

VTEM

Motion Terminal

FESTO

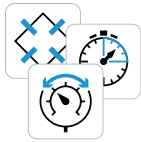


Quick Reference
PLC programming

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1.8

Firmware Version:
4.26.x



VTEM protocol

Running Motion App / Teach-in run



Valve at slot	0	1	2	3	4	5	6	7
Output data	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte
Input data	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte

Output data

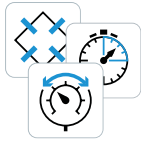
Output data, valve at slot 2				Output data, valve at slot 3				Output data, valve at slot 4			
Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4
Setpoint Value 1	Command			Setpoint Value 2	Setpoint Value 1		Command			Setpoint Value 2	Setpoint Value 1

Byte 1								Byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
App Option								App Control			Valve Mode				

Input data

Input data, valve at slot 2				Input data, valve at slot 3						Input data, valve at slot 4			
Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4	Byte 3	Byte 2
Actual Value 1	Status			Actual Value 2	Actual Value 1		Status			Actual Value 2	Actual Value 1		

Byte 1								Byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
App State								Valve State			Actual Valve Mode				



VTEM protocol

Running Motion App / Teach-in run

The operating mode of the valve is specified via the Valve Mode command:

Valve Mode	Meaning	IF	THEN
0	reserved	–	–
1 ... 59	Start / run Motion App 1 ... 59	– Required parametrisation has been completed. – Valve is inactive and configurable (Actual Valve Mode = 61, Valve State = 1 (configurable)). – Setpoint / control values are valid.	Requested Motion App is started
		– Valve is inactive and configurable (Actual Valve Mode = 61, Valve State = 1 (configurable)). – Setpoint / control values are invalid.	See „Invalid output data“ on page 21
		– Another Motion App or the Transfer Mode is still running	Running Motion App keeps running, visible via the actual Valve Mode
		– Startup process of the device has been completed, at least one inactive error but no active error is present (Valve Mode = 61, Valve State = 0 (not ready))	Motion App can not be started because of an inactive error that needs to be acknowledged first (send Valve Mode „62“)
		– Startup process of the device has been completed, at least one active error is present – (Valve Mode = 61, – Valve State = 3 (failure))	Motion App cannot be started because of an active error that needs to be fixed first. After the error has been fixed, Valve State should change to 0 (not ready).
60	Start Teach-in run	see Valve Mode 1 ... 59	
61	End running Motion App / Teach-in run	– Motion App / Teach-in run is running	Motion App is stopped (Current Valve Mode = 61, Valve State = 1 (configurable))
		– Transfer Mode is running	Transfer Mode keeps running
62	Acknowledge inactive errors and warnings	– Valve State = 0 (not ready) because of an inactive error	Valve State changes to „configurable“, malfunction list is cleaned
		– Valve State = 1 (configurable)	Warnings in malfunction list are deleted
63	Transfer Mode	– Valve is inactive (Actual Valve Mode = 61)	Transfer Mode command is executed

The current operating mode and state of the valve can be seen in the Actual Valve Mode and Valve State section of the input data:

Actual Valve Mode	Meaning	Valve State	Meaning
0	reserved	0	not ready
1 ... 59	Running Motion App 1 ... 59		
60	Executing Teach-in run		
61	Valve is inactive or performs self-calibration	1	configurable
63	Transfer Mode is active	2	running
		3	failure





Motion App 01

Directional control valve function

Parameters

Type	Index	Parameter	Range	Unit
System	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	223	Operating mode	0: open-loop 1: closed-loop	–

Control

App Option (Byte 1): Valve Type

01: 4/3 G (normally closed) 06: 3/2 O + 3/2 G
 02: 4/3 B (normally open) 07: 4/2 bistable
 03: 4/3 E (normally exhausted) 08: 2 × 2/2 G (normally closed)
 04: 2 × 3/2 O (normally open) 09: 4/2 mono
 05: 2 × 3/2 G (normally closed)

App Control (Byte 0, Bits 6 ... 7): Valve switching position

B = Blocked, E = Exhausted, P = Pressurised

Valve type	App Control value							
	00		01		02		03	
	(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
01	B	B	P	E	E	P	B	B
02	P	P	P	E	E	P	P	P
03	E	E	P	E	E	P	E	E
04	P	P	P	E	E	P	E	E
05	E	E	E	P	P	E	P	P
06	P	E	P	P	E	E	E	P
07	hold		P	E	E	P	hold	
08	B	B	B	P	P	B	P	P
09	P	E	E	P	P	E	E	P

Setpoint Value 1 (Byte 2 ... 3)

not used

Setpoint Value 2 (Byte 4 ... 5)

not used

Monitor

App State (Byte 1)

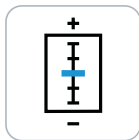
Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bits 3...4: (outlet port (2)) 0 → B; 1 → P; 2 → E; 3 → Error
 Bits 5...6: (outlet port (4)) 0 → B; 1 → P; 2 → E; 3 → Error
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Measured pressure at port (2)

–1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5): Measured pressure at port (4)

–1000 ... +32767 × 1 mbar



Motion App 02

Proportional directional control valve

Parameters

Type	Index	Parameter	Range	Unit
System	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	220	Characteristic (2)	0: Precise 1: Universal 2: Fast	–
	221	Characteristic (4)	0: Precise 1: Universal 2: Fast	–
	223	Operating mode	0: Seal seat behaviour 1: Servo mode	–

Control

App Option (Byte 1): Valve type, meaning of actual values

nc = normally closed

Value	Valve type (Bit 0...3)	Actual value 1 (Bit 5)	Actual value 2 (Bit 6)
14	4/3 G (nc) (14)	valve position (0)	valve position (0)
15	2×3/3 G (nc) (15)	valve position (0)	valve position (0)
46	4/3 G (nc) (14)	pressure (1)	valve position (0)
47	2×3/3 G (nc) (15)	pressure (1)	valve position (0)
78	4/3 G (nc) (14)	valve position (0)	pressure (1)
79	2×3/3 G (nc) (15)	valve position (0)	pressure (1)
110	4/3 G (nc) (14)	pressure (1)	pressure (1)
111	2×3/3 G (nc) (15)	pressure (1)	pressure (1)

App Control (Byte 0, Bits 6 ... 7): Outlet port activation

A = Active, I = Inactive

Valve type	App Control value							
	00 (2)	01 (4)	02 (2)	03 (4)	02 (2)	03 (4)	02 (2)	03 (4)
4/3 G (nc)	I	I	I	I	I	I	A	A
2 × 3/3 G (nc)	I	I	I	A	A	I	A	A

Setpoint Value 1 (Byte 2 ... 3): Setpoint valve position

Val. type 4/3 G: outlet port (2) and (4)
–10000 (14, 32) ... +10000 (12, 34) × 0.01 %
Val. type 2×3/3 G: outlet port (2)
–10000 (32) ... +10000 (12) × 0.01 %

Setpoint Value 2 (Byte 4 ... 5): Setpoint valve position

Val. type 4/3 G: not used
Val. type 2×3/3 G: outlet port (4)
–10000 (34) ... +10000 (14) × 0.01 %

Monitor

App State (Byte 1)

Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
Bit 5: 0 → actual value 1 shows valve position;
1 → actual value 1 shows pressure
Bit 6: 0 → actual value 2 shows valve position;
1 → actual value 2 shows pressure
Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Actual valve position at (2)

–10000 (32) ... +10000 (12) × 0.01 %

Actual pressure at (2)

–1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5): Actual valve position at (4)

–10000 (34) ... +10000 (14) × 0.01 %

Actual pressure at (4)

–1000 ... +32767 × 1 mbar



Motion App 03

Proportional pressure regulation

Parameters

Type	Index	Parameter	Range	Unit
System	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	
	71	End position detection advanced (optional) (Slot number × 10 + port number)		
Application	220	Characteristic (2)	0: small volumes (< 0.1 l) 1: medium volumes (0.1 l ... 1 l) 2: large volumes (> 1 l) 3: defined by tuning parameters	
	221	Characteristic (4)		
Tuning	230	Proportional gain for (2)	0 ... 30000	0.01 g/s/bar
	231	Integral gain for (2)	0 ... 30000	0.01 g/s ² /bar
	232	Time constant for (2)	0 ... 1000	1 ms
	233	Offset to threshold value for zero point switch-off function for (2)	-100 ... +100	1 mbar
	239	Proportional gain (relative adjustment) for (2)	-99 ... +1000	1 %
	240	Proportional gain for (4)	0 ... 30000	0.01 g/s/bar
	241	Integral gain for (4)	0 ... 30000	0.01 g/s ² /bar
	242	Time constant for (4)	0 ... 1000	1 ms
	243	Offset to threshold value for zero point switch-off function for (4)	-100 ... +100	1 mbar
	249	Proportional gain (relative adjustment) for (4)	-99 ... +1000	1 %

Tuning parameter values of characteristic presets (application parameters 220 and 221)

Tuning parameter	Characteristic "small volumes"	Characteristic "medium volumes"	Characteristic "large volumes"
230 / 240	2.00 g/s/bar	8.00 g/s/bar	15.00 g/s/bar
231 / 241	5.00 g/s ² /bar	5.00 g/s ² /bar	5.00 g/s ² /bar
232 / 242	5 ms	50 ms	80 ms

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Outlet port activation

A = Active, I = Inactive

App Control value							
00		01		02		03	
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
I	I	I	A	A	I	A	A

Setpoint Value 1 (Byte 2 ... 3): Setpoint pressure at (2)

-1000 ... +8000 × 1 mbar

Setpoint Value 2 (Byte 4 ... 5): Setpoint pressure at (4)

-1000 ... +8000 × 1 mbar

Monitor

App State (Byte 1)

Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Actual pressure at (2)

-1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5): Actual pressure at (4)

-1000 ... +32767 × 1 mbar



Motion App 04

Model-based proportional pressure regulation

Parameters

Type	Index	Parameter	Range	Unit
System	12	Tubing length at (2)	2000 ... 5000	1 mm
	13	Tubing length at (4)	2000 ... 5000	1 mm
	14	Tubing inner diameter at (2)	400 ... 1100	0.01 mm
	15	Tubing inner diameter at (4)	400 ... 1100	0.01 mm
	40	Volume at (2)	100 ... 5000	1 ml
	41	Volume at (4)	100 ... 5000	1 ml
	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	182	Maximum pressure rise at (2)	10 ... 20000	0.01 bar/s
	183	Maximum pressure rise at (4)	10 ... 20000	0.01 bar/s

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Outlet port activation

A = Active, I = Inactive

App Control value							
00	01	02	03				
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
I	I	I	A	A	I	A	A

Setpoint Value 1 (Byte 2 ... 3): Setpoint pressure at (2)

–1000 ... +8000 × 1 mbar

Setpoint Value 2 (Byte 4 ... 5): Setpoint pressure at (4)

–1000 ... +8000 × 1 mbar

Monitor

App State (Byte 1)

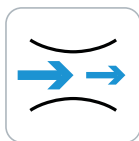
Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Actual pressure at (2)

–1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5): Actual pressure at (4)

–1000 ... +32767 × 1 mbar



Motion App 05

Supply and exhaust airflow control

Parameters

Type	Index	Parameter	Range	Unit
System	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	222	Soft-start function	0: inactive 1: active	–

Control

App Option (Byte 1): Meaning of actual values

Value	Actual value 1 (Bit 5)	Actual value 2 (Bit 6)
0	0: opening degree (exhaust)	0: opening degree (supply)
32	1: pressure (2)	0: opening degree (supply)
64	0: opening degree (exhaust)	1: pressure (4)
96	1: pressure (2)	1: pressure (4)

App Control (Byte 0, Bits 6 ... 7): Valve switching position

B = Blocked, E = Exhausted, P = Pressurised

App Control value							
00 (blocked)		01 (advance)		02 (retract)		03 (exhaust)	
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
B	B	E	P	P	E	E	E

Setpoint Value 1 (Byte 2 ... 3): Setpoint opening degree, exhaust air flow control

0 ... 10000 × 0.01 %

Setpoint Value 2 (Byte 4 ... 5): Setpoint opening degree, supply air flow control

0 ... 10000 × 0.01 %

Monitor

App State (Byte 1)

Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bit 5: 0 → actual value 1 shows opening degree (exhaust);
 1 → actual value 1 shows pressure (2)
 Bit 6: 0 → actual value 2 shows opening degree (supply);
 1 → actual value 2 shows pressure (4)
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3):

Actual opening degree, exhaust air flow control

–10000 [(3) → (2)] ... +10000 [(1) → (2)] × 0.01 %

Actual pressure at (2)

–1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5):

Actual opening degree, supply air flow control

–10000 [(3) → (4)] ... +10000 [(1) → (4)] × 0.01 %

Actual pressure at (4)

–1000 ... +32767 × 1 mbar



Motion App 06

ECO drive

Parameters

Type	Index	Parameter	Range	Unit
System	70	End position detection retracted (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Valve switching position

B = Blocked, E = Exhausted, P = Pressurised

App Control value							
00 (blocked)		01 (advance)		02 (retract)		03 (exhaust)	
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
B	B	E	P	P	E	E	E

Setpoint Value 1 (Byte 2 ... 3)

not used

Setpoint Value 2 (Byte 4 ... 5): Setpoint opening degree, supply air flow control

0 ... 10000 × 0.01 %

Monitor

App State (Byte 1)

Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Actual pressure at (2)

–1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5): Actual pressure at (4)

–1000 ... +32767 × 1 mbar



Motion App 07

Presetting of travel time

Parameters

Type	Index	Parameter	Range	Unit
System	12	Tubing length at (2)	0 ... 5000	1 mm
	13	Tubing length at (4)	0 ... 5000	1 mm
	14	Tubing inner diameter at (2)	400 ... 1000	0.01 mm
	15	Tubing inner diameter at (4)	400 ... 1000	0.01 mm
	20	Drive type (→ List of supported drives at Support Portal)	–	–
	21	Drive stroke	10 ... 1000	1 mm
	60	Installation position of drive	–9000 ... +9000	0.01 °
	70	End position detection retracted (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	100	Load, retracting	0 ... 10000	0.01 kg
	101	Load, advancing	0 ... 10000	0.01 kg
	102	Moment of inertia, retracting	0 ... 32767	1 kg × cm ²
	103	Moment of inertia, advancing	0 ... 32767	1 kg × cm ²
	120	Travel time, retracting	1 ... 3000	0.01 s
	121	Travel time, advancing	1 ... 3000	0.01 s
	222	Soft-start function	0: inactive 1: active	–

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Valve switching position

B = Blocked, E = Exhausted, P = Pressurised

App Control value							
00 (blocked)		01 (advance)		02 (retract)		03 (exhaust)	
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
B	B	E	P	P	E	E	E

Setpoint Value 1 (Byte 2 ... 3)

not used

Setpoint Value 2 (Byte 4 ... 5)

not used

Monitor

App State (Byte 1)

Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Actual travel time
 (set bit ... end position switch)

0 ... 32767 × 1 ms

Actual Value 2 (Byte 4 ... 5)

not used



Motion App 08

Selectable pressure level (ECO)

Parameters

Type	Index	Parameter	Range	Unit
System	12	Tubing length at (2)	0 ... 20000	1 mm
	13	Tubing length at (4)	0 ... 20000	1 mm
	14	Tubing inner diameter at (2)	200 ... 1100	0.01 mm
	15	Tubing inner diameter at (4)	200 ... 1100	0.01 mm
	20	Drive type (→ List of supported drives at Support Portal)	–	–
	21	Drive stroke	10 ... 5000	1 mm
	60	Installation position of drive	–18000 ... +18000	0.01 °
	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	100	Load, retracting	0 ... 10000	0.01 kg
	101	Load, advancing	0 ... 10000	0.01 kg
	102	Moment of inertia, retracting	0 ... 32767	1 kg × cm ²
	103	Moment of inertia, advancing	0 ... 32767	1 kg × cm ²
	222	Soft-start function	0: inactive 1: active	–
Tuning	239	Proportional gain for outlet port (2)	–35 ... +20	0,1 %
	249	Proportional gain for outlet port (4)	–35 ... +20	0,1 %

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Valve switching position

B = Blocked, E = Exhausted, P = Pressurised

App Control value							
00 (blocked)		01 (advance)		02 (retract)		03 (exhaust)	
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
B	B	E	P	P	E	E	E

Setpoint Value 1 (Byte 2 ... 3): Setpoint opening degree, exhaust air flow control

0 ... 10000 × 0.01 %

Setpoint Value 2 (Byte 4 ... 5): Setpoint air supply pressure during travel

0 ... 8000 × 1 mbar

Monitor

App State (Byte 1)

Bit 0: 0 → input for ret.pos = 0; 1 → input for ret.pos = 1
 Bit 2: 0 → input for adv.pos = 0; 1 → input for adv.pos = 1
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Actual pressure at (2)

–1000 ... +32767 × 1 mbar

Actual Value 2 (Byte 4 ... 5): Actual pressure at (4)

–1000 ... +32767 × 1 mbar

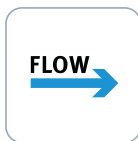


Motion App 10

Flow control

Parameters

Type	Index	Parameter	Range	Unit
System	42	Operating medium	1: dry air (CDA) at 0 °C 2: dry air (CDA) at 20 °C 3: Argon (Ar) at 0 °C 4: Argon (Ar) at 20 °C 5: Nitrogen (N ₂) at 0 °C 6: Nitrogen (N ₂) at 20 °C 7: CO ₂ at 0 °C 8: CO ₂ at 20 °C 9: Oxygen (O ₂) at 0 °C 10: Oxygen (O ₂) at 20 °C	–
	70	End position detection retracted (optional) (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	71	End position detection advanced (optional) (Slot number × 10 + port number)		
	81	Flow sensor for measurement at outlet port (2) (optional) (Slot number × 10 + port number)	–1 (no sensor) 20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	82	Flow sensor for measurement at outlet port (4) (optional) (Slot number × 10 + port number)		
Application	220	Characteristic for outlet port (2)	0: fast (short tubes) 1: medium (medium length tubes) 2: universal (esp. long tubes) 3: defined by tuning parameters	
	221	Characteristic for outlet port (4)		
	223	Operating mode (open-loop controlled = without external sensor, closed-loop controlled = with external sensor)	0: (2) and (4) open-loop controlled 1: (2) open-loop, (4) closed-loop 2: (2) closed-loop, (4) open-loop 3: (2) and (4) closed-loop controlled	
Tuning	230	Proportional gain for outlet port (2)	0 ... 10000	m ³ /s/bar
	231	Integral gain for outlet port (2)	0 ... 30000	m ³ /s ² /bar
	232	Reduction of the feedforward control rate for (2)	0 ... 100	1 %
	233	Boost to reach setpoint value for outlet port (2) earlier	0 ... 200	1 %
	234	Offset target flow rate limitation info for (2)	–95 ... +5	1 %
	235	Offset minimum considered setpoint for (2)	–25 ... +500	1 %
	240	Proportional gain for outlet port (4)	0 ... 10000	m ³ /s/bar
	241	Integral gain for outlet port (4)	0 ... 30000	m ³ /s ² /bar
	242	Reduction of the feedforward control rate for (4)	0 ... 100	1 %
	243	Boost to reach setpoint value for outlet port (4) earlier	0 ... 200	1 %
	244	Offset target flow rate limitation info for (4)	–95 ... +5	1 %
	245	Offset minimum considered setpoint for (4)	–25 ... +500	1 %



