0474-0001-02

EMERSON
Industrial Automation

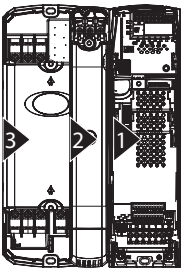


AFFINITY
Building Automation Drive
Pocket Start Up

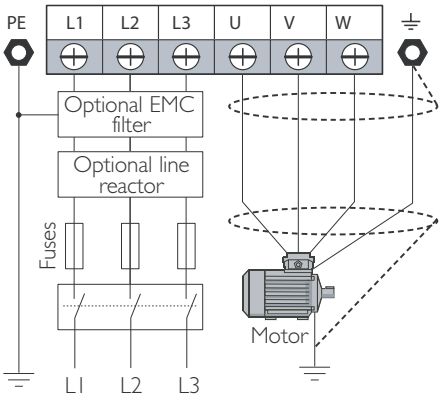
CONTROL TECHNIQUES
www.emersonct.com

WARNING: This is a brief guide only. It does not give safety information. Incorrect installation or operation of the drive could cause personal injury or equipment damage. Refer to **AFFINITY** User Guide for essential safety information.

POWER WIRING SIZES 1 TO 3



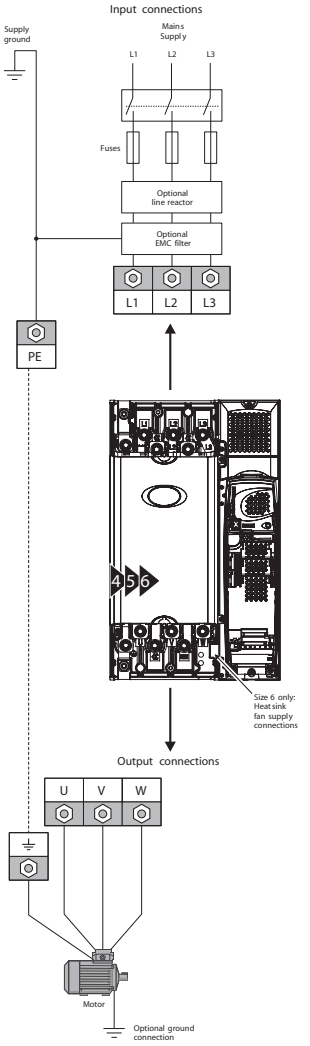
AC Connections



WARNING: For complete wiring and fusing instructions refer to the **AFFINITY** User Guide

*Thermal overload for external braking resistor to protect against fire risk. This must be wired to interrupt the AC supply in the event of a fault.

POWER WIRING SIZES 4 TO 6

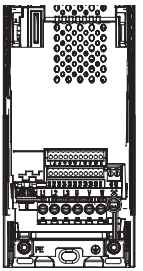


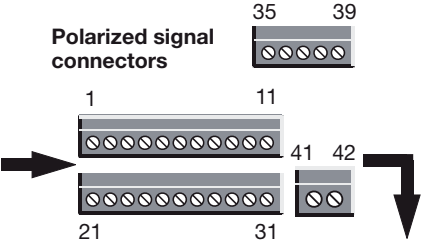
CONTROL WIRING

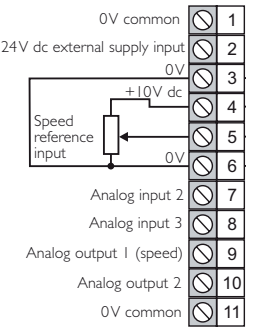
The **AFFINITY** default control mode is Auto

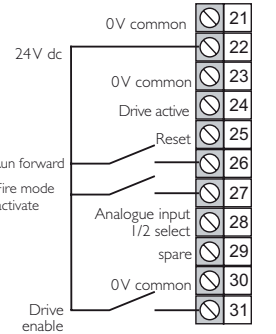
Terminal strips

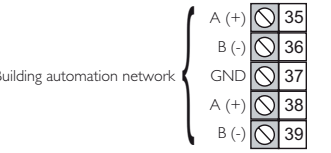
Default terminal functions. Digital I/O can be reconfigured using menu 8.

