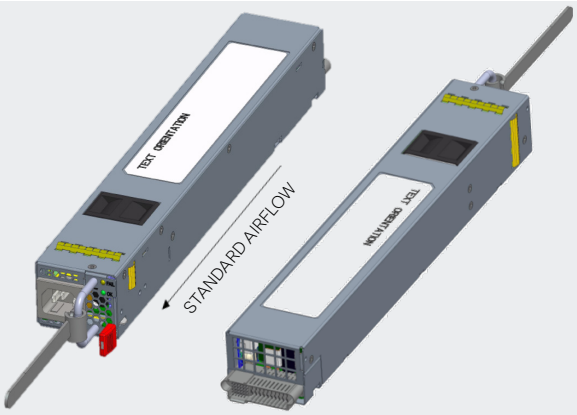
ARTESYN CSS1500FP-3

1500 W Distributed Power System



Advanced Energy's Artesyn CSS1500FP-3 series bulk front end AC-DC power supply accepts a wide range 90 to 264 VAC input and provides a main 12 V output plus a 3.3 V standby output. Rated at 1500 W it is an 80 Plus Platinum supply with a high peak efficiency of 94%. Housed in an industry standard 1U x 2.1 inch rack-mounting package, the power supply is ideal for space-constrained applications. This series comes in two airflow versions – DC-connector to AC-connector and vice versa.

SPECIAL FEATURES

- 1500 W output power
- High power and short form factor
- 1U power supply
- Power Factor Corrected
- EN61000-3-2 harmonic compliance
- Inrush current control
- 80 plus platinum efficiency
- N+1 or N+N redundant
- Hot-pluggable
- Active current sharing
- Full digital control
- PMBus compliant
- Accurate input power reporting
- Compatible with Artesyn's Universal PMBus GUI
- Reverse airflow option
- Three-year warranty

COMPLIANCE

- EMI conducted/radiated Class A Limits + 6 dB margin
- EN61000-4 electromagnetic compatibility
- RoHS 6/6

SAFETY

- UL/IEC/EN 62368
- CE Mark
- China CCC or CQC
- BSMI
- KC
- EAC
- BIS

AT A GLANCE

Front-end Bulk Power

Total Output Power

1100 W low line
1500 W high line

Wide Input Voltage

90 to 132 VAC, 1100 W
180 to 264 VAC, 1500 W
180 to 350 VDC, 1500 W

ELECTRICAL SPECIFICATIONS

Input						
Input Range	90 to 132 VAC low line 180 to 264 VAC high line 180 to 350 VDC high voltage DC input					
Frequency	47 Hz to 63 Hz					
Efficiency	80 plus @ platinum 20% load with 90%; 50% load with 94%; 100% load with 91% at 230 VAC					
Max Input Current	15 A at 100 VAC					
Inrush Current	35 Apk at cold turn on					
Conducted EMI	Class A +6 dB margin					
Radiated EMI	Class A +6 dB margin					
Power Factor	> 0.9 beginning at 20% load with normal input voltage 115/230 VAC					
Leakage Current	1.75 mA					
Hold-up Time	12 ms @ 1500 W; 20 ms @ 900 W					
Output						
	Main DC Output			Standby DC Output		
	MIN	NOM	MAX	MIN	NOM	MAX
Nominal Setting	-0.5%	12 V	+0.5%	-1%	3.3 V	1%
Total Output Voltage Range	11.64 V	12 V	12.36 V	3.14 V	3.3 V	3.46 V
Dynamic Load Regulation Range	11.40 V		12.60 V			
Output Ripple			180 mVp-p			45 mVp-p
Output Current - Low line			91.7 A			5.0 A
Output Current - High line & HVDC			125 A			5.0 A
Current Sharing	Within ±4.5A when system load ≥ 31.25 A			N/A		
Capacitive Loading	500 µF		11,000 µF	20 µF		1000 µF
Start-up From AC to Output			3000 ms			2500 ms
Output Rise Time	5 ms		100 ms	5 ms		100 ms

