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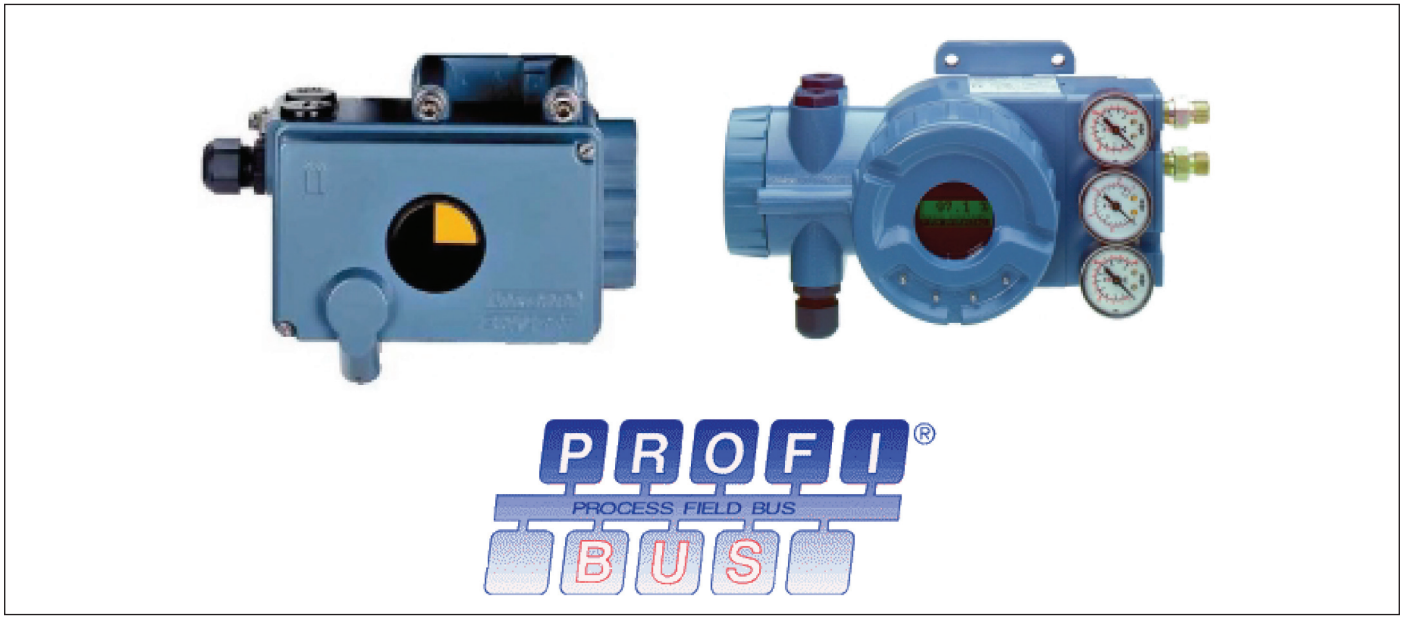
Technical Information 05.2002 TI EVE0105 P1-(en)

SRD991 Intelligent Positioner

SRD960 Universal Positioner Communication with PROFIBUS



The intelligent positioner SRD991 and the universal positioner SRD960 are designed to operate pneumatic valve actuators and can be operated from control systems (e.g. Foxboro I/A Series System), controllers or PC-based configuration and operation tools via Profibus communication according PROFIBUS PA Profile 3.0.

FEATURES

- Digital Input signal
- Supply voltage DC 9...32V [1]
- Operating current 10,5mA +/- 0,5mA (base current)
- Fault current: Base current +0mA for failures in application circuit, base current +4mA for failures in coupling circuit by means of independent FDE-Safety circuit.
- Electrical connection according IEC 1158-2
- FISCO-Model
- Data transmission according PROFIBUS-PA Profile 3.0

[1] Data for model with intrinisic safety

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1 CONFIGURATION OF SRD991 / SRD960 VIA PROFIBUS

1.1 General Information

The Profibus communication interface offers multiple possibilities: Cyclic communication with Profibus master Class 1 and acyclic communication for configuration and parameterization with Profibus master Class 1 and Profibus master Class 2.

How to operate the Profibus master has to be taken from the according master instruction.

1.2 Initial Setup via PROFIBUS

Before beginning the initial setup, the positioner should be correctly mounted and electrically ready for operation. **The safety regulations must be observed, as described in MI EVE 0105 D-(en) Chapter 13.**

The positioner is preset with default parameters by the manufacturer, and instrument-specific data are permanently stored. The internal temperature sensor, the position sensor angle and pressure sensors (if applicable) are calibrated.

During the first commissioning the bus address and application-specific data must be entered. If no entry is made, the default parameters are retained.

1.3 Setting of Bus address

According PROFIBUS-PA Profile 3.0 the default bus address is 126. Since this address isn't allowed for cyclic communication, it is required to change this address at the first commissioning. This can be done via the local push buttons at the device or with the Profibus service DDLM_SET_SLAVE_ADD.

Setting of the address via local push buttons is described at MI EVE0105 D-(en).

1.1 Application specific Parameter

At first commissioning at least the actuator system respectively the mounting side has to be configured before performing an autostart. This can be done via the local push buttons at the device or via the Parameter POSITION_ LINEARIZATION. How to set it via the local push buttons at menue 1 is described at MI EVE0105 P-(en), Chapter. 8.2. The default value is "Linear actuator, left-hand mounting".

Autostart or Short-autostart can be initiated as well via the local push buttons at the device or via communication (Parameter SELF_CALIB_CMD). How to do it via local push buttons is described in MI EVE0105 D-(en).

2 CYCLIC COMMUNICATION WITH MASTER CLASS 1

2.1 GSD-File

Configuration and Parameterization of the PROFIBUS itself and the PROFIBUS Master Class 1 will be done normally by using the GSD-File. The GSD-Files are named FOX_D991.GSD for SRD991 and FOX_D960.GSD for SRD960. Both are available via Internet at http://www.profibus.com. In this connection the Identification numbers are D991 respectively D960.

In addition to these GSD-Files offered by Foxboro Eckardt the SRD991 or SRD960 can operate also with the GSD-File defined by Profile 3.0 for actuators. The name of this GSD-File is PA139710.GSD and is available via Internet at http://www.profibus.com. Here the Identification number is 9710.

Within the GSD-File the (timing-) parameters relevant for the communication itself and the different possibilities of the cyclic date exchange is described.

2.2 Cyclic Data Exchange

For the cyclic data exchange the SRD991 or SRD960 offers 7 possibilites, which are described within the GSD-File. One of these possibilities has to be selected. Within Foxboro Eckardt's GSD-Files FOX_D991.GSD or FOX_D960.GSD these possibilities are listed in the so-called extended identifier format. In addition the Module "SP" is available in the so-called normal identifier format. The other Modules are described as a comment in the normal identifier format only for information. If necessary the comment signs can be removed.

2.2.1 Module "SP"

Normal format: Module Nr. 1 "SP (short)" 0xA4 Extended format: Module Nr. 2 "SP" 0x82,0x84,0x08,0x05

With this Module only the setpoint SP will be transmitted to the positioner. There is no data transmission from the positioner back to the master. The setpoint SP will be used by the positioner as the desired setpoint in mode "AUTO".

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
SP (Value, float IEEE)				Status SP

2.2.2 Module “RCAS_IN+RCAS_OUT“

Extended format: Module Nr. 3 “RCAS_IN+RCAS_OUT“ 0xC4,0x84,0x84,0x08,0x05,0x08,0x05 (Normal format: “RCAS_IN+RCAS_OUT“ 0xB4 [2])

With this Module the setpoint RCAS_IN will be transmitted to the positioner. The setpoint RCAS_OUT will be transmitted to the master. The setpoint RCAS_IN will be used by the positioner as the desired setpoint in mode “RCAS“.

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
RCAS_IN (Value, float IEEE)				Status RCAS_ IN

Input data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
RCAS_OUT (Value, float IEEE)				Status RCAS_ OUT

[2] Only as comment within SRD991/SRD960 GSD-File

2.2.3 Module “SP+READBACK+POS_D“

Extended format: Module Nr. 4 “SP+READBACK+POS_D“
0xC6,0x84,0x86,0x08,0x05.0x08,0x05,0x05,0x05

(Normal format: “SP+READBACK+POS_D“ 0x96,0xA4 [3])

With this Module the setpoint SP will be transmitted to the positioner. The actual position analog (READBACK) and discrete (POS_D) will be transmitted to the master. The setpoint SP will be used by the positioner as the desired setpoint in mode “AUTO“.

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
SP (Value, float IEEE)				Status SP

Input data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
READBACK (Value, float IEEE)				Status READ-BACK	POS_D (Value)	Status POS_D

[3] Only as comment within SRD991/SRD960 GSD-File

2.2.4 Module “SP+CHECKBACK“

Extended format: Module Nr. 5 “SP+CHECKBACK“ 0xC3,0x84,0x82,0x08,0x05,0x0A (Normal format: “SP+CHECKBACK“ 0x92,0xA4 [4])

With this Module the setpoint SP will be transmitted to the positioner. The detailed device information CHECK_BACK will be transmitted to the master. The setpoint SP will be used by the positioner as the desired setpoint in mode “AUTO“.

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
SP (Value, float IEEE)				Status SP

Input data:

Byte 1	Byte 2	Byte 3
CHECK BACK [0]	CHECK BACK [1]	CHECK BACK [2]

[4] Only as comment within SRD991/SRD960 GSD-File

2.2.5 Module “SP+READBACK+POS_D+CHECKBACK“

Extended format: Module Nr. 6 “SP+READBACK+POS_D+CHECKBACK“
0xC7,0x84,0x89,0x08,0x05.0x08,0x05,0x05,0x05,0x0A

(Normal format: “SP+READBACK+POS_D+CHECKBACK“ 0x99,0xA4 [5])

With this Module the setpoint SP will be transmitted to the positioner. The actual position analog (READBACK) and discrete (POS_D) as well as the detailed device information CHECK_BACK will be transmitted to the master. The setpoint SP will be used by the positioner as the desired setpoint in mode “AUTO“.

