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No.: JSP54-11-070

Date: Sep. 9, 2011

SPECIFICATION

FOR

Fiber-Optic Distributed Temperature Sensing System

FTR3000X-05 / 10

J-Power Systems Corporation

History of Revision

Issue No.	Description of Revisions	Date	Prepared by	Checked by	Approved by
-	Initial issue	Sep. 9, 2011	T. Shioji	K. Hashiba	H. Komeda

1. General

1.1. Coverage

This specification covers Fiber-optic Distributed Temperature Sensing Unit FTR3000X -05 and FTR3000-10 for 5 km and 10 km measurement model.

1.2. Warranty

JPS warrants that the delivered products meet this specification at the final inspection in productions. If the delivered products do not appear to meet this specification and JPS agrees such non-conforming condition, JPS will repair or replace such defective products. JPS makes no warranty, however, as to the result to be obtained from the use of these products. In no event shall JPS be liable for removal or installation costs or other indirect or consequential damages.

2. Specifications

2.1. Environmental Condition

(1) Operating Temperature	0 to 40 °C
(2) Storage Temperature	-20 to 60 °C
(3) Relative Humidity	85% Max. Non-condensing
(4) Supplied Power	AC100 - 240V, 50/60Hz, 50VA Max.

2.2. General

(1) Optical Fiber	GI 50/125 Optical Fiber (ITU-T Rec. G.651)
(2) Optical Connector	E2000/APC
(3) Optical Pulse Wavelength	1550nm band
(4) Laser Class	Class 1 (IEC60852-1-2001)
(5) Communication Interface	USB: 1 (USB1.1 B type) LAN: 1 (RJ45 100BASE-TX / 10BASE-T)
(6) Contact output	10 outputs, D-SUB 25 pin, MOS FET Relay
(7) Size	400 W x 88 H x 200D (mm)
(8) Weight	Approx. 6kg
(9) Color	TN-40 (Munsell N-4)

2.3. Performance

(1) Maximum Measuring Length	5km / 10km
(2) Sampling Resolution	1m / 0.5m / 0.25m
(3) Spatial Resolution ¹⁾	1.2m @ near end
(4) Measurement Update Interval	Approx. 14 seconds to 3.9 hours @ Sampling Resolution: 1m Measurement Range: 10km Integration times: 2 ¹⁴ to 2 ²⁶
(5) Readout Resolution	0.01 deg.C
(6) Temperature Accuracy ²⁾	+/- 2 deg. C

- (7) Short Term Stability³⁾ +/- 0.3 deg. C
 @ Integration times: 2[^]24
 Test duration: 24 hrs

(8) Temperature Resolution⁴⁾ and Measurement Update Interval

Measurement Range : 2km

Distance \ Measurement Update Interval	2km
Approx. 17 seconds (2 [^] 18)	+/- 0.8 deg.C
Approx. 55 seconds (2 [^] 20)	+/- 0.4 deg.C
Approx. 13.5 minutes (2 [^] 24)	+/- 0.2 deg.C

Measurement Range : 5km

Distance \ Measurement Update Interval	2km	5km
Approx. 36 seconds (2 [^] 18)	+/- 0.8 deg.C	+/- 1.2 deg.C
Approx. 120 seconds (2 [^] 20)	+/- 0.4 deg.C	+/- 0.6 deg.C
Approx. 30.3 minutes (2 [^] 24)	+/- 0.2 deg.C	+/- 0.2 deg.C

Measurement Range : 7km

Distance \ Measurement Update Interval	2km	5km	7km
Approx. 47 seconds (2 [^] 18)	+/- 0.8 deg.C	+/- 1.2 deg.C	+/- 1.5 deg.C
Approx. 164 seconds (2 [^] 20)	+/- 0.4 deg.C	+/- 0.6 deg.C	+/- 0.8 deg.C
Approx. 41.5 minutes (2 [^] 24)	+/- 0.2 deg.C	+/- 0.2 deg.C	+/- 0.2 deg.C

Measurement Range : 10km

Distance \ Measurement Update Interval	2km	5km	7km	10km
Approx. 65 seconds (2 [^] 18)	+/- 0.8 deg.C	+/- 1.2 deg.C	+/- 1.5 deg.C	+/- 1.5 deg.C
Approx. 229 seconds (2 [^] 20)	+/- 0.4 deg.C	+/- 0.6 deg.C	+/- 0.8 deg.C	+/- 0.8 deg.C
Approx. 58.3 minutes (2 [^] 24)	+/- 0.2 deg.C	+/- 0.2 deg.C	+/- 0.2 deg.C	+/- 0.3 deg.C

Note

- 1) Spatial Resolution: When a spatial temperature step-change is given to the fiber, Spatial Resolution is defined as a distance between the points at which the measured temperature rises are 10% and 90% of the step-change.
- 2) Temperature Accuracy: The maximum deviation between the true temperature and the average temperature over space of the valid points (51meters) at each one trace of full operating temperature range, which is measured after system calibration at 20deg.C.
- 3) Short Term Stability: Average over 20 points of one standard deviation over 24 hrs of a single spatial point, where DTS shall be held at controlled temperature of 20 ± 1 °C.