Protections			
Main Output	MIN	NOM	MAX
Overcurrent Protection[2]	106%		150%
Overvoltage Protection[1]	13.5 V		14.5 V
Overtemperature Protection		Yes, shutdown	
Fan Fault Protection		Yes	
Standby Output			
Overcurrent Protection[3]	106%		150%
Overvoltage Protection[1]	3.6 V		4.3 V

1 Latch mode
2 Autorecovery
3 Autorecovery

ELECTRICAL SPECIFICATIONS (CONTINUED)

LED Indicators		
Two seperate LED is used to indicate the power supply status		
Power Supply Condition	Green (OK) LED Status	Amber (FAIL) LED Status
No AC power to all power supplies	Off	Off
Power supply failure (includes over voltage, over current, over temperature and fan failure)	Off	On
Power supply warning events where the power supply continues to operate (high temperature, high power and slow fan)	Off	1 Hz Blinking
AC present / 3.3 VSB on (PSU OFF)	1 Hz Blinking	Off
Power supply ON and OK	On	Off

PMBus Reporting Accuracy And Monitoring			
	Accuracy Range		
Output Loading	<10%	10% to 20%	20% to 100%
Input Voltage	±5%		
Input Current	±1 A fixed error	±10%	±5%
Input Power	30 W fixed error up to 120 W	±15%	±10%
Output Voltage	±5%		±2%
Output Current	0.8 A fixed error	±15%	±5%
Temperature	±5 °C		
Fan Apeed	Actual ±250 RPM		

PMBus	YES
Remote ON/OFF	YES

I2C ADDRESSING

A0, A1 and A2 ADDRESS SELECTION (CSS1500FP-3-100 and -101)				
A2	A1	A0	PSU_ID (MCU) Address	EEPROM Address
0	0	0	0xB0	0xA0
0	0	1	0xB2	0xA2
0	1	0	0xB4	0xA4
0	1	1	0xB6	0xA6
1	0	0	0xB8	0xA8
1	0	1	0xBA	0xAA
1	1	0	0xBC	0xAC
1	1	1	0xBE	0xAE

For CSS1500FP-3-100 and -101 models, the highest order address bit, A2 internally wired to ground
The A2 address bit option is available. Please contact technical support

I2C ADDRESSING (CONTINUED)

ADDR ADDRESS SELECTION (CSS1500FP-3-200 and -201)		
Addr pin (A3) resistor to GND (kohm)	PSU_ID (MCU) Address	EEPROM Address
0.82	0xB0	0xA0
2.7	0xB2	0xA2
5.6	0xB4	0xA4
8.2	0xB6	0xA6
15	0xB8	0xA8
27	0xBA	0xAA
56	0xBC	0xAC
180	0xBE	0xAE

For CSS1500FP-3-200 and -201 models, an analog input that is used to set the address of the internal slave device used for the digital communication
The resistor shall be +/-1% tolerance

CONTROL AND STATUS SIGNALS

Input Signals			
PS_ON_L			
Active LOW signal which enables/disables the main output. Pulling this signal LOW will turn-on the main output. Recommended pull-up resistor to VSB is 10 kohms.			
		MIN	MAX
V_{IL}	Input logic level LOW		0.8 V
V_{IH}	Input logic level HIGH	2.0 V	3.6 V
I_{SOURCE}	Current that may be sourced by this pin		4 mA
PS_KILL			
First break/last mate active LOW signal which enables/disables the main output. This signal will have to be pulled to ground at the system side with a 10 kohm resistor.			
		MIN	MAX
V_{IL}	Input logic level LOW		0.8 V
V_{IH}	Input logic level HIGH	2.0 V	3.6 V
I_{SOURCE}	Current that may be sourced by this pin		4 mA
VSENSE+, VSENSE-			
VSENSE+ and VSENSE- lines are the remote sense lines for regulation. Each line will compensate for a maximum of 100 mV			
SCL, SDA			
Clock and data signals defined as per I2C requirements. It is recommended that these pins be pulled-up to a 100 kohm resistor to 3.3 V and by-pass capacitor (to ground) of 33pF max. for each of I2C bus signals (SCL and SDA)			
VL	Input logic level LOW		0.8 V
VH	Input logic level HIGH	2.0 V	3.6 V

