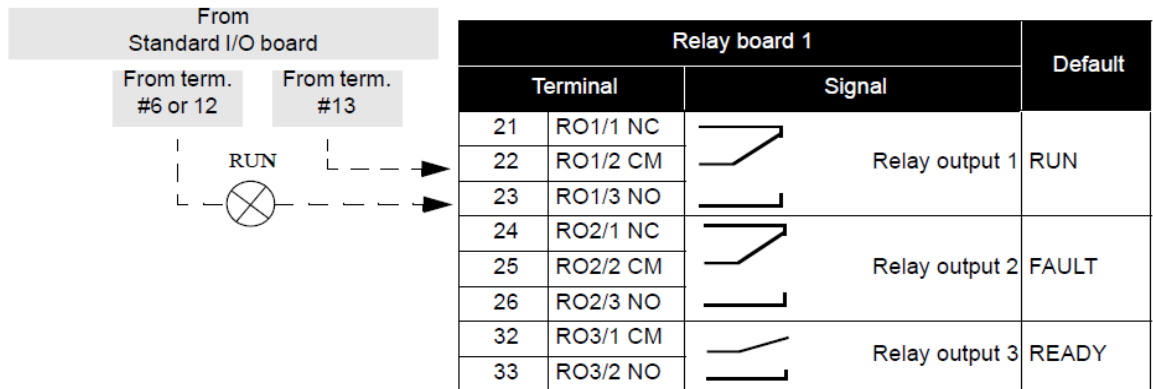
* - Switch settings on controller board determine physical input or output type (Voltage or Current).

