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TURCK

FM-IM/FMX-IM Flow Monitoring

IO-Link Parameters – Firmware 1.0, Firmware 1.1

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1 About these Instructions

These instructions describe the parameterization of of signal processors of the FM(X)-series with IO-Link. It contains the operation via IO-Link, information about IO-Link functions, and a list of all required IO-Link parameters.

1.1 Target groups

These instructions are aimed at qualified personnel and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols

The following symbols are used in these instructions:



DANGER

DANGER indicates an imminently hazardous situation with a high risk of death or serious injury if it is not prevented.



WARNING

WARNING indicates a potentially dangerous situation with medium risk of death or severe injury if not avoided.



CAUTION

CAUTION indicates a situation that may result in damage to property if it is not prevented.



NOTE

NOTE indicates tips, recommendations and important information. The notes will make work easier, contain information on specific action steps and help prevent more work due to incorrect processes.



CALL TO ACTION

This symbol identifies steps that the user has to perform.



ACTION RESULT

This symbol identifies relevant results of actions and action sequences.

1.3 Additional documents

Besides this document, the following material can be found on the Internet at www.turck.com:

- Data sheet
- Quick start guide
- Operating instructions

1.4 Feedback on these instructions

We are committed to always keeping these instructions as informative and as clear as possible. Should you have any suggestions for a better design or any information is missing from the instructions, please send your suggestions to techdoc@turck.com.

2 Notes on the Product

2.1 Product identification

These instructions apply to the following flow monitoring devices:

Type	Ident-No.	Description
FM-IM-3UP63X	7525100	Non-Ex application
FMX-IM-3UP63X	7525101	Ex application
FM-IM-3UR38X	7525102	Non-Ex application
FMX-IM-3UR38X	7525103	Ex application
FM-IM-2UPLi63X	7525104	Non-Ex application

2.2 Manufacturer and service

Hans Turck GmbH & Co. KG
 Witzlebenstraße 7
 45472 Mülheim an der Ruhr
 Germany

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats. You can access the product database at the following address: <http://www.turck.de/products/>

Should you have any further questions, please contact the sales and service team in Germany on the following telephone numbers:

Sales: +49 208 4952-380

Technology: +49 208 4952-390

Outside Germany, please contact your Turck representative.

3 Software-Supported IO-Link-Parameterization


NOTE

Locking of the pushbutton guided menu

During the time the data processing device communicates via IO-Link, the pushbutton-guided menu is locked; this means, the parameters can no longer be changed via the pushbuttons. However, the process values can be accessed via the pushbuttons.

The ports of the IO-Link master can be configured in the IO-Link-mode (IOL) or in the standard-IO-mode.

If a port is configured in the SIO-Mode, the IO-Link-Master on this port behaves like a normal digital input and the connected IO-Link device (here FM-IM/FMX-IM) sends the standard switching output to the IO-Link master – there is no communication between the device and the master.

If the port is configured in the IOL-mode, the IO-Link master tries to „wake“ the connected IO-Link-device via the „Wake-up Request“. If the master receives a response from the signal processor, both devices start to communicate with each other. First, the communication parameters are exchanged; then the cyclic data exchange of the process data (objects) starts.

With cyclic communication, the data is transmitted according to the process data image shown in chapter 6 on p. 6.

In case of active IO-Link-communication (IOL-mode), both cyclic and acyclic communication services are available.

Parameterization via IO-Link may be carried out in different ways:

- via on-request data objects (e. g., IO-Link-function block close to the control),
- via tool-based engineering via FDT/DTM (e.g., PACTware™ with the use of DTM or the IODD)

Device parameters (On-request Data Objects)

Device parameters are exchanged in an acyclical manner and upon the request of the IO-Link-Master. The IO-Link-Master always sends a request to the device first, then the device responds. This is the case when the data is written into the device and read from the device. With the help of the On-Request Data Objects (ORDO), the parameters can be written into the device (Write) or the device status can be read from the device (Read).

