SRD991 / SRD960 Intelligent Positioner with FIELDBUS communication

Fieldbus Foundation

The intelligent positioner SRD991/SRD960 is 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. The positioner is available with different communication protocols. This includes versions with analog setpoint (4...20 mA) and superimposed HART- or FoxCom-protocol, digital with FoxCom-protocol, or fieldbus-communication according to PROFIBUS-PA and FOUNDATION Fieldbus H1 based on IEC 1158-2.

Features:

Auto-start with self-calibration, self diagnostics, status and diagnostic messages, communication FOUNDATION Fieldbus H1, configuration by means of local keys, PC or host systems, low air consumption, low vibration effect in all directions, stroke 8 to 120 mm (0.3 to 4.7 in), angle range up to 95°, supply air pressure up to 6 bar (90 psig), single or double-acting, mechanical travel indicator, mounting on linear actuators directly or according to IEC534, Part 6 (NAMUR), mounting on rotary actuators according to VDI/VDE 3845, protection class IP 65, explosion protection: EEx ia IIC T6 according to ATEX or “Intrinsic safety” according to FM and CSA, ExD (SRD960 only) booster relay to minimize stroke time (optional), built-in independent inductive limit switches (optional), sensors for supply air pressure and output pressure (optional), LCDisplay (optional),additional in-/outputs (optional): 2 binary outputs (position alarms) or position feedback 4...20 mA, 1 alarm output or 2 binary inputs.

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1 GENERAL INFORMATION

This instruction manual contains operating information for SRD991, Rev. 3.4 or Rev. 3.5 and SRD960, Rev 2.0 Intelligent Positioners using the FOUNDATIONfieldbus™ technology to interconnect with other devices.

Fieldbus is an all digital, serial two-way communication system, a Local Area Network (LAN) for instruments with built-in capability to distribute control application across the network. This two-wire connection is used for power supply and digital communication in parallel.

The fieldbus allows multiple variables from each device to be brought into the control system for archival, trend analysis, process optimization and report generation.

SRD991/SRD960 is a Link Master device with the capability to become a Link Active Scheduler (LAS). A LAS initiates scheduled communication, publishing data to all devices on the fieldbus. Scheduled data are typically used for regular, cyclic transfer of control loop data between devices.

A Fieldbus may have multiple Link Masters. If the current LAS fail, one of the remaining Link Masters will become the LAS and operation of the Fieldbus will continue.

Unscheduled communication is possible for all devices, after the LAS grants permission to a device.

A SRD991/SRD960 consists of two Virtual Field Devices (VFD). One VFD is used for Network Management and System Management, the other for User Application. Network Management includes Virtual Communication Relationships (VCR), dynamic variables, statistics, and LAS schedules, if the device is a Link Master. System Management includes device tag and address information, and schedules for function block execution.

The device functions, which are determined by the arrangement and interconnection of blocks, are made visible to the fieldbus communication system through the User Application Virtual Field Device.

The SRD991/SRD960 intelligent positioner provides

- 1 Resource Block,
- 1 Analog Output Function Block,
- 1 Analog Output Transducer Block (Advanced Positioner Basic Valve Access Transducer Block APV),
- 1 PID Function Block,
- 2 Discrete Input Function Blocks,
- 1 Discrete Input Transducer Block,
- 1 Discrete Output Function block,
- 1 Discrete Output Transducer Block.

The User Application VFD consists of the following objects:

- Link Objects, where links between Function Block inputs and outputs are defined (internal to the device and across the network);
- Trend Objects, to allow hosts or other devices access to local trending of function block parameters;
- Alert Objects, to allow reporting of alarms and events on the fieldbus;
- View Objects, where predefined block parameter sets are grouped to be used by human/machine interfaces.

The SRD991/SRD960 Intelligent Positioner contains

- Up to 22 Link Objects,
- Up to 10 Floating Point Trend Objects,
- Up to 6 Discrete Trend Objects,
- 1 Float Alert Object,
- 1 Discrete Alert Object,
- 1 Update Event Alert Object,
- 9 View Objects for the Resource Block (the third View Object is divided into 4 views, the fourth View Object is divided into 3 views),
- 4 View Objects for the Analog Output Function Block,
- 4 View Objects for the PID Function Block,
- 12 View Objects for the AO Transducer Block (Advanced Positioner Valve Basic Access Transducer), the third View Object is divided into 3 views, the fourth View Object is divided into 7 views,
- 4 View Objects for the Discrete Input Function Blocks,
- 4 View Objects for the Discrete Input Transducer Block,
- 4 View Objects for the Discrete Output Function Block,
- 4 View Objects for the Discrete Output Transducer Block.

It contains no Domain and Program Invocation Objects and no Action Object.

1.1 Device Address Assignment

Every fieldbus device must have a unique network address and physical device tag for the fieldbus to operate properly.

When a SRD991/SRD960 Intelligent Positioner is shipped from the factory, it is programmed with a unique Physical Device Tag and a unique Device Identification and a default permanent address.

Table 1: system management identification data

Name	Value
Device Identification	3858842401-<yy/nnnnnn> or 3858842481-<yy/nnnnnn>
Physical Device Tag	SRD991-<yy/nnnnnn> or SRD960-<yy/nnnnnn>
Node Address	32 (0x20)

<yy/nnnnnn> = Fabrication number (for example: 93/123456).

Because all of these three parameters are set, the SRD991/SRD960 system management starts in state SM_OPERATIONAL. To become fully operational, it may be necessary to do further network communication configurations, depending on the host system or the actual network application.

If the station cannot use the assigned node address because this address is already used by another device, it is assigned one of the default addresses (0xF8..0xFF) and the state is set to INITIALIZED. In this state no other services are available except assigning a node address, clearing the physical device tag and identifying the device.

If Device Identification is set only, system management starts in state UNINITIALIZED. In this state no other services but identifying the device and configuring the device with a physical device tag are available.

1.2 Supported Services

The intelligent positioner SRD991/SRD960 Fieldbus supports the following services:

Table 2: Supported Fieldbus Services

Service	Type
Variable Access	Read Write Information Report
Event Management	Event Notification Event Notification with Type Acknowledge Event Notification
Context Management	Initiate Abort Reject
OD-Management	Get OD
VFD Status	Status Unsolicited Status Identify

For a detailed description of system management services and procedures see Fieldbus specification FF-880.

1.3 Block Modes

Commissioning a SRD991/SRD960 requires to modify some parameters in the Resource, Analog Output, and Transducer Block. A MODE parameter, which exists in every Block, determines the operating behavior of each block. The MODE parameter has 4 components:

- Target mode – the mode(s) set by the operator; multiple target modes can be set. Only modes from those allowed by the permitted modes may be requested.
- Actual mode – the current mode of the block. The value may differ from the target mode based on operating conditions.
- Permitted mode – defines the modes which are allowed for a block.
- Normal mode – This is the mode for a block under normal operating conditions. The normal mode is set by the configurator, but can only be set to a permitted mode.

Some parameters are only allowed to change, if the Block Mode (target or actual mode) has a specific value. The requirements to change a parameter are listed in the description of all parameters later in this manual (chapter 3.25).

FOUNDATIONfieldbus has defined the following target modes:

Table 3: Target Block Modes

Bit	Meaning	Priority
0 (LSB)	Remote-Output (ROUT)	0 - lowest
1	Remote-Cascade (RCAS)	1
2	Cascade (CAS)	2
3	Automatic (AUTO)	3
4	Manual (MAN)	4
5	Local Override (LO)	5
6	Initialization Manual (IMAN)	6
7 (MSB)	Out of Service (OOS)	7 - highest

The “automatic” modes are AUTO, CAS, and RCAS. The “manual” modes are IMAN, LO, MAN and ROUT. In OOS mode the normal algorithm is no longer executed and any outstanding alarms are cleared.

2 INITIAL SETUP

2.1 Procedure for Installing Device Description Files

The Fieldbus Foundation™ has specified a Device Description Language (DDL) to achieve interoperability between devices from various manufacturers. The Device Description (DD) describes all the information available at the fieldbus interface. The DD is available in the standard fieldbus binary format and contains the following set of files for SRD991 and another set for SRD960:

1001.FFO
1001.SYM.

Every fieldbus host application, which uses Device Description Services (DDS), is able to get information about a device description.

The file 100101.CFF is a common format file for use in configuring and maintaining devices and their function block applications. This is a human-readable document in plain text format.

The device description files need to be stored in the appropriate directories. It depends on the host system where the “device data” directory is localized. Sub-directories are organized in the following form:

```
ManufacturerID
        |
    DeviceType
        |
    DeviceRevDDRev.FFO
    DeviceRevDDRev.SYM
    DeviceRevDDRevCFFRev.CFF
```

ManufacturerID = 385884 (hexadecimal)
DeviceType = 2401 (hexadecimal) for SRD991 or 2481 (hexadecimal) for SRD960
DeviceRev = 10
DDRev = 01
CFFRev = 01

After installing the SRD9xx device description files the directory structure is as follows:

```
<DEVICE_DATA>
    |
    385884
        |
        2401
        |   |
        |   1001.FFO
        |   1001.SYM
        |   100101.CFF
        |
        2481
            |
            1001.FFO
            1001.SYM
            100101.CFF
```

Please note that even if the file names are identical for device types 2401 and 2481, their content is different.

Because the SRD9xx complies with Interoperability Test Kit Version 4.6, please verify that the standard text dictionary file STANDARD.DCT has at least version 1.32. Older versions cannot read the resource block descriptions correctly.

You can download the latest device description files from our website

http://www.foxboro-eckardt.de/products/srd991_en.html or
http://www.foxboro-eckardt.de/products/srd960_en.html.

2.2 Integration into AMS Device Manager and DeltaV DCS

AMS Device Manager and DeltaV DCS of Emerson Process Systems use in addition to the DD windows resource files to help users configure, manage calibrations and monitor devices. They provide access to Resource and Transducer blocks. SRD991 and SRD960 are fully integrated into these systems.

You can download a complete set of necessary files from our website

http://www.foxboro-eckardt.de/products/srd991_en.html or
http://www.foxboro-eckardt.de/products/srd960_en.html.

2.3 Commissioning

Before beginning the initial setup, the positioner should be correctly mounted and electrically ready for operation as described in MI EVE0105 A-(en). **The safety regulations must be observed, as described in MI EVE0105 A-(en) in Chap. 10!**

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

During first commissioning an Autostart must be performed. For the automatic determination of the operation range perform a Short Autostart (EXAMINE ENDPOINTS) only. For an automatic determination of the operation range and the control parameters four different types of AUTOSTART procedure can be selected:

Standard	medium response time, slight overshoot allowed, up to 3 iterations for calculating control parameters
Enhanced	medium response time, slight overshoot allowed, up to 10 iterations for calculating control parameters
Smooth	slower response time without overshoot
Fast	fast response time with overshoot probability

Before initiating an AUTOSTART, at least the following AO Transducer Block parameters have to be set to their correct values:

Table 4: Preset Parameters for Autostart

Parameter Label	Parameter Name	Description
VALVE_ACT	Actuator Type	1 = single-acting 2 = double-acting
POSITION_LINEARIZATION	Position linearization	2 = linear actuator (sliding stem), left mounted 3 = rotary actuator, opening counterclockwise 6 = linear actuator (sliding stem), right mounted 7 = rotary actuator, opening clockwise

The manufacturer has set VALVE_ACT to its correct value, POSITION_LINEARIZATION is set to 2 by default, which means linear actuator (sliding stem), left mounted.

Changing these values can be done by means of local keys as described in MI EVE0105 A-(en) or by using a configuration tool (for example NI-FBUS-Configurator System) or by a host system using FF communication protocol and write the desired values to these parameters, which are located in the AO Transducer Block.

During first commissioning the user-specific data must be entered. These are described in chapters 4 and 5 later in this manual. If no entry is made, the default parameters are retained.

Note

The Resource Block Mode must be OUT OF SERVICE before executing an AUTOSTART.

CAUTION

This function automatically opens and closes the valve. Isolate the device from the process before initiating this procedure. In case of performing an AUTOSTART previous control parameters will be overridden!

Initiating an Autostart can be done in three different ways:

- By means of local keys as described in MI EVE0105 A-(en);
- Using a configuration tool and write to parameter SELF_CAL_CMD in the APV Transducer Block. In case of SHORT AUTOSTART the value to be written is 3, in case of AUTOSTART the following values are available:

  2 Standard Type
  4 Smooth Type
  5 Fast Type
  6 Enhanced Type

- Use the provided AO Transducer methods PERFORM_AUTOSTART and PERFORM_SHORT_AUTOSTART. Refer to chapter 4.1 for details.

You can monitor the state of the procedure by watching the LED/LCD on the device or look at the value of the parameter STAT_AUTOINIT in the APV Transducer Block. Flashing of LED is described in MI EVE0105 A-(en). If you have initiated an Autostart with a method, a new window will be opened and you will get information about the course of it.

The following values are defined for parameter STAT_AUTOINIT:

0x10 to 0x11	finding end positions
0x20 to 0x2F	calculating I/P-converter parameters
0x30 to 0x3F	calculating control parameters (Standard, Smooth and Fast Autostart only)
0x40 to 0x42	measuring travel time (Standard, Smooth and Fast Autostart only)
0x01	Autostart error

When the value of the parameter STAT_AUTOINIT is set to ZERO again the Autostart is completed.

Note

The Autostart procedure may take several minutes.

After performing a SHORT AUTOSTART, or if the AUTOSTART procedure is aborted prematurely after determining the operating range, the control parameters must be determined and entered manually. Please refer to the Control Parameters section 4.3 for details.

The Autostart function will change the values of the following parameters:

POS_ENDPOINT_LOW, POS_ENDPOINT_HIGH,
ACT_STROKE_TIME_INC, ACT_STROKE_TIME_DEC,
ADC_GAIN, MOTOR_PAR, SPRING_ACT,
STAT_AUTOINIT,
SERVO_GAIN, SERVO_RATE, SERVO_RESET,
SERVO_GAIN2, SERVO_RATE2, SERVO_RESET2.

Please refer to chapter 5 (Configuration Procedure using a Fieldbus Host) for configuration details, if you use a National Instruments configuration system tool.

3 DATA STRUCTURES

The intelligent positioner SRD991/SRD960 has an internal database with data accessable via parameter numbers, parameter names or device description items. The data belong to the user application Virtual Field Device. They are according to FOUNDATIONfieldbus standard function blocks (Resource, Analog Output, PID, Discrete Input, Discrete Output Block) with additional manufacturer specific extensions and FOUNDATIONfieldbus transducer block called Standard Advanced Positioner Valve Basic Device Access with additional manufacturer specific extensions and manufacturer specific Discrete Input and Output Transducer Blocks. All in it is called the Object Dictionary Directory Object.

Table 5: Object Dictionary Directory Object

Index	Relative Index	Parameter Label	Parameter Name
000	-	-	Object Dictionary Object Description
001..255	-	-	Data types and data structures defined by Foundationfieldbus
256..263	-	-	Data structures defined by the manufacturer
298	-	-	Application Process Directory Header
Resource Block			
Standard Parameters			
300	0	BLK_DATA	Resource Block Object
301	1	ST_REV	Static Revision
302	2	TAG_DESC	Tag Description
303	3	STRATEGY	Strategy
304	4	ALERT_KEY	Alert Key
305	5	MODE_BLK	Resource Block Modes
306	6	BLOCK_ERR	Block Error
307	7	RS_STATE	Resource State
308	8	TEST_RW	Read/Write Test Structure
309	9	DD_RESOURCE	Device Description Resource
310	10	MANUFAC_ID	Manufacturer Identification Number
311	11	DEV_TYPE	Device Type
312	12	DEV_REV	Device Revision
313	13	DD_REV	Device Description Revision
314	14	GRANT_DENY	Grant/Deny Permission
315	15	HARD_TYPES	Hardware Type
316	16	RESTART	Restart
317	17	FEATURES	Features
318	18	FEATURES_SEL	Selected Features
319	19	CYCLE_TYPE	Cycle Types
320	20	CYCLE_SEL	Selected Cycle Type
321	21	MIN_CYCLE_T	Minimum Cycle Time
322	22	MEMORY_SIZE	Memory Size
323	23	NV_CYCLE_T	Minimum Non-volatile Cycle Time

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Index	Relative Index	Parameter Label	Parameter Name
324	24	FREE_SPACE	Free Space
325	25	FREE_TIME	Free Time
326	26	SHED_RCAS	Shedding RCAS Timeout
327	27	SHED_ROUT	Shedding ROUT Timeout
328	28	FAULT_STATE	Fault State
329	29	SET_FSTATE	Set Fault State
330	30	CLR_FSTATE	Clear Fault State
331	31	MAX_NOTIFY	Maximum Notify Messages
332	32	LIM_NOTIFY	Maximum Alert Messages
333	33	CONFIRM_TIME	Confirmation Time
334	34	WRITE_LOCK	Write Lock
335	35	UPDATE_EVT	Update Event
336	36	BLOCK_ALM	Block Alarm
337	37	ALARM_SUM	Alarm Summary
338	38	ACK_OPTION	Alarm Acknowledge Option
339	39	WRITE_PRI	Write Priority
340	40	WRITE_ALM	Write Lock Alarm
341	41	ITK_VER	ITK Version
Manufacturer Specific Resource Block Parameters			
342	42	TARGET_ERROR	Resource Target Error
343	43	DIAGNOSIS	Diagnosis Array
344	44	RESET_HIST_STATUS	Reset historical status in Diagnosis
345	45	SOFTWARE_REVISION	Software Revision
346	46	HARDWARE_REVISION	Hardware Revision
347	47	DEVICE_SER_NUM	Device Serial Number
348	48	MODELCODE	Model Code
349	49	DEVICE_OPTIONS	Device Options
350	50	LOCAL_OP_ENA_	Local Operation Enable
351	51	MESSAGE_1	Message 1
352	53	MESSAGE_2	Message 2
353	53	MESSAGE_3	Message 3
354	54	MESSAGE_4	Message 4
355	55	MESSAGE_5	Message 5
356	56	ECEP_NR	ECEP number
357	57	SERIAL_NUMBER	Serial number of electronics board
358	58	DATE_OF_MANUFACTURE	Date of manufacture of electronics board
359	59	TAG_NAME	Tag Name
360	60	DEVICE_NAME	Device Name
361	61	LOCATION	Geographic Location
362	62	LCD_CONFIG	LCD Configuration
363	63	SUB_TYPE	Sub Type
364	64	SET_MENU_TEXT	Set Menu Text
365	65	MENU_ID	Menu ID
366	66	BININ_CFG_TEXT	Binary Input Config Text
367	67	CYCLE_COUNT	Cycle Counter
368	68	CYCLE_COUNT_LIMIT	Cycle Count Limit
369	69	TRAVEL_SUM	Travel Sum
370	70	TRAVEL_SUM_LIMIT	Travel Sum Limit
371	71	TRAVEL_SUM_DEADBAND	Travel Sum Dead-band
372	72	RESET_CYCL_TRVL_CNT	Reset Cycle/Travel Counter
373	73	POS_VALVE_HIHI_ALARM	Valve Position High High Alarm Value
374	74	POS_VALVE_HI_ALARM	Valve Position High Alarm Value

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Index	Relative Index	Parameter Label	Parameter Name
375	75	POS_VALVE_LO_ALARM	Valve Position Low Alarm Value
376	76	POS_VALVE_LOLO_ALARM	Valve Position Low Low Alarm Value
377	77	ALARM_HYSTERESIS	Alarm Hysteresis
378	78	ACT_TIME_IN_OPERATION	Actual time in Operation
379	79	TIME_SINCE_LAST_SERVICE	Time since Last Service
380	80	SERVICE_REMINDER_AFTER	Service Reminder After
381	81	VALVE_DIAG_STATUS	Valve Diagnosis Status
382	82	RST_VALVE_DIAG_STAT	Reset Valve Diagnosis Status
383	83	MIN_MEAS_TEMP	Minimal Measured Temperature
384	84	MAX_MEAS_TEMP	Maximal Measured Temperature
385	85	RESPONSE_STATUS	Response Status
386	86	LOAD_FACTOR	Load Factor
387	87	LOAD_FACTOR_MIN	Minimum Load Factor
388	88	LOAD_FACTOR_MAX	Maximum Load Factor
389	89	LOAD_FACTOR_LOWER_LMT	Load Factor Lower Limit
390	90	LOAD_FACTOR_UPPER_LMT	Load Factor Upper Limit
391	91	LOAD_FACTOR_AVG	Load Factor Average
392	92	LOAD_FACTOR_REF_AVG	Load Factor Average Reference
393	93	LOAD_FACTOR_REF_TIM	Load Factor Reference Time
394	94	SET_LOAD_FACTOR_REF	Set Load Factor Reference
395	95	LOAD_FACTOR_DAYS_HIST	Load Factor Days History
396	96	LOAD_FACTOR_MONTHS_HIST	Load Factor Months History
397	97	SPRING_RANGE_LOWER_VAL	Spring Lower Range Value
398	98	SPRING_RANGE_UPPER_VAL	Spring Upper Range Value
399	99	SPRING_RANGE_UNIT	Spring Range Unit
400	100	TIME_SCALE_MIN_HIST	Time Scale Minute History
401	101	TIME_SCALE_HRS_HIST	Time Scale Hours History
402	102	TIME_SCALE_DAYS_HIST	Time Scale Days History
403	103	TIME_SCALE_MONTHS_HIST	Time Scale Months History
404	104	POS_MIN_HIST	Position Minutes History
405	105	POS_HRS_HIST	Position Hours History
406	106	POS_DAYS_HIST	Position Days History
407	107	POS_MONTHS_HIST	Position Months History
408	108	RSP_MIN_HIST	Response Minutes History
409	109	RSP_HRS_HIST	Response Hours History
410	110	RSP_DAYS_HIST	Response Days History
411	111	RSP_MONTHS_HIST	Response Months History
412	112	PST_CONFIG	Partial Stroke Test Configuration
413	113	PST_STATUS	Partial Stroke Test Status
414	114	PST_TIME_INTERVAL	Partial Stroke Test Time Interval
415	115	PST_SP_CHANGE	Partial Stroke Test Setpoint Change
416	116	PST_DURATION	Partial Stroke Test Duration
417	117	PST_COMMAND	Partial Stroke Test Command
418..419	-	Unused/reserved	-
Analog Output Block			
Standard Parameters			
420	0	BLK_DATA	Analog Output Block Object
421	1	ST_REV	Static Revision
422	2	TAG_DESC	Tag Description
423	3	STRATEGY	Strategy
424	4	ALERT_KEY	Alert Key

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Index	Relative Index	Parameter Label	Parameter Name
425	5	MODE_BLK	Resource Block Modes
426	6	BLOCK_ERR	Block Error
427	7	PV	Process Variable
428	8	SP	Analog Setpoint
429	9	OUT	Primary Output Value
430	10	SIMULATE	Simulate
431	11	PV_SCALE	Process Variable Scaling
432	12	XD_SCALE	READBACK/OUT Scaling
433	13	GRANT_DENY	Grant/Deny Permission
434	14	IO_OPTS	I/O Options
435	15	STATUS_OPTS	Status Options
436	16	READBACK	Readback
437	17	CAS_IN	Cascaded Input
438	18	SP_RATE_DN	Setpoint Rate Down
439	19	SP_RATE_UP	Setpoint Rate Up
440	20	SP_HI_LIM	Setpoint High Limit
441	21	SP_LO_LIM	Setpoint Low Limit
442	22	CHANNEL	Channel Number
443	23	FSTATE_TIME	Fault State Time
444	24	FSTATE_VAL	Fault State Value
445	25	BKCAL_OUT	Back Calculation Out
446	26	RCAS_IN	Remote Cascaded Input
447	27	SHED_OPT	Shedding Options
448	28	RCAS_OUT	Remote Cascaded Output
449	29	UPDATE_EVT	Update Event
450	30	BLOCK_ALM	Block Alarm
451..459	-	Unused/reserved	-
AO Transducer Block (Standard Advanced Positioner Valve Basic Access)			
Standard Parameters			
460	0	BLK_DATA	Transducer Block Object
461	1	ST_REV	Static Revision
462	2	TAG_DESC	Tag description
463	3	STRATEGY	Strategy
464	4	ALERT_KEY	Alert Key
465	5	MODE_BLK	Resource Block Modes
466	6	BLOCK_ERR	Block Error
467	7	UPDATE_EVT	Update Event
468	8	BLOCK_ALM	Block Alarm
469	9	TRANSDUCER_DIRECTORY	Transducer Directory
470	10	TRANSDUCER_TYPE	Transducer Type
471	11	XD_ERROR	Transducer Error
472	12	COLLECTION_DIRECTORY	Collection Directory
473	13	FINAL_VALUE	Final Value
474	14	FINAL_VALUE_RANGE	Final Value Range
475	15	FINAL_VALUE_CUTOFF_HI	Final Value Cutoff High
476	16	FINAL_VALUE_CUTOFF_LO	Final Value Cutoff Low
477	17	FINAL_POSITION_VALUE	Final Position Value
478	18	SERVO_GAIN	Servo Gain
479	19	SERVO_RESET	Servo Reset
480	20	SERVO_RATE	Servo Rate

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Index	Relative Index	Parameter Label	Parameter Name
481	21	ACT_FAIL_ACTION	Actuator Failure Action
482	22	ACT_MAN_ID	Actuator Manufacturer Identification Number
483	23	ACT_MODEL_NUM	Actuator Model Number
484	24	ACT_SN	Actuator Serial Number
485	25	VALVE_MAN_ID	Valve Manufacturer Identification Number
486	26	VALVE_MODEL_NUM	Valve Model Number
487	27	VALVE_SN	Valve Serial Number
488	28	VALVE_TYPE	Valve Type
489	29	XD_CAL_LOC	Device Calibration Location
490	30	XD_CAL_DATE	Device Calibration Date
491	31	XD_CAL_WHO	Device Calibration Person
Manufacturer Specific Transducer Block Parameters			
492	32	TARGET_ERROR	Transducer Target Error
493	33	INST_MODE	Instrument Mode
494	34	ACT_TYPE	Actuator Type
495	35	AMPL_TYPE	Amplifier Type
496	36	POSITION_LINEARIZATION	Position Linearization
497	37	LINEARIZATION_TYPE	Linearization Type
498	38	SELF_CALIB_CMD	Self-Calibration Command
499	39	STAT_AUTOINIT	Status Auto Initialization
500	40	CONTROL_ALGORITHM	Control Algorithm
501	41	SERVO_GAIN2	Servo Gain 2
502	42	SERVO_RESET2	Servo Reset 2
503	43	SERVO_RATE2	Servo Rate 2
504	44	CONTROL_GAP	Control Gap
505	45	TRAV_INC_LIM	Travel Rate Increasing Limit Time
506	46	TRAV_DEC_LIM	Travel Rate Decreasing Limit Time
507	47	CONTROL_DIFFERENCE	Control Difference
508	48	CONTROL_DIFF_LIMIT	Control Difference Limit
509	49	CONTROL_DIFF_TIME	Control Difference Time
510	50	VALVE_UPPER_LIM	Valve Upper Limit
511	51	VALVE_LOWER_LIM	Valve Lower Limit
512	52	CUTOFF_HYSTERESIS	Cutoff Hysteresis
513	53	ELECTRONICS_TEMP	Electronics Temperature
514	54	ELECTRONICS_TEMP_UNITS	Electronics Temperature Units
515	55	ELECTRONICS_TEMP_LL	Electronics Temperature Lower Limit
516	56	ELECTRONICS_TEMP_UL	Electronics Temperature Upper Limit
517	57	LOW_PRESSURE_LIMIT	Air Supply Pressure Lower Limit
518	58	AIR_SUPPLY	Air Supply Value
519	59	STEM_SETPOINT	Stem Setpoint
520	60	TRAVEL_POS	Travel Position
521	61	TRAVEL_POS_UNITS	Travel Position Units
522	62	TRAVEL_SPAN	Travel Span
523	63	POS_ENDPOINT_LOW	Lower Position Endpoint
524	64	POS_ENDPOINT_HIGH	Upper Position Endpoint
525	65	SPRING_ACT	Actuator Spring Effect
526	66	MOTOR_PAR	I/P-Motor Parameter
527	67	ADC_GAIN	A/D-Converter Gain
528	68	ACT_STROKE_TIME_DEC	Decreasing Actuator Stroke Time
529	69	ACT_STROKE_TIME_INC	Increasing Actuator Stroke Time
530	70	ANALOG_OUTPUT	Analog Output Value

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Index	Relative Index	Parameter Label	Parameter Name
531	71	CAL_ANALOG_FEEDBACK	Calibrate Analog Feedback Output
532	72	INPUT_CURRENT	Input Current Consumption
533	73	FX_CMD	Factory Command
534	74	FX_RSP	Factory Response
535	75	T_ENTRY	Table entry
536	76	T_MIN_NR	Table Minimum Number
537	77	T_MAX_NR	Table Maximum Number
538	78	T_ACT_NR	Table Actual Number
539	79	T_OPCODE	Table Operation Code
540	80	T_STAT	Table Status
541	81	T_VAL_0	Table Variate pair 0
542	82	T_VAL_1	Table Variate pair 1
543	83	T_VAL_2	Table Variate pair 2
544	84	T_VAL_3	Table Variate pair 3
545	85	T_VAL_4	Table Variate pair 4
546	86	T_VAL_5	Table Variate pair 5
547	87	T_VAL_6	Table Variate pair 6
548	88	T_VAL_7	Table Variate pair 7
549	89	T_VAL_8	Table Variate pair 8
550	90	T_VAL_9	Table Variate pair 9
551	91	T_VAL_10	Table Variate pair 10
552	92	T_VAL_11	Table Variate pair 11
553	93	T_VAL_12	Table Variate pair 12
554	94	T_VAL_13	Table Variate pair 13
555	95	T_VAL_14	Table Variate pair 14
556	96	T_VAL_15	Table Variate pair 15
557	97	T_VAL_16	Table Variate pair 16
558	98	T_VAL_17	Table Variate pair 17
559	99	T_VAL_18	Table Variate pair 18
560	100	T_VAL_19	Table Variate pair 19
561	101	T_VAL_20	Table Variate pair 20
562	102	T_VAL_21	Table Variate pair 21
563	103	BININ_CONFIG	Binary Input Configuration
564	104	BININ_STAT	Binary Input Status
565	105	BINOUT1_CONFIG	Binary Output Channel 1 Configuration
566	106	BINOUT2_CONFIG	Binary Output Channel 2 Configuration
567	107	ALARM_LINK	Alarm Link
568	108	SENSOR1_VALUE	Pressure Sensor 1 Value
569	109	SENSOR1_UNITS	Sensor 1 Engineering Units
570	110	SENSOR2_VALUE	Pressure Sensor 2 Value
571	111	SENSOR2_UNITS	Sensor 2 Engineering Units
572	112	SENSOR3_VALUE	Pressure Sensor 3 Value
573	113	SENSOR3_UNITS	Sensor 3 Engineering Units
574..579	-	Unused/reserved	-
PID Block			
Standard Parameters			
580	0	BLK_DATA	PID Block Object
581	1	ST_REV	Static Revision
582	2	TAG_DESC	Tag Description
583	3	STRATEGY	Strategy
584	4	ALERT_KEY	Alert Key

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Index	Relative Index	Parameter Label	Parameter Name
585	5	MODE_BLK	Resource Block Modes
586	6	BLOCK_ERR	Block Error
587	7	PV	Process Variable Value and Status
588	8	SP	Setpoint Value and Status
589	9	OUT	OUT Value and Status
590	10	PV_SCALE	Process Variable Scaling
591	11	OUT_SCALE	OUT Scaling
592	12	GRANT_DENY	Grant/Deny Permission
593	13	CONTROL_OPTS	Control Options
594	14	STATUS_OPTS	Status Options
595	15	IN	Primary Input Value and Status
596	16	PV_FTIME	PV Filter Time Constant
597	17	BYPASS	Bypass normal algorithm
598	18	CAS_IN	Cascade Input
599	19	SP_RATE_DN	Setpoint Rate Up
600	20	SP_RATE_UP	Setpoint Rate Down
601	21	SP_HI_LIM	Setpoint High Limit
602	22	SP_LO_LIM	Setpoint Low Limit
603	23	GAIN	Gain (P)
604	24	RESET	Reset (integral time constant I)
605	25	BAL_TIME	Balance Time
606	26	RATE	Rate (derivative time constant D)
607	27	BK_CAL_IN	Back Calculation Input
608	28	OUT_HI_LIM	Output High Limit
609	29	OUT_LO_LIM	Output Low Limit
610	30	BKCAL_HYS	Back Calculation Hysteresis
611	31	BKCAL_OUT	Back Calculation Output
612	32	RCAS_IN	Remote Cascade Input
613	33	ROUT_IN	ROUT Mode Input
614	34	SHED_OPT	Shedding Options
615	35	RCAS_OUT	Remote Cascade Output
616	36	ROUT_OUT	ROUT Mode Output
617	37	TRK_SCALE	Track Scaling
618	38	TRK_IN	Tack Input
619	39	TRK_VAL	Track Value
620	40	FF_VAL	Feed Forward Value
621	41	FF_SCALE	Feed Forward Scaling
622	42	FF_GAIN	Feed Forward Gain
623	43	UPDATE_EVT	Update Event
624	44	BLOCK_ALM	Block Alarm
625	45	ALARM_SUM	Alarm Summary
626	46	ACK_OPTION	Acknowledge Options
627	47	ALARM_HYS	Alarm Hysteresis
628	48	HI_HI_PRI	High High Alarm Priority
629	49	HI_HI_LIM	High High Alarm Limit
630	50	HI_PRI	High Alarm Priority
631	51	HI_LIM	High Alarm Limit
632	52	LO_PRI	Low Alarm Priority
633	53	LO_LIM	Low Alarm Limit
634	54	LO_LO_PRI	Low Low Alarm Priority
635	55	LO_LO_LIM	Low Low Alarm Limit