Wiring Diagram



* Selectable with DIP switches, see Siemens BT300 Installation Manual

** Digital inputs can be isolated from ground. See Installation Manual.



Default Operation

Chapter 3 - Applications

Application 1 - Cooling Tower Fan - Passive Input and Sleep Mode

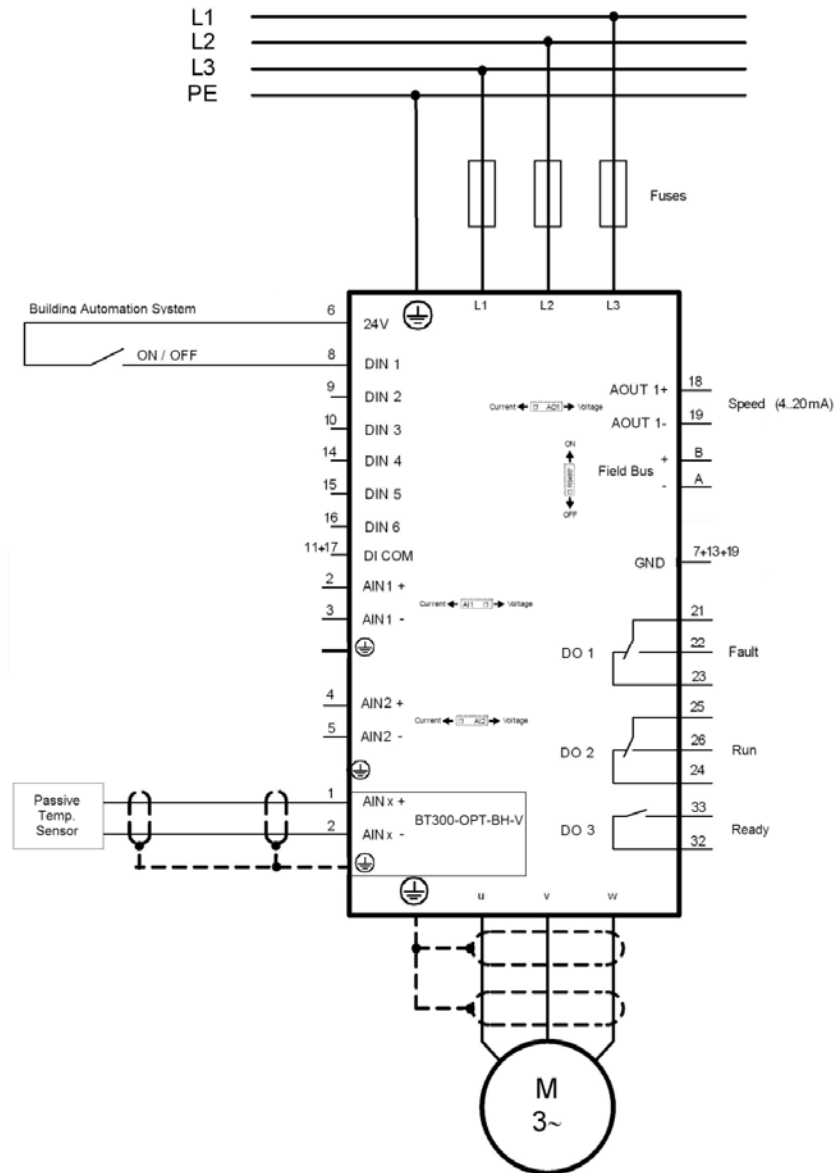
Sequence of Operation

1. Fan Application.
2. Run/Stop command comes from Digital Input 1.
3. Automatic Reset is active.
4. A PID loop is used to control the speed of the motor based on water temperature.
5. The PID loop feedback is from Analog Input 3 (passive temperature sensor).
6. The PID loop setpoint is adjustable from field bus (deg F).
7. Sleep mode is activated when appropriate.
8. Flying Start feature is active.
9. Motor Operating activates Digital Output 1 (default).
10. Fault activates Digital Output 2 (default).

Parameter Changes

Part. No.	Value	Parameter Function	Function Selection	Document Reference (DPD01149)
P6.5.1	OK	Reset Factory Defaults		Sect. 2.2.6.1
	Yes	Startup Wizard	Enter appropriate data	Sect. 1.1
M1		Quick Setup	Enter appropriate motor data	Sect. 3.3
P1.16	Enable	Automatic Reset		Sect. 3.5.12
P1.17	Activate	PID Mini-Wizard	Enter appropriate data	Sect. 1.2
P1.17	Yes	Sleep Function	Enter appropriate data	Sect. 3.5.14.2
P3.2.4	Flying Start	Start Function	Flying Start enabled	Sect. 3.5.4
P3.5.2.13	AnIn SlotX.1	A13 Signal Sel	Option board required (Slot) X = D or E	Sect. 3.5.1.2 and 3.5.7.1