- 4) Temperature Resolution: One standard deviation over 51 spatial points at each distance.
- 5) Above performance is warranted in accordance with the optical fiber loss which is defined as 0.33dB/km at wavelength 1550nm.

2.4. Functions

(1) Measurement Mode	PC control mode / Self-operating mode
(2) Data Output	Temperature/Stokes/Anti-Stokes Selectable
(3) Self-Check	Fiber break, Internal temperature, LD alarm, APD alarm, Power voltage, SD card over-current, Reference temperature error
(4) Data Storage ¹⁾	SD card, Class 4 or lower (Max. 2GB), FAT16 format.
(5) Contact Output ¹⁾	Normally Opened : 8 outputs for temperature alarm Normally Closed : 1 output for System alarm 1 output for watch dog pulse (Closed for 100msec per 1 minute interval)

Note

- 1) Data storage in SD Card and Contact output are available only on self-operating mode not PC control mode by PC and OPTHERMO Control Software.

2.5. Mechanical Feature

(1) Vibration	10-500Hz, 1.5G, 0.10 octave/min, 1 sweep / 3axis 10-500Hz, 3.0G, 0.25 octave/min, 1 sweep / 3axis
(2) Shock	Packaged: Free fall (height: 750mm), all side Unpackaged: Free fall (height: 100mm), 1side (bottom side down)

2.6. Standard OPTHERMO Control Software

OPTHERMO Control Software on Windows PC provides the following functions. The details are separately described in the specification.

- (1) Graphical display of temperature distribution on a real-time basis
- (2) Abnormal temperature detection and alarm output
- (3) Data storage on hard disk drive
- (4) Display of temperature trend
- (5) System error detection and alarm output

2.7. Attachments

(1) Power Cord	1	
(2) USB Cable	1.5 meters x 1	(for temporary measurement)
(3) LAN Cable (Cross)	2 meters x 1	(for continuous measurement)
(4) Attachments for EIA 19 inch rack	1	
(5) Pigtail cord with E2000/APC connector	1	
(6) Standard Control Software	1 (CD-ROM)	

3. Type Name & Ordering Information

FTR3000X -

Code	Maximum measuring length	Note
05	5km	
10	10km	

4. Testing and Inspection

4.1. General test

No.	Item	Specification	Measured Value	Judgment	Note
1	Constructional testing				
1-1	Construction	Drawing No. JPH 400839			
1-2	Appearance, Structure	No anomaly			
1-3	Size, Weight	JIS B 0405 Coarse			
1-4	Attachments	Refer to clause 2.7			
2	Optical & Electrical testing				
2-1	USB, LAN communication	To be able to communicate			
3	Power source testing				
3-1	Power voltage	AC 100 to 240V \pm 10% 50/60Hz			
3-2	Powe consumption	50VA or less			
3-3	Insulation resistance testing	5M ohm or more at DC500V			

4.2. Performance test

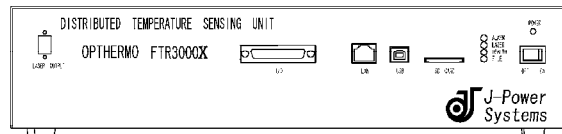
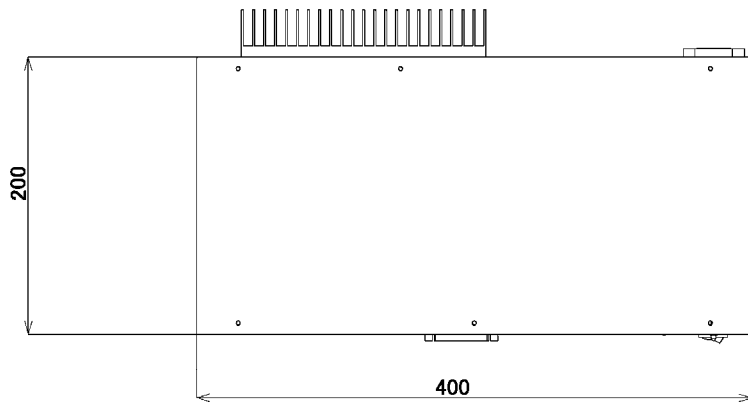
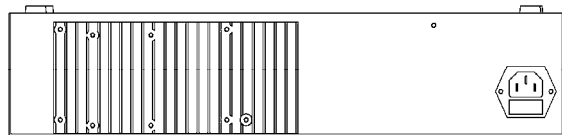
4.2.1 FTR3000X-05 (Maximum measuring length : 5km)

