

IO-Link Parameter Datasheet

Inductive high temperature sensor

F135-M18-E2-IO* series

PEPPERL+FUCHS

IO-Link

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DOCT-9417 - Version 1.00.000 / 2025-02-03

General Information

Device Identification	
Vendor ID	1 (0x0001)
Device ID	2098689 (0x200601)

Features	
Data Storage	Yes
Block Parameterization	Yes

Communication Characteristics	
IO-Link revision	V1.1 (specification V1.1.4)
IO-Link backward compatibility	n/a
Data transmission rate	COM2 (38.4 kbit/s)
Min. cycle time	2.3 ms
Process data input	5 bit
Process data output	n/a
SIO mode support	Yes
Compatible master port type	Class A, Class B (see NOTE)

Device Profile	
Smart Sensor - SSP 1.1	2 (0x0002)
Identification & Diagnosis - I&D	16384 (0x4000)
Function Class - Uncertainty Indication	32791 (0x8017)
Function Class - Locator	33025 (0x8101)
Function Class - Product URI	33026 (0x8102)

NOTE: For use at IO-Link master port Class B, use 3-pole adapter or 3-wire cable.

Supported Product Variants

Product ID	*Product Name*	*Description*	*Connector*
70157786	F135-M18-E2-IO-V31-V1	Inductive high temperature sensor, 250°C, switching output, PNP, M12 plug, 4-pin.	Plug, M12, 4-pin

Connection

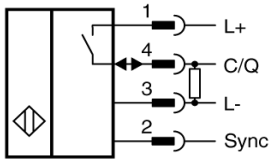
Connection Diagram	*Description*
	**Plug, M12, 4-pin** 1: Brown L+ 2: Sync 3: Blue L- 4: Black C/Q

Table of Contents

1. **Process Data**
   - Process Data Input ... 3
     - SSC - Switching Signal ... 3
     - OPTION - Uncertainty Indication ... 3
     - STAT - Sensor Head Status ... 3
     - DSC - Maintenance Warning ... 3
2. **Identification** ... 4
3. **Diagnosis**
   - Device Status ... 5
   - Detailed Device Status ... 5
   - Device Characteristics ... 5
   - Operating Hours ... 5
   - Synchronization Line - Status ... 5
   - Maintenance Diagnosis ... 5
   - Maintenance Monitor - Operating Time ... 6
   - Maintenance Monitor - SSC Incident Count ... 6
   - Maintenance Monitor - Measurement ... 6
   - Maintenance Reset Counter ... 6
4. **Parameterization & Configuration**
   - SSC Config - Logic ... 7
   - SSC Config - Extension ... 7
   - Synchronization Line - Mode ... 7
   - I/O Configuration - C/Q Type ... 7
   - Event Configuration ... 7
   - Maintenance Config. - Operating Time ... 8
   - Maintenance Config. - SSC Incident Count Limit Value ... 8
   - Maintenance Config. - Measurement ... 8
5. **Observation**
   - Observation Data ... 9
     - Operating Reserve ... 9
     - SSC - Switching Signal ... 9
     - OPTION - Uncertainty Indication ... 9
     - STAT - Sensor Head Status ... 9
     - DSC - Maintenance Warning ... 9
6. **Command Interface**
   - Locator Start ... 10
   - Locator Stop ... 10
   - Application Reset ... 10
   - Back-to-Box ... 10
   - Maintenance Reset ... 10
   - Teach-in actual Ls and Rs ... 10
7. **Error Codes** ... 11
8. **Event Codes**
   - Maintenance diagnosis ... 11
   - Uncertainty indication ... 11

Process Data

Process Data Input

Octet	*Bitoffs.*	*Name*	*Data type*	*Length*	*Value*	*Unit*	*Description*
0	0	SSC - Switching Signal	Boolean	1 bit	 *0* *1*		Indicates the detection status of a switching signal channel depending on process data and SSC Param and SSC Config. *Low* *High*
	1	OPTION - Uncertainty Indication	Boolean	1 bit	 *0* *1*		Switching distance was not exceeded / deceeded by more than +20%/-20% before the last switching status change. *Good* *Uncertain*
	2	STAT - Sensor Head Status	Boolean	1 bit	 *0* *1*		Indicates that the sensor head works correctly (if a Rs value < 45 Ohm is measured). *Sensor head not OK* *Sensor head OK*
	3	Reserved		1 bit			Reserved.
	4	DSC - Maintenance Warning	Boolean	1 bit	 *0* *1*		Indicates that at least one of the configured maintenance limit values is reached or exceeded. *Inactive* *Active*

