Profile Fluid Power Technology

Proportional Valves and Hydrostatic Transmissions

Version 1.5

PREFACE

This device profile has been elaborated in the VDMA committee "Bus Systems for Proportional Valves" and "Fluid Intelligent Drives".

The device profile has been defined for hydraulic proportional valves, hydrostatic pumps and hydrostatic transmissions. It can as well be applied on pneumatic devices.

The present draft has been forwarded to the user organizations of the following bus systems: InterbusS (InterbusS Club), CANopen (CiA), DeviceNet (CiA), ProfibusDP (PNO).

The organizations have been asked for bus system specific application, and for the preparation of a standardization of the proposal.

The profile shall be checked and implemented by the device manufacturers. Any doubts and comments will be collected, and the profile will be revised accordingly before standardization.

Frankfurt ....
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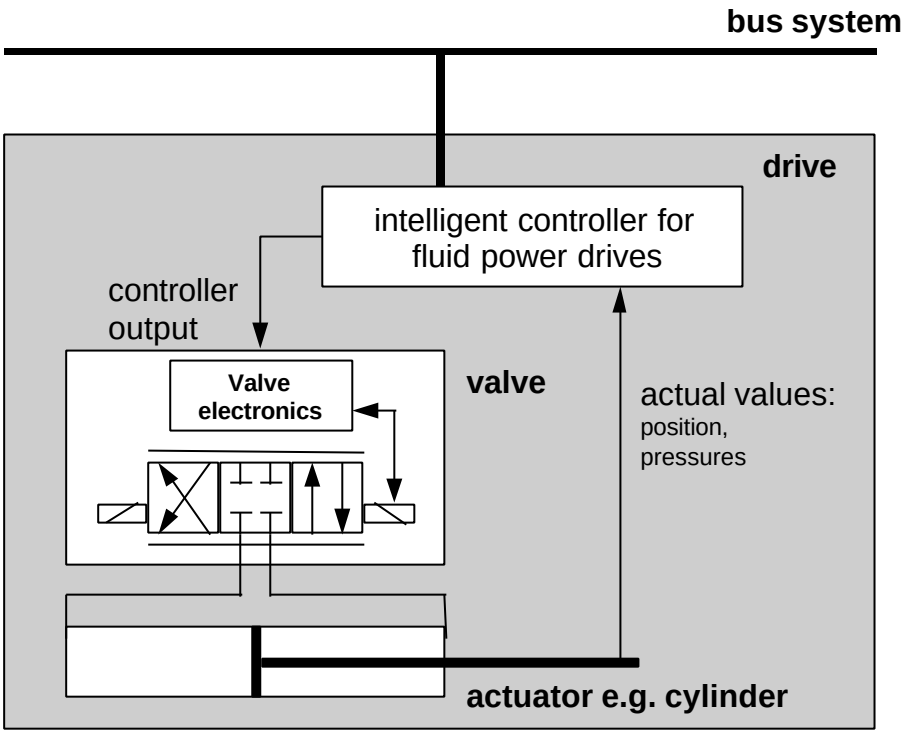
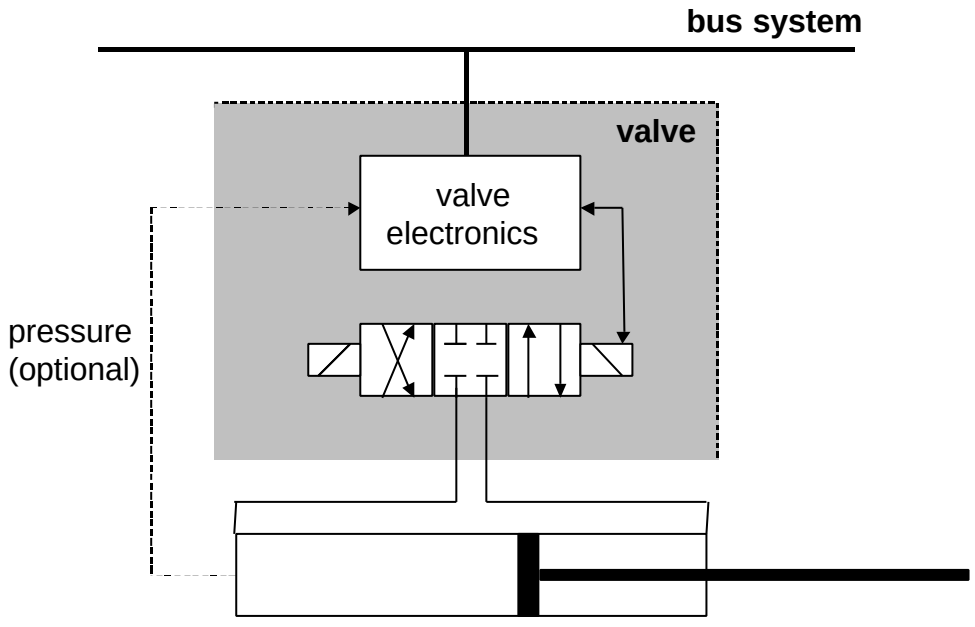
1 RANGE OF APPLICATION

This profile describes the functionality of interconnectable proportional valves, hydrostatic pumps and hydrostatic transmissions.

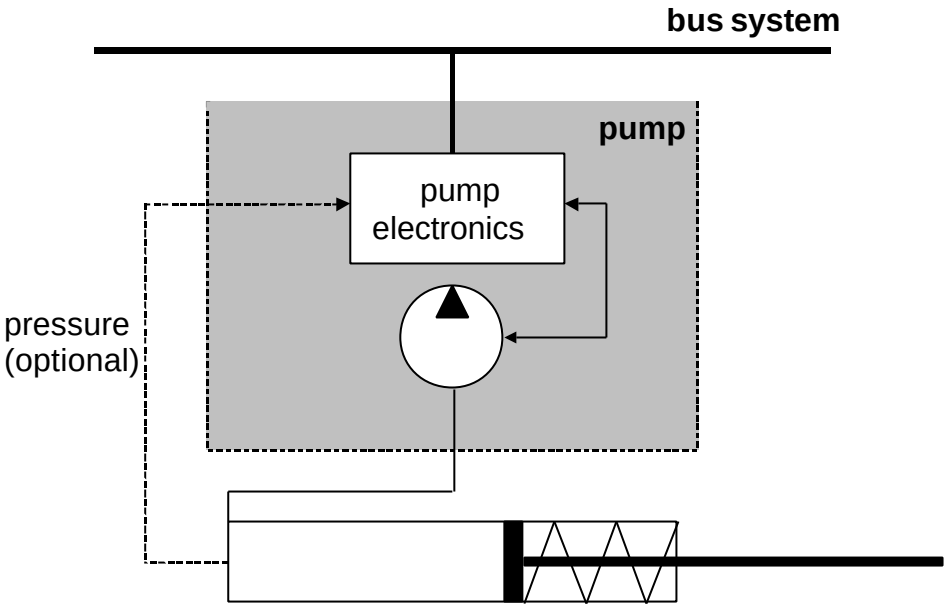
1.1 System Environment Hydrostatic Transmissions



1.2 System Environment Valves



1.3 System Environment Hydrostatic Pumps



Pumps are treated as valves (p/Q-control).

2 SYMBOLS AND ABBREVIATIONS

m	mandatory
c	conditional - parameter has to be present if optional function has been implemented
o	optional
r	read
w	write
r/w	read/write
vs	vendor specific
ir	internal resolution

3 GENERAL DEFINITIONS

Internal Resolution (ir)

The internal resolution is 16384 (4000 hex) for 100% and -16384 (C000 hex) for -100% of the range.

Direction of Data

- Input data are transmitted from the transmission or the valve to the bus
- Output data are transmitted from the bus to the transmission or the valve

Direction of Flow

A positive set point causes a flow from P to A.

Substitute Value

In case an optional parameter has not been implemented, the device behaves according to the substitute value for this parameter.

Conventions for Parameter Names

Device functions can be combined from several functions of the same type (e. g. demand value generators). Device functions can be combined through nesting of functions. The parameter names correspond to the following syntax:

parameter name = [< function group name > /] < function name > / < parameter >

Example:
Pressure / DemandValueGenerator / Ramp / AccelerationTime

Name Conventions for Parameter Describing Elements

element name = [< function group name > /] < function name > / < parameter > / < element >

Example:
Pressure / DemandValueGenerator / Ramp / AccelerationTime / Unit

Parameter Definitions

The parameters are defined only at one location at the corresponding function.

3.1 Description of Parameters

The description of parameters consists of the describing elements value, unit, and prefix. These describing elements are defined by the attributes name, data type, substitute value, default value, value range, access rights, and object class. For each parameter attributes have been established, device mode specific or vendor specific.

The profile does not describe when a change of a parameter is possible and/ or becomes valid. This is defined vendorspecifically.

Parameter name	name	data type	Substitute value	default value	value range	access rights	object class
value	.../Value	parameter specific	parameter specific	parameter specific	parameter specific	parameter specific	parameter specific
unit	.../Unit	UINT8	parameter specific	parameter specific	parameter specific	parameter specific	parameter specific
prefix	.../Prefix	INT8	parameter specific	parameter specific	vs	parameter specific	vs

In case of a fixed defined unit:

Parameter name	name	data type	Substitute value	default value	value range	access rights	object class
value	.../Value	parameter specific	parameter specific	parameter specific	parameter specific	parameter specific	parameter specific

The definitions of unit and prefix refer to the unit convention of the corresponding bus specific reproduction.

Parameter Value

Descriptive attribute	meaning
name	unambiguous object denomination of the parameter
data type	data types can be defined parameter specific or for a group of parameters
substitute value	for optional parameters not implemented
default value	value set by vendor (factory setting)
value range	value range will be given as a comment
access rights	r/w, r, w
object class	m, o or c

Parameter Unit

This element defines the unit of the parameter value with defined codes.

descriptive attribute	Meaning
name	unambiguous object denomination of the unit
data type	data type for the unit element is fixed
substitute value	defines the unit of the parameter value in case the unit element has not been implemented
default value	value set by vendor for the unit (factory setting)
value range	admitted units
access rights	r/w, r w = unit can be changed via bus r = unit can be read via bus
object class	m/ o m = unit is accessible via bus o = unit can be accessible via bus

Parameter Prefix

The parameter prefix is the exponent to the base 10 of the parameter value.

descriptive attribute	Meaning
name	unambiguous object denomination of the prefix
data type	data type for the prefix element is fixed
substitute value	defines the prefix of the parameter value in case the prefix element has not been implemented
default value	value set by vendor for the prefix (factory setting)
value range	admitted values for prefix
access rights	r/w, r w = prefix can be changed via bus r = prefix can be read via bus
object class	m/ o m = prefix is accessible via bus o = prefix can be accessible via bus

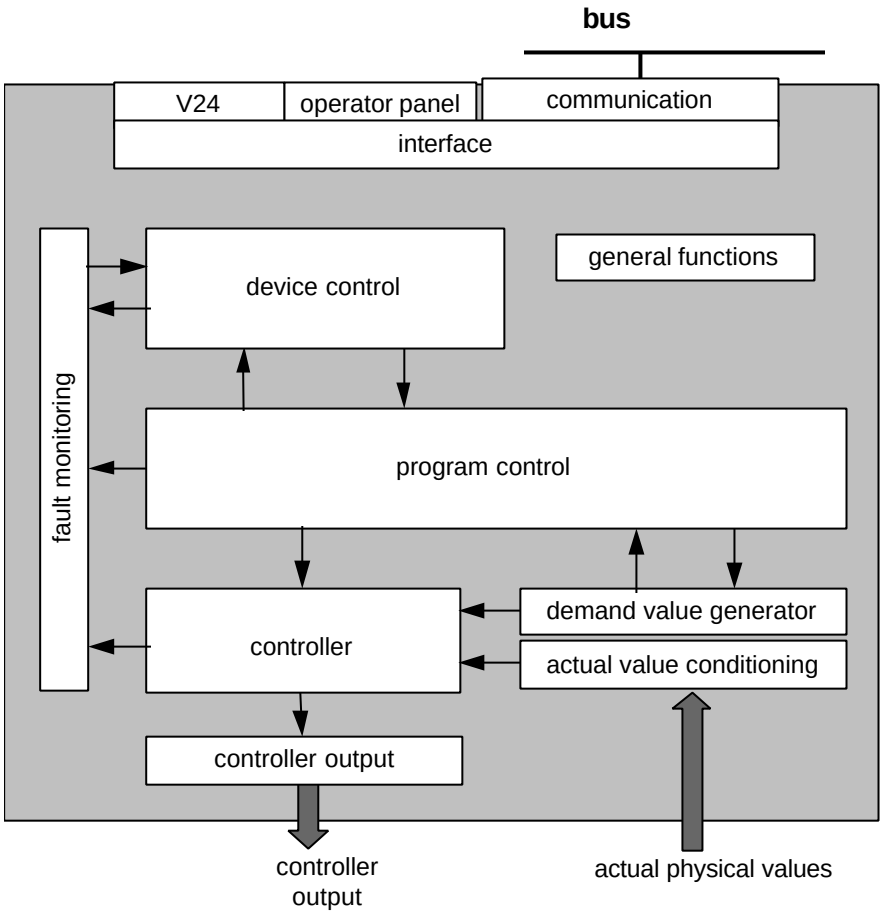
Example:

parameter name	data type	substitute value	default value	value range	access rights	object class
Position / Setpoint / Value	INT32	-	-	-2^{31} .. $(2^{31}-1)$	r/w	c
Position / Setpoint / Unit	UINT8	meter	meter	vs	r, r/w	o
Position / Setpoint / Prefix	INT8	µ	µ	vs	r, r/w	o

parameter name	data type	substitute value	default value	value range	access rights	object class
AccelerationTime / Value	INT32	-	-	-2^{31} .. $(2^{31}-1)$	r/w	c
AccelerationTime / Unit	UINT8	sec	sec	sec	r, r/w	o
AccelerationTime / Prefix	INT8	milli	milli	vs	r, r/w	o

4 DEVICE ARCHITECTURE

This device architecture has been chosen in order to describe simple valves as well as complex hydrostatic axis.

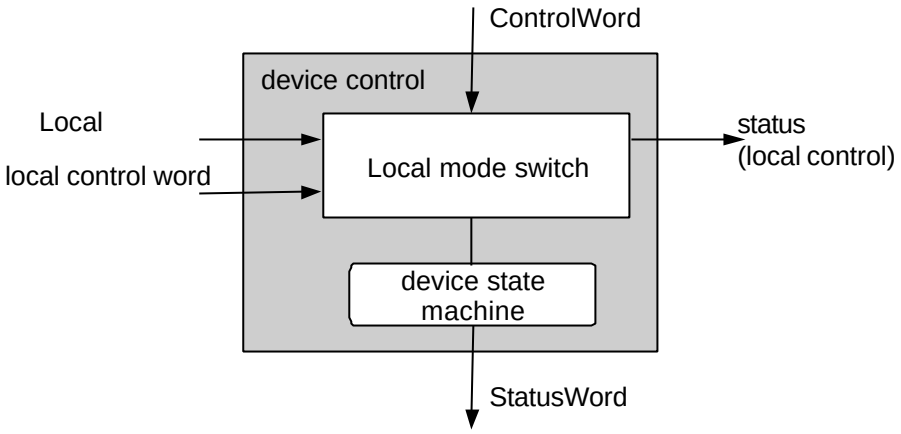


device architecture

Remark:
When several valves are driven by one electronic circuit, multiple architectures are used except for the interface.

5 DEVICE CONTROL

5.1 Local Mode



Device_Local

The parameter Device_Local indicates the source of the control word acting on the device state machine.

If the parameter is given by hardware, e. g. a switch, then this value always has priority over any value transmitted via another I/O-interface. In case of such a change attempt, a fault message via the used interface is initiated (see bus specific representation of the device profile).

parameter name	data type	substitute value	default value	value range	access rights	object class
Device_Local	INT8	see table	see table	vs	r, r/w	o

parameter name	device	Substitute value	default value
Device_Local	hydrostatic drive	1	vs
	proportional valve, hydrostatic pump	0	vs

local	meaning
0	ControlWord via bus
1	ControlWord local
2 .. 127	reserved
-1 .. –128	vs

ControlWord via Bus

The control word transmitted via the bus is effective.

ControlWord Local

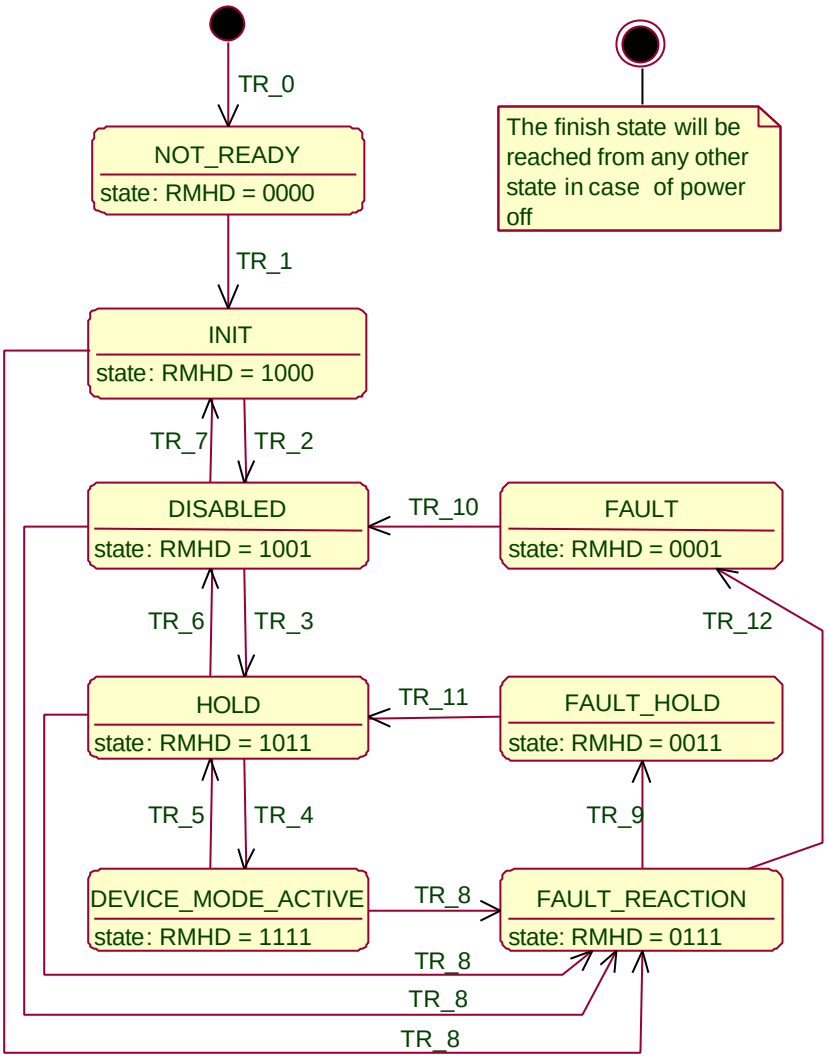
A locally generated control word is effective. Device mode, control mode and state transitions can be adjusted specifically by vendor.

Status (Local Control)

Bit = 1: The local control bit in the status word indicates that local operation is active.
Bit = 0: The control word is active via bus.

5.2 Device State Machine

In this profile some functions have been described with help of a device state machine. A state represents a certain internal and external behavior. It can only be left by defined events. Corresponding state transitions have been assigned to the events. During a transition, actions can be performed. During the transition, the state behavior is changed. At the termination of the transition, the actual state is changed into the following state.



Device Control Commands

state transition	device control command	bit 7 6 5 4 3 2 1 0 R M H D
2	activate disabled	x x x x x x x 1
3	activate hold	x x x x x x 1 1
4	activate device mode	x x x x x 1 1 1
5	de-activate device mode	x x x x x 0 x x
6	de-activate hold	x x x x x 0 0 x
7	de-activated disabled	x x x x x 0 0 0
10	reset fault (disabled)	x x x x 0 x 0 x - > x x x x 1 x 0 x
11	reset fault (hold)	x x x x 0 x 1 x - >

		x x x x 1 x 1 x

Internal Transitions

Transition	Meaning
0	power up
1	device init successful
8	fault detected
9	fault reaction successful (fault hold)
12	fault reaction successful (fault)

States Of Device Control

NOT READY:
- the electronic circuit has power
- self test running
- device init running (e. g. communication interface, hardware, software)
- device function disabled

INIT:
- device parameters can be set
- initialization of device parameters with stored values (if available)
- device function disabled

DISABLED:
- device parameters can be set
- device function disabled

HOLD:
- device parameters can be set
- the preset hold setpoint is effective (see chapters 7.2 and 8.2)
- the setpoint generated in the state DEVICE MODE ACTIVE is not effective

DEVICE MODE ACTIVE:
- device parameters can be set
- the device mode defined by the device mode parameter is active
- in this state the change of device modes is not admitted (write access to the device mode parameter will be responded negatively)

FAULT HOLD:
- device parameters can be set
- the actual value presently effective is held or a preset hold setpoint is effective
  the setpoint generated in the state DEVICE MODE ACTIVE is not effective

FAULT:

- device parameters can be set
- device function disabled

FAULT REACTION:

This state is assumed when the device is no longer able to operate.
- device parameters can be set
- a fault dependent vendor specific action is executed
- device function may be enabled

5.3 ControlWord

The control word is transmitted via the I/O-interfaces (e. g. the field bus) or will be generated locally. It controls the device status.

parameter name	data type	substitute value	default value	value range	access rights	object class
Device_ControlWord	UINT16	-	-	0000 – FFFF hex	r/w	m

Bit	ControlWord	Control Mode = 5 (p/Q Control Valve)	Device Mode = 2 (Install Mode)	Device Mode = 6 (Automatic Single Step)	m/o
0	disabled (D)				m
1	hold enable (H)				m
2	device mode active enable (M)				m
3	reset fault (R)				m
4	reserved				m
5	reserved				m
6	switch parameter set				o
7	switch parameter set				o
8	control mode specific	enable pressure controller (c)			
9	device mode specific	master/slave mode (o)	install mode positive (c)	single step (c)	
10	device mode specific	enable leakage compensation (o)	install mode negative (c)	reserved (c)	
11	device mode specific		reserved (c)	reserved (c)	
12	reserved				c
13	vs				-
14	vs				-
15	vs				-

Disabled, Hold Enable, Device Mode Active Enable, Reset Fault
These bits form the device control commands.

Control Mode: p/Q Control Valve

Enable Pressure Controller
This bit controls, in the control mode p/Q control valve, the activity of the pressure controller.

0: pressure controller disabled

1: pressure controller enabled.

Device Mode: Install Mode
According to the control mode set, a movement will be executed into the corresponding direction with the parameters preset for this specific device mode. When both directional bits are set, the same condition is

assumed as if no bit were set.

Install Mode Positive: Bit9 = 1: movement into positive direction

Install Mode Negative: Bit10 = 1: movement into negative direction

Switch parameter set
The two bits are used to switch between different parameter sets.

Master slave mode
This bit is used to enable the slave mode. This function is used for pumps only.

Enable Leakage Compensation
This bit is to enable/disable the leakage compensation.

Device Mode: Automatic Single Step

Single Step
At the shift of bit9 from 0 to 1 the next program step is executed.

Reserved
These bits have been reserved for profile extensions. The functions yet to be defined will not be enabled, when these bits are "0". In the application these bits have to be set "0".

vs
These control bits control vendor specific functions. The functions are not enabled, when these bits are "0". These bits have to be set "0", as long as they have not been assigned to a vendor specific function.