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
SP (Value, float IEEE)				Status SP

Input data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
READBACK (Value, float IEEE)				Status READ-BACK	POS_D (Value)	Status POS_D	CHECK BACK [0]	CHECK BACK [1]	CHECK BACK [2]

[5] Only as comment within SRD991/SRD960 GSD-File

2.2.6 Module “RCAS_IN+RCAS_OUT+CHECKBACK“

Extended format: Module Nr. 7 “RCAS_IN+RCAS_OUT+CHECKBACK“
0xC5,0x84,0x87,0x08,0x05,0x08,0x05,0x0A

(Normal format: “RCAS_IN+RCAS_OUT+CHECKBACK“ 0x97,0xA4 [6])

With this Module the setpoint RCAS_IN will be transmitted to the positioner. The setpoint RCAS_OUT as well as the detailed device information CHECK_BACK will be transmitted to the master. The setpoint RCAS_IN will be used by the positioner as the desired setpoint in mode “RCAS“.

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
RCAS_IN (Value, float IEEE)				Status RCAS_ IN

Input data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
RCAS_OUT (Value, float IEEE)				Status RCAS_ OUT	CHECK BACK [0]	CHECK BACK [1]	CHECK BACK [2]

[6] Only as comment within SRD991/SRD960 GSD-File

2.27 Module “SP+RB+RIN+ROUT+POS_D+CB“

Extended format: Module Nr. 8 “SP+RB+RIN+POS_D+CB“ 0xCB,0x89,0x8E,
0x08,0x05.0x08,0x05,0x08,0x05,0x08,0x05,0x05,0x05,0x0A

(Normal format: “SP+RB+RIN+POS_D+CB“ 0x9E,0xA9 [7])

With this Module the setpoint SP as well as the setpoint RCAS_IN will be transmitted to the positioner. The actual position analog (READBACK) and discrete (POS_D) as well as the setpoint RCAS_OUT and the detailed device information CHECK_BACK will be transmitted to the master. The setpoint SP will be used by the positioner as the desired setpoint in mode “AUTO”, the setpoint RCAS_IN in mode “RCAS”.

Output data:

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
SP (Value, float IEEE)				Status SP	RCAS_IN (Value, float IEEE)				Status RCAS_ IN

Input data:

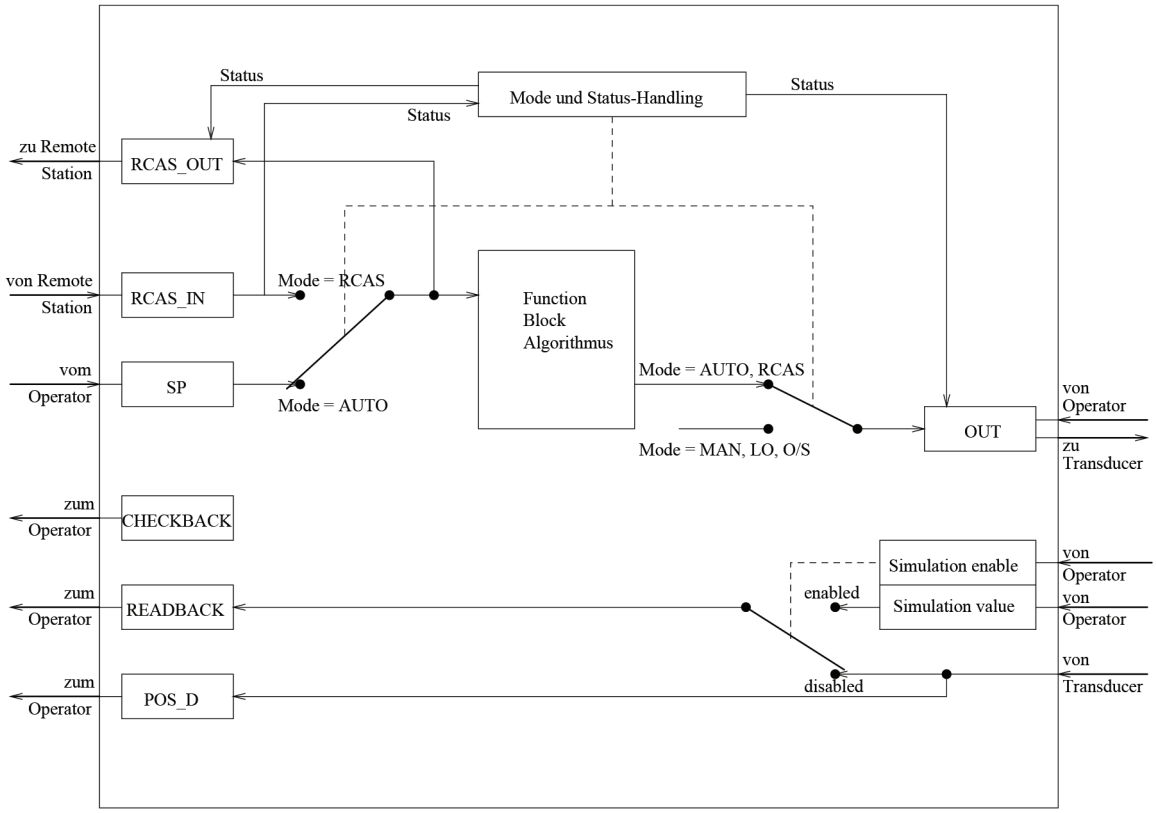
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9	Byte 10
READBACK (Value, float IEEE)				Status READ-BACK	RCAS_OUT (Value, float IEEE)				Status RCAS_ OUT

Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
POS_D (Value)	Status POS_D	CHECK BACK [0]	CHECK BACK [1]	CHECK BACK [2]

[7] Only as comment within SRD991/SRD960 GSD-File

2.3 Block Diagram “Function Block AO“

The PROFIBUS Master Class 1 has access to the parameters of the function block “Analog Output“ (AO) implemented in the positioner SRD991/SRD960 via the cyclic communication described above. According to Profile 3.0 this function block is based on the following block diagram:



As described in the previous chapters the setpoint SP and/or the setpoint RCAS_IN will be written via cyclic data exchange. Depending on the actual mode of the function block AO one of these setpoint will be used as the desired setpoint. This setpoint is available as RCAS_OUT and can be read via cyclic data exchange. In addition the positioner offers the detailed device information CHECKBACK, the analog position READBACK and the discrete position POS_D.

P2.4 Parameter Description of cyclic Parameters

Name	Description
CHECKBACK	Detailed Device information (3 Bytes), bit-wise coded. More than one message possible at once. Please refer to chapter **2.4.1**.
POS_D	Actual Position of the actuator (discrete) with status. 0: Not initialized 1: Closed 2: Opened 3: Intermediate A description about possible status contains chapter **2.4.2.**
RCAS_IN	Setpoint RCAS_IN in units of PV_SCALE with status provided normally by a DCS system respectively a PID-Function block. This setpoint will be used as the desired setpoint if the Function block AO is in mode RCAS and the status of RCAS_IN indicates, that the setpoint is ok (e.g. GOOD (Cascade) = 0xC0). For a detailed description of possible status see Chapter **2.4.2**. The range described by PV_SCALE is 0-100% per default.
RCAS_OUT	Setpoint RCAS_OUT in units of PV_SCALE with status, which is used as input for the Function Block algorithm. Depending on the mode of the Function Block RCAS_OUT contains the setpoint SP or the setpoint RCAS_IN. RCAS_OUT is provided for DCS-Systems and other Function Blocks. For a detailed description of possible status see Chapter **2.4.2**. The range described by PV_SCALE is 0-100% per default.
READBACK	Actual position of the actuator in units of PV_SCALE with status. The range described by PV_SCALE is 0-100% per default.
SP	Setpoint SP in units of PV_SCALE with status. This setpoint will be used as the desired setpoint if the Function block AO is in mode AUTO and the status of SP indicates, that the setpoint is ok (e.g. GOOD (Non Cascade) = 0x80). For a detailed description of possible status see Chapter **2.4.2**. The range described by PV_SCALE is 0-100% per default.

2.4.1 Coding CHECKBACK

Following device information will be provided by the positioner SRD991 or SRD960 according to Profile 3.0:

Byte 1:

7	6	5	4	3	2	1	0
0 (reserved)	0 (reserved)	0 (reserved)	CB_DISK_ DIR	CB_OVER RIDE	CB_LOCA L_OP	CB_REQ_ LOC_OP	CB_FAIL SAFE

Bit 7 reserved
Bit 6 reserved
Bit 5 reserved
Bit 4 CB_DISK_DIR: Control difference out of limit
Bit 3 CB_OVERRIDE: Binary Input set
Bit 2 CB_LOCAL_OP: Field device under local control (local push buttons) Bit 1 CB_REQ_LOC_OP:
Bit 0 CB_FAILSAFE: Field device in instrument mode FAILSAFE

Byte 2:

7	6	5	4	3	2	1	0
0 (reserved)	0 (reserved)	0 (reserved)	9 (unused)	CB_SIMUL ATE	CB_UPDA TE_EVT	0 (reserved)	0 (reserved)

Bit 7 reserved
Bit 6 CB_CONTR_INACT: Postioner inactive (OUT status = BAD)
Bit 5 reserved
Bit 4 unused
Bit 3 CB_SIMULATE: Simulation of process value READBACK enabled
Bit 2 CB_UPDATE_EVT: Indication of any change of static configuration data.
This flag will be set after any increment of ST_REV. It will be reset automatically after 10s.
Bit 1 reserved
Bit 0 reserved

Byte 3:

7	6	5	4	3	2	1	0
0 (unused)	0 (unused)	0 (unused)	0 (unused)	0 (unused)	0 (unused)	0 (reserved)	CB_TOT_ VALVE_ TRAVEL

Bit 7 unused
Bit 6 unused
Bit 5 unused
Bit 4 unused
Bit 3 unused
Bit 2 unused
Bit 1 reserved
Bit 0 CB_TOT_VALVE_TRAVEL: Indication, that the travel sum limit or cycle counter is exceeded.

A Description of the reserved Bits is included in Profile 3.0.

2.4.2 Coding Status

All data transmission via cyclic data exchange, except CHECKBACK, contain a status byte. The following codings defined by Profile 3.0 are used by the positioner SRD991 or SRD960:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Quality		Quality Substatus				Limits	

Quality:

7	6	5	4	3	2	1	0	
Quality		Substatus				Limits		
0	0							Bad
0	1							Uncertain
1	0							Good (Non Cascade)
1	1							Good (Cascade)

Coding of the Substatus depends on the coding of quality.