CONTROL AND STATUS SIGNALS (CONTINUED)

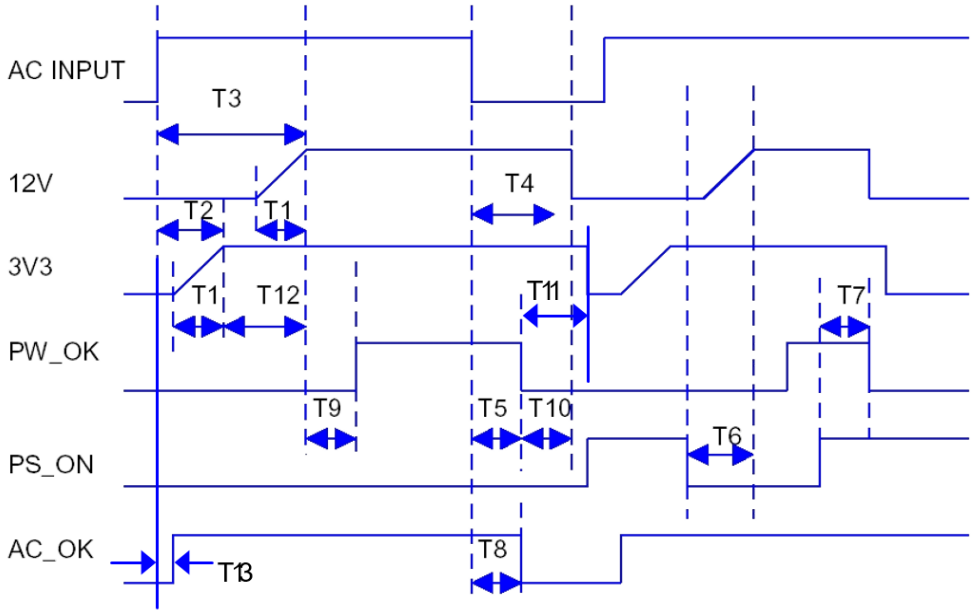
Output Signals			
AC_OK			
Signal used to indicate the presence of AC input to the power supply. A logic level HIGH will indicate that the AC input to the power supply can meet the minimum requirements while a logic level LOW will indicate that AC has been lost for more than 20 ms. This pin is pulled high by a 1 kohm resistor connected to 3.3 V inside the power supply.			
		MIN	MAX
V_{OL}	Output LOW Voltage		0.4 V
V_{OH}	Output HIGH Voltage	2.4 V	3.6 V
I_{SOURCE}	Current that may be sourced by this pin		2 mA
I_{SINK}	Current that may be sunk by this pin at low state	4 mA	
PWOK			
Signal used to indicate that main output voltage is within regulation range. The PWR_GOOD signal will be driven HIGH when the output voltage is valid and will be driven LOW when the output is < 10.9 V or > 13.2V, or if any of the outputs fail due to over current / voltage / temperature or fan failure. In the event AC mains power is lost, this signal will be druven low at least 20 ms before the standby output is lost. This pin is pulled high by a 1 kohm resistor connected to 3.3 V inside the power supply.			
		MIN	MAX
V_{OL}	Output LOW Voltage		0.4 V
V_{OH}	Output HIGH Voltage	2.0 V	3.6 V
I_{SOURCE}	Current that may be sourced by this pin		2 mA
I_{SINK}	Current that may be sunk by this pin at low state	4 mA	
PRESENT_L			
Signal used to sense the number of the power supplies in the system. This pin is shorted to the standby return in the power supply. Pull-up to 3.3 VSB located in system.			
		MIN	MAX
V_{OL}	Output LOW Voltage		0.4 V
V_{OH}	Output HIGH Voltage	2.0 V	3.6 V
I_{SINK}	Current that may be sunk by this pin at low state		4 mA
ALERT_L			
This signal indicates that the power supply is experiencing a problem that the user should investigate. This may be asserted due to Critical events or Warning events.			
		MIN	MAX
V_{OL}	Output LOW Voltage		0.4 V
V_{OH}	Output HIGH Voltage	2.0 V	3.6 V
I_{SOURCE}	Current that may be sourced by this pin		2 mA
I_{SINK}	Current that may be sunk by this pin at low state		4 mA
BUS Signals			
ISHARE			
Bus signal used by the power supply for active current sharing. maximum 6 units in parallel			
Voltage Range	The range of this signal for active sharing will be up to 8.0 V, which corresponds to the maximum output current.		
		MIN	MAX
I_{SHARE} Voltage	Voltage at 100% load, stand-alone unit	7.75 V	8.25 V
	Voltage at 50% load, stand-alone unit	3.85 V	4.15 V
	Voltage at 0% load, stand-alone unit	0 V	1.0 V