4 IO-Link Parameters (Firmware 1.0)

4.1 General Parameters

Name	Index (dec.)	Index (hex.)	Access	Byte count	Type	Description
Vendor name	16	0x10	Read	32		Manufacturer ID, fixed: "Turck"
Vendor text	17	0x11	Read	32		Fixed: "www.turck.com"
Product name	18	0x12	Read	32		Manufacturer's device designation, fixed: e. g. "FMX-IM-3UP63X"
Product ID	19	0x13	Read	16		Device ID, fixed: e. g. "7525100"
Product text	20	0x14	Read	32		Fixed: "Flow Monitoring"
Serial number	21	0x15	Read	16		Batch code and serial/consecutive batch number
Firmware revision	23	0x17	Read	16		Firmware revision (3-point notation), e. g. "1.1.4.1"
Application specific name	24	0x18	Read/Write	16		Default: "-"; user generated content with a maximum of 16 Byte

4.2 Process Data (Cyclic Communication)

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Process data				16		0	0	Switching state Out 1 (Flow): off / open
							1	Switching state Out 1 (Flow): on / closed
						1	0	Switching state Out 2 (Temp): off / open
							1	Switching state Out 2 (Temp): on / closed
						2	0	Switching state Out 3 (Fault): off / open
							1	Switching state Out 3 (Fault): on / closed
						3...5		Not used
						6...15	0...1023	Process value 0...100 %

4.3 Acyclic Communication (via ORDO)

4.3.1 General

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description	
System commands	80	0x50	Write	8	Uint8		128	Hardware Reset	
							130	Restore factory settings	
IO-Link communication disable / enable	89	0x59	Read/Write	8	Uint8		0	IO-Link parameterization not possible	
							1	IO-Link parameterization possible	
Temperature gradient (DeltaFlow)	145	0x91	Read	16			0...9	0...1023	DeltaFlow [0...1023 Bit]
							10...11	0	DeltaFlow acceptably small
								1	DeltaFlow low
								2	DeltaFlow medium
								3	DeltaFlow high
Teach status	146	0x92	Read	8	Uint8		0	Teachfunction approved	
							1	Teachfunction not approved	

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Read Public Flag Registers	304	0x0130	Read	64	Flag	0		DeltaFlow too high
						2		Short circuit DOut 1 (Flow) (only FM(X)-IM-3UP63X)
						3		Short circuit DOut 2 (Temp) (only FM(X)-IM-3UP63X and FM-IM-2UPLi63X)
						4		Short circuit DOut 3 (Fault) (only FM(X)-IM-3UP63X and FM-IM-2UPLi63X)
						5		Short circuit sensor
						6		Wire break sensor
						7		Wire break current source
						8		General fault (manual reset needed)
						10		Software error
						11		Hardware error
						12		DOut 1 (Flow) on / closed (only FM(X)-IM-3UP63X and FM(X)-IM-3UR38X)
						13		DOut 2 (Temp) on / closed
						14		DOut 3 (Fault) on / closed
						16		Error current at the moment active
						17		AOut in force mode (only FM-IM-2UPLi63X)
						18		Fault current source or load too high (switch-off of current source; power-reset needed)
						25		DOut in force mode
						32		Gap between MAX and MIN too small
						33		Flow rate above indicating range
						34		Flow rate below indicating range
35		Flow rate above operating range						
36		Temperature above indicating range						
37		Temperature below indicating range						
38		Temperature above operating range						
39		Temperature below operating range						