5.4 StatusWord

The status word is transmitted via the I/O interface (e. g. the field bus) and indicates the device condition.

parameter name	data type	substitute value	default value	value range	access rights	object class
Device_StatusWord	UINT16	-	-	0000 - FFFF hex	r	m

Bit	Status Word	Control Mode = 1..4 (Valves)	Control Mode = 5 (Valves)	Control Mode = 6..9 (Drives)	m/o
0	disabled (D)				m
1	hold enable (H)				m
2	device mode active enable (M)				m
3	ready (R)				m
4	local control				m
5	warning				o
6	reserved				o
7	reserved				o
8	control mode specific	reserved (c)	pressure controller enabled (c)		
9	control mode specific	ramp running (c)	ramp running (c)	reached end of program (c)	
10	control mode specific	limit touched (c)	limit touched (c)	limit touched (c)	
11	control mode specific	control error (c)	control error (c)	control error (c)	
12	actual value reached target				o

	window				
13	vs				-
14	vs				-
15	vs				-

Disabled, Hold, Device Mode Active, Ready
These bits determine the device condition.

Control Mode: p/Q-Control Valve

Enable Pressure Controller

bit = 1: pressure controller enabled

Value	Meaning
1	pressure controller enabled
0	pressure controller disabled

Control Error
bit = 1: Indicates a control deviation. This bit is set by the control monitoring function. The device continues to operate normally.
bit = 0: No control error, or not implemented.

Control Mode = 1..5 (Valves)

Ramp Running

bit = 1: The ramp function has **not** yet reached its limit.

Limit Touched

bit = 1: A chosen setpoint cannot be reached, because it is limited by the limit function. This is a collective message that can be generated e. g. a position setpoint limit, a pressure setpoint limit, or a power limit.

Warning

bit = 1: Collective message for vendor specific warnings. The type of warning will be indicated by a vendor specific parameter.

Local Control

bit = 1: The control word is given locally, and the control word transmitted via bus will be ignored (see local mode switch function).
bit = 0: The control word transmitted via bus is effective.

Reached end of program

This bit indicates the end of program (device mode = 5, automatic).

Actual value reached target window

This bit indicates if the actual value reached the target window.

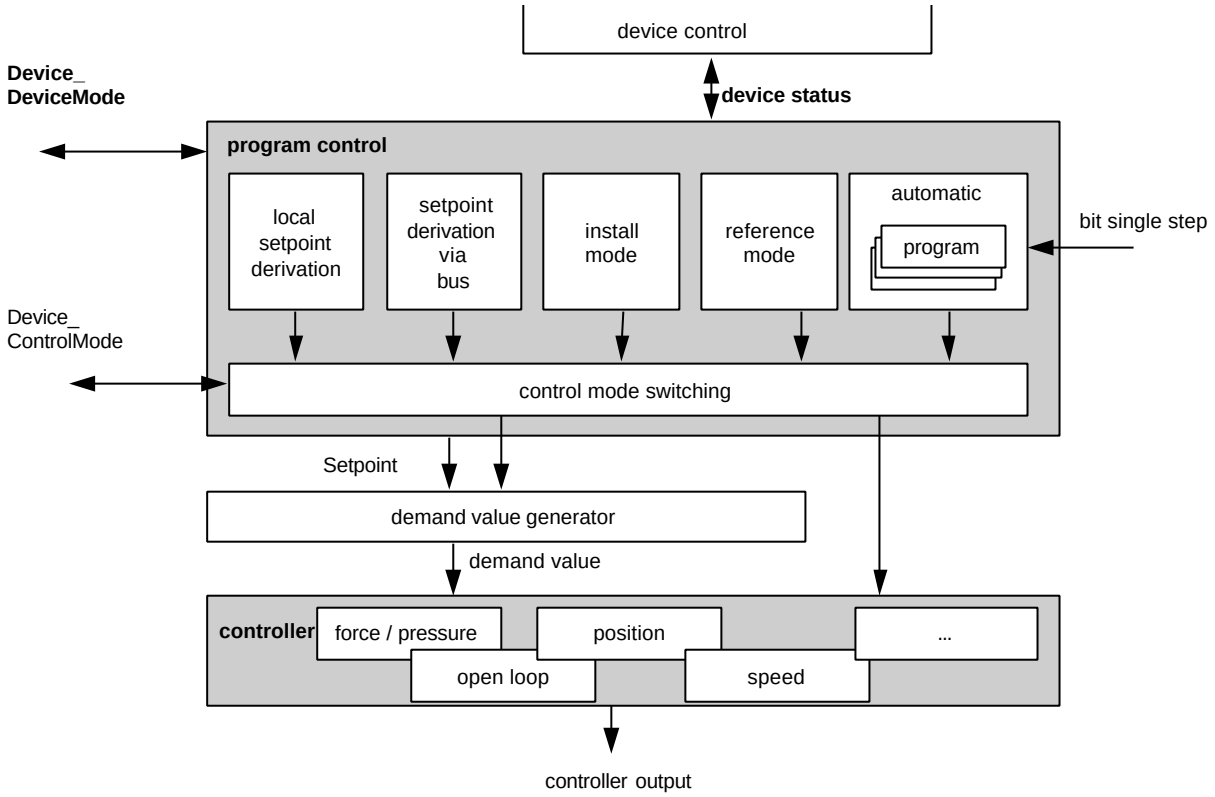
vs

Indicates vendor specific information.

6 PROGRAM CONTROL

The devices can execute predefined or freely programmable sequences. The program control controls these sequences dependent on device status and device mode.

- predefined sequences
- setpoint input via bus
- setpoint input locally
- reference mode
- install mode
- freely programmable operation
- programs



6.1 Device Modes

The device mode of the device mainly defines how the setpoints are put in. The device modes are subordinate to the device control. If the device mode is given by hardware, e. g. a switch, then this device mode always has priority over any device mode transmitted via another I/O-interface. In case of such a change attempt, a fault message via the used interface is initiated (see bus specific representation of the device profile).

For each device type only certain device modes are effective.

Device_DeviceMode
With this parameter the device mode is indicated and can be chosen.
The parameter is readable and writeable.

parameter name	data type	substitute value	default value	value range	access rights	object class
Device_DeviceMode	INT8	1	vs	vs	r, r/w	o

device mode	meaning
0	no device mode
1	setpoint input via bus
2	setpoint input locally
3	install mode (single step)
4	reference mode
5	automatic
6	automatic (single step)
7 .. 127	reserved
-1 .. –127	vs

6.1.1 No Device Mode

No device mode active. Device waits for setting of device mode and behaves like in the HOLD state.

6.1.2 Setpoint Input Via Bus

In this device mode the setpoints transmitted via the bus are passed on to the demand value generator.

6.1.3 Setpoint Input Locally

In this device mode the setpoints are input locally, and the ones transmitted via bus are ignored.

6.1.4 Install Mode

In this device mode predefined setpoints are effective. The direction of movement is determined by the device mode dependent bits in the control word.

6.1.5 Reference Mode

In this device mode a reference movement is executed.

6.1.6 Automatic

In this device mode a previously chosen program is executed, as soon as the DEVICE MODE ACTIVE state is assumed.

6.1.7 Automatic (Single Step)

In this device mode a previously chosen program is executed in single steps.

6.2 Control Mode Switching

Device_ControlMode

With this parameter the control mode of the device is indicated or switched. The device will then execute the functions defined in the open and closed loop control chapters (see chapter 7.1).

parameter name	data type	**substitute value**	**default value**	**value range**	**access rights**	**object class**
Device_ControlMode	INT8	see table	vs	see table / vs	r or r/w	o

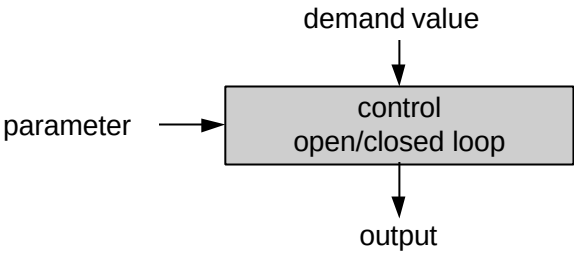
For each type of device, one or several control modes are supported.

control mode	**Meaning**
0	control mode not defined (substitute value for valves)
1	spool position control open loop
2	spool position control closed loop
3	pressure control valve open loop
4	pressure control valve closed loop
5	p/Q-control valve
6	open loop movement (substitute value for hydrostatic axis)
7	velocity control axis
8	force / pressure control axis
9	position control axis
10	positional dependent deceleration
11 .. 127	reserved
-1 .. –127	vs

7 DRIVES

7.1 Closed and Open Loop Control Functions

Depending on device type or supported control modes, see 6.2, the following closed and open loop control functions have to be implemented.



Demand Value

This value is an internal value and input to the controller.

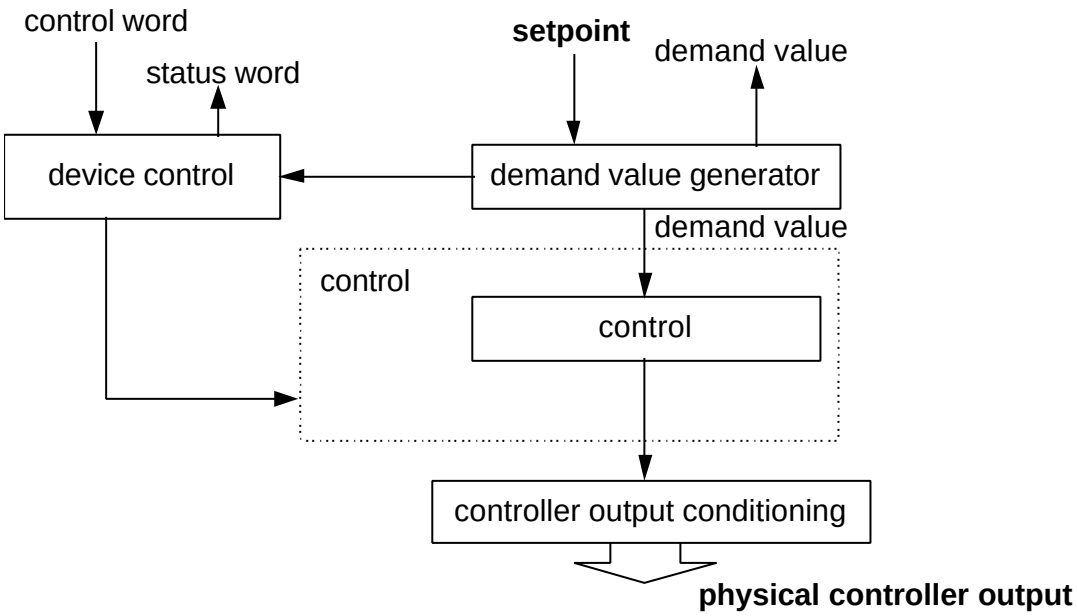
Output

This value is an internal value and is passed on to controller output conditioning.

Parameter

The control parameters are specified in physical units; controller setup is possible via bus.

7.1.1 Open Loop Movement

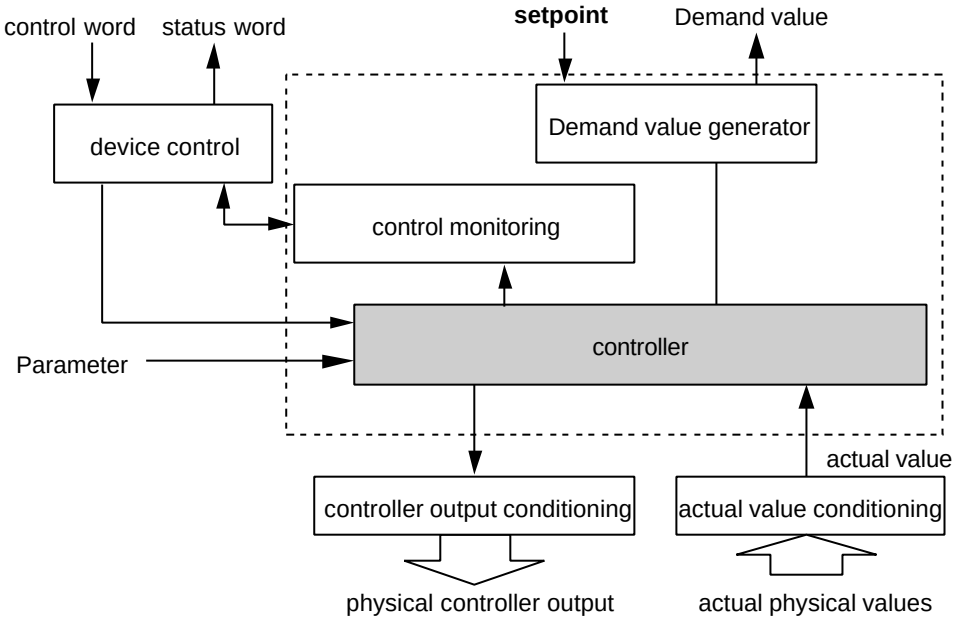


Setpoint

This parameter is transmitted via bus and corresponds to the velocity setpoint.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r/w	c
... / Setpoint / Unit	UINT8	meter/min	meter/min	vs	r, r/w	o
... / Setpoint / Prefix	INT8	milli	milli	vs	r, r/w	o

7.1.2 Position Control Closed Loop



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r/w	c
... / Setpoint / Unit	UINT8	meter	meter	vs	r, r/w	o
... / Setpoint / Prefix	INT8	µ	µ	vs	r, r/w	o
… / ActualValue / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r	o
… / ActualValue / Unit	UINT8	meter	meter	vs	r	o
… / ActualValue / Prefix	INT8	µ	µ	vs	r	o
... / ControlDeviation / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r	o
... / ControlDeviation / Unit	UINT8	meter	meter	vs	r	o
... / ControlDeviation / Prefix	INT8	µ	µ	vs	r	o

Setpoint

This parameter is transmitted via bus and corresponds to the position setpoint.

ActualValue

The ActualValue contains the Actual Value used in the controller. It is the same value as that of the selected interface and is also accessible via the ActualValueConditioning block.

Control Deviation

This value is the difference between demand value and actual value.
(control deviation = demand value - actual value)

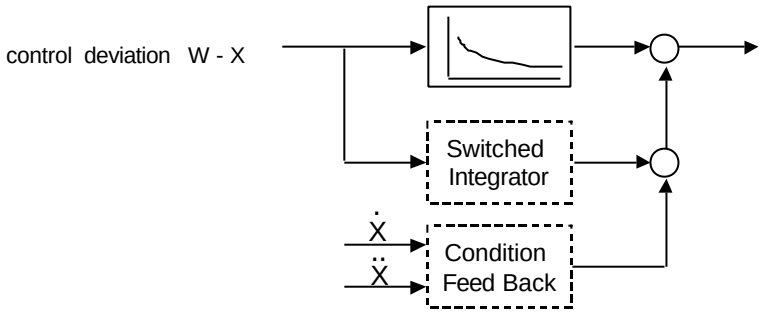
Remark: The unit of the control deviation is the same as the input (setpoint).

Referencing the actual value interface

The parameter InterfaceReference is to create the reference between the controller and the actual value. The parameter specifies the interface number of the actual value (see chapter 9.1 Actual Value conditioning).

parameter name	data type	substitute value	default value	value range	access rights	object class
... / InterfaceReference	UINT8	1	vs	vs	r/w	c

The position controller is basically a P-controller, with an optional DT1-block and possible vendor specific additions. In the figure, the dotted blocks are optional.

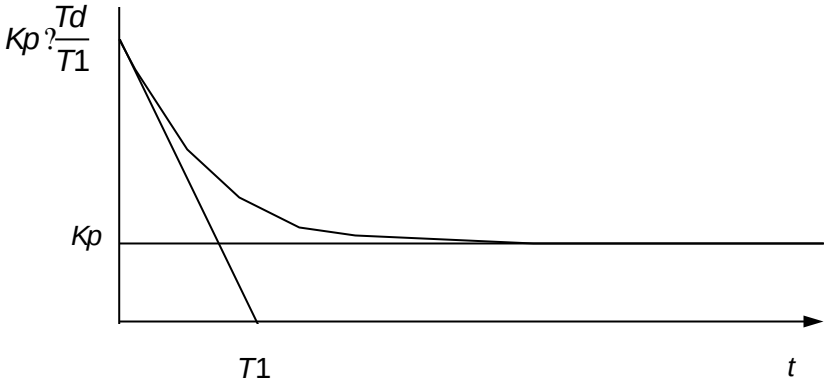


Name	Description
Kp	proportional gain
Td	rate time
T1	DT1 time delay

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Kp / Value	UINT32	0	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / Kp / Unit	UINT8	volt / meter	vs	vs	r, r/w	o
... / Kp / Prefix	INT8	milli	vs	vs	r, r/w	o
... / Td / Value	UINT32	0	vs	0 .. $(2^{32}-1)$	r/w	o
... / Td / Unit	UINT8	sec	sec	sec	r, r/w	o
... / Td / Prefix	INT8	milli	vs	vs	r, r/w	o
... / T1 / Value	UINT32	0	vs	0 .. $(2^{32}-1)$	r/w	o
... / T1 / Unit	UINT8	sec	sec	sec	r, r/w	o
... / T1 / Prefix	INT8	milli	vs	vs	r, r/w	o

If the time constant of a control block is set to zero, this control block is deactivated.

The PDT1-controller realizes the time discrete approximation of a PDT1-element. The transient function with the parameters given in the table is shown in the figure below.



7.1.2.1 Switched Integrator (Optional)

The optional function of a switched integrator is represented by a separate set of parameters called **switched integrator**. The switched integrator is for the fine positioning of the drive. The output signal of the integrator is changed only when the control deviation is within the position window dX.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Type	INT8	0	vs	vs	r/w	o

Type	Description
0	no switched integrator or deactivated
1	standard - switched integrator
2 .. 127	reserved
-127 .. -1	vs

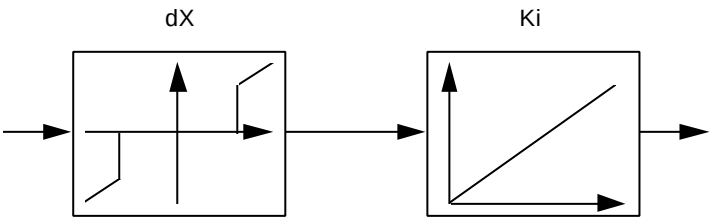
7.1.2.1.1 Standard Switched Integrator (Type = 1)

Parameters:

Name	Description
Ti	integration time
dX	position window

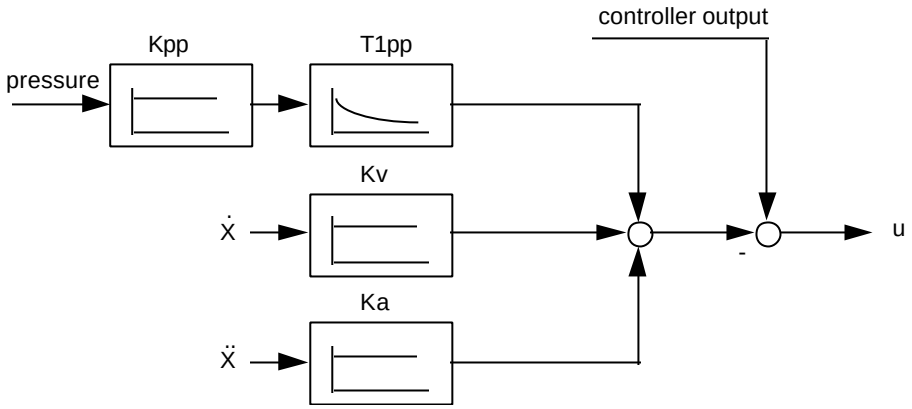
parameter name	data type	substitute value	default value	value range	access rights	object class
... / Ti / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Ti / Unit	UINT8	sec	sec	sec	r, r/w	o
... / Ti / Prefix	INT8	milli	vs	vs	r, r/w	o
... / dX / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / dX / Unit	UINT8	meter	meter	vs	r, r/w	o
... / dX / Prefix	INT8	µ	µ	vs	r, r/w	o

If the time constant of the controller component is set to zero, the controller component will be deactivated.



7.1.2.2 Condition Feed Back (Optional)

If for the realization of a state controller a condition feedback with the pressure, velocity and acceleration signals has been installed, then the output of the condition feedback is as follows:



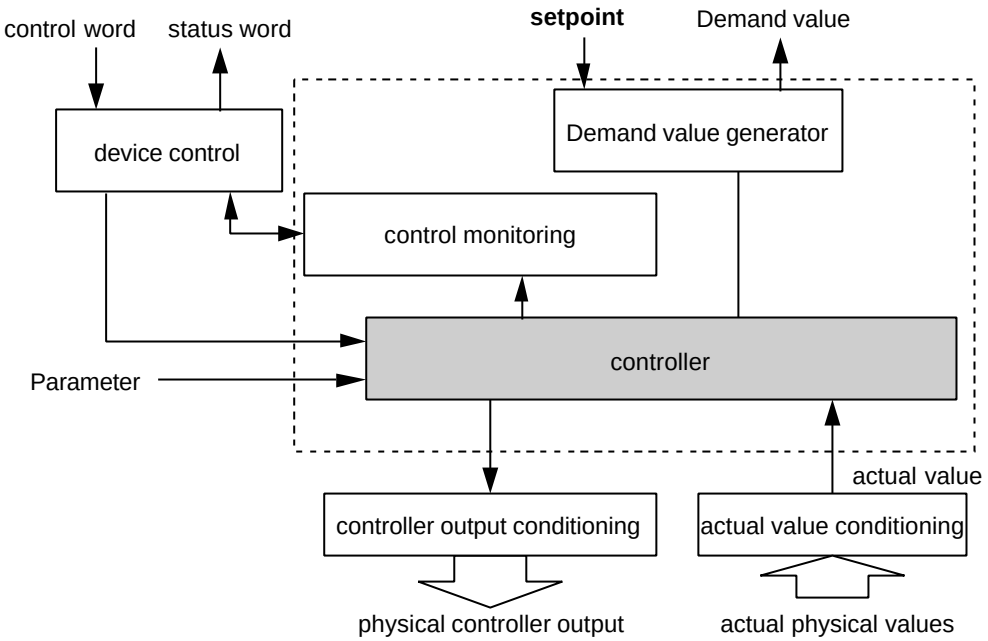
The output of the condition feedback is subtracted from the controller output.

Name	Description
Kv	velocity feedback
Ka	acceleration feedback
Kpp	pressure gain factor
T1pp	time constant high pass filter (DT1)

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Kv / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Kv / Unit	UINT8	volt (meter/sec)	vs	vs	r, r/w	o
... / Kv / Prefix	INT8	milli	vs	vs	r, r/w	o
... / Ka / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Ka / Unit	UINT8	volt (meter/sec^2)	vs	vs	r, r/w	o
... / Ka / Prefix	INT8	milli	vs	vs	r, r/w	o
... / Kpp / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Kpp / Unit	UINT8	volt/bar	vs	vs	r, r/w	o
... / Kpp / Prefix	INT8	milli	vs	vs	r, r/w	o
... / T1pp / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / T1pp / Unit	UINT8	sec	sec	sec	r, r/w	o
... / T1pp / Prefix	INT8	milli	vs	vs	r, r/w	o

If the time constant of a control block is set to zero, this control block is deactivated.