NOTE: The process data input content can be accessed in addition over parameter ‘Process Data Input’ at index 40 (0x28)

Parameter Data

Identification

Index .sub	Parameter	Access	Data type	Length	Default	Description	DS	R
16 (0x10)	Vendor Name	ro	String	max. 32 byte	Pepperl+Fuchs	The vendor name that is assigned to a Vendor ID.		
17 (0x11)	Vendor Text	ro	String	max. 32 byte	www.pepperl-fuchs.com/io-link	Additional information about the vendor.		
18 (0x12)	Product Name	ro	String	max. 32 byte	F135-M18-E2-IO-V31-V1	Complete product name.		
19 (0x13)	Product ID	ro	String	max. 32 byte	70157786	Vendor-specific product or type identification (e.g., item number or model number).		
20 (0x14)	Product Text	ro	String	max. 32 byte	Ind. high temperature sensor	Additional product information for the device.		
21 (0x15)	Serial Number	ro	String	max. 16 byte		Unique, vendor-specific identifier of the individual device.		
22 (0x16)	Hardware Revision	ro	String	max. 8 byte	HW**.**	Unique, vendor-specific identifier of the hardware revision of the individual device.		
23 (0x17)	Firmware Revision	ro	String	max. 8 byte	SW**.**	Unique, vendor-specific identifier of the firmware revision of the individual device.		
24 (0x18)	Application Specific Tag	rw	String	max. 32 byte	Your automation, our passion.	Possibility to mark a device with user- or application-specific information.	Y	F
25 (0x19)	Function Tag	rw	String	max. 32 byte	***	Possibility to mark a device with function-specific information.	Y	F
26 (0x1A)	Location Tag	rw	String	max. 32 byte	***	Possibility to mark a device with location-specific information.	Y	F
27 (0x1B)	Product URI	ro	String	max. 64 byte	https://pefu.de/<serial number>	Provides a unique instance identification compliant to DIN-SPEC 91406.		
192 (0xC0)	Installation Tag	rw	String	max. 32 byte	***	Provides the possibility to mark the device with the installation or initial commissioning data or date. Note: this entry will not be transferred to a new device on replacement.		F

NOTE 1: The parameter data provide the attributes DS (Data Storage) and R (Reset behavior). The following rules apply:

DS: Parameter marked with **'Y'** (yes) are exchanged with the master via the data storage mechanism.

R: Parameter marked with **'F'** are reset to the factory default value upon reception of the command 'Back-to-box'.

R: Parameter marked with **'A'** are reset to the factory default value upon reception of the command 'Application Reset'.

R: Parameter marked with **'M'** are reset to the factory default value upon reception of the command 'Maintenance Reset'.

NOTE 2: Parameter with datatype Record or Array, which are marked with **'S0'** can only be accessed over subindex 0 (whole parameter object). Subindex access to single items is not possible.