4.4 Specific

4.4.1 Parameters FM(X)-IM-3UP63X

Name	Index (dec.)	Index (hex.)	Access	Bit-count	Type	Bit	Value	Description
Output type Flow (SP1)	97	0x61	Read/Write	8	UInt8	1	1	PNP 1 Switching characteristic "active high"
						2	2	PNP 1 Switching characteristic "active low"
Output type Temp (SP2)	98	0x62	Read/Write	8	UInt8	1	1	PNP 2 Switching characteristic "active high"
						2	2	PNP 2 Switching characteristic "active low"
Teach	100	0x64	Write	8	UInt8	1	1	Upper limit teach (MAX teach)
						2	2	Lower limit teach (MIN teach)
						3	3	Quick teach
QuickTeach %	101	0x65	Read/Write	8	UInt8	9	9	6.00 % above actual flow process value
						8	8	4.50 % above actual flow process value
						7	7	3.00 % above actual flow process value
						6	6	1.50 % above actual flow process value
						5	5	0 % Quick-Teach actual flow process value as SP
						4	4	1.50 % below actual flow process value
						3	3	3.00 % below actual flow process value
						2	2	4.50 % below actual flow process value
Operating Mode	102	0x66	Read/Write	8	UInt8	1	1	Quick teach mode
						2	2	MAX/MIN trim
Flow rate	112	0x70	Read	16	UInt16	0...1023	0...1023	Process value flow with regard to the MAX/MIN Teach range 0 ... 100 % 0 = 0 % ... 1023 = 100 %
Media temperature	113	0x71	Read	16	Int16	-50...200	-50...200	Media Temperature -50 ... +200 °C [1 °C steps]
Switchpoint MAX/MIN Teach (SP1) [%]	129	0x81	Read/Write	8	UInt8	0...100	0...100	Switchpoint MAX/MIN Teach (Out 1) 0 ... 100 % [1 % steps] for MAX/MIN operation mode]
Switchpoint media temp (SP2)	130	0x82	Read/Write	16	Int16	-50...200	-50...200	Switchpoint media temp (Out 2) -50 ... +200 °C [1 °C steps]
Switching on delay Flow (SP1)	150	0x96	Read/Write	8	UInt8	0...255	0...255	PNP 1 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Temp (SP2)	151	0x97	Read/Write	8	UInt8	0...255	0...255	PNP 2 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s

Name	Index (dec.)	Index (hex.)	Access	Bit-count	Type	Bit	Value	Description
Switching on delay Fault (SP3)	152	0x98	Read/Write	8	Uint8		0...255	PNP 3 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Flow (SP1)	153	0x99	Read/Write	8	Uint8		0...255	PNP 1 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Temp (SP2)	154	0x9A	Read/Write	8	Uint8		0...255	PNP 2 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Fault (SP3)	155	0x9B	Read/Write	8	Uint8		0...255	PNP 3 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Simulate digital output (force mode)	300	0x012C	Write	8	Uint8		0x11	All PNP outputs off
							0x13	PNP output Out 1 on
							0x15	PNP output Out 2 on
							0x19	PNP output Out 3 on
							0x00	Exit simulation mode (force mode)
MAX/MIN Teach Range	994	0x03E2	Read/Write	32	2 × Uint16	0...15	0...1023	MIN teach value [Bit]
						16...31	0...1023	MAX teach value [Bit]