Wiring Diagram



Application 1 - Cooling Tower Fan - Passive Input and Sleep Mode,

Application 2 - Cooling Tower De-Icing Mode

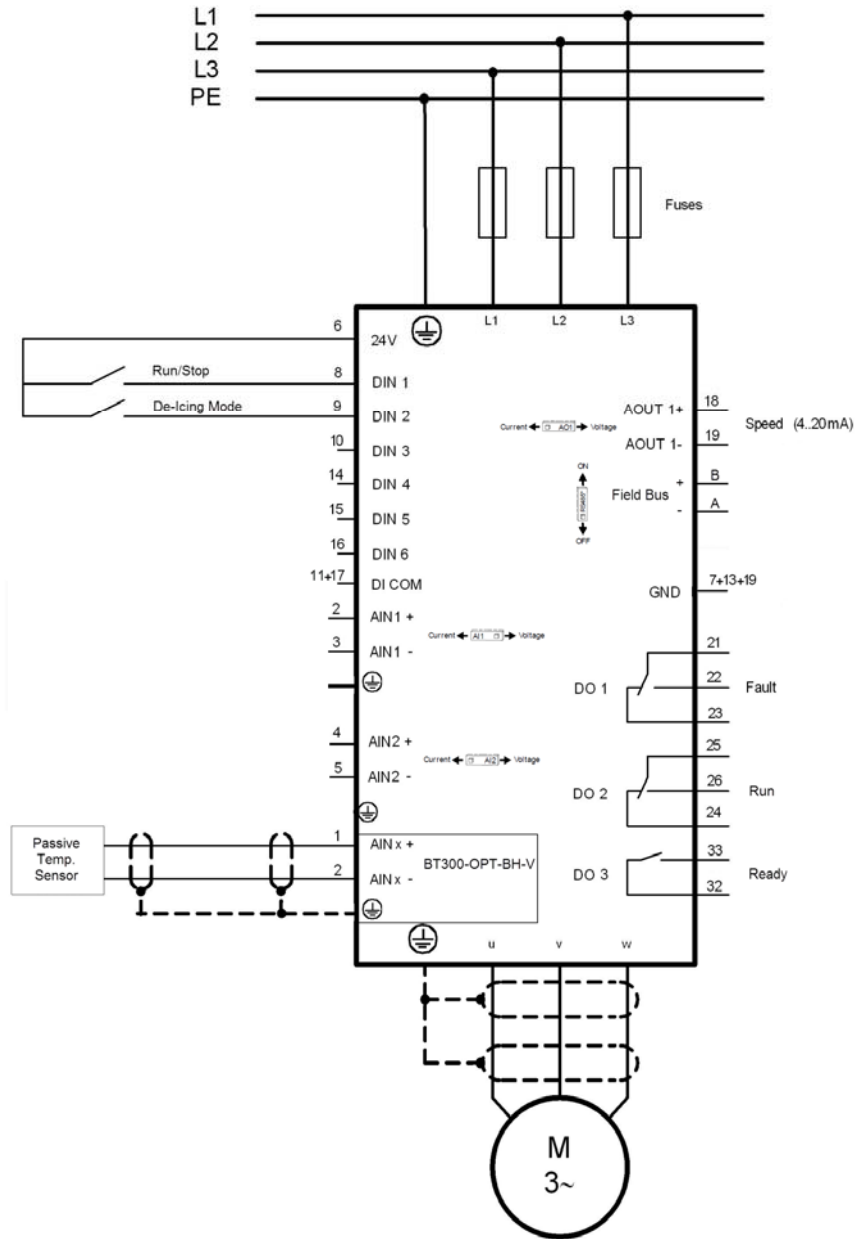
Sequence of Operation

1. Fan Application.
2. The De-Icing mode application requires a standard Run/Stop and speed reference using the terminal input or field bus when De-Icing mode is disabled (not discussed here). De-Icing mode activation causes the following changes to the drive's operation:
 - a. The De-Icing mode is activated at any time using Digital Input 2 closure.
 - b. Upon activation, a reverse command is issued to spin the motor backwards.
 - c. A Run command is issued to start the motor. This overrides the standard Run/Stop command being supplied by any other digital input or field bus.
 - d. The motor runs at a pre-defined speed.
 - e. The De-Icing mode is de-activated at any time using Digital Input 2 opening.

Parameter Changes (assuming Application 1 is already applied)

Part. No.	Value	Parameter Function	Function Selection	Document Reference (DPD01149)
P3.5.1.2	DigIn Slot0.1	Ctrl Signal 2 A	Remove DIN2 default	Sect. 3.5.1.2 and 3.5.7.1
P3.5.1.4	DigIn SlotA.2	Ctrl Signal 2 B	DIN2 Run Rev. Ctrl B	Sect. 3.5.1.2 and 3.5.7.1
P3.5.1.5	DigIn SlotA.2	I/O Ctrl Force	DIN2 force Ctrl B	Sect. 3.5.1.2 and 3.5.7.1
P3.3.4	PresetFreq0	I/O B Ctrl Ref B	PresetFreq0 is speed ref B	Sect. 3.5.5
P3.3.11	30 (or desired)	Preset Freq 0	Fixed speed as desired	Sect. 3.5.5

Wiring Diagram



Application 2 - Cooling Tower De-Icing Mode.

