

b maXX 6000

Application handbook BM5000 / BM6000

Firmware function: Servo pump V1

E

5.17002.05

**Read the Instruction handbook
before starting any work!**

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GENERAL INFORMATION

The application manual provides important information regarding handling the device. A prerequisite for safe working is compliance with all specified safety information and handling instructions.

Furthermore, the local accident prevention regulations and general safety requirements applicable to the area of application of the device must be observed.

Before starting any work on the device, completely read through this Application handbook and the Instruction handbook of the device, in particular the chapter on safety information. The handbooks are an integral part of the product and must be kept in the immediate vicinity of the device in order to be accessible to personnel at all times.

For commissioning of the device the parameter manual must be used. The parameter manual contains information to the parameters of the device.



NOTE!

The servo pump function V1 is only available for:

- Single axis BM53XX
- Mono units BM55XX
- Mono units BM65XX (only available firmware version 1.19 and newer)

The following versions (or newer) are required:

- ProDrive version 1.23.01.30
- The following combination of Firmware and SoftDrivePLC Project

Version V1	Firmware 1.20	SdSP_101106
	Firmware 1.19	SdSP_101105
	Firmware 1.16	SdSP_101104
	Firmware 1.15	SdSP_100103
	Firmware 1.14	SdSP_100102
	Firmware 1.13	SdSP_100102

1.1 Explanation of symbols



NOTE!

The servo pump function V1 is only available in devices with type code:

BM5XXX - XXXX - XXXX - XXXX - XX - XXXX - **E03**

BM5XXX - XXXX - XXXX - XXXX - XX - XXXX - **E83**

or

BM6XXX - XXXX - XXXX - XXXX - XX - XXXX - **E03**

BM6XXX - XXXX - XXXX - XXXX - XX - XXXX - **E83**

1.1 Explanation of symbols

Warnings

Warnings are identified by symbols in this Parameter Manual. The notices are introduced by signal words which express the magnitude of the danger.

Observe the notices without exception and exercise caution to prevent accidents, personal injury and damage to property.



DANGER!

...warns of an imminently dangerous situation which will result in death or serious injury if not avoided.



WARNING!

...warns of a potentially dangerous situation which may result in death or serious injury if not avoided.



CAUTION!

...warns of a potentially dangerous situation which may result in minor or slight injury if not avoided.



NOTICE!

...warns of a potentially dangerous situation which may result in material damage if not avoided.

Recommendations



NOTE!

...points out useful tips and recommendations, as well as information for efficient, trouble-free operation.

1.2 Limitation of liability

All specifications and information have been compiled taking account of the applicable standards and regulations, the state of the art and also our many years of expertise and experience.

The manufacturer accepts no liability for damage resulting from:

- Non-compliance with the Instruction handbook
- Non-intended use
- Use of untrained personnel

The product actually supplied may deviate from the versions and illustrations described here in the case of special versions, the use of additional ordering add-ons or as a result of the latest technical changes.

The user is responsible for carrying out servicing and maintenance in accordance with the safety regulations in the applicable standards and all other relevant national or local regulations concerning conductor dimensioning and protection, grounding, isolation switches, overcurrent protection, etc.

The person who carried out the assembly or installation is liable for damage arising during assembly or upon connection.

1.3 Copyright

Treat the Application handbook confidentially. It is intended exclusively for persons involved with the device. It must not be made available to third parties without the written permission of the manufacturer.



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NOTE!

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1.4 Guarantee conditions

The guarantee conditions are located as a separate document in the sales documents.

Operation of the devices described here in accordance with the stated methods/ procedures / requirements is permissible. Anything else, e.g. even the operation of devices in installed positions that are not shown here, is not permissible and must be checked with the factory in each individual case. If the devices are operated differently than described here, any guarantee will be invalidated.

1.5 Customer service

Our customer service department is available for technical information.

Information concerning the responsible contact person can be obtained at any time by telephone, fax, e-mail or over the internet.