4.4.2 Parameters FM(X)-IM-3UR38X

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Output type Flow (SP1)	97	0x61	Read/Write	8	uint8		1	Relay 1 Switching characteristic "normally open contact (NO)"
							2	Relay 1 Switching characteristic "normally closed contact (NC)"
Output type Temp (SP2)	98	0x62	Read/Write	8	uint8		1	Relay 2 Switching characteristic "normally open contact (NO)"
							2	Relay 2 Switching characteristic "normally closed contact (NC)"
Teach	100	0x64	Write	8	uint8		1	Upper limit teach (MAX teach)
							2	Lower limit teach (MIN teach)
							3	Quick teach
QuickTeach %	101	0x65	Read/Write	8	uint8		9	6.00 % above actual flow process value
							8	4.50 % above actual flow process value
							7	3.00 % above actual flow process value
							6	1.50 % above actual flow process value
							5	0 % (teach actual flow process value as SP)
							4	1.50 % below actual flow process value
							3	3.00 % below actual flow process value
							2	4.50 % below actual flow process value
							Operating Mode	102
2	MAX/MIN trim							
Flow rate	112	0x70	Read	16	uint16		0...1023	Process value flow with regard to the MAX/MIN Teach range 0 ... 100 % 0 = 0 % ... 1023 = 100 %
Media temperature	113	0x71	Read	16	int16		-50...200	Media Temperature -50 ... +200 °C [1 °C steps]
Switchpoint MAX/MIN Teach (SP1) [%]	129	0x81	Read/Write	8	uint8		0...100	Switchpoint MAX/MIN Teach (Out 1) 0 ... 100 % [1 % steps] for MAX/MIN operation mode
Switchpoint media temp (SP2)	130	0x82	Read/Write	16	int16		-50...200	Switchpoint media temp (Out 2) -50 ... +200 °C [1 °C steps]
Switching on delay Flow (SP1)	150	0x96	Read/Write	8	uint8		0...255	Relay 1 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Temp (SP2)	151	0x97	Read/Write	8	uint8		0...255	Relay 2 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Fault (SP3)	152	0x98	Read/Write	8	uint8		0...255	Relay 3 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Flow (SP1)	153	0x99	Read/Write	8	uint8		0...255	Relay 1 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Switching off delay Temp (SP2)	154	0x9A	Read/Write	8	uint8		0...255	Relay 2 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Fault (SP3)	155	0x9B	Read/Write	8	uint8		0...255	Relay 3 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Simulate digital output (force mode)	300	0x012C 0x012C 0x012C	Write	8	uint8		0x11	All relay outputs off
							0x13	Relay output Out 1 on
							0x15	Relay output Out 2 on
							0x19	Relay output Out 3 on
							0x00	Exit simulation mode (force mode)
MAX/MIN teach range	994	0x03E2	Read/Write	32	2 × uint16	0...15	0...1023	MIN teach value [Bit]
						16...31	0...1023	MAX teach value [Bit]

4.4.3 Parameters FM-IM-2UPLi63X

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Output type Temp (SP2)	98	0x62	Read/Write	8	uint8		1	PNP 2 Switching characteristic "active high"
							2	PNP 2 Switching characteristic "active low"
Teach	100	0x64	Write	8	uint8		1	Upper limit teach (MAX teach)
							2	Lower limit teach (MIN teach)
Operating Mode	102	0x66	Read/Write	8	uint8		2	MAX/MIN trim
Flow rate	112	0x70	Read	16	uint16		0...1023	Process value flow with regard to the MAX/MIN Teach range 0 ... 100 % 0 = 0 % ... 1023 = 100 %
Media temperature	113	0x71	Read	16	int16		-50...200	Media temperature -50 ... +200 °C [1 °C steps]
Switchpoint media temp (SP2)	130	0x82	Read/Write	16	int16		-50...200	Switchpoint media temp (Out 2) -50 ... +200 °C [1 °C steps]
Switching on delay Temp (SP2)	151	0x97	Read/Write	8	uint8		0...255	PNP 2 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Fault (SP3)	152	0x98	Read/Write	8	uint8		0...255	PNP 3 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Temp (SP2)	154	0x9A	Read/Write	8	uint8		0...255	PNP 2 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Fault (SP3)	155	0x9B	Read/Write	8	uint8		0...255	PNP 3 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Simulate digital output (force mode)	300	0x012C	Write	8	uint8		0x11	All PNP outputs off
							0x15	PNP output Out 2 on
							0x19	PNP output Out 3 on
							0x00	Exit simulation mode (force mode)
MIN/MAX Teach Range	994	0x03E2	Read/Write	32	2 × uint16		0...15	MIN teach value [Bit]
							16...31	MAX teach value [Bit]
Output current (analog)	995	0x03E3	Read	16	uint16		0...25000	Output current 0 ... 25.0 mA [1 µA steps]
Error current	997	0x03E5	Read/Write	8	uint8		1	Error current 0 mA
							2	Error current > 21 mA
Output current Mode (Range)	998	0x03E6	Read/Write	8	uint8		1	4 ... 20 mA
							3	20 ... 4 mA
Simulate current output (Force Mode)	999	0x03E7	Write	16	uint16		0	Exit simulation mode (force mode)
							1...25000	Output current 0.001 ... 25.0 mA [1 µA steps]