Substatus for Quality Bad:

7	6	5	4	3	2	1	0	
Quality = BAD		Substatus				Limits		
0	0	0	0	0	0			Non-specific
0	0	0	0	0	1			Configuration Error
0	0	0	0	1	0			Not connected (Error at measuring position)
0	0	0	0	1	1			Device Failure (Device in instrument mode FAIL)
0	0	0	1	0	1			No Communication, last usable value
0	0	0	1	1	0			No Communication, with no usable value
0	0	0	1	1	1			Out of Service (No valid value available, because the Function Block is out of service)

Substatus for Quality Uncertain:

7	6	5	4	3	2	1	0	
Quality = Uncertain		Substatus				Limits		
0	1	0	0	0	1			Last usable value (Device uses the last usable value)
0	1	0	0	1	0			Substitute-Set (Device uses failsafe value)

Substatus für Quality Good (Non Cascade):

7	6	5	4	3	2	1	0	
Quality = GOOD (NC)		Substatus				Limits		
1	0	0	0	0	0			Ok
1	0	0	0	1	0			Active Advisory Alarm (Priority < 8) (LO- or HI-Alarm reached)
1	0	0	0	1	1			Active Critical Alarm (Priority > 8) (LOLO- or HIHI-Alarm reached)
1	0	1	0	0	0			Initiate Failsafe (If setpoint SP contains this status and the Function Block is in mode AUTO, the mode will be switched to FAILSAFE after expiration of the FAILSAFE_TIME)

Substatus für Quality Good (Cascade):

7	6	5	4	3	2	1	0	
Quality = GOOD (C)		Substatus				Limits		
1	1	0	0	0	0			Ok
1	1	0	0	0	1			Initialization acknowledged (If the setpoint RCAS_IN contains this status and the mode of the Function Block is RCAS, the mode of the Function Blocks will be switched to RCAS.)
1	1	0	0	1	0			Initialization request (If the mode of the Function Blocks isn't yet in the desired mode RCAS, then this status will be provided within the setpoint RCAS_OUT, as long as, due to an Initialization acknowledged within the setpoint RCAS_IN, the mode is switched to RCAS.)
1	1	0	0	1	1			Not Invited (If the mode of the Function Block is MAN or AUTO and the target mode isn't RCAS, then this status will be provided within the setpoint RCAS_OUT.)
1	1	0	1	1	0			Local Override (Will be provided within RCAS_ OUT, if the Function Block is in mode Local Override (LO).
1	1	1	0	0	0			Initiate Failsafe (If the setpoint RCAS_IN contains this status then the mode of the Function Block will be switched to AUTO, allowing going to FAILSAFE after expiration of the FAILSAFE_TIME.)

Limits:

The Limits indicate, if the setpoint and following the position of the actuator is ok, constant or have reached the alarm limits.

7	6	5	4	3	2	1	0	
Quality		Substatus				Limits		
						0	0	Ok
						0	1	Low Limited (LO- or LOLO-Alarm reached)
						1	0	High Limited (HI- or HIHI-Alarm reached)
						1	1	Constant (The position is constant independent to the setpoint, since the Function Block is in mode OOS, MAN or LO.)

2.5 Modes of Function Block AO

The positioner SRD991 and SRD960 support the Function Block Mode “Out of Service” (O/S), “Automatic” (AUTO), “Manual” (MAN), “Remote Cascade” (RCAS) and with restrictions “Local Override” (LO).

By using the parameter TARGET_MODE the user can request the desired mode. The default value for TARGET_MODE is AUTO, meaning that the goal for the positioner is to change the mode of the Function Block to AUTO. The actual mode of the Function Block can be read with the parameter “Actual Mode”, which is part of the parameter MODE_BLK.

The meaning of the individual modes and the relevant transitions will be described in the following subchapters. A detailed description of all possible transitions is shown in Profile 3.0.

2.5.1 Out of Service (O/S)

The Function Block and with it the control loop of the positioner SRD991 or SRD960 is out of service. The pneumatic output to the actuator is constant. As long as no successful autostart has been performed, it’s impossible to leave this mode. This means, that the Function Block is independent to the TARGET_MODE always in mode O/S as long as no autostart is performed.

2.5.2 Automatic (AUTO)

This is the default mode of the Function Block (default value for TARGET_MODE). At this mode, the control loop of the positioner is closed and the setpoint SP will be used as input for the function block algorithm, if it is allowed by the status of SP. The Function Block switches its mode to AUTO when the device is ready for operation (valid configuration data, autostart performed) and TARGET_MODE is equal to AUTO. If TARGET_MODE is equal to RCAS, mode AUTO will be reached before switching to RCAS.

2.5.3 Manual (MAN)

This mode can be reached on request by TARGET_MODE, when the device is ready for operation after a successfully performed autostart. In the mode MAN the control loop of the positioner is closed but the setpoints SP or RCAS_IS will not be used for control. It’s now possible to write via acyclic communication to the parameter OUT, which is the connection to the Transducer Block.

2.5.4 Remote Cascade (RCAS)

In this mode, the control loop of the positioner is closed and the setpoint RCAS_IN will be used as input for the function block algorithm, if it is allowed by the status of RCAS_IN. The mode RCAS will be reached by the following sequence:

1. Requirement: TARGET_MODE is configured to RCAS.
2. Device is ready for operation (Autostart performed).
3. Cyclic communication by using module 3, 7 or 8 is established.
4. Positioner SRD991/SRD960 is in mode AUTO and is requesting the initialization of the master via the according status of RCAS_OUT (0xC8, Good (Cascade) Initialization request).
5. Now the application on the master has to send in RCAS_IN the status Good (Cascade) Initialization acknowledge (0xC4).
6. Function Block will switch its mode to RCAS.

2.5.5 Local Override (LO)

This mode will be reached, when local operation is activated at the push buttons. As soon as the local operation at the push buttons is finished (all LEDs are off), this mode will be left automatically. It's not possible to request the mode LO via the variable TARGET_MODE.

2.6 Slave Diagnosis

According to PROFIBUS Profile 3.0 the positioner SRD991 or SRD960 answers to the Profibus service auf DDLM_ SLAVE_DIAG with 14 Bytes. They are coded:

Byte	Name	Value / Information
1...6	DIAG_STATUS	6 Byte standard PROFIBUS-DP status information (see Chapter **2.6.1**)
7	Header	Len of status bytes after DIAG_STATUS. For SRD991/ SRD960: 8 Bytes.
8	Status_Type	0xFE (In future unused)
9	Slot_Number	Slot number of Physical Block: 0x00
10	Specifier	0x01: Status in Diagnosis appeared 0x02: Status in Diagnosis disappeared
11...14	Diagnosis	Diagnosis identical to parameter DIAGNOSIS of Physical Block (see Chapter **2.6.2**).

Byte 1 of DIAG_STATUS contains the so-called "Diag.Ext_Diag"-Bit. This bit is always set, as long as one bit within Diagnosis is set.

2.6.1 DIAG_STATUS

The followed described 6 bytes of the so-called DIAG_STATUS are defined in **[Ref. 2]** Chapter 8.3:

Byte 1:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Diag.Master_Lock	Diag.Prm_Fault	Diag.Invalid_Slave_Response	Diag.Not_Supported	Diag.Ext_Diag	Diag.Cfg_Fault	Diag.Station_Not_Ready	Diag.Station_Non_Existent

Bit 7 Diag.Master_Lock: The DP-Slave has been parameterized from another master. This bit is set by the DP-Master (Class 1), if the address in Byte 4 is different from 255 and different from the own address. The DP_Slave sets this bit to 0.

Bit 6 Diag.Prm_Fault: This bit is set by the DP-Slave if the last parameter frame was faulty, e.g. wrong length, wrong Identnumber or invalid parameters.

Bit 5 Diag.Invalid_Slave_Response: For DP-Slaves always 0.

Bit 4 Diag.Not_Supported: This bit is set by the DP-Slave as soon as a function was requested, which isn't supported from this device.

Bit 3 Diag.Ext_Diag: This bit is set by the DP-Slave. It indicates, that a diagnostic entry exists in the slave specific diagnostic area (Diagnosis).

Bit 2 Diag.Cfg_Fault: This bit is set by the DP-Slave, as soon as the last received configuration data from the DP-master are different from these which the DP-Slave has determined.

Bit 1 Diag.Station_Not_Ready: This bit is set by the DP-Slave, if the DP-Slave is not yet ready for data transfer.

Bit 0 Diag.Station_Non_Existent: For DP-Slaves always 0.

Byte 2:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Diag. De- activated	reserved	Diag.Sync_ Mode	Diag.Freeze _Mode	Diag.WD_ On	Always 1	Diag.Stat_ Diag	Diag.Prm_ Req

Bit 7 Diag.Deactivated: For DP-Slaves always 0.

Bit 6 reserved.

Bit 5 Diag.Sync_Mode: For SRD991/SRD960 always 0.

Bit 4 Diag.Freeze_Mode: For SRD991/SRD960 always 0.

Bit 3 Diag.WD_On: This bit is set by the DP-Slave as soon as the Profibus-Watchdog has been activated.

Bit 2 Always 1

Bit 1 Diag.Stat_Diag: If the DP-Slave sets this bit, the DP-Master shall fetch diagnostic information as long as this bit is reset again. For example, the DP-Slave sets this bit, if it is not able to provide valid user data.

Bit 0 Diag.Prm_Req: This bit is set by the DP-Slave for indication, that the respective DP-Slave shall be reparameterized and reconfigured. The bit remains set until parameterization is finished. Then it will be reset by the DP-Slave.

Byte 3:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Diag.Ext_ Diag_ Overflow	reserved	reserved	reserved	reserved	reserved	reserved	reserved

Bit 7 Diag.Ext_Diag_Overflow: For SRD991 / SRD960 always 0.

Bit 0-6 reserved.

Byte 4: Diag.Master_Add: In this Byte the address of the Profibus Master Class 1 is entered, which has parameterized this DP-Slave. As long as the DP-Slave isn't parameterized by a DP-Master, then the DP-Slave inserts the address 255 in this byte.

Byte 5 und 6: Ident number of the device. For the positioner SRD991/SRD960 this number depends on the parameter "IDENT_NUMBER_SELECTOR" of the Physikal Block. Per default the value for the Ident number is 0xD991 respectively 0xD960. Alternative, the parameter

"IDENT_NUMBER_SELECTOR" can be configured that the Ident number contains the Profile Ident number 0x9710.

2.6.2 Diagnosis

The parameter DIAGNOSIS, which is part of the Physical Blocks, contains 4 Byte of diagnosis information. The following tables are showing the coding. Hereby a bit will be set as long as the specified condition is true. Is the condition no longer valid, the bit will be reset.

Byte 1:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Init Err	Not Init	Meas. Fail	Mem chksum	Temp high	reserved	Mech. Fail	HW Fail

Bit 7 DIA_INIT_ERR: Autostart performed with error Bit 6
DIA_NOT_INIT: Autostart not performed.

