

04-2203

FASTUS

Good Thinking, Good Future

INDEX LIST

Digital Fiber Amplifier with IO-Link interface

D4RF SERIES

IO-Link

Communication specifications

Minimum cycle time		0.5 ms	
Baud rate		COM 3 (230.4kbps)	
M-Sequence code in Pre-operate mode		0	
M-Sequence code in Operate mode		4	
ISDU support		Yes	
IO-Link revision		1.1	
Number of process input data bytes		4 byte	
Number of process output data bytes		0 byte	
Vender ID		DEC: 1076	HEX: 0434
Device ID	(20529)	DEC: 65546	HEX: 1000A
	(20530, 20531)	DEC: 65545	HEX: 10009

Process Data Format

With the D4RF series, the content of process input data transmitted via IO-Link communication can be selected from the following two formats.

*The format of process input data can be switched by using Index 120.

#	Description		Byte No.	Bit							
				7	6	5	4	3	2	1	0
1	When value of Index 120 is 0x00 *Default setting	Received light level and output	n+0	Received light level (no units)							
			n+1								
			n+2	Reserved							
			n+3	Reserved				Qint. 2	Qint. 1	QL 2	QL 1
2	When value of Index 120 is 0x12	Counter value and output	n+0	Counter value							
			n+1								
			n+2	Reserved							
			n+3	Reserved				Qint. 2	Qint. 1	QL 2	QL 1

Service Data

Category	Name	Index No. DEC (HEX)	Sub index No.	Read/Write *	Backup	Format	Length in bytes	Default	Setting details	Remarks (Unit)
System	System command	2 (0x02)	0	W		UINT	1		0x41: 1-point teach (threshold 1) 0x42: 1-point teach (threshold 2) 0x43: 2-point teach (teach point 1) 0x44: 2-point teach (teach point 2) 0x45: Through teach 0x47: Auto teach start 0x48: Auto Teach stop 0x4B: Zone teach 0x81: Setting reset 0x82: Restore factory settings 0xC0: Reset counter 0xC1: Preset counter 0xD0: Load preset number 0xD1: Save to preset number 0xD6: Zero set of measurement value 0xD7: Zero reset of measurement value 0xE4: Reset diagnostics parameter	
General Settings	Access Lock	12 (0x0C)	0	R/W	✓	UINT	2	0	bit 01: Storage lock bit 02: Parameter lock bit 03: Key lock	
Identification	Vendor Name	16 (0x10)	0	R		STRING	8	OPTEX FA		
	Product Name	18 (0x12)	0	R		STRING	8	D4RF-TD D4RF-T D4RF-TC4		
	Product ID	19 (0x13)	0	R		STRING	5	20529 20530 20531		
	Product Text	20 (0x14)	0	R		STRING	26	Photoelectric Fiber Sensor		
	Serial Number	21 (0x15)	0	R		STRING	8	YYWWNNNN		Y=Year, W=CW, N=Number
	Hardware Version	22 (0x16)	0	R		STRING	4			
	Firmware Version	23 (0x17)	0	R		STRING	6			
Observation	Application Specific Tag	24 (0x18)	0	R/W	✓	STRING	32	*****		
	Device Status	36 (0x24)	0	R		UINT	1		0x00: Device is OK 0x01: Maintenance required 0x02: Out of specification 0x04: Failure	