5 IO-Link Parameters (Firmware 1.1)

5.1 General Parameters

Name	Index (dec.)	Index (hex.)	Access	Byte count	Type	Description
Vendor name	16	0x10	Read	32		Manufacturer ID, fixed: "Turck"
Vendor text	17	0x11	Read	32		Fixed: "www.turck.com"
Product name	18	0x12	Read	32		Manufacturer's device designation, fixed: e. g. "FMX-IM-3UP63X"
Product ID	19	0x13	Read	16		Device ID, fixed: e. g. "7525100"
Product text	20	0x14	Read	32		Fixed: "Flow Monitoring"
Serial number	21	0x15	Read	16		Batch code and serial/consecutive batch number
Firmware revision	23	0x17	Read	16		Firmware revision (3-point notation), e. g. "1.1.4.1"
Application specific name	24	0x18	Read/Write	16		Default: "-"; user generated content with a maximum of 16 Byte

5.2 Process Data (Cyclic Communication)

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Process data				16		0	0	Switching state Out 1 (Flow): off / open
							1	Switching state Out 1 (Flow): on / closed
						1	0	Switching state Out 2 (Temp): off / open
							1	Switching state Out 2 (Temp): on / closed
						2	0	Switching state Out 3 (Fault): off / open
							1	Switching state Out 3 (Fault): on / closed
						3...5		Not used
						6...15	0...1023	Process value 0...100 %

5.3 Acyclic Communication (via ORDO)

5.3.1 General

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description	
System commands	80	0x50	Write	8	Uint8		128	Hardware Reset	
							130	Restore factory settings	
IO-Link communication disable / enable	89	0x59	Read/Write	8	Uint8		0	IO-Link parameterization not possible	
							1	IO-Link parameterization possible	
Temperature gradient (DeltaFlow)	145	0x91	Read	16			0...9	0...1023	DeltaFlow [0...1023 Bit]
							10...11	0	DeltaFlow acceptably small
								1	DeltaFlow low
								2	DeltaFlow medium
								3	DeltaFlow high
Teach status	146	0x92	Read	8	Uint8		0	Teachfunction approved	
							1	Teachfunction not approved	

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Read Public Flag Registers	304	0x0130	Read	64	Flag	0		DeltaFlow too high
						2		Short circuit DOut 1 (Flow) (only FM(X)-IM-3UP63X)
						3		Short circuit DOut 2 (Temp) (only FM(X)-IM-3UP63X and FM-IM-2UPLi63X)
						4		Short circuit DOut 3 (Fault) (only FM(X)-IM-3UP63X and FM-IM-2UPLi63X)
						5		Short circuit sensor
						6		Wire break sensor
						7		Wire break current source
						8		General fault (manual reset needed)
						10		Software error
						11		Hardware error
						12		DOut 1 (Flow) on / closed (only FM(X)-IM-3UP63X and FM(X)-IM-3UR38X)
						13		DOut 2 (Temp) on / closed
						14		DOut 3 (Fault) on / closed
						16		Error current at the moment active
						17		AOut in force mode (only FM-IM-2UPLi63X)
						18		Fault current source or load too high (switch-off of current source; power-reset needed)
						25		DOut in force mode
						32		Gap between MAX and MIN too small
						33		Flow rate above indicating range
						34		Flow rate below indicating range
35		Flow rate above operating range						
36		Temperature above indicating range						
37		Temperature below indicating range						
38		Temperature above operating range						
39		Temperature below operating range						