7.1.3 Speed Control



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT32	-	-	-2^{31} .. $(2^{31}-1)$	r/w	c
... / Setpoint / Unit	UINT8	meter / min	meter / min	vs	r, r/w	o
... / Setpoint / Prefix	INT8	milli	milli	vs	r, r/w	o
… / ActualValue / Value	INT32	-	-	-2^{31} .. $(2^{31}-1)$	r	o
… / ActualValue / Unit	UINT8	meter / min	meter / min	vs	r	o
… / ActualValue / Prefix	INT8	milli	milli	vs	r	o
... / ControlDeviation / Value	INT32	-	-	-2^{31} .. $(2^{31}-1)$	r	o
... / ControlDeviation / Unit	UINT8	meter / min	meter / min	vs	r	o
... / ControlDeviation / Prefix	INT8	milli	milli	vs	r	o

Setpoint

This parameter is transmitted via bus and corresponds to the velocity setpoint.

ActualValue

The ActualValue contains the Actual Value used in the controller. It is the same value as that of the selected interface and is also accessible via the ActualValueConditioning block.

Control Deviation

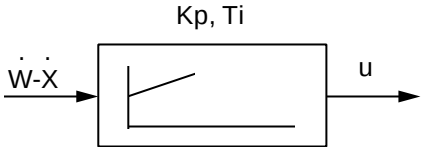
This value is the difference between demand value and actual value.
(control deviation = demand value - actual value)

Remark: The unit of the control deviation is the same as the input (setpoint).

Referencing the actual value interface

The parameter InterfaceReference is to create the reference between the controller and the actual value. The parameter specifies the interfaceNo of the actual value (see chapter 9.1 Actual Value conditioning).

parameter name	data type	substitute value	default value	value range	access rights	object class
... / InterfaceReference	UINT8	1	vs	vs	r/w	c



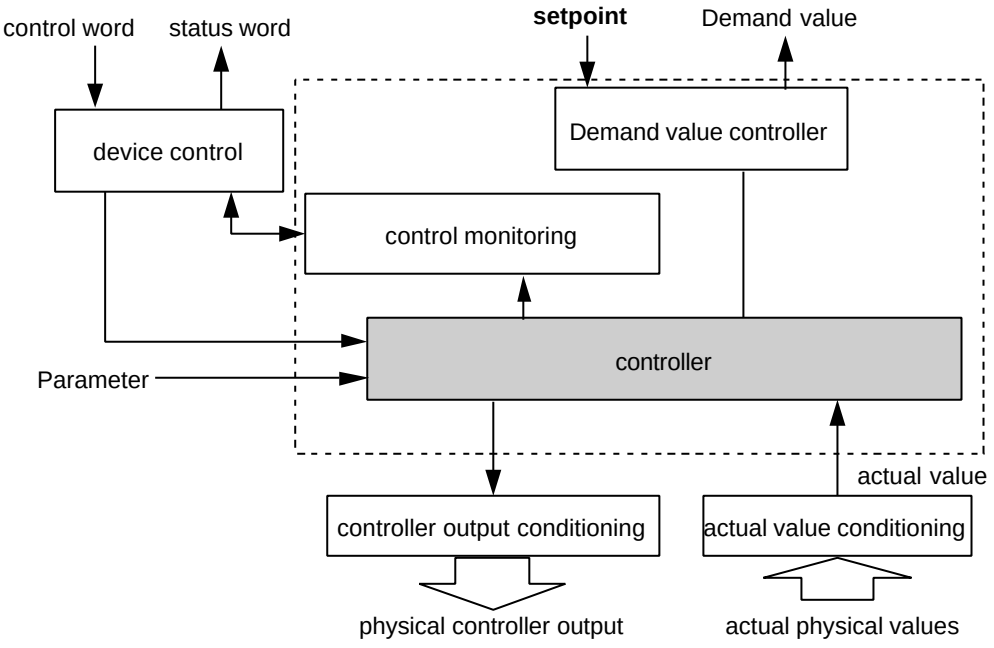
7.1.3.1 PI Controller & Optional Extensions

Name	Description
Kp	proportional factor
Ti	integration time constant

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Kp / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Kp / Unit	UINT8	volt (meter / sec)	vs	vs	r, r/w	o
... / Kp / Prefix	INT8	milli	vs	vs	r, r/w	o
... / Ti / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Ti / Unit	UINT8	sec	sec	sec	r, r/w	o
... / Ti / Prefix	INT8	milli	vs	vs	r, r/w	o

If the time constant of a control block is set to zero, this control block is deactivated.

7.1.4 Force/Pressure Control



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r/w	c
... / Setpoint / Unit	UINT8	bar	bar	vs	r, r/w	o
... / Setpoint / Prefix	INT8	milli	milli	vs	r, r/w	o
… / ActualValue / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r	o
… / ActualValue / Unit	UINT8	bar	bar	vs	r	o
… / ActualValue / Prefix	INT8	milli	milli	vs	r	o
... / ControlDeviation / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r	o
... / ControlDeviation / Unit	UINT8	bar	bar	vs	r	o
... / ControlDeviation / Prefix	INT8	milli	milli	vs	r	o

Setpoint

This parameter is transmitted via bus and corresponds to the force / pressure setpoint.

ActualValue

The ActualValue contains the Actual Value used in the controller. It is the same value as that of the selected interface and is also accessible via the ActualValueConditioning block.

Remark: 1 bar = 10^5 N / m^2

Control Deviation

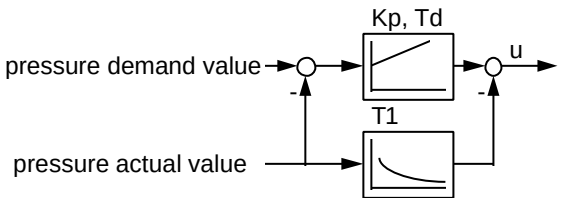
This value is the difference between demand value and actual value.
(control deviation = demand value - actual value)

Remark: The unit of the control deviation is the same as the input (setpoint).

Referencing the actual value interface

The parameter InterfaceReference is to create the reference between the controller and the actual value. The parameter specifies the interface number of the actual value (see chapter 9.1 Actual Value conditioning).

parameter name	data type	substitute value	default value	value range	access rights	object class
... / InterfaceReference	UINT8	1	vs	vs	r/w	c



The force / pressure controller is basically a PI-controller, with optional extensions. In the figure, the dotted blocks are optional.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / PressureSampleTime / Value	UINT32	-	vs	0 .. (2^{32} -1)	r/w	c
... / PressureSampleTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / PressureSampleTime / Prefix	INT8	?	?	vs	r, r/w	o

The pressure sample time parameter describes the sample time of the pressure controller in ms. Sample time zero means, the pressure / force controller is disabled.

7.1.4.1 PI(DT1) Controller & Optional Extensions

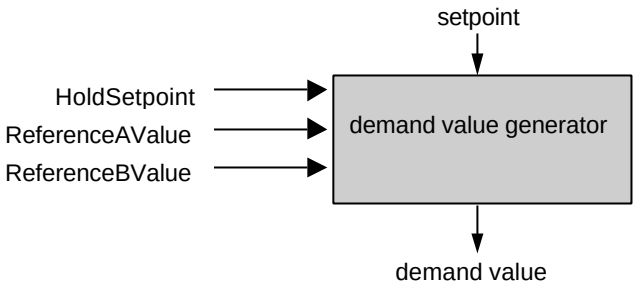
Name	Description
Kp	proportional factor
Ti	integration time constant
Td	rate time DT1
T1	time delay DT1

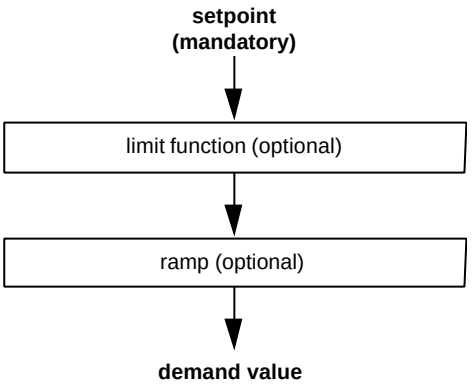
parameter name	data type	substitute value	default value	value range	access rights	object class
... / Kp / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Kp / Unit	UINT8	volt / bar	vs	vs	r, r/w	o
... / Kp / Prefix	INT8	milli	milli	vs	r, r/w	o
... / Ti / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / Ti / Unit	UINT8	sec	sec	sec	r, r/w	o
... / Ti / Prefix	INT8	milli	vs	vs	r, r/w	o
... / Td / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	o
... / Td / Unit	UINT8	sec	sec	sec	r, r/w	o
... / Td / Prefix	INT8	milli	vs	vs	r, r/w	o
... / T1 / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	o
... / T1 / Unit	UINT8	sec	sec	sec	r, r/w	o
... / T1 / Prefix	INT8	milli	vs	vs	r, r/w	o

If the time constant of a control block is set to zero, this control block is deactivated.

7.2 Demand Value Generator

The demand value generator is a group of functions consisting of the functions shown below.





Setpoint

The setpoint is a position setpoint, a velocity setpoint, or a pressure setpoint, depending on the control mode.

Hold Setpoint

The hold setpoint is active in the states HOLD and FAULT HOLD.

Demand Value

The demand value is calculated from the setpoint. (see chapter 7.1.1-4)

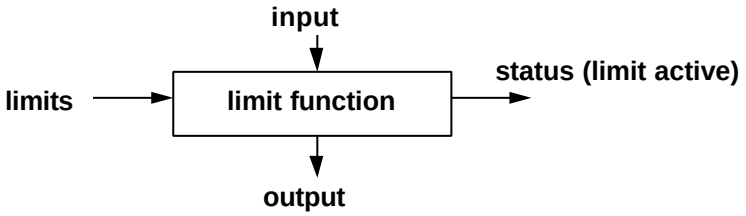
ReferenceAValue, ReferenceBValue

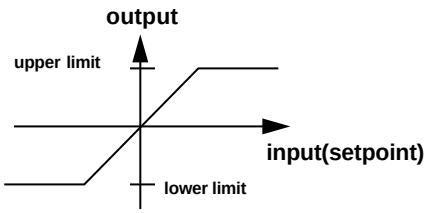
The reference values are the values corresponding to 100% of physical capabilities. If only one reference value is used, ReferenceAValue is valid for both directions.

parameter name	data type	substitute value	default value	value range	access rights	Object class
... / DemandValue / Value	INT32	0		-2^{31} .. (2^{31} -1)	r	c
... / DemandValue / Unit	UINT8	control mode specific	control mode specific	vs	r	o
... / DemandValue / Prefix	INT8	control mode specific	control mode specific	vs	r	o
... / ReferenceAValue / Value	INT32	0		-2^{31} .. (2^{31} -1)	r/w	o
... / ReferenceAValue / Unit	UINT8	control mode specific	control mode specific	vs	r, r/w	o
... / ReferenceAValue / Prefix	INT8	control mode specific	control mode specific	vs	r, r/w	o
... / ReferenceBValue / Value	INT32	0		-2^{31} .. (2^{31} -1)	r/w	o
... / ReferenceBValue / Unit	UINT8	control mode specific	control mode specific	vs	r, r/w	o
... / ReferenceBValue / Prefix	INT8	control mode specific	control mode specific	vs	r, r/w	o
... / HoldSetpoint / Value	INT32	0	vs	-2^{31} .. (2^{31} -1)	r/w	o
... / HoldSetpoint/ Unit	UINT8	control mode specific	control mode specific	vs	r, r/w	o
... / HoldSetpoint/ Prefix	INT8	control mode specific	control mode specific	vs	r, r/w	o

7.2.1 Limit (Optional)

This function limits the setpoint in its value range. The input will be limited to the preset values.





Input

The input of this function is the setpoint.

Limits

The limits limit the setpoint. The upper limit limits the setpoint to an upper value should this value be exceeded. The lowerLimit limits the setpoint to a lower value should this value be exceeded. The resolution of the limits corresponds to the resolution of the input (setpoint).

parameter name	data type	substitute value	default value	value range	acces s rights	object class
... / UpperLimit / Value	INT32	2^{31} -1	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / UpperLimit / Unit	UINT8	control mode specific	control mode specific	vs	r, r/w	o
... / UpperLimit / Prefix	INT8	control mode specific	control mode specific	vs	r, r/w	o
... / LowerLimit / Value	INT32	-2^{31}	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / LowerLimit / Unit	UINT8	control mode specific	control mode specific	vs	r, r/w	o
... / LowerLimit / Prefix	INT8	control mode specific	control mode specific	vs	r, r/w	o

Remark: Parameter selection resulting in Lower Limit > Upper Limit must be rejected.

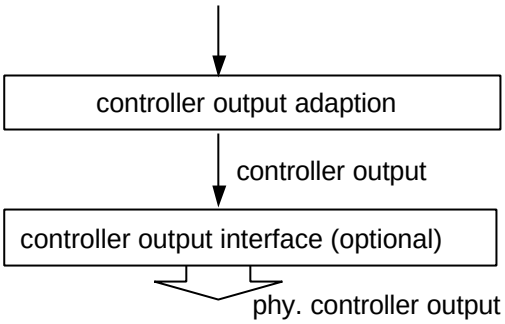
7.2.2 Ramp

see chapter 9.3

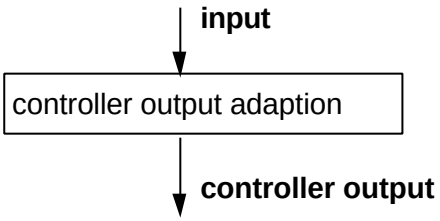
7.3 Actual Value Conditioning

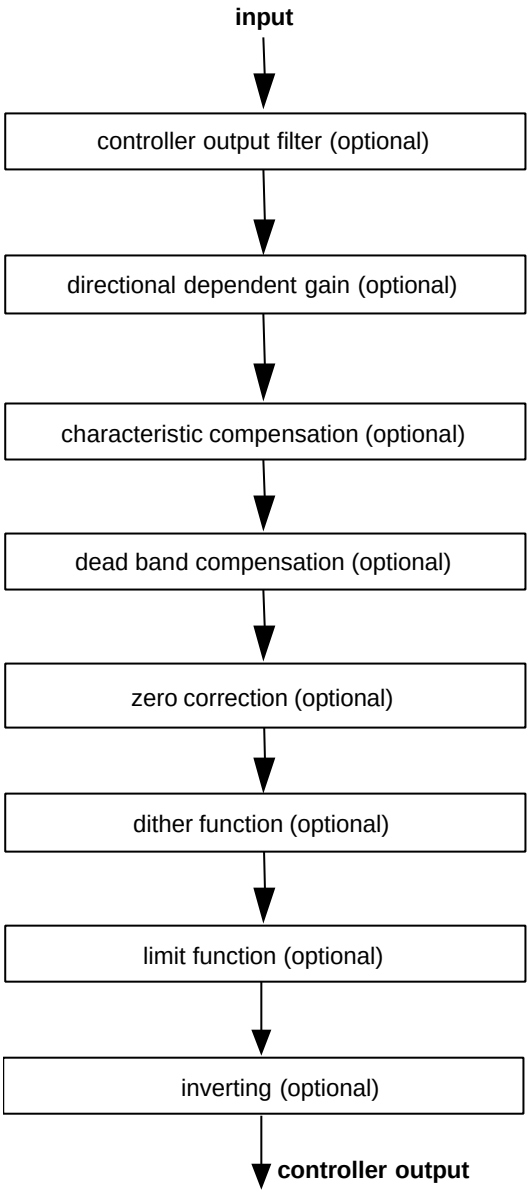
see chapter 9.1

7.4 Controller Output Conditioning



7.4.1 Controller Output Adaption





7.4.1.1 Controller Output Filter (Optional)

Type	Meaning
0	no filter
1	type 1
2	type 2
3 .. 127	reserved
-1 .. – 128	vs

Type 1

parameter name	data type	substitute value	default value	value range	access rights	object class
... / T1 / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / T1 / Unit	UINT8	sec	sec	sec	r, r/w	o
... / T1 / Prefix	INT8	milli	vs	vs	r, r/w	o

The T1 parameter indicates the time constant of the optional low pass filter.

Type 2

parameter name	data type	substitute value	default value	value range	access rights	object class
... / D / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / D / Unit	UINT8	no unit	no unit	vs	r, r/w	o
... / D / Prefix	INT8	milli	milli	vs	r, r/w	o
... / f0 / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	c
... / f0/ Unit	UINT8	Hz	Hz	Hz	r, r/w	o
... / f0/ Prefix	INT8	milli	milli	vs	r, r/w	o

The D parameter indicates the damping constant and f0 the natural frequency of the second order low pass filter.

7.4.1.2 Directional Dependent Gain (Optional)

see chapter 9.4

7.4.1.3 Characteristic Compensation (Optional)

see chapter 9.5

7.4.1.4 Dead Band Compensation (Optional)

see chapter 9.6

7.4.1.5 Zero Correction (Optional)

see chapter 9.7

7.4.1.6 Dither Function (Optional)

see chapter 9.2

7.4.1.7 Limit (Optional)

parameter name	data type	substitute value	default value	value range	access rights	object class
... / UpperLimit / Value	INT32	1000	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / UpperLimit / Unit	UINT8	no unit	no unit	vs	r, r/w	o
... / UpperLimit / Prefix	INT8	milli	milli	vs	r, r/w	o
... / LowerLimit / Value	INT32	-1000	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / LowerLimit / Unit	UINT8	no unit	no unit	vs	r, r/w	o
... / LowerLimit / Prefix	INT8	milli	milli	vs	r, r/w	o

The **upperLimit** and **lowerLimit** parameters indicate the minimum or maximum controller output.

7.4.1.8 Inverting

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Sign	INT8	1	vs	-1 or 1	r/w	o

Sign

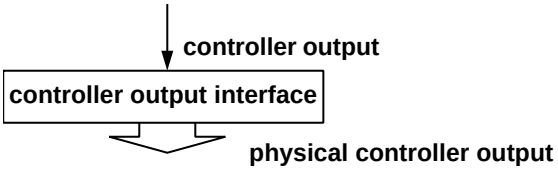
With the sign parameter the sign of the controller output can be changed.

7.4.2 Controller Output

This value is an internal value and the output of the controller output.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / ControllerOutput / Value	INT32	-	-	-2^{31} .. (2^{31} -1)	r	o
... / ControllerOutput / Unit	UINT8	no unit	vs	vs	r	o
... / ControllerOutput / Prefix	INT8	milli	vs	vs	r	o

7.4.3 Controller Output Interface (optional)



Name	Description
Min	min. numerical value
Max	max. numerical value

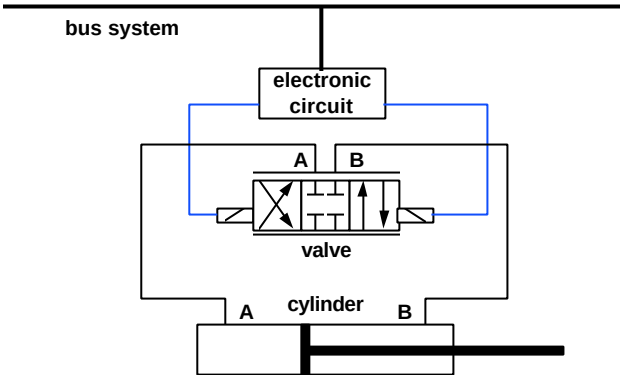
parameter name	data type	substitute value	default value	value range	access rights	object class
... / Min / Value	INT32	- 10000	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / Min / Unit	UINT8	volt	vs	vs	r, r/w	o
... / Min / Prefix	INT8	milli	vs	vs	r, r/w	o
... / Max / Value	INT32	10000	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / Max / Unit	UINT8	volt	vs	vs	r, r/w	o
... / Max / Prefix	INT8	milli	vs	vs	r, r/w	o

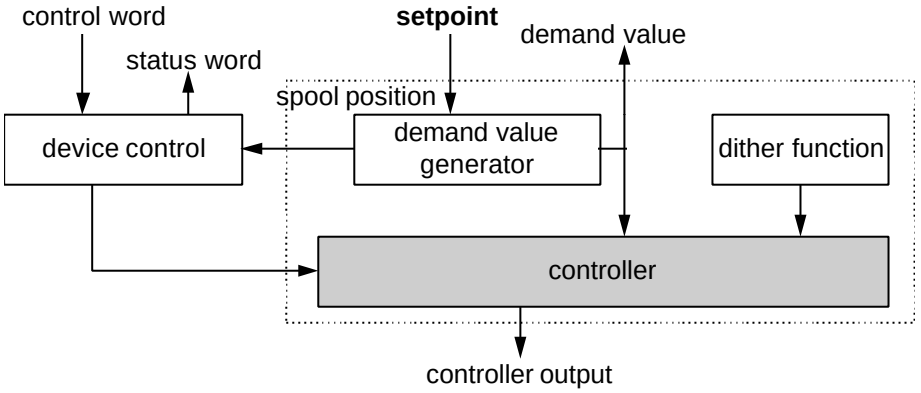
8 VALVES

8.1 Closed and Open Loop Control Functions

8.1.1 Spool Position Control Open Loop

In this control mode a spool position is input as a setpoint. The actual position is not measured.





Setpoint

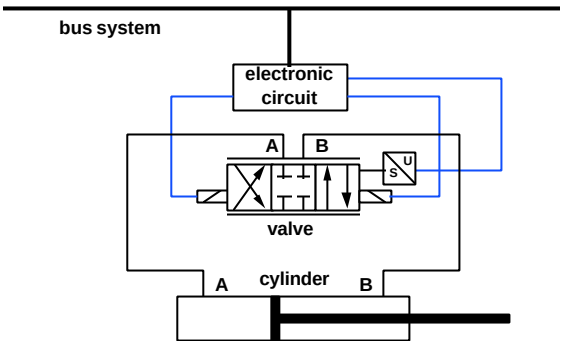
This parameter corresponds to the spool position setpoint.

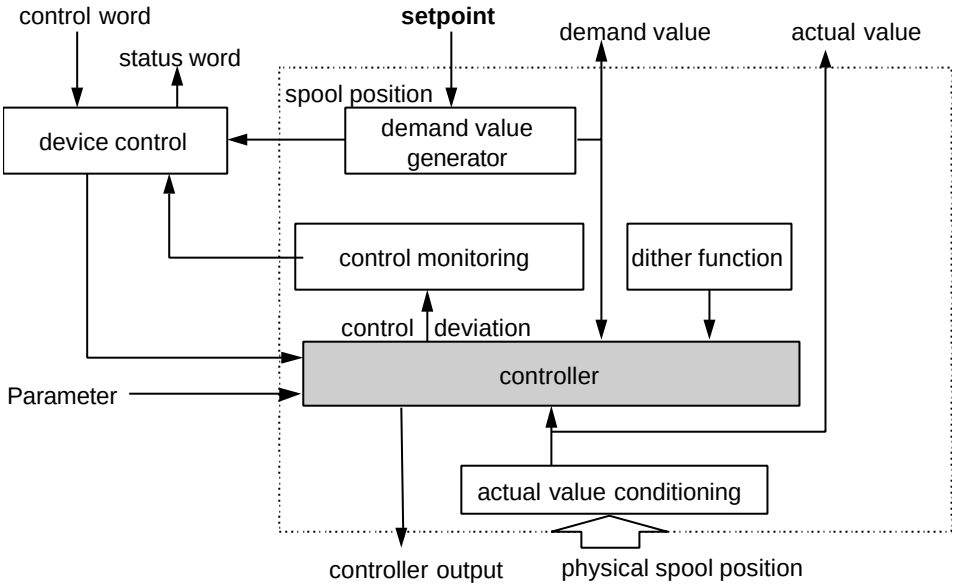
parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT16	-	-	-2^{15} .. (2^{15} -1)	r/w	c
... / Setpoint / Unit	UINT8	ir	ir	vs	r, r/w	o
... / Setpoint / Prefix	INT8	0	0	vs	r, r/w	o

Remark: Unit and prefix are also valid for other, derived parameters (see corresponding parameter description)

8.1.2 Spool Position Control Closed Loop

In this control mode a spool position is input as a setpoint. The actual position is measured.





parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT16	-	-	-2^{15} .. $(2^{15}-1)$	r/w	c
... / Setpoint / Unit	UINT8	ir	ir	vs	r, r/w	o
... / Setpoint / Prefix	INT8	0	0	vs	r, r/w	o
… / ActualValue / Value	INT16	-	-	-2^{15} .. $(2^{15}-1)$	r	c
… / ActualValue / Unit	UINT8	ir	ir	vs	r	o
… / ActualValue / Prefix	INT8	0	0	vs	r	o
... / ControlDeviation / Value	INT16	-	-	-2^{15} .. $(2^{15}-1)$	r	o
... / ControlDeviation / Unit	UINT8	ir	ir	ir	r	o
... / ControlDeviation / Prefix	INT8	0	0	vs	r	o

ActualValue

The ActualValue contains the Actual Value used in the controller. It is the same value as that of the selected interface and is also accessible via the ActualValueConditioning block.