* R: Read only, W: Write only, R/W: Read/Write

Category	Name	Index No. DEC (HEX)	Sub index No.	Read/Write *	Backup	Format	Length in bytes	Default	Setting details	Remarks (unit)
Observation	Detailed Device Status	37 (0x25)	1	R		UINT	9		Expressed in 3 bytes per set of EVENT information currently occurring Event #1 n+0, n+1: Event code 0x1800: High temperature (depends on high temperature setting of index 179, subindex 1) 0x1801: Low temperature (depends on low temperature setting of index 179, subindex 2) 0x1802: Operating hours (depends on operating hours setting of index 179, subindex 3) 0x1803: Received light level diagnostic 0x1804: Short-circuit on output n+2: Event details Bit 00 to 02: Source (0: Unknown, 4: On application) Bit 03: Reserved Bit 04 to 05: Type (1: Notification, 2: Warning, 3: Failure) Bit 06 to 07: Mode (1: One-off, 2: Resolved, 3: Occurred) Same format as above for events #2...3 thereafter.	
Detection Setting	Teach channel	58 (0x3A)	0	R/W		UINT	1	0	0x00: default Qint. = Qint. 1 0x01: Qint. 1 0x02: Qint. 2	
Observation	Teach status	59 (0x3B)	0	R		UINT	1		Bit 0 to 3: Teach status 0: IDLE 1: 1-PT SUCCESS 2: 2-PT SUCCESS 3: 1/2-PT SUCCESS 4: WAITING FOR COMMAND 5: BUSY 7: ERROR Bit 4: Teach status 1-PT TP1 0: Teach point 2 not taught 1: Teach point 2 successfully taught Bit 5: Teach flag SP1 TP2 0: Teach point 2 not taught 1: Teach point 2 successfully taught Bit 6: Teach flag SP2 TP1 0: Teach point 2 not taught 1: Teach point 2 successfully taught	
Detection Settings	Qint. 1 SP1/SP2: Qint. 1 threshold 1	60 (0x3C)	1	R/W	✓	INT	2	100		
	Qint. 1 SP1/SP2: Qint. 1 threshold 2		2	R/W	✓	INT	2	200		
	Qint. 1 configuration: Qint. 1 switchpoint logic	61 (0x3D)	1	R/W	✓	UINT	1	0	0x00: Light on/N.O. 0x01: Dark on/N.C.	
	Qint. 1 configuration: Qint. 1 switchpoint mode		2	R/W	✓	UINT	1	1	0x00: Not used 0x01: 1-point mode 0x02: 2-point zone mode 0x80: Edge height jump	
	Qint. 1 configuration: Qint. 1 switchpoint hysteresis		3	R/W	✓	UINT	2	5	1 to 99	Unit: %
	Qint. 2 SP1/SP2: Qint. 2 threshold 1	62 (0x3E)	1	R/W	✓	INT	2	100		
	Qint. 2 SP1/SP2: Qint. 2 threshold 2		2	R/W	✓	INT	2	200		
	Qint. 2 configuration: Qint. 2 switchpoint logic	63 (0x3F)	1	R/W	✓	UINT	1	0	0x00: Light on/N.O. 0x01: Dark on/N.C.	
	Qint. 2 configuration: Qint. 2 switchpoint mode		2	R/W	✓	UINT	1	1	0x00: Not used 0x01: 1-point mode 0x02: 2-point zone mode 0x80: Edge height jump	
	Qint. 2 configuration: Qint. 2 switchpoint hysteresis		3	R/W	✓	UINT	2	5	1 to 99	Unit: %
Identification	Device/function name	64 (0x40)	0	R/W	✓	STRING	32	*****		
Detection Settings	Teach offset	90 (0x5A)	0	R/W	✓	INT	1	10	0 to 99	Unit: %
	Setup edge height jump Qint. 1: Cycle offset	93 (0x5D)	1	R/W	✓	UINT	1	10	1 to 255	
	Setup edge height jump Qint. 1: Minimum height jump		2	R/W	✓	UINT	2	100	0 to 9999	
	Setup edge height jump Qint. 1: Maximum height jump		3	R/W	✓	UINT	2	9999	0 to 9999	
	Setup edge height jump Qint. 1: Hysteresis		4	R/W	✓	UINT	2	5	1 to 9999	
	Setup edge height jump Qint. 1: Jump direction		5	R/W	✓	UINT	1	2	0x00: Positive edge 0x01: Negative edge 0x02: Positive and negative edge	
	Setup edge height jump Qint. 2: Cycle offset	94 (0x5E)	1	R/W	✓	UINT	1	10	1 to 255	
	Setup edge height jump Qint. 2: Min. height jump		2	R/W	✓	UINT	2	100	0 to 9999	
	Setup edge height jump Qint. 2: Max. height jump		3	R/W	✓	UINT	2	9999	0 to 9999	
	Setup edge height jump Qint. 2: Hysteresis		4	R/W	✓	UINT	2	5	1 to 9999	
General Settings	Emitter setting: Emitter status	97 (0x61)	1	R/W		UINT	1	0	0x00: Emitter on 0x01: Emitter off	
	Emitter setting: Emitter power		2	R/W	✓	UINT	1	0	0x00: Maximum 0x01: Middle 0x02: Minimum 0x0A: Auto	
	Emitter setting: Emitter APC		3	R/W	✓	UINT	1	1	0x00: Off 0x01: On	
Detection Settings	ASC	112 (0x70)	0	R/W	✓	UINT	1	0	0x00: Off 0x01: On - standard 0x02: On - fast 0x03: On - max	
General Settings	Process data select	120 (0x78)	0	R/W	✓	UINT	1	0	0x00: AO = Present receiver level live 0x12: AO = Smart Task analog value Counter	