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Index	Relative Index	Parameter Label	Parameter Name
636	56	DV_HI_PRI	Deviation High Alarm Priority
637	57	DV_HI_LIM	Deviation High Alarm Limit
638	58	DV_LO_PRI	Deviation Low Alarm Priority
639	59	DV_LO_LIM	Deviation Low Alarm Limit
640	60	HI_HI_ALM	High High Alarm
641	61	HI_ALM	High Alarm
642	62	LO_ALM	Low Alarm
643	63	LO_LO_ALM	Low Low Alarm
644	64	DV_HI_ALM	Deviation High Alarm
645	65	DV_LO_ALM	Deviation Low Alarm
646..649		Unused/reserved	
DI Block 1			
Standard Parameters			
650	0	BLK_DATA	DI Block Object
651	1	ST_REV	Static Revision
652	2	TAG_DESC	Tag Description
653	3	STRATEGY	Strategy
654	4	ALERT_KEY	Alert Key
655	5	MODE_BLK	Resource Block Modes
656	6	BLOCK_ERR	Block Error
657	7	PV_D	Process Value Discrete
658	8	OUT_D	Output Value Discrete
659	9	SIMULATE_D	Simulate Discrete
660	10	XD_STATE	Transducer State Index
661	11	OUT_STATE	Output State
662	12	GRANT_DENY	Grant Deny
663	13	IO_OPTS	IO Options
664	14	STATUS_OPTS	Status Options
665	15	CHANNEL	Channel
666	16	PV_FTIME	Process Value Filter Time
667	17	FIELD_VAL_D	Field Value Discrete
668	18	UPDATE_EVT	Update Event
669	19	BLOCK_ALM	Block Alarm
670	20	ALARM_SUM	Alarm Summary
671	21	ACK_OPTION	Acknowledge Alarm
672	22	DISC_PRI	Discrete Priority
673	23	DISC_LIM	Discrete Limit
674	24	DISC_ALM	Discrete Alarm
675..679		Unused/reserved	
DI Block 2			
Standard Parameters			
680	0	BLK_DATA	DI Block Object
681	1	ST_REV	Static Revision
682	2	TAG_DESC	Tag Description
683	3	STRATEGY	Strategy
684	4	ALERT_KEY	Alert Key
685	5	MODE_BLK	Resource Block Modes
686	6	BLOCK_ERR	Block Error
687	7	PV_D	Process Value Discrete
688	8	OUT_D	Output Value Discrete
689	9	SIMULATE_D	Simulate Discrete

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Index	Relative Index	Parameter Label	Parameter Name
690	10	XD_STATE	Transducer State Index
691	11	OUT_STATE	Output State Index
692	12	GRANT_DENY	Grant Deny
693	13	IO_OPTS	IO Options
694	14	STATUS_OPTS	Status Options
695	15	CHANNEL	Channel
696	16	PV_FTIME	Process Value Filter Time
697	17	FIELD_VAL_D	Field Value Discrete
698	18	UPDATE_EVT	Update Event
699	19	BLOCK_ALM	Block Alarm
700	20	ALARM_SUM	Alarm Summary
701	21	ACK_OPTION	Acknowledge Alarm
702	22	DISC_PRI	Discrete Priority
703	23	DISC_LIM	Discrete Limit
704	24	DISC_ALM	Discrete Alarm
705..709		Unused/reserved	
DO Block			
Standard Parameters			
710	0	BLK_DATA	DO Block Object
711	1	ST_REV	Static Revision
712	2	TAG_DESC	Tag Description
713	3	STRATEGY	Strategy
714	4	ALERT_KEY	Alert Key
715	5	MODE_BLK	Resource Block Modes
716	6	BLOCK_ERR	Block Error
717	7	PV_D	Process Value Discrete
718	8	SP_D	Setpoint Discrete
719	9	OUT_D	Output Value Discrete
720	10	SIMULATE_D	Simulate Discrete
721	11	PV_STATE	Process Value State Index
722	12	XD_STATE	Transducer State Index
723	13	GRANT_DENY	Grant Deny
724	14	IO_OPTS	IO Options
725	15	STATUS_OPTS	Status Options
726	16	READBACK_D	Readback Discrete
727	17	CAS_IN_D	Cascade Input Discrete
728	18	CHANNEL	Channel
729	19	FSTATE_TIME	Fault State Time
730	20	FSTATE_VAL_D	Fault State Value Discrete
731	21	BKCAL_OUT_D	Back Calculate Output Discrete
732	22	RCAS_IN_D	Remote Cascade Input Discrete
733	23	SHED_OPT	Shedding Options
734	24	RCAS_OUT_D	Remote Cascade Output Discrete
735	25	UPDATE_EVT	Update Event
736	26	BLOCK_ALM	Block Alarm
737..739		Unused/reserved	
DI Transducer Block			
Standard Parameters			
740	0	BLK_DATA	DI Block Object
741	1	ST_REV	Static Revision
742	2	TAG_DESC	Tag Description

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Index	Relative Index	Parameter Label	Parameter Name
743	3	STRATEGY	Strategy
744	4	ALERT_KEY	Alert Key
745	5	MODE_BLK	Resource Block Modes
746	6	BLOCK_ERR	Block Error
747	7	UPDATE_EVT	Update Event
748	8	BLOCK_ALM	Block Alarm
749	9	TRANSDUCER_DIRECTORY	Transducer Directory
750	10	TRANSDUCER TYPE	Transducer Type
751	11	XD_ERROR	Transducer Error
752	12	COLLECTION_DIRECTORY	Collection Directory
753	13	PRIMARY_VALUE_D	Primary Value Discrete
754	14	CONFIG_DI1	Configuration Discrete Input 1
755	15	ALARM_DI1	Alarm Discrete Input 1
756	16	CONFIG_DI2	Configuration Discrete Input 2
757	17	ALARM_DI2	Alarm Discrete Input 2
758	18	TARGET_ERROR	TARGET_ERROR for DI Transducer
759..774		Unused/reserved	
DO Transducer Block			
Standard Parameters			
775	0	BLK_DATA	DI Block Object
776	1	ST_REV	Static Revision
777	2	TAG_DESC	Tag Description
778	3	STRATEGY	Strategy
779	4	ALERT_KEY	Alert Key
780	5	MODE_BLK	Resource Block Modes
781	6	BLOCK_ERR	Block Error
782	7	UPDATE_EVT	Update Event
783	8	BLOCK_ALM	Block Alarm
784	9	TRANSDUCER_DIRECTORY	Transducer Directory
785	10	TRANSDUCER TYPE	Transducer Type
786	11	XD_ERROR	Transducer Error
787	12	COLLECTION_DIRECTORY	Collection Directory
788	13	FINAL_POSITION_VALUE	Final Position Value
789	14	FINAL_VALUE_D	Final Value Discrete
790	15	CONFIG_DO	TDO Configuration
791	16	RB_LOWER_THRESHOLD	Readback Lower Threshold
792	17	RB_UPPER_THRESHOLD	Readback Upper Threshold
793	18	TARGET_ERROR	TARGET_ERROR for DO Transducer
794..799		Unused/reserved	
Link Objects			
Standard Parameters			
800..821	-	FB_LINK01..FB_LINK22	Function Block Link Objects 1 to 22
Alert Objects			
Standard Parameters			
830	-	ALERT_FLT01	Float Alert Object
831	-	ALERT_DSC01	Discrete Alert Object
832	-	ALERT_EVT01	Update Event Alert Object
833..839	-	Unused/reserved	-

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Index	Relative Index	Parameter Label	Parameter Name
Trend Objects			
Standard Parameters			
840..849	-	TREND_FLT01..10	Float Trend Object 1..10
850..855	-	TREND_DSC01.. TREND_DSC06	Discrete Trend Object 1..6
856..889	-	Unused/reserved	
View Objects			
Standard Parameters			
890	-	VIEW_1	Resource Block View 1
891	-	VIEW_2	Resource Block View 2
892	-	VIEW_3	First Resource Block View 3
893	-	VIEW_3	Second Resource Block View 3
894	-	VIEW_3	Third Resource Block View 3
895	-	VIEW_3	Forth Resource Block View 3
896	-	VIEW_4	First Resource Block View 4
897	-	VIEW_4	Second Resource Block View 4
898	-	VIEW_4	Third Resource Block View 4
899	-	Unused/reserved	-
900	-	VIEW_1	Analog Output Block View 1
901	-	VIEW_2	Analog Output Block View 2
902	-	VIEW_3	Analog Output Block View 3
903	-	VIEW_4	Analog Output Block View 4
904..909	-	Unused/reserved	-
910	-	VIEW_1	AO Transducer Block View 1
911	-	VIEW_2	AO Transducer Block View 2
912	-	VIEW_3	First AO Transducer Block View 3
913	-	VIEW_3	Second AO Transducer Block View 3
914	-	VIEW_3	Third AO Transducer Block View 3
915	-	VIEW_4	First AO Transducer Block View 4
916	-	VIEW_4	Second AO Transducer Block View 4
917	-	VIEW_4	Third AO Transducer Block View 4
918	-	VIEW_4	Forth AO Transducer Block View 4
919	-	VIEW_4	Fifth AO Transducer Block View 4
920	-	VIEW_4	Sixth AO Transducer Block View 4
921	-	VIEW_4	Seventh AO Transducer Block View 4
922..929	-	Unused/reserved	-
930	-	VIEW_1	PID Block View 1
931	-	VIEW_2	PID Block View 2
932	-	VIEW_3	PID Block View 3
933	-	VIEW_4	PID Block View 4
936..939	-	Unused/reserved	-
940	-	VIEW_1	DI1 Block View 1
941	-	VIEW_2	DI1 Block View 2
942	-	VIEW_3	DI1 Block View 3
943	-	VIEW_4	DI1 Block View 4
944..949	-	Unused/reserved	-
950	-	VIEW_1	DI2 Block View 1
951	-	VIEW_2	DI2 Block View 2
952	-	VIEW_3	DI2 Block View 3
953	-	VIEW_4	Di2 Block View 4
954..959	-	Unused/reserved	-

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Index	Relative Index	Parameter Label	Parameter Name
960	-	VIEW_1	DO Block View 1
961	-	VIEW_2	DO Block View 2
962	-	VIEW_3	DO Block View 3
963	-	VIEW_4	DO Block View 4
964..969	-	Unused/reserved	-
970	-	VIEW_1	DI Transducer Block View 1
971	-	VIEW_2	DI Transducer Block View 2
972	-	VIEW_3	DI Transducer Block View 3
973	-	VIEW_4	DI Transducer Block View 4
974..979	-	Unused/reserved	-
980	-	VIEW_1	DO Transducer Block View 1
981	-	VIEW_2	DO Transducer Block View 2
982	-	VIEW_3	DO Transducer Block View 3
983	-	VIEW_4	DO Transducer Block View 4

3.1 Parameter Description

Table Legend:

Store: S: Static. The parameter is stored non-volatile in EEPROM. Changing of the parameter increases the static revision counter.
N: Non-volatile parameter stored in EEPROM. Changing of the parameter does not increase the static revision counter.
D: Dynamic. The parameter is dynamic and is calculated or changed by the block. It is stored in RAM only.

Access: ro Read only
rw Read- and writable

Table 6: Parameter Description

Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
Resource Block						
ACK_OPTION	Selection of alarms which will be automatically acknowledged	300	39	S / rw	Bit String; Set Bit 0: writes have been disabled 7: Block alarm	0
ACT_TIME_IN_OPERATION	Actual time in operation (lifetime counter)	378	79	S / ro	Unsigned32: 0 to 0xFFFFFFFF unit: 0.1h (6 minutes)	0
ALARM_HYSTERESIS	Hysteresis for the parameters: final value range and position limits in percent	428	49	S / rw	Float: Positive	1.0
ALARM_SUM	Current alert status	299	38	SD / rw	DS-74 data structure: current alarms, unacknowledged, unreported, disabled Set Bit 0: writes have been disabled 7: Block alarm	0,0,0,0 Zero (0) state indicates alarm clear, acknowledged, reported, enabled

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	304	5	S / rw	Unsigned8: 1 to 255	0
BININ_CFG_TEXT	Configurable text which will be indicated for an optional active binary input status in the diagnosis method	366	67	S / rw	Visible String: up to 12 characters	„Binary Input“
BLK_DATA	Resource Block Object	300	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	336	37	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLOCK_ERR	Block error(s)	306	7	D / ro	Bit String; Set Bit 0: Other (LSB) 1: Block Configuration Error 2: Link Configuration Error 3: Simulate active 4: Local Override 5: Device Fault State set 6: Device needs maintenance soon 7: Input failure / process variable has BAD status (continued on next page)	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
BLOCK_ERR (continued)					(continued from previous page) Bit String; Set Bit 8: Output failure 9: Memory failure 10: Lost static data 11: Lost NV data 12: Readback check failed 13: Device needs maintenance now 14: Power-up 15: Out-of-Service	0
CLR_FSTATE	Clear the device fault state if field condition has cleared	330	31	D / rw	Unsigned8: 1 = Off 2 = Set	0
CONFIRM_TIME	Maximum time the resource will wait for confirmation of receipt of a report before trying again	333	34	S / rw	Unsigned32: Unit 1/32 msec	640000 (20 sec.)
CYCLE_COUNT	cycle counter which counts changes in movement (up/down or right/left)	367	68	S / rw	Unsigned32: 0 to 0xFFFFFFFF	By Manufacturing
CYCLE_COUNT_LIMIT	Limit for cycle counter. When the cycle count value exceeds the limit value the CYCLE_COUNT_LIMIT status bit will be set in the DIAGNOSIS parameter.	368	69	S / rw	Unsigned32: 0 to 0xFFFFFFFF	90000000
CYCLE_TYPE	Block execution methods available	319	20	S / ro	Bit String; Set Bit 0: Scheduled (LSB) 1: completion of block execution 2: manufacturer specific	Scheduled and completion of block execution

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
CYCLE_SEL	Select block execution method	320	21	S / rw	Bit String; See CYCLE_TYPE	See CYCLE_TYPE
DATE_OF_MANUFACTURE	Manufacturing date of the electronics board	358	59	S / ro	Date; - ms (0...59 999) - min (0...59) - h (0...23, including SU in the highest bit (0 = standard time 1 = summer time)) - day of month (1...31, including day of week in upper 3 bits (1...7)) - months (1...12) - years (0..99)	By manufacturing
DD_RESOURCE	Device Description Resource	309	10	S / ro	Visible String; Up to 32 characters	Spaces
DD_REV	Device Description Revision	313	14	S / ro	Unsigned8: 0 to 255	2
DEV_TYPE	Device Type, manufacturers model number	311	12	S / ro	Unsigned16: 0 to 65535	0x2401 (SRD991) 0x2481 (SRD960)
DEV_REV	Device Revision	312	13	S / ro	Unsigned8: 0 to 255	16
DEVICE_NAME	Device Name known as letterbug in Foxboro I/A system	360	61	D / rw	Visible String: up to 6 characters	Spaces
DEVICE_OPTIONS	Configuration of additional boards, connectable to the main board (refer to chapters 4.8, 4.9 and 4.11 for details)	314	51	S / rw	Bit String: Set Bit 0: external position return 1: internal pressure sensors 2: external binary inputs 3: external binary outputs 7: external binary in-/outputs	By manufacturing

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
DEVICE_SER_NUM	Device serial number which appears on the fabrication plate	347	48	S / ro	Visible String: up to 16 characters for example: 82/230417	By manufacturing
DIAGNOSIS	Provides diagnostic information about the device	343	44	D / ro	Manuf. spec. data structure: Array of Unsigned8 See chapter 3.10	0,0,0,0,0,0
ECEP_NR	Special construction number (if applicable)	356	57	S / ro	Visible String; up to 12 characters	spaces
FEATURES	Supported resource block options	317	18	S / ro	Bit String: Set Bit 0: unicode strings (LSB) 1: reports supported 2: fault state supp. 3: soft write lock supported 4: hard write lock supported 5: output readback supported 6: direct write supported 7: change of BYPASS in an automatic mode	Reports, fault state, soft write lock and output readback supported
FEATURES_SEL	Selected resource block options	318	19	S / rw	Bit String: See FEATURES	See FEATURES
FREE_SPACE	Percent of memory available for further configuration	324	25	S / ro	Float: 0 to 100 % 0 = pre-configured device	0
FREE_TIME	Percent of processing time to process additional blocks	325	26	S / ro	Float: 0 to 100 %	0
GRANT_DENY	Options for controlling access of host systems and local control panels	314	15	D / rw	DS-70 data structure: See chapter 3.12	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
HARD_TYPES	Type of hardware available as channel numbers	315	16	S / ro	Bit String: Set Bit 0: Scalar Input (LSB) 1: Scalar Output 2: Discrete Input 3: Discrete Output	Discrete Output
HARDWARE_REVISION	Hardware revision of the device	346	47	S / ro	Visible String: Up to 16 characters, format: xx.yyy	By manufacturing (such as 03.000)
ITK_VER	Major revision number of the interoperability test facility	341	42	S / ro	Unsigned16: Set by FF	4
LCD_CONFIG	LCD configuration	362	63	S / rw	Unsigned8: 0x80 = English, default orientation 0x81 = German, default orient. 0x82 = configured language, default orientation 0x90 = English, flipped orient. 0x91 = German, flipped orient. 0x92 = configured language, flipped orientation	0x80
LIM_NOTIFY	Maximum number of unconfirmed alert notify messages	332	33	S / ro	Unsigned8: 0 to 255	8
LOAD_FACTOR	Load Factor (friction measurement), optional pressure sensors are required to measure supply and output pressure.	386	87	S / ro	Float: -1.0 to +1.0	0.0
LOAD_FACTOR_AVG	Average load factor	391	92	S / ro	Float: 0.0 to 1.0	0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
LOAD_FACTOR_DAYS_HIST	Load Factor days history: contains the actual set of load factor data depending on the configured days time scale	395	96	S / ro	Array of 7 Unsigned8 unit in percent of friction change compared to initial measurement 1 = -50 < x ≤ -100 2 = -25 < x ≤ 50 3 = -5 < x ≤ 25 4 = -5 < x ≤ 5 5 = 5 < x ≤ 25 6 = 25 < x ≤ 50 7 = 50 < x ≤ 100 refer to chapter 3.23 for details	0,0,0,0,0,0,0
LOAD_FACTOR_LOWER_LMT	LOAD_FACTOR_REF_AVG and LOAD_FACTOR_AVG are compared. If the difference reaches Load Factor Lower Limit, the corresponding status will be set in VALVE_DIAG_STATUS	389	90	S / rw	Float: -110.0 to +110.0 –110.0 = disabled	-50.0
LOAD_FACTOR_MIN	Minimal Load Factor since issuing a corresponding reset valve diagnostic command	387	88	S / ro	Float: -1.0 to +1.0	-1.0
LOAD_FACTOR_MAX	Maximal Load Factor since issuing a corresponding reset valve diagnostic command	388	89	S / ro	Float: -1.0 to +1.0	1.0
LOAD_FACTOR_MONTHS_ HIST (continued on next page)	Load factor months history: contains the actual set of load factor data depending on the configured months time scale	396	97	S / ro	Array of 7 Unsigned8 unit in percent of change of friction compared to initial measurement 1 = -50 < x ≤ -100 2 = -25 < x ≤ 50 3 = -5 < x ≤ 25 4 = -5 < x ≤ 5 (continued on next page)	0,0,0,0,0,0,0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
LOAD_FACTOR_MONTHS_HIST (continued from previous page)	Load factor months history: contains the actual set of load factor data depending on the configured months time scale	396	97	S / ro	(continued from previous page) 5 = 5 < x ≤ 25 6 = 25 < x ≤ 50 7 = 50 < x ≤ 100 refer to chapter 3.23 for details	0,0,0,0,0,0,0
LOAD_FACTOR_REF_AVG	Reference value for calculating average load factor history; will be set by a write access to parameter SET_LOAD_FACTOR_REF	392	93	S / ro	Float: 0.0 to 1.0	0.0
LOAD_FACTOR_REF_TIM	Reference time value for calculating load factor history; will be set by a write access to parameter SET_LOAD_FACTOR_REF	393	95	S / ro	Float: 0.0 to 1.0	0.0
LOAD_FACTOR_UPPER_LMT	LOAD_FACTOR_REF_AVG and LAOD_FACTOR_AVG are compared. If the difference reaches Load Factor Upper Limit, the corresponding status will be set in VALVE_DIAG_STATUS	390	91	S / ro	Float: -110.0 to +110.0 percent +110.0 = disabled	+50.0
LOCAL_OP_ENA	Local enable (lock/unlock local keys)	350	51	N / rw	Unsigned8: 1 = local keys enabled 2 = local keys disabled	1 = Enabled
LOCATION	Geographic location where the device is installed (defined by user)	361	62	D / rw	Visible String: up to 14 characters	“location”
MANUFAC_ID	Manufacturer Identification number	310	11	S / ro	Unsigned32: Controlled by FF	0x385884
MAX_NOTIFY	Maximum number of unconfirmed notify messages	331	32	S / ro	Unsigned8: 0 to 255	8

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
MEMORY_SIZE	Available configuration memory in the empty resource	322	23	S / ro	Unsigned16: Unit KBytes	0
MENU_ID	Menu ID is a key to supported languages available for local display	365	66	S / ro	Visible String: 14 characters	
MESSAGE_1	User-defined message	351	52	S / rw	Visible String: Up to 32 characters	Spaces
MESSAGE_2	User-defined message	352	53	S / rw	Visible String: Up to 32 characters	Spaces
MESSAGE_3	User-defined message	353	54	S / rw	Visible String: Up to 32 characters	Spaces
MESSAGE_4	User-defined message	354	55	S / rw	Visible String: Up to 32 characters	Spaces
MESSAGE_5	User-defined message	356	56	S / rw	Visible String: Up to 32 characters	Spaces
MAX_MEAS_TEMP	Maximal measured temperature value on the electronics board can be reset by writing to parameter RST_VALVE_DIAG_STAT	384	85	S / ro	Float: engineering unit associated with the value of ELECTRONICS_TEMP_UNITS	0.0
MIN_CYCLE_T	Shortest cycle interval of which the resource is capable	321	22	S / ro	Unsigned32: Unit 1 / 32 ms	2400 (75 msec)
MIN_MEAS_TEMP	Minimal measured temperature value on the electronics board; can be reset by writing to parameter RST_VALVE_DIAG_STAT	383	84	S / ro	Float: engineering unit associated with the value of ELECTRONICS_TEMP_UNITS	0.0
MODELCODE	Model code of the device	348	49	S / rw	Visible String: See SRD991 Product specifications	By Manufacturing (such as BQNS..)
MODE_BLK	Actual, target, permitted and normal modes of the block	305	6	SN / rw	DS-69 data structure: See chapter 1.3	OOS, OOS, OOS | MAN | AUTO, AUTO

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
NV_CYCLE_T	Minimum time interval for writing copies of non-volatile parameters to non-volatile memory	323	24	S / ro	Unsigned32: 0 to 0xFFFFFFFF 0 = it will never be automatically copied	0
POS_MIN_HISTORY	Position minutes history: contains the actual set of position data depending on the configured minutes time scale	404	105	S / ro	Array of 10 Unsigned8 Each array entry value reflects a 10 percent range	0,0,0,0,0,0,0,0,0,0
POS_HRS_HISTORY	Position hours history: contains the actual set of position data depending on the configured hours time scale	405	106	S / ro	Array of 10 Unsigned8 Each array entry value reflects a 10 percent range	0,0,0,0,0,0,0,0,0,0
POS_DAYS_HISTORY	Position days history: contains the actual set of position data depending on the configured days time scale	406	107	S / ro	Array of 10 Unsigned8 Each array entry value reflects a 10 percent range	0,0,0,0,0,0,0,0,0,0
POS_MONTHS_HISTORY	Position months history: contains the actual set of position data depending on the configured months time scale	407	108	S / ro	Array of 10 Unsigned8 Each array entry value reflects a 10 percent range	0,0,0,0,0,0,0,0,0,0
POS_VALVE_HIHI_ALARM	Defines valve position when main upper Alarm Status in DIAGNOSIS will be set	373	74	S / rw	Float: ±INF	110.0
POS_VALVE_HI_ALARM	Defines valve position when first upper Alarm Status in DIAGNOSIS will be set	374	75	S / rw	Float: ±INF	110.0
POS_VALVE_LO_ALARM	Defines valve position when first lower Alarm Status in DIAGNOSIS will be set	375	76	S / rw	Float: ±INF	-10.0
POS_VALVE_LOLO_ALARM	Defines valve position when main lower Alarm Status in DIAGNOSIS will be set	376	77	S / rw	Float: ±INF	-10.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
PST_COMMAND	Command to start a partial stroke test manually	417	118	D / rw	Unsigned8: 0 = PST not started 1 = initiate PST immediately	0
PST_CONFIG	Select operating mode for partial stroke test	412	113	S / rw	Bit String: Set Bit 0: Automatic within interval specified in PST_TIME_INTERVAL 1: Y2 Usage as output to the actuator	0
PST_DURATION	Maximal waiting time for a position change to occur within partial stroke test	416	117	S / rw	Float: 0.0 to 655.0 unit: seconds	30.0
PST_SP_CHANGE	The downward difference to the actual setpoint, which a valve should reach within the configured maximal waiting time for a position change within partial stroke test	415	116	S / rw	Float: 0.0 to 100.0 %	5 %
PST_STATUS	Status of partial stroke test	413	114	D / ro	Unsigned8: 0x00 = Not done, PST never been performed 0x01 = OK, PST successfully 0x02 = Running 0x04 = Not possible, pre-conditions not met (actual position < 99% or difference between actual SP and PST_SP_CHANGE < FV_CUTTOFF_HI 0x80 = Error refer to chapter 3.24 for details	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
PST_TIME_INTERVAL	Interval for the partial stroke test to execute in automatic mode	414	115	S / rw	Unsigned32: 0 to 0xFFFFFFFF Unit: 0.1 h = 6 minutes	240
RESET_CYCL_TRVL_CNT	Set parameter CYCLE_COUNT and TRAVEL_SUM to ZERO	372	73	D / rw	Unsigned8: 0 to 0xFF writing access performs action	0
RESET_HIST_STATUS	Clears all set markers in the historian part of parameter DIAGNOSIS	344	45	D / rw	Unsigned8	0
RST_VALVE_DIAG_STAT	Reset valve diagnosis status	382	83	D / rw	Manuf. Spec. data structure Array of Unsigned8 See chapter 3.19	0
RESPONSE_STATUS	Actual Response status	385	86	S / ro	Unsigned8 0x00 = Offline 0x01 = Steady 0x02 = Transient 0x04 = Offset 0x08 = Unstable	0
RESTART	Allows a manual restart	316	17	D / rw	Unsigned8: 1 = Run 2 = Restart resource 3 = Restart with defaults 4 = Restart processor 5 = Set configuration data to factory defaults and restart 6 = Set configuration and calibration data to factory defaults for a single-acting system and restart 7 = Set configuration and calibration data to factory defaults for a double-acting system and restart	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
RS_STATE	Resource State	307	8	D / ro	Unsigned8: 0 = Undefined 1 = Start / Restart 2 = Initialization 3 = On-line linking 4 = On-line 5 = Standby 6 = Failure	0
RSP_MIN_HIST	Response minutes history: contains the actual set of response data depending on the configured minutes time scale	408	109	S / ro	Array of 5 Unsigned8 index 0 = OFFLINE index 1 = STEADY index 2 = TRANSIENT index 3 = OFFSET index 4 = UNSTABLE	0,0,0,0,0
RSP_HRS_HIST	Response hours history: contains the actual set of response data depending on the configured hours time scale	409	110	S / ro	Array of 5 Unsigned8 index 0 = OFFLINE index 1 = STEADY index 2 = TRANSIENT index 3 = OFFSET index 4 = UNSTABLE	0,0,0,0,0,
RSP_DAYS_HIST	Response days history: contains the actual set of response data depending on the configured days time scale	410	111	S / ro	Array of 5 Unsigned8 index 0 = OFFLINE index 1 = STEADY index 2 = TRANSIENT index 3 = OFFSET index 4 = UNSTABLE	0,0,0,0,0,
RSP_MONTHS_HIST	Response months history: contains the actual set of response data depending on the configured months time scale	411	112	S / ro	Array of 5 Unsigned8 index 0 = OFFLINE index 1 = STEADY index 2 = TRANSIENT index 3 = OFFSET index 4 = UNSTABLE	0,0,0,0,0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SERIAL_NUMBER	Serial number of the electronics board	357	58	S / ro	UNSIGNED16	By manufacturing
SERVICE_REMINDER_AFTER	Service reminder: Valve diagnosis status will be set, if parameter value TIME_SINCE_LAST_SERVICE equals SERVICE_REMINDER_AFTER	380	81	S / ro	Unsigned32: 0 to 0xFFFFFFFF Unit: 0.1 h = 6 minutes	1000000
SET_FSTATE	Initiate Fault State condition manually	329	30	D / rw	Unsigned8: 1 = Off 2 = Set	0
SET_LOAD_FACTOR_REF	Set reference value for load factor	394	95	S / ro	Float: 0.0 to 1.0	0.0
SET_MENU_TEXT	Menu text field which will be used while downloading a new language as a replacement for the third language	364	65	D / rw	Octet String: up to 17 characters	
SHED_RCAS	Time duration at which to give up on computer writes to function block RCAS locations	326	27	S / rw	Unsigned32: Unit 1 / 32 msec.	64000 (2 sec.)
SHED_ROUT	Time duration at which to give up on computer writes to function block ROUT locations	327	28	S / rw	Unsigned32: Unit 1 / 32 msec.	64000 (2 sec.)
SOFTWARE_REVISION	Software revision of the device	345	47	S / ro	Visible String: Up to 16 characters format: xx.yyy	By manufacturing (such as 16.069)
SPRING_RANGE_LOWER_VAL	Spring range lower value	397	98	S / rw	Float: 0.0 to +INF	1.2
SPRING_RANGE_UPPER_VAL	Spring range upper value	398	99	S / rw	Float: 0.0 to +INF	2.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SPRING_RANGE_UNIT	Spring range unit	399	100	S / rw	Unsigned16: 1141 = psi 1137 = bar 1133 = kPa	Bar
ST_REV	Static Revision	301	2	S / ro	Unsigned16: 1 to 65535	0
STRATEGY	Can be used to identify grouping of blocks	303	4	S / rw	Unsigned16: 0 to 65535	0
SUB_TYPE	Sub-Type is an identification code for available positioners	363	64	S / rw	Unsigned8: 0x04 – SRD991 bus ield. 0x84 – SRD960 bus ield.	0x04 (SRD991) 0x84 (SRD960)
TAG_NAME	Tag number defined by user	359	60	D / rw	Visible String: up to 14 characters	“Owner Tag Name”
TAG_DESC	User description of the intended application of the block	302	3	S / rw	Octet String: Up to 32 characters	Spaces
TARGET_ERROR	Target errors which are relevant for the whole device including information about the course of errors	342	43	S / ro	Manuf. Spec. data structure Array of Unsigned16 See chapter 3.11.	0
TEST_RW	Read/write Test parameter, used only for conformance testing	308	9	D / rw	DS-85 data structure: See Fieldbus Specification FF809	0
TIME_SINCE_LAST_SERVICE	Time since last service	379	80	S / ro	Unsigned32: 0 to 0xFFFFFFFF Unit: 0.1 h = 6 minutes	0
TIME_SCALE_MIN_HIST	Time scale for a minutes history diagram	400	101	S / ro	Unsigned8: constant 15	15
TIME_SCALE_HRS_HIST	Time scale for a hours history diagram	401	102	S / rw	Unsigned8: 1 to 24	24
TIME_SCALE_DAYS_HIST	Time scale for a days history diagram	402	103	S / rw	Unsigned8: 1 to 30	30
TIME_SCALE_MONTHS_HIST	Time scale for a months history diagram	403	104	S / rw	Unsigned8: 1 to 60	12