Bit 5 DIA_MEASUREMENT: Error in measuring position Bit 4 DIA_
MEM_CHECKSUM: Checksum error in memory

Bit 3 DIA_TEMP_ELECTR: Electronics temperature too high Bit 2
reserved

Bit 1 DIA_HW_MECHANICS: Actuator out of working range (0...100%) Bit 0 DIA_
HW_ELECTR: Hardware failure of electronics

Byte 2:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Ident violation	reserved	reserved	reserved	Conf Inval	reserved	Supply Fail	reserved

Bit 7 Ident Number Violation: Set to 1, if the Ident number (see Chapter **2.1**) of the running cyclic data transfer and the value of the Physical Block Parameter “IDENT_NUMBER_SELECTOR“ are different.

Bit 6 reserved

Bit 5 reserved

Bit 4 reserved

Bit 3 DIA_CONF_INVAL: Invalid configuration data.

Bit 2 reserved

Bit 1 DIA_SUPPLY: Insufficient air supply pressure.

Bit 0 reserved

Byte 3: All bits are reserved by PNO for future use.

Byte 4:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Extension Avail.	reserved	reserved	reserved	reserved	reserved	reserved	reserved

Bit 7 Extension Available: This Bit is set to 1, if the parameter ADDITIONAL_STATUS of the Physikal Blocks contains valid status bits.

Bit 6 reserved

Bit 5 reserved

Bit 4 reserved

Bit 3 reserved

Bit 2 reserved

Bit 1 reserved

Bit 0 reserved

3 ACYCLIC COMMUNICATION WITH MASTER CLASS 1 OR MASTER CLASS 2

Acyclic Communication with the positioner SRD991 or SRD960 is possible for Master Class 1 and Master Class2 as specified in Profibus Profile 3.0.

The parameters provided by SRD991 or SRD960 can be read or written by a Master Class 2 via the Profibus services DDLM_READ and DDLM_WRITE. Master Class 1 can do this via the Profibus services C1Read and C2Write, which are defined within DPV1 (**[Ref. 3]**).

The positioners SRD991 and SRD960 are supporting all mandatory parameters specified by Profibus PA-Profile 3.0 for Actuators. In addition, most of the optional Parameters are supported as well as manufacturer specific parameters for the positioner SRD991 or SRD960.

3.1 List of all Parameters

For the intelligent positioner SRD991 and universal positioner SRD960 all parameters of the Physical Block are contained in Slot #0 and the parameters of the Function Block and Transducer Block are within Slot #1.

3.1.1 Slot #0 (Physical Block)

Index (dec.) absolute	Index (dec.) relative	Name	Definition	Len in Bytes	Acc ess	Range	Default
00... 15	00... 15	Unused/Reserved	MS	-	-	-	-
Physical Block							
Standard Parameter							
16	00	BLOCK_OBJECT	P(M)	20	r	-	-
17	01	ST_REV	P(M)	2	r	-	0
18	02	TAG_DESC	P(M)	32	r,w	-	-
19	03	STRATEGY	P(M)	2	r,w	-	-
20	04	ALERT_KEY	P(M)	1	r,w	-	-
21	05	TARGET_MODE	P(M)	1	r,w	0x08= AUTO (ONLINE)	AUTO
22	06	MODE_BLK	P(M)	3	r	-	0x08, 0x08, 0x08
23	07	ALARM_SUM	P(M)	8	r	X, 0, 0, 0, 0, 0, 0, 0	0, 0, 0, 0, 0, 0, 0, 0
Additional Parameter for Physical Block defined by Profile							
24	08	SOFTWARE_ REVISION	P(M)	16	r	Format: xx.yyy	-
25	09	HARDWARE_ REVISION	P(M)	16	r	Format: xx.yyy	3.0
26	10	DEVICE_MAN ID	P(M)	2	r	-	0x003F
27	11	DEVICE_ID	P(M)	16	r	-	“SRD991“ for SRD991 ”SRD960” for SRD960
28	12	DEVICE_SER_ NUM	P(M)	16	r	-	82/140892
29	13	DIAGNOSIS	P(M)	4	r	-	-
30	14	DIAGNOSIS_EXT	P(O)	6	r	-	-
31	15	DIAGNOSIS_ MASK	P(M)	4	r	-	0xFB, 0x8A, 0x00, 0x80
32	16	DIAGNOSIS_ EXT_MASK	P(O)	6	r	-	0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF
33	17	Unused/Reserved	P	-	-	-	-

34	18	WRITE_ LOCKING	P(O)	2	r,w	0= write protected 2457= not write protected 1=	Not write protected
35	19	FACTORY_ RESET	P(O)	2	r,w	Restore factory settings 2506= Reset Device 2712= Reset Bus address 32768= Reset Hist. Stat.	0
36	20	DESCRIPTOR	P(O)	32	r,w	-	Owner Tag Name
37	21	MESSAGE	P(O)	32	r,w	- 1= enable	Message 1
38	22	Unused/Reserved	P	-	-	0= disable	-
39	23	LOCAL_OP_ENA	P(O)	1	r,w	0= Profile Ident number. 1= SRD991 or SRD960 Ident number.	enable
40	24	IDENT_NUMBER_ SELECTOR	P(M)	1	r,w	- -	SRD991 or SRD960 Ident number
41	25	Unused/Reserved	P	-	-		-
42... 48	26... 32	Reserved by PNO	P	-	-		-
Additional Parameter for Analog Output Physical Block defined by Foxboro Eckardt							
49	33	MESSAGE_2	MS	32	r,w	-	-
50	34	MESSAGE_3	MS	32	r,w	-	-
51	35	MESSAGE_4	MS	32	r,w	-	-
52	36	MESSAGE_5	MS	32	r,w	-	-
53	37	DEVICE_OPTIONS	MS	1	r,w	0x01=Ext. Position Feedb. 0x02=Int. Press. Sensors 0x04=Ext. Binary Inputs 0x08=Ext. Binary Outputs 0x10=Ext. Sensor	At factory
54	38	MODELCODE	MS	14	r,w	-	BPNS....
55	39	SUPPLY CURRENT	MS	4	r	-	-
56	40	DIAGNOSIS_DIAGBIT_ MASK	MS	4	r,w	-	0x73, 0x0A, 0x00, 0x80
57	41	DIAGNOSIS_DIAGBIT_ EXT_MASK	MS	6	r,w	-	0x7F, 0x64, 0xF0, 0x00, 0x00, 0x00
58	42	VIEW-1-PB	P(M)	17	r	-	-
59... 253	43... 237	Unused/Reserved	MS	-	-	-	-

Legend:

Definition:	P	Profile 3.0
	P(M)	Mandatory parameter Profile 3.0
	P(O)	Optional Parameter Profile 3.0
	MS	Manufacturer specific by Foxboro Eckardt defined
Access:	r	Read
	w	Write

3.1.2 Slot #1 (Function und Transducer Block)

Index (dec.) absolute	Index (dec.) relative	Name	Definition	Len in Bytes	Access	Range	Default
00	00	DIRECTORY_OBJECT_HEADER	P(M)	12		-	-
01	01	COMPOSITE_LIST_DIRECTORY_ENTRIES/COMPOSITE_DIRECTORY ENTRIES	P(M)	24	r r -	-	-
02... 15	02... 15	Unused/Reserved	P(M)	-		-	-
Function Block							
Standard Parameter							
16	00	BLOCK_OBJECT	P(M)	20	r	-	-
17	01	ST_REV	P(M)	2	r	-	0
18	02	TAG_DESC	P(M)	32	r,w	-	-
19	03	STRATEGY	P(M)	2	r,w	-	-
20	04	ALERT_KEY	P(M)	1	r,w	-	-
21	05	TARGET_MODE	P(M)	1	r,w	0x80= OOS (OFFLINE) 0x10= Manual 0x08= AUTO (ONLINE) 0x02= RCAS (ONLINE)	AUTO
22	06	MODE_BLK	P(M)	3	r		-, 0x9A, 0x08
23	07	ALARM_SUM	P(M)	8	r	X, 0, 0, 0, 0, 0, 0, 0	0, 0, 0, 0, 0, 0, 0, 0
24	08	BATCH	P(M)	10	r,w		0 in every element
25	09	SP	P(M)	5	r,w	-	-
26	10	Unused/Reserved	P	-	-	-	-
27	11	PV_SCALE	P(M)	11	r,w		100.0, 0.0, 1342, 1
28	12	READBACK	P(M)	5	r	-	-
29	13	Unused/Reserved	P	-	-	-	-
30	14	RCAS_IN	P(O)	5	r,w	-	-
31... 36	15... 20	Unused/Reserved	P	-	-	-	-
37	21	IN_CHANNEL	P(M)	2	r,w	-	0x0194
38	22	OUT_CHANNEL	P(M)	2	r,w	-	0x0193
39	23	FSAVE_TIME	P(M)	4	r,w	-	30
40	24	FSAVE_TYPE	P(M)	1	r,w	2= Safety Position 1= Hold last Value 0= Target Value	Hold last Value
41	25	FSAVE_VALUE	P(M)	4	r,w	-	0.0
42	26	Unused/Reserved	P	-	-	-	-
43	27	RCAS_OUT	P(O)	5	r	-	-
44... 46	28... 30	Unused/Reserved	P	-	-	-	-
47	31	POS_D	P(M)	2	r	0= Not initialized 1= Closed 2= Opened 3= Intermediate	-
48	32	SETP_DEVIAT.	P(O)	4	r	-	-
49	33	CHECK_BACK	P(M)	3	r	-	-
50	34	CHECK_BACK_MASK	P(M)	3	r	-	0x1F, 0x4C, 0x01
51	35	SIMULATE	P(M)	6	r,w	Enable: 0= disable 1= enable	disable
52	36	INCREASE_CLOSE	P(M)	1	r,w	0= Normal 1= Invert	Normal
53	37	OUT	P(M)	5	r,w	-	-
54	38	OUT_SCALE	P(M)	11	r,w		100.0, 0.0, 1342, 1
55... 64	39... 48	Reserved by PNO	P	-	-	-	-