* R: Read only, R/W: Read/Write

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Category	Name	Index No. DEC (HEX)	Sub index No.	Read/ Write *	Backup	Format	Length in bytes	Default	Setting details	Remarks (unit)
I/O Settings	Pin 2 setting	121 (0x79)	0	R/W	✓	UINT	1	17	D4RF-TD 0x00: Not used 0x01: External input (Multi operations) 0x10: Emitter off 0x11: Teach input 0x03: Load preset D4RF-T, D4RF-TC4 0x00: Not used 0x01: External input (Multi operations) 0x10: Emitter off 0x11: Teach input 0x21: Received light alarm output 0x22: Switching signal DO2 0x23: Detection output Quint.1 0x24: Detection output Quint.2 0x27: Switching signal DO1 0x28: Switching signal DO1/	
	Pin 5 setting	122 (0x7A)	0	R/W	✓	UINT	1	34	0x00: Not used 0x21: Received light alarm output 0x22: Switching signal DO2 0x23: Detection output Dint.1 0x24: Detection output Dint.2 0x27: Switching signal DO1 0x28: Switching signal DO1/ 0x02: Acknowledge	Only D4RF-TD
Diagnosis	Temperature: Present temperature	153 (0x99)	1	R		INT	1			
	Temperature: Highest temperature all time		2	R		INT	1			
	Temperature: Lowest temperature all time		3	R		INT	1			
	Temperature: Highest temperature since last reset		4	R		INT	1			
	Temperature: Lowest temperature since last reset	175 (0xAF)	5	R		INT	1			
	Received light level		0	R		UINT	1		0 to 254 255 (not available)	Unit: %
	Received light level threshold		0	R/W	✓	UINT	1		0 to 90	
	Alarm limit for diagnostic parameters: High temperature		1	R/W	✓	INT	1		-128 to 127	
	Alarm limit for diagnostic parameters: Low temperature	179 (0xB3)	2	R/W	✓	INT	1		-128 to 127	
	Alarm limit for diagnostic parameters: Operating hours		3	R/W	✓	UINT	4		0 to 1000000	
Observation	Present receiver level (live)	180 (0xB4)	0	R		UINT	2			
	Upper Threshold (switch-on) dynamic	181 (0xB5)	0	R		UINT	2			
Diagnosis	Operating hours: Total operating hours	190 (0xBE)	1	R		UINT	4			
	Operating hours: Operating hours since last reset		2	R		UINT	4			
Identification	Find me	204 (0xCC)	0	R/W		UINT	1	0	0x00: Find me deactivated 0x01: Find me activated	
General Settings	Preset number	222 (0xDE)	0	R/W		UINT	1	1	1 to 5	
Observation	System status	226 (0xE2)	0	R		UINT	2		Bit 6: Received light alarm output 0: Alarm not active 1: Alarm active Bit 7: Input signal status Pin2 0: External input OFF 1: External input ON	
General Settings	Notification handling	227 (0xE3)	0	R/W	✓	UINT	1	0	0x00: All enabled 0x01: All disabled 0x02: Events enabled, PD invalid flag disabled 0x03: Events disabled, PD invalid flag enabled	
	Display setting: Display mode, channel 1	234 (0xEA)	1	R/W	✓	UINT	1	0	0x00: Value (absolute) 0x01: Bar graph 0x02: Percentage value 0x03: Counter value 0x04: Edge value	
	Display setting: Display mode, channel 2		2	R/W	✓	UINT	1	0	0x00: Value (absolute) 0x01: Bar graph 0x02: Percentage value 0x03: Counter value 0x04: Edge value	
	Display setting: Display brightness		3	R/W	✓	UINT	1	100	10 to 100	
	Display setting: Eco mode		4	R/W	✓	UINT	1	0	0x00: Off 0x01: On	
	Display setting: Rotate display		5	R/W	✓	UINT	1	0	0x00: Off 0x01: On	
	Display setting: Invert display		6	R/W	✓	UINT	1	0	0x00: Off 0x01: On	
	Display setting: Alarm display		7	R/W	✓	UINT	1	0	0x00: Off 0x01: On	
	Display setting: Language		8	R/W	✓	UINT	1	1	0x01: English 0x06: Spanish 0x07: Simplified Chinese 0x08: Japanese 0x0A: Korean	
	Display hold setting: Hold mode, channel 1	235 (0xEB)	1	R/W	✓	UINT	1	0	0x00: Off 0x01: Peak/bottom 0x02: Peak 0x03: Bottom 0x04: Time	
	Display hold setting: Hold mode, channel 2		2	R/W	✓	UINT	1	0	0x00: Off 0x01: Peak/bottom 0x02: Peak 0x03: Bottom 0x04: Time	
Smart task	Counter mode	1001 (0x3E9)	0	R/W	✓	UINT	1	2	0x00: Up 0x01: Down 0x02: OFF	
	Preset mode	1002 (0x3EA)	0	R/W	✓	UINT	1	0	0x00: Preset internal disabled 0x01: Preset internal enabled	
	Preset value	1003 (0x3EB)	0	R/W	✓	UINT	2	0	0 to 16383	
	Comparator value low	1004 (0x3EC)	0	R/W	✓	UINT	2	10	0 to 16383	
	Comparator value high	1005 (0x3ED)	0	R/W	✓	UINT	2	10	0 to 16383	
	Counter value	1006 (0x3EE)	0	R	✓	UINT	2			
	Filtering time 1	1033 (0x409)	0	R/W	✓	UINT	4	0	0 to 30000000	
	Received light level D1	1034 (0x40A)	0	R	✓	UINT	2			
	Filtering time 2	1035 (0x40B)	0	R/W	✓	UINT	4	0	0 to 30000000	
	Received light level D2	1036 (0x40C)	0	R	✓	UINT	2			
	Input selector 1	1081 (0x439)	0	R/W	✓	UINT	1	0	0x00: Quint.1 0x01: Quint.2 0x40: Ext.input 1	