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
TRAVEL_SUM	Actual summarized travel value in full strokes	369	70	S / rw	Unsigned32: 0 to 0xFFFFFFFF	By Manufacturing
TRAVEL_SUM_LIMIT	Limit value for summarized travel (in full strokes). When the travel sum parameter value exceeds the limit value the TRAVEL_SUM_LIMIT status bit will be set in the DIAGNOSIS parameter	370	71	S / rw	Unsigned32: 0 to 0xFFFFFFFF	90000000
TRAVEL_SUM_DEADBAND	Configurable deadband for the summarized travel value	371	72	S / rw	Float: 0 to 100 %	1.0
UPDATE_EVT	Generated by any change to the static data	335	36	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
SHED_ROUT	Time duration at which to give up on computer writes to function block ROUT locations	327	28	S / rw	Unsigned32: Unit 1 / 32 msec.	64000 (2 sec.)
VALVE_DIAG_STATUS	Valve diagnosis status	381	82	D / ro	Manuf. Spec. data structure Array of Unsigned8 See chapter 3.18	0
WRITE_ALM	Alert generated if WRITE_LOCK is cleared	340	41	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
WRITE_LOCK	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK	334	35	S / rw	Unsigned8: 1 = unlocked 2 = locked	1
WRITE_PRI	Priority of the alarm generated by clearing the WRITE_LOCK	339	40	S / rw	Unsigned8: 0 to 15	0
Analog Output Block						
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms	424	5	S / rw	Unsigned8: 1 to 255	0
BKCAL_OUT	Value and status required by an upper blocks BKCAL_IN	445	26	D / ro	DS-65 data structure: status, value	0, 0.0
BLK_DATA	Analog Output Block Object	420	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 0
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	450	31	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLOCK_ERR	Block error(s)	426	7	D / ro	Bit String: See description in Resource Block	0
CAS_IN	Remote setpoint value from another FF-block or a DCS block through a defined link	437	18	N / rw	DS-65 data structure: status, value	0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
CHANNEL	Number of logical hardware channel connected to AO-Block	442	23	S / rw	Unsigned16: 0 = Uninitialized 1 = linked to AO Transducer	0
FSTATE_TIME	Time in seconds from detection of remote setpoint fault to output action if condition still exists	443	24	S / rw	Float: Positive	0.0
FSTATE_VAL	Preset analog setpoint value to use when fault occurs	444	25	S / rw	Float: Limited to PV_SCALE ± 10 %	0.0
GRANT_DENY	Options for controlling access of host systems and local control panels	433	14	D / rw	DS-70 data structure See chapter 3.12	0
IO_OPTS	Options to alter input and output block processing by user	434	15	S / rw	Bit String: See chapter 3.13	0
MODE_BLK	Actual, target, permitted and normal modes of the block	425	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO | CAS | RCAS, CAS | AUTO
OUT	Primary analog output value (result of executing AO-Block)	429	10	N / rw	DS-65 data structure: status, value	0, 0.0
PV	Process Value, calculated from the READBACK or SIMULATE value	427	8	D / ro	DS-65 data structure: status, value	0, 0.0
PV_SCALE	Scaling of PV and parameters with the same scaling as PV	431	12	S / rw	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	 100.0 0.0 1342 (percent) 1

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
RCAS_IN	Target setpoint and status provided by a supervisory host	446	27	N / rw	DS-65 data structure: status, value	0, 0.0
RCAS_OUT	Block setpoint and status after ramping—provided to a supervisory host	448	29	D / ro	DS-65 data structure: status, value	0, 0.0
READBACK	Indicates readback of actuator position	436	17	D / ro	DS-65 data structure: status, value	0, 0.0
SHED_OPT	Defines action to be taken on remote control device timeout	447	28	S / rw	Unsigned8: See chapter 3.16	0
SIMULATE	Allows the transducer input/output to the block manually supplied	430	11	D / rw	DS-82 data structure: - simulate status - simulate value - transducer status - transducer value - simulate enable/disable	 0 0.0 0 0.0 simulate disable
SP	Analog setpoint	428	9	N / rw	DS-65 data structure: status, value; value limited to PV_SCALE ± 10 %	0, 0.0
SP_HI_LIM	Setpoint high limit (the highest setpoint operator entry that can be used by the block)	440	21	S / rw	Float: Limited to PV_SCALE ± 10 %	100.0
SP_LO_LIM	Setpoint low limit (the lowest setpoint operator entry that can be used by the block)	441	22	S / rw	Float: Limited to PV_SCALE ± 10 %	0.0
SP_RATE_DN	Ramp rate for downward setpoint changes in PV units per second	438	19	S / rw	Float: +INF 0 = use setpoint immediately	+INF

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SP_RATE_UP	Ramp rate for upward setpoint changes in PV units per second	439	20	S / rw	Float: +INF 0 = use setpoint immediately	+INF
ST_REV	Static Revision	421	2	S / ro	Unsigned16: 1 to 65535	0
STATUS_OPTS	Options for block processing of status by user	435	16	S / rw	Bit String: See chapter 3.14	0
STRATEGY	Can be used to identify grouping of blocks	423	4	S / rw	Unsigned16: 0 to 65535	0
TAG_DESC	User description of the intended application of the block	422	3	S / rw	Octet String: Up to 32 characters	Spaces
UPDATE_EVT	Generated by any change to the static data	449	30	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
XD_SCALE	Scaling READBACK/OUT for a specified channel	432	13	S / rw	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	 100.0 0.0 1342 (percent) 1
AO Transducer Block (Standard Advanced Positioner Valve Basic Device Access)						
ACT_FAIL_ACTION	Specifies the action the actuator takes in case of failure	481	22	S / rw	Unsigned8: 0 = undefined 1 = Self-closing 2 = Self-opening 3 = Hold last value 4 = Maximum value 5 = Minimum value 255 = indeterminate	255

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
ACT_MAN_ID	Actuator manufacturer identification number	482	23	N / rw	Unsigned32: Defined by FF	0x385884
ACT_MODEL_NUM	Actuator model number	483	24	N / rw	Visible String: Up to 32 characters	NULL
ACT_SN	Actuator serial number	484	25	N / rw	Visible String: Up to 32 characters	0
ACT_STROKE_TIME_DEC	Measured fastest time of the actuator/valve combination for a whole decreasing stroke in seconds	528	68	S / ro	Float: 0 to +INF	0
ACT_STROKE_TIME_INC	Measured fastest time of the actuator/valve combination for a whole increasing stroke in seconds	529	69	S / ro	Float: 0 to +INF	0
ACT_TYPE	Actuator Type	494	35	S / rw	Unsigned8: 1 = single-acting 2 = double-acting	Single-acting
ADC_GAIN	Actual gain code for position input	527	67	S / rw	Unsigned8: 0 to 0x78 (Do **NOT** change)	0
AIR_SUPPLY	Air supply pressure defined by user (only needed for SRD970)	518	58	S / rw	Float: 0.0 to +INF	6.0
ALARM_LINK	Alarm link: defines the behavior of binary output 1 channel on an optional analog feedback board	567	107	S / rw	Manuf. Spec. data structure Array of Unsigned8 See chapter 3.17	0,0,0,0,0,0,0,0
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	464	5	S / rw	Unsigned8: 1 to 255	0
AMPL_TYPE	Pneumatic Amplifier Type	495	35	S / ro	Unsigned8: 1 = single-acting 2 = double-acting 3 = spool valve	By Manufacturing

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
ANALOG_OUTPUT	Value of the analog output signal displayed in mA	530	70	S / ro	Float: Positive	0.0
BININ_CONFIG	Configuration data for external binary input option board	563	103	S / rw	Bit String: 0 to 0x0F Refer to chap. 4.8	0x0F
BININ_STAT	Actual Binary Input Status	564	104	D / ro	Bit String: 0 to 131 Refer to chap. 4.8	0
BINOUT1_CONFIG	Defines the behavior of optional binary output channel 1	565	105	S / rw	Bit String: 0 to 0x8F Refer to chap. 4.9	0x08
BINOUT2_CONFIG	Defines the behavior of optional binary output channel 2	566	106	S / rw	Bit String: 0 to 0x8F Refer to chap. 4.9	0x04
BLK_DATA	Transducer Block Object	460	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	468	9	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code – value	0,0,0,0,0
BLOCK_ERR	Block error(s)	466	7	D / ro	Bit String: See description in Resource Block	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
CAL_ANALOG_FEEDBACK	Calibrate analog feedback output (optional)	531	71	S / rw	Unsigned8: 0x00 = normal operation (RD) Cancel Cal Proc (WR) 0x05 = increment output in coarse steps 0x04 = increment output in fine steps 0x06 = decrement output in fine steps 0x07 = decrement output in coarse steps 0x10 = Start Cal for 4 mA 0x18 = Start Cal for 20 mA 0x40 = Cal incomplete (RD) 0x80 = Save Cal and switch back to normal operation see chapter 4.10	0x00
COLLECTION_DIRECTORY	Directory that specifies the number, starting indexes and DD-Item-Ids of the data collections in each transducer within a transducer block	472	13	S / ro	Array of Unsigned32: 1st element: number of data collections 2nd element: index of 1st data collection 3rd element: index of 2nd data collection...	1, 13, 0x80020380
CONTROL_ALGORITHM	Control algorithm used internally to position the valve	500	40	S / rw	Unsigned8: 000 = PID 254 = no control	0 = PID
CONTROL_DIFFERENCE	Difference between requested setpoint and actual position	507	47	D / ro	Float: Unit percent	0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
CONTROL_DIFF_LIMIT	If the control difference exceeds this limit for a time greater then the time specified in the CONTROL_DIFF_TIME parameter, the CONTROL DIFF LIMIT status will be set in the DIAGNOSIS parameter	508	48	S / rw	Float: 0 to 100 %	5
CONTROL_DIFF_TIME	This is the relevant time in Seconds for the control difference limit	509	49	S / rw	Float: Positive	60
CONTROL_GAP	Range in percent where a change of the setpoint doesn't make any sense caused by stiction of a valve	504	44	S / rw	Float: Positive	0.1
CUTOFF_HYSTERESIS	Hysteresis for the seal close span of a valve in percent	512	52	S / rw	Float: Positive	0.005
ELECTRONICS_TEMP	Internal temperature of the device in engineering units specified in electronics temperature units parameter	513	53	S / ro	Float: -40 to + 80 °Celsius	
ELECTRONICS_TEMP_LL	Lower limit of the internal temperature. When the electronics temperature is falling below this limit, the TEMP TOO LOW status bit will be set in the DIAGNOSIS parameter	515	55	S / ro	Float: -40 °Celsius	-40
ELECTRONICS_TEMP_UL	Upper limit of the internal temperature. When the electronics temperature is raising above this limit, the TEMP TOO HIGH status bit will be set in the DIAGNOSIS parameter	516	56	S / ro	Float: +80 °Celsius	80

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
ELECTRONICS_TEMP_UNITS	Specifies engineering unit for electronics temperature parameter	514	54	S / rw	Unsigned16: 1001 = °Celsius 1002 = °Fahrenheit	°Celsius
FINAL_POSITION_VALUE	Actual valve position and status	477	18	N / ro	DS-65 data structure: FINAL_VALUE_RANGE	0, 0.0
FINAL_VALUE	Requested valve position and status written by Analog Output Function Block	473	14	N / ro	DS-65 data structure: Limited to values in parameter FINAL_VALUE_RANGE	0.0
FINAL_VALUE_CUTOFF_HI	If FINAL_VALUE is more positive than this value, the valve is forced to its maximum high value (fully opened)	475	16	S / rw	Float: FINAL_VALUE_RANGE, +INF	+INF
FINAL_VALUE_CUTOFF_LO	If FINAL_VALUE is more negative than this value, the valve is forced to its minimum low value (fully closed)	476	17	S / rw	Float: FINAL_VALUE_RANGE, -INF	-INF
FINAL_VALUE_RANGE	Scaling of FINAL_VALUE and parameters with the same scaling as FINAL_VALUE	474	15	N / ro	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	 100.0 0.0 1342 (percent) 1
FX_CMD	Parameter for passing a factory diagnostic command to Transducer	533	73	D / rw	Manuf. Spec. data structure (**not for customer use**)	
FX_RSP	Parameter for the response to factory diagnostic command from Transducer	534	74	D / ro	Manuf. Spec. data structure (**not for customer use**)	
INPUT_CURRENT	Current consumption of the device	532	72	D / ro	Float: Unit mA	10.6 typically

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
INST_MODE	Reflects the internal software state of the positioner (will be automatically set through MODE_BLK)	493	34	N / rw	Unsigned8: 0 = OFFLINE 1 = ONLINE 2 = FAULT STATE 3 = DIAGNOSIS 4 = CALIBRATE 5 = INIT	OFFLINE
LINEARIZATION_TYPE	Setpoint characterization	497	37	S / rw	Unsigned8: 0 = Linear 1 = Equal percentage 1:50 2 = Quick open 3 = Customer spec.	Linear
LOW_PRESSURE_LIMIT	Lower limit of the sensor 1 parameter. When the pressure is falling below this limit, the PRESS_TOO_LOW status will be set in the DIAGNOSIS parameter	517	57	S / rw	Float: -INF to +INF	-0.5 bar
MODE_BLK	Actual, target, permitted and normal modes of the block	465	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO, AUTO
MOTOR_PAR	IP-Motor specific value calculated while autostart is running	526	66	S / rw	Unsigned32 Do **NOT** change	0
POS_ENDPOINT_HIGH	Upper endpoint for the valve position in degree	524	64	S / rw	Float	45.0
POS_ENDPOINT_LOW	Lower endpoint for the valve position in degree	523	63	S / rw	Float	-45.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
POSITION_LINEARIZATION	Position Linearization	496	36	S / rw	Unsigned8: 2 = stroke, left mounted 3 = rotary, opening counter-clockwise 6 = stroke, right mounted 7 = rotary, opening clockwise	Stroke, left mounted
SELF_CALIB_CMD	Parameter to initiate an Autostart or reset cycle/travel counter	498	38	S / rw	Unsigned8: 0 = no reaction/initial value 2 = Standard Autostart 3 = Examine Endpoints 4 = Smooth Autostart 5 = Fast Autostart 6 = Enhanced Autostart	0
SENSOR1_UNITS	Sensor1 units	569	109	S / rw	Unsigned16: 1141 = psi 1137 = bar 1133 = kPa	bar
SENSOR1_VALUE	Value and status for optional supply pressure sensor 1 (air supply)	568	108	D / ro	DS-65 data structure: status, value	0, 0.0
SENSOR2_UNITS	Sensor2 units	571	111	S / rw	Unsigned16: 1141 = psi 1137 = bar 1133 = kPa	bar
SENSOR2_VALUE	Value and status for optional output pressure sensor 2 (output1, Y1)	570	110	D / ro	DS-65 data structure: status, value	0, 0.0
SENSOR3_UNITS	Sensor3 units	573	113	S / rw	Unsigned16: 1141 = psi 1137 = bar 1133 = kPa	bar
SENSOR3_VALUE	Value and status for optional output pressure sensor 3 (output2, Y2)	572	112	D / ro	DS-65 data structure: status, value	0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SERVO_GAIN	PID gain value for valve opening direction (linear coefficient)	478	19	S / rw	Float: Positive	2.0
SERVO_GAIN2	PID gain value for valve closing direction (linear coefficient)	501	41	S / rw	Float: Positive	15.0
SERVO_RATE	PID rate value for valve opening direction (differential coefficient)	480	21	S / rw	Float: Positive	0.0
SERVO_RATE2	PID rate value for valve closing direction (differential coefficient)	503	43	S / rw	Float: Positive	0.0
SERVO_RESET	PID reset value for valve opening direction (integral coefficient)	479	20	S / rw	Float: Positive	2.7
SERVO_RESET2	PID reset value for valve closing direction (integral coefficient)	502	42	S / rw	Float: Positive	7.5
SPRING_ACT	Spring effect	525	65	S / rw	Unsigned8: 0 = no spring 1 = spring closes valve 2 = spring opens valve	Spring closes valve
ST_REV	Static Revision	461	2	S / ro	Unsigned16: 1 to 65535	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
STAT_AUTOINIT	Actual status while an Autostart procedure is running	499	39	S / ro	Unsigned8: 0x00 = no error 0x01 = Autostart error 0x10..0x11 = find end positions 0x20..0x2F = calculate I/P-converter parameter 0x30..0x3F = calculate control parameter (Autostart only) 0x40..0x42 = measure travel time (Autostart only)	0
STEM_SETPOINT	Stem setpoint; the calculated value for the setpoint after applying limits, cutoffs and characterization	519	59	S / ro	Float	0.0
STRATEGY	Can be used to identify grouping of blocks	463	4	S / rw	Unsigned16: 0 to 65535	0
T_ACT_NR	The actual number of pair of variates which is present in the device defining a characteristic curve	538	78	S / ro	Unsigned8: 2 to 22	2
T_ENTRY	Identifies which table element is in the TAB_X and TAB_Y parameter currently	535	75	D / rw	Unsigned8: 1 to 22	0
T_MIN_NR	The minimum number of pair of variates for the device to define a characteristic curve	567	76	S / ro	Unsigned8: 2	2

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
T_MAX_NR	The maximum number of pair of variates for the device to define a characteristic curve	537	77	S / ro	Unsigned8: 22	22
T_OPCODE	Select operation mode to download a characteristic curve into the device. TAP_OP_CODE controls the transaction of the table	539	79	D / rw	Unsigned8: 0 = not initialized 1 = START, ready to download pair of variates 3 = END (end of transmission)	0
T_STAT	Status of the selected characteristic curve in the device	540	80	D / ro	Unsigned8: 0 = not initialized 1 = Good, table is valid 2 = Not monotonously increasing 4 = Not enough values 5 = Too many values 8 = Loading	0
TAB_XY_VALUE_0	Pair of variates which represents input signal (X) and valve position (Y) index 0	541	81	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_1	Pair of variates which represents input signal (X) and valve position (Y) with index 1	542	82	S / rw	Float: 0.0 to 100.0	100.0, 100.0
TAB_XY_VALUE_2	Pair of variates which represents input signal (X) and valve position (Y) with index 2	543	83	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_3	Pair of variates which represents input signal (X) and valve position (Y) with index 3	544	84	S / rw	Float: 0.0 to 100.0	0.0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
TAB_XY_VALUE_4	Pair of variates which represents input signal (X) and valve position (Y) with index 4	545	85	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_5	Pair of variates which represents input signal (X) and valve position (Y) with index 5	546	86	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_6	Pair of variates which represents input signal (X) and valve position (Y) with index 6	547	87	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_7	Pair of variates which represents input signal (X) and valve position (Y) with index 7	548	88	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_8	Pair of variates which represents input signal (X) and valve position (Y) with index 8	549	89	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_9	Pair of variates which represents input signal (X) and valve position (Y) with index 9	550	90	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_10	Pair of variates which represents input signal (X) and valve position (Y) with index 10	551	91	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_11	Pair of variates which represents input signal (X) and valve position (Y) with index 11	552	92	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_12	Pair of variates which represents input signal (X) and valve position (Y) with index 12	553	93	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_13	Pair of variates which represents input signal (X) and valve position (Y) with index 13	554	94	S / rw	Float: 0.0 to 100.0	0.0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
TAB_XY_VALUE_14	Pair of variates which represents input signal (X) and valve position (Y) with index 14	555	95	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_15	Pair of variates which represents input signal (X) and valve position (Y) with index 15	556	96	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_16	Pair of variates which represents input signal (X) and valve position (Y) with index 16	557	97	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_17	Pair of variates which represents input signal (X) and valve position (Y) with index 17	558	98	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_18	Pair of variates which represents input signal (X) and valve position (Y) with index 18	559	99	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_19	Pair of variates which represents input signal (X) and valve position (Y) with index 19	560	100	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_20	Pair of variates which represents input signal (X) and valve position (Y) with index 20	561	101	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAB_XY_VALUE_21	Pair of variates which represents input signal (X) and valve position (Y) with index 21	562	102	S / rw	Float: 0.0 to 100.0	0.0, 0.0
TAG_DESC	User description of the intended application of the block	462	3	S / rw	Octet String: Up to 32 characters	Spaces
TARGET_ERROR	Target errors which are relevant for the transducer including information about the course of errors	492	33	S / ro	Manuf. Spec. data structure Array of Unsigned16 See chapter 3.11.	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
TRANSDUCER_ DIRECTORY	Directory that specifies the number and starting indexes of the transducers in the transducer block	469	10	S / ro	Array of Unsigned16: 1st element: number of transducers 2nd element: index of 1st transducer 3rd element: index of 2nd transducer etc.	1, 10
TRANSDUCER_TYPE	Identifies the transducer that follows	470	11	S / ro	Unsigned16: Defined by FF	106 = Standard Advanced Positioner Valve
TRAV_DEC_LIM	Configurable T63 percent time limit for decreasing full span travel	506	46	S / rw	Float	0.4
TRAV_INC_LIM	Configurable T63 percent time limit for increasing full span travel	505	45	S / rw	Float	0.4
TRAVEL_POS	Actual travel position in engineering units specified in travel position units parameter	520	60	S / ro	Float	0.0
TRAVEL_POS_UNITS	Specifies engineering unit for travel position, travel span, and travel position limits parameter	521	61	S / rw	Unsigned16: 1005 = degree 1013 = mm 1019 = inch	Degree
TRAVEL_SPAN	Travel span of the valve in engineering units specified in travel position units parameter	522	62	S / rw	Float: Positive	90.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
UPDATE_EVT	Generated by any change to the static data	467	8	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
VALVE_MAN_ID	Valve manufacturer identification number	485	26	N / rw	Unsigned32: Defined by FF	0x385884
VALVE_MODEL_NUM	Valve model number	486	27	N / rw	Visible String: Up to 32 characters	NULL
VALVE_SN	Valve serial number	487	28	N / rw	Visible String: Up to 32 characters	0
VALVE_TYPE	Valve type	488	29	N / rw	Unsigned8: 000 = Undefined 001 = Linear 002 = Rotary 255 = Other	0
VALVE_LOWER_LIM	Valve lower limit: low limit for valve position in percent related to the physical range detected by an autostart procedure	511	51	S / rw	Float	0.0
VALVE_UPPER_LIM	Valve upper limit: high limit for valve position in percent related to the physical range detected by an autostart procedure	510	50	S / rw	Float	100.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
XD_CAL_DATE	Date of last positioner calibration	490	31	S / rw	Date: - ms (0...59 999) - min (0...59) - h (0...23, including SU in the highest bit (0 = standard time 1 = summer time)) - day of month (1...31, including day of week in upper 3 bits (1...7)) - months (1...12) - years (0..99)	By Manufacturing
XD_CAL_LOC	Location of last positioner calibration	489	30	S / rw	Visible String: Up to 32 characters	By Manufacturing
XD_CAL_WHO	Name of the person responsible for last positioner calibration	491	32	S / rw	Visible String: Up to 32 characters	By Manufacturing
XD_ERROR	Block Alarm Sub-code	471	12	D / ro	Unsigned8: 16 = unspecified error 17 = general error 18 = calibration error 19 = configuration error 20 = electronics error 21 = mechanical error 22 = I/O failure 23 = data integrity error 24 = software error 25 = algorithm error	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
PID Block						
ACK_OPTION	Selection of alarms which will be automatically acknowledged	626	47	S / rw	Bit String: 0: Auto Ack disabled 1: Auto Ack enabled	0
ALARM_HYS	Alarm hysteresis	627	48	S / rw	Float: 0 to 50 %	0.5 %
ALARM_SUM	Current alert status	625	46	SD / rw	DS-75 data structure: - current alarms - unacknowledged - unreported - disabled Set Bit 0: Discrete alarm (not used) 1: High high alarm 2: High alarm 3: Low low alarm 4: Low alarm 5: Deviation high alarm 6: Deviation low alarm 7: Block alarm Zero (0) state indicates alarm clear, acknowledged, reported, enabled	0,0,0,0
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	584	5	S / rw	Unsigned8: 1 to 255	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
BAL_TIME	Balancing time, the time constant at which the integral time will move to obtain balance when the output is limited and mode is AUTO, CAS, or RCAS	605	26	S / rw	Float: Positive	0.0
BKCAL_IN	Value and status from a lower block's BKCAL_OUT	607	28	D / ro	DS-65 data structure: status, value	0, 0.0
BKCAL_HYS	Back calculation hysteresis	610	31	S / rw	Float: 0 to 50 %	0.5 %
BKCAL_OUT	Value and status required by an upper blocks BKCAL_IN	611	32	D / ro	DS-65 data structure: status, value	0, 0.0
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	624	45	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLK_DATA	PID Block Object	580	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ERR	Block error(s)	586	7	D / ro	Bit String: See description in Resource Block	0
BYPASS	Normal control algorithm is bypassed if set	597	18	S / rw	Unsigned8: 0 = Uninitialized 1 = Off 2 = On	0
CAS_IN	Remote setpoint value from another FF-block or a DCS block through a defined link	598	19	N / rw	DS-65 data structure: status, value	0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
CONTROL_OPTS	Options the user may select to alter calculations done in the PID Block	593	14	S / rw	Bit String: See chapter 3.15	0
DV_HI_ALM	Status and time stamp associated with DV_HI_ALM	644	65	D / ro	DS-71 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
DV_HI_LIM	High deviation alarm setting	637	58	S / rw	Float: 0 to PV span, +INF	+INF
DV_HI_PRI	Priority of the high deviation alarm	636	57	S / rw	Unsigned8: 0 to 15	0
DV_LO_ALM	Status and time stamp associated with DV_LO_ALM	645	66	D / ro	DS-71 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
DV_LO_LIM	Low deviation alarm setting	639	60	S / rw	Float: -INF, -PV span to 0	-INF
DV_LO_PRI	Priority of the low deviation alarm	638	59	S / rw	Unsigned8: 0 to 15	0
FF_GAIN	Gain that the feed forward input is multiplied by before it is added to the calculated control output	622	43	S / rw	Float	0.0
FF_SCALE	Scaling for FF_VAL	621	42	S / rw	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	100.0 0.0 1342 (percent) 1
FF_VAL	Feed forward value and status	620	41	N / rw	DS-65 data structure: status, value	0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
GAIN	PID Gain value	603	24	S / rw	Float	0.0
GRANT_DENY	Options for controlling access of host systems and local control panels	592	13	D / rw	DS-70 data structure See chapter 3.12	0
HI_ALM	Status and time stamp associated with HI_ALM	641	62	D / ro	DS-71 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
HI_LIM	High alarm setting	631	52	S / rw	Float: PV_SCALE, +INF	+INF
HI_PRI	Priority of the high alarm	630	51	S / rw	Unsigned8: 0 to 15	0
HI_HI_ALM	Status and time stamp associated with HI_HI_ALM	640	61	D / ro	DS-71 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
HI_HI_LIM	High high alarm setting	629	50	S / rw	Float: PV_SCALE, +INF	+INF
HI_HI_PRI	Priority of the high high alarm	628	49	S / rw	Unsigned8: 0 to 15	0
IN	Primary input value	595	16	N / rw	DS-65 data structure: status, value; value limited to PV_SCALE ± 10 %	0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
LO_ALM	Status and time stamp associated with LO_ALM	642	63	D / ro	DS-71 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
LO_LIM	Low alarm setting	633	54	S / rw	Float: -INF, PV_SCALE	-INF
LO_PRI	Priority of the low alarm	632	53	S / rw	Unsigned8: 0 to 15	0
LO_LO_ALM	Status and time stamp associated with LO_LO_ALM	643	64	D / ro	DS-71 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
LO_LO_LIM	Low low alarm setting	635	56	S / rw	Float: -INF; PV_SCALE	-INF
LO_LO_PRI	Priority of the low low alarm	634	55	S / rw	Unsigned8: 0 to 15	0
MODE_BLK	Actual, target, permitted and normal modes of the block	585	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO | CAS | RCAS | ROUT, AUTO
OUT	Primary analog output value (result of executing PID-Block)	589	10	N / rw	DS-65 data structure: status, value	0, 0.0
OUT_HI_LIM	Limits the maximum output value	608	29	S / rw	Float: Limited to OUT_SCALE ± 10 %	100.0
OUT_LO_LIM	Limits the minimum output value	609	30	S / rw	Float: Limited to OUT_SCALE ± 10 %	0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
OUT_SCALE	Scaling of OUT and parameters with the same scaling as OUT	591	12	S / rw	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	 100.0 0.0 1342 (percent) 1
PV	Primary analog value or a process value associated with it	587	8	D / ro	DS-65 data structure: status, value	0, 0.0
PV_FTIME	Time constant of a single exponential filter for PV	596	17	S / rw	Float: Non-negative	0.0
PV_SCALE	Scaling of PV and parameters with the same scaling as PV	590	11	S / rw	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	 100.0 0.0 1342 (percent) 1
RATE	Derivative time constant	606	27	S / rw	Float	0.0
RCAS_IN	Target setpoint and status provided by a supervisory host	612	33	N / rw	DS-65 data structure: status, value	0, 0.0
RCAS_OUT	Block setpoint and status after ramping — provided to a supervisory host	615	36	D / ro	DS-65 data structure: status, value	0, 0.0
RESET	Integral time constant	604	25	S / rw	Float: Positive	+INF
ROUT_IN	Target output and status provided by a host for use as the output (ROUT mode)	613	34	N / rw	DS-65 data structure: status, value	0, 0.0
ROUT_OUT	Block Output and status provided to a host for back calculation in ROUT mode	616	37	D / ro	DS-65 data structure: status, value	0, 0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SHED_OPT	Defines action to be taken on remote control device timeout	614	35	S / rw	Unsigned8: See chapter 3.16	0
SP	Analog setpoint	588	9	N / rw	DS-65 data structure: status, value; value limited to PV_SCALE ± 10 %	0, 0.0
SP_HI_LIM	Setpoint high limit (the highest setpoint operator entry that can be used by the block)	601	22	S / rw	Float: Limited to PV_SCALE ± 10 %	100.0
SP_LO_LIM	Setpoint low limit (the lowest setpoint operator entry that can be used by the block)	602	23	S / rw	Float: Limited to PV_SCALE ± 10 %	0.0
SP_RATE_DN	Ramp rate for downward setpoint changes in PV units per second	599	20	S / rw	Float: +INF 0 = use setpoint immediately	+INF
SP_RATE_UP	Ramp rate for upward setpoint changes in PV units per second	600	21	S / rw	Float: +INF 0 = use setpoint immediately	+INF
ST_REV	Static Revision	581	2	S / ro	Unsigned16: 1 to 65535	0
STATUS_OPTS	Options for block processing of status by user	594	15	S / rw	Bit String: See chapter 3.14	0
STRATEGY	Can be used to identify grouping of blocks	583	4	S / rw	Unsigned16: 0 to 65535	0
TAG_DESC	User description of the intended application of the block	582	3	S / rw	Octet String: Up to 32 characters	Spaces
TRK_IN_D	Discrete input to initiate external tracking of the block output to the value specified by TRK_VAL	618	39	N / rw	DS-66 data structure: Status, value (On, Off)	Off