1.6 Other applicable documents

Refer to baumueller.com/download.

Instruction handbook

	Doc.-No.
Instruction handbook b maXX 5000	5.09021
Instruction handbook b maXX 5500	5.13008
Instruction handbook b maXX 6500	5.22004

Parameter manual

	Doc.-No.
Parameter manual b maXX 5000/6000	5.09022

2

CONTROL STRUCTURES

This chapter describes the structure of the servo pump function in the b maXX controller. The control model is described by using graphics.

2.1 Overview of operating pages

2.1 Overview of operating pages

Servo pump functionalities can be set in 5 ProDrive pages:

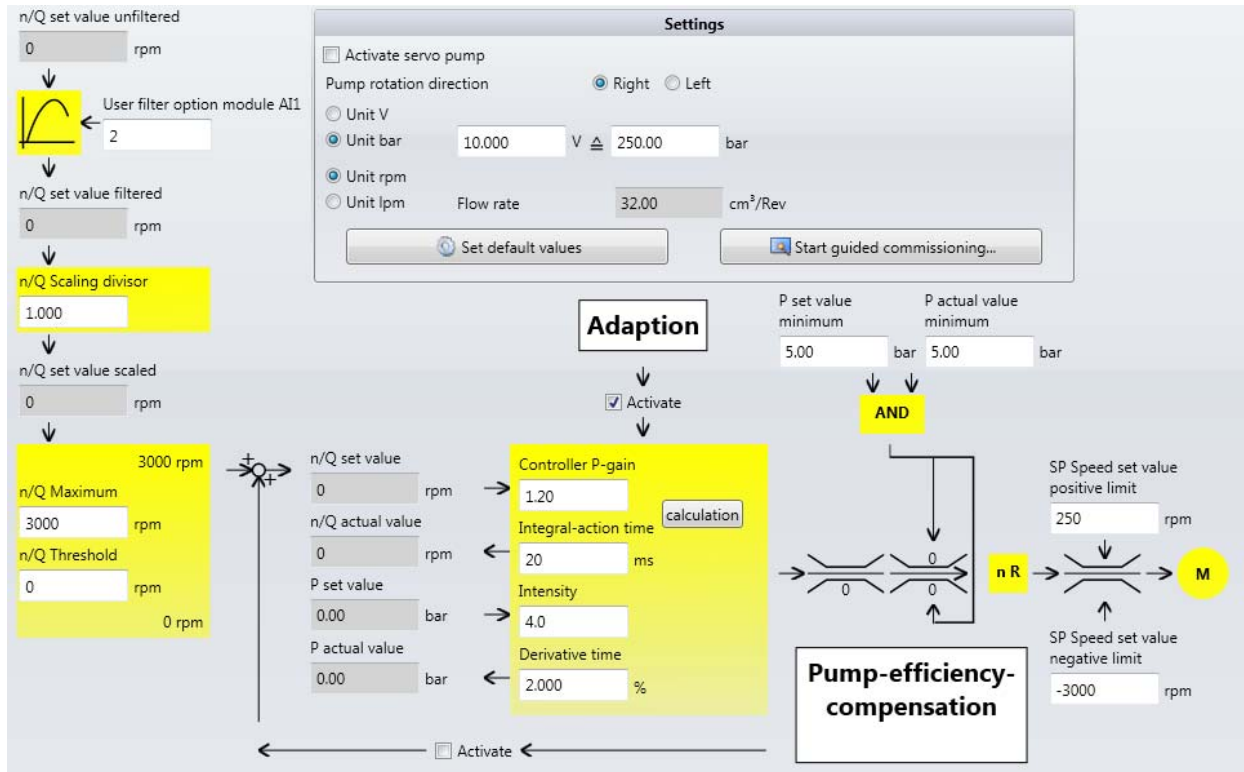


Figure 1: Servo pump V1: General

Mode		
<input checked="" type="checkbox"/> Activate adaption		
<input type="checkbox"/> Activate interpolation		
Filter order pressure controller adaption 0		
Pressure deviation	Controller P-gain	Integral-action time
0	1.00	10 ms
1	75.00 bar	8.00
2	25.00 bar	7.00
3	150.00 bar	0.00
4	25.00 bar	9.00
		30 ms

