KEYENCE

I96GB

Radar Type Level Sensor
FR Series

IO-Link Instruction Manual

This instruction manual explains the IO-Link specifications for the radar type level sensor FR Series. Details about the FR Series functions and how to use the unit can be found in the "FR Series User's Manual." A copy of the "FR Series User's Manual" can be downloaded off of the KEYENCE website. Alternatively, contact the nearest KEYENCE office.
The settings file can also be downloaded off of the KEYENCE website. If using the unit in an environment where it is not possible to download files over the Internet, contact the nearest KEYENCE office.
<KEYENCE website> www.keyence.com/glb

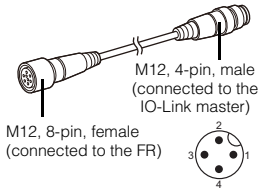
1. Specifications

Model	**Short-range type**	FR-S01 (with built-in display), FR-SA1C (with separated display)
	Long-range type	FR-LM20(L) (standard model), FR-LP20(L) (chemical model), FR-LS20(L) (sanitary model)
IO-Link approved standard		v.1.1
Transmission speed		COM2 (38.4 kbps)
Min. cycle time		10 ms
Process data length		12 byte

2. Wiring

Other than the FR-SA1C

Pin number*	Symbol	Name
1	L+	24 VDC
2	Q2	Control output 1
3	L-	0V
4	Q1/C	IO-Link/ Control output 2



* The pin layout indicates the case in which the optional IO-Link connection cable has been used to convert to an M12, 4-pin connector.

FR-SA1C

M8 connector

Pin number	Symbol	Name
1	L+	24 VDC
2	Other	Selectable*1
3	L-	0 V
4	Q1/C	IO-Link/Control output 1

*1 Assigned to control output 2, external input, or analog output.

3. Process Data

Process data is a function for communicating predetermined data at fixed intervals.

bit 95	bit 94	bit 93	bit 92	bit 91	bit 90	bit 89	bit 88	bit 87	bit 86	bit 85	bit 84	bit 83	bit 82	bit 81	bit 80
Current value															

bit 79	bit 78	bit 77	bit 76	bit 75	bit 74	bit 73	bit 72	bit 71	bit 70	bit 69	bit 68	bit 67	bit 66	bit 65	bit 64
Current value															

bit 63	bit 62	bit 61	bit 60	bit 59	bit 58	bit 57	bit 56	bit 55	bit 54	bit 53	bit 52	bit 51	bit 50	bit 49	bit 48
Accumulated level value (short-range type)/Flow conversion value (long-range type)															

bit 47	bit 46	bit 45	bit 44	bit 43	bit 42	bit 41	bit 40	bit 39	bit 38	bit 37	bit 36	bit 35	bit 34	bit 33	bit 32
Accumulated level value (short-range type)/Flow conversion value (long-range type)															

bit 31	bit 30	bit 29	bit 28	bit 27	bit 26	bit 25	bit 24	bit 23	bit 22	bit 21	bit 20	bit 19	bit 18	bit 17	bit 16
Error status															

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Rsv.	Stability			Rsv.	Indicator status			Reserved			Output 5	Output 4	Output 3	Output 2	Output 1

■ Process data details

[Monitored values]

Name	Numeric value range	Resolution*1				Note
		mm	m	inch	feet	
Current value	-199999 to 99999	1	0.001	0.01	0.001	"–199999" is stored when the sensor current value display is "---."
Accumulated level value (short-range type)	0 to 99999	1	0.001	0.01	0.001	"0" is stored and Disable accumulated level value (bit 28) turns ON when "---" is displayed for the accumulated level value on the sensor.
Flow conversion value (long-range type)	-199999999 to 99999999	1	0.001	0.01	0.001	"–199999999" is stored and Disable flow conversion value (bit 28) turns ON when "---" is displayed for the flow conversion value on the sensor.
Stability	0 to 4	-				Larger values indicate greater detection stability. 0 indicates the detection not possible status ("---").
Indicator status	0 to 4	-				0 = Always off 1 = Lit in green 2 = Lit in yellow 3 = Lit in red 4 = Blinking in red

*1 When Value scaling is set, the resolution depends on the set Decimal position (index number 127).