Diagnosis

Index .sub	Parameter	Access	Data type	Length	Bitoffs.	Default	Value	Unit	Description	DS	R
36 (0x24)	Device Status	ro	UInteger	8 bit		0	*0* *1* *2* *3* *4*		Indicator for the current device condition and diagnosis state. *Device is OK* *Maintenance required* *Out of specification* *Functional check* *Failure*		FA
37 (0x25)	Detailed Device Status	ro	Array [S0]	18 byte					List of all currently pending events in the device.		FA
.1	Element 1	ro	OctetStr.	3 byte	120						FA
.2	Element 2	ro	OctetStr.	3 byte	96						FA
176 (0xB0)	Device Characteristics	ro	Record	6 byte					Shows the relevant key characteristics of the device for use in applications.		
.1	Switching Distance	ro	Integer	16 bit	32		*0* *25* *50*		Shows the value of the specified switching distance. *No head connected* *25 mm* *50 mm*		
.2	Maximum Temperature	ro	Integer	16 bit	16			°C	Shows the maximum allowed operating temperature of the front end, i.e., of the sensor head.		
.3	Supply Current Requirement	ro	UInteger	16 bit	0			mA	Shows the maximum specified supply current for the device excluding load.		
224 (0xE0)	Operating Hours	ro	UInteger	32 bit			*0 ... 2^{32} -1*	h	Shows the overall hours of operation since initial commissioning.		
230 (0xE6)	Synchronization Line - Status	ro	UInteger	8 bit			*0* *1* *2* *3* *4*		Shows the actual state of the synchronization line. *Line is off* *Neighbor detected* *Line is low* *Line is high* *No connection*		FA
235 (0xEB)	Maintenance Diagnosis	ro	Record [S0]	2 byte					Shows the current maintenance diagnosis status.		FA M
.1	Operating Conditions Warning	ro	Boolean	1 bit	0		*0* *1*		Indicates if a limit value for operating conditions in the parameter 'Maintenance Configuration - Operating Time' is reached. To reset use 'Maintenance Reset'. *Inactive* *Active*		FA M
.2	SSC Limit Values Warning	ro	Boolean	1 bit	1		*0* *1*		Indicates if a limit value for switching signal channel (SSC) conditions in the parameter 'Maintenance Configuration - SSC' is reached. To reset use 'Maintenance Reset'. *Inactive* *Active*		FA M
.3	Measurement Limit Values Warning	ro	Boolean	1 bit	2		*0* *1*		Indicates if a limit value for measurement conditions in the parameter 'Maintenance Configuration - Measurement' is reached. To reset use 'Maintenance Reset'. *Inactive* *Active*		FA M

Diagnosis

Index .sub	Parameter	Access	Data type	Length	Bitoffs.	Default	Value	Unit	Description	DS	R
216 (0xD8)	Maintenance Monitor - Operating Time	ro	UInteger	32 bit		0	*0 ... 2^{32} -1*	h	Shows the powered operating time since the last maintenance reset.		FA M
217 (0xD9)	Maintenance Monitor - SSC Incident Count	ro	UInteger	32 bit		0	*0 ... 2^{32} -1*		Provides information on the monitored switching signal channel (SSC) incidents since the last maintenance reset.		FA M
218 (0xDA)	Maintenance Monitor - Measurement	ro	Record	14 byte					Provides information on the monitored measurement values and incidents since the last maintenance reset.		FA
.1	Actual Value Rs	ro	UInteger	16 bit	96		*4000 … 45000* *0*	mΩ	Shows the actual measured value of Rs. *No Data*		FA
.2	Actual Value Ls	ro	UInteger	16 bit	80		*2000 … 5500* *0*	µH	Shows the actual measured value of Ls. *No Data*		FA
.3	Signal Strength	ro	UInteger	16 bit	64		*0.806 … 1128* *(1 … 1400)* *0*	mV	Shows the actual signal strength. *No Data*		FA
.4	Signal Strength Last Minimum	ro	UInteger	16 bit	48		*0.806 … 1128* *(1 … 1400)* *0*	mV	Minimum signal strength of the previous switching cycle. *No Data*		FA
.5	Signal Strength (Rated) Last Minimum	ro	Integer	16 bit	32		*5* *4* *3* *2* *1* *0* *1* *-2* *-3* *-4* *-5*		Minimum signal strength relative to the switch point: -5 (> 120 %) … +5 (< 80 %). 0.00% ≤ s/s_r < 80.00 % 80.00% ≤ s/s_r ≤ 84.44 % 84.44 % < s/s_r ≤ 88.88 % 88.88 % < s/s_r ≤ 93.33 % 93.33 % < s/s_r ≤ 97.77 % 97.77 % < s/s_r ≤ 102.22 % 102.22 % < s/s_r ≤ 106.66 % 106.66 % < s/s_r ≤ 111.11 % 111.11 % < s/s_r ≤ 115.55 % 115.55 % < s/s_r ≤ 120.00% 120.00 % < s/s_r		FA
.6	Signal Strength Last Maximum	ro	UInteger	16 bit	16		*0.806 … 1128* *(1 … 1400)* *0*	mV	Maximum signal strength of the previous switching cycle. *No Data*		FA
.7	Signal Strength (Rated) Last Maximum	ro	Integer	16 bit	0		*5* *4* *3* *2* *1* *0* *1* *-2* *-3* *-4* *-5*		Maximum signal strength relative to the switch point: -5 (< 120 %) … +5 (< 80 %). 0.00% ≤ s/s_r < 80.00 % 80.00% ≤ s/s_r ≤ 84.44 % 84.44 % < s/s_r ≤ 88.88 % 88.88 % < s/s_r ≤ 93.33 % 93.33 % < s/s_r ≤ 97.77 % 97.77 % < s/s_r ≤ 102.22 % 102.22 % < s/s_r ≤ 106.66 % 106.66 % < s/s_r ≤ 111.11 % 111.11 % < s/s_r ≤ 115.55 % 115.55 % < s/s_r ≤ 120.00% 120.00 % < s/s_r		FA
223 (0xDB)	Maintenance Reset Counter	ro	UInteger	16 bit		0	*0 ... 2^{16} -1*		Shows the number of maintenance cycles, which have been reset with the command 'Maintenance Reset'.		FA