Application 3 - Stairway Pressurization with Fire Mode (24/7 Operation)

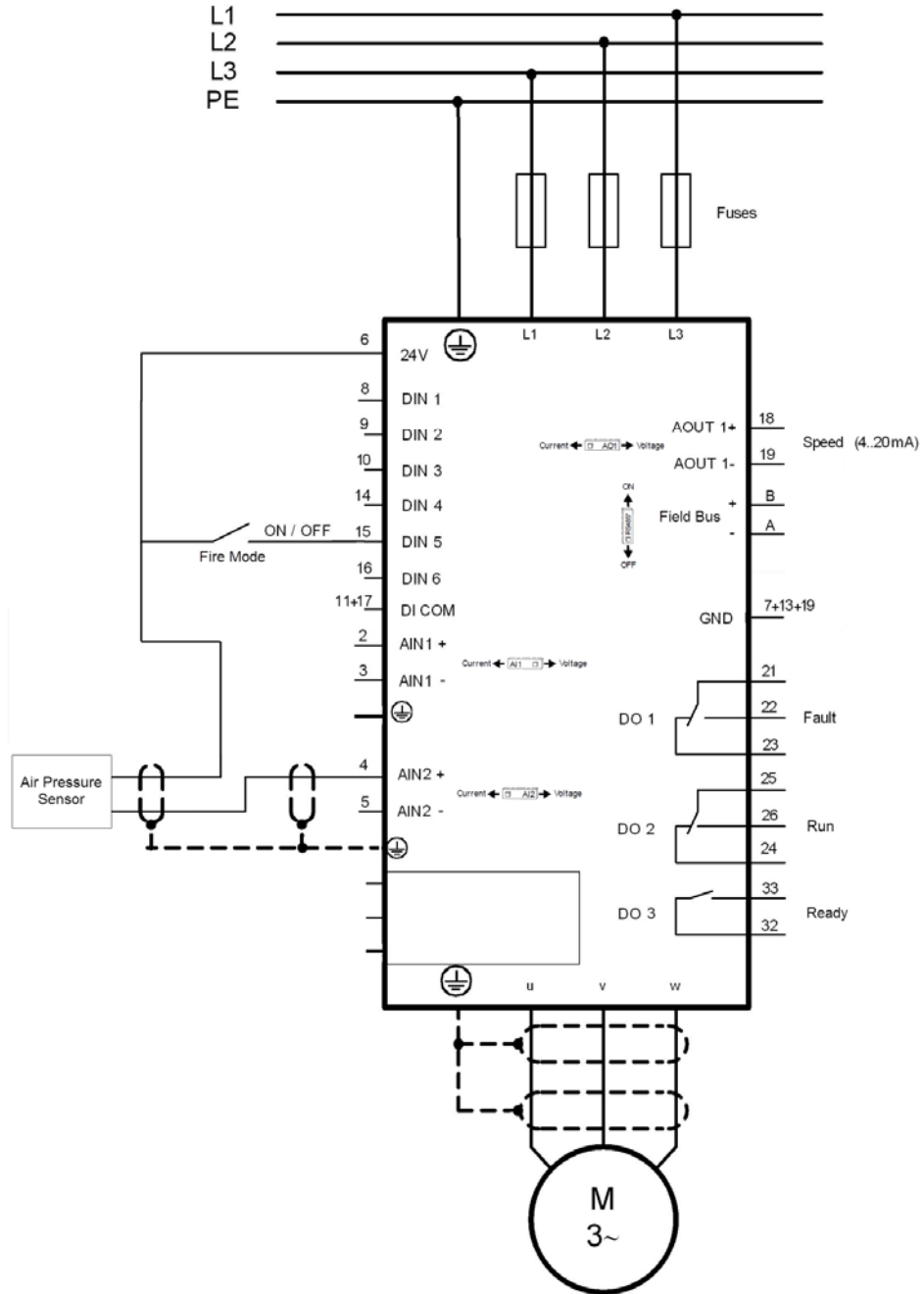
Sequence of Operation

1. Fan Application.
2. Automatic Reset is active.
3. Fire Mode is activated by Digital Input 5 and run at a fixed speed.
4. A PID loop controls the speed of the motor based on air pressure.
5. The PID loop feedback is from Analog Input 2 (4 to 20 mA - air pressure sensor).
6. The PID loop setpoint is fixed (in. wg).
7. Flying Start feature is active.
8. Motor Operating activates Digital Output 1 (default).
9. Fault activates Digital Output 2 (default).