[Error status]

bit	Description
bit 16	System error
bit 17	EEPROM error
bit 18	Overcurrent error (output 1)
bit 19	Overcurrent error (output 2)
bit 20	Overcurrent error (output 3)
bit 21	Overcurrent error (output 4)
bit 22	Overcurrent error (output 5)
bit 23	Head error
bit 24	Interference
bit 25	Learning data error
bit 26	Detection not possible
bit 27	Stability alert
bit 28	Disable accumulated level value (short-range type)/Disable flow conversion value (long-range type)
bit 29	Tracking in progress
bit 30	HIGH
bit 31	LOW

4. Service Data

Service data is a function in which the information between the IO-Link master and slave is only updated when there is a transmission request between these two devices.
Reading/writing of the sensor settings and status and execution of operation commands (resetting hold values) can be carried out.

- **Meaning of each item**

Item	Value	Meaning
Name	—	Shows the notation in the instruction manual
Format	Record	Data structure
	bit (x)	Bit number x in Record
	String	Character string
	Uint	Unsigned integer
	Int	Signed integer
Attribute	R	Readable
	R/W	Readable/writable
	W	Writable
	C	Operation command
Data storage	✓	Compatible with the data storage function*1
	—	Not compatible with the data storage function

*1 This is used to back up the sensor settings on the IO-Link master. This makes it possible to automatically restore the settings when the sensor is replaced.

4-1 Parameter List

■ Predefined parameter

Index		Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
DEC	HEX								
16	10H	Vendor Name	String	64byte	R	-	Keyence		
17	11H	Vendor Text	String	64byte	R	-	www.keyence.com/global.jsp		
18	12H	Product Name	String	64byte	R	-	(Different on each model)*1		
19	13H	Product ID	String	64byte	R	-	(Different on each model)*1		
20	14H	Product Text	String	64byte	R	-	Level Sensor		
21	15H	Serial Number	String	16byte	R	-	-		
22	16H	Hardware Version	String	64byte	R	-	-		
23	17H	Firmware Version	String	64byte	R	-	-		
24	18H	Application Specific Tag	String	32byte	R/W	✓	***	-	
37	25H	Detailed Device Status	Record	21byte	R	-	0	Refer to “5. Events.”	
40	28H	Process Data Input	Uint	12 byte	R	-	-	-	-

*1 The value is as follows depending on the model.
- Short-range type with built-in display → FR-S01
- Short-range type with separated display → FR-SA1C
- Long-range type (excluding the sanitary model) → FR-L
- Long-range type (sanitary model) → FR-LS20

■ Standard Command

Index		Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
DEC	HEX								
2	02H	System Command	Uint	1byte	C	-	-	5 = Param Download Store 129 = Application reset 131 = Back-to-box 240 = Event 8DFE appears 241 = Event 8DFE disappears 242 = Event 8DFF appears 243 = Event 8DFF disappears	-

Reference

5 = Param Download Store
This command is used to set the data storage function. With this function, data is uploaded to and recorded on the IO-Link master when parameters are changed via sensor operations but this uploading does not occur when sensor parameters are rewritten from a PLC or other higher-level device. In this situation, use the Param Download Store command to notify the IO-Link master of the change and upload the data.

129 = Application reset
Execute this command to initialize the settings on the device.

131 = Back-to-box
Execute this command to initialize the settings on the device then stop IO-Link communication.
Turning the power supply off then on restarts IO-Link communication.

240 = Event 8DFE appears / 241 = Event 8DFE disappears
242 = Event 8DFF appears / 243 = Event 8DFF disappears
These commands are used to issue test events. These commands can be used to generate and delete test events when checking operation during device startup and in other situations when events occur.