Motion App 10

Flow control

Tuning parameter values of characteristic presets (application parameters 220 and 221)

Tuning parameter	Characteristic "fast"	Characteristic "medium"	Characteristic "universal"
230 / 240	350 m ³ /s/bar	300 m ³ /s/bar	250 m ³ /s/bar
231 / 241	2500 m ³ /s ² /bar	1600 m ³ /s ² /bar	1000 m ³ /s ² /bar
232 / 242	2 %	4 %	6 %
233 / 243	0 %	0 %	0 %

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Outlet port activation

A = Active, I = Inactive

App Control value							
00	01	02	03	00	01	02	03
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
I	I	I	A	A	I	A	A

Setpoint Value 1 (Byte 2 ... 3): Flow rate at outlet port (2)

-10000 ... +10000 × 0.1 l/min

(Setpoints between -25 l/min and +25 l/min are ignored, if not modified by tuning parameter index 235)

Setpoint Value 2 (Byte 4 ... 5): Flow rate at outlet port (4)

-10000 ... +10000 × 0.1 l/min

(Setpoints between -25 l/min and +25 l/min are ignored, if not modified by tuning parameter index 245)

Monitor

App State (Byte 1)

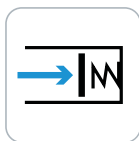
- Bit 0: End position retracted not reached (0) / reached (1)
- Bit 1: Outlet port (2) and (4) are operated inside (0) / at least one of them outside (1) the specification
- Bit 2: End position advanced not reached (0) / reached (1)
- Bit 3: Actual value for flow on (2) comes from calculation (0) / measurement (1) (higher accuracy)
- Bit 4: Actual value for flow on (4) comes from calculation (0) / measurement (1) (higher accuracy)
- Bit 5: Ratio of the set flow to the maximum adjustable flow at port (2) is lower (0) / higher (1) than the specified limit (95% of the maximum adjustable flow + value of parameter "Offset target flow rate limitation info for (2)")
- Bit 6: Ratio of the set flow to the maximum adjustable flow at port (4) is lower (0) / higher (1) than the specified limit (95% of the maximum adjustable flow + value of parameter "Offset target flow rate limitation info for (4)")
- Bit 7: 0 -> no active warning; 1 -> active warning

Actual Value 1 (Byte 2 ... 3): Flow rate at outlet port (2)

-32768 ... 32767 × 0.1 l/min

Actual Value 2 (Byte 4 ... 5): Flow rate at outlet port (4)

-32768 ... 32767 × 0.1 l/min



Motion App 11

Soft stop

Parameters

Type	Index	Parameter	Range	Unit
System	20	Drive type (→ List of supported drives at Support Portal)	–	–
	21	Drive stroke	200 ... 500	1 mm
	60	Installation position of drive	0 ... 0	0.01 °
	75	Partial stroke measurement retracted (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	76	Partial stroke measurement advanced (Slot number × 10 + port number)	20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	100	Load, retracting	1000 ... 5000	0.01 kg
	101	Load, advancing	1000 ... 5000	0.01 kg
Tuning	230	Maximum end position speed, advancing (offset)	–20 ... +100	0.001 m/s
	231	Maximum end position speed, retracting (offset)	–20 ... +100	0.001 m/s
	236	Contact pressure, end position advanced (offset)	–20 ... +10	0.1 bar
	237	Contact pressure, end position retracted (offset)	–20 ... +10	0.1 bar

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Valve switching position

B = Blocked, E = Exhausted, P = Pressurised

App Control value							
00 (blocked)	01 (advance)	02 (retract)	03 (exhaust)				
(2)	(4)	(2)	(4)	(2)	(4)	(2)	(4)
B	B	E	P	P	E	E	E

Setpoint Value 1 (Byte 2 ... 3)

not used

Setpoint Value 2 (Byte 4 ... 5)

not used

Monitor

App State (Byte 1)

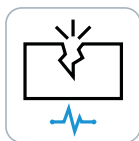
- Bit 0: End position retracted not reached (0) / reached (1)
- Bit 1: Contact pressure not reached (0) / reached (1)
- Bit 2: End position advanced not reached (0) / reached (1)
- Bit 3: Sensing range partial-stroke sensor retracted, piston outside (0) / piston inside (1)
- Bit 4: Sensing range partial-stroke sensor advanced, piston outside (0) / piston inside (1)
- Bit 7: 0 -> no active warning; 1 -> active warning

Actual Value 1 (Byte 2 ... 3): Position measurement partial-stroke advanced

0 ... 1600 × 0.1 mm

Actual Value 2 (Byte 4 ... 5): Position measurement partial-stroke retracted

0.0 ... 1600 × 0.1 mm



Motion App 12

Leakage diagnostics

Parameters

Type	Index	Parameter	Range	Unit
System	12	Tubing length at (2)	0 ... 5000	1 mm
	13	Tubing length at (4)	0 ... 5000	1 mm
	14	Tubing inner diameter at (2)	400 ... 1000	0.01 mm
	15	Tubing inner diameter at (4)	400 ... 1000	0.01 mm
	20	Drive type (→ List of supported drives at Support Portal)	–	–
	21	Drive stroke	10 ... 1000	1 mm
	40	Volume at (2)	0 ... 32000	1 ml
	41	Volume at (4)	0 ... 32000	1 ml
	60	Installation position of drive	–9000 ... +9000	0.01 °
Application	100	Load, retracting	0 ... 10000	0.01 kg
	101	Load, advancing	0 ... 10000	0.01 kg
	102	Moment of inertia, retracting	0 ... 32767	kg × cm ²
	103	Moment of inertia, advancing	0 ... 32767	kg × cm ²
	200	Maximum leakage for status „Good“	20 ... 6000	0.1 l/h
	201	Maximum leakage for status „Warning“	20 ... 6000	0.1 l/h
	202	Maximum leakage for status „Critical“	20 ... 6000	0.1 l/h

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Diagnosis control

00: Deactivate diagnosis

01: Activate diagnosis

02: Exhaust ((2) exhausted, (4) exhausted)

03: –

Setpoint Value 1 (Byte 2 ... 3)

not used

Setpoint Value 2 (Byte 4 ... 5)

not used

Monitor

App State (Byte 1)

Bit 0 ... 1: Status leakage at (2)

00 → Failure; 01 → Critical; 02 → Warning; 03 → Good

Bit 2 ... 3: Status leakage at (4)

00 → Failure; 01 → Critical; 02 → Warning; 03 → Good

Bit 4 ... 6: Status diagnosis

00 → inactive

01 → active

02 → cancelled

03 → partially completed (2)

04 → partially completed (4)

05 → completed

Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3): Leakage increase at (2)

–32768 ... +32767 × 0.1 l/h

Actual Value 2 (Byte 4 ... 5): Leakage increase at (4)

–32768 ... +32767 × 0.1 l/h

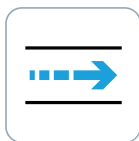


Motion App 33

Motion profile and positioning

Parameters

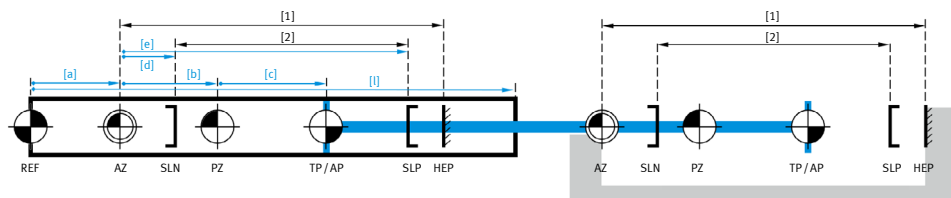
Type	Index	Parameter	Range	Unit
System	12	Tubing length at (2)	1000 ... 3000	1 mm
	13	Tubing length at (4)	1000 ... 3000	1 mm
	14	Tubing inner diameter at (2)	570 ... 590	0.01 mm
	15	Tubing inner diameter at (4)	570 ... 590	0.01 mm
	20	Drive type (→ List of supported drives at Support Portal)	–	–
	21	Drive stroke	20 ... 1000	1 mm
	60	Installation position of drive	–9000 ... +9000	0.01 °
	61	Offset axis zero point	0 ... 1000	1 mm
	75	Partial stroke measurement retracted (Slot number × 10 + port number) (Parameter is only active if parameter 80 is set to –1)	–1 (no sensor) 20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	76	Partial stroke measurement advanced (Slot number × 10 + port number) (Parameter is only active if parameter 80 is set to –1)	–1 (no sensor) 20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
	80	Full-stroke measurement	–1 (no sensor) 20 ... 27 40 ... 47, 50 ... 57 80 ... 87, 90 ... 97	–
Application	100 101	Load (advancing and retracting, both parameters contain the same value)	0 ... 30000	0.01 kg
	124	Damping time for “Target Position Reached”	1 ... 100	0.01 s
	126	Duration of threshold exceedance for error	1 ... 30000	0.001 s
	141	Tolerance for “Target Position Reached”	1 ... 10000	0.1 mm
	142	Maximum velocity (general)	1 ... 1000	0.01 m/s
	144	Maximum acceleration	1 ... 1000	0.1 m/s ²
	146	Maximum deceleration	1 ... 1000	0.1 m/s ²
	148	Maximum jerk	1 ... 32000	0.1 m/s ³
	150	Offset project zero point	–1000 ... +1010	1 mm
	151	Offset software limit negative (retracted)	–50 ... +1010	1 mm
	152	Offset software limit positive (advanced)	0 ... 1060	1 mm
	153	Distance to target position with constant final velocity in retracting direction	0 ... 10000	0.1 mm
	154	Distance to target position with constant final velocity in advancing direction	0 ... 10000	0.1 mm
	155	Final velocity in contact case in retracting direction	1 ... 10000	0.1 mm/s