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
TRK_VAL	Track value when external tracking is enabled by TRK_IN_D	619	40	N / rw	DS-65 data structure: status, value	0, 0.0
TRK_SCALE	Scaling values associated with TRK_VAL	617	38	S / rw	DS-68 data structure: - EU at 100 % - EU at 0 % - units index - decimal point	 100.0 0.0 1342 (percent) 1
UPDATE_EVT	Generated by any change to the static data	623	44	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
DI1 Block						
ACK_OPTION	Selection of alarms which will be automatically acknowledged	671	22	S / rw	Bit String: 0: Auto Ack disabled 1: Auto Ack enabled	0
ALARM_SUM	Current alert status	670	21	SD / rw	DS-75 data structure: - current alarms - unacknowledged - unreported - disabled Set Bit 0: Discrete alarm) 1: High high alarm 2: High alarm 3: Low low alarm (continued on next page)	0,0,0,0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
ALARM_SUM (continued)					4: Low alarm 5: Deviation high alarm 6: Deviation low alarm 7: Block alarm Zero (0) state indicates alarm clear, acknowledged, reported, enabled	
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	654	5	S / rw	Unsigned8: 1 to 255	0
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	669	20	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLK_DATA	DI Block Object	650	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ERR	Block error(s)	656	7	D / ro	Bit String: See description in Resource Block	0
CHANNEL	Number of logical hardware channel connected to DI1-Block	665	16	S / rw	Unsigned16: 0 = Uninitialized 2 = linked to DI Transducer	0
DISC_PRI	Priority of the discrete alarm	672	23	S / rw	Unsigned8: 0 to 15	0
DISC_LIM	State of the discrete which will generate an alarm	673	24	S / rw	Unsigned8: range: PV_STATE	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
DISC_ALM	Status and time stamp associated with the discrete alarm	674	25	D / ro	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0, 0,0,0,0
FIELD_VAL_D	Field value discrete	502	13	D / rw	DS-66 data structure See chapter 3.12	0, 0
GRANT_DENY	Options for controlling access of host systems and local control panels	662	13	D / rw	DS-70 data structure See chapter 3.12	0
IO_OPTS	Options to alter input and output block processing by user	663	14	S / rw	Bit String: See chapter 3.13	0
MODE_BLK	Actual, target, permitted and normal modes of the block	655	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO, AUTO
OUT_D	Output discrete	658	9	N / rw	DS-66 data structure: status, value; value limited to OUT_STATE	0, 0
OUT_STATE	Index to the text describing the states of a discrete output	661	12	S / rw	Unsigned16	0
PV_D	Process value discrete	657	8	D / ro	DS-66 data structure: status, value	0, 0
PV_FTIME	Time constant of a single exponential filter for PV	666	17	S / rw	Float: Non-negative	0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SIMULATE_D	Simulate discrete	659	10	D / rw	DS-83 data structure: status, value; value limited to OUT_STATE	disabled
ST_REV	Static Revision	581	2	S / ro	Unsigned16: 1 to 65535	0
STATUS_OPTS	Options for block processing of status by user	664	15	S / rw	Bit String: See chapter 3.14	0
STRATEGY	Can be used to identify grouping of blocks	653	4	S / rw	Unsigned16: 0 to 65535	0
TAG_DESC	User description of the intended application of the block	652	3	S / rw	Octet String: Up to 32 characters	Spaces
UPDATE_EVT	Generated by any change to the static data	668	19	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
XD_STATE	Index to the text describing the states of a transducer	660	11	S / rw	Unsigned16	0
DI2 Block						
ACK_OPTION	Selection of alarms which will be automatically acknowledged	701	22	S / rw	Bit String: 0: Auto Ack disabled 1: Auto Ack enabled	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
ALARM_SUM	Current alert status	700	21	SD / rw	DS-75 data structure: - current alarms - unacknowledged - unreported - disabled Set Bit 0: Discrete alarm 1: High high alarm 2: High alarm 3: Low low alarm 4: Low alarm 5: Deviation high alarm 6: Deviation low alarm 7: Block alarm Zero (0) state indicates alarm clear, acknowledged, reported, enabled	0,0,0,0
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	684	5	S / rw	Unsigned8: 1 to 255	0
BLK_DATA	DI Block Object	680	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ERR	Block error(s)	686	7	D / ro	Bit String: See description in Resource Block	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	699	20	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
CHANNEL	Number of logical hardware channel connected to DI1-Block	695	16	S / rw	Unsigned16: 0 = Uninitialized 3 = linked to DI Transducer	0
DISC_PRI	Priority of the discrete alarm	702	23	S / rw	Unsigned8: 0 to 15	0
DISC_LIM	State of the discrete which will generate an alarm	703	24	S / rw	Unsigned8: range: PV_STATE	0
DISC_ALM	Status and time stamp associated with the discrete alarm	704	25	D / ro	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0, 0,0,0,0
FIELD_VAL_D	Field value discrete	697	18	D / rw	DS-66 data structure See chapter 3.12	0, 0
GRANT_DENY	Options for controlling access of host systems and local control panels	692	13	D / rw	DS-70 data structure See chapter 3.12	0
IO_OPTS	Options to alter input and output block processing by user	693	14	S / rw	Bit String: See chapter 3.13	0
MODE_BLK	Actual, target, permitted and normal modes of the block	685	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO, AUTO
OUT_STATE	Index to the text describing the states of a discrete output	691	12	S / rw	Unsigned16	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
PV_D	Process value discrete	687	8	D / ro	DS-66 data structure: status, value	0, 0.0
PV_FTIME	Time constant of a single exponential filter for PV	696	17	S / rw	Float: Non-negative	0.0
SIMULATE_D	Simulate discrete	689	10	D / rw	DS-83 data structure: status, value; value limited to OUT_STATE	disabled
ST_REV	Static Revision	681	2	S / ro	Unsigned16: 1 to 65535	0
STATUS_OPTS	Options for block processing of status by user	694	15	S / rw	Bit String: See chapter 3.14	0
STRATEGY	Can be used to identify grouping of blocks	683	4	S / rw	Unsigned16: 0 to 65535	0
TAG_DESC	User description of the intended application of the block	682	3	S / rw	Octet String: Up to 32 characters	Spaces
OUT_D	Output discrete	688	9	N / rw	DS-66 data structure: status, value; value limited to OUT_STATE	0, 0
UPDATE_EVT	Generated by any change to the static data	698	19	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
XD_STATE	Index to the text describing the states of a transducer	690	11	S / rw	Unsigned16	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
DO Block						
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	714	5	S / rw	Unsigned8: 1 to 255	0
BKCAL_OUT_D	Value and status required by an upper blocks BKCAL_IN	731	22	D / ro	DS-66 data structure: status, value	0, 0
BLK_DATA	DO Block Object	710	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	736	27	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLOCK_ERR	Block error(s)	716	7	D / ro	Bit String: See description in Resource Block	0
CAS_IN_D	Remote setpoint value from another FF-block or a DCS block through a defined link	727	18	N / ro	DS-66 data structure: status, value;	0, 0
CHANNEL	Number of logical hardware channel connected to DO-Block	728	19	S / rw	Unsigned16: 0 = Uninitialized 4 = linked to DO Transducer	0
FSTATE_TIME	Time in seconds from detection of remote setpoint fault to output action if condition still exists	729	20	S / rw	Float: Positive	0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
FSTATE_VAL_D	Preset discrete value to use when fault occurs	730	21	S / rw	Unsigned8	0.0
GRANT_DENY	Options for controlling access of host systems and local control panels	723	14	D / rw	DS-70 data structure See chapter 3.12	0
IO_OPTS	Options to alter input and output block processing by user	724	15	S / rw	Bit String: See chapter 3.13	0
MODE_BLK	Actual, target, permitted and normal modes of the block	715	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO | CAS, AUTO
OUT_D	Output discrete	719	10	N / rw	DS-66 data structure: status, value; value limited to OUT_STATE	0, 0
PV_D	Process value discrete	717	8	D / ro	DS-66 data structure: status, value	0, 0
PV_STATE	Index to the text describing the states of a discrete	721	12	D / rw	Unsigned16	0
RCAS_IN_D	Target setpoint and status provided by a supervisory host	732	23	N / rw	DS-66 data structure: status, value	0, 0
RCAS_OUT_D	Block setpoint and status — provided to a supervisory host	734	25	D / ro	DS-66 data structure: status, value	0, 0
READBACK_D	Readback of the actual discrete value	726	17	D / ro	DS-66 data structure: status, value; value limited to XD_STATE	0, 0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
SHED_OPT	Defines action to be taken on remote control device timeout	733	24	S / rw	Unsigned8: See chapter 3.16	0
SIMULATE_D	Simulate discrete	720	11	D / rw	DS-83 data structure: status, value; value limited to OUT_STATE	disabled
SP_D	Setpoint value discrete	718	9	N / rw	DS-66 data structure: status, value; value limited to PV_STATE	0, 0
ST_REV	Static Revision	711	2	S / ro	Unsigned16: 1 to 65535	0
STATUS_OPTS	Options for block processing of status by user	725	16	S / rw	Bit String: See chapter 3.14	0
STRATEGY	Can be used to identify grouping of blocks	713	4	S / rw	Unsigned16: 0 to 65535	0
TAG_DESC	User description of the intended application of the block	712	3	S / rw	Octet String: Up to 32 characters	Spaces
OUT_D	Output discrete	719	10	N / rw	DS-66 data structure: status, value; value limited to OUT_STATE	0, 0
UPDATE_EVT	Generated by any change to the static data	735	26	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
XD_STATE	Index to the text describing the states of a discrete for the value obtained from the transducer	722	13	S / rw	Unsigned16	0
DI Transducer Block						
ALARM_DI1	Reflects the sources for the actual state of PRIMARY_VALUE_D, if associated channel is set to 1	755	16	D / ro	Manuf.spec. record See chapter 3.21	0,0,0,0,0,0,0,0
ALARM_DI2	Reflects the sources for the actual state of PRIMARY_VALUE_D, if associated channel is set to 1	757	18	D / ro	Manuf.spec. record See chapter 3.21	0,0,0,0,0,0,0,0
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	744	5	S / rw	Unsigned8: 1 to 255	0
BLK_DATA	DI Transducer Block Object	740	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	748	9	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLOCK_ERR	Block error(s)	746	7	D / ro	Bit String: See description in Resource Block	0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
COLLECTION_DIRECTORY	Directory that specifies the number, starting indexes and DD-Item-Ids of the data collections in each transducer within a transducer block	752	13	S / ro	Array of Unsigned32: 1st element: number of data collections 2nd element: index of 1st data collection 3rd element: index of 2nd data collection...	1, 14, 0x200F9
CONFIG_DI1	Defines the sources which are evaluated for PRIMARY_VALUE_D, if associated channel is set to 1	754	15	S / rw	Manuf.spec. record See chapter 3.20	0,0,0,0,0,0,0,0
CONFIG_DI2	Defines the sources which are evaluated for PRIMARY_VALUE_D, if associated channel is set to 2	756	17	S / rw	Manuf.spec. record See chapter 3.20	0,0,0,0,0,0,0,0
MODE_BLK	Actual, target, permitted and normal modes of the block	745	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO, AUTO
PRIMARY_VALUE_D	Process value discrete	753	14	D / ro	DS-66 data structure: status, value	0, 0
ST_REV	Static Revision	741	2	S / ro	Unsigned16: 1 to 65535	0
STRATEGY	Can be used to identify grouping of blocks	743	4	S / rw	Unsigned16: 0 to 65535	0
TRANSDUCER_ DIRECTORY	Directory that specifies the number and starting indexes of the transducers in the transducer block	749	10	S / ro	Array of Unsigned16: 1st element: number of transducers 2nd element: index of 1st transducer 3rd element: index of 2nd transducer etc.	1, 10

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
TRANSDUCER_TYPE	Identifies the transducer that follows	750	11	S / ro	Unsigned16: Defined by FF	0xFFFF
UPDATE_EVT	Generated by any change to the static data	747	8	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0
XD_ERROR	Block Alarm Sub-code	751	12	D / ro	Unsigned8: 16 = unspecified error 17 = general error 18 = calibration error 19 = configuration error 20 = electronics error 21 = mechanical error 22 = I/O failure 23 = data integrity error 24 = software error 25 = algorithm error	0
DO Transducer Block						
ALERT_KEY	Identification number of the plant. This information may be used in the host system for sorting alarms etc.	779	5	S / rw	Unsigned8: 1 to 255	0
BLK_DATA	DO Block Object	775	1	S / rw	DS-64 data structure: See chapter 3.9	See chapter 3.9

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
BLOCK_ALM	Block alarm for all configuration, hardware, connection failure or system problems	783	9	D / rw	DS-72 data structure: - unacknowledged - update state - time stamp - sub-code - value	0,0,0,0,0
BLOCK_ERR	Block error(s)	781	7	D / ro	Bit String: See description in Resource Block	0
COLLECTION_DIRECTORY	Directory that specifies the number, starting indexes and DD-Item-Ids of the data collections in each transducer within a transducer block	787	13	S / ro	Array of Unsigned32: 1st element: number of data collections 2nd element: index of 1st data collection 3rd element: index of 2nd data collection...	1, 13, 0x80020362
CONFIG_DO	Configuration for discrete output; action depends on the value of FINAL_VALUE_D	790	16	S / rw	Unsigned8: 0 – do nothing 1 – Goto 0 %, if input is 1 2 – Goto 100 %, if input is 1 3 – Hold last value, if input is 1 4 – Toggle between 0 and 100 % (ON/OFF mode), while input is toggling	
FINAL_POSITION_VALUE	Actual valve position and status	788	14	D / ro	DS-65 data structure: FINAL_VALUE_RANGE	0, 0.0
FINAL_VALUE_D	Requested valve position and status written by Analog Output Function Block	789	15	N / ro	DS-65 data structure: Limited to values in parameter FINAL_VALUE_RANGE	0.0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
MODE_BLK	Actual, target, permitted and normal modes of the block	780	6	SN / rw	DS-69 data structure See chapter 1.3	OOS, OOS, OOS | MAN | AUTO, AUTO
RB_LOWER_THRESHOLD	Defines the offset of the valve position in percent where FINAL_VALUE_D has to change its value to 0	791	17	S / rw	Float in unit percent	0.0
RB_UPPER_THRESHOLD	Defines the offset of the valve position in percent where FINAL_VALUE_D has to change its value to 1	792	18	S / rw	Float in unit percent	100.0
ST_REV	Static Revision	776	2	S / ro	Unsigned16: 1 to 65535	0
STRATEGY	Can be used to identify grouping of blocks	778	4	S / rw	Unsigned16: 0 to 65535	0
TRANSDUCER_ DIRECTORY	Directory that specifies the number and starting indexes of the transducers in the transducer block	784	10	S / ro	Array of Unsigned16: 1st element: number of transducers 2nd element: index of 1st transducer 3rd element: index of 2nd transducer etc.	1, 10
TRANSDUCER_TYPE	Identifies the transducer that follows	785	11	S / ro	Unsigned16: Defined by FF	0xFFFF
UPDATE_EVT	Generated by any change to the static data	782	44	D / ro	DS-73 data structure: - unacknowledged - update state - time stamp - static revision - relative index	0,0,0,0,0

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
XD_ERROR	Block Alarm Sub-code	786	12	D / ro	Unsigned8: 16 = unspecified error 17 = general error 18 = calibration error 19 = configuration error 20 = electronics error 21 = mechanical error 22 = I/O failure 23 = data integrity error 24 = software error 25 = algorithm error	0
Link Objects						
FB_LINK01... FB_LINK22	Link Objects to define links between function block application and between interface devices and field devices	800.. 821	-	N / rw	DS-81 data structure	
Alert Objects						
ALERT_FLT01	Float Event notification object	830	-	N / rw	DS-75 data structure	
ALERT_DSC01	Discrete Event notification object	831	-	N / rw	DS-76 data structure	
ALERT_EVT01	Update Event notification object	832	-	N / rw	DS-77 data structure	
Trend Objects						
TREND_FLT01... TREND_FLT10	Float Trend Object	840.. 849	-	N / rw	DS-78 data structure	
TREND_DSC01… TRNED_DSC06	Discrete Trend Object	850.. 855	-	N / rw	DS-79 data structure	

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of Resource Block						
VIEW_1	Resource Block View 1 (access to the dynamic operating parameters with a single read)	890	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, RS_STATE, FREE_TIME, FAULT_STATE, ALARM_SUM	-
VIEW_2	Resource Block View 2 (access to the static operating parameters with a single read)	891	-	D / ro	11 parameters: ST_REV, GRANT_DENY, FEATURES_SEL, CYCLE_SEL, NV_CYCLE_T, FREE_SPACE, SHED_RCAS, SHED_ROUT, LIM_NOTIFY, CONFIRM_TIME, WRITE_LOCK	-
VIEW_3	Resource Block View 3 (access to all dynamic operating parameters)	892	-	D / ro	See VIEW_1	-
VIEW_3	Second Resource Block VIEW 3 (access to all dynamic operating parameters)	893	-	D / ro	12 parameters: ST_REV, TARGET_ERROR, DIAGNOSIS, CYCLE_COUNT, TRAVEL_SUM, ACT_TIME_IN_OPERATION. TIME_SINCE_LAST_SERVICE, SERVIVE_REMINDER_AFTER, VALVE_DIAG_STATUS, MIN_MEAS_TEMP, MAX_MEAS_TEMP, RESPONSE_STATUS	-
VIEW_3	Third Resource Block VIEW 3 (access to all dynamic operating parameters)	894	-	D / ro	10 parameters: ST_REV, LOAD_FACTOR, LOAD_FACTOR_MIN, LOAD_FACTOR_MAX, LOAD_FACTOR_AVG, LOAD_FACTOR_DAYS_HIST, LOAD_FACTOR_MONTHS_HIST, SPRING_RANGE_LOWER_VAL, SPRING_RANGE_UPPER_VAL, SPRING_RANGE_UNIT	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
VIEW_3	Forth Resource Block VIEW 3 (access to all dynamic operating parameters)	895	-	D / ro	10 parameters: ST_REV, POS_MIN_HIST, POS_HRS_HIST, POS_DAYS_HIST, POS_MONTHS_HIST, RSP_MIN_HIST, RSP_HRS_HIST, RSP_DAYS_HIST, RSP_MONTHS_HIST	-
VIEW_4	Resource Block VIEW 4 (access to static parameters not included in VIEW_2)	896	-	D / ro	15 parameters: ST_REV, STRATEGY, ALERT_KEY, MANUFAC_ID, DEV_TYPE, DEV_REV, DD_REV, HARD_TYPES, FEATURES, CYCLE_TYPE, MIN_CYCLE_T, MEMORY_SIZE, MAX_NOTIFY, ACK_OPTION, WRITE_PRI	-
VIEW_4	Second Resource Block VIEW 4	897	-	D / ro	11 parameters: ST_REV, CYCLE_COUNT_LIMIT, TRAVEL_SUM_LIMIT, TRAVEL_SUM_DEADBAND, POS_VALVE_HIHI_ALARM, POS_VALVE_HI_ALARM, POS_VALVE_LO_ALARM, POS_VALVE_LOLO_ALARM, ALARM_HYSTERESIS, LCD_CONFIG, BININ_CFG_TEXT	-
VIEW_4	Third Resource Block VIEW 4	898	-	D / ro	13 parameters: ST_REV, LOAD_FACTOR_LOWER_LMT, LOAD_FACTOR_UPPER_LMT, LOAD_FACTOR_REF_AVG, LOAD_FACTOR_REF_TIM, TIME_SCALE_HRS_HIST, TIME_SCALE_DAYS_HIST, TIME_SCALE_MONTHS_HIST, PST_CONFIG, PST_STATUS, PST_TIME_INTERVAL, PST_SP_CHANGE, PST_DURATION	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of Analog Output Block						
VIEW_1	Analog Output Block VIEW 1 (access to the dynamic operating parameters with a single read)	900	-	D / ro	8 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV, SP, OUT, READBACK, CAS_IN	-
VIEW_2	Analog Output Block VIEW 2 access to the static operating parameters with a single read)	901	-	D / ro	6 parameters: ST_REV, PV_SCALE, XD_SCALE, GRANT_DENY, SP_HI_LIM, SP_LO_LIM	-
VIEW_3	Analog Output Block VIEW 3 (access to all dynamic operating parameters)	902	-	D / ro	11 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV, SP, OUT, READBACK, CAS_IN, BKCAL_OUT, RCAS_IN, RCAS_OUT	-
VIEW_4	Analog Output Block VIEW 4 (access to static parameters not included in VIEW_2)	903	-	D / ro	11 parameters: ST_REV, STRATEGY, ALERT_KEY, IO_OPTS, STATUS_OPTS, SP_RATE_DN, SP_RATE_UP, CHANNEL, FSTATE_TIME, FSTATE_VAL, SHED_OPT	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of AO Transducer Block						
VIEW_1	AO Transducer Block VIEW 1 (access to the dynamic operating parameters with a single read)	910	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, TRANSDUCER_TYPE, XD_ERROR, FINAL_VALUE, FINAL_POSITION_VALUE	-
VIEW_2	AO Transducer Block VIEW 2 access to the static operating parameters with a single read)	911	-	D / ro	3 parameters: ST_REV, TRANSDUCER_TYPE, FINAL_VALUE_RANGE	-
VIEW_3	First AO Transducer Block VIEW 3 (access to all dynamic operating parameters)	912	-	D / ro	See VIEW_1	-
VIEW_3	Second AO Transducer Block VIEW 3 (access to all dynamic operating parameters)	913	-	D / ro	11 parameters: ST_REV, TARGET_ERROR, INST_MODE, SELF_CALIB_CMD, STAT_AUTOINIT, ELECTRONICS_TEMP, STEM_SETPOINT, TRAVEL_POS, TRAVEL_POS_UNITS, TRAVEL_SPAN, ANALOG_OUTPUT	-
VIEW_3	Third AO Transducer Block VIEW 3 (access to all dynamic operating parameters)	914	-	D / ro	12 parameters: ST_REV, CONTROL_DIFFERENCE, CONTROL_DIFF_LIMIT, CONTROL_DIFF_TIME, INPUT_CURRENT, BININ_STAT, SENSOR1_VALUE, SENSOR1_UNITS, SENSOR2_VALUE, SENSOR2_UNITS, SENSOR3_VALUE, SENSOR3_UNITS	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
VIEW_4	First AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	915	-	D / ro	13 parameters: ST_REV, STRATEGY, ALERT_KEY, TRANSDUCER_TYPE, FINAL_VALUE_CUTOFF_HI, FINAL_VALUE_CUTOFF_LO, SERVO_GAIN, SERVO_RESET, SERVO_RATE, ACT_FAIL_ACTION, ACT_MAN_ID, ACT_MODEL_NUM, ACT_SN	-
VIEW_4	Second AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	916	-	D / ro	4 parameters: ST_REV, VALVE_MAN_ID, VALVE_MODEL_NUM, VALVE_SN, VALVE_TYPE	-
VIEW_4	Third AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	917	-	D / ro	3 parameters: ST_REV, XD_CAL_LOC, XD_CAL_DATE, XD_CAL_WHO	-
VIEW_4	Forth AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	918	-	D / ro	15 parameters: ST_REV, POSITION_LINEARIZATION, LINEARIZATION_TYPE, CUTOFF_HYSTERESIS, VALVE_UPPER_LIM, VALVE_LOWER_LIM, ELECTRONICS_TEMP_UNITS, ELECTRONICS_TEMP_LL, ELEXCTRONICS_TEMP_UL, LOW_PRESSURE_LIMIT, AIR_SUPPLY, BININ_CONFIG, BINOUT1_CONFIG, BINOUT2_CONFIG, ALARM_LINK	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
VIEW_4	Fifth AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	919	-	D / ro	8 parameters: ST_REV, SERVO_GAIN2, SERVO_RESET2, SERVO_RATE2, TRAVEL_INC_LIM, TRAVEL_DEC_LIM, CONTROL_GAP, CONTROL_ALGORITHM	-
VIEW_4	Sixth AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	920	-	D / ro	16 parameters : ST_REV, T_ENTRY, T_MIN_NR, T_MAX_NR, T_ACT_NR, T_OPCODE, T_STAT, T_VAL_0, T_VAL_1, T_VAL_2, T_VAL_3, T_VAL_4, T_VAL_5, T_VAL_6, T_VAL_7, T_VAL_8, T_VAL_9,	-
VIEW_4	Seventh AO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	921	-	D / ro	13 parameters : ST_REV, T_VAL_10, T_VAL_11, T_VAL_12, T_VAL_13, T_VAL_14, T_VAL_15, T_VAL_16, T_VAL_17, T_VAL_18, T_VAL_19, T_VAL_20, T_VAL_21	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of PID Block						
VIEW_1	PID Block VIEW 1 (access to the dynamic operating parameters with a single read)	930	-	D / ro	10 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV, SP, OUT, CAS_IN, TRK_IN_D, TRK_VAL, ALARM_SUM	-
VIEW_2	PID Block VIEW 2 access to the static operating parameters with a single read)	931	-	D / ro	9 parameters: ST_REV, PV_SCALE, OUT_SCALE, GRANT_DENY, BYPASS, SP_HI_LIM, SP_LO_LIM, OUT_HI_LIM, OUT_LO_LIM	-
VIEW_3	PID Block VIEW 3 (access to all dynamic operating parameters)	932	-	D / ro	18 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV, SP, OUT, IN, CAS_IN, BKCAL_IN, BKCAL_OUT, RCAS_IN, ROUT_IN, RCAS_OUT, ROUT_OUT, TRK_IN_D, TRK_VAL, FF_VAL, ALARM_SUM	-
VIEW_4	PID Block VIEW 4 (access to static parameters not included in VIEW_2)	933	-	D / ro	31 parameters: ST_REV, STRATEGY, ALERT_KEY, CONTROL_OPTS, STATUS_OPTS, PV_FTIME, SP_RATE_DN, SP_RATE_UP, GAIN, RESET, BAL_TIME, RATE, BKCAL_HYS, SHED_OPT, TRK_SCALE, FF_SCALE, FF_GAIN, ACK_OPTION, ALARM_HYS, HI_HI_PRI, HI_HI_LIM, HI_PRI, HI_LIM, LO_PRI, LO_LIM, LO_LO_PRI, LO_LO_LIM, DV_HI_PRI, DV_HI_LIM, DV_LO_PRI, DV_LO_LIM	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of DI1 Block						
VIEW_1	DI1 Block VIEW 1 (access to the dynamic operating parameters with a single read)	940	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV_D, OUT_D, FIELD_VAL_D, ALARM_SUM	-
VIEW_2	DI1 Block VIEW 2 access to the static operating parameters with a single read)	941	-	D / ro	4 parameters: ST_REV, XD_STATE, OUT_STATE, GRANT_DENY	-
VIEW_3	DI1 Block VIEW 3 (access to all dynamic operating parameters)	942	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV_D, OUT_D, FIELD_VAL_D, ALARM_SUM	-
VIEW_4	DI1 Block VIEW 4 (access to static parameters not included in VIEW_2)	943	-	D / ro	10 parameters: ST_REV, STRATEGY, ALERT_KEY, IO_OPTS, STATUS_OPTS, CHANNEL, PV_FTIME, ACK_OPTION, DISC_PRI, DISC_LIM	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of DI2 Block						
VIEW_1	DI2 Block VIEW 1 (access to the dynamic operating parameters with a single read)	950	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV_D, OUT_D, FIELD_VAL_D, ALARM_SUM	-
VIEW_2	DI2 Block VIEW 2 access to the static operating parameters with a single read)	951	-	D / ro	4 parameters: ST_REV, XD_STATE, OUT_STATE, GRANT_DENY	-
VIEW_3	DI2 Block VIEW 3 (access to all dynamic operating parameters)	952	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV_D, OUT_D, FIELD_VAL_D, ALARM_SUM	-
VIEW_4	DI2 Block VIEW 4 (access to static parameters not included in VIEW_2)	953	-	D / ro	10 parameters: ST_REV, STRATEGY, ALERT_KEY, IO_OPTS, STATUS_OPTS, CHANNEL, PV_FTIME, ACK_OPTION, DISC_PRI, DISC_LIM	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of DO Block						
VIEW_1	DO Block VIEW 1 (access to the dynamic operating parameters with a single read)	960	-	D / ro	8 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV_D, SP_D, OUT_D, READBACK_D, CAS_IN_D	-
VIEW_2	DO Block VIEW 2 access to the static operating parameters with a single read)	961	-	D / ro	4 parameters: ST_REV, PV_STATE, XD_STATE, GRANT_DENY	-
VIEW_3	DO Block VIEW 3 (access to all dynamic operating parameters)	962	-	D / ro	11 parameters: ST_REV, MODE_BLK, BLOCK_ERR, PV_D, SP_D, OUT_D, READBACK_D, CAS_IN_D, BKCAL_OUT_D, RCAS_IN_D, RCAS_OUT_D	-
VIEW_4	DO Block VIEW 4 (access to static parameters not included in VIEW_2)	963	-	D / ro	10 parameters: ST_REV, STRATEGY, ALERT_KEY, IO_OPTS, STATUS_OPTS, CHANNEL, FSTATE_TIME, FSTATE_VAL_D, SHED_OPT	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of DI Transducer Block						
VIEW_1	DI Transducer Block VIEW 1 (access to the dynamic operating parameters with a single read)	970	-	D / ro	9 parameters: ST_REV, MODE_BLK, BLOCK_ERR, TRANSDUCER_TYPE, XD_ERROR, PRIMARY_VALUE_D, ALARM_DI1, ALARM_DI2, TARGET_ERROR	-
VIEW_2	DI Transducer Block VIEW 2 access to the static operating parameters with a single read)	971	-	D / ro	4 parameters: ST_REV, TRANSDUCER_TYPE, CONFIG_DI1, CONFIG_DI2	-
VIEW_3	DI Transducer Block VIEW 3 (access to all dynamic operating parameters)	972	-	D / ro	See VIEW_1	-
VIEW_4	DI Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	973	-	D / ro	6 parameters: ST_REV, STRATEGY, ALERT_KEY, TRANSDUCER_TYPE, ALARM_DI1, ALARM_DI2	-

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Parameter Name	Description	Index	Rel-Index	Store/ Access	FF Data Type and Range	Default
View Objects of DO Transducer Block						
VIEW_1	DO Transducer Block VIEW 1 (access to the dynamic operating parameters with a single read)	980	-	D / ro	7 parameters: ST_REV, MODE_BLK, BLOCK_ERR, TRANSDUCER_TYPE, XD_ERROR, FINAL_VALUE_D, FINAL_POSITION_VALUE, TARGET_ERROR	-
VIEW_2	DO Transducer Block VIEW 2 access to the static operating parameters with a single read)	981	-	D / ro	4 parameters: ST_REV, TRANSDUCER_TYPE, CONFIG_DO, RB_LOWER_THRESHOLD, RB_UPPER_THRESHOLD	-
VIEW_3	DO Transducer Block VIEW 3 (access to all dynamic operating parameters)	982	-	D / ro	See VIEW_1	-
VIEW_4	DO Transducer Block VIEW 4 (access to static parameters not included in VIEW_2)	983	-	D / ro	6 parameters: ST_REV, STRATEGY, ALERT_KEY, TRANSDUCER_TYPE, XD_ERROR, FINAL_VALUE_D, CONFIG_DO; RB_LOWER_THRESHOLD, RB_UPPER_THRESHOLD	-

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Note to memory classes S, N, D

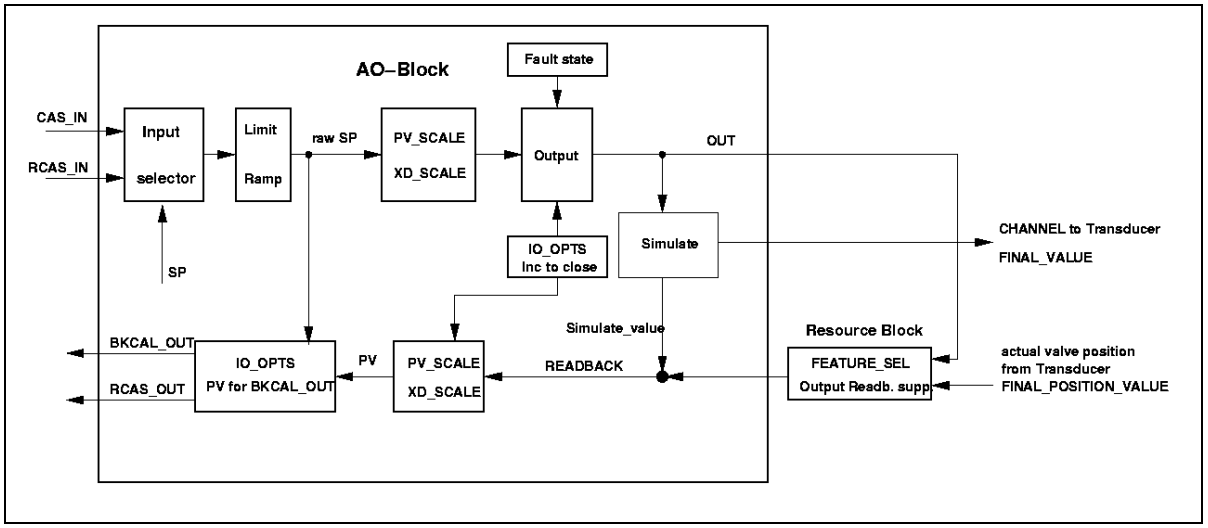
There is an EEPROM on each device which will store all the static (S) and non-volatile (N) data. Write accesses to this part are limited because of technical restrictions. Write access cycles are limited to around 100.000. Do not exceed this limit! Otherwise there is no security that data are retained and the functionality of the device is no longer ensured.

Please note that write accesses to static or non-volatile data using acyclic FF communication services (Client – Server, Source – Sink, Peer – Peer) will write to this section. Cyclic communication types (publisher – subscriber) won't write to EEPROM.

Do not write to static or non-volatile parameters permanently!

3.2 AO Function Block Diagram

The Analog Output function is a standard implementation of an AO function block as defined by FOUNDATIONfieldbus in specification FF891-2 (Function Block Application Part 2). All available parameters are described in section 3.1 above.