■ Device Parameter

Index	Sub-index	Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
100 (64H)	0	PNP/NPN	Uint	1 byte	R/W	✓	0	0 = PNP 1 = NPN	
102 (66H)	0	Distance unit	Uint	1 byte	R/W	✓	0	0 = mm 1 = m 2 = inch 3 = feet	
103 (67H)	0	Command request	Uint	1 byte	C	-	0	0 = Reserved 1 = Acquire peak 2 = Execute diagnosis 3 = Execute learning 4 = Clear learning 5 = Reserved 6 = Reserved 7 = Reset accumulated level value	[7 = Reset accumulated level value] is only available on the short-range type.
104 (68H)	0	Command status	Uint	1 byte	R	-	0	0 = Idle 1 = Executing 2 = Success 3 = Failure	
105 (69H)	0	Detection target	Uint	1 byte	R/W	✓	0	0 = Water based 1 = Oil based 2 = Powder	
106 (6AH)	0	Bottom distance	Uint	4 byte	R/W	✓	Refer to the note.	Short-range type: 0 to 2000 Long-range type: 0 to 25000	Short-range type initial value: 500 Long-range type initial value: 5000
107 (6BH)	0	Top distance	Uint	4 byte	R/W	✓	0	Short-range type: 0 to 2000 Long-range type: 0 to 25000	
108 (6CH)	0	Control outputs	Uint	1 byte	R/W	✓	0	0 = 0 1 = 1 2 = 2 3 = 3 4 = 4 5 = 5	
109 (6DH)	0	IO1 Settings							
	1	IO1 Control output mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Area	
	2	IO1 AUX output mode	Uint	1 byte	R/W	✓	0	0 = --- 1 = Error 2 = Stability alert 3 = Accumulated level	[3 = Accumulated level] is only available on the short-range type.
	3	IO1 Hysteresis direction	Uint	1 byte	R/W	✓	0	0 = Lower side 1 = Upper side	
	4	IO1 Logic	Uint	1 byte	R/W	✓	0	0 = N.O. 1 = N.C.	
	5	IO1 Set value/Set lower limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	IO1 Set upper limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	IO1 No detection output	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON 2 = Keep previous	
110 (6EH)	0	IO2 Settings							
	1	IO2 Control output mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Area	
	2	IO2 AUX output mode	Uint	1 byte	R/W	✓	0	0 = --- 1 = Error 2 = Stability alert 3 = Accumulated level	[3 = Accumulated level] is only available on the short-range type.
	3	IO2 Hysteresis direction	Uint	1 byte	R/W	✓	0	0 = Lower side 1 = Upper side	
	4	IO2 Logic	Uint	1 byte	R/W	✓	0	0 = N.O. 1 = N.C.	
	5	IO2 Set value/Set lower limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	IO2 Set upper limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	IO2 No detection output	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON 2 = Keep previous	
111 (6FH)	0	IO3 Settings							
	1	IO3 Control output mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Area	
	2	IO3 AUX output mode	Uint	1 byte	R/W	✓	0	0 = --- 1 = Error 2 = Stability alert 3 = Accumulated level	[3 = Accumulated level] is only available on the short-range type.
	3	IO3 Hysteresis direction	Uint	1 byte	R/W	✓	0	0 = Lower side 1 = Upper side	
	4	IO3 Logic	Uint	1 byte	R/W	✓	0	0 = N.O. 1 = N.C.	
	5	IO3 Set value/Set lower limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	IO3 Set upper limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	IO3 No detection output	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON 2 = Keep previous	
112 (70H)	0	IO4 Settings							
	1	IO4 Control output mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Area	
	2	IO4 AUX output mode	Uint	1 byte	R/W	✓	0	0 = --- 1 = Error 2 = Stability alert 3 = Accumulated level	[3 = Accumulated level] is only available on the short-range type.
	3	IO4 Hysteresis direction	Uint	1 byte	R/W	✓	0	0 = Lower side 1 = Upper side	
	4	IO4 Logic	Uint	1 byte	R/W	✓	0	0 = N.O. 1 = N.C.	
	5	IO4 Set value/Set lower limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	IO4 Set upper limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	IO4 No detection output	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON 2 = Keep previous	