Setpoint

See spool position control open loop

Control Deviation

This value is the difference between demand value and actual value.
(control deviation = demand value - actual value)

Remark: The unit of the control deviation is the same as the input (setpoint).

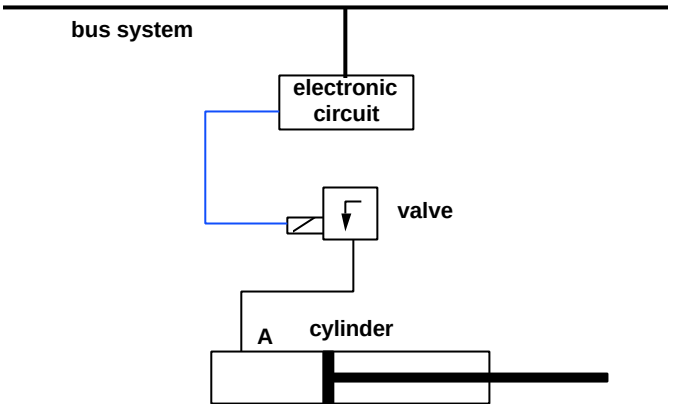
Referencing the actual value interface

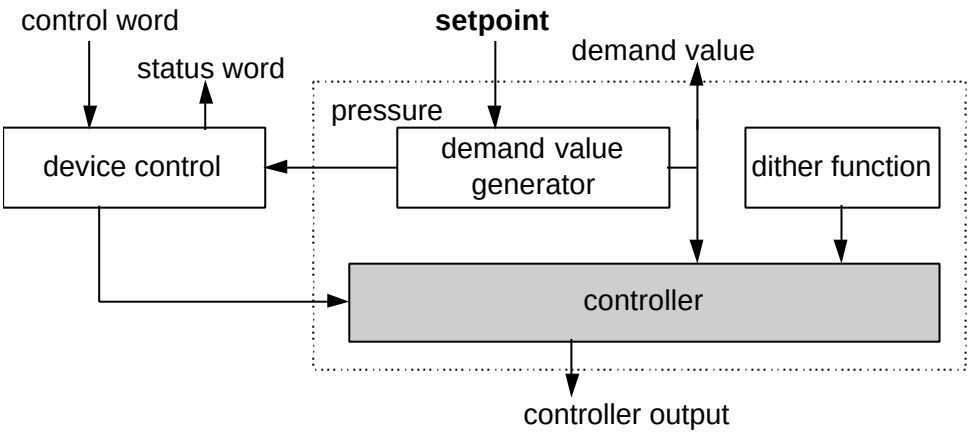
The parameter InterfaceReference is to create the reference between the controller and the actual value. The parameter specifies the interface number of the actual value (see chapter 9.1 Actual Value conditioning).

parameter name	data type	substitute value	default value	value range	access rights	object class
... / InterfaceReference	UINT8	1	vs	vs	r/w	c

8.1.3 Pressure Control Valve Open Loop

In this control mode a pressure is input as a setpoint. The actual pressure is not measured.





Setpoint

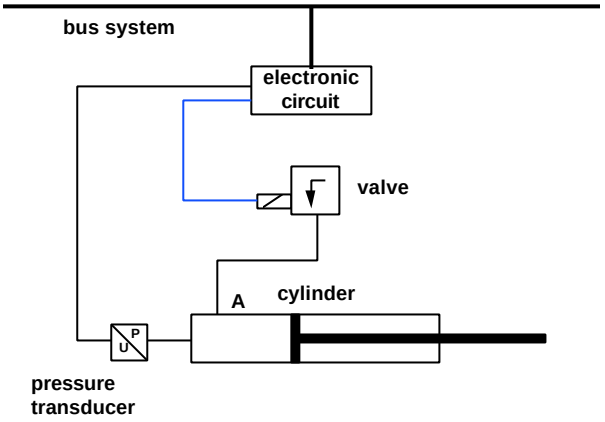
This parameter corresponds to the pressure setpoint.

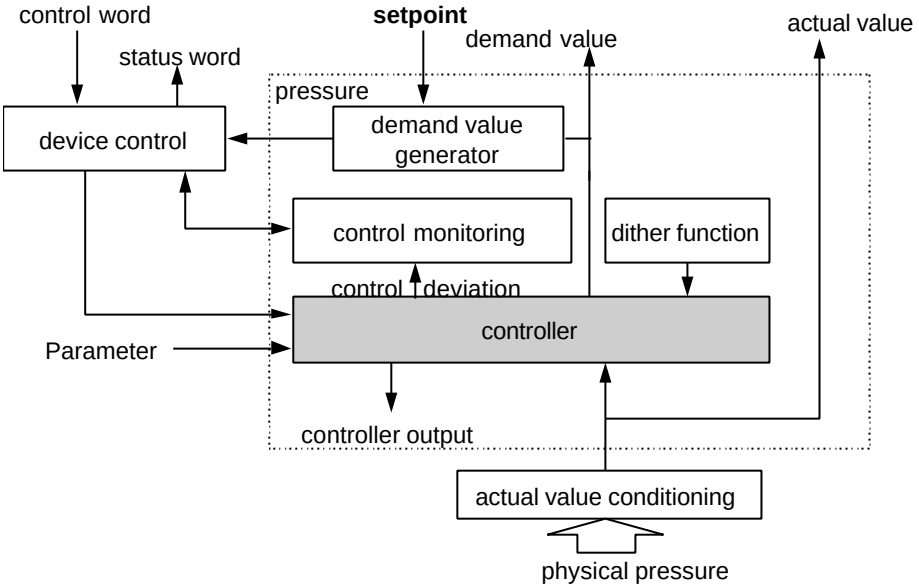
parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT16	-	-	-2^{15} .. (2^{15} -1)	r/w	c
... / Setpoint / Unit	UINT8	ir	ir	vs	r, r/w	o
... / Setpoint / Prefix	INT8	0	0	vs	r, r/w	o

Remark: Unit and prefix are also valid for other, derived parameters (see corresponding parameter description)

8.1.4 Pressure Control Valve Close Loop

In this control mode a pressure is input as a setpoint. The actual pressure is measured. The control parameters are defined vendor specifically.





parameter name	data type	substitute value	default value	value range	access rights	object class
... / Setpoint / Value	INT16	-	-	-2^{15} .. $(2^{15}-1)$	r/w	c
... / Setpoint / Unit	UINT8	ir	ir	vs	r, r/w	o
... / Setpoint / Prefix	INT8	0	0	vs	r, r/w	o
… / ActualValue / Value	INT16	-	-	-2^{15} .. $(2^{15}-1)$	r	c
… / ActualValue / Unit	UINT8	ir	ir	vs	r	o
… / ActualValue / Prefix	INT8	0	0	vs	r	o
... / ControlDeviation / Value	INT16	-	-	-2^{15} .. $(2^{15}-1)$	r	o
... / ControlDeviation / Unit	UINT8	ir	ir	ir	r	o
... / ControlDeviation / Prefix	INT8	0	0	vs	r	o

ActualValue

The ActualValue contains the Actual Value used in the controller. It is the same value as that of the selected interface and is also accessible via the ActualValueConditioning block.

Setpoint

See pressure control open loop

Control Deviation

This value is the difference between demand value and actual value.
(control deviation = demand value - actual value)

Remark: The unit of the control deviation is the same as the input (setpoint).

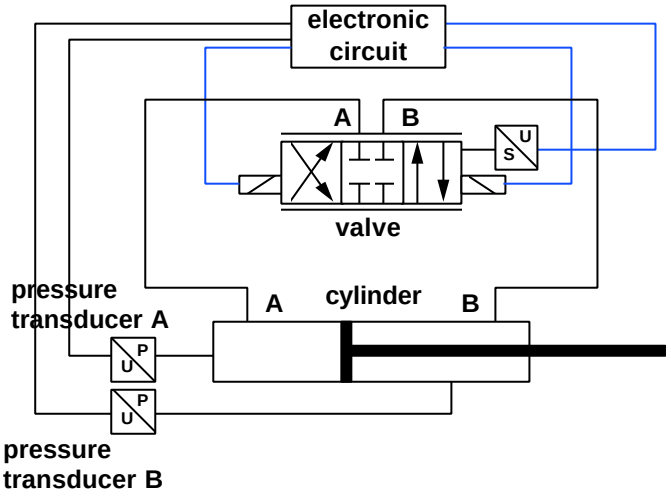
Referencing the actual value interface

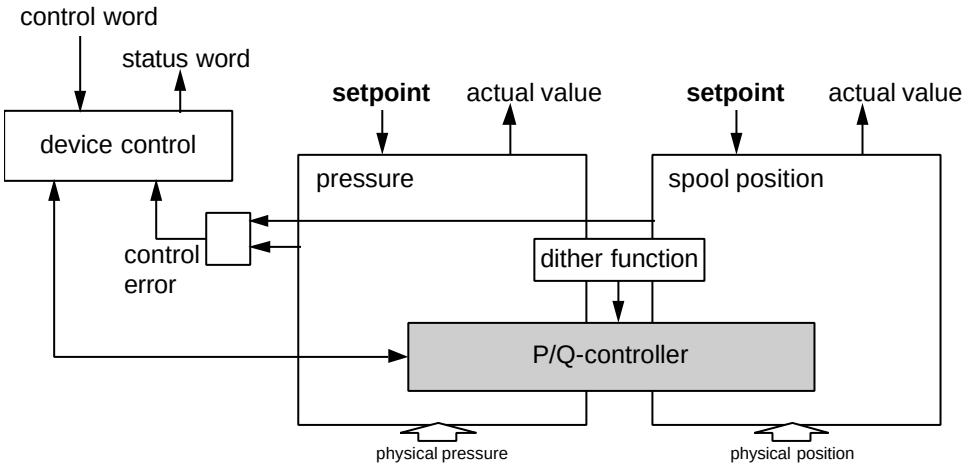
The parameter InterfaceReference is to create the reference between the controller and the actual value. The parameter specifies the interface number of the actual value (see chapter 9.1 Actual Value conditioning).

parameter name	data type	substitute value	default value	value range	access rights	object class
... / InterfaceReference	UINT8	1	vs	vs	r/w	c

8.1.5 p/Q Control Valve

In this control mode a pressure and a spool position are input as a setpoint. The actual pressure and spool position are measured. The controller structure, the parameters, and the dependencies of the setpoint derivation are defined vendor specifically.





Pressure / Setpoint

See pressure control.

SpoolPosition / Setpoint

See spool position control.

ActualValue

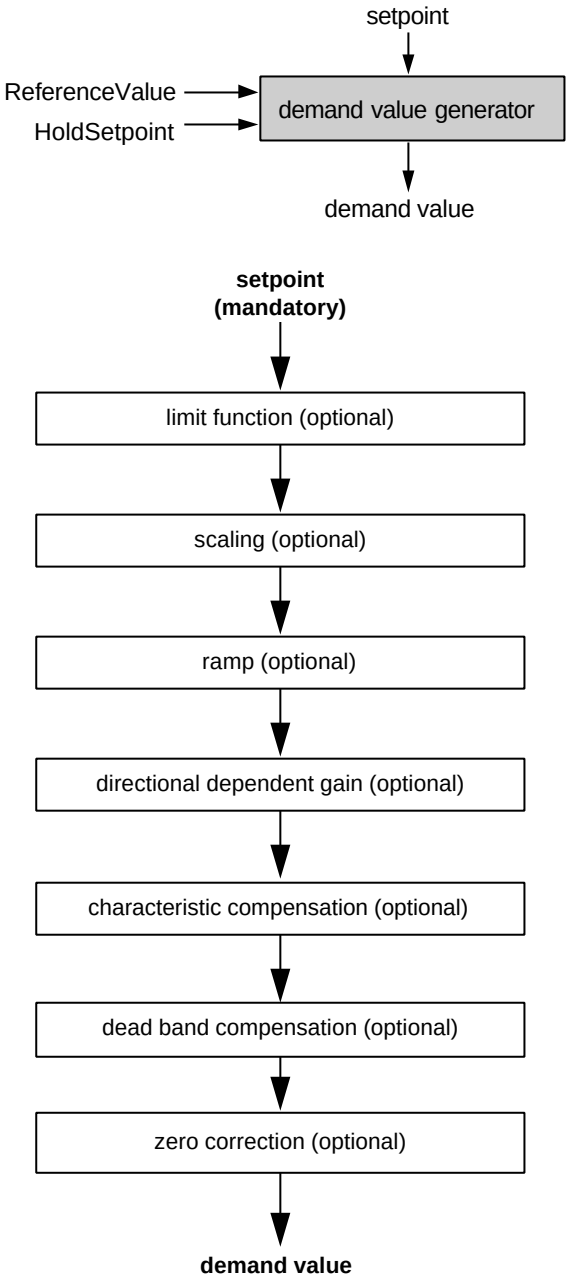
See spool position control and pressure control.

Referencing the actual value interface

See spool position control and pressure control.

8.2 Demand Value Generator

The demand value generator is a group of functions composed of the functions described below.



Internal structure of the demand value generator

Setpoint
The setpoint is a pressure setpoint or a spool position setpoint, depending on the device mode.

Demand Value
The demand value is calculated from the setpoint.

Reference Value

The reference value is the value corresponding to 100% of the setpoint.

Hold Setpoint

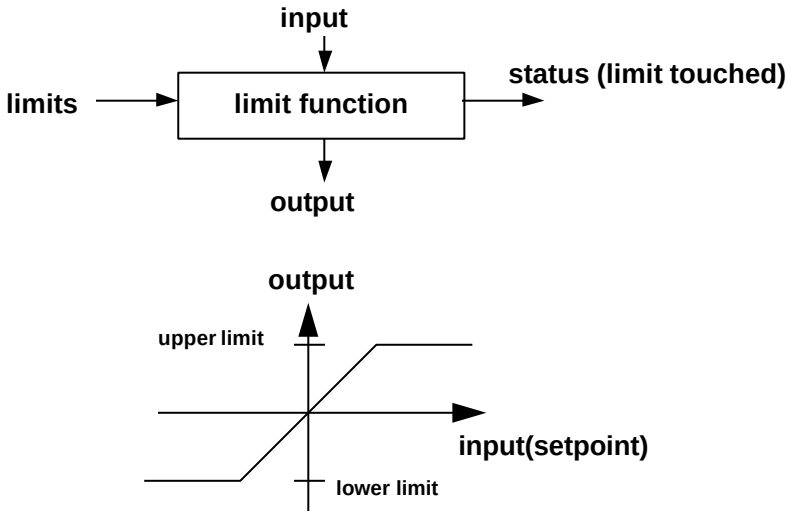
The hold setpoint is active in the HOLD and FAULT HOLD state.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / DemandValue / Value	INT16	-	-	-2^{15} .. (2^{15} -1)	r	c
... / DemandValue / Unit	UINT8	control mode specific	control mode specific	vs	r	o
... / DemandValue / Prefix	INT8	control mode specific	control mode specific	vs	r	o
... / ReferenceValue / Value	INT16	2^{15} –1	vs	-2^{15} .. (2^{15} –1)	r/w	o
... / ReferenceValue / Unit	UINT8	ir	ir	vs	r	o
... / ReferenceValue / Prefix	INT8	0	0	vs	r	o
... / HoldSetpoint / Value	INT16	0	vs	-2^{15} .. (2^{15} -1)	r/w	o
... / HoldSetpoint / Unit	UINT8	ir	ir	vs	r	o
... / HoldSetpoint / Prefix	INT8	0	0	vs	r	o

Remark: The unit of demand value, reference value, and hold setpoint correspond to the input (setpoint) unit.

8.2.1 Limit

This function limits the setpoint in its value range. The input is limited to the preset values.



Input

The input of this function is the setpoint.

UpperLimit

The UpperLimit limits the setpoint to an upper value in case of exceeding.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / UpperLimit / Value	INT16	2^{15} -1	vs	-2^{15} .. (2^{15} –1)	r/w	c
... / UpperLimit / Unit	UINT8	ir	ir	vs	r	o
... / UpperLimit / Prefix	INT8	0	0	vs	r	o

LowerLimit

The LowerLimit limits the setpoint to a lower value in case of exceeding.

parameter name	data type	substitute value	default value	value range	Access rights	object class
... / LowerLimit / Value	INT16	- 2^{15}	vs	-2^{15} .. (2^{15} –1)	r/w	c
... / LowerLimit / Unit	UINT8	ir	ir	vs	r	o
... / LowerLimit / Prefix	INT8	0	0	vs	r	o

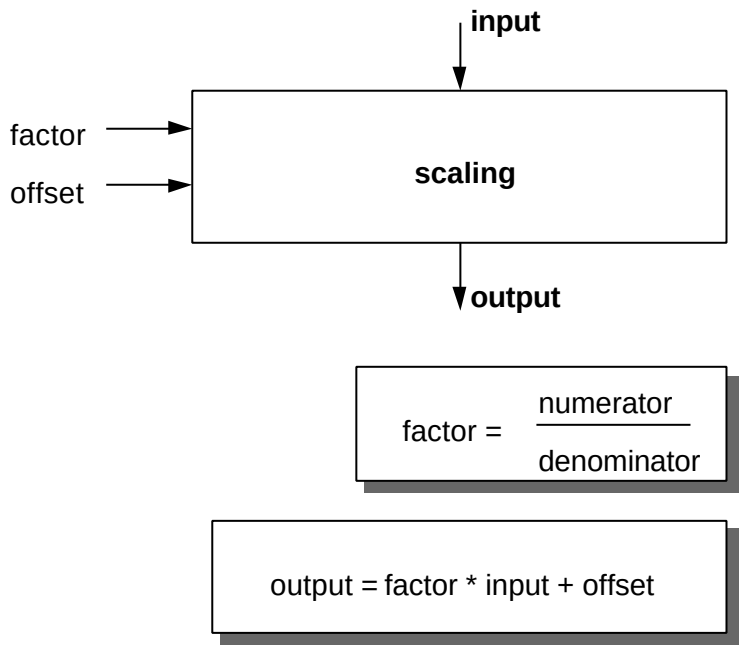
Remark: The unit of the limits corresponds to the input (setpoint) unit. Parameter selection resulting in LowerLimit > UpperLimit must be rejected.

Status (Limit Touched)

This value indicates if the limits are active. This information is projected on to the corresponding bit in the status word.

8.2.2 Scaling

The 'scaling' serves to change the resolution or the signal range of the setpoint derivation.



Factor

The factor is composed of the elements numerator and denominator. The value 0 is not allowed neither for numerator nor denominator.

31 16	15 0
numerator	denominator

name	data type	substitute value
factor	UINT32	00010001hex
numerator	INT16	1
denominator	INT16	1

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Factor	UINT32	00010001hex	vs	0 .. FFFFFFFFhex	r/w	c

Offset

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Offset / Value	INT16	0	0	vs	r/w	c
... / Offset / Unit	UINT8	ir	ir	vs	r	o
... / Offset / Prefix	INT8	0	0	vs	r	o

Remark: The unit of the offset corresponds to the input (setpoint) unit.

Input

The input value is recalculated with the scaling function.

Output

The output is the scaled setpoint.

8.2.3 Ramp

see chapter 9.3

8.2.4 Directional Dependent Gain

see chapter 9.4

8.2.5 Characteristic Compensation

see chapter 9.5

8.2.6 Dead Band Compensation

see chapter 9.6

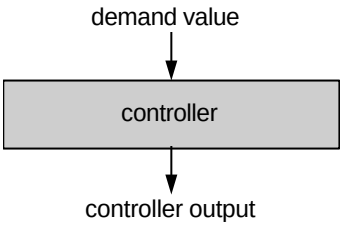
8.2.7 Zero Correction

see chapter 9.7

8.3 Controller Closed / Open Loop

8.3.1 Controller Open Loop for Valves

This function is to control the spool position or the pressure in open loop.

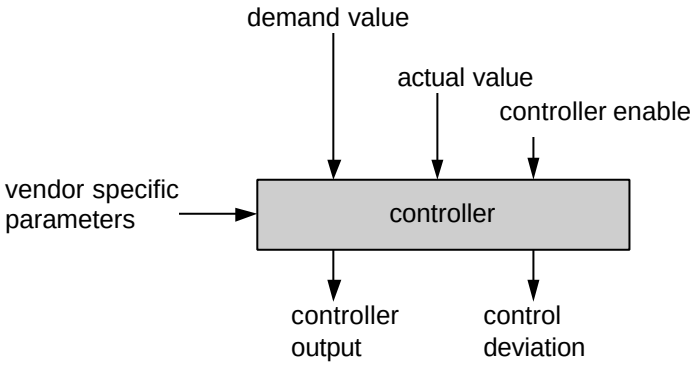


Controller Output

This value is an internal value and output of the controller. It is passed on for example to the booster.

8.3.2 Controller Closed Loop for Valves

This function is to control the spool position or the pressure in closed loop.



Demand Value

This value is input to the controller.

Actual Value

The actual value is the actual value fed into the controller. Depending on the controller application it is the actual physical spool position value or the actual pressure value.

Controller Output

This value is an internal value, output of the controller, and e. g. fed into the booster.

Control Deviation

This value is the difference between demand value and actual value.
(control deviation = demand value - actual value)

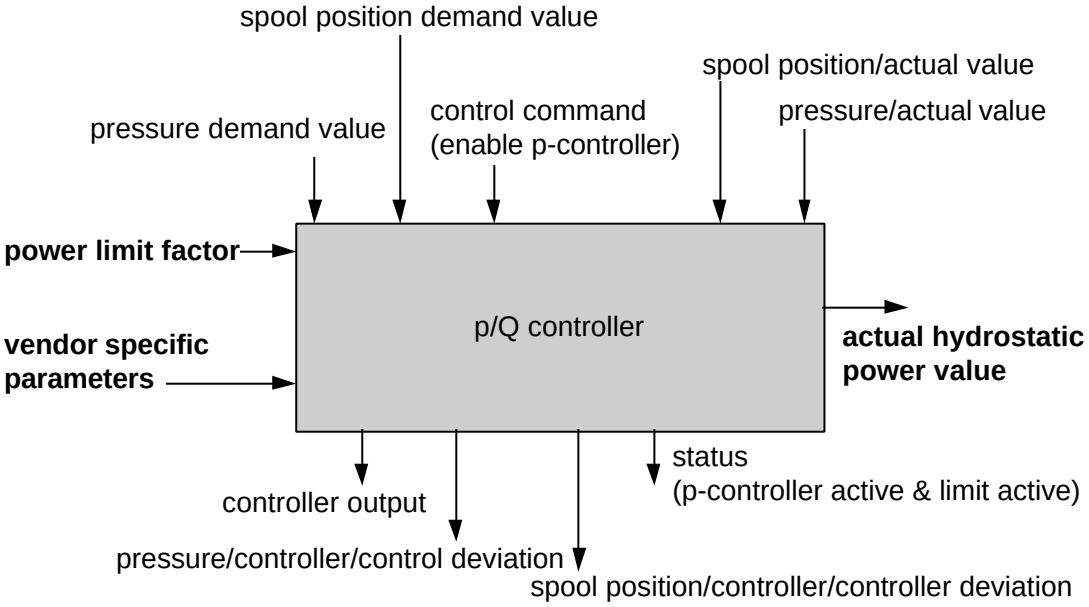
Remark: The unit of the control deviation is the same as the input (setpoint).