Motion App 33

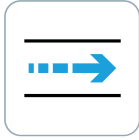
Motion profile and positioning

Type	Index	Parameter	Range	Unit
Application	156	Final velocity in contact case in advancing direction	1 ... 10000	0.1 mm/s
	184	Mean pressure level	0 ... 100	0.1 bar rel.
	204	Threshold for position following error	1 ... 30000	1 mm
	205	Threshold for velocity following error	1 ... 30000	0.001 m/s
	222	Soft-start function	0: inactive 1: active	–
	224	End position monitoring	0: active for ret. + adv. 1: active for ret. 2: active for adv. 3: inactive	–
	225	Option of pressure build-up into mechanical end position	0: inactive 1: active	–
Tuning	230	Controller gain (relative adjustment)	–50 ... +50	1 %
	231	Damping of the controlled system (absolute adjustment)	–99 ... +99	0.01
	232	Pliability (relative adjustment)	–30 ... +70	1 %
	233	Reduction of pilot control (relative adjustment)	0 ... 100	1 %
	234	Coulomb friction taken into account (relative adjustment)	–100 ... +1000	1 %



- [a] Offset axis zero point
- [b] Offset project zero point
- [c] Set position / actual position rel. to PZ (Setpoint / actual values)
- [d, e] Offset software limits
- [l] Drive stroke / Nominal stroke
- [1] Range of mechanical movement
- [2] Effective stroke (effective range)

- REF Reference point
- AZ Axis zero point
- PZ Project zero point
- TP / AP Target position / actual position
- HEP Hardware end position positive
- SLN Software limits negative
- SLP Software limit positive



Motion App 33

Motion profile and positioning

Control

App Option (Byte 1): Approaching

- 0: Approaching inactive for current movement
- 1: Approaching active for current movement

App Control (Byte 0, Bits 6 ... 7): Motion control

- 00: Locked
- 01: Apply setpoint value
- 02: Controlled stop
- 03: Exhaust

Setpoint Value 1 (Byte 2 ... 3): Target position

$-10600 \dots +10600 \times 0.1 \text{ mm}$
(Additionally limited by drive-related parameters like stroke and offsets)

Setpoint Value 2 (Byte 4 ... 5): Max. velocity (currently)

$0 \dots 10000 \times 0.001 \text{ m/s}$
(Value applies regardless of travel direction)

Monitor

App State (Byte 1)

- Bit 0: End position retracted not reached (0) / reached (1)
- Bit 1: Target Position not reached (0) / reached (1)
- Bit 2: End position advanced not reached (0) / reached (1)
- Bit 5: Overshoot over target position in planned path
not active (0) / active (1)
- Bit 6: Controlled stop due to end position violation
not active (0) / active (1)
- Bit 7: 0 -> no active warning; 1 -> active warning

Actual Value 1 (Byte 2 ... 3): Actual position

$-32768 \dots +32767 \times 0.1 \text{ mm}$

Actual Value 2 (Byte 4 ... 5): Actual pneumatic force

$-32768 \dots +32767 \times 0.5 \text{ N}$
(A positive value for the driving force acts in advancing direction)



Teach-in run

Parameters

Type	Index	Parameter	Range	Unit
Application	255	Motion App to be taught in	1 ... 59	–

Control

App Option (Byte 1)

not used

App Control (Byte 0, Bits 6 ... 7): Operating mode

00: Stop
 01: Auto
 02: Manual (Motion App #11 only)
 03: –

Setpoint Value 1 (Byte 2 ... 3): Motion control (manual operating only)

00: Block
 01: Advance
 02: Retract
 03: Exhaust

Setpoint Value 2 (Byte 4 ... 5)

not used

Monitor

App State (Byte 1)

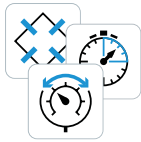
Bit 0: End position retracted not reached (0) / reached (1)
 Bit 2: End position advanced not reached (0) / reached (1)
 Bit 3 ... 6: Status process
 0 → reserved
 1 → unlearned
 2 → check tubes
 3 → choose control
 4 → tune trajectory
 5 → determine reference value
 6 → identification
 10 → Motion App already operable with reduced performance, further identification ongoing
 11 → completed with limitations
 12 → partially completed (only for (2))
 13 → partially completed (only for (4))
 14 → completed
 15 → error
 Bit 7: 0 → no active warning; 1 → active warning

Actual Value 1 (Byte 2 ... 3)

not used

Actual Value 2 (Byte 4 ... 5)

not used



Running Motion App / Teach-in run

Additional functions

Invalid output data

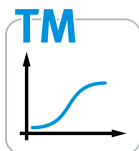
In case of invalid output data, the input data contains information about the cause of invalidity and will look like this:

Byte 5								Byte 4								Byte 3								Byte 2								Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Current pressure at (4) in mbar								Current pressure at (2) in mbar								<feedback information>								C* = 1								Valve Mode = 61															

* Configurable

Meaning of feedback information value:

Value in Byte 1	Meaning
1	Invalid value in section "Valve Mode"
2	Invalid value in section "App Control"
3	Invalid value in section "App Option"
4	Invalid value in "Setpoint Value 1" section
5	Invalid value in "Setpoint Value 2" section
6	Incorrect parametrisation
10	Access by PLC denied owing to active access by WebConfig interface
11	Access blocked due to active save process
12	No licence available for the requested Motion App
13	No free licence available for the requested Motion App
14	Licence file is invalid
15	No valve detected on the valve slot addressed
16	Valve self-calibration process in operation



VTEM protocol

Running Transfer mode



Valve at slot	0	1	2	3	4	5	6	7
Output data	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte
Input data	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte	6 Byte

Output data

Output data, valve at slot 2				Output data, valve at slot 3				Output data, valve at slot 4			
Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4
Parameter	Command			Value		Parameter	Command			Value	Parameter

Byte 1								Byte 0							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Transfer Control				Channel				–		Valve Mode					

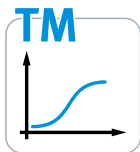
Output data, valve at slot 2				Output data, valve at slot 3				Output data, valve at slot 4			
Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0	Byte 5	Byte 4
Parameter	Command			Value		Parameter	Command			Value	Parameter

Byte 3								Byte 2							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Index								Addressed Target							



Input data is a mirror of the output data if

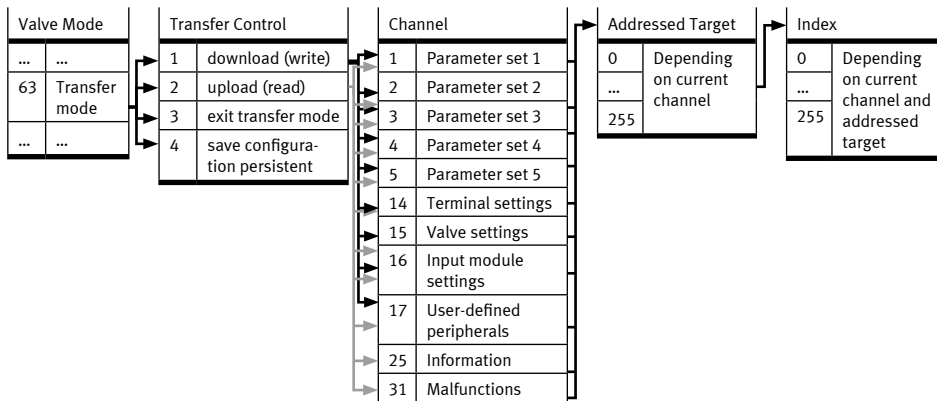
- output data is valid
- output data was received correctly by the Motion Terminal



VTEM protocol

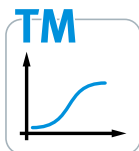
Running Transfer mode

Hierarchical structure



Addressed Targets per Channel

Channel	Addr. Target	Meaning
1 ... 5	1 ... 59	ID of the Motion App for which parameters are to be transferred. For system parameters, the purpose of the specification is a validity check of the specified value, with this check being specific to the Motion App.
	60	Transfer parameters for the teach-in run
	101 ... 159	100 + ID of Motion App for which the teach-in data is to be transferred.
14	0	Settings of the entire Motion Terminal
15	0	Valve settings
16	1	Transfer information on the peripherals at the first input module from the left
	2	Transfer information on the peripherals at the second input module from the left
17	1 ... 3	User-defined position sensor 1 ... 3
	11 ... 13	User-defined flow sensor 1 ... 3
	101 ... 108	User-defined drive 1 ... 8
25	1	Hardware information
	2	Software information
	3	Licence information
	4	Product Keys
	11	Pressures
	12	Temperatures
	13	Booster opening degrees
	14	Flow rates
	21	Proximity signals (via digital sensors on input module)
	22	Positions (via analogue sensors on input module)
	23	Flow rates (via analogue sensors on input module)
31	0	Malfunction list
	100 ... 107	Malfunction lists of valves at slots 0 ... 7



Transfer Mode

Indices per addressed target and channel

Indices per addressed target for channel 1 ... 5 (parameter set)

These channels are not accessible via other valves or empty slots.

Chan-nel	Addressed Target	Index	Meaning
1 ... 5	1 ... 60	0 ... 255	ID of the system, application or tuning parameters that are to be transferred.
	101 ... 159	0 ... 255	ID of the teach-in value that is to be transferred.