Figure 2: Servo pump V1: Adaption

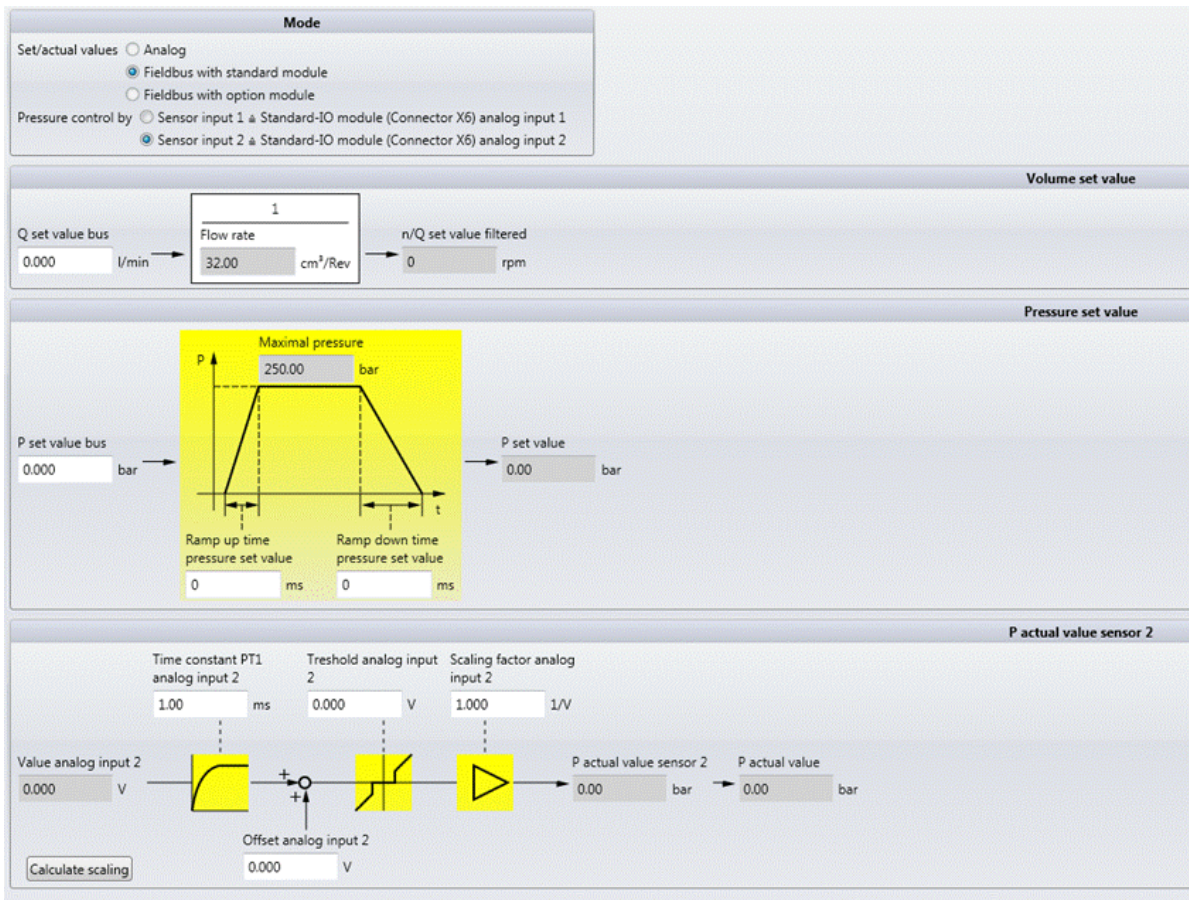


Figure 3: Servo pump V1: Set/actual values

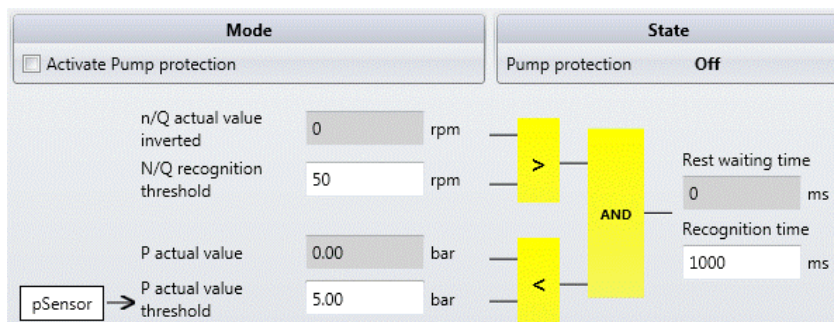


Figure 4: Servo pump V1: Pump protection

2.2 Signal processing of set values

2.2 Signal processing of set values

2.2.1 Volume set values and pressure set values via field bus