Parameterization & Configuration

Index .sub	Parameter	Access	Data type	Length	Bitoffs.	Default	Value	Unit	Description	DS	R
57 (0x39)	SSC Config - Logic	rw	UInteger	8 bit		0	*0* *1*		Defines the logical representation of the switching signal SSC in the process data. *High active* *Low active*	Y	FA
64 (0x40)	SSC Config - Extension	rw	Record	6 byte					Defines extended configuration options for the switching signal channel (SSC).	Y	FA
.2	Pulse Extension	rw	UInteger	8 bit	8	0	*0* *1* *2* *3* *4*		Extends the active state of the switching signal by the selected time. Auto: pulse extension based on master cycle time. *Off* *Auto* *10 ms* *100 ms* *1 s*	Y	FA
.3	Substitute Behaviour	rw	UInteger	8 bit	0	3	*0* *2* *3*		Defines the behavior of the switching signal if the sensor status STAT in the process data is "Sensor not ok". *Hold* *Active* *Inactive*	Y	FA
101 (0x63)	Synchronization Line - Mode	rw	UInteger	8 bit		2	*0* *1* *2*		Defines the mode of the synchronization line. *Off* *On* *On with timeout*	Y	FA
112 (0x70)	I/O Configuration - C/Q Type	rw	UInteger	8 bit		1	*0* *1*		Configures the type of output at pin 4 or at black wire. *Output - Push-pull* *Output - PNP*	Y	FA
120 (0xC0)	Event Configuration	rw	Record [S0]	2 byte					Defines which event sources can trigger events.	Y	FA
.8	Warning - Maintenance Diagnosis	rw	Boolean	1 bit	7	0	*0* *1*		Enabled: an event is generated if the maintenance warning in the process data becomes active (Event code 0x8D00). *Disabled* *Enabled*	Y	FA
.9	Warning - Uncertainty Indication	rw	Boolean	1 bit	8	0	*0* *1*		Enabled: an event is generated if the Uncertainty indication in the process data becomes active (Event code: 0x8D40). *Disabled* *Enabled*	Y	FA