Indices per addressed target for channel 14 (Settings of the entire Motion Terminal)

Chan-nel	Addressed Target	Index	Meaning
14	0	51	Retention of existing teach-in data for parameter changes
		52	Access to extended sensor list (out of specification)
		53	Access to extended drive list (out of specification)
		54	Usage of demo licences during demo period

Indices per addressed target for channel 15 (valve settings)

This channel is not accessible via other valves or empty slots.

Chan-nel	Addressed Target	Index	Meaning
15	0	1	Number of the active parameter set
		2	ID of the assigned Motion App

Indices per addressed target for channel 16 (input module settings)

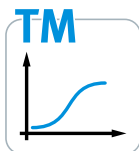
Chan-nel	Addressed Target	Index	Meaning
16	1	0 ... 255	ID of the sensor port and parameter
	2		

Details: → „Transfer Mode
Channel 16 (input module settings)“ on page 26

Indices per addressed target for channel 17 (User-defined peripherals)

Chan-nel	Addressed Target	Index	Meaning
17	1 ... 3	0 ... 255	ID of the parameter for user-defined position sensor 1 ... 3
	11 ... 13	0 ... 255	ID of the parameter for the user-defined flow sensor 1 ... 3
	101 ... 108	0 ... 255	ID of the parameter for user-defined drive 1 ... 8

Details: → „Transfer Mode
Channel 17 (user-defined peripherals)“ on page 28



Transfer Mode

Indices per addressed target and channel

Indices per addressed target for channel 25 (information)

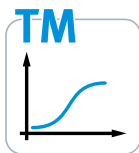
Channel	Addressed Target	Index	Meaning
25	1	0 ... 255	ID of the hardware information
	2	0 ... 255	ID of the software information
	3	1 ... 59	number of licences for Motion App #01 ... #59 (according to licence file)
		101 ... 159	number of free licences for Motion App #01 ... #59 (depending on current usage)
		253	remaining time of demo period, number of hours hh (regarding time format hh:mm)
		254	remaining time of demo period, number of minutes mm (regarding time format hh:mm)
	4	1 ... 6	Product Key Controller
	11	0 ... 255	ID of the pressure value
	12	0 ... 255	ID of the temperature value
	13	0 ... 255	ID of the booster opening degree information
	14	0 ... 255	ID of the flow rate information
	21	0 ... 255	ID of the proximity signal value
	22	0 ... 255	ID of the position value
	23	0 ... 255	ID of the flow value

Details: → „Transfer Mode Channel 25 (information)“ on page 29

Indices per addressed target for channel 31 (malfunction)

Channel	Addressed Target	Index	Meaning
31	0 (malfunction list of the valve whose process data are used) 100 ... 107 (malfunction lists of valves at slots 0 ... 7)	1 ... 40	Malfunction messages in reverse order of their occurrence
		51 ... 90	Time stamp (I) of malfunction messages 1 ... 40, (hours)
		101 ... 140	Time stamp (II) of malfunction messages 1 ... 40, (minutes, seconds)
		151 ... 190	Time stamp (III) of malfunction messages 1 ... 40, (milliseconds)
		250	Time stamp (I) of the list (hours)
		251	Time stamp (II) of the list (minutes, seconds)
		252	Time stamp (III) of the list (milliseconds)
		253	Position of the most recent malfunction message of type “error”
		254	Position of the earliest malfunction message of type “error”
		255	Number of malfunction messages in the malfunction list

Details: → „Transfer Mode Channel 31 (malfunctions)“ on page 39



Transfer Mode

Channel 16 (input module settings)

Addressed Target	Index (ID)	Parameter	Values	Meaning		
1 (first input module from the left) 2 (second input module from the left)	Input no. $\times 30 + 1$	Sensor type	1001	SMT-8M-A-PS-24V-...		
			2001	SDAP-MHS-M50-...		
			2002	SDAP-MHS-M100-...		
			2003	SDAP-MHS-M160-...		
			2901	User-definded position sensor 1 ¹⁾		
			2902	User-definded position sensor 2 ¹⁾		
			2903	User-definded position sensor 3 ¹⁾		
			3001	SFAB-50U-...-2SA-...		
			3002	SFAB-200U-...-2SA-...		
			3003	SFAB-600U-...-2SA-...		
			3004	SFAB-1000U-...-2SA-...		
			3101	SFAH-50U-...-PNVBA-...		
			3102	SFAH-100U-...-PNVBA-...		
			3103	SFAH-200U-...-PNVBA-...		
			3901	User-defined flow sensor 1 ¹⁾		
			3902	User-defined flow sensor 2 ¹⁾		
			3903	User-defined flow sensor 3 ¹⁾		
			Input no. $\times 30 + 2$	Sensor orientation (only for analogue sensors)	0	Regular ²⁾
					1	Inverse ³⁾

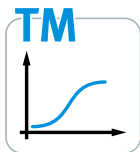
¹⁾ Sensor data is parametrised via channel 17

²⁾ position sensor: output signal rises in advancing direction; flow sensor: positive flow values

³⁾ position sensor: output signal falls in advancing direction; flow sensor: negative flow values

Example1: Getting the correct index number

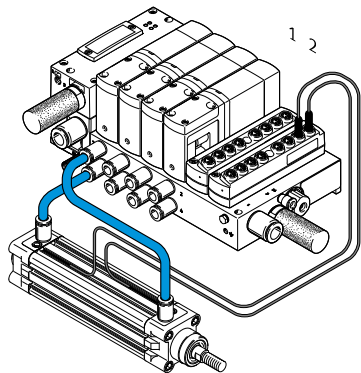
- The sensor type for the input 0 is addressed with the ID 1 ($0 \times 30 + 1$).
- The sensor orientation for the input 4 is addressed with the ID 122 ($4 \times 30 + 2$)



Transfer Mode

Channel 16 (input module settings)

Example 2: Configure position sensors



Two SDAP-MHS-M50-... analogue sensors are connected to the analogue input module of the Motion Terminal, that is on the second position of the input modules. One is orientated with a rising signal in advancing direction, the other one is directed with a falling signal in rising direction.

Commands to send to the Motion Terminal:

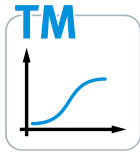
1. Setting Sensor type for port 0:

Valve Mode:	63 (Transfer mode)
Transfer Control:	1 (download)
Channel:	16 (input module settings)
Addressed Target:	2 (second input module from the left)
Index:	1 (ID of parameter sensor type for port 0)
Value:	2001 (SDAP-MHS-M50-...)
2. Setting sensor orientation for port 0:

Valve Mode:	63 (Transfer mode)
Transfer Control:	1 (download)
Channel:	16 (input module settings)
Addressed Target:	2 (second input module from the left)
Index:	2 (ID of parameter sensor orientation for port 0)
Value:	1 (Output signal falls in advancing direction)
3. Setting Sensor type for port 1:

Valve Mode:	63 (Transfer mode)
Transfer Control:	1 (download)
Channel:	16 (input module settings)
Addressed Target:	2 (second input module from the left)
Index:	31 (ID of parameter sensor type for port 0)
Value:	2001 (SDAP-MHS-M50-...)
4. Setting sensor orientation for port 1:

Valve Mode:	63 (Transfer mode)
Transfer Control:	1 (download)
Channel:	16 (input module settings)
Addressed Target:	2 (second input module from the left)
Index:	32 (ID of parameter sensor orientation for port 0)
Value:	0 (Output signal rises in advancing direction)



Transfer Mode

Channel 17 (user-defined peripherals)

User-defined position sensors

Addressed Target	Index	Meaning	Range	Unit
1 User-defined position sensor 1	1	Sensing range (0 mm ... ____)	0 ... 10000	1 mm
2 User-defined position sensor 2	1	Sensing range (0 mm ... ____)	0 ... 10000	1 mm
3 User-defined position sensor 3	1	Sensing range (0 mm ... ____)	0 ... 10000	1 mm

Example

To parametrise the user-defined position sensor 1 with a sensing range of 0 mm ... 250 mm, the index 1 of addressed target 1 has to be written with the value 250.

User-defined flow sensors

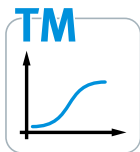
Addressed Target	Index	Meaning	Range	Unit
11 ... 13 User-defined flow sensor 1 ... 3	1	Sensing range (0 l/min ... ____)	1 ... 3000	1 l/min
	2	Lower limit of measured values to be assumed as reliable (in relation to maximum value)	1 ... 100	0.1 %

User-defined drives

Addressed Target	Index	Meaning	Range	Unit
101 ... 108 User-defined drive 1 ... 8	1	Drive type 1: Single acting piston rod cylinder 2: Double acting piston rod cylinder 3: Rodless cylinder (linear drive)	1 ... 3	–
	2	Piston diameter (inner diameter of cylinder)	50 ... 32767	0.1 mm
	3	Piston rod diameter	0 ... 32767	0.1 mm
	4	Piston mass	1 ... 32767	0.01 kg
	5	Piston rod mass per running meter	0 ... 32767	0.01 kg/m
	6	Dead volume at retracted end of drive	1 ... 32767	0.1 cm ³
	7	Dead volume at advanced end of drive	1 ... 32767	0.1 cm ³
	8	Pneumatic conductance at port advancing	10 ... 32767	0.01 l/(s×bar)
	9	Pneumatic conductance at port retracting	10 ... 32767	0.01 l/(s×bar)
	10	Coulomb friction force	0 ... 32767	0.1 N
	11	Viscous friction coefficient	1 ... 32767	0.1 Ns/m
	12	Maximum impact energy at retracted end of drive	10 ... 32767	0.001 J
	13	Maximum impact energy at advanced end of drive	10 ... 32767	0.001 J
	14	Eff. range of end position damping at ret. end of drive	0 ... 32767	0.1 mm
	15	Eff. range of end position damping at adv. end of drive	0 ... 32767	0.1 mm

Note

To be able to use the user-defined drives, the parameter “Access to extended drive list” must be activated (see Channel 14, Index 53).