No.	Item	Specification	Definition/ Criteria	Test method						Results	Judgment	Note
				Equipment Condition			Measured Position					
				DTS temp.	Integration Time	Sampling Resolution	Distance	Temperature	Processing			
1	Measuring length	5km	To be able to acquire 5km temperature data	Room temp.	2^18	1m		Room temp.				
2	Sampling resolution	1m / 0.5m / 0.25m	To be able to acquire data in accordance with setting	Room temp.	2^20	1m		Room temp.				
3	Measurement update interval	Approx. 36 seconds	To be able to acquire data in accordance with setting	Room temp.	2^18	1m	5km	Room temp.				
		Approx. 120 seconds			2^20							
		Approx. 30.3 minutes			2^24							
4	Temperature accuracy	+2deg.C(<5km)	The maximum deviation between the true temperature and the average temperature over the valid points(51 meters) of one trace at full operating temperature range, which measured after system calibration at 20 deg.C.	0 deg.C 20 deg.C 40 deg.C	2^20	1m	2km 5km	20 deg.C	Average over 51 spatial points from 1 trace.	2km	5km	
												0 deg.C
												20 deg.C
												40 deg.C
5	Short term stability	± 0.3deg.C	The standard deviation over time of a single spatial point held at controlled, fixed temperature.	20 ± 1deg.C	2^24	1m	5km	60 deg.C	Average over 20 spatial points of one SD from 1 spatial point for 24 hrs.			
6	Temperature resolution	± 0.4deg.C (2km) ± 0.6deg.C (5km)		20 ± 1deg.C	2^20	1m	2km 5km	20 deg.C	One SD over 51 spatial points from 1 trace.			
7	Spatial resolution	< 1.2m		20 ± 1deg.C	2^20	0.25m	Near end	40 deg.C difference	To measure the length of 10% to 90% from 1trace.			

4.2.2 FTR3000X-10 (Maximum measuring length : 10km)

No.	Item	Specification	Definition/ Criteria	Test method						Results	Judgment	Note		
				Equipment Condition			Measured Position							
				DTS temp.	Integration Time	Sampling Resolution	Distance	Temperature	Processing					
1	Measuring length	10km	To be able to acquire 10km temperature data	Room temp.	2 [^] 18	1m		Room temp.						
2	Sampling resolution	1m / 0.5m / 0.25m	To be able to acquire data in accordance with setting	Room temp.	2 [^] 18	1m / 0.5m / 0.25m		Room temp.						
3	Measurement update interval	Approx. 65 seconds	To be able to acquire data in accordance with setting	Room temp.	2 [^] 18	1m	10km range	Room temp.						
		Approx. 229 seconds			2 [^] 20									
		Approx. 58.3 minutes			2 [^] 24									
4	Temperature accuracy	+2deg.C (< 10km)	The maximum deviation between the true temperature and the average temperature over the valid points(51 meters) of one trace at full operating temperature range, which measured after system calibration at 20 deg.C.	0 deg.C 20 deg.C 40 deg.C	2 [^] 20	1m	2km 5km 7km 10km	20 deg.C	Average over 51 spatial points from 1 trace.	2km	5km	7km	10km	
														0 deg.C
														20 deg.C
														40 deg.C
5	Short term stability	± 0.3deg.C	The standard deviation over time of a single spatial point held at controlled, fixed temperature.	20 ± 1deg.C	2 [^] 24	1m	10km	60 deg.C	Average over 20 spatial points of one SD from 1 spatial point for 24 hrs.					
6	Temperature resolution	± 0.4deg.C (2km) ± 0.6deg.C (5km) ± 0.8deg.C (7km) ± 0.8deg.C (10km)	One standard deviation over space of the valid points (51 meters), taken at one trace of temperature measurement.	20 ± 1deg.C	2 [^] 20	1m	2km 5km 7km 10km	20 deg.C	One SD over 51 spatial points from 1 trace.	2km	5km	7km	10km	
7	Spatial resolution	<1.2m	When a spatial temperature step-change is given to the fiber, spatial Resolution is defined as the distance between the points at which the measured temperature rises are 10% and 90% of the step-change.	20 ± 1deg.C	2 [^] 20	0.25m	Near end	40 deg.C difference	To measure the length of 10% to 90% from 1trace.					

REV	DESCRIPTION	DATE	DESIGNED	APPROVED



DRAWN	T. Shioji	SCALE	1/1	FTR3000X	
DESIGNED		SCALE	1/1		
APPROVED	H. KOMEDA	DATE	'10-9-28		
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