Index	Sub-index	Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
113 (71H)	0	IO5 Settings							
	1	IO5 Control output mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Area	
	2	IO5 AUX output mode	Uint	1 byte	R/W	✓	0	0 = --- 1 = Error 2 = Stability alert 3 = Accumulated level	[3 = Accumulated level] is only available on the short-range type.
	3	IO5 Hysteresis direction	Uint	1 byte	R/W	✓	0	0 = Lower side 1 = Upper side	
	4	IO5 Logic	Uint	1 byte	R/W	✓	0	0 = N.O. 1 = N.C.	
	5	IO5 Set value/Set lower limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	IO5 Set upper limit	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	IO5 No detection output	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON 2 = Keep previous	
114 (72H)	0	Analog settings							
	1	Analog current	Uint	1 byte	R/W	✓	0	0 = 4-20 mA 1 = 0-20 mA	
	2	Target	Uint	1 byte	R/W	✓	0	0 = Level 1 = Flow conversion value	[1 = Flow conversion value] is only available on the long-range type.
	3	Analog low limit	Int	4 byte	R/W	✓	0	-99999 to 99999	
	4	Analog hi limit	Int	4 byte	R/W	✓	1500	-99999 to 99999	
	5	No detection output	Uint	1 byte	R/W	✓	1	0 = 3.5 mA (0 mA) 1 = 21.5 mA 2 = Keep previous 3 = Fixed value	
	6	Analog when ---	Uint	1 byte	R/W	✓	35	0 to 215	Unit: 0.1 mA This parameter is used when No detect output (sub-index number 5) is [3 = Fixed value].
115 (73H)	0	Analog output	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON	This parameter is only available on the FR-SA1C (short-range type with separated display).
116 (74H)	0	External input	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON	This parameter is only available on the short-range type.
117 (75H)	0	Input function	Uint	1 byte	R/W	✓	0	0 = Disabled 1 = Reset accumulated level 2 = Stop accumulated level	This parameter is only available on the short-range type.
119 (77H)	0	Response time	Uint	1 byte	R/W	✓	2	0 = 0.4 s 1 = 1.5 s 2 = 4 s 3 = 10 s	
120 (78H)	0	Accumulated level settings							This parameter is only available on the short-range type.
	1	Accumulated level	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON	
	2	Accumulated level time	Uint	1 byte	R/W	✓	0	0 = 1 h 1 = 10 h 2 = 24 h 3 = 100 h	
	3	Tolerable amount of change	Uint	4 byte	R/W	✓	20	0 to 99999	
121 (79H)	0	Stop accumulated level	Uint	1 byte	R/W	-	0	0 = OFF 1 = ON	This parameter is only available on the short-range type.
123 (7BH)	0	Flow conversion settings							This parameter is only available on the long-range type.
	1	Flow conversion	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON	
	2	Conversion time	Uint	1 byte	R/W	✓	0	0 = min 1 = hour	
	3	Conversion average time	Uint	1 byte	R/W	✓	0	0 = 2.5 s 1 = 5 s 2 = 10 s 3 = 30 s 4 = 60 s 5 = 120 s 6 = 200 s	
124 (7CH)	0	Pro settings							
	1	Reserved	Uint	1 byte	R/W	✓	0		
	2	Near mask	Uint	1 byte	R/W	✓	1	0 = Manual 1 = Automatic	
	3	Near mask distance	Uint	4 byte	R/W	✓	0	0 to 99999	
	4	Far mask	Uint	1 byte	R/W	✓	1	0 = Manual 1 = Automatic	
	5	Far mask distance	Uint	4 byte	R/W	✓	Refer to the note.	0 to 99999	Short-range type initial value: 1600 Long-range type initial value: 5500
	6	Sensitivity	Uint	1 byte	R/W	✓	Refer to the note.	0 = 1 1 = 2 2 = 3 3 = 4	Short-range type initial value: 2 (= 3) Long-range type initial value: 1(= 2)
	7	Select peak mode	Uint	1 byte	R/W	✓	0	0 = Peak priority 1 = Front priority	
	8	Tracking time	Uint	1 byte	R/W	✓	2	0 = OFF 1 = 1 s 2 = 5 s 3 = 10 s 4 = 100 s 5 = No time limit	
	9	Tracking range	Uint	1 byte	R/W	✓	1	0 = 1 1 = 2 2 = 3 3 = 4 4 = 5	
	10	HIGH hold	Uint	1 byte	R/W	✓	1	0 = OFF 1 = ON	
	11	LOW hold	Uint	1 byte	R/W	✓	1	0 = OFF 1 = ON	
	12	Near level lost	Uint	1 byte	R/W	✓	1	0 = OFF 1 = ON	
	13	Far level lost	Uint	1 byte	R/W	✓	1	0 = OFF 1 = ON	
	14	Powder near hold	Uint	1 byte	R/W	✓	1	0 = OFF 1 = ON	