Additional	Parameter for Analog Output Function Block defined by Foxboro Eckardt						
65	49	POS_VALVE_HI_ALARM	MS	4	r,w		110
66	50	POS_VALVE_HIHI_ALARM	MS	4	r,w		110
67	51	POS_VALVE_LO_ALARM	MS	4	r,w	-	-10
68	52	POS_VALVE_LOLO_ ALARM	MS	4	r,w	- -	-10
69	53	POWER_UP_ACTION	MS	1	r,w	-	1= ONLINE
70	54	BININ_CONFIG	MS	1	r,w	1= ONLINE 2= FAILS. 0x01=Switch 1: Goto 0% 0x02=Switch 2: Goto 100% 0x04=Switch 1: Indication at additional Status 0x08=Switch 2: Indication at additional	0x0F
71	55	BININ_STAT	MS	1	r	Status. 0x01=Switch 1 0x02=Switch 2 0x80=Setpoint change forced	-
72	56	SENSOR1_VALUE	MS	5	r	-	-
73	57	SENSOR2_VALUE	MS	5	r	-	-
74	58	SENSOR1_UNITS	MS	2	r,w	1141= psi 1137= bar 1133= kPa	1137= bar
75	59	SENSOR2_UNITS	MS	2	r,w	1141= psi 1137= bar 1133= kPa	1137= bar
76	60	INSTRUMENT_MODE	MS	1	r,w	0= OFFLINE 1= ONLINE 2= FAILS. 3= DIAG. 4= CALIB. 5= INIT 6= FAIL	-
77	61	SENSOR3_VALUE	MS	5	r	-	-
78	62	SENSOR3_UNITS	MS	2	r,w	1141= psi 1137= bar 1133= kPa	1137= bar
79... 84	63... 68	Unused/Reserved	MS	-	-	-	-
85	69	VIEW-1-FB	P(M)	23	r	-	-
86... 89	70... 73	Unused/Reserved	MS	-	-		-

Transducer Block							
Standard Parameter							
90	00	BLOCK_OBJECT	P(M)	20	r	-	-
91	01	ST_REV	P(M)	2	r	-	0
92	02	TAG_DESC	P(M)	32	r,w	-	-
93	03	STRATEGY	P(M)	2	r,w	-	-
94	04	ALERT_KEY	P(M)	1	r,w	-	-
95	05	TARGET_MODE	P(M)	1	r,w	0x08= AUTO (ONLINE)	AUTO
96	06	MODE_BLK	P(M)	3	r	-	0x08, 0x08, 0x08
97	07	ALARM_SUM	P(M)	8	r	X, 0, 0, 0, 0, 0, 0, 0	0, 0, 0, 0, 0, 0, 0, 0
98	08	Unused/Reserved	P	-	-	-	-
Additional Parameter for Analog Output Transducer Block defined by Profile							
99	09	ACT_STROKE_TIME_DEC	P(O)	4	r		1.0
100	10	ACT_STROKE_TIME_INC	P(O)	4	r		1.0
101-106	11...16	Unused/Reserved	P	-	-	-	-
107	17	TAB_ENTRY	P(O)	1	r,w	-	1
108	18	TAB_X_Y_VALUE	P(O)	8	r,w	-	-
109	19	TAB_MIN_NUMBER	P(O)	1	r		2
110	20	TAB_MAX_NUMBER	P(O)	1	r	1...22	22
111	21	TAB_ACTUAL_NUMBER	P(O)	1	r	- 2	2
112	22	DEADBAND	P(O)	4	r,w	22	0.1
113	23	DEVICE_CALIB_DATE	P(O)	16	r,w	2...22 -	At factory Format: yyyy-mm-dd
114	24	Unused/Reserved	P	-	-	-	-
115	25	LIN_TYPE	P(M)	1	r,w	0= Linear 52= Equal percent 1:50 53= Invers Eq. perc. 1:50	Linear
116...	26...	Unused/Reserved	P	-	-	1= Characterization Curve	-
121	31					-	
122	32	RATED_TRAVEL	P(M)	4	r,w	-	-
123	33	SELF_CALIB_CMD	P(M)	1	r,w	0= No Action 2= Autostart 3= Short autostart 7 = Reset Travel Sum and Cycle Counter	No Action
124	34	SELF_CALIB_STATUS	P(M)	1	r	0= Undefined 4= Error in mech. System 254= Success	-
125	35	SERVO_GAIN1	P(O)	4	r,w	-	2.0
126	36	SERVO_RATE1	P(O)	4	r,w	-	0.0
127	37	SERVO_RESET1	P(O)	4	r,w	-	2.7
128	38	SETP_CUTOFF_DEC	P(M)	4	r,w	-	0.0
129	39	SETP_CUTOFF_INC	P(M)	4	r,w		100.0
130-134	40-44	Unused/Reserved	P	-	-	-	-
135	45	TOTAL_VALVE_TRAVEL	P(O)	4	r	-	-
136	46	TOT_VALVE_TRAV_LIM	P(O)	4	r,w	-	90000000
137	47	TRAVEL_LIMIT_LOW	P(M)	4	r,w	-	0
138	48	TRAVEL_LIMIT_UP	P(M)	4	r,w	-	100
139	49	TRAVEL_RATE_DEC	P(M)	4	r,w	-	0.4
140	50	TRAVEL_RATE_INC	P(M)	4	r,w	-	0.4
141	51	Unused/Reserved	P	-	-	-	-
142	52	SERVO_GAIN2	P(O)	4	r,w		15
143	53	SERVO_RATE2	P(O)	4	r,w		0.0
144	54	SERVO_RESET2	P(O)	4	r,w		7.5

145	55	TAB_OPCODE	P(O)	1	r,w	0= Not initialized 1= New Curve 2= reserved 3= Last pair of values, start validation...	0
146	56	TAB_STATUS	P(O)	1	r	0= Not initialized 1= Ok 2= Not monotone increasing 4= Not enough pair of values	0
147	57	POSITIONING_VALUE	P(M)	5	r	5= Too much pair of val. 8= Table changed	-
148	58	FEEDBACK_VALUE	P(M)	5	r	-	-
149	59	VALVE_MAN	P(M)	16	r,w	-	-
150	60	ACTUATOR_MAN	P(M)	16	r,w	-	-
151	61	VALVE_TYPE	P(M)	1	r,w	1= Globe 2= Rotary 3= Butterfly 4= Ball	Globe
152	62	ACTUATOR_TYPE	P(M)	1	r	5= Diaphragm 0= Electro-pneumatic	Electro-pneumatic
153	63	ACTUATOR_ACTION	P(M)	1	r,w	0= Not initialized 1= Spring closes 2= Spring opens	Spring closes
154	64	VALVE_SER_NUM	P(O)	16	r,w	3= No spring	-
155	65	ACTUATOR_SER_NUM	P(O)	16	r,w	-	-
156-159	66-69	Unused/Reserved	P	-	-	-	-
160-169	70-79	Reserved by PNO	P	-	-	-	-
Additional Parameter for Analog Output Transducer Block defined by Foxboro Eckardt							
170	80	VALVE_ACT	MS	1	r,w		Singe acting
171	81	CONTROL_ALGORITHM	MS	1	r,w	1= Singe acting 2= Double acting	PID
172	82	POSITION_LINEARIZATION	MS	1	r,w	0= PID 2= Linear/Left Mounted 3= Rotary counter clockwise 6= Linear/Right Mounted 7= Rotary clockwise	Linear/Left Mounted
173	83	CYCLE_COUNT	MS	4	r	-	-
174	84	CYCLE_COUNT_LIMIT	MS	4	r,w	-	90000000
175	85	TRAVEL_SUM_DEADBAND	MS	4	r,w	-	1.0
176	86	ANALOG_OUTPUT	MS	4	r	-	-
177	87	ELECTRONICS_TEMP	MS	4	r	-	-
178	88	ELECTRONICS_TEMP_UNITS	MS	2	r,w	1001= Celsius 1002= Fahrenheit	Celsius
179	89	CONTROL_DIFF_LIMIT	MS	4	r,w	-	5.0
180	90	CONTROL_DIFF_TIME	MS	4	r,w	-	60
181	91	CUTOFF_HYSTERESES	MS	4	r,w	-	0.005
182	92	ALARM_HYSTERESES	MS	4	r,w	-	1.0
183	93	ELECTRONICS_TEMP_LL	MS	4	r	-	-40
184	94	ELECTRONICS_TEMP_UL	MS	4	r	-	80
185	95	LOW_PRESSURE_LIMIT	MS	4	r,w		0.5 bar

186	96	BINOUT1_CONFIG	MS	1	r,w	0x01=Hi Alarm 0x02=Lo Alarm 0x04=HiHi Alarm 0x08=LoLo Alarm 0x80=Output inverted	0x08
187	97	BINOUT2_CONFIG	MS	1	r,w	0x01=Hi Alarm 0x02=Lo Alarm 0x04=HiHi Alarm 0x08=LoLo Alarm 0x80=Output inverted	0x04
188	98	POS_ENDPOINT_LOW	MS	4	r,w	-	-
189	99	POS_ENDPOINT_HIGH	MS	4	r,w	-	-
190	100	MOTOR_PAR	MS	4	r,w	-	-
191	101	ADC_GAIN	MS	1	r,w	-	-
192	102	STAT_AUTOINIT	MS	1	r	0= OK 1= Error 2= Not ready 0x10...11= Endpoints det.. 0x20...2F= Param. I/P-M. 0x30...3F= Contr. param. 0x40...42= Meas. Stroket.	-
193... 202	103... 112	Unused/Reserved	MS	-	-	-	-
203	113	TRANSDUCER_COMMAND	MS	5...32	w	-	-
204	114	TRANSDUCER_ RESPONSE	MS	4...31	r	-	-
205	115	VIEW-1-TB	P(M)	13	r	-	-
206... 253	116... 163	Unused/Reserved	MS	-	-	-	-

Legend:

Definition:	P	Profile 3.0
	P(M)	Mandatory parameter Profile 3.0
	P(O)	Optional Parameter Profile 3.0
	MS	Manufacturer specific by Foxboro Eckardt defined
Access:	r	Read
	w	Write

3.2 Parameter Description

All the parameters listed above are described in the following table in alphabetic order.