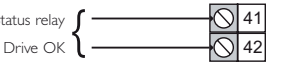












KEYPAD & DISPLAY



Upper Line
Displays the parameter number or drive status on the left, and parameter value or trip code on the right

Control Buttons
Auto (blue) button
Off/reset (red) button
Hand (green) button

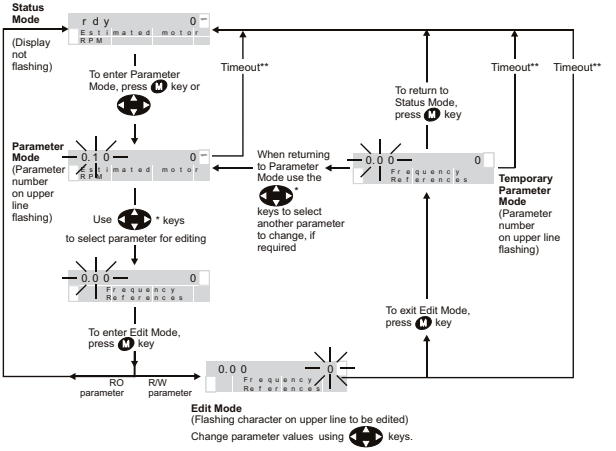
Lower Lines
Displays the parameter name or help text

Mode (black) Button
Changes between parameter edit and monitor mode

Help Button
Displays text briefly describing the selected parameter

Joypad
Used to select a parameter and change its value

Display modes



Reset to factory defaults

Enter the appropriate value shown below into Pr **0.00** and then press the button.

Display	Function
1233	Resets parameters to 50Hz supply default
1244	Resets parameters to 60Hz supply default

OPEN LOOP START-UP

The **AFFINITY** default operating mode is Open Loop.
The **AFFINITY** default control mode is Auto.
See Control Wiring diagram for default connections.

Before power-up

Ensure:

- The drive enable signal is open (terminal 31)
- Motor is connected

Power-up the drive

Ensure:

- Drive displays 'inh'

If the drive trips, see Trip Codes.

Enter motor nameplate details

Enter:

- Motor rated frequency in Pr **0.47** (Hz)
- Motor rated current in Pr **0.46** (A)
- Motor rated speed in Pr **0.45** (rpm)
- Motor rated voltage in Pr **0.44** (V)

Set maximum frequency

Enter:

- Maximum frequency in Pr **0.02** (Hz)

Set acceleration/deceleration rates

Enter:

- Acceleration rate in Pr **0.03** (seconds/100Hz)
- Deceleration rate in Pr **0.04** (seconds/100Hz)

OPEN LOOP START-UP CONTINUED

Autotune (optional)

AFFINITY is able to perform either a stationary or a rotating autotune. The motor must be at a standstill before an autotune is enabled. A rotating autotune should be used whenever possible.



WARNING: A rotating autotune will cause the motor to accelerate up to 2/3 base speed in the direction selected regardless of the reference provided. Once complete the motor will coast to a stop. The enable signal must be opened before the drive can be made to run at the required reference. The drive can be stopped at any time by removing the drive enable.

- A stationary autotune can be used when the motor is loaded and it is not possible to remove the load from the motor shaft. A stationary autotune does not measure the power factor of the motor so the value on the name plate must be entered into Pr **0.43**.
- A rotating autotune should only be used if the motor is unloaded or the load is uncoupled.

To perform an autotune

- Set Pr **0.40** = 1 for a stationary autotune or set Pr **0.40** = 2 for a rotating autotune.
- Close the enable signal (terminal 31). The drive will display 'rdY'.
- Press the green Hand button. The lower display will flash 'Autotune in progress' while the drive is performing the autotune.
- Wait for the drive to display 'inh' and for the motor to come to a standstill.

Open the enable signal from the drive.

Run

- Drive is now ready to run.
- Close the enable signal (terminal 31).
- Press the green Hand button to start the motor.
- Press the up arrow button on the joypad to increase the speed.
- Press the down arrow button on the joypad to decrease the speed.
- Press the red Off/reset button to stop the motor.

Auto

- Close the enable signal (terminal 31).
- Press the blue Auto button.
- Close the run forward signal (terminal 26).
- The drive will now run under the control of the reference signal (terminal 5).
- Open the run forward signal to stop the motor.