Index	Sub-index	Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
124 (7CH)	15	Tracking mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Average	
	16	Special hi sensitivity	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON (+5[s]) 2 = ON (+20[s]) 3 = ON (+80[s])	This parameter is only available on the long-range type.
	17	Reserved	Uint	1 byte	R/W	✓	0		
	18	Reserved	Uint	1 byte	R/W	✓	0		
	19	Reserved	Uint	4 byte	R/W	✓	0		
	20	Reserved	Uint	4 byte	R/W	✓	0		
125 (7DH)	0	Value scaling	Uint	1 byte	R/W	✓	0	0 = OFF 1 = ON	
126 (7EH)	0	Value unit	Uint	1 byte	R/W	✓	2	0 = None 1 = mL 2 = L 3 = hL 4 = m^3 5 = g 6 = kg 7 = t 8 = mm 9 = m 10 = % 11 = gal 12 = ft^3 13 = bbl 14 = lb 15 = STon 16 = LTon 17 = inch 18 = feet	
127 (7FH)	0	Decimal position	Uint	1 byte	R/W	✓	0	0 = 99999 1 = 9999.9 2 = 999.99 3 = 99.999 4 = 9.9999	
128 (80H)	0	Tank shape	Uint	1 byte	R/W	✓	0	0 = Straight tank 1 = Spherical tank 2 = Cylindrical tank (horizontal placement) 3 = Cone base tank 4 = Quadrangular pyramid base tank 5 = Sloped base tank 6 = Manual multi point	This parameter is only available on the long-range type.
129 (81H)	0	Base height	Uint	4 byte	R/W	✓	0	0 to 99999	This parameter is only available on the long-range type.
130 (82H)	0	Tank capacity	Uint	4 byte	R/W	✓	1000	0 to 99999	
131 (83H)	0	Manual points quantity	Uint	1 byte	R/W	✓	2	2 to 32	This parameter is only available on the long-range type.
132 (84H)	0	Manual multi pt settings 1-16							This parameter is only available on the long-range type.
	1	Current value 1	Uint	4 byte	R/W	✓	0	0 to 99999	
	2	Current value 2	Uint	4 byte	R/W	✓	0	0 to 99999	
	3	Known value 3	Uint	4 byte	R/W	✓	0	0 to 99999	
	4	Current value 3	Uint	4 byte	R/W	✓	0	0 to 99999	
	5	Known value 4	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	Current value 4	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	Known value 5	Uint	4 byte	R/W	✓	0	0 to 99999	
	8	Current value 5	Uint	4 byte	R/W	✓	0	0 to 99999	
	9	Known value 6	Uint	4 byte	R/W	✓	0	0 to 99999	