ORDERING INFORMATION

Model Number	Nominal Main Output	Standby Output	Airflow Direction
CSS1500FP-3-100	12 V	3.3 V	Standard air flow (SAF) (from output to input connector)
CSS1500FP-3-101	12 V	3.3 V	Reverse[1] air flow (RAF) (from input to output connector)
CSS1500FP-3-200	12 V	3.3 V	Standard air flow (SAF) (from output to input connector)
CSS1500FP-3-201	12 V	3.3 V	Reverse[1] air flow (RAF) (from input to output connector)

1 Derating may apply

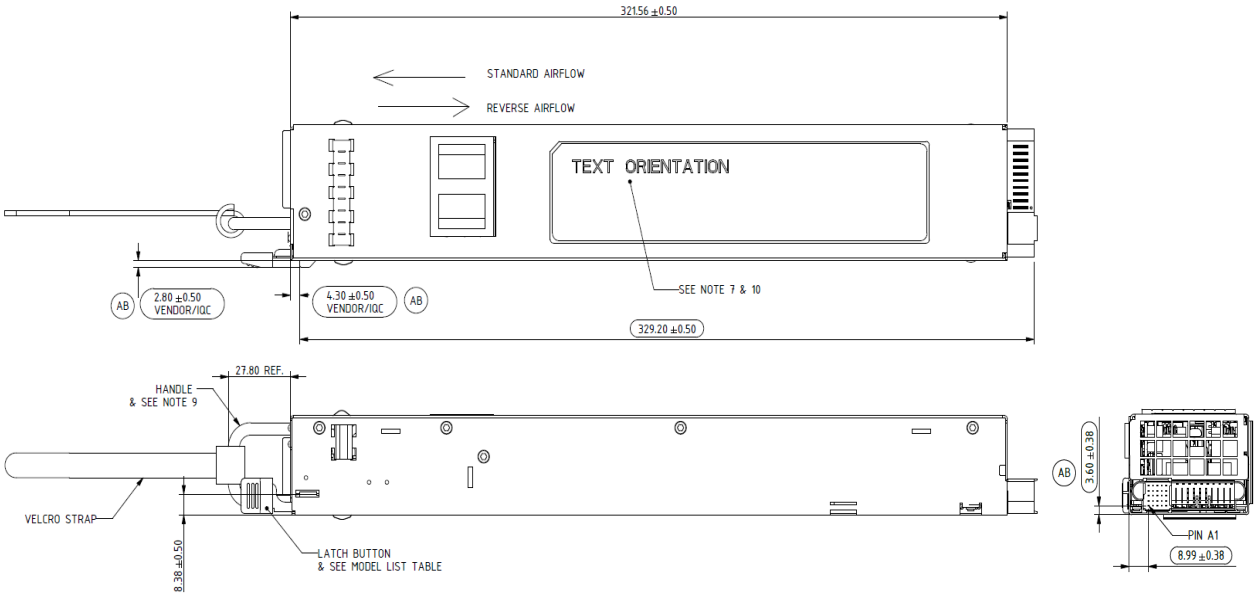
TIMING DIAGRAM



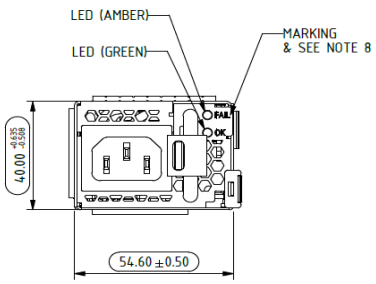
Timing Specifications				
	Description	Min	Max	Unit
T1 (Tvout_rise)	Output voltage rist time from each main output	20	100	ms
T2 (Tsb_on_delay)	Delay from AC being applied to 3.3 V being within regulation		2500	ms
T3 (Tac_on_delay)	Delay from AC being applied to all output voltages being within regulation		3000	ms
T4 (Tvout_holdup)	Time all output voltages, including 3.3 V, stay within regulation after loss of AC	12		ms
T5 (Tpw_ok_holdup)	Delay from loss of AC to de-assertion of PW_OK	5		ms