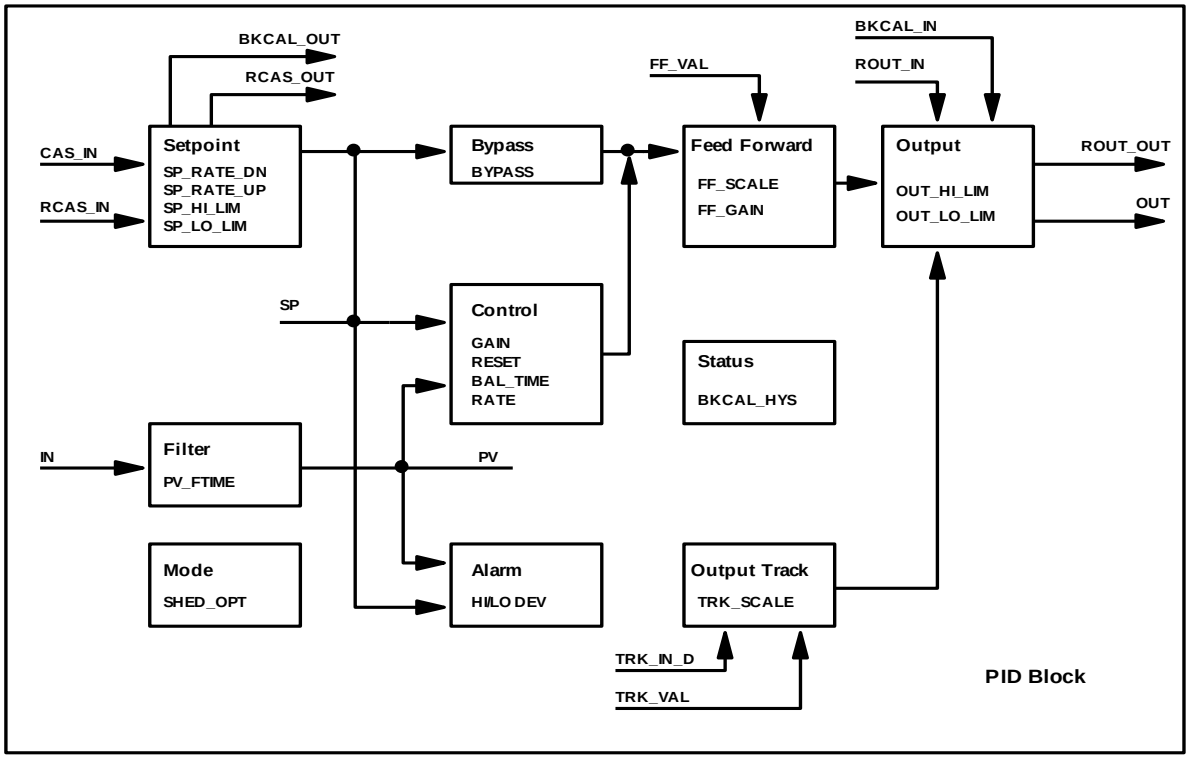


Note: While first commissioning or after performing a “Restart with Defaults” (see chapter 4.13) please verify that the parameter CHANNEL is set to 1. Otherwise there is no valid link to the AO Transducer.

3.3 PID Function Block Diagram

The PID function is a standard implementation of a PID function block as defined by FOUNDATIONfieldbus in specification FF891-2 (Function Block Application Part 2).

The functional schematic appears below:



The PID controller uses a standard PID algorithm.

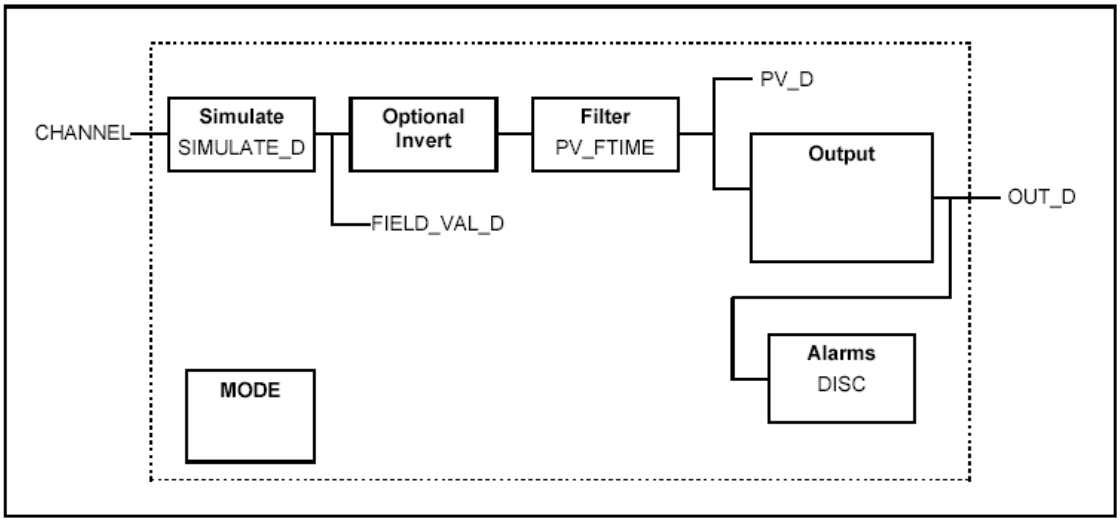
If in doubt about the meaning of a particular parameter, please refer to the parameter description in Chapter 3.1.

Note: While first commissioning or after performing a “Restart with Defaults” please verify that the parameter BYPASS is set to Enabled or Disabled and GAIN is set to a value greater than 0.0. Otherwise executing PID will result in an error.

3.4 DI Function Block Diagram

The DI function is a standard implementation of a DI function block as defined by FOUNDATIONfieldbus in specification FF891-2 (Function Block Application Part 2).). All available parameters are described in section 3.1 above.

The functional schematic appears below:



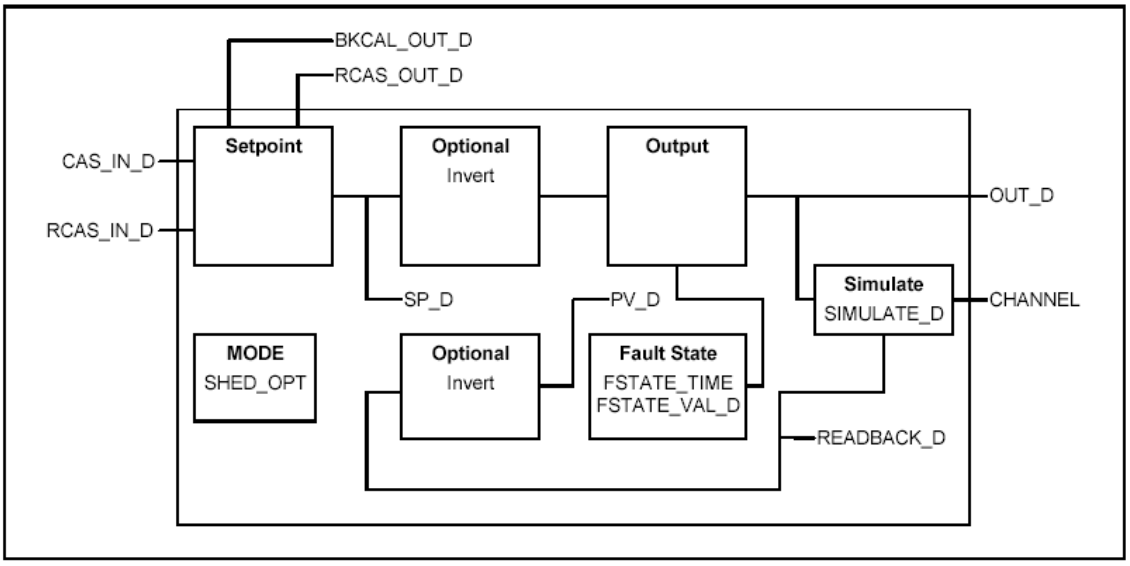
FIELD_VAL_D shows the state of the hardware linked to the DI Transducer block parameter PRIMARY_VALUE_D. Optional inverting is available in IO_OPTS. A delay time can be configured with PV_FTIME which sets the time for FIELD_VAL_D being in one state until it will be passed to PV_D.

Function blocks DI1 and DI2 are identical. Both are linked to the same DI Transducer block.
DI1 should be connected to CHANNEL 2 and DI2 to CHANNEL 3 respectively. There are two parameters available in the DI transducer to configure these channels. They are called CONFIG_DI1 and CONFIG_DI2. Please refer to chapter 3.20 for details.

3.5 DO Function Block Diagram

The DO function is a standard implementation of a DO function block as defined by FOUNDATIONfieldbus in specification FF891-2 (Function Block Application Part 2).).
All available parameters are described in section 3.1 above.

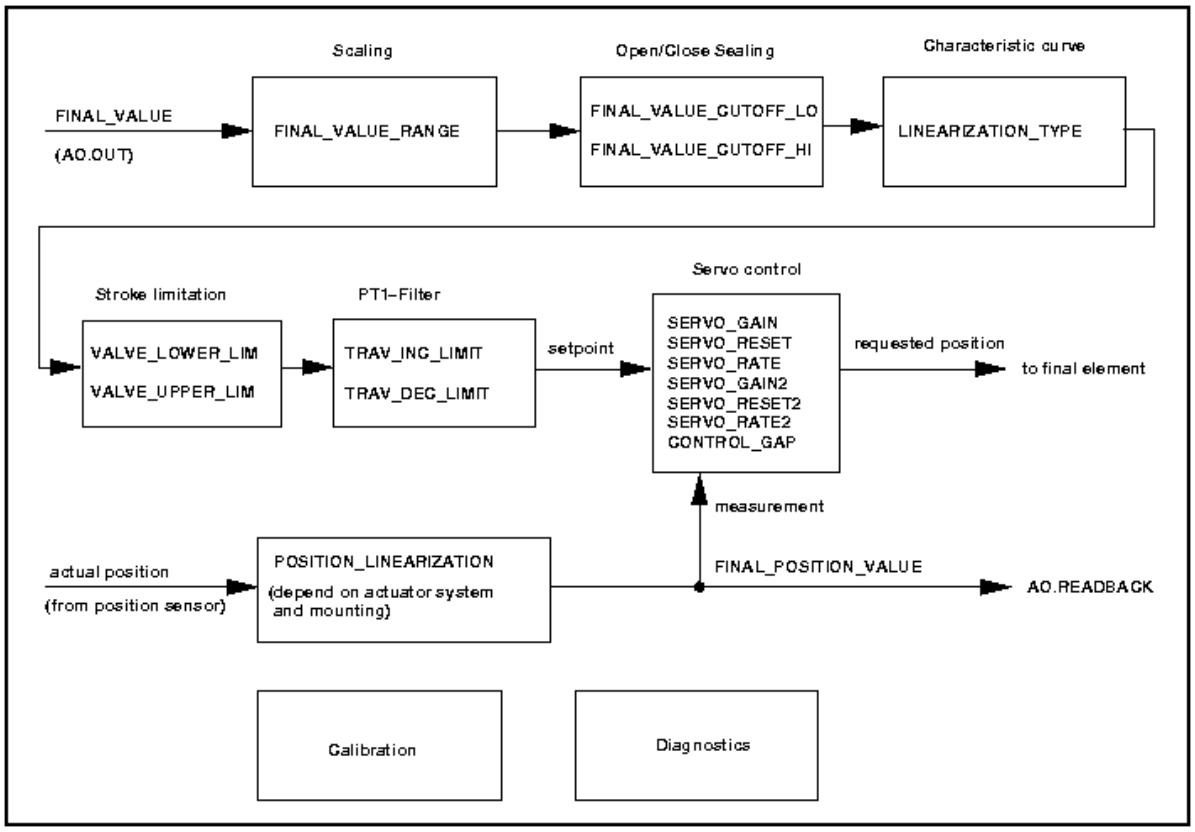
The functional schematic appears below:



SP_D supports the full cascade sub-function. Set target mode of MODE_BLK to CAS | AUTO to transfer the output of another block to CAS_IN_D. Optional inverting is available in IO_OPTS. OUT_D will be transferred to FINAL_VALUE_D of the DO Transducer if CHANNEL is set to 4. READBACK_D is supported if enabled in IO_OPTS. READBACK_D will hold the value of parameter FINAL_POS_VAL_D of the DO Transducer block.

For details about the DO Transducer refer to chapter 3.8 below.

3.6 AO Transducer Block Diagram



The AO Transducer is a Standard Advanced Positioner Valve Basic Access Block with additional manufacturer specific extensions.

The transducer input is the FINAL_VALUE parameter, which is fed by the Analog Output Parameter OUT. The value can be modified using scaling, sealing, characterization, stroke limitations and filtering functions. This modified value is the working setpoint for the servo control section.

The actual position is measured using the position sensor input and modified depending on the selected actuator system and mounting type (POSITION_LINEARIZATION parameter). The resulting value is stored in the parameter FINAL_POSITION_VALUE and transferred to the Analog Output parameter READBACK. FINAL_POSITION_VALUE is the actual value for the servo control section.

The servo control function uses a standard PID control algorithm with one set of GAIN, RESET and RATE parameters for valve opening direction and another set (GAIN2, RESET2, RATE2) for valve closing direction. Output of the servo control unit is the current to the final element, which is the I/P-converter module.

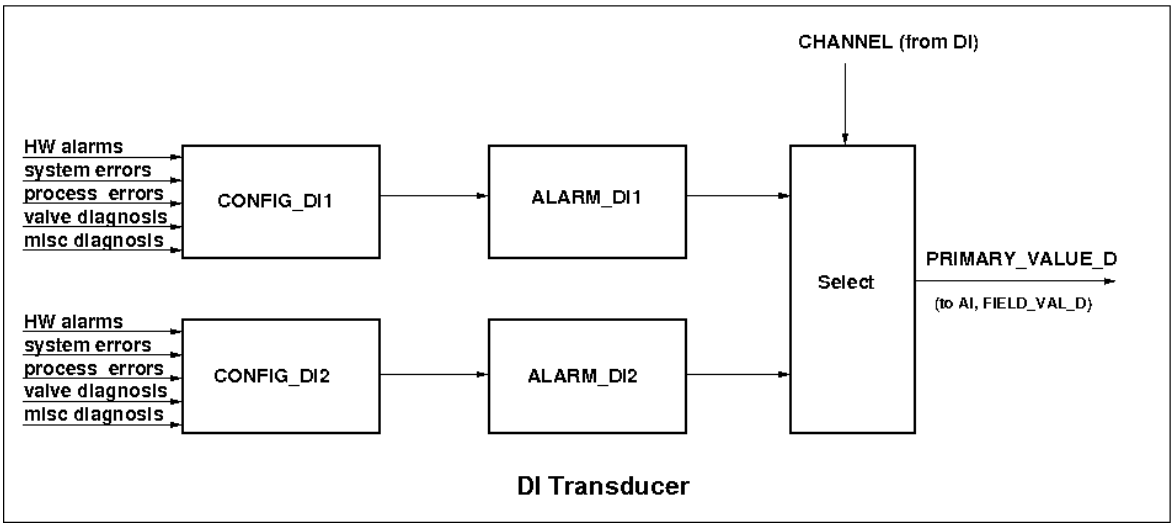
Parameter CONTROL_GAP defines the sensitivity of the positioner so that no corrective action is taken if the control difference is less than the defined limit (i.e. defining a deadband where a change of the setpoint doesn't make any sense caused by stictio the device ieldbus ally of a valve).

If another characteristic than *LINEAR* is active, the Analog Output process value (PV) will be re-calculated to a linear behavior based on the selected characterization.

3.7 DI Transducer Block Diagram

The DI transducer block is a manufacturer specific implementation. All available parameters are described in section 3.1 above.

The functional schematic is shown below:



Depending on the value of CONFIG_DI1 and CONFIG_DI2 different sources can be enabled to set the value of PRIMARY_VALUE_D to 1. All possible sources are described for each configuration parameter in section 3.1 above.

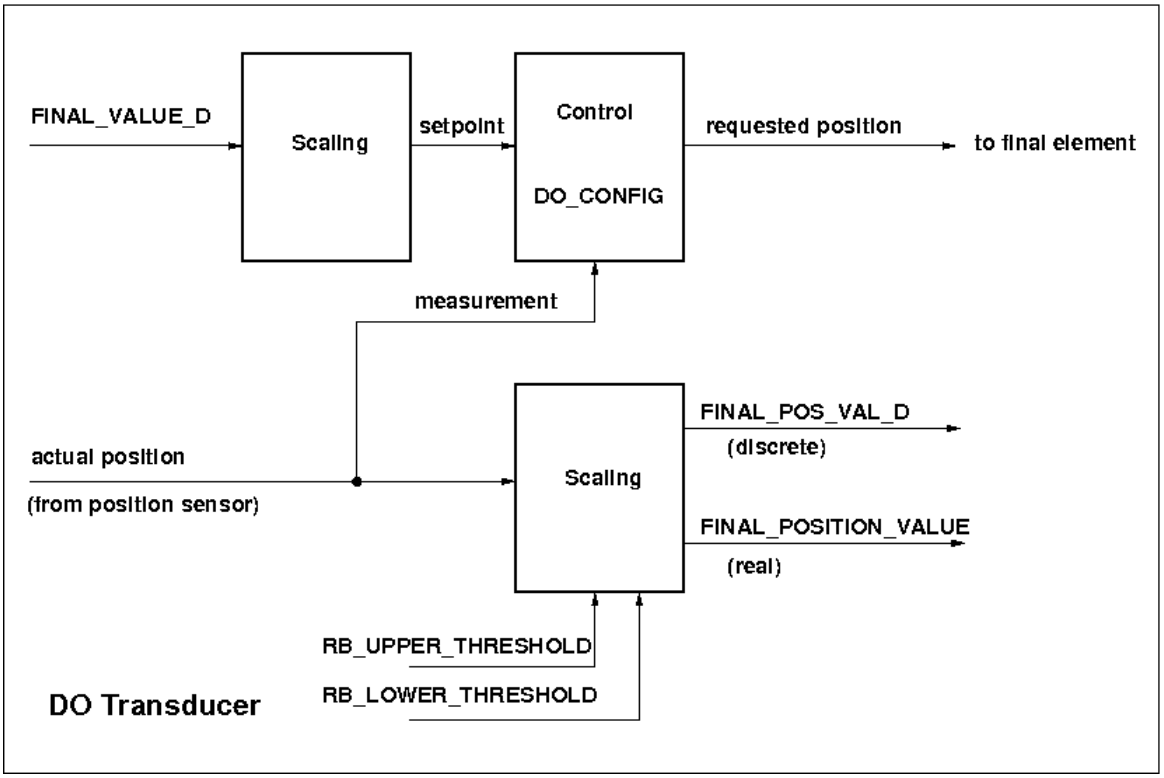
ALARM_DI1 and ALARM_DI2 provide the set state of each source enabled through CONFIG_DI1 or CONFIG_DI2 respectively. Depending on the value of CHANNEL an or-ed value of ALARM_DI1 or ALARM_DI2 will be generated and transferred to PRIMARY_VALUE_D.

A value 0 means no selected input is set. A value 1 means at least one of the selected inputs is set.

3.8 DO Transducer Block Diagram

The DO transducer block is a manufacturer specific implementation. All available parameters are described in section 3.1 above.

The functional schematic is shown below:



Parameter CONFIG_DO determines how the input FINAL_VALUE_D is calculated to parameter value FINAL_POS_VAL_D. Refer to page 80 for details about the range of values for CONFIG_DO.

Transducer input FINAL_VALUE_D will be rescaled to the end positions detected by the Autostart procedure. In addition the working setpoint will be calculated using the open/close sealing, upper/lower limit settings, linearization type settings and PT1 filtering section of the APV Transducer. The whole servo control package of the APV transducer will be used to control the valve so that the velocity can be set by the user.

The actual position is measured using the position sensor input and modified depending on the selected actuator system and mounting type (POSITION_LINEARIZATION parameter set in APV Transducer). The resulting value is stored in the parameter FINAL_POSITION_VALUE in percent units. FINAL_POS_VAL_D provides the matching discrete value, rescaled using the threshold values in parameters RB_LOWER_THRESHOLD and RB_UPPER_THRESHOLD i.e. if the actual position is lower than RB_LOWER_THRESHOLD the value of FINAL_POS_VAL_D will be set to 0. If the actual position reaches the value of RB_UPPER_THRESHOLD, the value of FINAL_POS_VAL_D will be set to 1. FINAL_POSITION_VALUE will represent the actual position in percent.

Please note that an optional binary input board has a higher priority and will override the settings in the DO Transducer.

3.9 BLK_DATA Parameter

The Block data structure consists of the attributes of a block. The default values are shown in the tables below:

Element Name	**Values for Resource Block**	**Values for AO-Block**	**Values for PID- Block**	**Values for DI1- Block**	**Values for DI2- Block**	**Values for DO- Block**
Block Tag	SRD991_RES-<fab#> or SRD960_RES-<fab#>	SRD991__AO-<fab#> or SRD960__AO-<fab#>	SRD991_PID-<fab#> or SRD960_PID-<fab#>	SRD991_DI1-<fab#> or SRD960_DI1-<fab#>	SRD991_DI2-<fab#> or SRD960_DI2-<fab#>	SRD991__DO-<fab#> or SRD960__DO-<fab#>
DD Character ID	0x80020AF5	0x800201F7	0x800202B0	0x80020217	0x80020217	0x80020237
DD Item ID	0x80020AF0	0x800201F0	0x800202B9	0x80020210	0x80020210	0x80020230
DD Revision	1	1	1	1	1	1
Profile	0x133	0x102	0x108	0x103	0x103	0x104
Profile Revision	0x0201	0x0001	0x0001	0x0001	0x0001	0x0001
Execution Time	0	1120 [1/32 ms] = 35ms	960 [1/32 ms] = 30 ms	640 [1/32 ms] = 20 ms	640 [1/32 ms] = 20 ms	960 [1/32 ms] = 30 ms
Period of Execution	0	32000 [1/32 ms]	32000 [1/32 ms]	32000 [1/32 ms]	32000 [1/32 ms]	32000 [1/32 ms]
Number of Parameters	118	31	66	25	25	27
Next FB to Execute	0	0	0	0	0	0
Starting index of Views	890	900	930	940	950	960
Number of VIEW3	4	1	1	1	1	1
Number of VIEW4	3	1	1	1	1	1

Fab# = <yy/nnnnnn> = Fabrication number (for example: 93/123456).

Table 7: BLK_DATA structure of transducer blocks

Element Name	Values for APV Transducer Block	Values for DI Transducer Block	Values for DO Transducer Block
Block Tag	SRD991_TAO-<fab#> or SRD960_TAO-<fab#>	SRD991_TDI-<fab#> or SRD960_TDI-<fab#>	SRD991_TDO-<fab#> or SRD960_TDO-<fab#>
DD Character ID	0x80020536	0x20166	0x2016F
DD Item ID	0x80020530	0x20165	0x2016E
DD Revision	1	1	1
Profile	0x810D	0x8003	0x8004
Profile Revision	0x0101	0x0101	0x0101
Execution Time	0	0	0
Period of Execution	0	0	0
Number of Parameters	115	19	19
Next FB to Execute	0	0	0
Starting index of Views	910	970	980
Number of VIEW_3	3	1	1
Number of VIEW_4	7	1	1

fab# = <yy/nnnnnn> = Fabrication number (for example: 93/123456).

3.10 DIAGNOSIS

The SRD991/SRD960 has several built-in functions to monitor the behavior of the positioner/actuator/ valve system.

- The Resource Block parameter DIAGNOSIS holds actual and historical information about system and process errors.

- AO Transducer parameters CONTROL_DIFF_LIMIT and CONTROL_DIFF_TIME are configuration parameters, which hold information about when Resource Block alarm *Device need maintenance now* will be generated if a control difference between requested transducer final value and actual valve position exceeds the allowed limit for the user-specified time.

- Resource Block parameters CYCLE_CNT and TRAVEL_SUM count the changes in actuator movement and the number of full stroke movements. Resource Block parameters CYCLE_CNT_LIMIT and TRAVEL_SUM_LIMIT and TRAVEL_SUM_DEADBAND hold the user-specified limit values, when Resource Block alarm *Device need maintenance now* will be generated, if the actual value of CYCLE_CNT or TRAVEL_SUM exceed the configured limit.

- AO Transducer Block parameter LOW_PRESSURE_LIMIT allows the user to specify a lower limit for supply air, if optional pressure sensors are available. When the pressure is falling below this limit the Resource Block alarm *Device need maintenance now* will be generated.

- Parameter TARGET_ERROR in each Function and Transducer Block give the user information about problems with the ieldbus interface. Please refer to chapter 3.11 for details.

- A set of 13 methods in the Resource Block informs about actual status and configuration of the device. Please refer to chapter 4.7 **Using Diagnostic Methods** for details.

3.10.1 DIAGNOSIS Parameter

The actual and historical status can be read in the DIAGNOSIS parameter, which contains six entries of data type bit enumerated.

Entry 1 contains system errors. The individual bits of the status byte are defined below. When the specified condition exists, the status bit will be set to one, otherwise the status bit will be reset to zero. Table 8 describes system errors.

Entry 2 contains additional system errors. The individual bits of the status byte are defined below. When the specified condition exists, the status bit will be set to one, otherwise the status bit will be zero. Table 9 describes additional system errors.

Entry 3 contains process errors. The individual bits of the status byte are defined below. When the specified condition exists, the status bit will be set to one, otherwise the status bit will be zero. Table 10 describes process errors.

Entries 4, 5 and 6 contain historical errors. The meaning of the individual bits of the status bytes is the same as described above.

When the specified condition arises, the corresponding historical status bit will be set to one. Bits, which are set, can be cleared, if the specified condition is no longer active. The only function, which allows clearing a historical status, is performing a RESET HISTORICAL STATUS command – e.g. writing any value to Resource Block parameter RESET_HIST_STATUS.

Table 8: DIAGNOSIS system errors

Bit	Value	DD Text	Explanation	Recommended Action
7	128	Opt err	Option board was not configured or failed.	Check configuration, activate option by writing the desired value to Resource block parameter DEVICE_OPTIONS or replace failed option board.
6	64	Poti err	Connection of potentiometer to electronics board failed.	Replace failed item or positioner.
5	32	IP Loop err	Connection of I/P-converter to electronics board failed.	Replace failed item or positioner.
4	16	Act. OOL	Position is not within permissible range (-5%...105%)	Check mechanics of actuator and valve. Perform Short Autostart.
3	8	ADC err	A/D-converter function not controllable.	Replace failed item or positioner.
2	4	EPROM err	Error writing into positioner ROM	Replace failed item or positioner.
1	2	EEPROM err	Error writing into positioner EEPROM	Replace failed item or positioner.
0	1	RAM err	Error writing into positioner RAM	Replace failed item or positioner.

Table 9: DIAGNOSIS additional system errors (system errors2)

Bit	Value	DD Text	Explanation	Recommended Action
7	128	Binin set	Binary Input Channel 1 or 2 is set	Monitor situation or correct cause; check cable joint
6	64	Feedbk Cal err	Feedback unit requires calibration	Perform angle calibration.
5	32	Rsvd	Reserved	None
4	16	CycleCnt Lim	Cycle Count Limit has exceeded limit configured (limit value in Resource parameter CYCLE_CNT_LIMIT)	Check valve performance and conduct maintenance if necessary.
3	8	TravSum lim	Travel Sum Limit has exceeded limit configured (limit value in Resource parameter TRAVEL_SUM_LIMIT)	Check valve performance and conduct maintenance if necessary.
2	4	Conf invalid	Configuration not valid	Correct configuration, perform Restore Factory Settings, re-run Autostart procedure.
1	2	Temp Lo	Device temperature too low (limit value in AOTD parameter ELECTRONICS_TEMP_LL)	Operation outside temperature limit may damage positioner components and violate electrical safety certification requirements. Stop operating positioner.
0	1	Temp Hi	Device temperature too high (limit value in AOTD parameter ELECTRONICS_TEMP_UL)	

Table 10: DIAGNOSIS process errors

Bit	Value	DD Text	Explanation	Recommended Action
7	128	Output press Alm	Output pressure error (plausibility check)	Check mechanics of actuator. Check pneumatics in positioner and replace item or positioner if necessary.
6	64	Air Supply Alm	The supply pressure has fallen below the configured lower limit (value in AOTD parameter LOW_PRESSURE_LIMIT)	Check to ensure that there is adequate supply pressure.
5	32	Autostart fail	No Autostart was done or Autostart was run and did not complete successfully.	Ensure proper mounting of positioner and adequate supply pressure. Rerun Autostart Calibration procedure. Refer to troubleshooting section of MI EVE 0105A.
4	16	Contr Diff	Difference between requested setpoint and actual position exceeds allowed limit for a user specified time (values in AOTD parameters CONTR_DIFF_LIMIT and CONTR_DIFF_TIME)	Check to ensure that there is adequate supply pressure. Verify tuning parameters. Refer to troubleshooting section of MI EVE 0105A.
3	8	LoLo Alm	Position below main low alarm setpoint (lower than the value in Resource parameter POS_VALVE_LOLO_ALARM)	Monitor situation or correct cause.
2	4	HiHi Alm	Position above main high alarm setpoint (higher than the value in Resource parameter POS_VALVE_HIHI_ALARM)	Monitor situation or correct cause.
1	2	Lo Alm	Position below warning low alarm setpoint. (lower than the value in Resource parameter POS_VALVE_LO_ALARM)	Monitor situation or correct cause.
0	1	Hi Alm	Position above warning high alarm setpoint (higher than the value in Resource parameter POS_VALVE_HI_ALARM)	Monitor situation or correct cause.

If more than one error is detected, values will accumulate. For example if position is below warning and main alarm level, process errors will be set to 10, which means bit 3 and bit 1 are set. If Device Description information is used, *LoLo Alm* | *Lo Alm* will be reported.

3.11 TARGET_ERROR Parameter

The TARGET_ERROR parameter gives the user an information about the cause of problems – for example while writing to specific parameters, which are write checked against valid ranges or special block modes.

Target error reasons are stored in an array of 6 error codes. The uppermost value shows the actual target error value. The remaining values indicate the historical course.

Particulars about error codes are described in the following table:

Table 11: Resource Block TARGET_ERROR codes

Code (hex)	Explanation	Description
0000	No error information available	Current block is not running or has reinitialized target error parameter and is updating its status
1000	no errors detected	No errors detected
1001	RB Target Mode is OOS	User has requested Resource Target Mode to switch to Out of Service. In this state the device cannot control the valve. But this mode is required for performing an Autostart procedure.
1002	Diagnosis Status is set	Check Resource Block DIAGNOSIS parameter or perform diagnostic methods
1003	Device is write locked	Cannot write because the device is write locked. To unlock please change the Resource Block parameter WRITE_LOCK.
1005	Write EEPROM error	Write error because the device is not able to write to EEPROM.
100A	RB range error	Cannot write to RESOURCE block parameter because the value is out of the defined range. Please check range
100B	RB access error	Device Access Manager denied writing to a parameter which is part of the Raw_conf structure. AOTD Parameter INST_MODE may be in the wrong state.
100C	RB Mode Check error	Changing the actual Block Mode to the desired target value is not allowed.
100D	RB Alarm Check error	Can not acknowledge alarm because either the wrong value or the wrong subindex should be written
2001	AO Target Mode is OOS	Analog Output Target Mode is Out of Service. In this state the device cannot control the valve. But this mode is required for writing to the following AO block parameters: IO_OPTS, STATUS_OPTS, CHANNEL
2002	CHANNEL link error	AO block is unable to access transducer data. Set AO Block Mode to OOS and write appropriate value (1) to CHANNEL parameter
2003	AO Readback status is bad	Reading parameter READBACK shows a BAD status. Check AO Transducer Block settings

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Code (hex)	Explanation	Description
2004	Autostart running	Autostart procedure is running and not completed yet. Please wait until Autostart has ended.
2005	No Autostart done	Set Resource Block Mode to OOS, then set VALVE_ACT and POSITION_LINEARIZATION (AO Transducer) to the desired values and initiate an Autostart (writing to SELF_CALIB_ CMD parameter or use Autostart method in AO Transducer Block).
2006	Function block(s) not scheduled	Block(s) not scheduled, please download a schedule.
2007	Cannot switch instrument mode to OFFLINE	Check AO Transducer Block INST_MODE parameter
2008	Cannot switch instrument mode to ONLINE	Check AO Transducer Block INST_MODE parameter
2009	Cannot write because of wrong AO block mode	The desired value cannot be written, because the AO target block mode is not in the required state.
200A	AO range error	Cannot write to AO block parameter because the value is out of the defined range. Please check range.
200B	AO access error	Cannot write to AO block parameter because the device access manager has denied it. Please check the value of AO Transducer parameter INST_MODE; it should be OFFLINE.
200C	AO Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.
200D	AO Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
200E	AO RCAS/SHED_OPT Config error	Target Mode is RCAS but SHED_OPT is 0; please set SHED_OPT to an appropriate value.
200F	AO Exec time ZERO	AO execution impossible because BLK_DATA (relative index 0) element execution_time is 0. Download a schedule so that this element will be set.
2010	AO invalid EU in XD_SCALE	Entered engineering units are not supported for XD_SCALE.