Parameter Changes

Part. No.	Value	Parameter Function	Function Selection	Document Reference (DPD01149)
P6.5.1	OK	Reset Factory Defaults		Sect. 2.2.6.1
	Yes	Startup Wizard	Enter appropriate data	Sect. 1.1
M1		Quick Setup	Enter appropriate motor data	Sect. 3.3
P1.16	Enable	Automatic Reset		Sect. 3.5.12
P1.17	Activate	PID Mini-Wizard	Enter appropriate data	Sect. 1.2
P1.20	Activate	Fire Mode Wizard	Enter appropriate data	Sect. 3.5.17
P3.2.4	Flying Start	Start Function	Flying Start enabled	Sect. 3.5.4
P3.5.1.16	DigIn Slot0.1	Preset Freq Sel1	Remove default of DIN5	Sect. 3.5.1.2 and 3.5.7.1
P3.5.1.1	DigIn Slot0.2	Ctrl Signal 1 A	Run signal always ON	Sect. 3.5.1.2 and 3.5.7.1

Wiring Diagram



Application 3 - Stairway Pressurization with Fire Mode (24/7 Operation).

Application 4 - Pressure Controlled Fan and Fire Mode

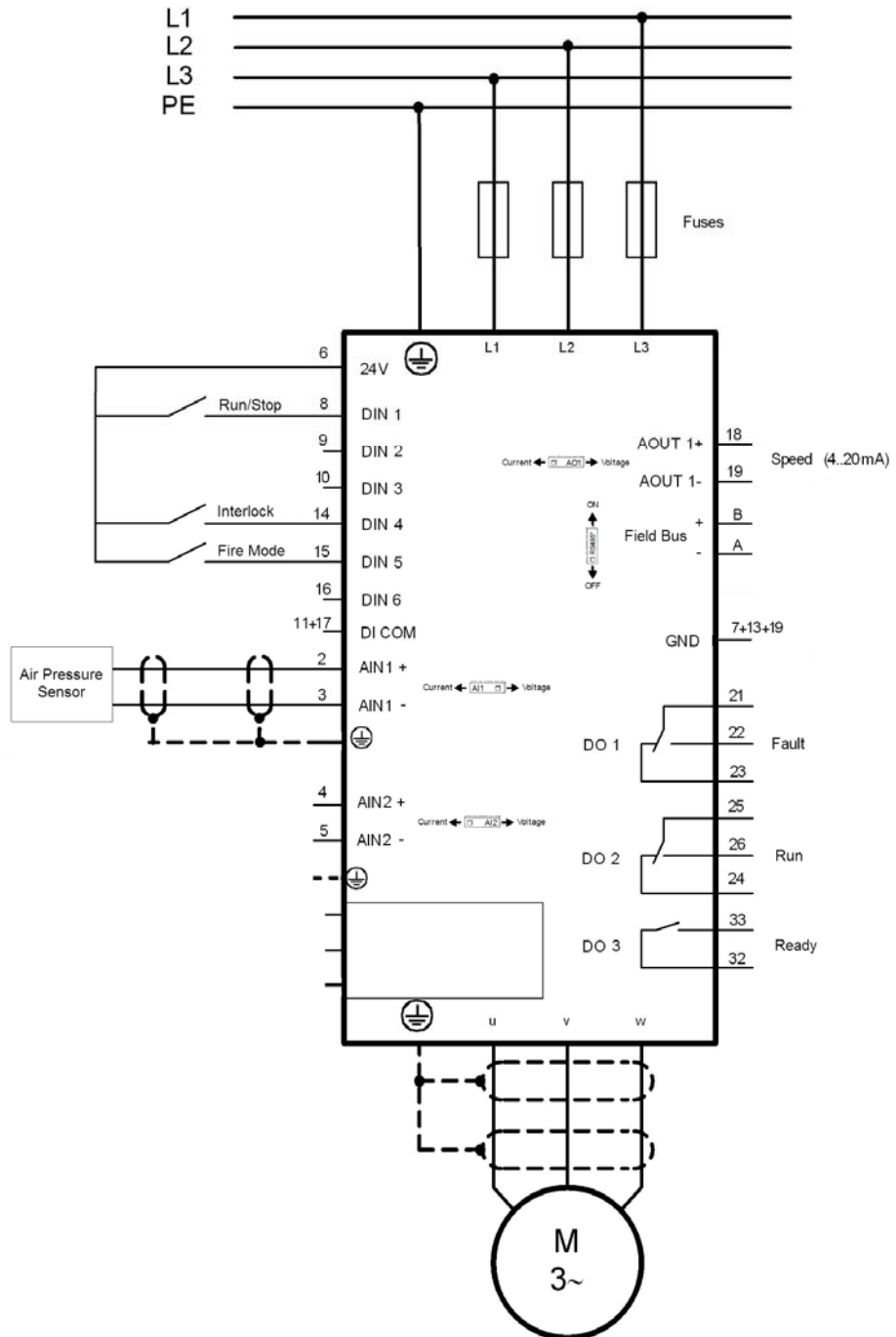
Sequence of Operation

1. Fan Application.
2. Run/Stop command comes from Digital Input 1.
3. Automatic Fault Reset is active.
4. Damper End-Switch Interlock is active on Digital Input 4 before motor may start running.
5. A PID loop controls the speed of the motor based on air pressure.