Transfer Mode

Channel 25 (information)

Structure of channel 25

The channel is divided into separate areas for the different parts of the Motion Terminal. These areas use the following index values:

Index	Meaning
1 ... 20	Controller and Backplane
21 ... 40	Valve at slot 0
41 ... 60	Valve at slot 1
61 ... 80	Valve at slot 2
81 ... 100	Valve at slot 3
101 ... 120	Valve at slot 4
121 ... 140	Valve at slot 5
141 ... 160	Valve at slot 6
161 ... 180	Valve at slot 7
181 ... 200	Input module 1
201 ... 220	Input module 2

Addressed target 1 (hardware information)

Index	Meaning
1	Hardware ID controller CTMM-S1-C
2	Hardware ID of the interlinking board
21	Hardware revision valve 0
22	Hardware ID valve 0
41	Hardware revision valve 1
42	Hardware ID valve 1
61	Hardware revision valve 2
62	Hardware ID valve 2
81	Hardware revision valve 3
82	Hardware ID valve 3
101	Hardware revision valve 4
102	Hardware ID valve 4
121	Hardware revision valve 5
122	Hardware ID valve 5
141	Hardware revision valve 6
142	Hardware ID valve 6

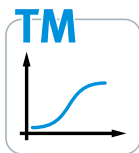
Index	Meaning
161	Hardware revision valve 7
162	Hardware ID valve 7
181	Hardware revision input module 1
201	Hardware revision input module 2

The hardware revision consists of the month and year, each of which is assigned to one byte of the return word:

Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Month								Year							

Addressed target 2 (software information)

Index	Meaning
1	Firmware version controller, major number
2	Firmware version controller, minor number
3	Firmware version controller, patch number
5	Bootloader version controller, major number
6	Bootloader version controller, minor number
7	Bootloader version controller, patch number
21	Firmware version valve 0, major number
22	Firmware version valve 0, minor number
23	Firmware version valve 0, patch number
25	Bootloader version valve 0, major number
26	Bootloader version valve 0, minor number
27	Bootloader version valve 0, patch number
41	Firmware version valve 1, major number
42	Firmware version valve 1, minor number
43	Firmware version valve 1, patch number
45	Bootloader version valve 1, major number
46	Bootloader version valve 1, minor number
47	Bootloader version valve 1, patch number
61	Firmware version valve 2, major number
62	Firmware version valve 2, minor number
63	Firmware version valve 2, patch number



Transfer Mode

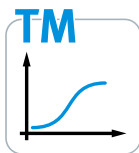
Channel 25 (information)

Index	Meaning
65	Bootloader version valve 2, major number
66	Bootloader version valve 2, minor number
67	Bootloader version valve 2, patch number
81	Firmware version valve 3, major number
82	Firmware version valve 3, minor number
83	Firmware version valve 3, patch number
85	Bootloader version valve 3, major number
86	Bootloader version valve 3, minor number
87	Bootloader version valve 3, patch number
101	Firmware version valve 4, major number
102	Firmware version valve 4, minor number
103	Firmware version valve 4, patch number
105	Bootloader version valve 4, major number
106	Bootloader version valve 4, minor number
107	Bootloader version valve 4, patch number
121	Firmware version valve 5, major number
122	Firmware version valve 5, minor number
123	Firmware version valve 5, patch number
125	Bootloader version valve 5, major number
126	Bootloader version valve 5, minor number
127	Bootloader version valve 5, patch number
141	Firmware version valve 6, major number
142	Firmware version valve 6, minor number
143	Firmware version valve 6, patch number
145	Bootloader version valve 6, major number
146	Bootloader version valve 6, minor number
147	Bootloader version valve 6, patch number
161	Firmware version valve 7, major number
162	Firmware version valve 7, minor number
163	Firmware version valve 7, patch number
165	Bootloader version valve 7, major number
166	Bootloader version valve 7, minor number
167	Bootloader version valve 7, patch number

Index	Meaning
181	Firmware version input module 1, major number
182	Firmware version input module 1, minor number
183	Firmware version input module 1, patch number
185	Bootloader version input module 1, major number
186	Bootloader version input module 1, minor number
187	Bootloader version input module 1, patch number
201	Firmware version input module 2, major number
202	Firmware version input module 2, minor number
203	Firmware version input module 2, patch number
205	Bootloader version input module 2, major number
206	Bootloader version input module 2, minor number
207	Bootloader version input module 2, patch number

Addressed target 3 (licence information)

Index	Meaning
1 ... 59	number of licences for Motion App #01 ... #59 (according to licence file)
101 ... 159	number of free licences for Motion App #01 ... #59 (depending on current usage)
253	remaining time of demo period, number of hours hh (regarding time format hh:mm)
254	remaining time of demo period, number of minutes mm (regarding time format hh:mm)



Transfer Mode

Channel 25 (information)

Addressed target 4 (Product Keys)

Index	Meaning	High byte	Low Byte
1	Product Key of the Controller	Digit 1	Digit 2
2	Product Key of the Controller	Digit 3	Digit 4
3	Product Key of the Controller	Digit 5	Digit 6
4	Product Key of the Controller	Digit 7	Digit 8
5	Product Key of the Controller	Digit 9	Digit 10
6	Product Key of the Controller	Digit 11	– (value 0)

The 16-bit value of an index contains 2 characters. The high-order byte contains the characters with the odd digit (1, 3, 5, ...), the low-order byte contains the characters with the even digit (2, 4, 6, ...).

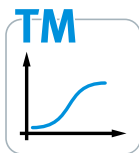
Structure of a combined value:

Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Odd digit (1, 3, 5, ...)								Even digit (2, 4, 6, ...)							

The characters are coded in ASCII format.

Decimal	Hex	Binary	ASCII-Character
48	30	0011 0000	0
49	31	0011 0001	1
50	32	0011 0010	2
51	33	0011 0011	3
52	34	0011 0100	4
53	35	0011 0101	5
54	36	0011 0110	6
55	37	0011 0111	7
56	38	0011 1000	8
57	39	0011 1001	9
65	41	0100 0001	A
66	42	0100 0010	B
67	43	0100 0011	C
68	44	0100 0100	D
69	45	0100 0101	E
70	46	0100 0110	F
71	47	0100 0111	G
72	48	0100 1000	H

Decimal	Hex	Binary	ASCII-Character
73	49	0100 1001	I
74	4A	0100 1010	J
75	4B	0100 1011	K
76	4C	0100 1100	L
77	4D	0100 1101	M
78	4E	0100 1110	N
79	4F	0100 1111	O
80	50	0101 0000	P
81	51	0101 0001	Q
82	52	0101 0010	R
83	53	0101 0011	S
84	54	0101 0100	T
85	55	0101 0101	U
86	56	0101 0110	V
87	57	0101 0111	W
88	58	0101 1000	X
89	59	0101 1001	Y
90	5A	0101 1010	Z



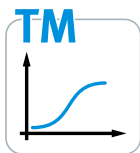
Transfer Mode

Channel 25 (information)

Addressed target 11 (pressure values)

Index	Meaning	Digit value
1	Supply pressure (absolute)	0.001 bar
2	Supply pressure (relative)	0.001 bar
3	Exhaust air pressure (absolute)	0.001 bar
4	Exhaust air pressure (relative)	0.001 bar
5	Ambient pressure (absolute)	0.001 bar
21	Pressure at valve 0, air port (2) (absolute)	0.001 bar
22	Pressure at valve 0, air port (2) (relative)	0.001 bar
23	Pressure at valve 0, air port (4) (absolute)	0.001 bar
24	Pressure at valve 0, air port (4) (relative)	0.001 bar
41	Pressure at valve 1, air port (2) (absolute)	0.001 bar
42	Pressure at valve 1, air port (2) (relative)	0.001 bar
43	Pressure at valve 1, air port (4) (absolute)	0.001 bar
44	Pressure at valve 1, air port (4) (relative)	0.001 bar
61	Pressure at valve 2, air port (2) (absolute)	0.001 bar
62	Pressure at valve 2, air port (2) (relative)	0.001 bar
63	Pressure at valve 2, air port (4) (absolute)	0.001 bar
64	Pressure at valve 2, air port (4) (relative)	0.001 bar
81	Pressure at valve 3, air port (2) (absolute)	0.001 bar
82	Pressure at valve 3, air port (2) (relative)	0.001 bar
83	Pressure at valve 3, air port (4) (absolute)	0.001 bar
84	Pressure at valve 3, air port (4) (relative)	0.001 bar
101	Pressure at valve 4, air port (2) (absolute)	0.001 bar

Index	Meaning	Digit value
102	Pressure at valve 4, air port (2) (relative)	0.001 bar
103	Pressure at valve 4, air port (4) (absolute)	0.001 bar
104	Pressure at valve 4, air port (4) (relative)	0.001 bar
121	Pressure at valve 5, air port (2) (absolute)	0.001 bar
122	Pressure at valve 5, air port (2) (relative)	0.001 bar
123	Pressure at valve 5, air port (4) (absolute)	0.001 bar
124	Pressure at valve 5, air port (4) (relative)	0.001 bar
141	Pressure at valve 6, air port (2) (absolute)	0.001 bar
142	Pressure at valve 6, air port (2) (relative)	0.001 bar
143	Pressure at valve 6, air port (4) (absolute)	0.001 bar
144	Pressure at valve 6, air port (4) (relative)	0.001 bar
161	Pressure at valve 7, air port (2) (absolute)	0.001 bar
162	Pressure at valve 7, air port (2) (relative)	0.001 bar
163	Pressure at valve 7, air port (4) (absolute)	0.001 bar
164	Pressure at valve 7, air port (4) (relative)	0.001 bar