Vendor Specific Parameters

These parameters are to set controller parameters and are defined by the vendor.

8.3.3 p/Q Controller for Valves

The p/Q-control consists of a combination of controllers for pressure and spool position.



parameter name	data type	substitute value	default value	value range	Access rights	object class
... / PowerLimitFactor	UINT32	0	vs	0 .. FFFFFFFFhex	r/w	c
... / HydrActualPower / Value	INT16	-	-	-2^{15} .. (2^{15} -1)	r	c
... / HydrActualPower / Unit	UINT8	ir	ir	vs	r, r/w	o
... / HydrActualPower / Prefix	INT8	0	0	vs	r, r/w	o

Power Limit Factor

The powerLimitFactor determines the maximum hydrostatic power. The factor is the quotient of nominal actuation power ($P_{[antr.]}$) and hydrostatic corner power ($P_{[hyd.]}$). The value 0 is not allowed for $P_{[antr.]}$ and $P_{[hyd.]}$.

$$\textbf{power limit factor} = \frac{\text{nominal actuation power } P_{[Antr.]}}{\text{hydrostatic corner power } P_{[hyd.]}}$$

31 16	15 0
NominalActuationPower	HydrostaticCornerPower

name	data type	substitute value
PowerLimitFactor	UINT32	00010001hex
NominalActuationPower	UINT16	1
HydrostaticCornerPower	UINT16	1

Hydrostatic Actual Power

The hydrostatic actual power is calculated by the controller from the input physical actual values.

Pressure Control Deviation

This value is the difference between pressure demand value and actual pressure.
(control deviation = pressure demand value - actual pressure). The value range corresponds to that of the setpoint. The parameter is readable.

Spool Position Control Deviation

This value is the difference between spool position demand value and actual physical spool position. (control deviation = spool position demand value - actual physical spool position). The value range corresponds to that of the setpoint. The parameter is readable.

Status (Pressure Controller Enabled, Limit Touched)

This value indicates if the pressure controller is active and if the power limit is active. These information are represented in the corresponding bits in the status word.

Vendor Specific Parameters

These parameters are to set controller parameters and are defined by the vendor.

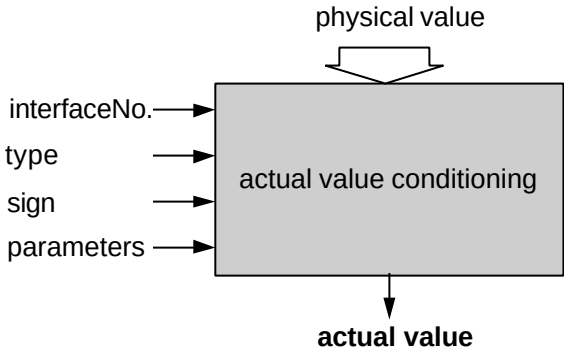
9 GENERAL FUNCTIONS

The general functions are used by hydrostatic drives as well as proportional valves and hydrostatic pumps. The data type of the value parameter element is INT32 or UINT32 with drives and INT16 or UINT16 with proportional valves and hydrostatic pumps. Therefore, in the general part it will be indicated as INTn or UINTn.

	hydrostatic drives (n=32)	**proportional valves and hydrostatic pumps (n=16)**
INTn	INT32	INT16
UINTn	UINT32	UINT16

9.1 Actual Value Conditioning

The actual value conditioning calculates the actual value from the physical value input to the actual value interface.



parameter name	**data type**	**substitute value**	**default value**	**value range**	**access rights**	**object class**
... / InterfaceNo	UINT8	1	1	vs	r/w	o
... / MaxInterfaceNo	UINT8	1	vs	vs	r	o
... / Type	INT8	-	vs	vs	r/w	o
... / Sign	INT8	1	vs	-1 or 1	r/w	o
... / ActualValue / Value	INTn	-	-	-2^{n-1} .. $(2^{n-1}-1)$	r	c
... / ActualValue / Unit	UINT8	see table	see table	see table	r, r/w	o
... / ActualValue / Prefix	INT8	see table	see table	see table	r, r/w	o

parameter name	**transducer**	**substitute value**	**default value**	**value range**
.../ ActualValue / Unit				
	type			
	1	ir	ir	vs
	2	bar	bar	vs
	64-69	meter	meter	vs
.../ ActualValue / Prefix				
	hydrostatic drive			
	2	milli	milli	vs
	64-69	µ	µ	vs
	proportional valve, hydrostatic pump			
	1	0	0	vs
	2	0	0	vs

InterfaceNo

This parameter defines the number of the selected interface. The parameters of the actual value conditioning function relate now to the selected interface.

MaxInterfaceNo

This parameter defines the maximum value for available interface numbers in the device. For example, if a device contains 4 physical interfaces for actual values, the parameter MaxInterfaceNo has to be set to 4. The parameter InterfaceNo is always less or equal to MaxInterfaceNo.

Type

This parameter defines the type of actual value conditioning.

Type	Meaning	
0	no transducer function	
1	transducer spool position	
2	pressure transducer	
3 .. 63	reserved	
64	position transducer incremental	for drives only
65	position transducer SSI binary	for drives only
66	position transducer SSI Gray code	for drives only
67	position transducer analog	for drives only
68	position transducer start-stop interface	for drives only
69	position transducer ENDAT interface	for drives only
70 .. 127	reserved	
-1 .. -128	vs	

Sign

With the sign parameter the sign of the actual value can be changed.

Actual Value

This parameter is derived from the physical value, and is used for the control and for the actual value output.

Actual Value 1 .. Actual Value 8

These actual values have been defined additionally and assigned to the interfaces with the nos. 1 .. 8, in order to make them accessible in the process data channel.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / ActualValue1 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue1 / Unit	UINT8	*	*	vs	r	o
... / ActualValue1 / Prefix	INT8	*	*	vs	r	o
... / ActualValue2 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue2 / Unit	UINT8	*	*	vs	r	o
... / ActualValue2 / Prefix	INT8	*	*	vs	r	o
... / ActualValue3 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue3 / Unit	UINT8	*	*	vs	r	o
... / ActualValue3 / Prefix	INT8	*	*	vs	r	o
... / ActualValue4 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue4 / Unit	UINT8	*	*	vs	r	o
... / ActualValue4 / Prefix	INT8	*	*	vs	r	o
... / ActualValue5 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue5 / Unit	UINT8	*	*	vs	r	o
... / ActualValue5 / Prefix	INT8	*	*	vs	r	o
... / ActualValue6 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue6 / Unit	UINT8	*	*	vs	r	o
... / ActualValue6 / Prefix	INT8	*	*	vs	r	o
... / ActualValue7 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue7 / Unit	UINT8	*	*	vs	r	o
... / ActualValue7 / Prefix	INT8	*	*	vs	r	o
... / ActualValue8 / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r	o
... / ActualValue8 / Unit	UINT8	*	*	vs	r	o
... / ActualValue8 / Prefix	INT8	*	*	vs	r	o

* the values selected for the corresponding interfaceNo. are assumed

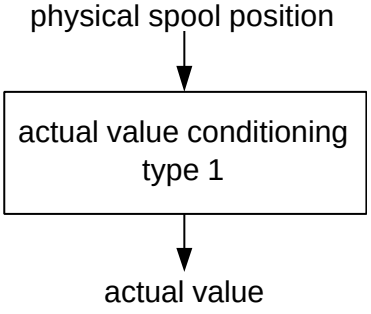
Parameters

The parameters depend on the type.

Remark: In case multiple actual value conditioning functions have been implemented, multiple parameters exist internally of the various actual value conditioning functions. Access to these parameters is switched by means of the interface number.

9.1.1 Transducer Spool Position (Type 1)

This actual value conditioning builds the actual value from the spool position. The actual value is the physical spool position actual value fed into the controller.



9.1.2 Pressure Transducer (Type 2)

parameter name	data type	substitute value	default value	value range	acces s rights	object class
... / MinimumPressure / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / MinimumPressure / Unit	UINT8	bar	bar	vs	r, r/w	o
... / MinimumPressure / Prefix	INT8	see table	see table	vs	r, r/w	o
... / MaximumPressure / Value	INTn	-	-	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / MaximumPressure / Unit	UINT8	bar	bar	vs	r, r/w	o
... / MaximumPressure / Prefix	INT8	see table	see table	vs	r, r/w	o
... / Area / Value	INTn	-	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / Area / Unit	UINT8	m^2	m^2	vs	r, r/w	o
... / Area / Prefix	INT8	µ	µ	vs	r, r/w	o
... / PressureOffset / Value	INTn	0	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	o
... / PressureOffset / Unit	UINT8	bar	bar	vs	r, r/w	o
... / PressureOffset / Prefix	INT8	0	0	vs	r, r/w	o
... / MinimumTransducerSignal / Value	INTn	0	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / MinimumTransducerSignal / Unit	UINT8	V	vs	vs	r, r/w	o
... / MinimumTransducerSignal / Prefix	INT8	0	vs	vs	r, r/w	o
... / MaximumTransducerSignal / Value	INTn	10	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / MaximumTransducerSignal / Unit	UINT8	V	vs	vs	r, r/w	o
... / MaximumTransducerSignal / Prefix	INT8	0	vs	vs	r, r/w	o

parameter name	device	substitute value	default value	value range
... /MinimumPressure /Prefix				
	drive	milli	milli	vs
	valve	-1	-1	vs
... / MaximumPressure / Prefix				
	drive	milli	milli	vs
	valve	-1	-1	vs

MinimumPressure

This parameter is the lower measurement range limit of the transducer.

MaximumPressure

This parameter is the upper measurement range limit of the transducer (nominal pressure).

Area

This is the cylinder area corresponding to the pressure transducer.

PressureOffset

For force / pressure control with only one pressure transducer (pressure 2 = constant), the optional offset parameter can be defined. It is added to the actual value.

MinimumTransducerSignal

Transducer output at minimum pressure.

MaximumTransducerSignal

Transducer output at maximum pressure.

9.1.2.1 Position Transducer Incremental Sensor (Type = 64)

Parameters:

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Resolution / Value	INT32	-	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / Resolution / Unit	UINT8	meter	meter	vs	r, r/w	o
... / Resolution / Prefix	INT8	µ	µ	vs	r, r/w	o
... / ZeroShift / Value	INT32	0	0	-2^{31} .. $(2^{31}-1)$	r/w	c
... / ZeroShift / Unit	UINT8	meter	meter	vs	r, r/w	o
... / ZeroShift / Prefix	INT8	µ	µ	vs	r, r/w	o

9.1.2.2 Position Transducer SSI Sensor Binary (Type = 65)

Parameters:

Parameter name	data type	substitute value	default value	value range	access rights	object class
... / Resolution / Value	INT32	-	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / Resolution / Unit	UINT8	meter	meter	vs	r, r/w	o
... / Resolution / Prefix	INT8	µ	µ	vs	r, r/w	o
... / PositionOffset / Value	INT32	0	0	-2^{31} .. $(2^{31}-1)$	r/w	c
... / PositionOffset / Unit	UINT8	meter	meter	vs	r, r/w	o
... / PositionOffset / Prefix	INT8	µ	µ	vs	r, r/w	o
... / BitSize / value	UINT8	24	24	0 .. $(2^{8}-1)$	r/w	o

The parameter **BitSize** indicates the number of bits to represent a measurement value.

9.1.2.3 Position Transducer SSI Sensor Gray Code (Type = 66)

Parameters:

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Resolution / Value	INT32	-	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / Resolution / Unit	UINT8	meter	meter	vs	r, r/w	o
... / Resolution / Prefix	INT8	µ	µ	vs	r, r/w	o
... / PositionOffset / Value	INT32	0	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / PositionOffset / Unit	UINT8	meter	meter	vs	r, r/w	o
... / PositionOffset / Prefix	INT8	µ	µ	vs	r, r/w	o
... / BitSize / value	UINT8	24	24	0 .. $(2^{8}-1)$	r/w	o

The parameter **BitSize** indicates the number of bits to represent a measurement value.

9.1.2.4 Position Transducer Analog (Type = 67)

The decoding of the analog position transducer is based on the parameters below.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / MinimumReference / Value	INT32	-	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / MinimumReference / Unit	UINT8	meter	meter	vs	r, r/w	o
... / MinimumReference / Prefix	INT8	µ	µ	vs	r, r/w	o
... / MaximumReference / Value	INT32	-	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / MaximumReference / Unit	UINT8	meter	meter	vs	r, r/w	o
... / MaximumReference / Prefix	INT8	µ	µ	vs	r, r/w	o
... / T1 / Value	UINT32	0	vs	0 .. (2^{32} -1)	r/w	o
... / T1 / Unit	UINT8	sec	sec	sec	r, r/w	o
... / T1 / Prefix	INT8	milli	milli	milli	r, r/w	o
... / MinimumInterface / Value	INT32	-10	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / MinimumInterface / Unit	UINT8	volt	vs	vs	r, r/w	o
... / MinimumInterface / Prefix	INT8	0	vs	vs	r, r/w	o
... / MaximumInterface / Value	INT32	10	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / MaximumInterface / Unit	UINT8	volt	vs	vs	r, r/w	o
... / MaximumInterface / Prefix	INT8	0	vs	vs	r, r/w	o

The **actualPositionValue** is build through linear interpolation from the analog signal, with the above parameters.

With the **T1** parameter the time constant of the (optional) low pass filter can be given.

9.1.2.5 Position Transducer Start/Stop Interface (Type = 68)

Parameters:

parameter name	data type	substitute value	default value	value range	access rights	object class
... / C / Value	INT32	-	vs	-2^{31} .. (2^{31} -1)	r/w	c
... / C / Unit	UINT8	sec	sec	sec	r, r/w	o
... / C / Prefix	INT8	milli	milli	milli	r, r/w	o
... / Type	INT8	-	vs	-2^{7} .. (2^{7} -1)	r/w	c

Name	Description
Type	see below
C	speed of sound

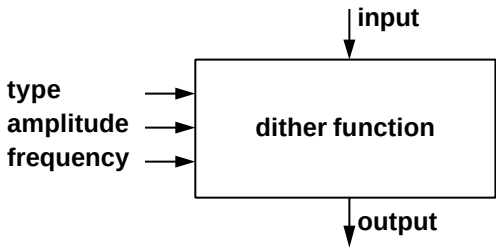
Type	Description
- 127 .. – 1	vs
0	double resolution (25 µ)
1 .. 127	reserved

9.1.2.6 Position Transducer ENDAT Interface (Type = 69)

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Resolution / Value	INT32	-	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / Resolution / Unit	UINT8	meter	meter	-	r, r/w	o
... / Resolution / Prefix	INT8	µ	µ	vs	r, r/w	o
... / PositionOffset / Value	INT32	-	vs	-2^{31} .. $(2^{31}-1)$	r/w	c
... / PositionOffset / Unit	UINT8	meter	meter	-	r, r/w	o
... / PositionOffset / Prefix	INT8	µ	µ	vs	r, r/w	o

9.2 Dither Function

With this function an oscillating value is modulated onto the input.



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Type	INT8	0	vs	-2^{7} .. $(2^{7}-1)$	r/w	c
... / Amplitude / Value	UINTn	0	vs	0 .. $(2^{n}-1)$	r/w	c
... / Amplitude / Unit	UINT8	see table	see table	see table	r, r/w	o
... / Amplitude / Prefix	INT8	see table	see table	vs	r, r/w	o
... / Frequency / Value	UINTn	0	vs	0 .. $(2^{n}-1)$	r/w	c
... / Frequency / Unit	UINT8	Hz	Hz	Hz	r, r/w	o
... / Frequency / Prefix	INT8	0	0	vs	r, r/w	o

parameter name	Device	substitute value	default value	value range
... / Amplitude / Unit				
	Hydrostatic drive	no unit	vs	vs
	Proportional valve, hydrostatic pump	ir	ir	vs
... / Amplitude / Prefix				
	Hydrostatic drive	milli	milli	vs
	Proportional valve, hydrostatic pump	0	0	vs

Type

This parameter is to switch on the dither function and to determine the type of function.

Type	Meaning
0	dither function off
1	dither with square wave
2	dither with triangular wave
3	dither with sinusoidal wave (distortion factor 0.001%)
4 .. 127	reserved
- 1 .. - 128	vs

Amplitude

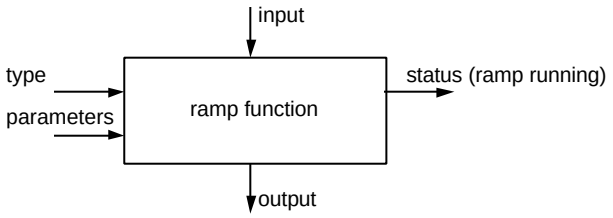
This parameter determines the amplitude of the modulated value. The resolution corresponds to the internal setpoint.

Frequency

This parameter determines the frequency of the modulated value.

9.3 Ramp

With help of the ramp function the setpoint is influenced over time. The shape of the influence over time is determined by the ramp type.



Status (Ramp Running)

The information "ramp running" is represented in the status word.

parameter name	data type	substitute value	default value	value range	access rights	object class
... / Type	INT8	0	vs	vs	r/w	c

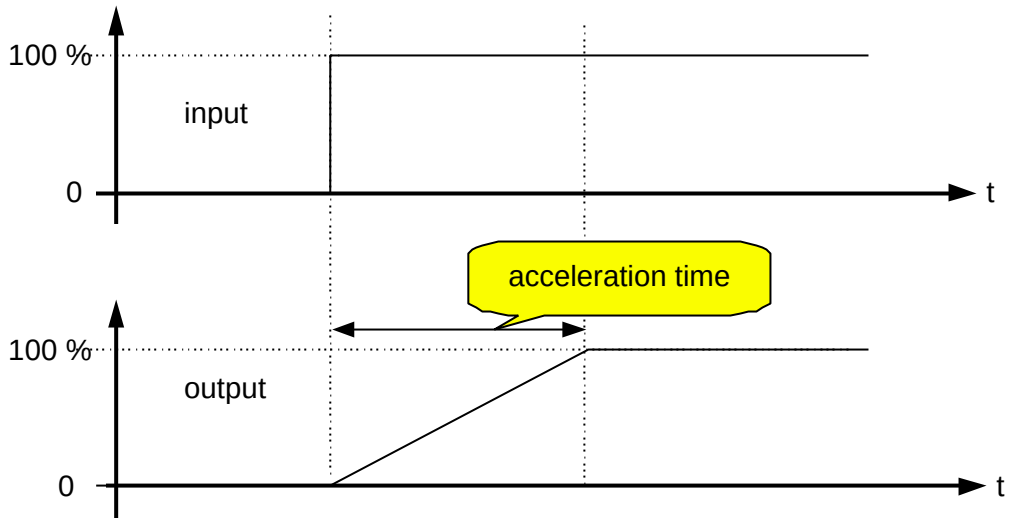
This parameter defines the ramp shape.

Type	Meaning
0	no ramp
1	linear (same value for all quadrants)
2	linear (2 parameters for acceleration and deceleration, pos. and neg. values equal)
3	linear (4 parameters for all quadrants)
4	Sine square
5	Profile generator linear
6	Profile generator sine square
7 .. 127	reserved

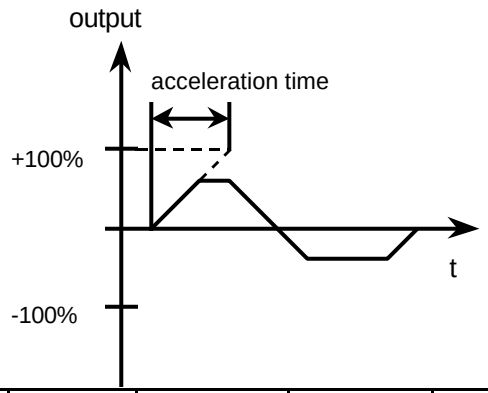
-1 .. – 128	vs

Parameter

The parameters are type dependant and indicate the ramp time.



9.3.1 Ramp Type 1

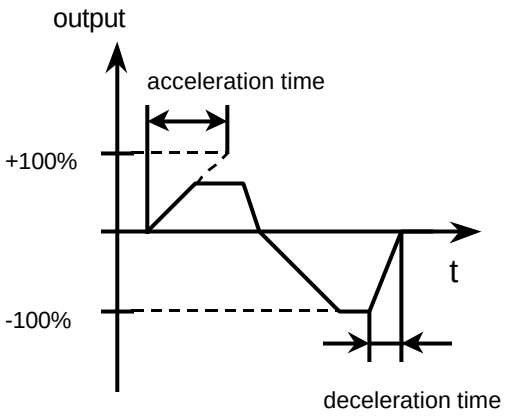


parameter name	data type	substitute value	default value	value range	access rights	object class
... / AccelerationTime / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / AccelerationTime / Unit	UINT8	sec	sec	vs	r, r/w	o
... / AccelerationTime / Prefix	INT8	milli	milli	vs	r, r/w	o

AccelerationTime

The AccelerationTime parameter defines the rising speed of the output. The ramp parameter is the time in which the output would shift the amount of the reference value.

9.3.2 Ramp Type 2



parameter name	data type	substitute value	default value	value range	access rights	object class
... / AccelerationTime / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / AccelerationTime / Unit	UINT8	sec	sec	vs	r, r/w	o
... / AccelerationTime / Prefix	INT8	milli	milli	vs	r, r/w	o
... / DecelerationTime / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / DecelerationTime / Unit	UINT8	sec	sec	vs	r, r/w	o
... / DecelerationTime / Prefix	INT8	milli	milli	vs	r, r/w	o

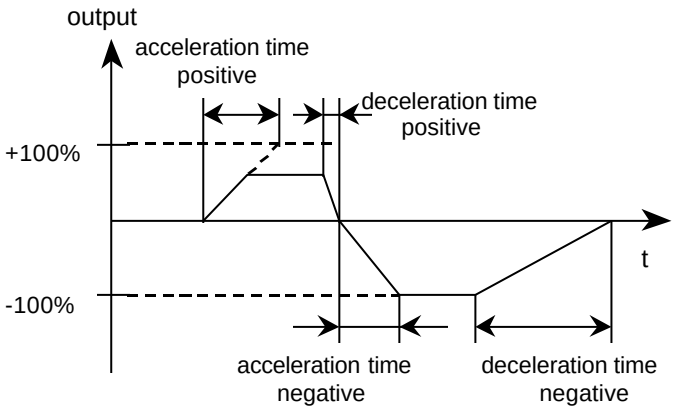
AccelerationTime

The AccelerationTime parameter defines the rising speed of the output. The ramp parameter is the time in which the output would shift the amount of the reference value.