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Code (hex)	Explanation	Description
4001	PID Block CONTROL_OPT parameter BYPASS is not set	The desired value cannot be written, because it is required to set CONTROL_OPT bypass enable first.
4009	Wrong PID block mode	The desired value can not be written, because the PID target block mode is not in the required state
400A	PID range error	Cannot write to PID block parameter because the value is out of the defined range. Please check range.
400C	PID Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.
400D	PID Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
400E	PID RCAS/SHED_OPT Config error	Target Mode is RCAS but SHED_OPT is 0; please set SHED_OPT to an appropriate value.
400F	PID Exec time ZERO	PID execution impossible because BLK_DATA (relative index 0) element execution_time is 0. Download a schedule so that this element will be set.
4011	PID Bypass error	PID BYPASS is 0; please set BYPASS to an appropriate value.
4012	PID ROUT/SHED_OPT Config error	Target Mode is ROUT but SHED_OPT is 0; please set SHED_OPT to an appropriate value.
5001	DI Target Mode is OOS	Discrete Input Target Mode is Out of Service. Block execution is not possible in this state. But this mode is required for writing to the following DI block parameters: IO_OPTS, STATUS_OPTS, CHANNEL
500A	DI range error	Cannot write to DI block parameter because the value is out of the defined range. Please check range.
500C	DI Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.
500D	DI Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
500F	DI Exec time ZERO	DI execution impossible because BLK_DATA (relative index 0) element execution_time is 0. Download a schedule so that this element will be set.

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6001	DO Target Mode is OOS	Discrete Output Target Mode is Out of Service. Block execution is not possible in this state. But this mode is required for writing to the following DO block parameters: IO_OPTS, STATUS_OPTS, CHANNEL
600A	DO range error	Cannot write to DO block parameter because the value is out of the defined range. Please check range.
600C	DO Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.
600D	DO Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
600E	DO RCAS/SHED_OPT Config error	Target Mode is RCAS but SHED_OPT is 0; please set SHED_OPT to an appropriate value.
600F	DO Exec time ZERO	DO execution impossible because BLK_DATA (relative index 0) element execution_time is 0. Download a schedule so that this element will be set.

Table 12: Transducer TARGET_ERROR codes

Code (hex)	Explanation	Description
0000	No error information available	Current block is not running or has reinitialized target error parameter and is updating its status
1000	no errors detected	No errors detected
1003	Device is write locked	Cannot write because the device is “write locked”. To unlock please change the value of Resource Block parameter WRITE_LOCK.
3001	AOTB Block Mode is OS	AOTB Transducer Block Mode is out of service. Check Resource Block mode or AO Transducer Block target mode or perform an Autostart.
3002	Cannot write to AO Transducer parameter FINAL_VALUE	Check AO Transducer Block parameter MODE_BLK – should be AUTO. Check AO Transducer Block parameter INST_MODE parameter; it should be ONLINE. Check local override: device should be in normal operation mode = LED shouldn’t flash in a 50/50 frequency
3005	Wrong TAB_OP_CODE value in AOTB	Changing values in the custom characteristic curve requires the value for TAB_OP_CODE set to START. Please check TAB_OP_CODE.
3009	AOTB wrong block mode	The desired value cannot be written, because the target block mode is not in the required state.
300A	AOTB range error	Cannot write because the value is out of the defined range. Please check range.
300C	AOTB Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.
300D	AOTB Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
3011	AOTB XD error active	AOTB Transducer specific error is set. Please read parameter XD_ERROR for details.
7001	DITB Block Mode is OS	DITB Transducer Block Mode is out of service. Check Resource Block mode.
7009	DITB wrong block mode	The desired value cannot be written, because the target block mode is not in the required state.
700A	DITB range error	Cannot write because the value is out of the defined range. Please check range.
700C	DITB Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.

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700D	DITB Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
7011	DITB XD error active	DITB Transducer specific error is set. Please read parameter XD_ERROR for details.
8001	DOTB Block Mode is OS	DOTB Transducer Block Mode is out of service. Check Resource Block mode.
8009	DOTB wrong block mode	The desired value cannot be written, because the target block mode is not in the required state.
800A	DOTB range error	Cannot write because the value is out of the defined range. Please check range.
800C	DOTB Block Mode Check error	Changing the actual Block Mode to the desired value in target is not allowed.
800D	DOTB Block Alarm Check error	Cannot acknowledge alarm because either the wrong value or the wrong subindex should be written.
8011	DOTB XD error active	DOTB Transducer specific error is set. Please read parameter XD_ERROR for details.

3.12 GRANT_DENY Parameter

The Grant/Deny parameter is used to allow the operator grant and deny access permissions to sets of function block parameters by other devices.

Table 13: GRANT_DENY structure

Element Number	Element Name	Description
1	Grant	Set Bit 0: **Program** – A higher level device may change the target mode, setpoint (if the block mode is MAN or AUTO), or output (if block mode is MAN) of the block 1: **Tune** – A higher level device may change the tuning parameters of the block 2: **Alarm** – A higher level device may change the tuning parameters of the block 3: **Local** – A local operator's panel or hand-held device may change the target mode , setpoint (if the block mode is MAN or AUTO), or output (if block mode is MAN) of the block
2	Deny	Set Bit 0: **Program Denied** - The Program permission item has been turned off 1: **Tune Denied** - The Tune permission item has been turned off 2: **Alarm Denied** - The Alarm permission item has been turned off 3: **Local Denied** - The Local permission item has been turned off

3.13 IO_OPTS Parameter

The following Block options can be configured in the bitstring Parameter IO_OPTS:

Table 14: IO_OPTS Parameter

Bit	Meaning
0 (LSB)	Invert (reserved for DI and DO Blocks)
1	SP-PV Track in MAN
2	Reserved
3	SP-PV Track in LO
4	SP Track retained target
5	Increase to close
6	Fault State to value
7	Use Fault State value on restart
8	Target to MAN if Fault State activated
9	Use PV for BKCAL_OUT
10	Low cutoff (reserved for AI Block) Fault State at OOS (special for AO)
11	Reserved
12	Reserved
13	Reserved
14	Reserved
15	Reserved

Table legend:

Invert	The discrete input should be logically inverted before it is stored in the process variable
SP-PV Track in MAN	Permit the setpoint to track the process variable when the target mode of the block is MAN
SP-PV Track in LO	Permits the setpoint to track the process variable when the actual mode of the block is LO (Local Override)
SP Track retained target	Permits the setpoint to track the RCAS or CAS parameter based on the retained target when the actual mode of the block is LO or MAN.
Increase to close	Indicates whether the output value should be inverted before it is communicated to the I/O channel
Fault State to value	Output action to take when fault occurs (0=freeze, 1 = go to preset value)
Use PV for BKCAL_OUT	BKCAL_OUT and RCAS_OUT values are normally the working SP. When set, PV value will be used after the cascade is closed.
Low cutoff	Fault State performed by the AO block when actual block mode is switched to OOS

3.14 STATUS_OPTS Parameter

FOUNDATIONfieldbus defines several Status options codes for several blocks. Please refer to the following table for options available in the SRD991/SRD960 in an AO-, DI-, DO- and PID-Block:

Table 15: STATUS_OPTS Parameter

Bit	Meaning
0 (LSB)	IFS if BAD IN
1	IFS if BAD CAS_IN
2	Use Uncertain as Good
3	Reserved for AI/DI
4	Propagate Fault Backward
5	Target to MAN if BAD IN
8	Uncertain if MAN mode

Table legend:

IFS if BAD IN	Available for PID: Set Initiate Fault State status in OUT, if status of IN is BAD.
IFS if BAD CAS_IN	Available for PID: Set Initiate Fault State status in OUT, if status of CAS_IN is BAD.
Use Uncertain as Good	Available for PID: If status of IN is Uncertain, treat it as Good. Otherwise treat is as BAD.
Propagate Fault Backward	Available for AO: If the status from the actuator is Bad, Device failure or Fault State Active or Local Override is active, propagate this as Bad, Device Failure or Good Cascade, Fault State Active or Local Override to BKCAL_OUT respectively without generating an alarm. The user may determine whether alarming (sending of an alert) will be done by the block or propagated upstream for alarming.
Target to MAN if BAD IN	Available for PID: Set target mode to MAN, if status of IN is BAD. This latches PID block in MAN if the input ever goes bad.
Uncertain if MAN mode	Available for DI: set output status to uncertain if the measured value is limited.

3.15 CONTROL_OPTS Parameter

FOUNDATIONfieldbus defines control options for control blocks. The following block options can be configured in the bitstring Parameter CONTROL_OPTS, which is available in the SRD991/SRD960-PID-Block:

Table 16: CONTROL_OPTS Parameter

Bit	Meaning
0 (LSB)	Bypass Enable
1	SP-PV Track in MAN
2	SP-PV Track in ROUT
3	SP-PV Track in LO or IMAN
4	SP Track retained target
5	Direct Acting
6	Reserved
7	Track Enable
8	Track in MAN
9	Use PV for BKCAL_OUT
10	Act on IR (reserved for BG-, PD-, R-Blocks)
11	Use BKCAL_OUT with IN_1 (reserved for BG- and R-Blocks)
12	Obey SP limits if CAS or RCAS
13	No OUT limits in MAN
14	Reserved
15	Reserved

Table legend:

Bypass Enable	If true, allows BYPASS to be set
SP-PV Track in MAN	Permits the setpoint to track the process variable when the target mode of the block is MAN
SP-PV Track in ROUT	Permits the setpoint to track the process variable when the target mode of the block is ROUT
SP-PV Track in LO or IMAN	Permits the setpoint to track the process variable when the actual mode of the block is LO (Local Override) or IMAN
SP Track retained target	Permits the setpoint to track the RCAS or CAS parameter based on the retained target when the actual mode of the block is IMAN, LO, MAN or ROUT
Direct Acting	When selected, an increase in PV results in an increase in the output
Track Enable	Enables external tracking function. If true, TRK_VAL will replace OUT if TRK_IN_D becomes true and target mode is not MAN
Track in MAN	Enables TRK_VAL to replace OUT when target mode is MAN and TRK_IN_D is true. The actual mode will then be LO.

Use PV for BKCAL_OUT	BKCAL_OUT and RCAS_OUT values are normally the working SP. When set, PV value will be used after the cascade is closed.
Obey SP limits if CAS or RCAS	Normally setpoint will not be restricted. If set setpoint will be restricted to the absolute limits in CAS and RCAS modes.
No OUT limits in MAN	If set, OUT_HI_LIM or OUT_LO_LIM will not be applied when target and actual modes are MAN.

3.16 SHED_OPT Parameter

This parameter may be used to configure the desired behavior when shedding. It determines the actual shed mode when the setpoint or output is not updated within a time-out limit in the remote-cascade mode or remote-output mode (remote-out is not available for an AO-Block).

The shed option is available in the SRD991/SRD960 AO-, DO- and PID-Block and has the following enumerations:

Table 17: Shed_opt parameter

Value	Meaning
0	Un-defined, invalid
1	Normal shed, normal return
2	Normal shed, no return
3	Shed to AUTO, normal return
4	Shed to AUTO, no return
5	Shed to MAN, normal return
6	Shed to MAN, no return
7	Shed to retained target, normal return
8	Shed to retained target, no return (change target to retained target)

3.17 ALARM_LINK Parameter

The newly designed Alarm Link allows the operator to freely define and activate the alarm that he wants to display on his alarm channel of an additional Analog Feedback Board (optional).

The ALARM LINK parameter contains 8 entries. Each entry holds definitions for up to 8 alarm sources. All sources can be selected individually. Details are explained on next page.

Following enumerations are available:

Table 18: Alarm Link parameter

	0x80	**0x40**	**0x20**	**0x10**	**0x08**	**0x04**	**0x02**	**0x01**
al_messages1	reserved	Write protected	Bad CRC	Cal invalid	Current invalid	Feedback defective	IP converter defective	No pressure
al_messages2	Autostart error 1	Autostart error 2	Option board error	Control difference error	Reached lower limit	Reached upper limit	Maintenance required	reserved
al_system_errors	RAM error	EEPROM error	EPROM error	ADC error	Actuator out of range	IP loop error	Feedback error	Option board error
al_system_errors2	Temperature too high	Temperature too low	Configuration invalid	Travel Sum limit reached	Cycle Count limit reached	reserved	Feedback Calibration error	Binary Input set
al_process_errors	Position warning high alarm	Position warning low alarm	Position main high alarm	Position main low alarm	Control difference error	Autostart failed	Air Supply Alarm	Output pressure alarm
al_valve_diag1	Service interval reached	reserved	Load Factor low alarm	Load Factor high alarm	reserved	Backlash alarm	Partial stroke test alarm	reserved
al_valve_diag2	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved
al_misc_diag	Power supply low	Power supply high	reserved	reserved	reserved	reserved	reserved	reserved

3.18 VALVE_DIAG_STATUS Parameter

The actual and historical valve status can be read in the resource block parameter VALVE_DIAG_STATUS, which contains six entries of data type bit-enumerated.

The first three entries (al_valve_diag1, al_valve_diag2, al_misc_diag) contain actual status the last three contain historical status. The meaning of the individual bits of the historical status bytes is the same as the definition for the actual status.

When the specified condition arises, the corresponding historical status bit will be set to one. Bits, which are set, can be cleared, if the specified condition is no longer active.

The only function, which allows clearing a historical status, is performing a RESET HISTORICAL STATUS command – e.g. write any value to Resource Block parameter RESET_HIST_STATUS.

The meaning of the first three entries is described in the following table:

Table 19: Valve diagnosis status parameter

	0x80	**0x40**	**0x20**	**0x10**	**0x08**	**0x04**	**0x02**	**0x01**
al_valve_diag1	Service interval reached	rsvd	Load Factor low alarm	Load Factor high alarm	rsvd	Backlash alarm	Partial stroke test alarm	rsvd
al_valve_diag2	rsvd	rsvd	rsvd	rsvd	rsvd	rsvd	rsvd	rsvd
al_misc_diag	Power supply low	Power supply high	rsvd	rsvd	rsvd	rsvd	rsvd	rsvd

3.19 RST_VALVE_DIAG_STAT Parameter

Writing to resource block parameter RST_VALVE_DIAG_STAT makes it possible to clear valve diagnosis data and clear position and/or response history data selectable through following enumerations in two command bytes.

Table 20: Reset valve diagnosis status parameter, first byte

Bit	**Value**	**Value (hexadecimal)**	**Meaning**
0 (LSB)	1	0x01	Select position history
1	2	0x02	Select response history
2	4	0x04	Clear service time reached
3	8	0x08	Clear Min/Max measured temperature
4	16	0x10	Clear Min/Max Load Factor
5	32	0x20	Reserved
6	64	0x40	Reserved
7	128	0x80	Reserved

Table 21: Reset valve diagnosis status parameter, second byte

Bit	Value	Value (hexadecimal)	Meaning
0 (LSB)	1	0x01	Clear minutes history
1	2	0x02	Clear hours history
2	4	0x04	Clear days history
3	8	0x08	Clear months history
4	16	0x10	Reserved
5	32	0x20	Reserved
6	64	0x40	Reserved
7	128	0x80	Reserved

Examples:

To reset response days history the two bytes 0x02, 0x04 have to be send.

0xFF, 0xFF resets all valve diagnosis data.

3.20 CONFIG DI1/DI2 Parameter

Two discrete input blocks can be connected to one discrete input transducer block. The DI transducer contains one configuration parameter for each DI function block. Parameter CONFIG_DI1 can be set to enable the alarm conditions for discrete input block 1 and CONFIG_DI2 selects the alarm sources for discrete input block 2. The alarms are identical to the definition of the ALARM_LINK parameter. Please refer to chapter 3.17 **ALARM_LINK Parameter** for details.

3.21 ALARM DI1/DI2 Parameter

Parameters ALARM_DI1 and ALARM_DI2 reflect the actual status of the enabled alarm sources. These parameters are only updated, if a schedule is downloaded with the correct CHANNEL values to connect discrete input function block DI1 and DI2 to the DI transducer.

DI1 requires CHANNEL value set to 2 and DI2 is connected to the transducer with CHANNEL value 3.

The data structure is identical to the definition of the ALARM_LINK parameter. Please refer to chapter 3.17 **ALARM_LINK Parameter** for details.

3.22 Maintenance – History Interval and Service Interval

The history intervals TIME_SCALE_MIN_HIST, TIME_SCALE_HRS_HIST, TIME_SCALE_DAYS_HIST, TIME_SCALE_MONTHS_HIST are used to configure the four different historians for the Position History and the Response History. These historians store the data inside of the positioner for a later upload for the specific time windows. Later in operation this enables to see what happened within the process,
showing the last 15 minutes (POS_MIN_HIST and RSP_MIN_HIST),
up to 24 hours (POS_HRS_HIST and RSP_HRS_HIST),
up to 30 days (POS_DAYS_HIST and RSP_DAYS_HIST)
and up to 60 months/5 years (POS_MONTHS_HIST and RSP_MONTHS_HIST).

Attention!

Once the history intervals are set, they should not be reconfigured during operation, because this will delete all stored data of each historian.

For details about how to reset the data see description of RST_VALVE_DIAG_STAT parameter.

POS_MIN_HIST and RSP_MIN_HIST:

Preset to 15 minutes. This history shows the last 15 minutes of the process for the Position History and the Response History. The interval cannot be re-configured.

POS_HRS_HIST and RSP_HRS_HIST:

Preset to 24 hours. This history shows the last 1 to 24 hours of the process for the Position History and the Response History. The interval can be configured between 1 to 24 hours in parameter TIME_SCALE_HRS_HIST.

POS_DAYS_HIST and RSP_DAYS_HIST

Preset to 30 days. This history shows the last 1 to 30 days of the process for the Position History and the Response History. The interval can be configured between 1 to 30 days in parameter TIME_SCALE_DAYS_HIST.

POS_MONTHS_HIST and RSP_MONTHS_HIST*:*

Preset to 12 months. This history shows the last 1 to 12 months of the process for the Position History and the Response History. The interval can be configured between 1 to 60 months in parameter TIME_SCALE_MONTHS_HIST.

Parameter SERVICE_REMINDER_AFTER [0.1 hours] is used in connection with the value for parameter ACT_TIME_IN_OPERATION [0.1 hours]. The Actual Time in Operation provides the information how long the total operation time of this unit is. Once this value exceeds the value configured under Service Reminder status “Service interval reached” is set in parameter VALVE_DIAG_STATUS, informing that the device needs to be serviced. In addition the Status of Service Interval will switch from Good to Service. The device also shows the TIME_SINCE_LAST_SERVICE [0.1 hours].

Example values for parameter SERVICE REMINDER_AFTER are explained on next page.

Table 22: Example values for SERVICE_REMINDER_AFTER

years	months	days	hours	0.1 hours (6 min.)
0.5	6	182.5	4380	26280
1	12	365	8760	52560
2	24	730	17520	78840
3	36	1095	26280	105120
4	48	1460	35040	131400
5	60	1825	43800	157680
10	120	3650	87600	315360

3.23 Load Factor and Load Factor History

The Stem Friction Measurement is an indispensable feature for today's predictive maintenance capabilities of any control valve. This feature allows predicting possible leakages or stuck valves and in return prevents dangerous spills, injuries of personnel, damage to plant equipment and the environment, and in result expensive downtimes of the valve.

The Load Factor/Stem Friction is a value to determine the force/friction between the stem and the packing during a movement. This measurement requires the optional pressure sensors to measure the supply pressure and the output pressure(s). Each time the stem or shaft moves, the positioner measures the pressure overshoots caused by the stick-slip effect and calculates the values for the friction of the movement displayed as the Load Factor value.

The following Resource Block parameters contain information about Load Factor and Load Factor History:

VALVE_DIAG_STATUS
RST_VALVE_DIAG_STAT
RESPONSE_STATUS
LOAD_FACTOR
LOAD_FACTOR_MIN
LOAD_FACTOR_MAX
LOAD_FACTOR_LOWER_LMT
LOAD_FACTOR_UPPER_LMT
LOAD_FACTOR_AVG
LOAD_FACTOR_REF_AVG
LOAD_FACTOR_REF_TIM
SET_LOAD_FACTOR_REF
LOAD_FACTOR_DAYS_HIST
LOAD_FACTOR_MONTHS_HIST
SPRING_RANGE_LOWER_VAL
SPRING_RANGE_UPPER_VAL
SPRING_RANGE_UNIT

Before an accurate friction measurement can take place, the value of the spring range that is listed on the valve label needs to be entered. The spring range is only applicable to single-acting (spring

loaded) actuators and is defined with a lower and upper value. First select the engineering unit in psig, kPa or bar of how the spring range is defined (parameter SPRING_RANGE_UNIT) then enter the range.
The range is configured as SPRING_RANGE_LOWER_VAL to SPRING_RANGE_UPPER_VAL in psig/kPa/bar and identifies the valve movement from fully closed (at e.g. lower value 1.5 bar) to fully open (at e.g. upper value 2.7 bar).

In case the spring range is not available, it can also be determined manually after an Autostart has been executed. Select the display for the output pressure in the LCD Menu. Slowly increase the setpoint to the valve and check at what output pressure the valve starts moving (SPRING_RANGE_LOWER_VAL is identified) and when the valve is fully open (SPRING_RANGE_UPPER_VAL). This measurement is quite accurate.

After configuration write changes to the device.

Remark:

The Load Factor value can now still be very high, because the spring range originally could have been out of scale. In this case go to RST_VALVE_DIAG_STAT and check the box for the Load Factor and write the change to the device. The data in the fields for LOAD_FACTOR, LOAD_FACTOR_MIN, LOAD_FACTOR_MAX will be reset. These values show the present measured value (LOAD_FACTOR) and drag pointers for the Minimum Value (LOAD_FACTOR_MIN) and Maximum Value (LOAD_FACTOR_MAX) over time.

The Load Factor History data are available for days to month intervals.
The interval can be configured in parameter TIME_SCALE_DAYS_HIST (1 to 30 days) and TIME_SCALE_MONTHS_HIST (1 to 60 months).

Attention!

Once the history intervals are set, they should not be reconfigured during operation, because this will delete all stored data of each historian.

Friction measurement history data are presented as a change in friction compared to a reference value, which has been set by writing to parameter SET_LOAD_FACTOR_REF. The point in time when the reference value was set is indicated in parameter LOAD_FACTOR_REF_TIM.

The Load Factor alarm limits (LOAD_FACTOR_LOWER_LMT, LOAD_FACTOR_UPPER_LMT) should be configured after the first measurements have taken place and the average reference value has been set. The best time to set these values is after a certain time in operation, when the valve is “broken-in”. Then the Load Factor alarm limits should be configured. The values can be configured with a 25% increase of the measurements that is in relation to a 25% increase in the friction. This has to be done for both values.

Seven categories defined as a relative frequency in percent can be differentiated:

Table 23: Friction history table

Data index	Change in friction compared to reference *load_factor_ref* (x) in percent	Evaluated as
1	-50 < x <= - 100	no stem friction
2	-25 < x <= -50	reduced friction
3	-5 < x <= -25	slightly reduced friction
4	5 < x <= -5	within initial measurement
5	5 < x <= 25	slightly increased friction
6	25 < x <= 50	increased friction
7	50 < x <= 100	stem is stuck

3.24 Partial Stroke Test

Final control elements in ESD applications such as ON-OFF-, Blow Down- and Venting-Valves remain in one position over a longer time without any mechanical movement. These valves can show the tendency to get stuck and in result might not operate upon demand. This can have a severe impact to the functionality of a Safety System and in result to the operating personnel, plant equipment and the environment.

The Partial Stroke Test (PST) offers operators a tool to identify the trouble proof function of such ESD valves. The test can be easily executed. In the “Manual” mode the test can be activated via a “Start test” command and in “Automatic” within a freely defined time interval in [0.1hours] that allows stroking the valve periodically. In both cases the valve can be stroked within a stroke ratio of up to 30 %. The maximum wait time allows taking into account that each valve has a different dynamical behaviour e.g. caused by the process media or the valve itself. If the valve has performed the test without any problems, the status for the partial stroke test will go to “OK”. In case the valve does not move and could be stuck, the operator will be informed by an alarm indicating an “Error”. Besides this the device continuously monitors the health of the control valve, among others such as the stem friction, supply and output pressure.

The following resource block parameters are involved in the partial stroke test procedure:

PST_STATUS	Actual status 0 – Test has not been executed yet 1 – Test performed “OK” 2 – Test has been started and is in progress 4 – Test is restricted. Either the valve is in control or the valve is not fully open 8 – Test ended with an error. The valve is stuck and cannot move. The valve needs to be inspected.
PST_CONFIG	Switch between manual and automatic configuration: 0 – Manual 1 – Automatic
PST_SP_CHANGE	Defines the setpoint change of valve movement in percent from a fully open valve position. Range: 1 to 30 %
PST_DURATION	Defines the time in seconds how long the positioner will keep the setpoint change active
PST_COMMAND	If PST_CONFIG is set to “Manual”, writing the “Start test” command will initiate a Partial Stroke Test immediately: 0 – No command 1 – Start test

3.25 Write Checks

FOUNDATIONfieldbus has defined some restrictions for changing values of writable Block Parameters.

Valid ranges for several parameters and the required Block Mode to allow a change of the value of a parameter is specified. The valid range is described in the Parameters table above (see chapter 3.1). The lowest priority target mode required to modify parameters is listed in the table below.

Table 24: Block Mode write checklist

Index	Parameter Name	Required Block Mode to modify parameter
428	SP	AO-Block target mode: AUTO
429	OUT	AO-Block target mode: MAN
431	PV_SCALE	AO-Block target mode: MAN
432	XD_SCALE	AO-Block target mode: MAN
434	IO_OPTS	AO-Block target mode: OOS
435	STATUS_OPTS	AO-Block target mode: OOS
442	CHANNEL	AO-Block target mode: OOS
475	FINAL_VALUE_CUTOFF_HI	AO Transducer Block target mode: OOS
476	FINAL_VALUE_CUTOFF_LO	AO Transducer Block target mode: OOS
478	SERVO_GAIN	AO Transducer Block target mode: OOS
479	SERVO_RESET	AO Transducer Block target mode: OOS
480	SERVO_RATE	AO Transducer Block target mode: OOS
481	ACT_FAIL_ACTION	AO Transducer Block target mode: OOS
489	XD_CAL_LOC	AO Transducer Block target mode: OOS
490	XD_CAL_DATE	AO Transducer Block target mode: OOS
491	XD_CAL_WHO	AO Transducer Block target mode: OOS
497	SELF_CALIB_CMD	Resource Block target mode: OOS
535..562	T_ENTRY to T_VAL_21	Resource Block target mode: OOS
588	SP	PID-Block target mode: AUTO
589	OUT	PID-Block target mode: MAN
590	PV_SCALE	PID-Block target mode: OOS
591	OUT_SCALE	PID-Block target mode: OOS
593	CONTROL_OPTS	PID-Block target mode: OOS
594	STATUS_OPTS	PID-Block target mode: OOS
597	BYPASS	PID-Block target mode: MAN
617	TRK_SCALE	PID-Block target mode: OOS
621	FF_SCALE	PID-Block target mode: OOS

Continued on next page

Continued from previous page

Index	Parameter Name	Required Block Mode to modify parameter
428	SP	AO-Block target mode: AUTO
658	OUT_D	DI1-Block target mode: MAN
663	IO_OPTS	DI1-Block target mode: OOS
664	STATUS_OPTS	DI1-Block target mode: OOS
665	CHANNEL	DI1-Block target mode: OOS
688	OUT_D	DI2-Block target mode: MAN
693	IO_OPTS	DI2-Block target mode: OOS
694	STATUS_OPTS	DI2-Block target mode: OOS
695	CHANNEL	DI2-Block target mode: OOS
718	SP_D	DO-Block target mode: AUTO
719	OUT_D	DO-Block target mode: MAN
724	IO_OPTS	DO-Block target mode: OOS
725	STATUS_OPTS	DO-Block target mode: OOS
728	CHANNEL	DO-Block target mode: OOS

4 COMMON TASKS

4.1 Perform an Autostart Method

Two Autostart methods are available in the AO Transducer Block.

The Perform_Autostart method will execute a complete Autostart cycle which includes detection of valve end positions, calculating IP-converter parameters, calculating control parameters and overwrite previous control parameters in the device and measuring the positioning speed.

The Perform_Short_Autostart method determines physical endpoints and calculates IP-converter parameters only. No control parameters will be overwritten.

4.1.1 Perform_Autostart

If you use NI-FBUS Configurator System, this Method is available in the AO Transducer Block task line. Select Perform_Autostart and the method will begin with the following message:

This function will automatically detect the valve end positions and control parameters. It will open and close the valve and override the previous control parameters.
This procedure should be only performed, if it is safe to do so.
Do you want to proceed and initiate an Autostart procedure?

(1) Yes

(2) No

If <*No*> is selected, the method will end with the message

No Autostart will be performed. Method will be closed.

If <*Yes*> is selected, the next step will be to choose the mounting type:

Please assure yourself of the positioner mounting and then select the linearization type from the list below:

(1) Stroke left mounted

(2) Stroke right mounted

(3) Rotary opening counterclockwise

(4) Rotary opening clockwise

(5) Not sure – terminate

If option (5) is selected, the following message will be displayed and the method will be closed:

No change required. Method will be closed.

After entering the linearization type the Autostart type needs to be selected:

Please select the Autostart Type:

(1) Standard - medium response time, slight overshoot allowed with emphasis on a short duration

(2) Smooth . slower response without overshoot

(3) Fast - fast response with overshoot probability

(4) Enhanced - Standard Autostart with an extended procedure to calculate control parameters

(5) Break - Stop this procedure, method will be closed

If option (5) is selected, no Autostart will be executed and the method will end.

All other options will initiate an Autostart procedure and the actual status will be displayed.

As an example the following status messages could be indicated:

Autostart in progress. Please wait…
Phase 1: end positions. Status (16): Determining…
Phase 1: end positions. Status (17): Optimizing…
Phase 2: output parameter. Status (32): Determining…
Phase 2: output parameter. Status (33): Ramping Start…
Phase 2: output parameter. Status (34): Step 1
Phase 2: output parameter. Status (35): Step 2
Phase 2: output parameter. Status (36): Step 3
Phase 3: tuning parameters. Status (48): Start…
Phase 3: tuning parameters. Status (49): Measuring Velocity
Phase 3: tuning parameters. Status (50): Iteration 1
Phase 3: tuning parameters. Status (51): Iteration 2
Phase 3: tuning parameters. Status (52): Iteration 3
Phase 4: response time measurement. Status (64): Start with control 5 %
Phase 4: response time measurement. Status (65): Jump to 95 %
Phase 4: response time measurement. Status (66): Jump to 5 %

Autostart completed successfully
NOTE: Please download a FB schedule to complete start-up.

In case that the Autostart program in the device will detect a problem, this error will be reported with

Autostart has failed.

In most cases the following reasons could lead to an Autostart failure:

- Air supply too low
- Coupling mounted in wrong direction
- Pneumatic output to actuator closed or untight
- Mechanical stops not determinable

Please refer to Master instruction MI EVE0105 D-(en) for details.

4.1.2 Perform_Short_Autostart

If you use NI-FBUS Configurator System, this Method is available in the AO Transducer Block task line. Select Perform_Short_Autostart and the method will begin with the following message:

This command will open and close the valve which may cause a process upset.
This procedure should be only performed, if it is safe to do so.
Do you want to proceed and initiate a Short Autostart procedure?

(1) Yes

(2) No

If <*No*> is selected, the method will end with the message

No Autostart will be performed. Method will be closed.

If <*Yes*> is selected, the next step will be to choose the mounting type:

Please assure yourself of the positioner mounting and then select the linearization type from the list below:

(1) Stroke left mounted

(2) Stroke right mounted

(3) Rotary opening counterclockwise

(4) Rotary opening clockwise

(5) Not sure – terminate

If option (5) is selected, the following message will be displayed and the method will be closed:

No change required. Method will be closed.

All other options will initiate an Short Autostart procedure immediately and the actual status will be displayed. As an example the following status messages could be indicated:

Short Autostart will be performed…
Short Autostart in progress. Please wait…
Phase 1: end positions. Status (16): Determining…
Phase 1: end positions. Status (17): Optimizing…
Phase 2: output parameter. Status (32): Determining…
Phase 2: output parameter. Status (33): Ramping Start…
Phase 2: output parameter. Status (34): Step 1
Phase 2: output parameter. Status (35): Step 2
Phase 2: output parameter. Status (36): Step 3

Short Autostart completed successfully
NOTE: Please download a FB schedule to complete start-up.

In case that the Short Autostart program in the device will detect a problem, this error will be reported with

Short Autostart failed.

Main error reasons are the same as described in chapter **Perform_Autostart** above.

4.2 Setting Input Characterization

What kind of ACTUATOR ACTION do you want to use?

Direct-acting -> Do not set Bit 5 (Increase to close) of Analog Output Parameter IO_OPTS (default).

Reverse-acting -> Do set Bit 5 (Increase to close) of Analog Output Parameter IO_OPTS.

Choose LINEARIZATION TYPE**:**

Select **Linear**, **Equal Percentage (1:50**), **Quick Open (50:1**), or **Custom** in the AO Transducer Block parameter LINEARIZATION_TYPE.

If you want to download a custom characteristic curve, you can use a method in the AO Transducer Block, which is called *Select characteristic curve.* Please read the documentation of the host system, how to use methods.