Name	Description
ADC_GAIN	Foxboro Eckardt internal parameter for access to the A/D-converter. Will be detected during autostart.
ACT_STROKE _TIME_DEC	Minimum of time for moving the system positioner, actuator and valve into direction of 0%- in seconds as time constant T63. This time will be measured during autostart.
ACT_STROKE _TIME_INC	Minimum of time for moving the system positioner, actuator and valve into direction of 100%- in seconds as time constant T63. This time will be measured during autostart.
ACTUATOR_ ACTION	Defines, if the actuator has a spring and if true in which direction it is working.
ACTUATOR_ MAN	Name of actuator manufacturer.
ACTUATOR_ SER_NUM	Serial number of the actuator.
ACTUATOR_ TYPE	Type of the actuator respectively the positioner. For the positioner SRD991 or SRD960 it is “electro-pneumatic“.
ALARM_ HYSTERESIS	Float parameter which contains the hysteresis in percent for the positioning alarms POS_VALVE_HI_ ALARM, POS_VALVE_HIHI_ALARM, POS_VALVE_LO_ALARM and POS_VALVE_LOLO_ALARM. This hysteresis will be applied, when the valve position is around one these alarm values to avoid possible oscillations at the according status bits.
ALARM_SUM	This parameter contains the actual status of the block alarms and summarizes the status of up to 16 alarms. The data structure behind has 4 elements of 2 bytes. Actually only the first element is used for actual block alarms. Element #2, #3 and #4 is reserved for future use and not yet defined in Profile 3.0. The first byte of the actual status is bit-coded. As long as the specified condition is true, the status bit is set, otherwise it will be reset. Byte 1: Bit 7: Block Alarm. Will be set, if parameter ST_REV has been incremented. Will be reset automatically after 10s. Bit 6: reserved Bit 5: reserved Bit 4: Valve position LO alarm Bit 3: Valve position LOLO alarm Bit 2: Valve position Hi alarm Bit 1: Valve position HIHI alarm Bit 0: reserved The Bits 1...4 are only valid for the Function Block. For Transducer or Physical Block they are always 0. The second byte is reserved for future use. For more information see **[Ref. 4].**

ALERT_KEY	This parameter contains a user assigned Identification number. This number may be used in sorting alarms or events generated by a block.
ANALOG_ OUTPUT	For positioners with the option board “External Feedback Transmission“, the current value in unit mA will be supplied as a float parameter.
BATCH	This parameter structure of type DS-67 is intended for use in batch-applications according to IEC 61512 Part 1 (ISA S88). For more information see **[Ref. 4]**.
BININ_ CONFIG	For positioners with option board “Binary Input“ the behavior of the positioner refer to switched binary inputs can be configured. Per default by triggering switch 1 the system will go to valve position 0% and by triggering switch 2 the system will go to valve position 100%. In addition, triggering of one or both switched will be indicated within the parameter DIAGNOSE_ EXT.
BININ_STAT	Status-byte which indicates, which of the binary inputs of the according option board has been triggered and if this had influenced the setpoint.
BINOUT1_ CONFIG	For positioners with option board “Binary Output“ the behavior of the binary output 1 can be configured. On one side the assignment of the output to the alarms POS_VALVE_HI_ALARM, POS_VALVE_HIHI_ALARM, POS_VALVE_LO_ALARM and/or POS_VALVE_LOLO_ALARM can be done as well as an inversion of the binary output itself can be configured. Per default the binary output 1 is assigned to POS_VALVE_LOLO_ALARM and the output is not inverted.
BINOUT2_ CONFIG	For positioners with option board “Binary Output“ the behavior of the binary output 2 can be configured. On one side the assignment of the output to the alarms POS_VALVE_HI_ALARM, POS_VALVE_HIHI_ALARM, POS_VALVE_LO_ALARM and/or POS_VALVE_LOLO_ALARM can be done as well as an inversion of the binary output itself can be configured. Per default the binary output 2 is assigned to POS_VALVE_HIHI_ALARM and the output is not inverted.
BLOCK_ OBJECT	Contains the characteristics of the block, e.g. block type and profile number. For details see **[Ref. 4**].
CHECKBACK	Detailed Device information (3 Bytes), bit-wise coded. More than one message possible at once. Please refer chapter **2.4.1**.
CHECKBACK_ MASK	Definition of supported CHECKBACK information bit. Same structure as CHECKBACK. A “1” means, that the according bit will be supported.
COMPOSITE_ LIST_ DIRECTORY_ ENTRIES/ COMPOSITE_ DIRECTORY ENTRIES	Detailed description of the different blocks of the field device (e.g. start-index, number of parameter, etc.) according Profile 3.0. For details see **[Ref. 4]**.
CONTROL_ ALGORITHM	Control algorithm. For SRD991 and SRD960 it is always PID.
CONTROL_ DIFF_ LIMIT	Float parameter, which contains the limit for the control difference in percent. If the control difference exceed this limit for a time greater than the time specified by CONTROL_DIFF_ TIME, it will be indicated within the parameter CHECKBACK as well as within the parameter DIAGNOSIS_EXT.

CONTROL_ DIFF_TIME	Float parameter which contains the time limit in seconds. If the control difference exceed the limit defined by CONTROL_DIFF_LIMIT for this time, it will be indicated within the parameter CHECKBACK as well as within the parameter DIAGNOSIS_EXT.
CUTOFF_ HYSTERESIS	Float parameter, which contains the hysteresis in percent for the cutoffs SETP_CUTOFF_DEC and SETP_CUTOFF_INC. This hysteresis will be applied, when a cutoff should be left and is intended to avoid possible oscillations when the setpoint is around the starting point of a cutoff range.
CYCLE_ COUNT	Summary of cycle counts represented as a LONG parameter. This counter counts changes in movements (up/down or right/left).
CYCLE_ COUNT_ LIMIT	Limit for the CYCLE_COUNT. Exceeds the CYCLE_COUNT this value it will be indicated within the parameter CHECKBACK as well as within the parameter DIAGNOSIS_EXT.
DEADBAND	Defines the deadband of the controller. This is the range (of control difference) within no re-control of the valve position will be done.
DESCRIPTOR	User defined text which allows a description of the measuring point
DEVICE_ CALIB_DATE	Last calibration date of the device. Format: yyyy-mm-dd.
DEVICE_ID	Foxboro-Eckardt specific device type of the device. For the positioner it is ”SRD991“ respectively “SRD960”.
DEVICE_ OPTIONS	Shows the additional built-in options of the positioner. This information is bit-coded and there can be more than one option existing at one time (but only one option board): 0x01: External Position Transmission 4-20mA (Option board) 0x02: Internal Pressure cells 0x04: External Binary Inputs (Option board) 0x08: External Binary Outputs (Option board) 0x10: External Sensor
DEVICE_MAN _ID	Identification number of the manufacturer of this device. For the SRD991 and SRD960 it is Foxboro Eckardt with the Identification-number 0x003F.
DEVICE_SER_ NUM	Serial number of the SRD991 or SRD960 in the format xx/yyyyyy
DIAGNOSIS	Detailed information of the device 4 Bytes long, bit-wise coded. A description of this data is contained in Chapter **2.6.2**.
DIAGNOSIS_ EXT	Additional information of the device 6 Bytes long, bit-wise coded. A description of this data is contained in Chapter **3.3**.
DIAGNOSIS_ MASK	Definition of supported DIAGNOSIS information bit. Same structure as DIAGNOSIS. A “1” means, that the according bit will be supported.
DIAGNOSIS_ EXT_MASK	Definition of supported DIAGNOSIS_EXT information bit. Same structure as DIAGNOSIS_EXT. A “1” means, that the according bit will be supported.
DIAGNOSIS_ DIAGBIT_ MASK	Defines which bits set within DIAGNOSIS will cause that bit 3 (Ext_Diag) within DIAG_STATUS (see Chapter **2.6.1**) will be set.
DIAGNOSIS_ DIAGBIT_ EXT_ MASK	Defines which bits set within DIAGNOSIS_EXT will cause that bit 7 (Extension Available) within Diagnosis (see Chapter **2.6.2)** will be set.

DIRECTORY_ OBJECT_ HEADER	Root of the directory description, which define the block structure of the device according Profile 3.0. For more information see **[Ref. 4]**.
ELECTRONIC S_TEMP	Shows the temperature of the electronics as a float value in units of ELECTRONICS_TEMP_UNITS.
ELECTRONIC S_TEMP_LL	Float value for the lower limit for the electronics temperature ELECTRONICS_TEMP in units of ELECTRONICS_TEMP_UNITS. If the electronics temperature is falling below this value, it will be indicated within the parameter DIAGNOSIS_EXT.
ELECTRONICS_ TEMP_UL	Float value for the upper limit for the electronics temperature ELECTRONICS_TEMP in units of ELECTRONICS_TEMP_UNITS. If the electronics temperature exceeds this value it will be indicated within the parameter DIAGNOSIS (see Chapter **2.6.2**), as well as within the parameter DIAGNOSIS_ EXT.
ELECTRONIC S_TEMP_ UNITS	Unit code for the ELECTRONICS_TEMP. Valid units are Grad Celsius and Fahrenheit.
FACTORY_ RESET	Reset of the device. 1: Resetting the SRD991/SRD960 to factory default values, except the bus address. 2506: Command for warmstart of the device. The device behaves like power- on, this means, that all configuration and calibration-data remains unchanged 2712: Reset of the bus address to the default value 126. 32768: Reset of historical diagnostic data within DIAGNOSIS_EXT.
FEEDBACK_ VALUE	Output of the Transducer Block. Since the positioner SRD991/SRD960 has a fixed connection between the Analog Output Function Block and the Transducer Block this is the normalized value, which will be used for calculation of the READBACK and POS_D (see also Chapter **2.3)**.
FSAFE_TIME	Float parameter for the time in seconds how long the positioner tolerates no receive of a valid setpoint until the behavior defined in FSAFE_TYPE will be performed.
FSAFE_TYPE	Defines the reaction of the positioner for failure in communication after exceeding the FAILSAFE_ TIME. The operation mode during Failsafe is always AUTO. Following 3 possibilities can be specified: Safety position: De-aeration of the actuator. For single acting actuator the spring defines the moving direction. Hold last value: The last received valid setpoint will be used and consequently the actual valve position will be kept. Target Value: The position defined by FSAFE_VALUE will be reached.
FSAFE_ VALUE	Float Parameter, which defines the target position in percent, when FSAFE_TYPE is configured to “Target value“ and Failsafe will be performed after the FSAFE_TIME.
HARDWARE_ REVISION	Hardware-Revision of the positioner SRD991 or SRD960 in the format xx.yyy.
IDENT_ NUMBER_ SELECTOR	Selection of the used Identification number. 0: Using Profile-Identification number 0x9710. 1: Using Identification-number 0xD991 for SRD991 / 0xD960 for SRD960. Per default the device is configured for using 0xD991 respectively 0xD960. If communication will be established with the wrong identification number, it will be indicated within byte #2 of the Diagnosis (see Chapter **2.6.2**).
IN_CHANNEL	Reference to the parameter of the active Transducer-Block, which contains the actual position. This value will be used for calculation of READBACK and POS_D. For details see **[Ref. 4]**.