5.4 Specific

5.4.1 Parameters FM(X)-IM-3UP63X

Name	Index (dec.)	Index (hex.)	Access	Bit-count	Type	Bit	Value	Description
Output type Flow (SP1)	97	0x61	Read/Write	8	Uint8		1	PNP 1 Switching characteristic "active high"
							2	PNP 1 Switching characteristic "active low"
Output type Temp (SP2)	98	0x62	Read/Write	8	Uint8		1	PNP 2 Switching characteristic "active high"
							2	PNP 2 Switching characteristic "active low"
Teach	100	0x64	Write	8	Uint8		1	Upper limit teach (MAX teach)
							2	Lower limit teach (MIN teach)
							3	Quick teach
Operating Mode	102	0x66	Read/Write	8	Uint8		1	Quick teach mode
							2	MAX/MIN trim
QuickTeach %	103	0x67	Read/Write	8	Uint8		40	4.0 % above actual flow process value
							35	3.5 % above actual flow process value
							30	3.0 % above actual flow process value
							25	2,5 % above actual flow process value
							20	2.0 % above actual flow process value
							15	1.5 % above actual flow process value
							10	1.0 % above actual flow process value
							5	0.5 % above actual flow process value
							0	(Set current flow process value as SP flow)
							-5	0.5 % below actual flow process value
							-10	1.0 % below actual flow process value
							-15	1.5 % below actual flow process value
							-20	2.0 % below actual flow process value
-25	2,5 % below actual flow process value							
-30	3.0 % below actual flow process value							
-35	3.5 % below actual flow process value							
-40	4.0 % below actual flow process value							
Flow rate	112	0x70	Read	16	Uint16		0...1023	Process value flow with regard to the MAX/MIN Teach range 0 ... 100 % 0 = 0 % ... 1023 = 100 %
Media temperature	113	0x71	Read	16	Int16		-50...200	Media temperature -50 ... 200 °C [1 °C steps]
Instantaneous switchpoint (SP1) [Bit]	128	0x80	Read	16	Uint16		0...1023	Current switchpoint flow process value 0...1023
Switchpoint MAX/MIN Teach (SP1) [%]	129	0x81	Read/Write	8	Uint8		0...100	Switchpoint MAX/MIN Teach (Out 1) 0 ... 100 % [1 % steps] for MAX/MIN operation mode

Name	Index (dec.)	Index (hex.)	Access	Bit-count	Type	Bit	Value	Description
Switchpoint media temp (SP2)	130	0x82	Read/Write	16	Int16		-50...200	Switchpoint media temp (Out 2) -50 ... +200 °C [1 °C steps]
Switchpoint Quick-Teach (SP1) [Bit]	131	0x83	Read	16	UInt16		0...1023	Saved switchpoint flow rate (Out 1) 0...1023 for Quick-Teach operation mode
Switching on delay Flow (SP1)	150	0x96	Read/Write	8	UInt8		0...255	PNP 1 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Temp (SP2)	151	0x97	Read/Write	8	UInt8		0...255	PNP 2 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Fault (SP3)	152	0x98	Read/Write	8	UInt8		0...255	PNP 3 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Flow (SP1)	153	0x99	Read/Write	8	UInt8		0...255	PNP 1 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Temp (SP2)	154	0x9A	Read/Write	8	UInt8		0...255	PNP 2 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Fault (SP3)	155	0x9B	Read/Write	8	UInt8		0...255	PNP 3 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Simulate digital output (force mode)	300	0x012C	Write	8	UInt8		0x11	All PNP outputs off
							0x13	PNP output Out 1 on
							0x15	PNP output Out 2 on
							0x19	PNP output Out 3 on
							0x00	Exit simulation mode (force mode)
MAX/MIN teach range	994	0x03E2	Read/Write	32	2 × UInt16	0...15	0...1023	MIN teach value [Bit]
						16...31	0...1023	MAX teach value [Bit]