	10	Current value 6	Uint	4 byte	R/W	✓	0	0 to 99999	
	11	Known value 7	Uint	4 byte	R/W	✓	0	0 to 99999	
	12	Current value 7	Uint	4 byte	R/W	✓	0	0 to 99999	
	13	Known value 8	Uint	4 byte	R/W	✓	0	0 to 99999	
	14	Current value 8	Uint	4 byte	R/W	✓	0	0 to 99999	
	15	Known value 9	Uint	4 byte	R/W	✓	0	0 to 99999	
	16	Current value 9	Uint	4 byte	R/W	✓	0	0 to 99999	
	17	Known value 10	Uint	4 byte	R/W	✓	0	0 to 99999	
	18	Current value 10	Uint	4 byte	R/W	✓	0	0 to 99999	
	19	Known value 11	Uint	4 byte	R/W	✓	0	0 to 99999	
	20	Current value 11	Uint	4 byte	R/W	✓	0	0 to 99999	
	21	Known value 12	Uint	4 byte	R/W	✓	0	0 to 99999	
	22	Current value 12	Uint	4 byte	R/W	✓	0	0 to 99999	
	23	Known value 13	Uint	4 byte	R/W	✓	0	0 to 99999	
	24	Current value 13	Uint	4 byte	R/W	✓	0	0 to 99999	
	25	Known value 14	Uint	4 byte	R/W	✓	0	0 to 99999	
	26	Current value 14	Uint	4 byte	R/W	✓	0	0 to 99999	
	27	Known value 15	Uint	4 byte	R/W	✓	0	0 to 99999	
	28	Current value 15	Uint	4 byte	R/W	✓	0	0 to 99999	
	29	Known value 16	Uint	4 byte	R/W	✓	0	0 to 99999	
	30	Current value 16	Uint	4 byte	R/W	✓	0	0 to 99999	
133 (85H)	0	Manual multi pt settings 17-32							This parameter is only available on the long-range type.
	1	Known value 17	Uint	4 byte	R/W	✓	0	0 to 99999	
	2	Current value 17	Uint	4 byte	R/W	✓	0	0 to 99999	
	3	Known value 18	Uint	4 byte	R/W	✓	0	0 to 99999	
	4	Current value 18	Uint	4 byte	R/W	✓	0	0 to 99999	
	5	Known value 19	Uint	4 byte	R/W	✓	0	0 to 99999	
	6	Current value 19	Uint	4 byte	R/W	✓	0	0 to 99999	
	7	Known value 20	Uint	4 byte	R/W	✓	0	0 to 99999	
	8	Current value 20	Uint	4 byte	R/W	✓	0	0 to 99999	
	9	Known value 21	Uint	4 byte	R/W	✓	0	0 to 99999	
	10	Current value 21	Uint	4 byte	R/W	✓	0	0 to 99999	
	11	Known value 22	Uint	4 byte	R/W	✓	0	0 to 99999	
	12	Current value 22	Uint	4 byte	R/W	✓	0	0 to 99999	
	13	Known value 23	Uint	4 byte	R/W	✓	0	0 to 99999	
	14	Current value 23	Uint	4 byte	R/W	✓	0	0 to 99999	
	15	Known value 24	Uint	4 byte	R/W	✓	0	0 to 99999	
	16	Current value 24	Uint	4 byte	R/W	✓	0	0 to 99999	