* R: Read only, R/W: Read/Write

Category	Name	Index No. DEC (HEX)	Sub index No.	Read/ Write *	Backup	Format	Length in bytes	Default	Setting details	Remarks (unit)
Smart task	Input selector 2	1082 (0x43A)	0	R/W	✓	UINT	1	1	0x00: Quint.1 0x01: Quint.2 0x40: Ext.input 1	
	Logic 1	1083 (0x43B)	0	R/W	✓	UINT	1	0	0x00: DIRECT 0x03: Window Mode 0x04: Hysteresis	
	Logic 2	1084 (0x43C)	0	R/W	✓	UINT	1	0	0x00: DIRECT 0x03: Window Mode 0x04: Hysteresis	
	Timer 1 mode	1085 (0x43D)	0	R/W	✓	UINT	1	0	0x00: Deactivated 0x01: On-delay timer 0x02: Off-delay timer 0x03: On/Off-delay timer 0x04: Pulse (one shot) 0x05: On-delay pulse timer	
	Timer 2 mode	1086 (0x43E)	0	R/W	✓	UINT	1	0	0x00: Deactivated 0x01: On-delay timer 0x02: Off-delay timer 0x03: On/Off-delay timer 0x04: Pulse (one shot) 0x05: On-delay pulse timer	
	Timer 1 setup	1087 (0x43F)	0	R/W	✓	UINT	2	1	1 to 30000	Unit: ms
	Timer 2 setup	1088 (0x440)	0	R/W	✓	UINT	2	1	1 to 30000	Unit: ms
	Output mode 1	1089 (0x441)	0	R/W	✓	UINT	1	0	0x00: Not inverted 0x01: Inverted	
	Output mode 2	1090 (0x442)	0	R/W	✓	UINT	1	0	0x00: Not inverted 0x01: Inverted	
	Timer 1.1 setup	1091 (0x443)	0	R/W	✓	UINT	2	1	1 to 30000	Unit: ms
I/O Settings	Timer 2.1 setup	1092 (0x444)	0	R/W	✓	UINT	2	1	1 to 30000	Unit: ms
	Ext. input for input mode	1093 (0x445)	0	R/W	✓	UINT	1	0	0x00: Not inverted 0x01: Inverted	
Main interface	Device display	3584 (0x0E00)	0	R		STRING	1			Format: Display 1,Display 2, Display 3,Display 4,Display 5 *2
	Device buttons	3585 (0x0E01)	0	W		UINT	1		0: Release 1: Push	Bit0:Plus button Bit1:Minus button Bit2:Menu/OK button Bit3:Teach/ESC button
	Device LEDs - Power LED	3586 (0x0E02)	1	R		UINT	1		0: off 1: on 2: blink1(1Hz 50:50) 3: blink2(6Hz 50:50) 4: blink3(4Hz 25:75) 5: blink4(1Hz 50:50) 6: blink5(1Hz 90:10)	
	Device LEDs - Q1 LED		2	R		UINT	1		0: off 1: on 2: blink1(1Hz 50:50) 3: blink2(6Hz 50:50) 4: blink3(4Hz 25:75) 5: blink4(1Hz 50:50) 6: blink5(1Hz 90:10)	
	Device LEDs - Q2 LED		3	R		UINT			0: off 1: on 2: blink1(1Hz 50:50) 3: blink2(6Hz 50:50) 4: blink3(4Hz 25:75) 5: blink4(1Hz 50:50) 6: blink5(1Hz 90:10)	

*1 R: Read only, W: Write only
*2 The display will be in the following state.

Display 1
Display 2

Display 4

Display 3
Display 4

Display 5

Events

Code		Description
DEC	HEX	
4227	0x1083	Received light level diagnostic
6144	0x1800	High temperature (depends on high temperature setting of index 179, subindex 1)
6145	0x1801	Low temperature (depends on low temperature setting of index 179, subindex 2)
6146	0x1802	Operating hours (depends on Operating hours setting of index 179, subindex 3)
30480	0x7710	Short-circuit on output