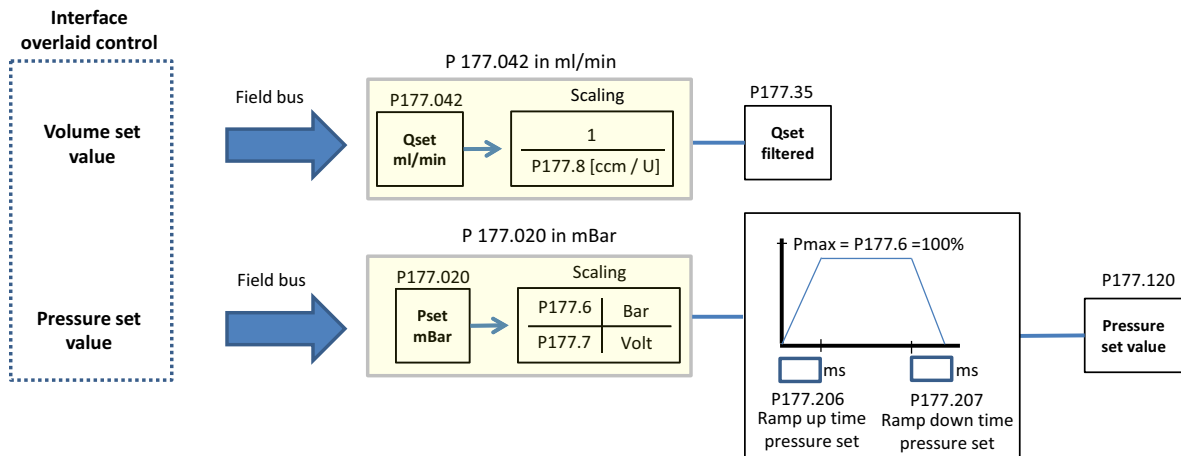


Figure 5: Set values via field bus



NOTE!

When using the speed profile "S curve" set value over and undershoots can occur! It is therefore recommended to use the default speed profile "Trapezoid" (>P110.002< Bit 4 =0) for servo pump applications.