DecelerationTime

The decelerationTime parameter defines the decreasing speed of the output. The ramp parameter is the time in which the output would shift the amount of the reference value.

9.3.3 Ramp Type 3



parameter name	data type	substitute value	default value	value range	access rights	object class
... / AccelerationTimePositive / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / AccelerationTimePositive / Unit	UINT8	sec	sec	vs	r, r/w	o
... / AccelerationTimePositive / Prefix	INT8	milli	milli	vs	r, r/w	o
... / DecelerationTimePositive / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / DecelerationTimePositive / Unit	UINT8	sec	sec	vs	r, r/w	o
... / DecelerationTimePositive / Prefix	INT8	milli	milli	vs	r, r/w	o
... / AccelerationTimeNegative / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / AccelerationTimeNegative / Unit	UINT8	sec	sec	vs	r, r/w	o
... / AccelerationTimeNegative / Prefix	INT8	milli	milli	vs	r, r/w	o
... / DecelerationTimeNegative / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / DecelerationTimeNegative / Unit	UINT8	sec	sec	vs	r, r/w	o
... / DecelerationTimeNegative / Prefix	INT8	milli	milli	vs	r, r/w	o

AccelerationTime Positive

The accelerationTime parameter defines the rising speed of the output with a positive value. The ramp parameter is the time in which the output would shift the amount of the reference value.

DecelerationTime Positive

The decelerationTime parameter defines the decreasing speed of the output with a positive value. The ramp parameter is the time in which the output would shift the amount of the reference value.

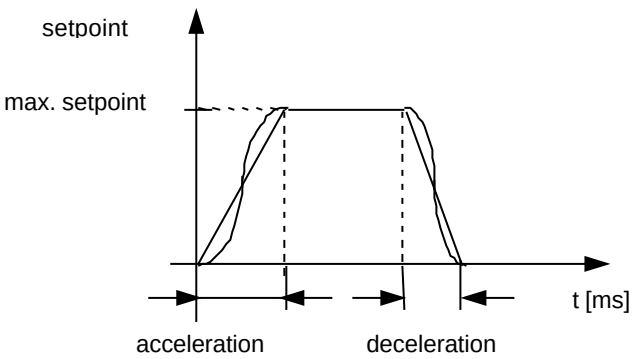
AccelerationTime Negative

The accelerationTime parameter defines the rising speed of the output with a negative value. The ramp parameter is the time in which the output would shift the amount of the reference value.

DecelerationTime Negative

The decelerationTime parameter defines the decreasing speed of the output with a negative value. The ramp parameter is the time in which the output would shift the amount of the reference value.

9.3.4 Squared Sine Ramp (Type = 4)

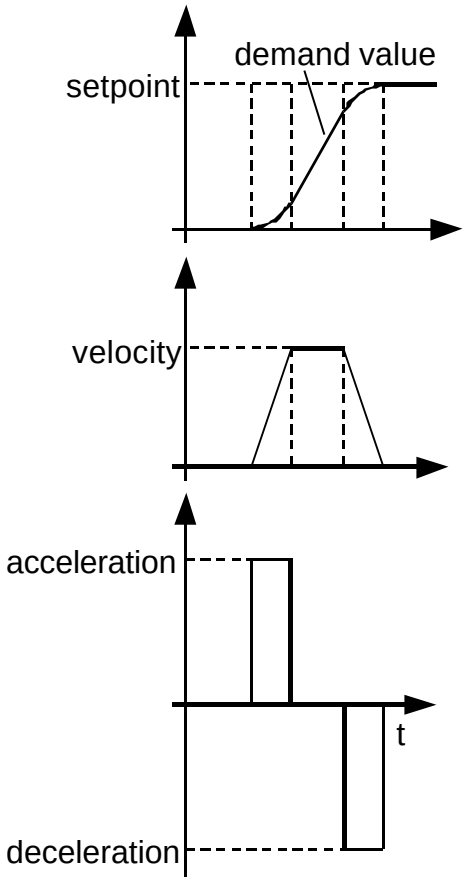


parameter name	data type	substitute value	default value	value range	access rights	object class
... / AccelerationTime / Value	UINTn	-	vs	0 .. (2^n -1)	r/w	c
... / AccelerationTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / AccelerationTime / Prefix	INT8	milli	milli	vs	r, r/w	o
... / DecelerationTime / Value	UINTn	-	vs	0 .. (2^n -1)	r/w	c
... / DecelerationTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / DecelerationTime / Prefix	INT8	milli	milli	vs	r, r/w	o

For the meaning of the parameters, see above.

9.3.5 Ramp Type 5

Ramp Type 5 is to generate a demand value profile according to the following figure. This function should be used for drive position control only.



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Velocity / Value	INTn	0	vs	2^{31}.. (2^{31} -1)	r/w	c
... / Velocity / Unit	UINT8	m/min	m/min	vs	r, r/w	o
... / Velocity / Prefix	INT8	milli	milli	Vs	r, r/w	o
... / Acceleration / Value	UINTn	0	vs	0 .. (2^{32} -1)	r/w	c
... / Acceleration / Unit	UINT8	m/(s*s)	m/(s*s)	vs	r, r/w	o
... / Acceleration / Prefix	INT8	milli	milli	vs	r, r/w	o
... / Deceleration / Value	UINTn	0	vs	0 .. (2^{32} -1)	r/w	c
... / Deceleration / Unit	UINT8	m/(s*s)	m/(s*s)	vs	r, r/w	o

... / Deceleration / Prefix	INT8	milli	milli	vs	r, r/w	o

Velocity

The velocity parameter defines the velocity to generate the profile (ramp) of the demand value.

Acceleration

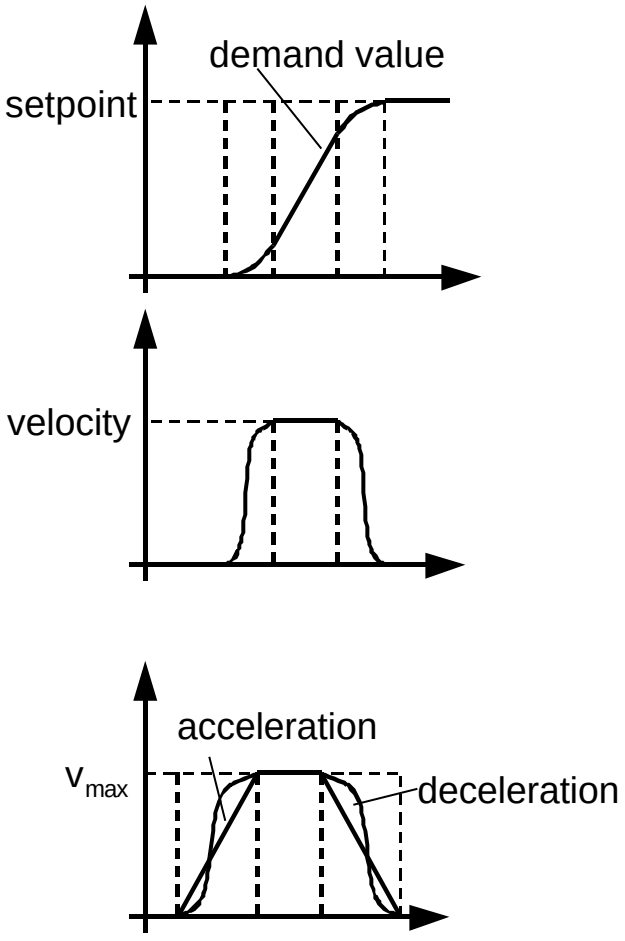
The acceleration parameter defines the acceleration to generate the profile (ramp) of the demand value.

Deceleration

The deceleration parameter defines the deceleration to generate the profile (ramp) of the demand value.

9.3.6 Ramp Type 6 (sin²)

The function is to generate the profile for the demand value according to the following figure. Ramp Type 6 should be used for drive position control only.



parameter name	data type	Substitute value	default value	value range	access rights	object class
... / Velocity / Value	INTn	0	vs	2^{31}.. (2^{31} -1)	r/w	c
... / Velocity / Unit	UINT8	m/min	m/min	vs	r, r/w	o
... / Velocity / Prefix	INT8	milli	milli	vs	r, r/w	o
... / Acceleration / Value	UINTn		vs	0 .. (2^{32} -1)	r/w	c
... / Acceleration / Unit	UINT8	m/(s*s)	m/(s*s)	vs	r, r/w	o

... / Acceleration / Prefix	INT8	milli	milli	vs	r, r/w	o
... / Deceleration / Value	UINTn	0	vs	0 .. (2^{32} -1)	r/w	c
... / Deceleration / Unit	UINT8	m/(s*s)	m/(s*s)	vs	r, r/w	o
... / Deceleration / Prefix	INT8	milli	milli	vs	r, r/w	o

Velocity

The velocity parameter defines the velocity to generate the profile (ramp) of the demand value.

Acceleration

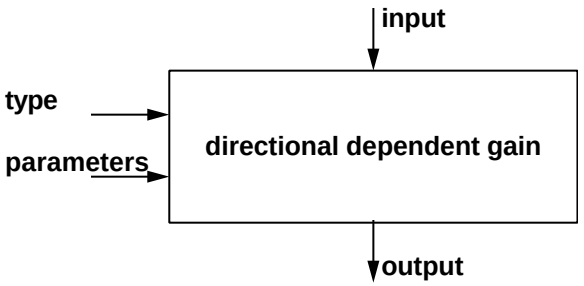
The acceleration parameter defines the acceleration to generate the profile (ramp) of the demand value.

Deceleration

The deceleration parameter defines the deceleration to generate the profile (ramp) of the demand value.

9.4 Directional Dependent Gain

This function has a directional dependent influence on the input. With this feature, the compensation on the ratio of cylinder areas can be set, for example.



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Type	INT8	0	vs	-2^7 .. (2^7 -1)	r/w	c

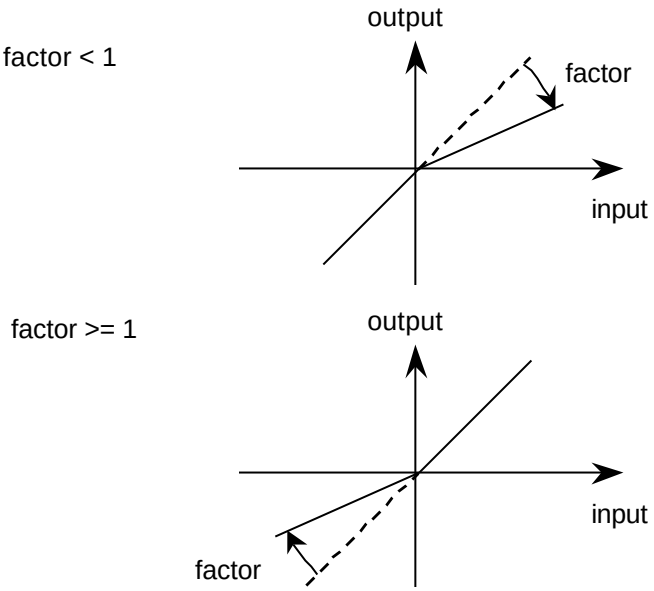
Type

With this parameter, the type of the directional dependent gain is selected, or the directional dependent gain is switched off.

Type	Meaning
0	no directional dependent gain
1	directional dependent gain type 1
2 .. 127	reserved
-1 .. – 128	vs

9.4.1 Directional Dependent Gain Type 1

$$\text{factor} = \frac{\text{numerator}}{\text{denominator}}$$



Factor < 1	input positive	output = input * |factor|
	input negative	output = input
Factor >= 1	input positive	output = input
	input negative	output = input / |factor|

parameter name	**data type**	**substitute value**	**default value**	**value range**	**access rights**	**object class**
... / Factor	UINT32	00010001hex	vs	0 .. FFFFFFFFhex	r/w	c

Factor

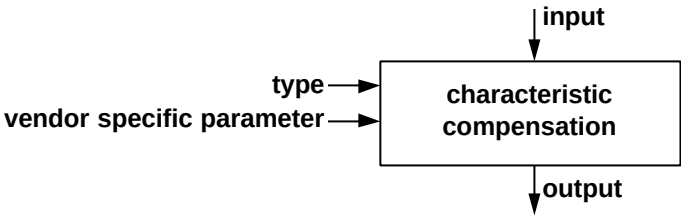
The factor is composed of the elements numerator and denominator.

31 16	15 0
numerator	denominator

name	**data type**	**substitute value**
factor	UINT32	00010001hex
numerator	INT16	1
denominator	INT16	1

9.5 Characteristic Compensation

This function compensates the non-linearities of a valve.



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Type	INT8	0	vs	-2^7 .. (2^7 -1)	r/w	c

Type

With this parameter, the type of characteristic is selected, or the characteristic compensation is switched off.

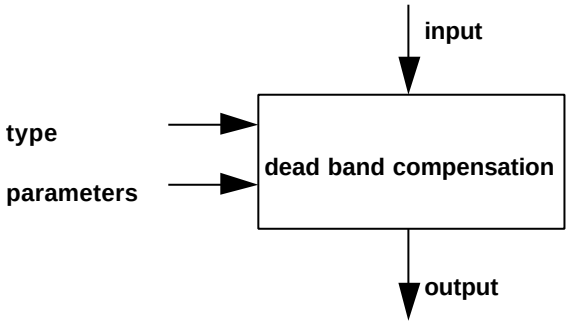
Type	Meaning
0	no characteristic compensation
1 .. 127	reserved
-1 .. – 128	vs

Vendor Specific Parameters

The function is defined via further vendor specific parameters

9.6 Dead Band Compensation

This function compensates for valve overlap.



parameter name	data type	substitute value	default value	value range	access rights	object class
... / Type	INT8	0	vs	-2^7 .. (2^7 -1)	r/w	c

Type

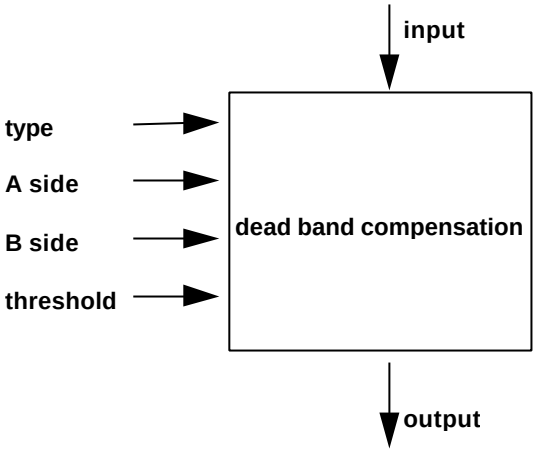
With this parameter, the type of dead band compensation is selected, or the dead band compensation is switched off.

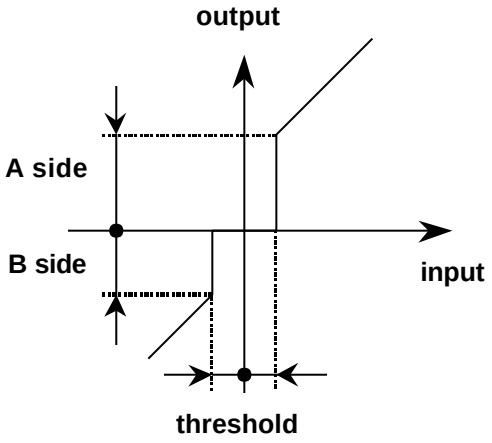
Type	Meaning
0	no dead band compensation
1	type 1

2	type 2
3 .. 127	reserved
-1 .. – 128	vs

Dead Band Compensation (Type 1)

During a change of the parameters A side and B side the grade of the characteristic is modified in such a way that the value for 100% remains valid.





Parameter name	data type	substitute value	default value	value range	acces s rights	object class
... / ASide / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / ASide / Unit	UINT8	see table	see table	vs	r, r/w	o
... / ASide / Prefix	INT8	see table	see table	vs	r, r/w	o
... / BSide / Value	UINTn	see table	see table	0 .. (2^n -1)	r/w	c
... / BSide / Unit	UINT8	see table	see table	vs	r, r/w	o
... / BSide / Prefix	INT8	0	0	vs	r, r/w	o
... / Threshold / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / Threshold / Unit	UINT8	see table	see table	vs	r, r/w	o
... / Threshold / Prefix	INT8	see table	see	vs	r, r/w	o

			table			

parameter name	Device	substitute value	default value	value range
... / ASide / Unit				
	hydrostatic drive	no Unit	vs	vs
	proportional valve, hydrostatic pump	ir	ir	vs
... / ASide / Prefix				
	hydrostatic drive	milli	milli	vs
	proportional valve, hydrostatic pump	0	0	vs
... / BSide / Unit				
	hydrostatic drive	no Unit	vs	vs
	proportional valve, hydrostatic pump	ir	ir	vs
... / BSide / Prefix				
	hydrostatic drive	milli	milli	vs
	proportional valve, hydrostatic pump	0	0	vs
... / Threshold / Unit				
	hydrostatic drive	no Unit	vs	vs
	proportional valve, hydrostatic pump	ir	ir	vs
... / Threshold / Prefix				
	hydrostatic drive	milli	milli	vs
	proportional valve, hydrostatic pump	0	0	vs

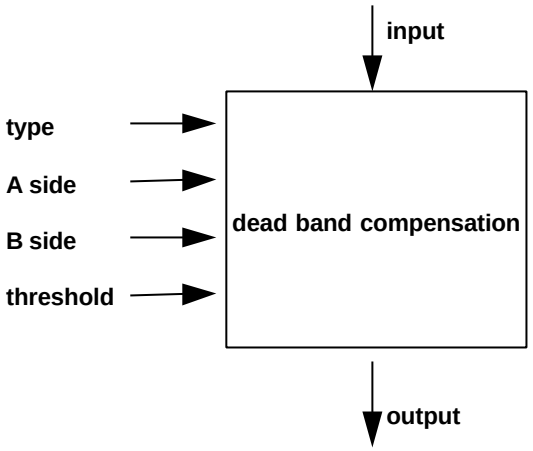
A Side
This parameter determines the step height of the A side.

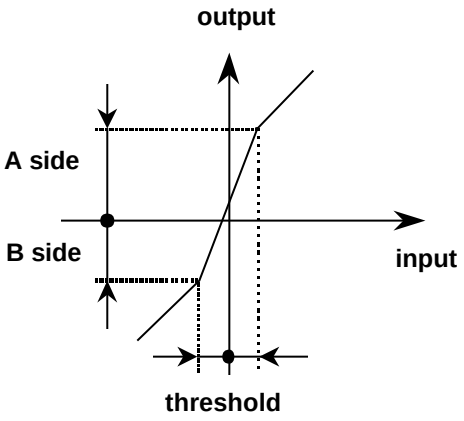
B Side
This parameter determines the step height of the B side.

Threshold
This parameter determines the starting point of the compensation step.

Dead Band Compensation (Type 2)

During a change of the parameters A side and B side the grade of the characteristic is modified in such a way that the value for 100% remains valid.





parameter name	data type	substitute value	default value	value range	access rights	object class
... / ASide / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / ASide / Unit	UINT8	see table	see table	vs	r, r/w	o
... / ASide / Prefix	INT8	see table	see table	vs	r, r/w	o
... / BSide / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / BSide / Unit	UINT8	see table	see table	vs	r, r/w	o
... / BSide / Prefix	INT8	see table	see table	vs	r, r/w	o
... / Threshold / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	c
... / Threshold / Unit	UINT8	see table	see table	vs	r, r/w	o
... / Threshold / Prefix	INT8	see table	see table	vs	r, r/w	o

parameter name	Device	substitute value	default value	value range
... / ASide / Unit				
	hydrostatic drive	no Unit	vs	vs

	proportional valve, hydrostatic pump	ir	ir	vs
... / ASide / Prefix				
	hydrostatic drive	milli	milli	vs
	proportional valve, hydrostatic pump	0	0	vs
... / BSide / Unit				
	hydrostatic drive	no Unit	vs	vs
	proportional valve, hydrostatic pump	ir	ir	vs
... / BSide / Prefix				
	hydrostatic drive	milli	milli	vs
	proportional valve, hydrostatic pump	0	0	vs
... / Threshold / Unit				
	hydrostatic drive	no Unit	vs	vs
	proportional valve, hydrostatic pump	ir	ir	vs
... / Threshold / Prefix				
	hydrostatic drive	milli	milli	vs
	proportional valve, hydrostatic pump	0	0	vs

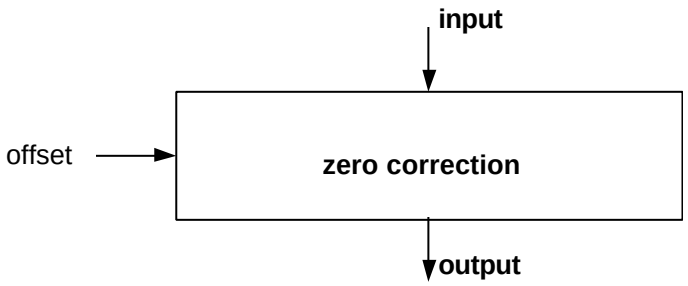
A Side
This parameter determines the step height of the A side.

B Side
This parameter determines the step height of the B side.

Threshold
This parameter determines the starting point and end point of the compensation ramp.

9.7 Zero Correction

The zero correction function is used to adjust the zero position.



output = input + offset

parameter name	data type	substitute value	default value	value range	acces s rights	object class
... / Offset / Value	INTn	0	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / Offset / Unit	UINT8	see table	see table	vs	r, r/w	o
... / Offset / Prefix	INT8	see table	see table	vs	r, r/w	o

parameter name	Device	substitute value	default value	value range
... / Offset / Unit				
	hydrostatic drive	no Unit	vs	vs
	proportional valve, hydrostatic pump	ir	ir	vs
... / Offset / Prefix				
	hydrostatic drive	milli	milli	vs
	pProportional valve, hydrostatic pump	0	0	vs

Offset

The offset is added to the input.

9.8 Control Monitoring General

This function monitors the control function. With the type parameter, the type of control monitoring is selected or the control monitoring is switched off.

In case of a p/Q-control, the control monitoring is active for both pressure and spool position. The control fault bit in the status word results from the combination of both control faults for pressure and spool position.

parameter name	data type	substitute value	default value	value range	acces s rights	object class
... / Type	INT8	0	vs	-2^7 .. (2^7-1)	r/w	o

Type

This parameter defines the type of control monitoring. The value range is -128 .. 127. The substitute value is 0.