You can select one of the characteristics described above, but in addition you have the option to download a custom characteristic. If you select another type than *Custom*, LINEARIZATION_TYPE will be set to the selected value and the method returns with the message "*characterization is written*".

If another linearization type than **Linear** is selected, the value of the AO-Block parameter READBACK differs from PV. READBACK will show the actual valve position, PV will hold the back-calculated value (re-calculated to a linear behavior) determined by the chosen characteristic curve.

4.2.1 Download a Custom Characteristic Curve

There is a Method called "*Select characteristic curve*", which guides you through the procedure. If you use NI-FBUS Configurator System, this Method is available in the AO Transducer Block task line.

This method allows you to enter a curve consisting of up to 22 variates (X-Y pairs). The X-value represents the value of the input signal in engineering unit percent (%), the Y-value represents the desired valve position in engineering unit percent (%) for the particular X-value.

Please refer to the following step-by-step description for downloading a custom characteristic:

Select <*Methods*> and then <*Select characteristic curve*>. The Method prompts you as follows:

You can select one out of the characterization tables following below.
If you want to change a custom characteristic curve, please verify first,
that the device resource block mode is "OUT OF SERVICE":

1 Equal percentage 1:50
(2) Quick opening
(3) Custom specific
(4) Cancel

If you select <*Custom specific*>, the prompt is as follows for the default configuration:

You have selected custom specific characteristic curve.
The current truth table stored in the device is:

Array index	*X-Value*	*Y-Value*
0	*0.0*	*0.0*
1	*100.0*	*100.0*

Do you want to change this characteristic curve?

1 Yes
(2) No

If you select <*No*>, the Method informs you that the displayed characteristic is selected in the device and closes:

Custom specific characterization, which is already present in the device, is selected.

If you select <*Yes*>, you will be asked to enter the desired number of sampling points.

Please enter number of pair of variates (Min = 2, Max = 22):

If you have entered an invalid value, the Method displays the following information and aborts:

Illegal value <value> *for number of pairs of variates, please try again.*
Method aborting...

If the input is valid, the Method goes into a loop and prompts you to enter the setpoint value (X-value) and the desired valve position accordingly for a specific entry. The engineering unit is percent. Index numbering starts with 0 and increments until the entered value minus 1 is reached. The Method expects monotonically increasing sampling values.

Enter X-value for index <0..21> (0.00 to 100.00):
Enter Y-value for index <0..21> (0.00 to 100.00):

If an input is invalid, you have to start all over again. The Method informs you about it and aborts:

Invalid value <value>; has to be within 0.00 and 100.00%.
Please start again with entering a characteristic curve.
Method aborting...

If the last expected entry is entered, the Method displays the whole table and asks for confirmation (X- and Y-values to exemplify only, desired number of sampling points in this example is 10):

This is the truth table, which will be stored in the device:

Array index	*X-Value*	*Y-Value*
0	0.0	0.0
1	*5.6*	*10.4*
2	*15.1*	*25.3*
3	*25.0*	*40.2*
4	*35.8*	*56.7*
5	*46.2*	*70.3*
6	*57.5*	*85.9*
7	*68.3*	*95.1*
8	*75.0*	*98.5*
9	*100.0*	*100.0*
10	*0.0*	*0.0*
11	*0.0*	*0.0*
12	*0.0*	*0.0*
13	*0.0*	*0.0*
14	*0.0*	*0.0*
15	*0.0*	*0.0*
16	*0.0*	*0.0*
17	*0.0*	*0.0*
18	*0.0*	*0.0*
19	*0.0*	*0.0*
20	*0.0*	*0.0*
21	*0.0*	*0.0*

Do you want to write this characteristic to the device?

1 Yes
(2) No
(3) Cancel

If you select <*Yes*>, the values will be written to the device. If no transmission error occurs or additional checks in the device will not fail, the custom specific characteristic is downloaded successfully and the Method is completed.

Custom specific characterization is written.

If an error occurs, the Method will terminate with one of the following messages:

Characteristic curve not initialized. Please try again.

Entered value pairs are not monotonously increasing – please try again.

Number of pair of variates and entered value pairs do not match. Too many values – please try again.

If you select <No> or <Cancel>, none of the entered values will be written to the device. The characteristic already remaining will be activated and the Method is completed.

You have cancelled downloading a new custom characteristic. The characterization, which was already stored in the device, is active.

4.3 Setting Control Parameters

In case of non-satisfactory results of the Autostart function you can change control parameters in the Analog Output and Transducer Block. Prior to changing some of these values please check the following:

- Is increasing / decreasing travel rate within expected range? Check ACT_STROKE_TIME_DEC and ACT_STROKE_TIME_INC parameter of AO Transducer Block. If it is too slow, check mechanics of actuator and valve. Is air capacity too low? Would it be better to mount an additional booster?

- Is there sufficient supply pressure? Read SENSOR1_VALUE of Analog Output Block, if internal pressure sensors are available.

When there is no error in mechanics you can try to change the control behavior by changing the values of the following parameters:

Analog Output Block Parameters

SP_RATE_UP	ramp rate for upward setpoint changes in PV units per second (0 = use setpoint immediately with no ramp delay).
SP_RATE_DOWN	ramp rate for upward setpoint changes in PV units per second (0 = use setpoint immediately with no ramp delay).

AO Transducer Parameter

SERVO_GAIN	Enter the desired proportional gain value for valve opening direction.
SERVO_RESET	Enter the desired integral value for valve opening direction.

SERVO_RATE	Enter the desired differential value for valve opening direction.
SERVO_GAIN2	Enter the desired proportional gain value for valve closing direction.
SERVO_RESET2	Enter the desired integral value for valve closing direction.
SERVO_RATE2	Enter the desired differential value for valve closing direction.
CONTROL_GAP	Control gap defines the sensitivity of the positioner so that no corrective action is taken if the control difference is less than the defined limit.
TRAV_INC_LIM	Choose a value in seconds for a desired minimum T63 percent time limit for increasing full span travel (0 = no delay).
TRAV_DEC_LIM	Choose a value in seconds for a desired minimum T63 percent time limit for decreasing full span travel (0 = no delay).

4.4 Test Settings

If you want to use the positioners local keys you can select menu 8 (Setpoint) and step through setpoint changes in 1 % or 12.5 % increments/decrements.

When using a Fieldbus Configurator like NI-FBUS-Configurator System you should follow the instructions below:

- Verify that the value of the Analog Output Block parameter CHANNEL is 1. Writing to this parameter is only allowed if Analog Output Block target mode is in Block mode OUT OF SERVICE.
- Set Analog Output Block Parameter SP_RATE_UP and SP_RATE_DOWN to zero, if the setpoint should be used immediately with no delay.
- Switch Resource Block Mode parameter to AUTO.
- Switch Analog Output Block Mode to AUTO.
- Switch AO Transducer Block Mode to AUTO.
- Set the Analog Output parameter Setpoint (SP) to the desired values.

If the step response is not as expected during observation, the control parameters can be adapted manually. Please refer to the Control Parameters section 4.3 for details.

4.5 Setting Travel Limits

The SRD991 provides the following parameters in the AO Transducer block to set travel limits:

- FINAL_VALUE_RANGE — There are two data elements in this data structure to enter travel limits in percent of total stroke. The value in EU AT 100% determines the upper travel stop and the value in EU AT 0% determines the lower travel stop.
- FINAL_VALUE_CUTOFF_HI — If FINAL_VALUE is more positive than this value, the valve is forced to is set maximum high value (fully opened)
- FINAL_VALUE_CUTOFF_LO — If FINAL_VALUE is more negative than this value, the valve is forced to is set minimum low value (fully closed)
- CUTOFF_HYSTERESIS — Enter the amount of hysteresis in percent of travel required above the cutoff low value and below the cutoff high value respectively, before the valve can re-open or re-close again. For example: 2% cutoff low with 0.5% cutoff hysteresis allows the valve to reopen at 2.5%.
- VALVE_UPPER_LIMIT — Works just like a mechanical stop. This parameter defines the upper stop.
- VALVE_LOWER_LIMIT — Works just like a mechanical stop. This parameter defines the lower stop.

As well it is possible to limit the value of the setpoint parameter SP using the Analog Output Block parameter SP_HI_LIM and SP_LO_LIM.

4.6 Diagnostic Options

The SRD991/SRD960 has several built-in diagnostic capabilities to inform the user about current and historical error conditions. They are summarized in 6 diagnostic Bytes and mapped to BLOCK_ERR status in Resource Block, Analog Output Block or Transducer Blocks and Alarm Sub-codes in Transducer Block parameter XD_ERROR. When XD_ERROR is set, the Transducer Block BLOCK_ERR status will be set to OTHER. The diagnostic status information is available by reading the Resource Block parameter DIAGNOSIS. A description of all status bits can be found in chapter 3.10.

BLOCK_ERR is a bitstring parameter defined by FF. Error conditions will be reflected (0=inactive, 1=active) in the bitstring as follows:

Table 25: BLOCK_ERR codes

Bit	Meaning
0 (LSB)	Other
1	Block Configuration Error
2	Link Configuration Error
3	Simulate Active
4	Local Override
5	Device Fault State Set
6	Device Needs Maintenance Soon
7	Input Failure / process variable has BAD status
8	Output Failure
9	Memory Failure
10	Lost Static Data
11	Lost Non-volatile Data
12	Readback Check Failed
13	Device Needs Maintenance Now
14	Power-up
15	Out-of-Service

XD_ERROR is an unsigned8 enumerated parameter with the following list of valid values:

Table 26: XD_ERROR codes

Value	Meaning
16	Unspecified Error
17	General Error
18	Calibration Error
19	Configuration Error
20	Electronics Error
21	Mechanical Failure
22	I/O Failure
23	Data Integrity Error
24	Software Error
25	Algorithm Error

The mapping of Resource Block parameter DIAGNOSIS status to BLOCK_ERR and XD_ERROR status is described in the table on next page.

Table 27: BLOCK_ERR/XD_ERROR mapping list

Diagnosis Status	BLOCK_ERR (in Resource or AO-Block)	XD_ERROR (Transducer)
Option board was not configured or failed.	Other in Resource Block	-
Connection of potentiometer to electronics board failed.	-	Electronics Error
Connection of I/P-converter to electronics board failed.	-	Electronics Error
Position is not within permissible range (-5%...105%)	-	Mechanical Error
A/D-converter function error	-	Electronics Error
Error writing into positioner ROM	Memory Error in Resource Block	-
Error writing into positioner EEPROM	Memory Error in Resource Block	-
Error writing into positioner RAM	Memory Error in Resource Block	-
Binary Input Channel 1 or 2 is set	Other in AO-Block	-
Feedback unit requires calibration	Readback check failed in Resource Block	Calibration Error
Cycle Count Limit has exceeded limit configured	Device needs maintenance now in AO-Block	-
Travel Sum Limit has exceeded limit configured	Device needs maintenance now in AO-Block	-
Configuration not valid	-	Configuration Error
Device temperature too low	Device needs maintenance now in Resource Block	Electronics Error
Device temperature too high	Device needs maintenance now in Resource Block	Electronics Error
Output pressure error	Device needs maintenance now in Resource Block	Mechanical Error
The supply pressure has fallen below the configured lower limit	Device needs maintenance now in Resource Block	Mechanical Error
No Autostart was done or Autostart was run and did not complete successfully.	Device needs maintenance now in Resource Block	Calibration Error
Difference between requested setpoint and actual position exceeds allowed limit for a user specified time.	Other in AO-Block	-
Position below main low alarm setpoint.	Other in AO-Block	-
Position above main high alarm setpoint.	Other in AO-Block	-
Position below warning low alarm setpoint.	Other in AO-Block	-
Position above warning high alarm setpoint.	Other in AO-Block	-

If the actual value of cycle counter or travel sum has reached 95 percent of the configured cycle count limit or travel sum limit the AO-Block BLOCK_ERR parameter will be set to ”*Device needs maintenance soon*”.

4.7 Using Diagnostic Methods

The Resource Block provides a set of methods to inform the user about the evaluation of the valve health, operation and configuration. The onboard functionality and memory automatically retrieves and stores all important valve data collected by the positioner during the operation. This feature enables the software to run on demand. In result it mustn't run continuously on the control system and therefore can reduce unnecessary traffic on the communication signal.

The following Resource block methods are available:

- Restart_Options
- DD_Info
- Diag_Overview
- Diag_Process
- Diag_Hardware
- Diag_Calibration
- Diag_Pos_Alms
- Diag_Service_Mngt
- Diag_Pos_Hist
- Diag_Rsp_Hist
- Diag_Load_Factor
- Diag_Load_Factor_Hist
- Diag_Rst_Valve_Diag

The following chapters explain these methods and show examples.

4.7.1 Restart Options Method

Choosing the Restart_Options method allows to select a particular RESTART procedure to perform. The following dialogue will be indicated after entering the method:

This command will restart the device or reset data to factory defaults or FF defaults.
Please select one restart option and confirm the selection

(1) Restart device

(2) Restart with FF defaults

(3) Restart processor

(4) Reset conf to factory defaults

(5) Reset conf and cal to factory defaults, single-acting

(6) Reset conf and cal to factory defaults, double-acting

(7) Do nothing, terminate

After selection of options 1 to 6 the desired action will be executed and the method closes with the message

Selected Restart option performed.

If option (7) is selected, no restart function will be executed. The method closes with the message

Method aborting…

4.7.2 DD Info Method

The DD_Info method shows which DD file version matches to the firmware revision of the device. It will read the relevant parameter values from the device and reports the result as follows:

The following values are read from the device:
Manufacturer ID= 0x385884
Device Type = 0x2401
Device Revision= 0x10
DD Revision = 0x01

Matching DD files are 1001.ffo and 1001.sym.
The relative path to these files should be /385884/2401/.

4.7.3 Diagnosis Overview Method

The Diag_Overview method indicates the current and historical main diagnosis status of the device. Because some host systems don't offer to change the window size where the method output will be displayed, the user will be requested to acknowledge, when more data should be displayed.

The following status values are defined:

OK	No error detected
FAILURE	Failure is detected
PASS	Hardware passed test, no error detected

The General Device Status shows a summary of all diagnostic items which follow. The Diagnostic Error Status is a summary of all hardware related items.

The Overview itself is divided in four parts.

GENERAL DEVICE STATUS:	*OK*
DIAGNOSTIC ERROR STATUS:	*NO_DIAG_ERROR*

	Current	*Historical*
Temp High:	*OK*	*OK*
Temp Low:	*OK*	*OK*
Invalid Configuration:	*OK*	*OK*
Travel Sum Limit:	*OK*	*OK*
Cycle Count Limit:	*OK*	*OK*

Please acknowledge to indicate the second part of the overview.

After pressing the <Enter> key on the keyboard or select the OK button with the mouse the second part of the diagnosis overview will be displayed.

Second part of Diagnostic Overview:

	Current	*Historical*
Input Loop Trim:	*OK*	*OK*
Feedback Trim:	*OK*	*OK*
Binary Input:	*OK*	*OK*

Position High Alarm:	*OK*	*OK*
Position Low Alarm:	*OK*	*OK*
Position High High Alarm:	*OK*	*OK*
Position Low Low Alarm:	*OK*	*OK*

Please acknowledge to indicate the third part of the overview.

After another acknowledge the following data will be displayed:

Third part of Diagnostic Overview:

	Current	*Historical*
Control Diff OOL:	*OK*	*OK*
No Autostart Done:	*OK*	*OK*
Air Supply Pressure Alarm:	*OK*	*OK*
Output Pressure Alarm:	*OK*	*OK*
Diagnostic:	*OK*	

Do you want detailed information about diagnostic error codes?

(1) Yes

(2) No

If <*Yes*> is selected, the following status will be displayed*:*

DETAILED DIAGNOSTIC ERROR STATUS

RAM:	*PASS*
EEPROM:	*PASS*
EPROM:	*PASS*
AD Converter:	*PASS*
Actuator out of Range:	*PASS*
Current Loop IP Converter:	*PASS*
Potentiometer:	*PASS*
Option Board:	*PASS*

If <*No*> is selected, the method closes with

No request for additional diagnostic information – Method will be closed.

Please note that historical *FAILURE* status can only be acknowledged through a write to resource block parameter RESET_HIST_STATUS. If the corresponding actual error is no longer present, the historical status will be set to OK.

4.7.4 Process Diagnosis Method

The Process Diagnosis method indicates current and historical diagnosis alarm status related to the actual process.
Possible status values are *OK* or *FAILURE*. The partial stroke test status could be *Not Done, OK, Running, Not possible, and Error*.

PROCESS_DIAGNOSIS STATUS

	Current	*Historical*
PROCESS DATA		
Temperature High:	*OK*	*OK*
Temperature Low:	*OK*	*OK*
POWER SUPPLY ALARMS		
Power Supply High:	*OK*	*OK*
Power Supply Low:	*OK*	*OK*
PARTIAL STROKE TESTING STATUS		
Testing Status:	*Not done*	*N/A*
MEASURED TEMPERATURE VALUES		
Max. Temperature:	*47.35 °C*	
Min. Temperature:	*15.27 °C*	

Do you want to refresh this information about process status?

(1) Yes

(2) No

If <*Yes*> is selected, the updated data are presented again. If <*No*> is selected the method closes with

No request for updating diagnostic information – Method will be closed.

4.7.5 Hardware Diagnosis Method

The Hardware Diagnosis method indicates current and historical diagnosis alarm status related to the hardware components.

The following status values are defined:

OK	No error detected
FAILURE	Failure is detected
PASS	Hardware passed test, no error detected

HARDWARE DIAGNOSIS STATUS

ELECTRONIC COMPONENTS	
RAM:	*PASS*
EEPROM:	*PASS*
ROM:	*PASS*
AD Converter:	*PASS*
INTERNAL ELECTRONIC INTERFACES	
Current Loop I/P Converter:	*PASS*
Potentiometer:	*PASS*

EXTERNAL ELECTRONIC INTERFACES
Option Board: *PASS*

Please acknowledge to indicate the remaining hardware diagnosis status.

After an acknowledge the following data will be displayed:

Second part of Hardware diagnosis status:

MECHANICAL INTERFACES

	Current	*Historical*
Actuator Out of Range:	*OK*	*OK*
Control Diff Out of Limit:	*OK*	*OK*

4.7.6 Calibration Diagnosis Method

The Calibration Diagnosis method indicates current and historical diagnosis alarm status related to calibration and configuration.
Possible status values are *OK* or *FAILURE*.

CALIBRATION DIAGNOSIS STATUS

	Current	*Historical*
INITIAL STARTUP:		
No Autostart done:	*OK*	*OK*
CONFIGURATION:		
Invalid Configuration:	*OK*	*OK*
CALIBRATION:		
Input Current Calibration:	*OK*	*OK*
Internal Feedback Calibration:	*OK*	*OK*

4.7.7 Position Alarms Method

The Position Alarm method indicates current and historical diagnosis alarm status related to valve position and configured limits.
Possible status values are *OK* or *FAILURE*.

POSITION ALARM STATUS

	Current	*Historical*
Position High High Alarm:	*OK*	*OK*
Position High Alarm:	*OK*	*OK*
Position Low Alarm:	*OK*	*OK*
Position Low Low Alarm:	*OK*	*OK*

Please acknowledge to indicate the configured limits for alarms.

After an acknowledge the following data will be displayed:

POSITION ALARM STATUS second part:

	Configured Limits
Position High High Alarm:	*110.00*
Position High Alarm:	*110.00*
Position Low Alarm:	*-10.00*
Position Low Low Alarm:	*-10.00*

4.7.8 Service Management Method

The Service Management method indicates status and adjustments related to maintenance issues. Possible status values are *GOOD* or *BAD.*

SERVICE MANAGEMENT STATUS

Status of Service Interval:	*GOOD*	
Actual Time in Operation	*3551*	*Hours*
Time Since Last Service:	*122*	*Hours*
Service Reminder After:	*5000*	*Hours*
Cycle Count:	*13578*	*Cycles*
Cycle Count Limit	*1000000*	*Cycles*
Travel Sum:	*1476*	*Strokes*
Travel Sum Limit:	*100000*	*Strokes*

Do you want to refresh this information about service management?

(1) Yes

(2) No

If <*Yes*> is selected, the updated data are presented again. If <*No*> is selected the method closes with

No request for updating service management information – Method will be closed.

4.7.9 Position History Method

Position History Data are stored in the device for four time intervals between minutes to months. The minute time interval is pre-selected to 15 minutes and cannot be changed. The hours, days and months interval depends on the values of the corresponding time scale parameters. This method doesn't offer to change the time scale values, because all history data would be cleared after doing it.

The Position History method allows selecting one time interval and displays the history data as requested.

Position History data are available for four time domains. Please select a time interval:

(1) 1 to 15 minutes

(2) 1 to 24 hours

(3) 1 to 30 days

(4) 1 to 60 months

After choosing a time interval (e.g. 1 to 24 hours with TIME_SCALE_HRS_HIST set to 4) the position history data are displayed as follows:

POSITION HISTORY (1 to 4 hours):

Position Area in percent	*Duration in Actuator Position in percent*
00 - 09	*002*
10 - 19	*000*
20 - 29	*000*
30 - 39	*000*
40 - 49	*014*
50 - 59	*000*
60 - 69	*000*
70 - 79	*043*
80 - 89	*003*
90 – 100	*000*

Do you want to refresh this information about position history?

(1) Yes

(2) No

If <*Yes*> is selected, the updated data are presented again. If <*No*> is selected the method closes with

No request for updating position history – Method will be closed.

4.7.10 Response History Method

Response History Data are stored in the device for four time intervals between minutes to months. The minute time interval is pre-selected to 15 minutes and cannot be changed. The hours, days and months interval depends on the values of the corresponding time scale parameters. This method doesn't offer to change the time scale values, because all history data are cleared after doing it.

The Response History method allows selecting one time interval and displays the history data as requested. Available response status values are: OFFLINE, STEADY, TRANSIENT, OFFSET and UNSTABLE.

Response History data are available for four time domains. Please select a time interval:

(5) 1 to 15 minutes

(6) 1 to 24 hours

(7) 1 to 30 days

(8) *1 to 60 months*

After choosing a time interval (e.g. 1 to 30 days with TIME_SCALE_DAYS_HIST set to 4) the response history data are displayed as follows:

RESPONSE HISTORY (1 to 4 days):

Response Status	*Duration over Time in percent*
Offline	*005*
Steady	*085*
Transient	*003*
Offset	*000*
Unstable	*000*

Do you want to refresh this information about response history?

(1) Yes

(2) No

If <*Yes*> is selected, the updated data are presented again. If <*No*> is selected the method closes with

No request for updating position history – Method will be closed.

4.7.11 Load Factor Method

The Load Factor Diagnosis method gives a summary about stem friction status. Please refer to chapter Load Factor for definition details. After selecting Diag_Load_Factor the following dialogue is displayed:

LOAD FACTOR STATUS

LOAD FACTOR VALUES
Measured Value:
Minimum Value:
Maximum Value:

LOAD FACTOR ALARM LIMITS
Lower Limit:
Upper Limit:

LOAD FACTOR ALARMS

	Current	*Historical*
Load Factor Alarm Low:	*OK*	*OK*
Load Factor Alarm High:	*OK*	*OK*

Do you want to refresh this information about load factor status?

(1) Yes

(2) No

If <*Yes*> is selected, the updated data are presented again. If <*No*> is selected the method closes with

No request for updating position history – Method will be closed.

4.7.12 Load Factor History Method

The Load Factor History Diagnosis method gives a summary about stem friction status. Please refer to chapter Load Factor for definition details. After selecting Diag_Load_Factor the following dialogue is displayed:

Load Factor History data are available for two different time domains. Please select a time interval:

(1) 1 to 30 days

(2) 1 to 12 months

After choosing a time interval (e.g. 1 to 30 days with TIME_SCALE_DAYS_HIST set to 14) the load factor history data are displayed as follows:

LOAD FACTOR HISTORY (1 to 14 days)

Load Factor Stem-Packing-Friction		*Relative Frequency in percent*
1	*no stem friction*	*000*
2	*reduced friction*	*000*
3	*slightly reduced friction*	*003*
4	*initial measurement*	*087*
5	*slightly increased friction*	*005*
6	*increased friction*	*000*
7	*stem is stuck*	*000*

Do you want to refresh this information about load factor history?

(1) Yes

(2) No

If <*Yes*> is selected, the updated data are presented again. If <*No*> is selected the method closes with

No request for updating position history – Method will be closed.

Refer to **Table 23: Friction history table** about definitions for data entries 1 to 7 above.

4.7.13 Reset Valve Diagnosis Method

The Reset Valve Diagnosis method allows selecting particular sources of valve diagnosis alarms to be cleared and re-initialize position history or response history data in a whole or partly. Please refer to chapter Reset Valve Diagnosis for definition details. The dialogue is conducted as follows:

Do you want to clear valve diagnosis status information or re-initialize position history or response history data as a whole or partly?

(1) Yes

(2) No

If <*No*> is selected, nothing in the device is changed and the method closes with the message

User canceled operation – no data changed in VALVE_DIAG_STATUS.
Method will be closed.

If <*Yes*> is selected, the next choices have to be made:

Do you want to clear the whole diagnosis status information?

(1) Yes

(2) No, only partial

If <*Yes*> is selected, all valve diagnosis data are cleared and the method closes with the message

Valve diagnostic status is cleared.

If <*No*> is selected, the user has to choose the valve diagnosis status to be cleared. In the following example Service Time, Min/Max Temperature and Min/Max Load Factor will be selected.

Do you want to clear SERVICE_TIME status?

(1) Yes

(2) No

Do you want to clear MIN/MAX_TEMPERATURE status?

(1) Yes

(2) No

Do you want to clear MIN/MAX_LOAD_FACTOR status and LOAD_FACTOR_HIST data?

(1) Yes

(2) No

Do you want to clear all POSITION_HIST data?

(1) Yes

(2) No

Do you want to clear all RESPONSE_HIST data?

(1) Yes

(2) No

This is the selection for clearing status in VALVE_DIAG_STATUS.
TRUE indicates that the related status will be cleared.
FALSE indicates that the related status will be not affected.

Position History	*FALSE*
Response History	*FALSE*
Service Time	*TRUE*
Min/Max Temperature	*TRUE*
Min/Max Load Factor	*TRUE*

Do you want to perform these actions?

(1) Yes

(2) No

If <*No*> is selected, nothing in the device is changed and the method closes with the message

User canceled operation – no data changed in VALVE_DIAG_STATUS.
Method will be closed.

If <*Yes*> is selected, the selected valve diagnosis data are cleared and the method closes with the message

Selected valve diagnostic status is cleared.

4.8 Configure Binary Input Option

The Binary Input option features two independent binary inputs with internal supply for connection of sensors. A connected switch is loaded with 3.5 V and 0.15 mA.

If the binary input option board is installed by the manufacturer, the Resource Block Parameter DEVICE_OPTIONS is set to the correct value. If a binary input option will be installed after shipping, you have to check the value of DEVICE_OPTIONS and activate this option by setting the matching Bit in this parameter.

Using the AO Transducer Block parameter BININ_CONF, you can configure an active signal to activate an alarm status and force the actuator to go to 0% or 100% or hold last value.

Table 28: Binary Input Parameter

Set Bit	Value	DD Text	Explanation
0	1	In1->0%	Position will change to 0 %, when binary input channel 1 is set (switch open)
1	2	In2->100%	Position will change to 100 %, when binary input channel 2 is set (switch open)
2	4	Enb diag In1	Status BINARY_INPUT_SET will be set in DIAGNOSIS, when binary input channel 1 is set
3	8	Enb diag In2	Status BINARY_INPUT_SET will be set in DIAGNOSIS, when binary input channel 2 is set
4	16	In1->PST	When binary input channel 1 is set a partial stroke test will be invoked
5	32	In2->PST	When binary input channel 2 is set a partial stroke test will be invoked
6	64	Invert In1	Behavior of In1 is inverted
7	128	Invert In2	Behavior of In2 is inverted

The actual binary input status can be read in the AO Transducer Block Parameter BININ_STAT.

Table 29: Binary Input Status Parameter

Set Bit	Value	DD Text	Explanation
0	1	In1 act	Binary input channel 1 is set to its active state
1	2	In2 act	Binary input channel 2 is set to its active state
7	128	Setp forced	Setpoint is forced by an active binary input

Example:

If binary input 1 is set, the read value will be 129 (*In1 act* | *Setp forced*). If binary input 2 is set, the read value will be 130 (*In2 act* | *Setp forced*). If binary inputs 1 and 2 are set, the read value will be 131 (*In1 act* | *In2 act* | *Setp forced*).

4.9 Configure Binary Output Option

The Binary Output option enables you to define which alarm status activates the binary outputs.

There are two independent binary output channels available, when a binary output option board is connected to the main electronics. Please refer to Master Instruction MI EVE0105 A-(en) for further details of how to connect electrically.

If the binary output option board is installed by the manufacturer, the Resource Block Parameter DEVICE_OPTIONS is set to the correct value. If a binary output option will be installed after shipping, you have to check the value of DEVICE_OPTIONS and activate this option by setting the matching Bit in this parameter.

Table 30: Binary Output Parameter

Set Bit	Value	DD Text	Explanation
0	1	hi alarm	Switch to active state in case of first (warning) position high alarm status (position is higher than the value in Resource Block parameter POS_VALVE_HI_ALARM)
1	2	lo alarm	Switch to active state in case of first (warning) position low alarm status (position is lower than the value in Resource Block parameter POS_VALVE_LO_ALARM)
2	4	hihi alarm	Switch to active state in case of main position high alarm status (position is higher than the value in Resource Block parameter POS_VALVE_HIHI_ALARM)
3	8	lolo alarm	Switch to active state in case of main position low alarm status (position is lower than the value in Resource Block parameter POS_VALVE_LOLO_ALARM)
4	16	PST output	Switch to active state in case of a successful PST, switch to non-active state in case of a running or failed PST
5	32	Alarm Link	Switch to active state in case of an alarm defined within ALARM_LINK
6	64	40mA alm current	Switches between Namur and Binary output signal level: Bit Set is 0…40mA, Bit not Set is Namur (<1mA…>2.2mA)
7	128	inverted alarm	Invert active state of alarm

Using the Resource Block Parameters BINOUT1_CONFIG and BINOUT2_CONFIG, you can configure the desired active states for each output channel. You can choose the polarity for the active state: Bit7 = 0 means active high level, Bit 7 = 1 means active low level.

4.10 Calibrate Analog Feedback Option Board

Analog feedback option boards are calibrated ex factory. But it is possible to re-calibrate it. Pre-condition for doing it is to open the electric circuit and connect an ampere measuring instrument with a working range of 20 mA into the loop.

There is one parameter in the AO Transducer called CAL_ANALOG_FEEDBACK, which provides necessary calibration commands. The following set of commands is available:

Table 31: Calibration commands/status for analog feedback option

Command value (decimal)	Command value (hexadecimal)	Device description text	Meaning
000	0x00	Normal operation (RD) or Cancel (WR)	Writing ZERO aborts an already started calibration cycle. The device will use the previous calibration data set. Reading a ZERO value means, that calibration is completed and the feedback channel returned to normal operation.
004	0x04	Inc out +	Increments output value in coarse steps
005	0x05	Inc out ++	Increments output value in fine steps
006	0x06	Dec out -	Decrements output value in fine steps
007	0x07	Dec out --	Decrements output value in coarse steps
016	0x10	Start Cal 4 mA	Initiate calibration cycle for the 4 mA value.
024	0x18	Start Cal 20 mA	Initiate calibration cycle for the 20 mA value.
064	0x40	Choose Save+OK to complete Cal or inc/dec to adjust	No command. This value is readable only. It shows that a calibration cycle has been started and not saved. This is a normal condition after writing a “Start Cal” command. The device is waiting for an increment or decrement command or Save+OK or Cancel.
128	0x80	Save+OK	Save current calibration values and switch back to normal operation

A typical calibration command sequence looks like this:

- Read CAL_ANALOG_FEEDBACK. Read value is ZERO.
- Write “Start Cal 4 mA” command to CAL_ANALOG_FEEDBACK.
- Wait until device returns status 0x40 in parameter CAL_ANALOG_FEEDBACK.

- Use Inc or Dec commands to adjust the output value to 4 mA, while an ampere measuring instrument is connected into the loop. Between each write wait until device returns status 0x40 to be sure that the command is accepted.

- After 4 mA adjustment write “Start Cal 20 mA” command to CAL_ANALOG_FEEDBACK.

- Wait until device returns status 0x40.

- Use Inc or Dec commands to adjust the output value to 20 mA, while an ampere measuring instrument is connected into the loop. Between each write wait until device returns status 0x40 to be sure that the command is accepted.

- After 20 mA adjustment write “Save+OK” command to CAL_ANALOG_FEEDBACK. If a read access to the same parameter returns ZERO, the calibration cycle is successfully completed.