Parameterization & Configuration

Index .sub	Parameter	Access	Data type	Length	Bitoffs.	Default	Value	Unit	Description	DS	R
208 (0xD0)	Maintenance Config. - Operating Time	rw	UInteger	32 bit		0	*1 ... 2^{32} -1* *0*	h	Defines the limit value for the operating time. Once this limit value is reached, the maintenance warning in the process data is activated. *Disabled*	Y	FA
209 (0xD1)	Maintenance Config. - SSC Incident Count Limit Value	rw	UInteger	32 bit		0	*1 ... 2^{32} -1* *0*		Defines the limit value for the number of switching signal channel (SSC) incidents. Once this limit value is reached, the maintenance warning in the process data is activated. *Disabled*	Y	FA
210 (0xD2)	Maintenance Config. - Measurement	rw	Record	16 byte					Defines the parameters for monitoring of measurement incidents and the maintenance limits.	Y	FA
.1	Lower Threshold Rs	rw	Integer	16 bit	112	0	*-90 … -2* *(-900 … -20)* *0*	%	The maintenance monitor is triggered if the change of Rs falls below this threshold. (see NOTE) *Disabled*	Y	FA
.2	Upper Threshold Rs	rw	Integer	16 bit	96	0	*2 … 300* *(20 … 3000)* *0*	%	The maintenance monitor is triggered if the change in Rs exceeds this threshold value. (see NOTE) *Disabled*	Y	FA
.3	Comparative Value Rs	rw	UInteger	16 bit	80	11500	*5000 … 45000*	mΩ	Comparative value for lower/upper threshold. This value can be set manually or via the teach-in system command.	Y	FA
.4	Lower Threshold Ls	rw	Integer	16 bit	64	0	*-90 … -1* *(-900 … -10)* *0*	%	The maintenance monitor is triggered if the change of Ls falls below this threshold. (see NOTE) *Disabled*	Y	FA
.5	Upper Threshold Ls	rw	Integer	16 bit	48	0	*1 … 20* *(10 … 200)* *0*	%	The maintenance monitor is triggered if the change in Ls exceeds this threshold value. (see NOTE) *Disabled*	Y	FA
.6	Comparative Value Ls	rw	UInteger	16 bit	32	3500	*2500 … 5500*	µH	Comparative value for lower/upper threshold. This value can be set manually or via the teach-in system command.	Y	FA
.7	Lower Threshold Signal Strength	rw	UInteger	16 bit	16	0	*0.806 … 1128* *(1 … 1400)* *0*	mV	The maintenance monitor is triggered if the change of signal strength falls below this threshold. (see NOTE) *Disabled*	Y	FA
.8	Upper Threshold Signal Strength	rw	UInteger	16 bit	0	0	*0.806 … 1128* *(1 … 1400)* *0*	mV	The maintenance monitoris triggered if the change of signal strength exceeds this threshold. (see NOTE) *Disabled*	Y	FA

NOTE: For further information on typical values and the use of Rs, Ls and signal strength monitoring contact Pepperl+Fuchs.

Observation

Index .sub	Parameter	Access	Data type	Length	Bitoffs.	Default	Value	Unit	Description	DS	R
236 (0xEC)	Observation Data	ro	Record	6 byte					Provides a set of relevant data suitable for observation purposes.		FA
.1	Operating Reserve	ro	Integer	16 bit	32				The operating reserve is calculated from the signal strength. It gives an estimation for the distance **s** between the sensor face and a standard steel plate in comparison to the effective operating distance $\mathbf{s}_r$ of the sensor.		FA
							5		0.00% ≤ $\mathbf{s/s}_r$ < 80.00 %		
							4		80.00% ≤ $\mathbf{s/s}_r$ ≤ 84.44 %		
							3		84.44 % < $\mathbf{s/s}_r$ ≤ 88.88 %		
							2		88.88 % < $\mathbf{s/s}_r$ ≤ 93.33 %		
							1		93.33 % < $\mathbf{s/s}_r$ ≤ 97.77 %		
							0		97.77 % < $\mathbf{s/s}_r$ ≤ 102.22 %		
							1		102.22 % < $\mathbf{s/s}_r$ ≤ 106.66 %		
							-2		106.66 % < $\mathbf{s/s}_r$ ≤ 111.11 %		
							-3		111.11 % < $\mathbf{s/s}_r$ ≤ 115.55 %		
							-4		115.55 % < $\mathbf{s/s}_r$ ≤ 120.00%		
							-5		120.00 % < $\mathbf{s/s}_r$		
.2	SSC - Switching Signal	ro	UInteger	8 bit	24				Indicates the detection status of a switching signal channel depending on sensor data and SSC Config.		FA
							0		*Low*		
							1		*High*		
.3	OPTION - Uncertainty Indication	ro	UInteger	8 bit	16				Switching distance was not exceeded / deceeded by more than +20% / -20% before the last switching status change.		FA
							0		*Good*		
							1		*Uncertain*		
.4	STAT - Sensor Head Status	ro	UInteger	8 bit	8				Indicates that the sensor front-end element works correctly.		FA
							0		*Sensor head not OK*		
							1		*Sensor head OK*		
.5	DSC - Maintenance Warning	ro	UInteger	8 bit	0				Indicates that at least one of the configured maintenance limit values is reached or exceeded.		FA M
							0		*Inactive*		
							1		*Active*		