T6 (Tps_on_delay)	Delay from PS_ON_L active to output voltages within regulation limits	5	400	ms
T7 (Tps_on_pw_ok)	Delay from PS_ON_L de-active to PW-OK being de-asserted		50	ms
T8 (Tac_ok_off)	Delay from loss of AC input to de-assertion of AC_OK		20	ms
T9 (Tpw_ok_on)	Delay from output voltages within regulation limits to PW_OK	100	200	ms
T10 (Tpw_ok_off_12V)	Delay from PW_OK de-asserted to 12 V dropping out of regulation limits	1	700	ms
T11 (Tpw_ok_off_3.3V)	Delay from PW_OK de-asserted to 3.3 V dropping out of regulation limits	20		ms
T12 (Tsb_vout)	Delay from 3.3 V being in regulation to 12 V being in regulation at AC turn on	50	1000	ms
T13 (Tac_ok_on)	Delay from AC being applied to assertion of AC_OK		1500	ms

MECHANICAL OUTLINE

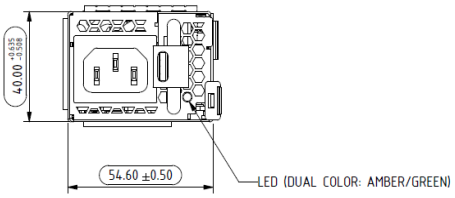
CSS1500FP-3-10X and 20X series:



CSS1500FP-3-10X series:



CSS1500FP-3-20X series:

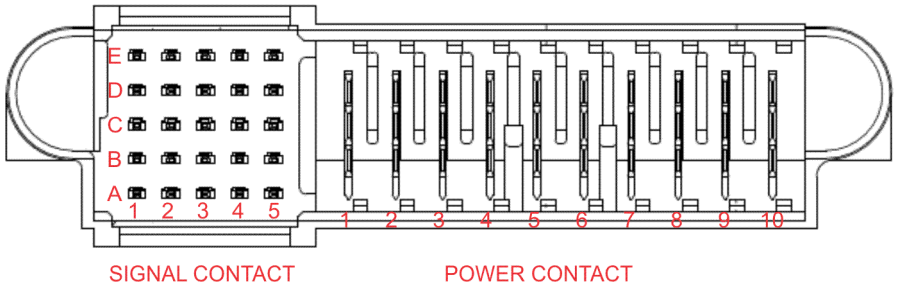


AC INPUT CONNECTOR

AC Input Connector on Power Supply	IEC60320-C14
Mating Connector or Equivalent	IEC60320-C13