DISPLAY MESSAGES

Status messages

dEC	Decelerating. The drive is decelerating the motor.
inh	Inhibit. The drive is inhibited and cannot be run. The drive enable signal is open on terminal 31 or Pr **6.15** is set to 0.
rdY	Ready. The drive is ready to be run in auto.
StoP	Stop or holding zero speed. The drive is holding zero speed.
triP	Trip condition. The drive has tripped and is no longer controlling the motor. The trip code appears on the upper display.
OVLd	Motor overload alarm. If the load is not reduced an It.AC trip will occur.
Hand	Drive is runing in Hand.
Auto	Drive is runing in Auto.
Off	Drive is Off.
Heat	Motor pre-heat is active.

Trip codes

Et	External trip
It. AC	Motor overload
OI.AC	Instantaneous overcurrent
OU	Overvoltage
PH	Input power phase loss
th	Motor overtemp or thermistor open circuit
UU	Undervoltage

For other status messages and trip codes please refer to User Guide.

BASIC PARAMETERS (MENU 0)

OPEN LOOP (refer to the User Guide for RFC mode)

Parameter			Range(⇳)	Default(⇨)
0.00	**xx.00**	{**x.00**}	0 to 32,767	0
0.01	Minimum reference clamp	{**1.07**}	±3,000.0Hz	0.0
0.02	Maximum reference clamp	{**1.06**}	0 to 3,000.0Hz	EUR> 50.0 USA> 60.0
0.03	Acceleration rate	{**2.11**}	0.0 to 3,200.0 s/100Hz	EUR> 40.0 USA> 33.3
0.04	Deceleration rate	{**2.21**}	0.0 to 3,200.0 s/100Hz	EUR> 40.0 USA> 33.3
0.05	Reference select	{**1.14**}	A1.A2 (0), A1.Pr (1), A2.Pr (2), Pr (3), PAd (4), Prc (5)	A1.A2 (0)
0.06	Current limit	{**4.07**}	0 to Current_limit_max %	110
0.07	Voltage mode select	{**5.14**}	Ur_S (0), Ur (1), Fd (2), Ur_Auto (3), Ur_I (4), SrE (5)	Ur_I (4)
0.08	Voltage boost	{**5.15**}	0.0 to 25.0% of motor rated voltage	Size 1 to 3: 3.0 Size 4 & 5: 2.0 Size 6 upwards: 1.0
0.09	Dynamic V/F	{**5.13**}	OFF (0) or On (1)	OFF (0)
0.10	Estimated motor speed	{**5.04**}	±180,000 rpm	
0.11	Drive output frequency	{**5.01**}	±Speed_freq_max Hz	
0.12	Total motor current	{**4.01**}	0 to Drive_current_max A	
0.13	Percentage load	{**4.20**}	-User_current_max to User_current_max %	
0.14	Ramp mode select	{**2.04**}	FASt (0), Std (1), Std.hV (2)	Std (1)
0.15	Sleep threshold	{**6.53**}	±SPEED_FREQ_MAX Hz/rpm	0.0
0.16	Sleep delay time	{**6.54**}	0.0 to 250.0s	10.0s
0.18	Spin start boost		0.0 to 10.0	1.0
0.19	Analog input 2 mode	{**7.11**}	0-20 (0), 20-0 (1), 4-20tr (2), 20-4tr (3), 4-20 (4), 20-4 (5), VOLt (6)	4-20 (4)
0.20	Analog input 2 destination	{**7.14**}	Pr **0.00** to Pr **21.51**	Pr **1.37**
0.21	Analog input 3 mode	{**7.15**}	0-20 (0), 20-0 (1), 4-20tr (2), 20-4tr (3), 4-20 (4), 20-4 (5), VOLt (6), th.SC (7), th (8), th.diSp (9)	VOLt (6)
0.22	Date	{**6.16**}	0 to 311299	
0.23	Time	{**6.17**}	0.00 to 23.59	
0.24	Date/Time selector	{**6.19**}	0 to 5	3
0.25	Date format	{**6.20**}	Std (0), Std.ds (1), US (2), US.ds (3)	EUR> Std (0) USA> US (2)
0.26	Low load detection level	{**4.27**}	0.0 to 100.0%	0.0%
0.27	Low load detection speed/ frequency threshold	{**4.28**}	0.0 to +Speed_freq_ max Hz/rpm	0.00