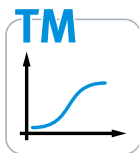


Transfer Mode

Channel 25 (information)

Addressed target 12 (temperatures)

Index	Meaning	Digit value
1	Temperature at supply pressure sensor	0.1 °C
3	Temperature at exhaust pressure sensor	0.1 °C
5	Temperature at ambient pressure sensor	0.1 °C
21	Temperature at valve 0, air port (2)	0.1 °C
23	Temperature at valve 0, air port (4)	0.1 °C
41	Temperature at valve 1, air port (2)	0.1 °C
43	Temperature at valve 1, air port (4)	0.1 °C
61	Temperature at valve 2, air port (2)	0.1 °C
63	Temperature at valve 2, air port (4)	0.1 °C
81	Temperature at valve 3, air port (2)	0.1 °C
83	Temperature at valve 3, air port (4)	0.1 °C
101	Temperature at valve 4, air port (2)	0.1 °C
103	Temperature at valve 4, air port (4)	0.1 °C
121	Temperature at valve 5, air port (2)	0.1 °C
123	Temperature at valve 5, air port (4)	0.1 °C
141	Temperature at valve 6, air port (2)	0.1 °C
143	Temperature at valve 6, air port (4)	0.1 °C
161	Temperature at valve 7, air port (2)	0.1 °C
163	Temperature at valve 7, air port (4)	0.1 °C

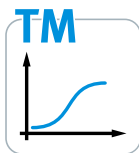


Transfer Mode

Channel 25 (information)

Addressed target 13 (Booster opening degrees)

Index	Meaning	Digit value
21	Opening degree of pressurising booster for outlet port 2 of valve 0	0.01 %
22	Opening degree of exhausting booster for outlet port 2 of valve 0	0.01 %
23	Opening degree of pressurising booster for outlet port 4 of valve 0	0.01 %
24	Opening degree of exhausting booster for outlet port 4 of valve 0	0.01 %
41	Opening degree of pressurising booster for outlet port 2 of valve 1	0.01 %
42	Opening degree of exhausting booster for outlet port 2 of valve 1	0.01 %
43	Opening degree of pressurising booster for outlet port 4 of valve 1	0.01 %
44	Opening degree of exhausting booster for outlet port 4 of valve 1	0.01 %
61	Opening degree of pressurising booster for outlet port 2 of valve 2	0.01 %
62	Opening degree of exhausting booster for outlet port 2 of valve 2	0.01 %
63	Opening degree of pressurising booster for outlet port 4 of valve 2	0.01 %
64	Opening degree of exhausting booster for outlet port 4 of valve 2	0.01 %
81	Opening degree of pressurising booster for outlet port 2 of valve 3	0.01 %
82	Opening degree of exhausting booster for outlet port 2 of valve 3	0.01 %
83	Opening degree of pressurising booster for outlet port 4 of valve 3	0.01 %
84	Opening degree of exhausting booster for outlet port 4 of valve 3	0.01 %
101	Opening degree of pressurising booster for outlet port 2 of valve 4	0.01 %
102	Opening degree of exhausting booster for outlet port 2 of valve 4	0.01 %
103	Opening degree of pressurising booster for outlet port 4 of valve 4	0.01 %
104	Opening degree of exhausting booster for outlet port 4 of valve 4	0.01 %
121	Opening degree of pressurising booster for outlet port 2 of valve 5	0.01 %
122	Opening degree of exhausting booster for outlet port 2 of valve 5	0.01 %
123	Opening degree of pressurising booster for outlet port 4 of valve 5	0.01 %
124	Opening degree of exhausting booster for outlet port 4 of valve 5	0.01 %
141	Opening degree of pressurising booster for outlet port 2 of valve 6	0.01 %
142	Opening degree of exhausting booster for outlet port 2 of valve 6	0.01 %
143	Opening degree of pressurising booster for outlet port 4 of valve 6	0.01 %
144	Opening degree of exhausting booster for outlet port 4 of valve 6	0.01 %
161	Opening degree of pressurising booster for outlet port 2 of valve 7	0.01 %
162	Opening degree of exhausting booster for outlet port 2 of valve 7	0.01 %
163	Opening degree of pressurising booster for outlet port 4 of valve 7	0.01 %
164	Opening degree of exhausting booster for outlet port 4 of valve 7	0.01 %



Transfer Mode

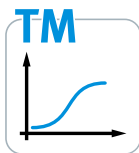
Channel 25 (information)

Addressed target 14 (Flow rates)

Index	Meaning	Digit value
22	Flow rate at valve 0, air port (2)	0.1 l/min
24	Flow rate at valve 0, air port (4)	0.1 l/min
26	Flow rate at valve 0, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
42	Flow rate at valve 1, air port (2)	0.1 l/min
44	Flow rate at valve 1, air port (4)	0.1 l/min
46	Flow rate at valve 1, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
62	Flow rate at valve 2, air port (2)	0.1 l/min
64	Flow rate at valve 2, air port (4)	0.1 l/min
66	Flow rate at valve 2, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
82	Flow rate at valve 3, air port (2)	0.1 l/min
84	Flow rate at valve 3, air port (4)	0.1 l/min
86	Flow rate at valve 3, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
102	Flow rate at valve 4, air port (2)	0.1 l/min
104	Flow rate at valve 4, air port (4)	0.1 l/min
106	Flow rate at valve 4, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
122	Flow rate at valve 5, air port (2)	0.1 l/min
124	Flow rate at valve 5, air port (4)	0.1 l/min
126	Flow rate at valve 5, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
142	Flow rate at valve 6, air port (2)	0.1 l/min
144	Flow rate at valve 6, air port (4)	0.1 l/min
146	Flow rate at valve 6, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min
162	Flow rate at valve 7, air port (2)	0.1 l/min
164	Flow rate at valve 7, air port (4)	0.1 l/min
166	Flow rate at valve 7, air port (2) (low byte, signed) and (4) (high byte, signed)	10 l/min

Structure of a combined value:

Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Flow rate at air port (4)								Flow rate at air port (2)							

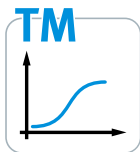


Transfer Mode

Channel 25 (information)

Addressed target 21 (proximity signals)

Index	Meaning
181	Raw value from proximity sensor at input module 1, port 0
182	Interpreted value from proximity sensor at input module 1, port 0
183	Raw value from proximity sensor at input module 1, port 1
184	Interpreted value from proximity sensor at input module 1, port 1
185	Raw value from proximity sensor at input module 1, port 2
186	Interpreted value from proximity sensor at input module 1, port 2
187	Raw value from proximity sensor at input module 1, port 3
188	Interpreted value from proximity sensor at input module 1, port 3
189	Raw value from proximity sensor at input module 1, port 4
190	Interpreted value from proximity sensor at input module 1, port 4
191	Raw value from proximity sensor at input module 1, port 5
192	Interpreted value from proximity sensor at input module 1, port 5
193	Raw value from proximity sensor at input module 1, port 6
194	Interpreted value from proximity sensor at input module 1, port 6
195	Raw value from proximity sensor at input module 1, port 7
196	Interpreted value from proximity sensor at input module 1, port 7
201	Raw value from proximity sensor at input module 2, port 0
202	Interpreted value from proximity sensor at input module 2, port 0
203	Raw value from proximity sensor at input module 2, port 1
204	Interpreted value from proximity sensor at input module 2, port 1
205	Raw value from proximity sensor at input module 2, port 2
206	Interpreted value from proximity sensor at input module 2, port 2
207	Raw value from proximity sensor at input module 2, port 3
208	Interpreted value from proximity sensor at input module 2, port 3
209	Raw value from proximity sensor at input module 2, port 4
210	Interpreted value from proximity sensor at input module 2, port 4
211	Raw value from proximity sensor at input module 2, port 5
212	Interpreted value from proximity sensor at input module 2, port 5
213	Raw value from proximity sensor at input module 2, port 6
214	Interpreted value from proximity sensor at input module 2, port 6
215	Raw value from proximity sensor at input module 2, port 7
216	Interpreted value from proximity sensor at input module 2, port 7

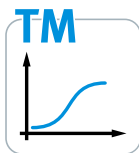


Transfer Mode

Channel 25 (information)

Addressed target 22 (positions)

Index	Meaning	Digit value
181	Raw value from position sensor at input module 1, port 0	0.001 mA
182	Interpreted value from position sensor at input module 1, port 0	0.1 mm
183	Raw value from position sensor at input module 1, port 1	0.001 mA
184	Interpreted value from position sensor at input module 1, port 1	0.1 mm
185	Raw value from position sensor at input module 1, port 2	0.001 mA
186	Interpreted value from position sensor at input module 1, port 2	0.1 mm
187	Raw value from position sensor at input module 1, port 3	0.001 mA
188	Interpreted value from position sensor at input module 1, port 3	0.1 mm
189	Raw value from position sensor at input module 1, port 4	0.001 mA
190	Interpreted value from position sensor at input module 1, port 4	0.1 mm
191	Raw value from position sensor at input module 1, port 5	0.001 mA
192	Interpreted value from position sensor at input module 1, port 5	0.1 mm
193	Raw value from position sensor at input module 1, port 6	0.001 mA
194	Interpreted value from position sensor at input module 1, port 6	0.1 mm
195	Raw value from position sensor at input module 1, port 7	0.001 mA
196	Interpreted value from position sensor at input module 1, port 7	0.1 mm
201	Raw value from position sensor at input module 2, port 0	0.001 mA
202	Interpreted value from position sensor at input module 2, port 0	0.1 mm
203	Raw value from position sensor at input module 2, port 1	0.001 mA
204	Interpreted value from position sensor at input module 2, port 1	0.1 mm
205	Raw value from position sensor at input module 2, port 2	0.001 mA
206	Interpreted value from position sensor at input module 2, port 2	0.1 mm
207	Raw value from position sensor at input module 2, port 3	0.001 mA
208	Interpreted value from position sensor at input module 2, port 3	0.1 mm
209	Raw value from position sensor at input module 2, port 4	0.001 mA
210	Interpreted value from position sensor at input module 2, port 4	0.1 mm
211	Raw value from position sensor at input module 2, port 5	0.001 mA
212	Interpreted value from position sensor at input module 2, port 5	0.1 mm
213	Raw value from position sensor at input module 2, port 6	0.001 mA
214	Interpreted value from position sensor at input module 2, port 6	0.1 mm
215	Raw value from position sensor at input module 2, port 7	0.001 mA
216	Interpreted value from position sensor at input module 2, port 7	0.1 mm