OUTPUT CONNECTOR

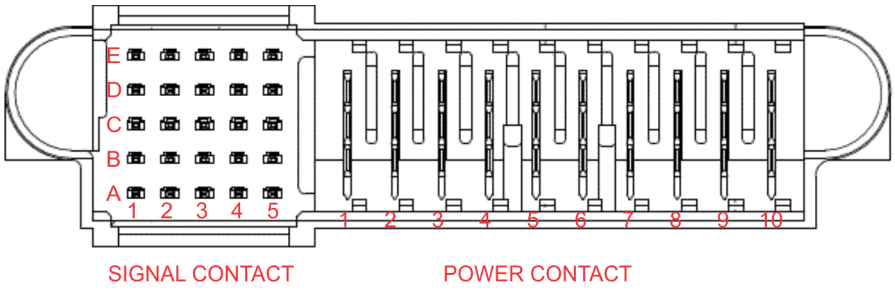
Output Connector Part Number	TEI 2-1926736-2 (CSS1500FP-3-100 and -101) or equivalent
Mating Connector Part Number	TEI 2-1926739-5, 1892787-6 or equivalent



Output Connector Pin Configuration (CSS1500FP-3-100 and -101)		
Pin	Signal Name	Description
1,2,3,4,5	+12 V Return	Main output return contact
6,7,8,9,10	+12 V	Main output return contact
A1	3.3 VSB	Standby output
B1	3.3 VSB	Standby output
C1	3.3 VSB	Standby output
D1	3.3 VSB	Standby output
E1	3.3 VSB	Standby output
A2	SGND	Signal ground
B2	SGND	Signal ground
C2	Reserved	Option design: "WP_EN_L" disable write operation for both primary and secondary MCUs FW upgrade / OR "I2C_A2" highest order address bit A2 (max. 8 addresses)
D2	Reserved	
E2	Reserved	
A3	PS_KILL	Short pin
B3	Reserved	
C3	SDA	I^2C data
D3	-Remote_Sense	Wire drop compensation
E3	+Remote_Sense	Wire drop compensation
A4	SCL	I^2C clock
B4	PS_ON_L	Enable/Inhibit
C4	ALERT_L	Alert for failure
D4	ISHARE	Current share bus
E4	AC_OK	Input indicator
A5	A0	I^2C address
B5	Reserved	
C5	PW_OK	Output indicator
D5	A1	I^2C address
E5	PRESENT_L	Power supply present

OUTPUT CONNECTOR (CONTINUED)

Output Connector Part Number	FCI 10122460-007LF (CSS1500FP-3-200 and -201) or equivalent
Mating Connector Part Number	TEI 2-1926739-5, 1892787-6 or equivalent



Output Connector Pin Configuration (CSS1500FP-3-200 and -201)		
Pin	Signal Name	Description
1,2,3,4,5	+12 V Return	Main output return contact
6,7,8,9,10	+12 V	Main output return contact
A1	3.3 VSB	Standby output
B1	3.3 VSB	Standby output
C1	3.3 VSB	Standby output
D1	3.3 VSB	Standby output
E1	3.3 VSB	Standby output
A2	SGND	Signal ground
B2	SGND	Signal ground
C2	Reserved	
D2	Reserved	
E2	Reserved	
A3	ADDR	I2C address selection (select by external pull down resistor)
B3	Reserved	
C3	SDA	I^2C data
D3	-Remote_Sense	Wire drop compensation
E3	+Remote_Sense	Wire drop compensation
A4	SCL	I^2C clock
B4	PS_ON_L	Enable/Inhibit
C4	ALERT_L	Alert for failure
D4	Reserved	
E4	AC_OK	Input indicator
A5	PSKILL	(Short pin)
B5	ISHARE	Current share bus (Short pin)
C5	PW_OK	Output indicator (Short pin)
D5	Reserved	(Short pin)
E5	PRESENT_L	Power supply present, (Short pin)