Writing a “Cancel” command to CAL_ANALOG_FEEDBACK aborts an already started calibration cycle at any time and the device uses the previously stored calibration data and returns to normal operation mode.

4.11 Configure Pressure Sensors

The SRD991 can be ordered with two built-in pressure sensors, SRD960 is available with three built-in pressure sensors. Because they are part of the main board, the electronics has to be exchanged for conversion to this option. Refer to Master Instruction MI EVE0105 A-(en) for details.

The pressure sensor option is installed and calibrated by the manufacturer; therefore the Resource Block Parameter DEVICE_OPTIONS is set to the correct value.

No additional configuration is needed. The user can choose the engineering unit for displaying the actual measured sensor values. The values of AO Transducer Block parameter SENSOR1_VALUE (supply pressure) or SENSOR2_VALUE (output pressure Y1) will be shown in the engineering unit set in AO Transducer Block parameter SENSOR1_UNITS and SENSOR2_UNITS. SENSOR3_VALUE and SENSOR3_UNITS are valid for SRD960 only.

4.12 Setting Fault State Parameters

The following AO function block parameters determine the behavior of the device for fault state in Block Mode Cascade:

FSTATE_TIME, FSTATE_VALUE and IO_OPTS.

FSTATE_TIME contains the time in seconds from detection of remote setpoint fault to output action if this condition still exists.

FSTATE_VALUE contains the preset analog setpoint value to use when fault occurs.

IO_OPTS offers the user several opportunities to configure the device in case of fault state condition or restart with FSTATE_VAL. Please refer to chapter 3.13 for details.

4.13 Restart the Device

Fieldbus offers several levels of Restart functions, which can be initiated by choosing the desired function in the Resource Block Parameter RESTART.

- Restart Resource: Performing a Restart Resource has no effect on the SRD991/SRD960.
- Restart Processor: Performing a Restart Processor has the same effect as hitting the reset button on the device or power-cycle the device.
- Restart with Defaults: Performing a Restart with Defaults will reset all configurable function block application objects to their initialized state. It will also clear all configured Trend and Link Objects. A restart of the processor will be performed automatically after re-initialization has been done.

> **CAUTION** - When you do a "Defaults" RESTART command in the Resource Block, the configured parameters will automatically default to the values predetermined by the FOUNDATION, which are NOT the same as the factory defaults. The Defaults RESTART should only be used when the configuration in the valve positioner has been incorrect and the user cannot fix the problem by using the troubleshooting information. In all cases, try cycling the power to the valve positioner first. Then go back to the block with the problem and try to write the changes to the valve positioner. If that does not clear the problem, proceed with the Default RESTART procedure.
>
> If you want to run a Restart with Factory Defaults, you can use the local keys on the device. Select Menu 9 (Calibrate functions for workshop) and choose entry 1 (resetting of configuration to "ex-factory"). If in doubt how to use the local keys, please refer to Master Instruction MI EVE0105 D-(en).

If you use National Instruments NIFBUS-Configurator System you can access RESTART in the following way:

Open the Resource Block and put it in the OOS mode.

In the Process tab, make sure the MODE_BLK • ACTUAL reads OOS.

In the Options tab, open the RESTART box and select one of the following:

- Un-initialized – do not use.
- Run – this is the default setting, the nominal state when not restarting.
- Resource – do not use. This selection has no effect on the positioner.
- Defaults – Sets the parameters to the FOUNDATION defaults. This will reset all configurable function block application objects. It will also clear all configured Trend and Link Objects. Network and system management data are not changed.
- Processor – does a warm restart of CPU and has the same effect as cycling the power (OFF/ON) to the positioner.
- Restart_fact_config – Sets configuration data to factory defaults and restarts the device automatically
- Restart_fact_cal_1 – Sets configuration and calibration data to factory defaults for a single-acting system and restart restarts the device automatically
- Restart_fact_cal_2 – Sets configuration and calibration data to factory defaults for a double-acting system and restarts the device automatically

- Click on the Write Changes button.
- Put the Resource Block back into AUTO mode (the RESTART selection will automatically default to the Run position).
- If you performed a "Defaults" or “fact_config” or “fact_cal” RESTART, reconfigure the appropriate function blocks, link object and trends.

Note: There is a Restart function in the National configuration software and it is the equivalent to a Processor Restart mentioned above.

4.14 Maintenance and Trouble-shooting

Maintaining and trouble-shooting information provides Master Instruction MI EVE0105 A-(en).

Additional descriptions can be found about diagnostic functions in chapter 3.10, fieldbus communication status in chapter 3.11 and 3.25, alarming in chapter 4.6 and diagnostic methods in chapter 4.7.

5 CONFIGURATION PROCEDURE USING A FIELDBUS HOST

Note: These instructions assume the following:

a) You are using the National Instruments Fieldbus Configurator System Software (NI-FBUS).

b) You are familiar with the NI software and have loaded the DD's.

c) The NI-FBUS software is running "Online" and connected to a functional valve positioner.

d) If you cannot find any parameter in the tab mentioned, do a right mouse click anywhere on the block window and select "Customize Parameters". Check the box for the parameter you need. When you click again on the window, that parameter will be added to that window. When you go to close out that window, you will be prompted to save your customization. Click on Yes.

e) The following procedure covers 98% of all typical installations. For complex or advanced situations, the user will have to reconfigure other parameters for their application.

f) The FoxCAE Configurator in a Foxboro I/A Series System is similar to the National Configurator software. If you are attaching the valve positioner to an I/A System, please refer to B0400FD for specific details on parameter configuration limitations.

1. The valve position must be completely mounted to the valve. Also, the air supply and power from the fieldbus power supply must be activated. Connect the fieldbus wiring to the OUTPUT terminals. The valve positioner is polarity independent, so it cannot be wired backwards (no plus/minus labels). Refer to MI EVE0105 D for instructions.

2. The factory default for the DEV_TAG parameter has been factory defaulted to a unique value, such as "SRD991-16/010020". The user may reconfigure this tag, but it must be unique. Right click on the Device and select Set Tag. Type in a new tag name/number. Make sure the Set to OOS block is checked. Click on OK.

3. The factory default for the DEV_ADD (Device Address) parameter has been factory defaulted to a number, such as "32(0x20)". The user may reconfigure this address, but it must be a unique value. Right click on the Device and select Set Address. Use the up and down arrows to select a new address or type in a unique value. Make sure the Set to OOS block is checked. Click on OK.

> **CAUTION** – The DEV_ADD address of multiple valve positioners from Foxboro and or other devices from other manufacturers can be identical. Care must be taken to make sure the address is not duplicated in another Fieldbus device on the same wiring segment.

4. If you do not see the Transducer block on the NI-FBUS screen, click on the Show/Hide Transducers & Device ID's icon on the menu bar. The icon has a capital letter T with a red X. The factory default for the BLOCK_TAG parameter in the Transducer Block has been assigned a unique value, such as "SRD991_TAO-16/010020". The user may reconfigure this tag, but it must be unique. Right click on the Transducer Block and select Set Tag. Type in a new name/number. Make sure the Set to OOS block is checked. Click on OK.

5. The factory default for the BLOCK_TAG parameter in the Resource Block has been assigned a unique device ID, such as “SRD991_RES-16/010020”. The user may reconfigure this tag, but it must be unique. Right click on the Resource Block and select Set Tag. Type in a new name/number. Make sure the Set to OOS block is checked. Click on OK.

6. The factory default for the BLOCK_TAG parameter in the Analog Output Block has been assigned a unique tag, such as “SRD991_AO-16/010020”. The user may reconfigure this tag, but it must be unique. Right click on the AO block and select Set Tag. Type in a new tag identification. Make sure the Set to OOS block is checked. Click on OK.

7. Open the **Resource Block**. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

8. Open the **AO Transducer Block.** Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

9. In the Others Tab, make sure the ACT_TYPE parameter is set to the proper type of actuator on the valve. From the drop down box, set to single-acting or double-acting. Factory default depends on the ordered pneumatic amplifier type of the device.

10. Review the POSITION_LINEARIZATION parameter. It should be set as follows:

Actuator Type	**POSITION_LINEARIZATION (See Note)**
Linear (sliding stem or stroke)	stroke left mounted (factory default) or stroke right mounted
Rotary	rotary opening counterclockwise or rotary opening clockwise

Note: Identified while viewing the front face of the positioner.

11. The TRAVEL_POS_UNITS should be set based upon the POSITION_LINEARIZATION parameter. If set to Stroke, the TRAVEL_POS_UNITS should be set to either mm or inch. If set to rotary, the TRAVEL_POS_UNITS should be set to degree. Although this parameter does not need to be configured for proper operation, it is used by many other parameters, especially in regards to diagnostics. Therefore, we strongly recommend it is configured properly.

12. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner.

13. The valve positioner is now ready to perform an AUTOSTART. The AUTOSTART procedure will automatically set 13 different parameters, by stroking the valve numerous times from 0 to 100% of travel. Select an “Autostart” type from the drop down box in the SELF_CALIB_CMD parameter.

CAUTION: The AUTOSTART opens and closes the valve and will override the existing setpoint. Do not initiate an AUTOSTART with the valve holding process pressure or fluid. The AUTOSTART procedure may take several minutes to complete.

14. Click on the Write Changes button at the bottom of the AO Transducer Block page, which will initiate the AUTOSTART procedure. Directly under the SELF_CALIB_CMD parameter is a read-only parameter called STAT_AUTOINIT. Once the value of STAT_AUTOINIT returns to zero (0), the Autostart is completed. If the value of STAT_AUTOINIT displays a value of 1, there was an error during the procedure. Refer to MI EVE0105D for information on troubleshooting. Fix the problem. Do another Autostart.

The AUTOSTART automatically sets the values for the following parameters:

Parameter Name	**Block**	**Tab**
ACT_STROKE_TIME_INC (Read-Only Parameter)	Transducer	Other
ACT_STROKE_TIME_DEC (Read-Only Parameter)	Transducer	Other
ADC_GAIN (Do **NOT** change)	Transducer	Other
MOTOR_PAR (Do **NOT** change)	Transducer	Other
SPRING_ACT	Transducer	Other
SERVO_GAIN	Transducer	Other
SERVO_GAIN2	Transducer	Other
SERVO_RATE	Transducer	Other
SERVO_RATE2	Transducer	Other
SERVO_RESET	Transducer	Other
SERVO_RESET2	Transducer	Other
STAT_AUTOINIT	Transducer	Other

Note: A **Short** Autostart (Examine Endpoints) should be used when a diagnostic error is displayed,
or if the actuator/valve/positioner was mechanically disconnected for adjustments,
or replacement after an Autostart had been performed.

15. The FINAL_VALUE_RANGE sub-parameters are factory defaulted to:

EU_100	100
EU_0	0
UNITS_INDEX	% (Do **NOT** change)
DECIMAL	1

These parameters are normally left at the factory defaults, unless there is a reason why you do not want the valve to fully open or fully close. For example, if the valve was attached to the suction side of a compressor, you can configure the EU_0 to a value such as 10. This would not allow the positioner to close the valve any less than 10 percent of its total travel, thereby protecting the compressor

16. The FINAL_VALUE_CUTOFF_LO is factory defaulted to 2 (percent). If the FINAL_VALUE (requested valve position) is lower than the value in this parameter, the valve is forced to its minimum low value (fully closed). This is similar to the low flow cutoff in a flow transmitter. If this parameter were set to 5, then whenever the set point to the positioner was less than 5 percent, the valve would be forced fully closed.

17. The FINAL_VALUE_CUTOFF_HI is factory defaulted to 100 (percent). If the FINAL_VALUE (requested valve position) is higher than the value in this parameter, the valve is forced to its maximum high value (fully open).

18. The CUTOFF_HYSTERESIS is used in conjunction with the FINAL_VALUE_CUTOFF parameters in the previous steps. Increasing the value will increase the hysteresis. For example, if the FINAL_VALUE_CUTOFF_LO parameter were set to 10%, then the valve would be completely closed for any input that was below 10% of scale. If the CUTOFF_HYSTERESIS were set to 1%, then the set point input would have to be 11% to start opening the valve. The factory default is 0.005%.

19. The LINEARIZATION_TYPE parameter is used for characterizing the setpoint. The default is linear, with additional choice of Equal Percentage (1:50), Quick Open or Customer Specific.

20. The CONTROL_DIFF_TIME value (default = 60 seconds) is used by the CONTROL_DIFF_LIMIT parameter in the next step.

21. The CONTROL_DIFF_LIMIT parameter is defaulted to 5%. If the control difference (set point vs. valve position) is greater than this value in percent, for the period of time entered into the CONTROL_DIFF_TIME parameter, the CONTROL_DIFF_LIMIT status will be set in the DIAGNOSIS parameter. For example, using the default settings, if the control difference exceeds 5% for more than 60 seconds, a status bit will be set in the DIAGNOSIS parameter in the Others tab of the Resource Block.

22. The TRAVEL_SPAN parameter must be set to the stroke of the actuator (in mm or inches for linear). If the POSITION_LINEARIZATION parameter is set for rotary, the TRAVEL_SPAN must be set to Degrees.

23. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner.

24. Set the Target Mode in the AO Transducer block to Auto. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the Transducer Block window.

25. Open Analog Output Block and click on the OOS box to put the valve positioner Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS. Ignore this step if the ACTUAL mode reads OOS.

26. In the Process tab, make sure the CHANNEL parameter is set to 1.

27. In the Scaling tab, set the XD_SCALE parameters to the same values used in the FINAL_VALUE_RANGE parameters in the AO Transducer Block. The factory default values are

EU_100	100
EU_0	0
UNITS_INDEX	%
DECIMAL	1

28. The factory default values for the PV_SCALE parameters are:

EU_100	100
EU_0	0
UNITS_INDEX	%
DECIMAL	1

These values should NOT be changed.

29. In the Limits tab, the SP_RATE_UP (default = 1.#INF) and the SP_RATE_DOWN (default = 1.#INF) determine the ramp rates for setpoint changes in PV units per second when the AO block is in Auto mode. If these parameters are set to zero, or the AO block is in a mode other than Auto, the setpoint change will be used immediately. These parameters affect the ramp rate in both testing and normal operation.

30. The SP_LO_LIM (default = 0) determines the lowest setpoint (SP, CAS_IN or RCAS_IN) that can be used by the block. Please note that the FINAL_VALUE_RANGE EU_0 parameter set in step #15 limits the minimum setpoint value during normal operation.

31. The SP_HI_LIM (default = 100) determines the highest setpoint (SP, CAS_IN or RCAS_IN) that can be used by the block. Please note that the FINAL_VALUE_RANGE EU_100 parameter set in step #15 limits the maximum setpoint value during normal operation.

32. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto, and the OUT value on the Process tab should display a good value.

If the OUT value is not correct you may have to schedule the device with your configurator software as follows:

- Double click on the Function Block Application to open a new window
- Drag the AO block to the middle window. You can now configure the outputs of the AO blocks and assign them if necessary.
- Click on the Download Project icon and answer questions.
- Check the OUT value of the AO blocks. If good, basic configuration completed.

If the block does not change to Auto, go to the BLOCK_ERR parameter in the Diagnostics tab to see what is wrong. An explanation of the BLOCK_ERR is described in the Troubleshooting section. Fix problem and make sure that in the Process tab that the MODE_BLK • ACTUAL value reads Auto. Close out the "configured" Analog Output Block window.

33. The *basic* configuration of the positioner is now complete. **The valve response to an input setpoint change should be tested at this time.** Valve response can be observed by changing the SP_VALUE parameter in the Process tab of the Analog Output block. Refer to section 4.4 for details.

34. Please go to the next section to review or change the “Optional Parameters” which in most applications do not need to be re-configured from the factory default. Some parameters are

used for customizing the application in regards to testing, alarms, failsafe actions, normal behavior and other such functions. Other parameters are only used for storing information and the data is not checked or processed by any of the blocks.

Note: After reviewing the "Optional Parameters" section, proceed with the "Optional Features" section if the actuator is equipped with any optional features.

5.1 Optional Parameter Configuration

35. Open the AO Transducer Block, Resource Block and Analog Output block and click on the OOS box to put the blocks Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

36. In the Diagnostic or Process tab of the AO Transducer Block, Resource Block and Analog Output block, the factory default for the MODE_BLK • NORMAL parameter is Auto. If for some reason you want the valve positioner to start in the Out Of Service mode, or other selection when power is first applied, set the parameters in all three blocks to the desired action.

37. In the Options tab of the AO Transducer Block, Resource Block and Analog Output block, the ALERT_KEY parameter (default = 0) can be set to any number between 1 and 255 to be used by the host system as an identification number for sorting alarms, etc.

38. In the Options tab of the AO Transducer Block, Resource Block and Analog Output block, the STRATEGY parameter (default = 0) can be set to a number between 0 and 32767 for identifying grouping of blocks.

39. In the Others tab of the Resource block, review the ALARM_SUM • DISABLED parameter. There are a wide variety of selections in the drop down box, such as Disc Alm Disabled, HiHi Alm Disabled, etc. The factory default is that all alarms will have a check mark, which disables all "Fieldbus Alarms". If the host control system supports Fieldbus Alarms, remove the check marks to the appropriate alarms to make them active, and the set the appropriate alarm limits. The "Fieldbus Alarms" are different, and they have no effect on the alarming and diagnostic capabilities built into the positioner and mentioned in this configuration procedure.

40. In the Process tab of the AO Transducer Block, Resource Block and Analog Output block, the parameter TAG_DESC can be used for identification of the application. For example – "Valve for Controlling Drum #2 Level". Type in the information desired.

41. Open the **AO Transducer Block.** In the Other tab, there are some parameters to identify the actuator and the valve. Review or change any information in the following parameters:

ACT_MAN_ID, ACT_MODEL_NUM, ACT_SN
VALVE_MAN_ID, VALVE_MODEL_NUM, VALVE_SN
VALVE_TYPE

42. There are 3 parameters that can be filled out in regards to the calibration of the positioner. The XD_CAL_WHO parameter can be filled in with the name of the person who did the last calibration (i.e. John Smith, etc). The XD_CAL_LOC parameter can be used to identify the location of the last calibration. The XD_CAL_DATE can signify the date of the last calibration.

43. The TRAVEL_DEC_LIM parameter represents the fastest one time constant response (63.2%) for a decreasing full span travel and is factory defaulted at 0.4 seconds. You can set this to zero for a very fast responding actuator. Or you could increase the value to make the response slower. This parameter may be changed if the valve testing in step #34 was unsatisfactory (refer to section 4.4 for details).

44. The TRAVEL_INC_LIM parameter represents the fastest one time constant response (63.2%) for an increasing full span travel and is factory defaulted at 0.4 seconds. You can set this to zero for a very fast responding actuator. Or you could increase the value to make the response slower. . This parameter may be changed if the valve testing in step #34 was unsatisfactory (refer to section 4.4 for details).

45. The CYCLE_COUNT_LIMIT is defaulted to 90 million. If the valve manufacturer publishes a suggested maintenance interval based upon a cycle value, use that value. When the actual value of the cycle counter has reached 95% of the configured CYCLE_COUNT_LIMIT, the AO-Block BLOCK_ERR parameter will be set to “Device needs maintenance soon”. When the actual cycle count exceeds this value, a status bit (CYCLECNT_LIM) will be set in the DIAGNOSIS parameter.

46. The TRAVEL_SUM_DEADBAND parameter (default = 1%) is used to eliminate very small movements of the valve (hunting) from the summarized travel value. With the default of 1%, any valve movement less than 1% of the total stroke will not be counted in the summarized travel value.

47. The TRAVEL_SUM_LIMIT is defaulted to 90 million. If the valve manufacturer publishes a suggested maintenance interval based upon totalized stem travel, use that value. When the actual value of the cycle counter has reached 95% of the configured TRAVEL_SUM_LIMIT, the AO-Block BLOCK_ERR parameter will be set to “Device needs maintenance soon”. When the actual travel exceeds this value, the TRAVEL_SUM_LIMIT status bit will be set in the DIAGNOSIS parameter in the Others tab of the Resource Block.

48. The ACT_FAIL_ACTION parameter can be configured based upon the failsafe action for the actuator. This parameter is for information only and has no effect on the positioner or actuator during any fault or failure. The choices are:

Self-closing
Self-opening
Hold on last good value
Maximum value
Minimum value
Uninitialized (Fieldbus default – do not use)
Indeterminate (Factory Default)

49. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the AO Transducer Block window.

50. Open the Resource Block. In the others tab, you can enter up to 32 characters in the MESSAGE parameters (MESSAGE_1 to MESSAGE_5). These messages are just for information purposes only, and are not used in a diagnostic message.

51. In the Alarms tab, the CONFIRM_TIME parameter (default = 640000 millisecond) is the amount of time the resource will wait for confirmation of receipt of a report before trying again.

52. In the Others tab, the CYCLE_SEL parameter (default = Scheduled and Block Execution) selects the block execution method. Add or remove a check mark to the applicable selections of Scheduled, Block Execution and/or Manuf Specific.

53. The FEATURES_SEL parameter allows the user to chose what resource block options are used. The defaults are Reports, Faultstate, Soft W Lock and Out Readback. Add or remove a check mark to the applicable selections.

54. The LOCAL_OP_ENA parameter can be set to prevent anyone from reconfiguring the positioner database using the local keys on the positioner. The default is local operation enabled. Select local operation disabled if you want to disable the local keys.

55. The WRITE_LOCK parameter can be set to prevent anyone from reconfiguring the positioner database using the local keys on the positioner and from any remote configurator. The default is unlocked which allows full reconfiguration capability from any and all configurators. If the value is set to locked, the only command the device will accept is to unlock that parameter. If the WRITE_LOCK parameter is set to Locked, an alert will be generated when the parameter is changed back to unlocked.

56. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section and fix problem.

57. In the Others tab, there are four parameters that determine what valve position will set a status bit in the DIAGNOSIS parameter in the Others tab of the Resource Block. The four parameters, the allowable range and the factory defaults are:

Parameter	Allowable Range	Factory Default
POS_VALVE_LOLO_ALARM	±INF	-10
POS_VALVE_LO_ALARM	±INF	-10
POS_VALVE_HI_ALARM	±INF	110
POS_VALVE_HIHI_ALARM	±INF	110

58. With the factory defaults set beyond the valve position limits (FINAL_VALUE_RANGE), this will result in NO error messages about the valve position status in the DIAGNOSIS parameter in the Resource Block.

59. Mark in the appropriate box. Refer to Chapter 3.14 for a description of the options. The factory default is no check marks. Close the Resource Block window.

60. Open the Analog Output Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS. Ignore this step if the ACTUAL mode reads OOS.

61. The IO_OPTS parameter allows options to alter the input and output block processing. Refer to Chapter 3.13 for details. The factory default is there are NO checkmarks. Note - only one option is currently defined by the FOUNDATION for an Analog Output block, and that is Propagate Fault Backwards.

62. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem, set block to Auto, and close the **Analog Output Block** window.

63. If you do not have any optional feature on the positioner, proceed to the next step. If you do have optional feature(s), skip the next step and proceed to the Optional Features Configuration section below.

64. If necessary, adjust the execution times of the primary Link Active Scheduler (LAS). The valve positioner can be used as the primary or back-up LAS for the wiring segment. Also, define the links between the blocks on the wiring segment. Refer to the host configurator software for details. Configuration is completed, unless there are “Optional Features” included in the positioner.

5.2 Optional Features Configuration

The “Optional Features Configuration” must be completed if the actuator is equipped with any of the following options:

- Inductive Limit Switch (Note 1)
- Two Pressure Sensors (Note 2)
- Position Feedback 4-20 mA and One Binary Alarm Output (Note 3)
- Two Binary Inputs (Note 3)
- Two Binary Outputs (Note 3)

Notes:

1) The inductive limit switch option is external to the positioner and has no effect on configuration parameters and does not limit the amount of other options internal to the positioner.

2) The Two Pressure Sensor option is available with or without any of the other options.

3) Only one of these options per positioner (only the Binary Inputs, or only the Binary Outputs or only the Pos Feedback).

5.2.1 Position Feedback 4-20 mA and Alarm

The position feedback option regulates a 4 to 20 mA signal on a separate pair of wires for use as an input to another device. User must provide separate power to the pair of wires between 8 and 48 V (lower power for hazardous areas). The 0 and 100% value positions (stroke of valve) will generate a linear 4 to 20 mA signal.

In addition to the 4 to 20 mA signal, this option also includes one binary output channel for external alarming over another pair of wires. When the positioner activates certain error messages in the DIAGNOSIS parameter and the corresponding values in AO Transducer parameter ALARM_LINK are set, the binary output channel will also be activated. Refer to the Binary Output section for configuration.

65. Open the **Resource Block**. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

66. In the Others tab, the DEVICE_OPTIONS parameter has a drop down box listing the following choices:

- ☒ pos ret
- ☐ press
- ☐ binin
- ☐ binout
- ☐ sens (Do not select - reserved for future options)

Make sure there is a check mark next to the pos rets selection. Do not remove any check marks for the other optional features.

67. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the **Resource Block** window.

68. If you want to configure the one binary output, skip down to Step #74

5.2.2 Two Binary Inputs

The Binary Inputs option is used to override the valve position based upon the activation of one or two external user-supplied switches wired separately to the positioner. When the switch is closed, the voltage in the pair of wires will be approximately 3.5 Volts DC, and there will be a current flow of approximately 0.15 mA. User should select correct switches for this application. The option card supplies the power and the switches control the current flow.

69. Open the **Resource Block**. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

70. In the Others tab, the DEVICE_OPTIONS parameter has a drop down box listing the following choices:

- ☐ pos ret
- ☐ press
- ☒ binin
- ☐ binout
- ☐ sens (Do not select - reserved for future options)

Make sure there is a check mark next to the binin selection. Do not remove any check marks for the other optional features.

71. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the Resource Block window.

72. Open the Analog Output Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

73. In the Others tab, the BININ_CONF parameter configures an active signal to force the actuator to go to 0% or 100% and/or activate an alarm status.

This option will override the configuration of the valve and actuator parameters. Based upon the condition of the switches, the **positioner** will react as follows:

Input 1	**Input 2**	**Positioner Action**	**BININ_CONF**
Closed	Closed	IN SERVICE (normal operation)	
Open (Active)	Closed	Forces Valve to 0%, if -------→	check mark on In1->0% box
Closed	Open (Active)	Forces Valve to 100%, if ----→	check mark on In2->100% box
Open (Active)	Open (Active)	Holds on Last Good Value	

CAUTION: If the closing or opening limits are set by changing the FINAL_VALUE_RANGE parameters to values above 0% or below 100%, the actuator will force the valve fully open or closed by the action of the Binary Inputs.

Based upon the condition of the switches, an Analog Output Block alarm with sub-code OTHER can be generated as follows:

Input 1	**Input 2**	**Alarm Generated**	**BININ_CONF**
Closed	Closed	No	
Open (Active)	Closed	Yes, if ----------→	check mark on Enb diag In1 box
Closed	Open (Active)	Yes, if ----------→	check mark on Enb diag In2 box
Open (Active)	Open (Active)	Yes, if ----------→	check mark on Enb diag In1 or Enb diag In2 box

74. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem, set block to Auto, and close the Analog Output Block window.

5.2.3 Two Binary Outputs

There are two galvanically isolated binary output channels for external alarming over two separate pairs of wires based on the configurable limits of the measured valve position. When the positioner activates certain error messages in the DIAGNOSIS parameter, the binary output channel will also be activated. This option is usually called the "solid state programmable limit switches".

The user has to provide an external supply with 8 to 48 VDC. A current below 50 µA means the positioner is defective, lower than 1 mA means the valve position is below the configured limit and a current greater than 2.2 mA means the valve position is above configured limit.

You can configure these limits by configuring the Resource Block parameters

POS_VALVE_LOLO_ALARM
POS_VALVE_LO_ALARM
POS_VALVE_HIHI_ALARM
POS_VALVE_HI_ALARM

The values of BINOUT1_CONFIG and BINOUT2_CONFIG determine which one of these limits will be responsible for activating a binary output.

75. Open the Resource Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

76. In the Others tab, the DEVICE_OPTIONS parameter has a drop down box listing the following choices:

- ☐ pos ret
- ☐ press
- ☐ binin
- ☒ binout
- ☐ sens (Do not select - reserved for future options)

Make sure there is a check mark next to the binout selection. Do not remove any check marks for the other optional features.

77. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the Resource Block window.

78. Open the AO Transducer Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

79. In the Others tab, the BINOUT1_CONFIG and BINOUT2_CONFIG parameters have a drop down box with the following choices:

- ☐ hi alarm
- ☐ lo alarm
- ☐ hihi alarm
- ☐ lolo alarm
- ☐ inverted alarm

Select one choice of alarming for each parameter (BINOUT1_CONFIG and BINOUT2_CONFIG) as follows:

Selecting *hi alarm* in BINOUT1_CONFIG means that the value of POS_VALVE_HI_ALARM (first warning) is the configured limit for binary output1.

Selecting *hihi alarm* in BINOUT1_CONFIG means that the value of POS_VALVE_HI_HI_ALARM (main alarm) is the configured limit for binary output1.

Selecting *lo alarm* in BINOUT1_CONFIG means that the value of POS_VALVE_LO_ALARM (first warning) is the configured limit for binary output1.

Selecting *lolo alarm* in BINOUT1_CONFIG means that the value of POS_VALVE_LO_LO_ALARM (main alarm) is the configured limit for binary output1.

The option *inverted alarm* switches the active signal (i.e. valve position above configured limits will lead to a current lower than 1 mA, valve position below limit will lead to a current above 2.2 mA).

80. Based upon the selections in the previous step, configure the appropriate POS_VALVE_xxyy_ALARM parameter(s) located in the Resource Block to the desired limits required to activate the binary output(s).

81. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the AO Transducer Block window.

5.2.4 Two Pressure Sensors for SRD991 / Three Pressure Sensors for SRD960

The pressure sensor option consists of two or three pressure sensors. One sensor measures the supply pressure, and the second sensor measures the pressure applied to the actuator. The third measures the second output to the actuator. If the supply pressure falls below a configurable limit, a message will appear in the DIAGNOSIS parameter.

82. Open the Resource Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

83. In the Others tab, the DEVICE_OPTIONS parameter has a drop down box listing the following choices:

- ☐ pos ret
- ☒ press
- ☐ binin
- ☐ binout
- ☐ sens (Do not select - reserved for future options)

Make sure there is a check mark next to the press selection. Do not remove any check marks for the other optional features.

84. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the Resource Block window.

85. Open the AO Transducer Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

86. In the Others tab, set the SENSOR1_UNITS and SENSOR2_UNITS and SENSOR3_UNITS parameters for the EGU's for the pressure sensors (kPa, Bar or psi). All available sensors should be set to the same EGU to eliminate confusion. The actual pressure being measured by the pressure sensors are displayed in the SENSOR1_VALUE and SENSOR2_VALUE and SENSOR3_VALUE parameters. Sensor #1 is the supply pressure, Sensor #2 is output Y1 and sensor #3 is output Y2.

87. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem, set block to Auto, and close the AO Transducer Block window.

88. Open the AO Transducer Block. Click on the OOS box to put the block Out Of Service. Make sure that in the Process tab that the MODE_BLK • ACTUAL value reads OOS.

89. In the Others tab, if sensor #1 (supply pressure) falls below the LOW_PRESSURE_LIMIT value, the PRESS TOO LOW status bit will be set in the DIAGNOSOIS parameter in the Others tab of the Resource Block. Most users set the limit to a pressure at or slightly above the pressure required to stroke the actuator fully open (actuator spring rate value). The factory default is -0.5 Bar to insure that no diagnostic bits are set initially.

90. Click on the Write Changes button at the bottom of the page to download the changes to the valve positioner. Now click on the AUTO button. The MODE_BLK • ACTUAL in the Process tab should change to Auto. If the block does not change to Auto, go to the Troubleshooting section. Fix problem and close the AO Transducer Block window.

6 REFERENCE DOCUMENTS

[Ref. 1] **FOUNDATION Specification System Architecture**
FF-800

[Ref. 2] **FOUNDATION Specification Communication Profile**
FF-940

[Ref. 3] **FOUNDATION Specification System Management**
FF-880

[Ref. 4] **FOUNDATION Specification Network Management**
FF-801

[Ref. 5] **FOUNDATION Specification Fieldbus Message Specification**
FF-870

[Ref. 6] **FOUNDATION Specification Fieldbus Access Sublayer**
FF-875

[Ref. 7] **FOUNDATION Specification Data Link Services Subset**
FF-821

[Ref. 8] **FOUNDATION Specification Data Link Protocol Specification**
FF-822

[Ref. 9] **FOUNDATION Specification Function Block Application Process Part 1 + 2**
FF-890 + FF-891

[Ref. 10] **FOUNDATION Specification Transducer Block Application Process Part 1 + 2**
FF-902 + FF-903

[Ref. 11] **PC20 Master Instruction**
MI 020-495

[Ref. 12] **SRD991 Intelligent Positioner Master Instruction**
MI EVE0105 A-(en)