INCREASE_ CLOSE	Working direction of the positioner: 0: Increasing setpoint opens the valve 2: Increasing setpoint closes the valve
INSTRUMENT _MODE	Instrument mode of the SRD991/SRD960
LIN_TYPE	Selection of the characterization curves provided by the positioner: Linear Equal percentage 1:50 Invers equal percentage 1:50 Custom specific curve The custom specific curve can be read and write with the parameters TAB_...
LOCAL_OP_ ENA	Enables or disables operation of the positioner via local push buttons. Per default local operation is enabled, meaning that local operation is allowed.
LOW_PRESSU RE_LIMIT	Float Parameter representing the lower limit for the air supply pressure in units of SENSOR1_ UNITS. If internal pressure cells are available and the air supply pressure is falling below the specified lower limit it will be indicated with the parameter DIAGNOSIS_EXT.
MESSAGE... MESSAGE_5	Free usable text area allowing storage of any textual information.
MODE_BLK	Data structure (DS-37), containing 3 bytes of Mode information: Byte: Actual Mode of the block Byte: Permitted block mode Byte: Normal (Default) block mode The actual mode will be determined at normal operation of the block. The Normal Block mode shows the default value for the according block. The Permitted Block mode shows the possible values, which can be written for the parameter TARGET_MODE.
MODELCODE	Modelcode of the device.
MOTOR_PAR	Foxboro Eckardt internal parameter for accessing the I/P-Module. Will be detected during autostart.
OUT	Output setpoint of the Function Block in units of OUT_SCALE with Status. Is the Function Block in mode MAN, then this parameter can be written.
OUT_ CHANNEL	Reference to the parameter of the active Transducer-Block, in which the Function Block writes the setpoint for the final control. For details see **[Ref. 4]**.
OUT_SCALE	Describes the conversion for the normalized Output signal (percent) of the Function Blocks into the output variable OUT in the hereby defined engineering unit. The data structure of Type DS-36 (see **[Ref. 4]**) contains the high and low scale value, an engineering units code and the number of digits to the right of the decimal point. Per default OUT_SCALE is adjusted, that OUT operates in the range of 0-100%. In addition to % the unit Grad, mm and inch will be supported.
POS_ ENDPOI NT_LOW	Float parameter which represents the endpoint of the actuator 0% in degree. The value will be detected by the positioner during autostart.

POS_ENDPOINT_HIGH	Float parameter which represents the endpoint of the actuator 100% in degree. The value will be detected by the positioner during autostart.
POS_D	Actual Position of the actuator (discrete) with status. 0: Not initialized 1: Closed 2: Opened 3: Intermediate For more information see Chapter **2.4**.
POS_VALVE_HI_ALARM	Float parameter, which defines the HI-Alarm. If the valve position exceeds the defined alarm limit, it will be indicated within the Limits-Bits (see Chapter 2.4.2), as well as within the parameter DIAGNOSIS_EXT.
POS_VALVE_HIHI_ALARM	Float parameter, which defines the HIHI-Alarm. If the valve position exceeds the defined alarm limit, it will be indicated within the Limits-Bits (see Chapter 2.4.2), as well as within the parameter DIAGNOSIS_EXT.
POSITION_LINEARIZATIO N	Defines the mounting of the positioner at the actuator respective the mounting side. Possible options are: 2 = Linear/Left mounted or direct mounting on valves from Invensys Flow Control 3 = Rotary, counter clockwise 6 = Linear/Right mounted 7 = Rotary, clockwise
POWER_UP_ACTION	Defines the reaction of the positioner after power up of the bus power until the positioner receives the first valid setpoint via communication. Alternatives are “In Service“ and “Failsafe“. At “In Service“ the setpoint will be initialized in the way, that the valve doesn’t move (Safety position). At “Failsafe” the action defined at FSAVE_TYPE will be done.
POS_VALVE_LO_ALARM	Float parameter, which defines the LO-Alarm. If the valve position falls below the defined alarm limit, it will be indicated within the Limits-Bits (see Chapter 2.4.2), as well as within the parameter DIAGNOSIS_EXT.
POS_VALVE_LOLO_ALARM	Float Parameter, which defines the LOLO-Alarm. If the valve position falls below the defined alarm limit, it will be indicated within the Limits-Bits (see Chapter **2.4.2**), as well as within the parameter DIAGNOSIS_EXT.
POSITIONING_VALUE	Input for the Transducer Block. Since the positioner SRD991/SRD960 has a fixed connection between the Analog Output Function Block and the Transducer Block this is identical to the Parameter OUT.
PV_SCALE	Describes the conversion of a process value in the hereby defined engineering unit into a normalized value (percent) which will be used as input of the Function Block. The data structure of Type DS-36 (see [Ref. 4]) contains the high and low scale value, an engineering units code and the number of digits to the right of the decimal point. Per default OUT_SCALE is adjusted, that the parameters depending on PV_SCALE operates in the range of 0-100%.
RATED_TRAVEL	Nominal stroke for the actuator/valve-combination in units of OUT_SCALE. If the positioner is mounted to a rotary actuator and the unit of OUT_SCALE is in consequence Grad, the value of this parameter will be detected during autostart and can’t be written in this case.
RCAS_IN	Setpoint RCAS_IN in units of PV_SCALE with status. For details see Chapter **2.4**.

RCAS_OUT	Setpoint RCAS_OUT in units of PV_SCALE with status. For details see Chapter **2.4.**
READBACK	Actual position of the actuator in units of PV_SCALE with status. For details see Chapter **2.4.**
SELF_CALIB_ CMD	Writing of a value defined in the parameter list will initiate one of the following actions: Autostart Short autostart Reset of TOTAL_VALVE_TRAVEL and CYCLE_COUNT to 0.
SELF_CALIB_ STATUS	Result or status after performing an autostart or short autostart.
SENSOR1_ UNITS	Unit for the variable SENSOR1_VALUE (Air supply pressure). Valid units are Bar, PSI und kPa.
SENSOR2_ UNITS	Unit for the variable SENSOR2_VALUE (Output pressure Y1). Valid units are Bar, PSI and kPa.
SENSOR3_ UNITS	Unit for the variable SENSOR3_VALUE (Differential pressure Y1-Y2). Valid units are Bar, PSI and kPa.
SENSOR1_ VALUE	If the positioner contains internal pressure cells, the actual air supply pressure will be shown with status in engineering unit of SENSOR1_UNITS.
SENSOR2_ VALUE	If the positioner contains internal pressure cells, the output pressure Y1 will be shown with status in engineering unit of SENSOR2_UNITS.
SENSOR3_ VALUE	If the universal positioner SRD960 contains internal pressure cells, the difference of the output pressures Y1 – Y2 will be shown with status in engineering unit of SENSOR3_UNITS. For the intelligent positioner SRD991 the value is always identical with SENSOR2_VALUE.
SERVO_ GAIN1	Proportional-action coefficient in the moving direction of opening the valve.
SERVO_ GAIN2	Proportional-action coefficient in the moving direction of closing the valve.
SERVO_ RATE1	Derivative-action coefficient in seconds in the moving direction of opening the valve.
SERVO_ RATE2	Derivative-action coefficient in seconds in the moving direction of closing the valve.
SERVO_ RESET1	Integral-action coefficient in seconds in the moving direction of opening the valve.
SERVO_ RESET2	Integral-action coefficient in seconds in the moving direction of closing the valve.
SETP_ CUTOFF_DEC	When the setpoint goes below this defined value (in percent), the valve will be moved with maximum force in direction of the endpoint 0%. This will be done by totally ventilate/filling of the actuator depending on the safety position.
SETP_ CUTOFF_INC	When the setpoint goes above this defined value (in percent), the valve will be moved with maximum force in direction of the endpoint 100%. This will be done by totally ventilate/filling of the actuator depending on the safety position.
SETP_ DEVIATION	Float value which shows the difference between setpoint and the actual valve position in percent.

SIMULATE	Data structure DS-50, which contains a value (float) with Status and the so-called SIMULATION ENABLE. If SIMULATION ENABLED is activated the value and status defined here will be delivered within READBACK instead of the actual valve position.
SOFTWARE_ REVISION	Software-Revision of the positioner SRD991/SRD960 in the format xx.yyy.
SP	Setpoint SP in the engineering unit PV_SCALE with status. For details see Chapter **2.4**.
ST_REV	Counter of the so-called STATIC REVISION. Every block contains static parameters, that are not changed by the process. Every time such a parameter will be changed during configuration of the device, this counter will be increased by 1. This provides a check of the parameter revision. Since the positioner is a so-called "Simple/Compact" device, this parameter is identical for all existing blocks.
STAT_ AUTOINIT	This parameter shows the actual status of the autostart or short autostart during its performing.
STRATEGY	2 Bytes, intended for grouping of Function Blocks. This parameter will not be interpreted by SRD991/ SRD960.
SUPPLY_ CURRENT	Float parameter, which represents the actual current used by the positioner in engineering units of mA.
TAB_ACTUAL_ NUMBER	Contains the actual numbers of pairs of values of the present valid characterization table.
TAB_ENTRY	Identifies a pair of values in the characterization table. A detailed description of handling a table is contained in [Ref. 4].
TAB_MAX_ NUMBER	Maximum number of pairs of values for a characterization table. For the positioner SRD991/SRD960 this value is 22 constant.
TAB_MIN_ NUMBER	Minimum number of pairs of values for a characterization table. For the positioner SRD991/SRD960 this value is 2 constant.
TAB_ OPCODE	Defines the situation respectively the action to be performed by the characterization table. 0 = Not initialized (Default value) 1 = New characterization table. Hereby the writing/downloading of a new characterization will be started. By using the parameters TAB_ENTRY and TAB_X_Y_VALUE can be written now into the positioner. 3 = The last pair of values has been written and checking of the characterization can be done now. When everything is ok the new table will be taken over. A detailed description of handling a table is contained in **[Ref. 4]**.
TAB_STATUS	Status of the present written characterization table.
TAB_X_Y_ VALUE	Structure which contains 2 float parameters representing a pair of values of the characterization table. This parameter allows reading or writing of a pair of values. A detailed description of handling a table is contained in **[Ref. 4**].
TAG_DESC	TAG-Number of the device. This TAG-Number has to be unique within a fieldbus system. Since the position is a so-called "Simple/Compact" device, this parameter is identical for all existing blocks of the device.