6. The PID loop feedback is from Analog Input 1 (0 to 10V - air pressure sensor).
7. The PID loop setpoint is fixed (in. wg).
8. Fire Mode is activated by Digital Input 5 and run at a fixed speed.
9. Flying Start feature is active.
10. Motor Operating activates Digital Output 1.
11. Faults activate Digital Output 2.

Parameter Changes

Part. No.	Value	Parameter Function	Function Selection	Document Reference (DPD01149)
P6.5.1	OK	Reset Factory Defaults		Sect. 2.2.6.1
	Yes	Startup Wizard	Enter appropriate data	Sect. 1.1
M1		Quick Setup	Enter appropriate motor data	Sect. 3.3
P1.16	Enable	Automatic Reset		Sect. 3.5.12
P1.17	Activate	PID Mini-Wizard	Enter appropriate data	Sect. 1.2
P1.20	Activate	Fire Mode Wizard	Enter appropriate data	Sect. 3.5.17
P3.2.4	Flying Start	Start Function	Flying Start enabled	Sect. 3.5.4
P3.5.1.15	DigIn Slot0.1	Preset Freq Sel0	Remove default of DIN4	Sect. 3.5.1.2 and 3.5.7.1
P3.5.1.16	DigIn Slot0.1	Preset Freq Sel1	Remove default of DIN5	Sect. 3.5.1.2 and 3.5.7.1
P3.5.1.12	DigIn SlotA.4	Run Interlock 1	Damper interlock on DIN4	Sect. 3.5.1.2 and 3.5.7.1

Wiring Diagram



Application 4 - Pressure Controlled Fan and Fire Mode.