2.2.2 Volume set values and pressure set values via analog inputs

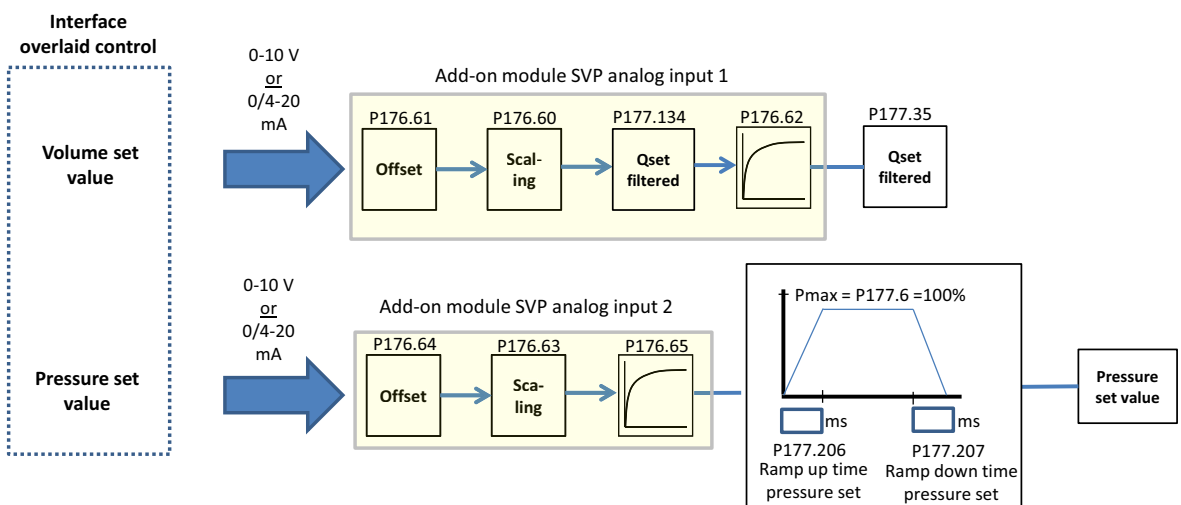


Figure 6: Set values via analog inputs

2.3 Signal processing of actual values

2.3.1 Interface pressure actual values if add-on module SVP is available

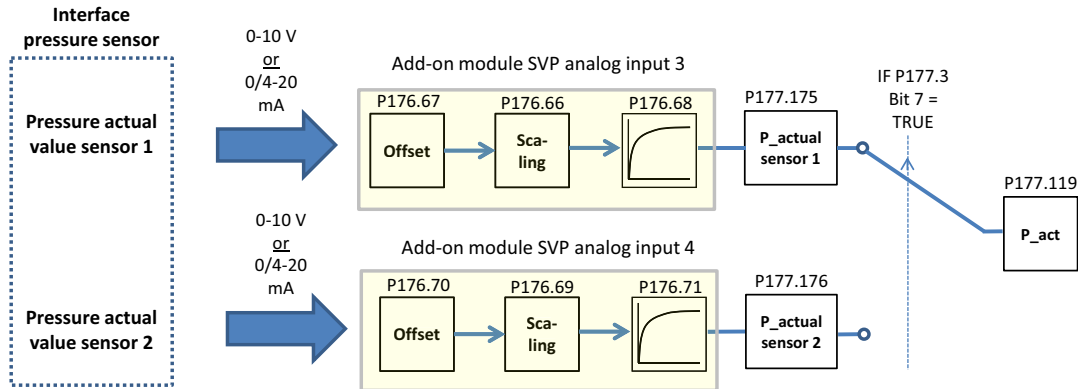


Figure 7: Pressure actual values via add-on module SVP

2.3.2 Interface pressure actual values if no add-on module SVP is available

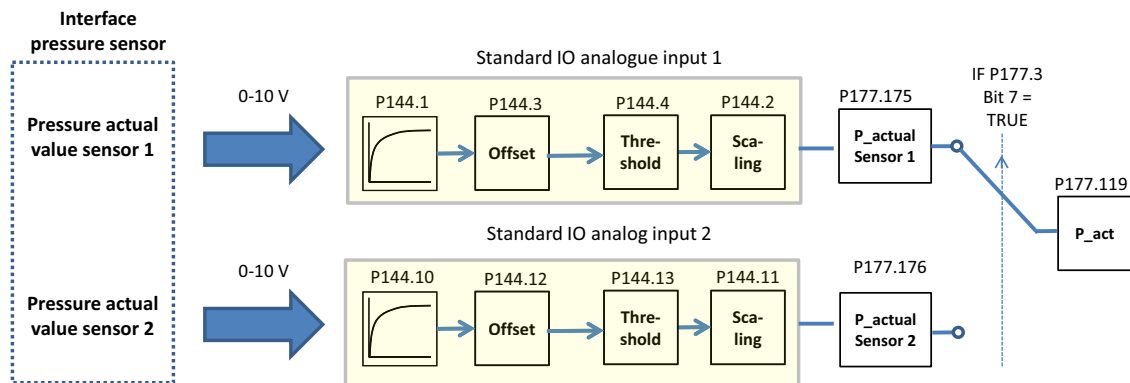


Figure 8: Pressure actual values without using an add-on module SVP

2.4 Scaling and ramps of volume set values

2.4 Scaling and ramps of volume set values