5.4.2 Parameters FM(X)-IM-3UR38X

Name	Index (dec.)	Index (hex.)	Access	Bit-count	Type	Bit	Value	Description
Output type Flow (SP1)	97	0x61	Read/Write	8	Uint8		1	PNP 1 Switching characteristic "active high"
							2	PNP 1 Switching characteristic "active low"
Output type Temp (SP2)	98	0x62	Read/Write	8	Uint8		1	PNP 2 Switching characteristic "active high"
							2	PNP 2 Switching characteristic "active low"
Teach	100	0x64	Write	8	Uint8		1	Upper limit teach (MAX teach)
							2	Lower limit teach (MIN teach)
							3	Quick teach
Operating Mode	102	0x66	Read/Write	8	Uint8		1	Quick teach mode
							2	MAX/MIN trim
QuickTeach %	103	0x67	Read/Write	8	Uint8		40	4.0 % above actual flow process value
							35	3.5 % above actual flow process value
							30	3.0 % above actual flow process value
							25	2,5 % above actual flow process value
							20	2.0 % above actual flow process value
							15	1.5 % above actual flow process value
							10	1.0 % above actual flow process value
							5	0.5 % above actual flow process value
							0	0.0 % (Set current flow process value as SP flow)
							-5	0.5 % below actual flow process value
							-10	1.0 % below actual flow process value
							-15	1.5 % below actual flow process value
							-20	2.0 % below actual flow process value
							-25	2,5 % below actual flow process value
-30	3.0 % below actual flow process value							
-35	3.5 % below actual flow process value							
-40	4.0 % below actual flow process value							
Flow rate	112	0x70	Read	16	Uint16		0...1023	Process value flow with regard to the MAX/MIN Teach range 0 ... 100 % 0 = 0 % ... 1023 = 100 %
Media temperature	113	0x71	Read	16	Int16		-50...200	Media temperature -50 ... 200 °C [1 °C steps]
Instantaneous switchpoint (SP1) [Bit]	128	0x80	Read	16	Uint16		0...1023	Current switchpoint flow process value 0...1023
Switchpoint MAX/MIN TEACH (SP1)[%]	129	0x81	Read/Write	8	Uint8		0...100	Switchpoint MAX/MIN Teach (Out 1) 0 ... 100 % [1 % steps] for MAX/MIN operation mode

Name	Index (dec.)	Index (hex.)	Access	Bit-count	Type	Bit	Value	Description
Switchpoint media temp (SP2)	130	0x82	Read/Write	16	Int16		-50...200	Switchpoint media temp (Out 2) -50 ... +200 °C [1 °C steps]
Switchpoint Quick-Teach (SP1) [Bit]	131	0x83	Read	16	UInt16		0...1023	saved switchpoint flow rate (Out 1) 0...1023 for Quick-Teach operation mode
Switching on delay Flow (SP1)	150	0x96	Read/Write	8	UInt8		0...255	PNP 1 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Temp (SP2)	151	0x97	Read/Write	8	UInt8		0...255	PNP 2 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Fault (SP3)	152	0x98	Read/Write	8	UInt8		0...255	PNP 3 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Flow (SP1)	153	0x99	Read/Write	8	UInt8		0...255	PNP 1 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Temp (SP2)	154	0x9A	Read/Write	8	UInt8		0...255	PNP 2 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Fault (SP3)	155	0x9B	Read/Write	8	UInt8		0...255	PNP 3 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Simulate digital output (force mode)	300	0x012C	Write	8	UInt8		0x11	All PNP outputs off
							0x13	PNP output Out 1 on
							0x15	PNP output Out 2 on
							0x19	PNP output Out 3 on
							0x00	Exit simulation mode (force mode)
MAX/MIN teach range	994	0x03E2	Read/Write	32	2 × UInt16	0...15	0...1023	MIN teach value [Bit]
						16...31	0...1023	MAX teach value [Bit]