TARGET_ MODE	Contains the desired mode of the concerned Block. Only one mode is permitted at one time. A detailed description of possible mode within the positioner is contained in Chapter **2.5**.
TOTAL_VALVE _TRAVEL	Accumulated valve travel represented by a float parameter. It is the summarized valve travel in nominal duty cycles.
TOTAL_VALVE _TRAV_LIM	Limit for the TOTAL_VALVE_TRAVEL. If TOTAL_VALVE_TRAVEL exceeds this defined value it will be indicated within the parameter CHECKBACK as well as within the parameter DIAGNOSIS_EXT.
TRANSDUCER _COMMAND	Foxboro Eckardt internal parameter.
TRANSDUCER _RESPONSE	Foxboro Eckardt internal parameter.
TRAVEL_ LIMIT_LOW	Lower Limit of the valve position in percent of travel span.
TRAVEL_ LIMIT_UP	Upper Limit of the valve position in percent of travel span.
TRAVEL_ RATE_DEC	Configurable travel time in seconds in moving direction 0% position as time constant T63.
TRAVEL_ RATE_INC	Configurable travel time in seconds in moving direction 100% position as time constant T63.
TRAVEL_SUM _DEADBAND	Defines the hysteresis respectively deadband for the counters CYCLE_COUNT and TOTAL_ VALVE_TRAVEL in percent as a float parameter. Movements of the actuator/valve within this deadband will not be added to these counters. The default value of this deadband is 1%.
VALVE_ACT	Defines the valve action of the actuator. The positioner SRD991/SRD960 supports single- and double-acting actuators.
VALVE_MAN	Name of valve manufacturer
VALVE_SER_ NUM	Serial number of the valve.
VALVE_TYPE	Valve type
VIEW-1-FB	The VIEW-1-FB-parameter groups according to Profibus Profile 3.0, allowing reading of all this information with one single read-service (23 Bytes). ST_REV (2 Bytes) MODE_BLK (3 Bytes) ALARM_SUM (8 Bytes) READBACK (5 Bytes) POS_D (2 Bytes) CHECK_BACK (3 Bytes)
VIEW-1-PB	The VIEW-1-PB-parameter groups according to Profibus Profile 3.0, allowing reading of all this information with one single read-service (17 Bytes). ST_REV (2 Bytes) MODE_BLK (3 Bytes) ALARM_SUM (8 Bytes) DIAGNOSIS (4 Bytes)

VIEW-1-TB	The VIEW-1-TB-parameter groups according to Profibus Profile 3.0, allowing reading of all this information with one single read-service (13 Bytes). ST_REV (2 Bytes) MODE_BLK (3 Bytes) ALARM_SUM (8 Bytes)
WRITE_ LOCKING	Write protection for the device. If the device is write protected all acyclic write attempts, with exception of the WRITE_LOCKING itself, will be refused. Also local operation via local push buttons is impossible.

3.3 Additional Diagnosis

The additional Diagnosis consists of 6 Byte Diagnosis information. It is bit-coded as described below. The first 3 bytes contain actual information. Here a bit is set as long as the specified condition is true. When the condition no longer exists, the bit will be reset immediately. Bytes 4-6 contain historical diagnosis data. Here a bit will be set, when the specified condition is true. Such bits are set until they will be reset explicitly by writing the value 32768 to the parameter FACTORY_RESET. Doing this will also reset the “Extension Available“-bit within the Diagnosis (see Chapter2.6.2.).

Byte 1 contains System Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
OPTION Error	Poti Defect	IP LOOP Error	ACTUAT. OOL	ADC Defect	EPROM Defect	EEPROM Defect	RAM Defect

Bit 7	OPTION Error:	Missing or faulty Optionboard.
Bit 6	Poti Defect:	Potentiometer failed.
Bit 5	IP LOOP Error:	Current Loop to I/P-Module broken.
Bit 4	ACTUAT. OOL:	Actuator out of range 0...100%.
Bit 3	ADC Defect:	Faulty AD-Converter.
Bit 2	ERPOM Defect:	Checksum-error at ROM (EPROM).
Bit 1	EEPROM Defect:	Checksum-error at E

Byte 2 contains additional System Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
BinIn high	Feedback Calibration	Loop Calibration	Cycle Count	Travel Sum	Config invalid	Temp low	Temp high

Bit 7	BinIn high:	Binary Input Channel set.
Bit 6	Feedback Calibration:	Faulty Calibration of Position Feedback (Potentiometer).
Bit 5	Loop Calibration:	Faulty Calibration of Input Loop Current Measuring.
Bit 4	Cycle Count:	CYCLE_COUNT has reached CYCLE_COUNT_LIMIT.
Bit 3	Travel Sum:	TOTAL_VALVE_TRAVEL has reached TOTAL_VALVE_TRAVEL_LIM.
Bit 2	Configuration invalid:	Invalid Configuration data.
Bit 1	Temp low:	ELECTRONICS_TEMP is falling below ELECTRONICS_TEMP_LL.
Bit 0	Temp high:	ELECTRONICS_TEMP is exceeding ELECTRONICS_TEMP_UL.

Byte 3 contains Process Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output P. Alarm	Air supply Alarm	Autostart failed	Control Diff Lim	LoLo Alarm	HiHi Alarm	Lo Alarm	Hi Alarm

Bit 7 Output P. Alarm: Output pressure Y1 (SENSOR2_VALUE) not plausible.
Bit 6 Air supply Alarm: Air supply pressure (SENSOR1_VALUE) is falling below LOW_PRESSURE_LIMIT.
Bit 5 Autostart failed: Autostart not or performed with error.
Bit 4 Control Diff Lim: Limit for Control difference (CONTROL_DIFF_LIMIT, CONTROL_DIFF_TIME) reached.
Bit 3 LoLo Alarm: LoLo Alarm reached (POS_VALVE_LOLO_ALARM)
Bit 2 HiHi Alarm: HiHi Alarm reached (POS_VALVE_HIHI_ALARM)
Bit 1 Lo Alarm: Lo Alarm reached (POS_VALVE_LO_ALARM)
Bit 0 Hi Alarm: Hi Alarm reached (POS_VALVE_HI_ALARM)

Byte 4 contains historical System Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
OPTION Error	Poti Defect	IP LOOP Error	ACTUAT. OOL	ADC Defect	EPROM Defect	EEPROM Defect	RAM Defect

Bit 7 OPTION Error: Optionboard was missing or faulty.
Bit 6 Poti Defect: Potentiometer had been failed.
Bit 5 IP LOOP Error: Current Loop to I/P-Module had been broken.
Bit 4 ACTUAT. OOL: Actuator was out of range 0...100%.
Bit 3 ADC Defect: AD-Converter was faulty.
Bit 2 ERPOM Defect: ROM (EPROM) had Checksum-error.
Bit 1 EEPROM Defect: EEPROM had Checksum-error.
Bit 0 RAM Defect: RAM-Test was faulty.

Byte 5 contains historical additional System Errors.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
BinIn high	Feedback Calibration	Loop Calibration	Cycle Count	Travel Sum	Config invalid	Temp low	Temp high

Bit 7 BinIn high: Binary Input Channel had been set.
Bit 6 Feedback Calibration: Calibration of Position Feedback (Potentiometer) was faulty.
Bit 5 Loop Calibration: Calibration of Input Loop Current Measuring was faulty.
Bit 4 Cycle Count: CYCLE_COUNT had been reached CYCLE_COUNT_LIMIT.
Bit 3 Travel Sum: TOTAL_VALVE_TRAVEL had been reached TOTAL_VALVE_TRAVEL_LIM.
Bit 2 Configuration invalid: Configuration data was invalid.
Bit 1 Temp low: ELECTRONICS_TEMP had been falling below ELECTRONICS_TEMP_LL.
Bit 0 Temp high: ELECTRONICS_TEMP had exceeded ELECTRONICS_TEMP_UL.

Byte 6 contains historical Process Errors:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output P. Alarm	Air supply Alarm	Autostart failed	Control Diff Lim	LoLo Alarm	HiHi Alarm	Lo Alarm	Hi Alarm

Bit 7 Output P. Alarm: Output pressure Y1 (SENSOR2_VALUE) was not plausible.
Bit 6 Air supply Alarm: Air supply pressure (SENSOR1_VALUE) had been falling below LOW_PRESSURE_LIMIT.
Bit 5 Autostart failed: Autostart was not or had been performed with error.
Bit 4 Control Diff Lim: Limit for Control difference (CONTROL_DIFF_LIMIT, CONTROL_DIFF_TIME) had been reached.
Bit 3 LoLo Alarm: LoLo Alarm had been reached (POS_VALVE_LOLO_ALARM)
Bit 2 HiHi Alarm: HiHi Alarm had been reached (POS_VALVE_HIHI_ALARM)
Bit 1 Lo Alarm: Lo Alarm had been reached (POS_VALVE_LO_ALARM)
Bit 0 Hi Alarm: Hi Alarm had been reached (POS_VALVE_HI_ALARM)

3.4 Errorcodes for acyclic Data Transfer

At reading/writing of parameters with the PROFIBUS-DPV1-services described in Chapter 3 the following errorcodes can occur. These codes are derived of [Ref. 3] Chapter 10.3.1. and [Ref. 4]

“Mapping of the Profile“ Chapter 3.2. They will be transferred within Byte #3 of a so-called “Error PDU“. The 4 most significant bits of this byte are representing the error class and the 4 LSB are representing the errorcode itself.

Error Class	Error-code	Total Error-code	Name	Description
Access (11 = 0xB)	0	0xB0	invalid index	Parameter is not implemented or is not visible.
	1	0xB1	write length error	The length in the write request does not match to the size of the parameter.
	2	0xB2	invalid slot	Accessed Slot contains no parameters at all.
	3	0xB3	type conflict	Not used by SRD991/SRD960.
	4	0xB4	invalid area	Not used by SRD991/SRD960.
	5	0xB5	state conflict	Device is busy (e.g. direct after a reset) and can not execute the request.
	6	0xB6	access denied	The parameter can not be written because the device is write protected.
	7	0xB7	invalid range	The parameter can not be written because the value is out of range.
	8	0xB8	invalid parameter	Not used by SRD991/SRD960.
	9	0xB9	invalid type	Not used by SRD991/SRD960.
	10	0xBA	read only	Parameter can’t be written because it’s a read only parameter.
	11	0xBB	temporal invalid	Not used by SRD991/SRD960.
	12-14	0xBC-0xBE	manufacturer specific	Not used by SRD991/SRD960.
	15	0xBF	other	Other non-specific error.

4 REFERENCE DOCUMENTS

[Ref. 1] Profibus Standard DIN 19245 Part 1 and Part 2
PNO, Order.-Nr. 0.002

[Ref. 2] Profibus Standard DIN 19245 Part 3 (DP)
PNO, Order.-Nr. 0.002

[Ref. 3] Profibus Technical Guideline: Profibus-DP Extensions to EN 50170 (DPV1) Vers. 2.0, April 98
PNO, Order.-Nr.: 2.082

[Ref. 4] Profibus Profile for Process automation Version 3.0, October 1999 PNO, Order.-Nr. 3.042

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