Index	Sub-index	Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
133 (85H)	17	Known value 25	Uint	4 byte	R/W	✓	0	0 to 99999	This parameter is only available on the long-range type.
	18	Current value 25	Uint	4 byte	R/W	✓	0	0 to 99999	
	19	Known value 26	Uint	4 byte	R/W	✓	0	0 to 99999	
	20	Current value 26	Uint	4 byte	R/W	✓	0	0 to 99999	
	21	Known value 27	Uint	4 byte	R/W	✓	0	0 to 99999	
	22	Current value 27	Uint	4 byte	R/W	✓	0	0 to 99999	
	23	Known value 28	Uint	4 byte	R/W	✓	0	0 to 99999	
	24	Current value 28	Uint	4 byte	R/W	✓	0	0 to 99999	
	25	Known value 29	Uint	4 byte	R/W	✓	0	0 to 99999	
	26	Current value 29	Uint	4 byte	R/W	✓	0	0 to 99999	
	27	Known value 30	Uint	4 byte	R/W	✓	0	0 to 99999	
	28	Current value 30	Uint	4 byte	R/W	✓	0	0 to 99999	
	29	Known value 31	Uint	4 byte	R/W	✓	0	0 to 99999	
	30	Current value 31	Uint	4 byte	R/W	✓	0	0 to 99999	
	31	Known value 32	Uint	4 byte	R/W	✓	0	0 to 99999	
	32	Current value 32	Uint	4 byte	R/W	✓	0	0 to 99999	
134 (86H)	0	Offset	Uint	4 byte	R/W	✓	0	0 to 99999	
135 (87H)	0	Zero cut	Uint	1 byte	R/W	✓	1	0 = OFF 1 = ON	
136 (88H)	0	Zero cut value	Uint	4 byte	R/W	✓	0	0 to 99999	
137 (89H)	0	Hysteresis	Uint	4 byte	R/W	✓	5	0 to 99999	
138 (8AH)	0	Indicator settings							
	1	Indicator mode	Uint	1 byte	R/W	✓	0	0 = Standard 1 = Custom 2 = All off	
	2	Indicator order	Uint	1 byte	R/W	✓	4	0 = Order 1 1 = Order 2 2 = Order 3 3 = Only green 4 = Always off	
	3	Hi red areas	Uint	1 byte	R/W	✓	0	0 = 0 1 = 1 2 = 2 3 = 3	
	4	Hi yellow areas	Uint	1 byte	R/W	✓	0	0 = 0 1 = 1 2 = 2 3 = 3	
	5	Low red areas	Uint	1 byte	R/W	✓	0	0 = 0 1 = 1 2 = 2 3 = 3	
	6	Low yellow areas	Uint	1 byte	R/W	✓	0	0 = 0 1 = 1 2 = 2 3 = 3	
	7	Middle color	Uint	1 byte	R/W	✓	0	0 = Green 1 = Always off	
139 (8BH)	0	Brightness	Uint	1 byte	R/W	✓	Refer to the note.	0 = Brightness 5 1 = Brightness 4 2 = Brightness 3 3 = Brightness 2 4 = Brightness 1 5 = OFF when no op.	Initial value on models other than sanitary model: 0 Initial value on sanitary model: 5
140 (8CH)	0	Flip display	Uint	1 byte	R/W	✓	0	0 = Normal 1 = Reverse	This parameter is only available on the FR-SA1C (short-range type with separated display).
141 (8DH)	0	Language	Uint	1 byte	R/W	✓	0	0 = ENGLISH 1 = JAPANESE 2 = SIMPLIFIED CHINESE 3 = DEUTSCH	
142 (8EH)	0	Key lock settings							
	1	Key lock status	Uint	1 byte	R/W	✓	0	0 = Unlocked 1 = Keys locked 2 = Keys locked (COM)	
	2	Key lock method	Uint	1 byte	R/W	✓	0	0 = Standard 1 = With password	
	3	Password	Uint	2 byte	R/W	✓	0	0 to 9999	
143 (8FH)	0	Execute simulate	Uint	1 byte	R/W	-	0	0 = OFF 1 = ON	
144 (90H)	0	Simulation current value	Int	4 byte	R/W	-	0	-99999 to 99999	
145 (91H)	0	No detection simulation	Uint	1 byte	R/W	-	0	0 = OFF 1 = ON	
146 (92H)	0	Distance	Uint	4 byte	R	-	0	0 to 4294967295	
147 (93H)	0	Current value	Int	4 byte	R	-	0	-199999 to 99999	
148 (94H)	0	Accumulated level value	Uint	4 byte	R	-	0	0 to 99999	For the short-range type.
		Flow conversion value	Int					-199999999 to 99999999	For the long-range type.
149 (95H)	0	Percent	Int	2 byte	R	-	0	-32768 to 32767	
150 (96H)	0	Error status	Uint	2 byte	R	-	0	This is the same as “Error status” in the process data. Check the meaning of the bits on page 2.	
151 (97H)	0	Stability	Uint	1 byte	R	-	0	0 to 4	
152 (98H)	0	Indicator status	Uint	1 byte	R	-	0	0 = Always off 1 = Lit in green 2 = Lit in yellow 3 = Lit in red 4 = Blinking in red	
153 (99H)	0	Output status	Uint	1 byte	R	-	0	Bits 0 to 4 indicate the output status of outputs 1 to 5. When a bit is 1, the output is on. When a bit is 0, the output is off.	