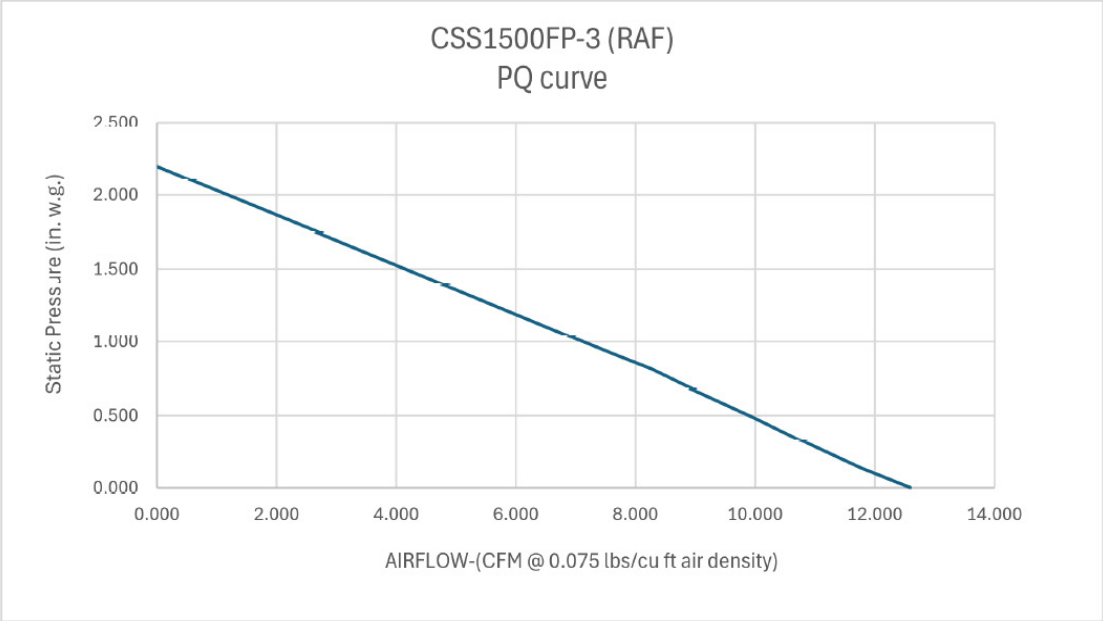
ENVIRONMENTAL SPECIFICATIONS

Operating temperature	CSS1500FP-3-100 and -200 CSS1500FP-3-101 and -201	Full power at 0 to 55 °C (SAF, 100% load, 1100 W LL/1500 W HL, 0" H_2O) Full power at 0 to 45 °C (RAF, 100% load, 1100 W LL/1500 W HL, 0" H_2O)
Operating relative humidity	5% to 90% non-condensing	
Storage relative humidity	5% to 95% non-condensing	
Operating altitude	Up to 10,000 feet	
Operating temperature	0 to +55 °C, Standard Air Flow (SAF) 0 to +45 °C, Reverse Air Flow (RAF)	
Storage temperature	-40 to +85 °C	
Vibration and shock	Standard operating/non-operating random shock and vibration	
RoHS compliance	Yes	
MTBF	>300,000 hours using Telcordia Issue 4 at 40 °C and 50% part count (method 1 case 1)	
Operating life	Minimum of 7 years at typical operating conditions	
Reliability	All electronic component derating analysis and capacitor life calculation is done at 40 °C ambient, 80% of maximum rated load, nominal input line voltage.	

CSS1500FP-3-100 AND -200 SAF PQ CURVE

CSS1500FP-3 (SAF)	
MAX. AIR FLOW, CFM (at zero static pressure)	17.6
MAX. AIR FLOW, CFM (at zero flow)	4.1

CSS1500FP-3-101 AND -201 RAF PQ CURVE



SS1500FP-3 (RAF)	
MAX. AIR FLOW, CFM (at zero static pressure)	12.6
MAX. AIR FLOW, CFM (at zero flow)	2.2

Note: "Higher speed PSU fan options are available. Please contact technucal support"

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

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