Application 5 - Pump Delta P Control

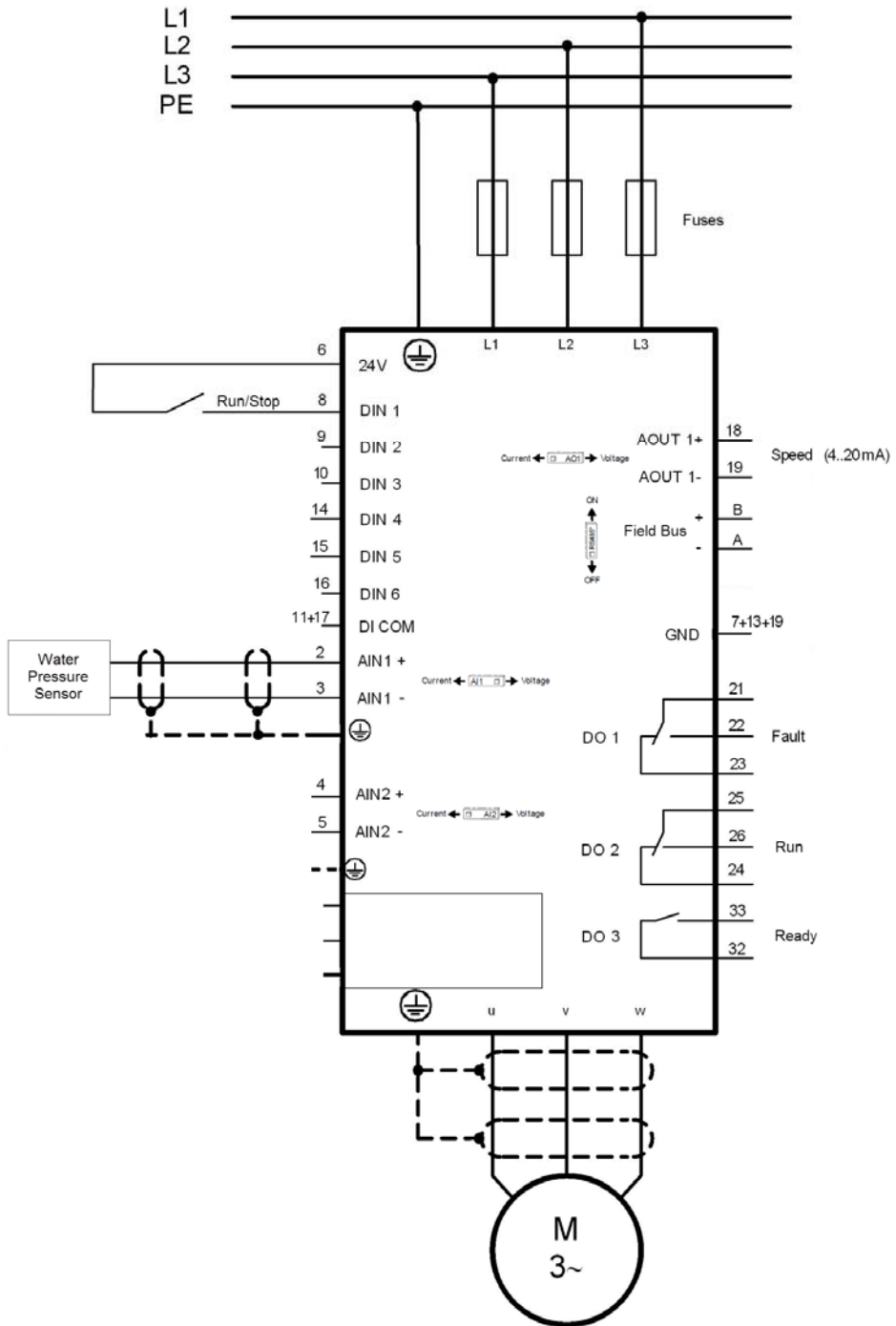
Sequence of Operation

1. Pump Application.
2. Run/Stop command is from Digital Input 1.
3. Automatic Fault Reset is active.
4. A PID loop controls the speed of the motor based on water pressure across the pump.
5. The PID loop feedback is from Analog Input 1 (0 to 10V - water pressure sensor).
6. The PID loop setpoint is fixed (PSI).
7. Flying Start feature is active.
8. Motor Operating activates Digital Output 1.
9. Faults activate Digital Output 2.

Parameter Changes

Part. No.	Value	Parameter Function	Function Selection	Document Reference (DPD01149)
P6.5.1	OK	Reset Factory Defaults		Sect. 2.2.6.1
	Yes	Startup Wizard	Enter appropriate data	Sect. 1.1
M1		Quick Setup	Enter appropriate motor data	Sect. 3.3
P1.16	Enable	Automatic Reset		Sect. 3.5.12
P1.17	Activate	PID Mini-Wizard	Enter appropriate data	Sect. 1.2
P3.2.4	Flying Start	Start Function	Flying Start enabled	Sect. 3.5.4

Wiring Diagram



Application 5 - Pump Delta P Control.