5.4.3 Parameters FM-IM-2UPLi63X

Name	Index (dec.)	Index (hex.)	Access	Bit count	Type	Bit	Value	Description
Output type Temp (SP2)	98	0x62	Read/Write	8	uint8		1	PNP 2 Switching characteristic "active high"
							2	PNP 2 Switching characteristic "active low"
Teach	100	0x64	Write	8	uint8		1	Upper limit teach (MAX teach)
							2	Lower limit teach (MIN teach)
Operating Mode	102	0x66	Read/Write	8	uint8		2	MAX/MIN trim
Flow rate	112	0x70	Read	16	uint16		0...1023	Process value flow with regard to the MAX/MIN Teach range 0 ... 100 % 0 = 0 % ... 1023 = 100 %
Media temperature	113	0x71	Read	16	int16		-50...200	Media temperature -50 ... 200 °C [1 °C steps]
Switchpoint media temp (SP2)	130	0x82	Read/Write	16	int16		-50...200	Switchpoint media temp (Out 2) -50 ... +200 °C [1 °C steps]
Switching on delay Temp (SP2)	151	0x97	Read/Write	8	uint8		0...255	PNP 2 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching on delay Fault (SP3)	152	0x98	Read/Write	8	uint8		0...255	PNP 3 Switch-on delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Temp (SP2)	154	0x9A	Read/Write	8	uint8		0...255	PNP 2 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Switching off delay Fault (SP3)	155	0x9B	Read/Write	8	uint8		0...255	PNP 3 Switch-off delay 0 = 0.0 s ... 255 = 25.5 s
Simulate digital output (force mode)	300	0x012C	Write	8	uint8		0x11	All PNP outputs off
							0x15	PNP output Out 2 on
							0x19	PNP output Out 3 on
							0x00	Exit simulation mode (force mode)
MAX/MIN teach range	994	0x03E2	Read/Write	32	2 × uint16		0...15	MIN teach value [Bit]
							16...31	MAX teach value [Bit]
Output current (analog)	995	0x03E3	Read	16	uint16		0...25000	Output current 0 ... 25.0 mA [1 µA steps]
Error current	997	0x03E5	Read/Write	8	uint8		1	Error current 0 mA
							2	Error current > 21 mA
Output current Mode (Range)	998	0x03E6	Read/Write	8	uint8		1	4 ... 20 mA
							3	20 ... 4 mA
Simulate current output (Force Mode)	999	0x03E7	Write	16	uint16		0	Exit simulation mode (force mode)
							1...25000	Output current 0.001 ... 25.0 mA [1 µA steps]

6 Error messages

6.4.1 Error messages FM(X)-IM-3UP63X

Name	Index (dec.)	Index (hex.)	Access	Bit count	Bit	Description
Fault indication	144	0x90	Read	16	0	Gap between MAX and MIN too small
					1	Flow rate above indicating range
					2	Flow rate below indicating range
					3	Flow rate above operating range
					4	Temperature above indicating range
					5	Temperature below indicating range
					6	Temperature above operating range
					7	Temperature below operating range
					8	Wire break sensor
					9	Short circuit sensor
					11	Short circuits PNP-Out 2 (Temp)
					12	Short circuit PNP-Out 3 (Fault)
					13	General fault (manual reset needed)

6.4.2 Error messages FM(X)-IM--3UR38X

Name	Index (dec.)	Index (hex.)	Access	Bit count	Bit	Description
Fault indication	144	0x90	Read	16	0	Gap between MAX and MIN too small
					1	Flow rate above indicating range
					2	Flow rate below indicating range
					3	Flow rate above operating range
					4	Temperature above indicating range
					5	Temperature below indicating range
					6	Temperature above operating range
					7	Temperature below operating range
					8	Wire break sensor
					9	Short circuit sensor
					13	General fault (manual reset needed)

6.4.3 Error messages FM-IM-2UPLi63X

Name	Index (dec.)	Index (hex.)	Access	Bit count	Bit	Description
Fault indication	144	0x90	Read	16	0	Gap between MAX and MIN too small
					1	Flow rate above indicating range
					2	Flow rate below indicating range
					3	Flow rate above operating range
					4	Temperature above indicating range
					5	Temperature below indicating range
					6	Temperature above operating range
					7	Temperature below operating range
					8	Wire break sensor
					9	Short circuit sensor
					11	Short circuits PNP-Out 2 (Temp)
					12	Short circuit PNP-Out 3 (Fault)
					13	General fault (manual reset needed)
					14	Wire break current source
					15	Fault current source or load too high (switch-off of current source; Power-reset needed)

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