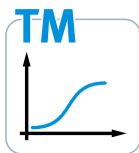


Transfer Mode

Channel 25 (information)

Addressed target 23 (flow rates from external sensors)

Index	Meaning	Digit value
181	Raw value from flow sensor at input module 1, port 0	0.001 mA
182	Interpreted value from flow sensor at input module 1, port 0	0.1 l/min
183	Raw value from flow sensor at input module 1, port 1	0.001 mA
184	Interpreted value from flow sensor at input module 1, port 1	0.1 l/min
185	Raw value from flow sensor at input module 1, port 2	0.001 mA
186	Interpreted value from flow sensor at input module 1, port 2	0.1 l/min
187	Raw value from flow sensor at input module 1, port 3	0.001 mA
188	Interpreted value from flow sensor at input module 1, port 3	0.1 l/min
189	Raw value from flow sensor at input module 1, port 4	0.001 mA
190	Interpreted value from flow sensor at input module 1, port 4	0.1 l/min
191	Raw value from flow sensor at input module 1, port 5	0.001 mA
192	Interpreted value from flow sensor at input module 1, port 5	0.1 l/min
193	Raw value from flow sensor at input module 1, port 6	0.001 mA
194	Interpreted value from flow sensor at input module 1, port 6	0.1 l/min
195	Raw value from flow sensor at input module 1, port 7	0.001 mA
196	Interpreted value from flow sensor at input module 1, port 7	0.1 l/min
201	Raw value from flow sensor at input module 2, port 0	0.001 mA
202	Interpreted value from flow sensor at input module 2, port 0	0.1 l/min
203	Raw value from flow sensor at input module 2, port 1	0.001 mA
204	Interpreted value from flow sensor at input module 2, port 1	0.1 l/min
205	Raw value from flow sensor at input module 2, port 2	0.001 mA
206	Interpreted value from flow sensor at input module 2, port 2	0.1 l/min
207	Raw value from flow sensor at input module 2, port 3	0.001 mA
208	Interpreted value from flow sensor at input module 2, port 3	0.1 l/min
209	Raw value from flow sensor at input module 2, port 4	0.001 mA
210	Interpreted value from flow sensor at input module 2, port 4	0.1 l/min
211	Raw value from flow sensor at input module 2, port 5	0.001 mA
212	Interpreted value from flow sensor at input module 2, port 5	0.1 l/min
213	Raw value from flow sensor at input module 2, port 6	0.001 mA
214	Interpreted value from flow sensor at input module 2, port 6	0.1 l/min
215	Raw value from flow sensor at input module 2, port 7	0.001 mA
216	Interpreted value from flow sensor at input module 2, port 7	0.1 l/min



Transfer Mode

Channel 31 (malfunctions)

Structure of channel 31

The malfunction list of a valve can be read out via the process data of the valve itself or via the process data of another valve or an empty slot. Addressed Target is used for this:

Addressed target	Meaning
0	Malfunction list of the valve whose process data are used
100 ... 107	Malfunction lists of the valves at slots 0 ... 7

Index	Meaning
1 ... 40	Malfunction messages in reverse order of their occurrence
51 ... 90	Time stamp (I) of malfunction messages 1 ... 40, (hours)
101 ... 140	Time stamp (II) of malfunction messages 1 ... 40, (minutes, seconds)
151 ... 190	Time stamp (III) of malfunction messages 1 ... 40, (milliseconds)
250	Time stamp (I) of the list (hours)
251	Time stamp (II) of the list (minutes, seconds)
252	Time stamp (III) of the list (milliseconds)
253	Position of the most recent malfunction message of type "error"
254	Position of the earliest malfunction message of type "error"
255	Number of malfunction messages in the malfunction list

A complete malfunction list entry consists of the malfunction itself with code, subcode and classification as well as the time stamp with hours, minutes, seconds and milliseconds.

The malfunction itself in index 1 ... 40 is structured as follows:

Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
class.								malfunction subcode							

Classification of malfunctions:

Value	Meaning	
1	Active error	The malfunction is classified as an error. The cause of the error is still present.
2	Inactive error	The malfunction is classified as an error. The cause of the error is no longer present, but the error has not been acknowledged.
3	Warning	The malfunction is classified as a warning.

The time stamp (I) in index 51 ... 90 or index 250 is structured as follows:

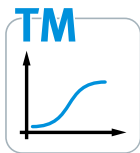
Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
hours															

The time stamp (II) in index 101 ... 140 or index 251 is structured as follows:

Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
minutes								seconds							

The time stamp (III) in index 101 ... 140 or index 252 is structured as follows:

Byte 5								Byte 4							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
milliseconds															



Transfer Mode

Channel 31 (malfunctions)

Example: Reading the malfunction list of the current valve

1. Send Command to read the number of malfunction messages:
 Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 255 (number of messages)
 Value: 0 (ignored)

2. Get number via the value section in the input data:
 Actual Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 255 (number of messages)
 Value: 10 (10 messages)

3. Send command to get position of the earliest error message:
 Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 254 (position of earliest error message)
 Value: 0 (ignored)

4. Get position in the input data:
 Actual Valve Mode: 63 (Transfer mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 254 (position of earliest error message)
 Value: 9 (earliest error message at position 9)

5. Send Command to get content from position 9
 Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 9 (content from position 9)
 Value: 0 (ignored)

6. Get Content in the input data:
 Actual Valve Mode: 63 (Transfer mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 9 (content from position 9)
 Value: 0100000000001010₂

Interpretation of the value:

Byte 5								Byte 4							
0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Class.		Malfunction subcode						Malfunction code							
1		0						10							

Reading time stamp of the error message

7. Send Command to read time stamp (I) of error message:
 Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 59 (time stamp (I) of message at position 9)
 Value: 0 (ignored)

8. Get time stamp (I) of message at position 9:
 Actual Valve Mode: 63 (Transfer mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 59 (time stamp (I) of message at position 9)
 Value: 0000000000001010₂

Interpretation of the value: 5 hours

9. Send Command to read time stamp (II) of error message:
 Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 109 (time stamp (II) of message at position 9)
 Value: 0 (ignored)

10. Get time stamp (II) of error message:
 Actual Valve Mode: 63 (Transfer mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 109 (time stamp (II) of message at position 9)
 Value: 0000101000000110₂

Interpretation of the value: 10 minutes, 6 seconds

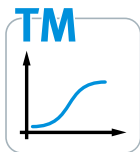
11. Send Command to read time stamp (III) of error message:
 Valve Mode: 63 (Transfer Mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 109 (time stamp (III) of message at position 9)
 Value: 0 (ignored)

12. Get time stamp (III) of error message:
 Actual Valve Mode: 63 (Transfer mode)
 Transfer Control: 2 (upload)
 Channel: 31 (malfunctions)
 Addressed Target: 0 (malfunction list of current valve)
 Index: 109 (time stamp (III) of message at position 9)
 Value: 0000000110100110₂

Interpretation of the value: 422 milliseconds

Time stamp of the error message at position 9 is
 5:10:6,422

➔ Document „Malfunction codes“ in Support Portal



Transfer Mode

Additional functions

Invalid output data

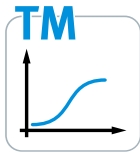
In case of invalid output data, the input data contains information about the cause of invalidity and will look like this:

Byte 5								Byte 4								Byte 3								Byte 2								Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
<feedback information>								Index = 0								Addressed Target = 0								T.C. = 0								Channel = 0								*) Valve Mode = 63							

*) actual valve state

Meaning of feedback information value:

Value in Byte 4 ... 5	Meaning
1	Invalid value in section "Channel"
2	Invalid value in section "Transfer Control"
3	Invalid value in section "Addressed Target"
4	Invalid value in section "Index"
5	Invalid value in section "Value"
6	Invalid combination of values in various sections
7	The addressed data is currently being used by another valve
8	Requested info is not available because the slot used for communication is empty.



Transfer Mode

Additional functions

Status of the saving process

When executing the „save configuration persistent“ function, the status of the saving process is displayed in the input data.
 Command for „save configuration persistent“:

Byte 5								Byte 4								Byte 3								Byte 2								Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
ignored																ignored								ignored								T.C. = 4				ignored				ig.				Valve Mode = 63			

Feedback in the input data:

Byte 5								Byte 4								Byte 3								Byte 2								Byte 1								Byte 0							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
feedback information																Index = 0								Addressed Target = 0								T.C. = 4				Channel = ...				*)				Valve Mode = 63			

*) actual valve state

Meaning of feedback information value:

Value in Byte 4 ... 5	Meaning
1	Save process active
2	Save process is completed
3	Save process cannot be executed – Repeat the process. – If the problem persists, contact Festo Support.
4	Save process failed – Repeat the process. – If the problem persists, contact Festo Support.

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