Index	Sub-index	Name	Format	Data length	Attribute	Data storage	Initial value	Setting range/details	Note
154 (9AH)	0	Number of peaks	Uint	1 byte	R	-	0	0 to 5	
155 (9BH)	0	Learning state	Uint	1 byte	R	-	0	0 = None available 1 = Available	
156 (9CH)	0	Learning diagnosis							
	1	Diagnostic code	Uint	1 byte	R	-	0	0 to 10	
	2	Near distance limit	Uint	4 byte	R	-	0	0 to 99999	
157 (9DH)	0	Detected peak information							
	1	Number of detected peaks	Uint	1 byte	R	-	0	0 to 5	
	2	Peak 1 distance	Uint	4 byte	R	-	0	0 to 4294967295	
	3	Peak 1 stability	Uint	1 byte	R	-	0	0 to 4	
	4	Peak 2 distance	Uint	4 byte	R	-	0	0 to 4294967295	
	5	Peak 2 stability	Uint	1 byte	R	-	0	0 to 4	
	6	Peak 3 distance	Uint	4 byte	R	-	0	0 to 4294967295	
	7	Peak 3 stability	Uint	1 byte	R	-	0	0 to 4	
	8	Peak 4 distance	Uint	4 byte	R	-	0	0 to 4294967295	
	9	Peak 4 stability	Uint	1 byte	R	-	0	0 to 4	
	10	Peak 5 distance	Uint	4 byte	R	-	0	0 to 4294967295	
	11	Peak 5 stability	Uint	1 byte	R	-	0	0 to 4	
158 (9EH)	0	Selected peak number	Uint	1 byte	R/W	-	0	0 = Distance 1 = Peak 1 2 = Peak 2 3 = Peak 3 4 = Peak 4 5 = Peak 5 6 = Empty	
159 (9FH)	0	Learning distance	Uint	4 byte	R/W	-	0	0 to 99999	
162 (A2H)	0	Adaption status	Uint	1 byte	R	0	0	0 = No 1 = Yes	

5. Events

When an event occurs, the sensor turns ON the event flag in the process data telegram.
The master detects the event flag and reads the value that corresponds to the event that occurred.
This allows the status of the sensor to be forwarded to the PLC or monitor through the IO-Link master.
While an event is being read, no service data is exchanged.

Value	Name	Description	Level
1803H	Head error	A head error occurred.	Error
1809H	Interference	Interference occurred.	Error
180AH	Learning error	A learning data error occurred.	Error
5000H	System error / EEPROM error	A system error or an EEPROM error occurred.	Error
7710H	Overcurrent	An overcurrent error occurred on one of the channels.	Error
8DFEH	Test Event 1	Event 8DFEH occurs when 240 is written to index 2. This event is deleted when 241 is written to the same index.	Error
8DFFH	Test Event 2	Event 8DFFH occurs when 242 is written to index 2. This event is deleted when 243 is written to the same index.	Error
FF91H	Data Storage Upload Request	Settings were changed on the sensor.	-

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A6WW1-MAN-2033

281006GB 2014-1 I96GB Printed in Japan

I96GB-1