Type	Meaning
0	no control monitoring
1	standard control monitoring (upper and lower threshold)
2	control monitoring (symmetric threshold)
3	dynamic control monitoring (upper and lower threshold)
4	dynamic control (symmetric threshold)
5 .. 127	reserved
-1 .. - 128	vs

Status (Control Error)

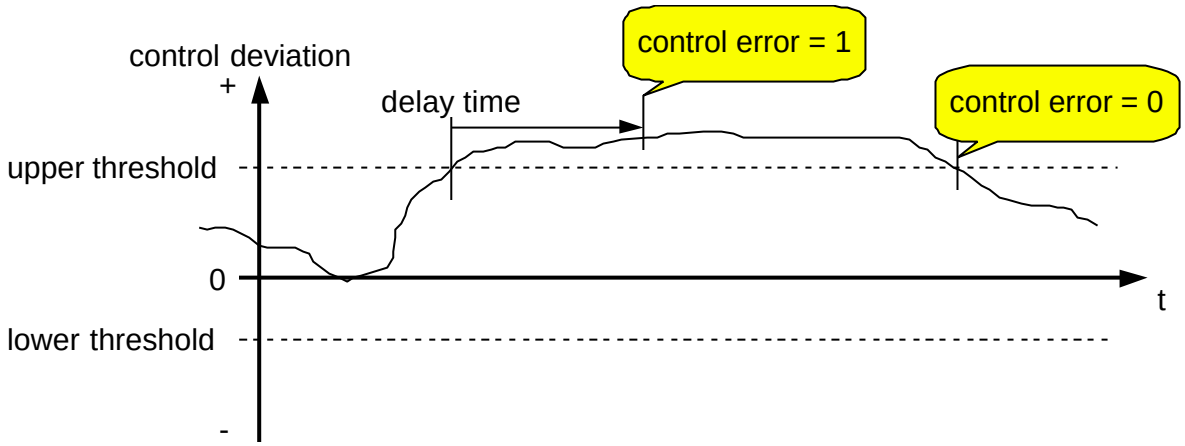
This value indicates if there is a control error. The control error is represented in the status word. The value range is 0 or 1 (Boolean).

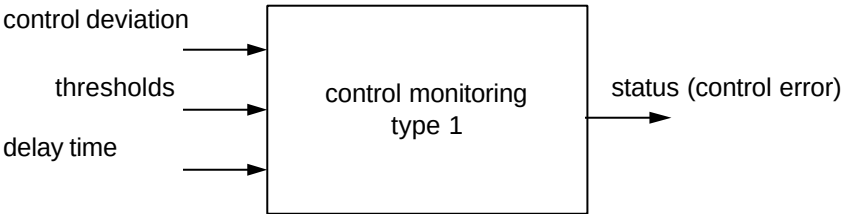
Parameters

The parameters are type dependent.

9.8.1 Control Monitoring Standard (Type 1)

This function monitors keeping of the tolerance band of the control deviation. The tolerance band is determined by an upper and a lower threshold. If the control deviation, for an interval greater than the delay time, is greater than the upper threshold or lower than the lower threshold, the control fault will be set to 1. If the control deviation is within the tolerance band, the control fault will immediately set to 0.





parameter name	data type	substitute value	default value	value range	access rights	object class
... / UpperThreshold / Value	INTn	$2^{n-1} - 1$	vs	-2^{n-1} .. $(2^{n-1} -1)$	r/w	c
... / UpperThreshold / Unit	UINT8	control word specific	Control word specific	vs	r	o
... / UpperThreshold / Prefix	INT8	control word specific	Control word specific	vs	r	o
... / LowerThreshold / Value	INTn	$- 2^{n-1}$	vs	-2^{n-1} .. $(2^{n-1} -1)$	r/w	c
... / LowerThreshold / Unit	UINT8	control word specific	Control word specific	vs	r	o
... / LowerThreshold / Prefix	INT8	control word specific	Control word specific	vs	r	o

... / DelayTime / Value	UINTn	0	vs	0 .. (2^n -1)	r/w	o
... / DelayTime / Unit	UINT8	sec	Sec	sec	r, r/w	o
... / DelayTime / Prefix	INT8	milli	milli	milli	r, r/w	o

Remark: The units of upper and lower thresholds are that of the setpoint.

Thresholds

This parameter defines upper threshold and lower threshold.

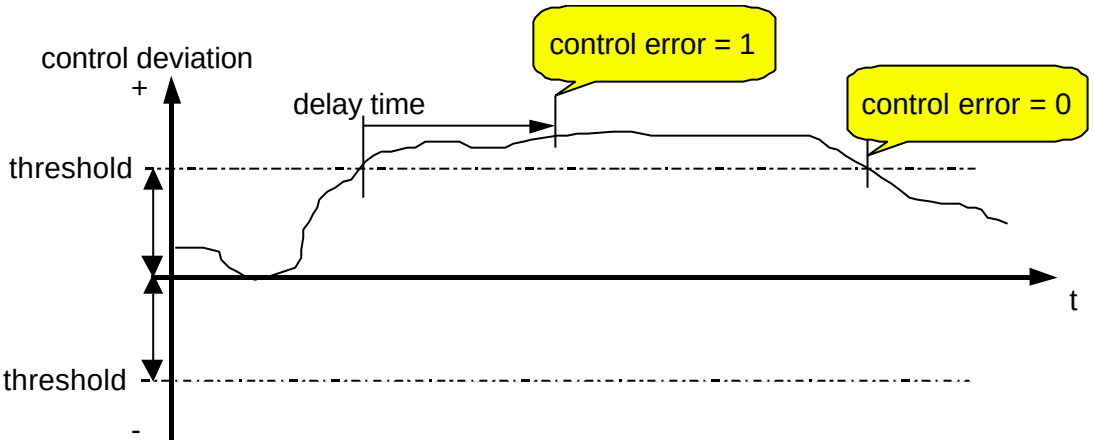
Remark: Setting of parameters to upper threshold < lower threshold must be rejected.

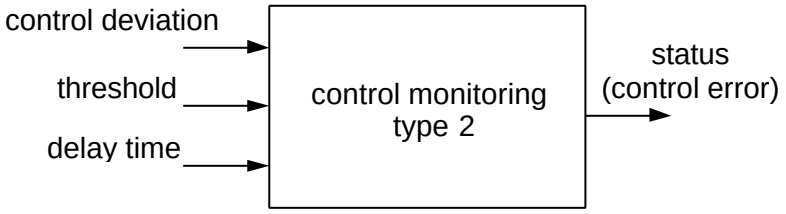
Delay Time

After the delay time a control deviation will be shown as a control fault.

9.8.2 Control Monitoring (symmetric threshold, Type 2)

This function monitors keeping of the tolerance band of the control deviation. The tolerance band is determined by a threshold. If the control deviation, for an interval greater than the delay time, is outside the tolerance band specified by the threshold, the control fault will be set to 1. If the control deviation is within the tolerance band, the control fault will be set to 0 immediately.





parameter name	**data type**	**substitute value**	**default value**	**value range**	**access rights**	**object class**
... / Threshold / Value	INTn	- 2^{n-1}	vs	-2^{n-1} .. (2^{n-1} -1)	r/w	c
... / Threshold / Unit	UINT8	control word specific	control word specific	vs	r	o
... / Threshold / Prefix	INT8	control word specific	control word specific	vs	r	o

... / DelayTime/ Value	UINTn	0	vs	0 .. (2^n -1)	r/w	o
... / DelayTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / DelayTime / Prefix	INT8	milli	milli	milli	r, r/w	o

Remark: The unit and prefix of the threshold are that of the setpoint.

Threshold

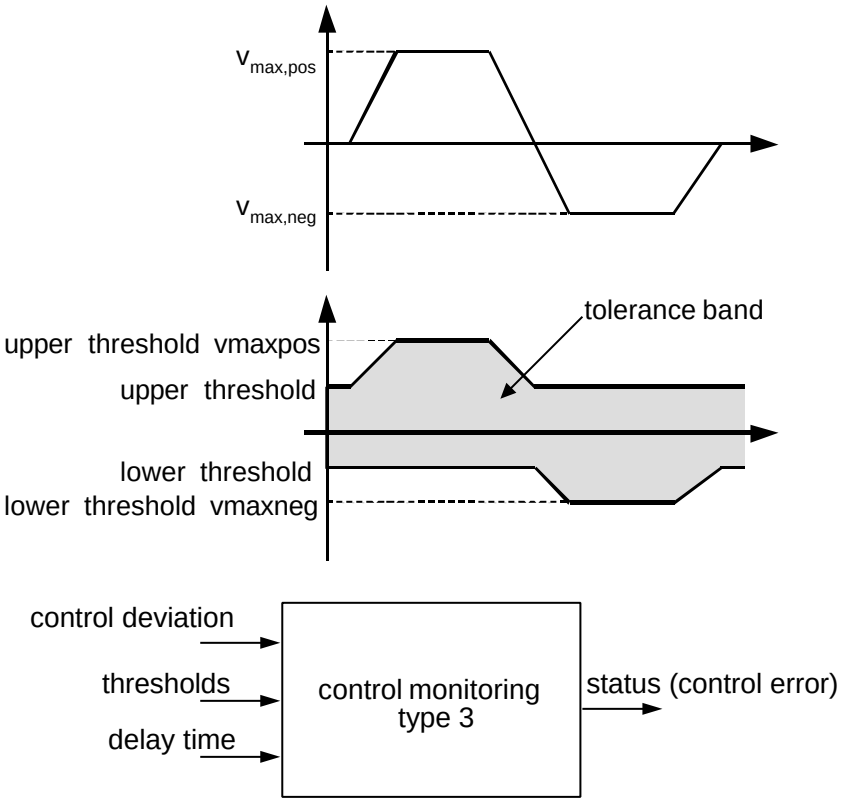
This parameter defines the width of the tolerance band.

Delay Time

After the delay time a control deviation outside the tolerance band will be shown as a control fault. This Parameter ist optional.

9.8.3 Dynamic Control Monitoring (Type 3)

This function monitors keeping of the tolerance band of the control deviation. The dynamic control monitoring considers the fact that the control deviation gains with increasing speed. Therefore the tolerance band can be adjusted to be larger for the maximum velocity. The tolerance band is then determined by an upper and a lower threshold for velocity equal to zero and a lower and upper threshold for the maximum velocity. Between those points of velocity the tolerance band is determined by interpolation. If the control deviation, for an interval greater than the delay time, is outside the tolerance band, the control fault will be set to 1. If the control deviation is within the tolerance band, the control fault will be set to 0 immediately.



parameter name	**data type**	**substitute value**	**default value**	**value range**	**access rights**	**object class**
... / UpperThreshold / Value	INTn	2^{n-1} - 1	–vs	-2^{n-1} .. (2^{n-1} -1)	r/w	c
... / UpperThreshold / Unit	UINT8	control	control	vs	r	o

		word specific	word specific			
... / UpperThreshold / Prefix	INT8	control word specific	control word specific	vs	r	o
... / UpperThresholdVmaxPos / Value	INTn	$2^{n-1} - 1$	vs	$-2^{n-1} .. (2^{n-1} -1)$	r/w	c
... / UpperThresholdVmaxPos / Unit	UINT8	control word specific	control word specific	vs	r	o
... / UpperThresholdVmaxPos / Prefix	INT8	control word specific	control word specific	vs	r	o
... / LowerThreshold / Value	INTn	$- 2^{n-1}$	vs	$-2^{n-1} .. (2^{n-1} -1)$	r/w	c
... / LowerThreshold / Unit	UINT8	control word specific	control word specific	vs	r	o
... / LowerThreshold / Prefix	INT8	control word specific	control word specific	vs	r	o
... / LowerThresholdVmaxNeg / Value	INTn	$- 2^{n-1}$	vs	$-2^{n-1} .. (2^{n-1} -1)$	r/w	c
... / LowerThresholdVmaxNeg / Unit	UINT8	control word specific	control word specific	vs	r	o
... / LowerThresholdVmaxNeg / Prefix	INT8	control word specific	control word specific	vs	r	o
... / DelayTime/ Value	INTn	0	vs	$0 .. (2^{n} -1)$	r/w	o
... / DelayTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / DelayTime / Prefix	INT8	milli	milli	milli	r, r/w	o

Remark: The units of upper and lower thresholds are that of the setpoint.

Thresholds

This parameter defines upper threshold and lower threshold.

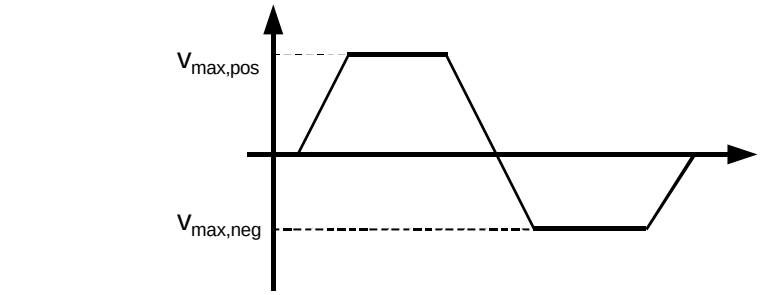
Remark: Setting of parameters to upper threshold < lower threshold must be rejected. Settings of parameters to upper threshold > upper threshold vmaxpos and lower threshold < lower threshold vamaxneg must be rejected.

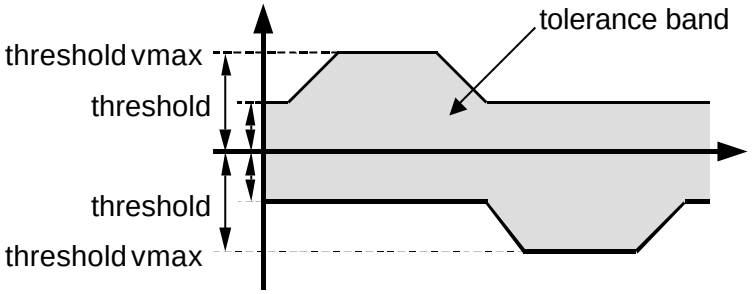
Delay Time

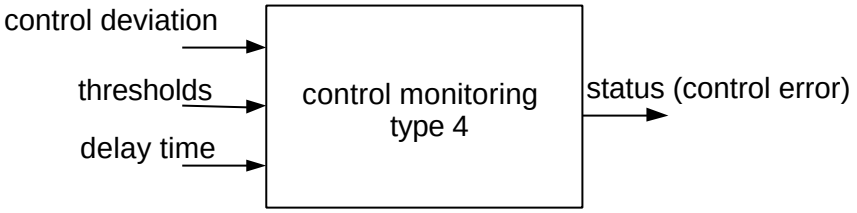
After the delay time a control deviation outside the tolerance band will be shown as a control fault.

9.8.4 Dynamic Control Monitoring (symmetric,Type 4)

This function monitors keeping of the tolerance band of the control deviation. The symmetric dynamic control monitoring considers the fact that the control deviation gains with increasing speed. Therefore the tolerance band can be adjusted to be larger for the maximum velocity. The tolerance band is then determined by threshold for velocity equal to zero and a threshold for the maximum velocity. Between those points of velocity the tolerance band is determined by interpolation. If the control deviation, for an interval greater than the delay time, is outside the tolerance band, the control fault will be set to 1. If the control deviation is within the tolerance band, the control fault will be set to 0 immediately.


$v_{max,pos}$
$v_{max,neg}$


tolerance band
threshold vmax
threshold
threshold
threshold vmax


control deviation
thresholds
delay time
control monitoring
type 4
status (control error)

parameter name	data type	substitute value	default value	value range	acces s rights	object class
... / Threshold / Value	INTn	2^{n-1} - 1	vs	-2^{n-1} .. (2^{n-1} -1)	r/w	c
... / Threshold / Unit	UINT8	control word specific	Control word specific	vs	r	o
... / Threshold / Prefix	INT8	control word specific	Control word specific	vs	r	o
... / ThresholdVmax / Value	INTn	2^{n-1} - 1	vs	-2^{n-1} .. (2^{n-1} -1)	r/w	c
... / ThresholdVmax / Unit	UINT8	control word specific	control word specific	vs	r	o
... / ThresholdVmax / Prefix	INT8	control word specific	control word specific	vs	r	o
... / DelayTime/ Value	UINTn	0	vs	0 .. (2^{n} -1)	r/w	o
... / DelayTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / DelayTime / Prefix	INT8	Milli	milli	milli	r, r/w	o

Remark: The units of upper and lower thresholds are that of the setpoint.

Thresholds

This parameter defines upper threshold and lower threshold.

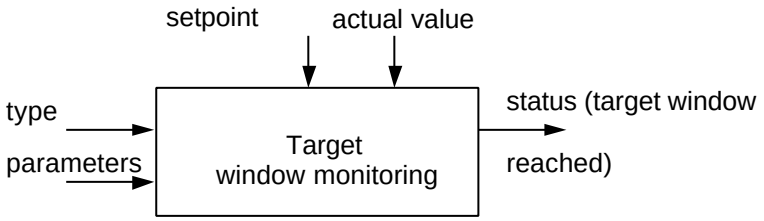
Remark: Setting of parameters to threshold > threshold vmax must be rejected.

Delay Time

After the delay time a control deviation outside the tolerance band will be shown as a control fault. This parameter is optional.

9.9 Target window monitoring

This function signals if the actual value reached the setpoint, which can be different from the demand value. With the type parameter, the type of target window monitoring is selected or the target window monitoring is switched off.



In case of a p/Q-control, the target window monitoring can be active for both pressure and spool position. The target window reached bit in the status word results from the combination of both control faults for pressure and spool position.

parameter name	data type	substitute value	default value	value range	acces s rights	object class

... / Type	INT8	0	Vs	$-2^7 .. (2^7-1)$	r/w	c

Type

This parameter defines the type of target window monitoring. The value range is -128 .. 127. The substitute value is 0.

Type	Meaning
0	No target window monitoring
1	Standard target window monitoring (upper and lower threshold)
2	Target window monitoring (symmetric threshold)
3 .. 127	reserved
-1 .. - 128	vs

Status (Target window reached)

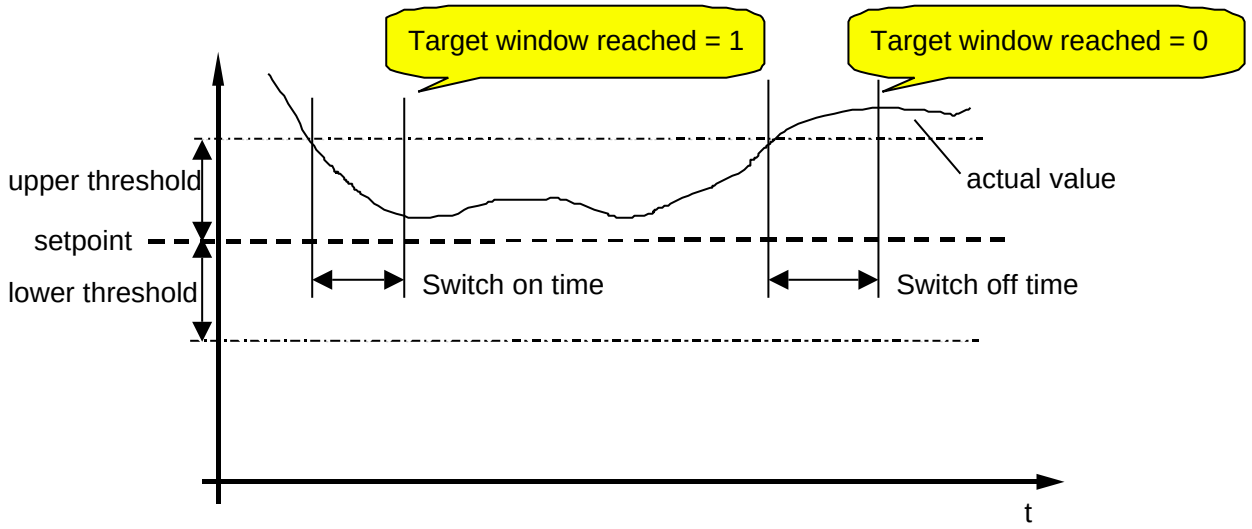
This value indicates if the target window is reached. The "target window reached" is represented in the status word. The value range is 0 or 1 (Boolean).

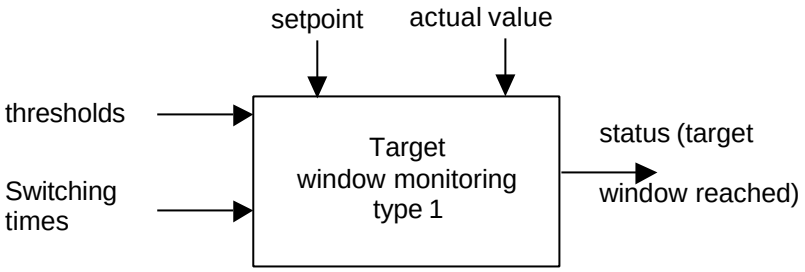
Parameters

The parameters are type dependent.

9.9.1 Target Window Monitoring Standard (Type 1)

This function monitors the difference between the setpoint and the actual value. The target window around the setpoint is determined by an upper and a lower threshold. If the actual value is inside the target window range the corresponding bit (target window reached) of the status word will be set to 1. If the actual value is outside the target window range, the bit will be set to 0 immediately.




setpoint
actual value
thresholds
Switching
times
Target
window monitoring
type 1
status (target
window reached)

parameter name	data type	substitute value	default value	value range	access rights	Object class
... / UpperThreshold / Value	INTn	2^{n-1} - 1	vs	-2^{n-1} .. (2^{n-1} -1)	r/w	c
... / UpperThreshold / Unit	UINT8	control word specific	control word specific	vs	r	o
... / UpperThreshold / Prefix	INT8	control word specific	control word specific	vs	r	o
... / LowerThreshold / Value	INTn	- 2^{n-1}	Vs	-2^{n-1} .. (2^{n-1} -1)	r/w	c
... / LowerThreshold / Unit	UINT8	control word specific	control word specific	vs	r	o
... / LowerThreshold / Prefix	INT8	control word specific	control word specific	vs	r	o
... / SwitchOnTime / Value	UINTn	0	vs	0.. (2^{n-1} -1)	r/w	o
... / SwitchOnTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / SwitchOnTime / Prefix	INT8	milli	milli	milli	r,r/w	o
... / SwitchOffTime / Value	UINTn	0	vs	0.. (2^{n-1} -1)	r/w	o
... / SwitchOffTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / SwitchOffTime / Prefix	INT8	milli	milli	milli	r,r/w	o

Remark: The units of upper and lower thresholds are that of the setpoint.

Thresholds

This parameter defines upper threshold and lower threshold.

Remark: Setting of parameters to upper threshold < lower threshold must be rejected.

SwitchonTime

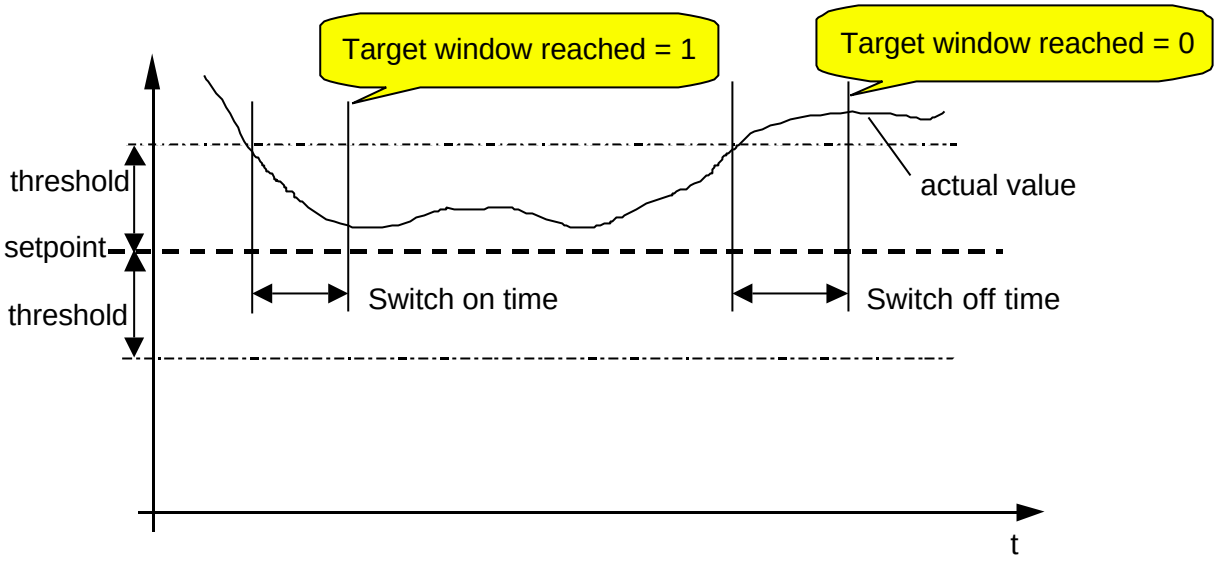
This parameter defines the time delay the bit of the status word is set to 1, after the control deviation reached the target window range.