BASIC PARAMETERS (MENU 0)
CONTINUED

Parameter			Range(⇳)	Default(⇨)
0.28	Trip on abnormal load detection	{**4.29**}	OFF (0) or On (1)	OFF (0)
0.29	SMARTCARD parameter data	{**11.36**}	0 to 999	0
0.30	Parameter cloning	{**11.42**}	nonE (0), rEAd (1), Prog (2), AutO (3), boot (4)	nonE (0)
0.31	Drive rated voltage	{**11.33**}	200 (0), 400 (1), 575 (2), 690 (3) V	
0.32	Drive current scaling	{**11.32**}	0.00 to 9999.99A	
0.33	Catch a spinning motor	{**6.09**}	0 to 3	0
0.34	User security code	{**11.30**}	0 to 999	0
0.35	Serial comms mode	{**11.24**}	AnSI (0), rtu (1), Lcd (2)	rtu (1)
0.36	Serial comms baud rate	{**11.25**}	300 (0), 600 (1), 1200 (2), 2400 (3), 4800 (4), 9600 (5), 19200 (6), 38400 (7), Modbus RTU only: 57600 (8), Modbus RTU only: 115200 (9)	19200 (6)
0.37	Serial comms address	{**11.23**}	0 to 247	1
0.38	Hold zero speed/ Motor pre-heat enable	{**6.08**}	OFF (0) or On (1)	OFF (0)
0.39	Motor pre-heat current magnitude	{**6.52**}	0 to 100%	0
0.40	Autotune	{**5.12**}	0 to 2	0
0.41	Maximum switching frequency	{**5.18**}	3 (0), 4 (1), 6 (2), 8 (3), 12 (4), 16 (5) kHz	3 (0)
0.42	No. of motor poles	{**5.11**}	0 to 60 (Auto to 120 pole)	0 (Auto)
0.43	Motor rated power factor	{**5.10**}	0.000 to 1.000	0.850
0.44	Motor rated voltage	{**5.09**}	0 to AC_voltage_set_max V	200V drive: 230 400V drive: EUR> 400, USA> 460 575V drive: 575 690V drive: 690
0.45	Motor rated full load speed (rpm)	{**5.08**}	0 to 180,000 rpm	EUR> 1,500, USA> 1,800
0.46	Motor rated current	{**5.07**}	0 to Rated_current_max A	Drive rated current [**11.32**]
0.47	Rated frequency	{**5.06**}	0 to 3,000.0 Hz	EUR> 50.0, USA> 60.0
0.48	Operating mode selector	{**11.31**}	OPEn LP (1), rfc (2)	OPEn LP (1)
0.49	Security status	{**11.44**}	L1 (0), L2 (1), Loc (2)	
0.50	Software version	{**11.29**}	1.00 to 99.99	
0.51	Positive logic select	{ **8.29**}	OFF (0) or On (1)	On (1)
0.52	Timer 1 start date	{**9.35**}	0 to 311299	0
0.53	Timer 1 start time	{**9.36**}	0.00 to 23.59	0.00
0.54	Timer 1 stop date	{**9.37**}	0 to 311299	0
0.55	Timer 1 stop time	{**9.38**}	0.00 to 23.59	0.00
0.56	Timer 1 repeat function	{**9.39**}	0 to 6	0
0.57	Timer 1 enable	{**9.40**}	OFF (0) or On (1)	OFF (0)
0.58	Timer 1 destination	{**9.40**}	0.00 to 50.99	0.00

SMARTCARD

Parameter storage/cloning



Pr **0.30 = rEAd +**

Drive reads all parameters from the SMARTCARD



Pr **0.30 = Prog +**

Programs all drive parameters to the SMARTCARD



Pr **0.30 = AutO +**

Drive automatically writes to the SMARTCARD when a parameter save is performed



Pr **0.30 = boot +**

Drive boots from the SMARTCARD on power up and automatically writes to the SMARTCARD when a parameter save is performed

SMARTCARD

Pre-programmed Macros

Macro Number	Macro Name
6501	User Defined
6502	I/O Set-up
6503	Monitor
6504	Variable Torque Pump and Fan
6505	Variable Torque Pressure Control
6506	Compressor

To load a Macro...





1. Remove keypad
2. Insert the smartcard into the slot (contacts facing the right-hand side of the drive)
3. Re-fit keypad
4. Set parameter zero in any menu Pr **xx.00** (i.e. Pr **1.00**, Pr **2.00**, Pr **3.00**, etc.) equal to the selected 4 digit Macro Number found on the front of this smartcard
5. Press the red reset button to load the macro

Refer to the **AFFINITY** *User Guide for further information*