Command Interface

Index	*Parameter*	*Access*	*Data type*	*Length*	*Value*	*Description*
2 (0x02)	System Command	wo	UInteger	8 bit	See command value	Command interface for applications. A positive acknowledge indicates the complete and correct finalization of the requested function.

Command Value	*Command*	*Description*
126 (0x7E)	Locator Start	The visual indicators of the device are switched to the localization display pattern, which makes it easier to spot a device in an application. The localization indication is active for 10 minutes.
127 (0x7F)	Locator Stop	The localization indication pattern is stopped. The optical indicators of the device will show again the device specific states of operation.
129 (0x81)	Application Reset	The parameter of the technology-specific application are set to default values. Identification parameter remain unchanged. An upload to the data storage of the master will be executed, if activated in the port configuration of the master.
131 (0x83)	Back-to-Box	The parameter of the device are set to factory default values and communication will be inhibited until the next power cycle. Note: Directly detach the device from the master port!.
176 (0xB0)	Maintenance Reset	The maintenance status and monitoring data are reset.
177 (0xB1)	Teach-in actual Ls and Rs	Transfer the actual measured Ls and Rs into the comparative values of the maintenance configuration.

Error Codes

Code	*Parameter*	*Name*	*Description*
128 (0x80)	00 (0x00)	Device application error – no details	This ErrorType shall be used if the requested service has been refused by the Device application and no detailed information of the incident is available.
128 (0x80)	17 (0x11)	Index not available	Read or write access attempt to a non-existing index.
128 (0x80)	18 (0x12)	Subindex not available	Read or write access attempt to a non-existing subindex of an existing index.
128 (0x80)	32 (0x20)	Service temporarily not available	Parameter not accessible due to the current state of the technology-specific application.
128 (0x80)	33 (0x21)	Service temporarily not available - local control	Parameter not accessible. The device is currently in an ongoing, locally controlled operation.
128 (0x80)	34 (0x22)	Service temporarily not available - device control	Parameter not accessible. The technology-specific application is currently in a remotely triggered operation.
128 (0x80)	35 (0x23)	Access denied	Write access to a read-only parameter or read access to write-only parameter.
128 (0x80)	48 (0x30)	Parameter value out of range	Written parameter value is outside of the permitted value range.
128 (0x80)	49 (0x31)	Parameter value above limit	Written parameter value is above its specified value range.
128 (0x80)	50 (0x32)	Parameter value below limit	Written parameter value is below its specified value range.
128 (0x80)	51 (0x33)	Parameter length overrun	Written parameter is longer than specified.
128 (0x80)	52 (0x34)	Parameter length underrun	Written parameter is shorter than specified.
128 (0x80)	53 (0x35)	Function not available	Written command is not supported by the technology-specific application.
128 (0x80)	54 (0x36)	Function temporarily unavailable	Written command is unavailable due to the current state of the technology-specific application.
128 (0x80)	64 (0x40)	Invalid parameter set	Written single parameter value collides with other existing parameter settings.
128 (0x80)	65 (0x41)	Inconsistent parameter set	Parameter set inconsistencies at the end of block parameter transfer. Device plausibility check failed.

Event Codes

Code	*Type*	*Name*	*Description*
36096 (0x8D00)	Warning	Maintenance diagnosis	A maintenance cycle is required. One of the configured limit values for a maintenance cycle is exceeded. For details, check the parameter 'Maintenance Diagnosis'.
36160 (0x8D40)	Warning	Uncertainty indication	An adjustment of the distance between the sensor and the damping element is recommended. For details, check the parameter 'Observation Data'.