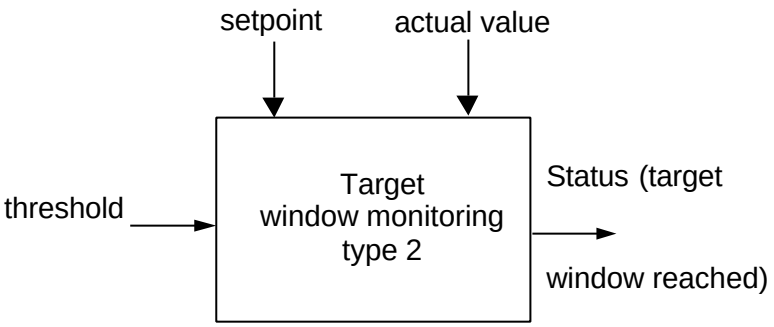
SwitchoffTime

This parameter defines the time delay the bit of the status word is set to 0, after the control deviation is outside the target window range.

9.9.2 Target Window Monitoring (symmetric threshold, Type 2)

This function monitors the difference between the setpoint and the actual value. The target window around the setpoint is determined by a threshold. If the actual value is inside the target window range, the corresponding bit (target window reached) of the status word will be set to 1. If the actual value is outside the target window range, the bit will be set to 0 immediately.





parameter name	data type	substitute value	default value	value range	access rights	object class
... / Threshold / Value	INTn	-2^{n-1}	vs	-2^{n-1} .. $(2^{n-1}-1)$	r/w	c
... / Threshold / Unit	UINT8	control word specific	control word specific	vs	r	o
... / Threshold / Prefix	INT8	control word specific	control word specific	vs	r	o
... / SwitchOnTime / Value	UINTn	0	vs	0.. $(2^{n-1}-1)$	r/w	o
... / SwitchOnTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / SwitchOnTime / Prefix	INT8	milli	milli	milli	r,r/w	o
... / SwitchOffTime / Value	UINTn	0	vs	0.. $(2^{n-1}-1)$	r/w	o
... / SwitchOffTime / Unit	UINT8	sec	sec	sec	r, r/w	o
... / SwitchOffTime / Prefix	INT8	milli	milli	milli	r,r/w	o

Remark: The unit and prefix of the threshold are that of the setpoint.

Threshold

This parameter defines the width of the target window range band.

SwitchonTime

This parameter defines the time delay the bit of the status word is set to 1, after the control deviation reached the target window range.

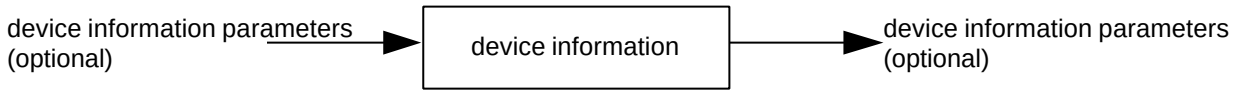
SwitchoffTime

This parameter defines the time delay the bit of the status word is set to 0, after the control deviation is outside the target window range.

9.10 Device Information

The function shown in the figure below administers the following device information:

- Device_Capability
- Device_VendorName
- Device_DeviceVersion
- Device_SoftwareVersion
- Device_HardwareVersion
- Device_SerialNo
- Device_ModelDescription
- Device_CodeNo
- Device_Description
- Device_ParameterSetCode



parameter name	data type	substitute value	default value	value range	access rights	object class
Device_Capability	UINT32	-	vs	-	r	o
Device_VendorName	visible string64	-	vs	-	r	o
Device_DeviceVersion	visible string64	-	vs	-	r	o
Device_SoftwareVersion	visible string64	-	vs	-	r	o
Device_HardwareVersion	visible string64	-	vs	-	r	o
Device_SerialNo	visible string64	-	vs	-	r	o
Device_ModelDescription	visible string64	-	vs	-	r	o
Device_CodeNo	UINT16	-	0	0 .. (2^{16} -1)	r/w	o
Device_Description	visible string64	-	0	-	r/w	o
Device_ParameterSetCode	UINT8	-	0	0 .. 255	r/w	o

Device_Capability

Byte: MSB LSB

DeviceCapability															
additional information															specific information
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	

Bit 16=1: hydraulic drive

Bit 17=1: controller mode open loop movement supported
Bit 18=1: controller mode velocity control supported
Bit 19=1: controller mode force/pressure control supported
Bit 20=1: controller mode position control supported
Bit 21..23 reserved
Bit 24=1: hydraulic proportional valve
Bit 25=1: controller mode spool position control open loop supported
Bit 26=1: controller mode spool position control closed loop supported
Bit 27=1: controller mode pressure control open loop supported
Bit 28=1: controller mode pressure control closed loop supported
Bit 29=1: controller mode pressure flow control closed loop supported
Bit 30 reserved
Bit 31=1: modular device

In a modular device the parameter Device_Capability has to be implemented also for each module.

Meaning of specific information:

0000H	no specific information available
0001H..7FFFH	reserved
8000H..FFFFH	manufacture-specific

Device_VendorName

This parameter contains the name of the device vendor.

Device_DeviceVersion

This parameter contains the device version of the device.

Device_SoftwareVersion

This parameter contains the software version of the device.

Device_HardwareVersion

This parameter contains the hardware version of the device.

Device_SerialNo

This parameter contains the serial number.

Device_ModelDescription

This parameter contains a text which the device vendor has deposited in this parameter. It can for example contain a short device description. The parameter has a max. length of 64 characters.

Device_CodeNo

With this function the user can deposit a code number in a non-volatile way in the device. The value can be chosen freely. Therefore, within the bus each number can be allocated several times. By an appropriate allocation of code numbers in the bus, e. g. the exchange of a device or the confusion of bus connections can be detected.

Device_Description

This parameter contains a text deposited in this parameter by the device user. The device description is stored in a non-volatile memory. Here, the device user can deposit for example a description of the device usage in the installation. The parameter has a fixed length of 64 characters.

Device_ParameterSetCode

This parameter indicates the actually valid set of device parameters. If a device cannot store safely in case of power failure the set of device parameters received, then the DeviceParameterSetCode is set to 0 by he device automatically as soon as power is available again. The user can evaluate this information and initiate again accordingly.

0	The set of parameters of the device has been initiated via bus.
1 .. 254	The set of parameters of the device has been initiated via bus. For identification it has received the freely chooseable CodeNo 1 .. 254.
255	Device has been switched to local mode, and it is not guaranteed that the set of parameters loaded previously is unchanged.

9.11 Device Parameter Storage

The storage of the parameter settings of a device in a non-volatile memory is optional. This storage of the actual parameters is initiated bus specifically (for exact description see bus specific implementation). Furthermore the factory setting can be restored. The activation of the parametervalues stored in the non-volatile memory is possible through a state transition of the device control (device state machine).

9.12 Diagnostics

In case the device goes into warning state or the fault state, the fault occurred will be indicated in the error code parameter.

parameter name	**data type**	**substitute value**	**default value**	**value range**	**access rights**	**object class**
Device_ErrorCode	UINT16	-	0	0 .. (2^{16} -1)	r	o

Assignment of the error codes is mandatory.

Meaning

no error code available
general warning
general error
current
- current device input
- current device internal
  - current device internal no. 1
  - current device internal no. 2
- current device output

voltage
- mains voltage
- device internal voltage
  - device internal high voltage
  - device internal low voltage
- output voltage
- input voltage
  - power voltage
    - high voltage
    - low voltage
  - control voltage
    - high voltage
    - low voltage

temperature
- ambient temperature

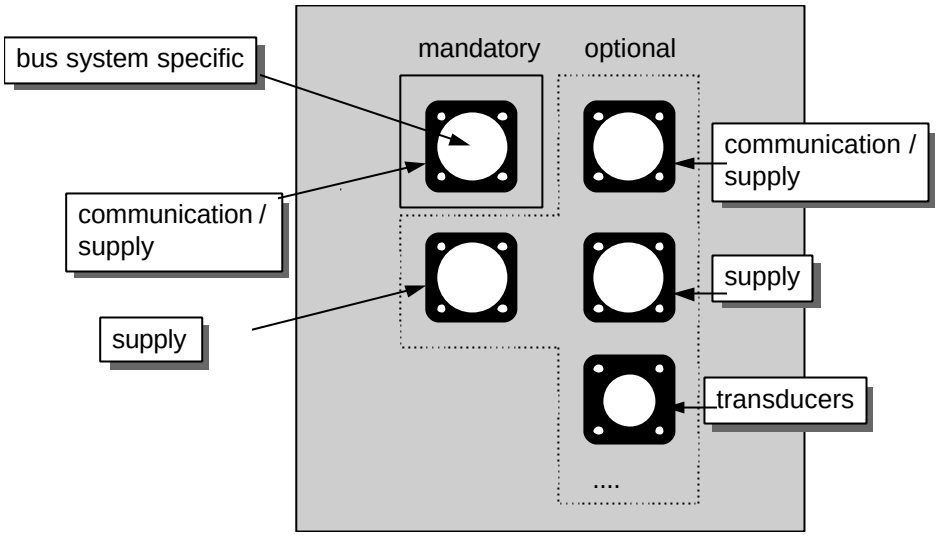
- high ambient temperature
- low ambient temperature
- device temperature
  - electronics temperature
    - electronics high temperature
    - electronics low temperature
  - hydraulics / pneumatics temperature
    - hydraulics / pneumatics high temperature
    - hydraulics / pneumatics low temperature
- device hardware
  - power supply
    - internal supply voltages
  - controller
    - measurement circuits
    - processing circuits
    - transducers
      - sensor 1
      - sensor 2
      - sensor 3
      - sensor 4
      - sensor 5
      - sensor 6
      - sensor 7
      - sensor 8
  - Limit switches
    - pressure sensor 4
  - operator panel
  - power section
    - booster stages
  - data memory
    - RAM
    - EPROM
    - EEPROM
- device software
  - software reset (watch dog)
  - internal software
  - user software
  - data record
    - loss of parameter
    - error of parameter
- additional assemblies
  - transducer
    - pressure transducer
- monitoring
  - communication
  - controller
    - spool position control
    - pressure control

Codes not listed here are reserved.

9.12 Password Protection

All open or closed loop control functions can be adjusted by additional vendor specific parameters. These can be read or written over a password protection.

10 CONNECTION TECHNIQUE



10.1 Communication Connection

For the communication connection at least one connector or optional two connectors have to be provided. The number of communication connections, the number of pins, and the assignment of pins have been determined bus specifically (see appendix).

10.2 Power Supply

For the power supply connection at least one male connector or optional two connectors have to be provided. The optional female power supply connector is wired 1:1 internally with the first connector. The number of power supply connections, the number of pins, and the assignment of pins can been determined and changed bus specifically. Two general power connections are described below.

10.2.1 Power Supply 6+PE

10.2.1.1 Connection Type

Thread: 7/8-20 UNF 2A, DIN 43563
The standard has been proposed as a European Standard, but not yet been adopted.

10.2.1.2 Connection Pins

Pin	Marking	Description
A	+ UB	power supply voltage +24 VDC
B	0 V	power supply voltage 0 V
C	GND	measurement zero
D	setpoint+	setpoint input positive
E	setpoint-	setpoint input negative
F	actual	actual value
PE	PE	PE

10.2.2 Power Supply 11+PE

10.2.2.1 Connection Type

Thread: M26x1.5, DIN 43651
The standard has been proposed as a European Standard, but not yet been adopted.

10.2.2.2 Connection Pins

Pin	**Marking**		**Description**
1	+ UB P		power supply voltage +24 VDC
2	0 V P		power supply voltage 0 V
3	ENABLE		Enable
4	IN 1		input value 1
5	GND IN		Ground of Pin 4 and 7
6	OUT 1		output value 1
7	IN 2		input value 2
8	OUT 2		output value 2
9	+ UB C		Control supply voltage +24 VDC
10	0 V C		Control supply voltage 0 V ground of Pin 3, 6,8 and 11
11	/ERROR		error output
PE	PE		PE

11 TABLES

11.1 Technical Terms

English	german	Meaning
acceleration time	Beschleunigungszeit	parameter
actual power value	Leistungsistwert	parameter
actual value	Istwert	parameter
actual value processing	Istwertaufbereitung	device function
amplitude	Amplitude	parameter
area ratio	Flächenverhältnis	area ratio of actuator
automatic	Automatik	
charactaristic adjust	Kennlinienanpassung	device function
control deviation	Regelabweichung	
control mode	Reglermode	
control mode specific	reglermodeabhängig	
controller fault	Regelfehler	parameter
controlword	Steuerwort	parameter
dead band comensation	Totbandkompensation	device function
dead band compensation	Kompensationssprung	
demand value	Führungsgröße	parameter
demand value generator	Führungsgrößengenerator	device function
denominator	Nenner	parameter element
device control	Gerätesteuerbefehle	
DEVICE MODE ACTIVE	Betriebsart aktiv	device condition
device status	Gerätezustand	parameter
device mode	Betriebsart	parameter
device mode specific	betriebsartenabhängig	
differential pressure control	Differenzdruckregelung	device function
DISABLED	gesperrt	device condition
dither function	Ditherfunktion	device function
electrical power rating	elektrische Nennleistung	parameter element
error code	Störungscode	parameter
factor	Faktor	parameter
FAULT	Störung	device condition
FAULT HOLD	Störung Halt	device condition
FAULT REACTION	Störungsreaktion	device condition
force control	Kraft/Druckregelung	device function
frequency	Frequenz	parameter
HOLD	Halt	device condition
hold demand value	Haltsollwert	parameter
hydrostatic corner power	hydraulische Eckleistung	parameter element
INIT	Initialisierung	device condition
install mode	Einrichtbetrieb	
limit	Begrenzung	device function
local	Lokal	parameter
local control	Lokalsteuerung	device function
lower limit	Untere Grenze	parameter
nominal actuation power	Antriebsnennleistung	
NOT READY	nicht initialisierungsbereit	device condition
numerator	Zähler	parameter element
open loop movement	gesteuertes Verfahren	device function
position control closed loop	Positionsregelung	device function
power limit factor	Leistungsbegrenzungsfaktor	parameter
prefix	Parameterprefix	The prefix is the exponent to basis 10 of the value
pressure control closed loop	Druckregelung	device function

pressure control open loop	Drucksteuerung	device function
pressure controller	Druckregler	
pressure reference	Bezugsdruck	parameter
program step	Programmschritt	
program-control	Ablaufsteuerung	device function
ramp	Rampenfunktion	device function
ramp time	Rampenzeit	parameter
reference movement	Referenzfahrt	
reference value	Bezugswert	parameter
sensor nominal pressure	Sensornenndruck	parameter
setpoint	Sollwert	parameter
sign	Vorzeichen	parameter
signal adaptation	Signalnormierung	
signal processing	Signalaufbereitung	device function
single step	Einzelschritt	
spool overlap	Ventilüberdeckung	
spool position control closed loop	Ventilkolbenpositionsregelung	device function
spool position control open loop	Ventilkolbenpositionssteuerung	device function
statusword	Statuswort	
threshold	Schwellwert	parameter
transducer function	Sensorfunktion	device function
unit	Parametereinheit	This element defines with codes the unit of the parameter value
upper limit	Obere Grenze	parameter
value	Parameterwert	
value range	Wertebereich	
velocity control	Geschwindigkeitsregelung	device function
warning	Warnung	
zero correction	Nullpunktverschiebung	device function

11.2 Parameter table

Device
ControlWord
StatusWord
DeviceMode
ControlMode
ErrorCode
Local
Capability
VendorName
DeviceVersion
SoftwareVersion
HardwareVersion
SerialNo
ModelDescription
CodeNo
Description
ParameterSetCode
Valve
ActualValueConditioning
InterfaceNo
Type
Sign
ActualValue
ActualValue1
ActualValue2
ActualValue3
ActualValue4
ActualValue5
ActualValue6
ActualValue7
ActualValue8
MinimumPressure
MaximumPressure
Area
PressureOffset
MinimumTransducerSignal
MaximumTransducerSignal
MinimumReference
MaximumReference
T1
MinimumInterface
MaximumInterface
Resolution
PositionOffset
ZeroShift
BitSize
C
StartStopType
Drive
ActualValueConditioning
InterfaceNo
Type
Sign
ActualValue

- ActualValue1
- ActualValue2
- ActualValue3
- ActualValue4
- ActualValue5
- ActualValue6
- ActualValue7
- ActualValue8
- MinimumPressure
- MaximumPressure
- Area
- PressureOffset
- MinimumTransducerSignal
- MaximumTransducerSignal
- MinimumReference
- MaximumReference
- T1
- MinimumInterface
- MaximumInterface
- Resolution
- PositionOffset
- ZeroShift
- BitSize
- C
- StartStopType

ControllerOutput

- Interface
  - Min
  - Max
- Filter
  - Type
  - T1
  - D
  - f0
- DirectionalDependentGain
  - Type
  - Factor
- CharacteristicCompensation
  - Type
- DeadBandCompensation
  - Type
  - ASide
  - BSide
  - Threshold
- ZeroCorrection
  - Offset
- Dither
  - Type
  - Amplitude
  - Frequency
- Limit
  - UpperLimit
  - LowerLimit
- Inverting
  - Sign

ValvePositionControl

- Setpoint

- ActualValue
- InterfaceReference
- DemandValueGenerator
  - DemandValue
  - ReferenceValue
  - HoldSetpoint
  - Limit
    - UpperLimit
    - LowerLimit
  - Scaling
    - Factor
    - Offset
  - ZeroCorrection
    - Offset
  - Ramp
    - Type
    - AccelerationTime
    - AccelerationTimePositive
    - AccelerationTimeNegative
    - DecelerationTime
    - DecelerationTimePositive
    - DecelerationTimeNegative
  - DirectionalDependentGain
    - Type
    - Factor
  - DeadBandCompensation
    - Type
    - ASide
    - BSide
    - Threshold
  - CharacteristicCompensation
    - Type
- ControlDeviation
- ControlMonitoring
  - Type
  - DelayTime
  - Threshold
  - UpperThreshold
  - LowerThreshold
- Dither
  - Type
  - Amplitude
  - Frequency
- TargetWindowMonitoring
  - Type
  - SwitchOnTime
  - SwitchOffTime
  - Threshold
  - UpperThreshold
  - LowerThreshold

ValvePressureControl

- Setpoint
- ActualValue
- InterfaceReference
- DemandValueGenerator
  - DemandValue
  - ReferenceValue

- HoldSetpoint
- Limit
  - UpperLimit
  - LowerLimit
- Scaling
  - Factor
  - Offset
- ZeroCorrection
  - Offset
- Ramp
  - Type
  - AccelerationTime
  - AccelerationTimePositive
  - AccelerationTimeNegative
  - DecelerationTime
  - DecelerationTimePositive
  - DecelerationTimeNegative
- DirectionalDependentGain
  - Type
  - Factor
- DeadBandCompensation
  - Type
  - ASide
  - BSide
  - Threshold
- CharacteristicCompensation
  - Type

- ControlDeviation
- ControlMonitoring
  - Type
  - DelayTime
  - Threshold
  - UpperThreshold
  - LowerThreshold
- Dither
  - Type
  - Amplitude
  - Frequency
- TargetWindowMonitoring
  - Type
  - SwitchOnTime
  - SwitchOffTime
  - Threshold
  - UpperThreshold
  - LowerThreshold

ValvepQControl

- PowerLimitFactor
- HydrActualPower
- Dither
  - Type
  - Amplitude
  - Frequency
- TargetWindowMonitoring
  - Type
  - SwitchOnTime
  - SwitchOffTime
  - Threshold

- UpperThreshold
- LowerThreshold

DriveControlOpenLoop

- Setpoint
- DemandValueGenerator
  - DemandValue
  - ReferenceAValue
  - ReferenceBValue
  - HoldSetpoint
  - Limit
    - UpperLimit
    - LowerLimit
  - Ramp
    - Type
    - AccelerationTime
    - AccelerationTimePositive
    - AccelerationTimeNegative
    - DecelerationTime
    - DecelerationTimePositive
    - DecelerationTimeNegative

DriveSpeedControl

- Setpoint
- ActualValue
- InterfaceReference
- Kp
- Ti
- DemandValueGenerator
  - DemandValue
  - ReferenceAValue
  - ReferenceBValue
  - HoldSetpoint
  - Limit
    - UpperLimit
    - LowerLimit
  - Ramp
    - Type
    - AccelerationTime
    - AccelerationTimePositive
    - AccelerationTimeNegative
    - DecelerationTime
    - DecelerationTimePositive
    - DecelerationTimeNegative
- ControlDeviation
- ControlMonitoring
  - Type
  - DelayTime
  - Threshold
  - UpperThreshold
  - LowerThreshold
  - ThresholdVmax
  - UpperThresholdVmaxPos
  - LowerThresholdVmaxNeg
- TargetWindowMonitoring
  - Type
  - SwitchOnTime
  - SwitchOffTime
  - Threshold

- UpperThreshold
- LowerThreshold

DriveForcePressureControl

- Setpoint
- ActualValue
- InterfaceReference
- Kp
- Td
- T1
- Ti
- PressureSampleTime
- DemandValueGenerator
  - DemandValue
  - ReferenceAValue
  - ReferenceBValue
  - HoldSetpoint
  - Limit
    - UpperLimit
    - LowerLimit
  - Ramp
    - Type
    - AccelerationTime
    - AccelerationTimePositive
    - AccelerationTimeNegative
    - DecelerationTime
    - DecelerationTimePositive
    - DecelerationTimeNegative
- ControlDeviation
- ControlMonitoring
  - Type
  - DelayTime
  - Threshold
  - UpperThreshold
  - LowerThreshold
  - ThresholdVmax
  - UpperThresholdVmaxPos
  - LowerThresholdVmaxNeg
- TargetWindowMonitoring
  - Type
  - SwitchOnTime
  - SwitchOffTime
  - Threshold
  - UpperThreshold
  - LowerThreshold

DrivePositionControl

- Setpoint
- ActualValue
- InterfaceReference
- Kp
- Td
- T1
- SwitchedIntegrator
  - Type
  - Ti
  - dX
- ConditionFeedback
  - Kv

		Ka	
		Kpp	
		T1pp	
	DemandValueGenerator		
		DemandValue	
		ReferenceAValue	
		ReferenceBValue	
		HoldSetpoint	
		Limit	
			UpperLimit
			LowerLimit
		Ramp	
			Type
			AccelerationTime
			AccelerationTimePositive
			AccelerationTimeNegative
			DecelerationTime
			DecelerationTimePositive
			DecelerationTimeNegative
			Velocity
			Acceleration
			Deceleration
	ControlDeviation		
	ControlMonitoring		
		Type	
		DelayTime	
		Threshold	
		UpperThreshold	
		LowerThreshold	
		ThresholdVmax	
		UpperThresholdVmaxPos	
		LowerThresholdVmaxNeg	
	TargetWindowMonitoring		
		Type	
		SwitchOnTime	
		SwitchOffTime	
		Threshold	
		UpperThreshold	
		LowerThreshold	