This scaling defines the scaling-relationship between the voltage-value of the Q-Set filtered ([P177.35](#)) in respect to the output drive-speed (nSet). The nSet-value is then sent to the ramp function generator (see [Ramps pressure set values](#) on page 14).

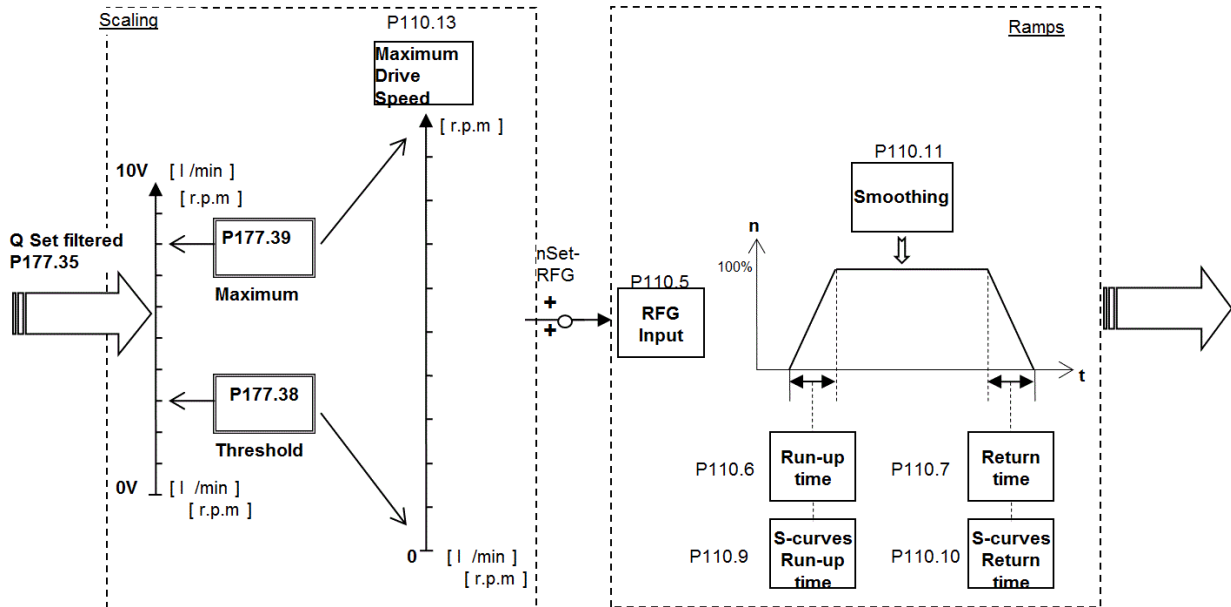


Figure 9: Scaling and ramps of volume set values

2.5 Ramps pressure set values

The Ramp function generator (RFG) generates a function with rising and falling ramps. The ramp up time can be defined in [P177.206](#) and sets the time needed to raise the pressure value to the pressure maximum value ([P177.6](#)). The ramp down time can be defined in [P177.207](#) and defines the time for the pressure falling down from 100 % to 0 %.

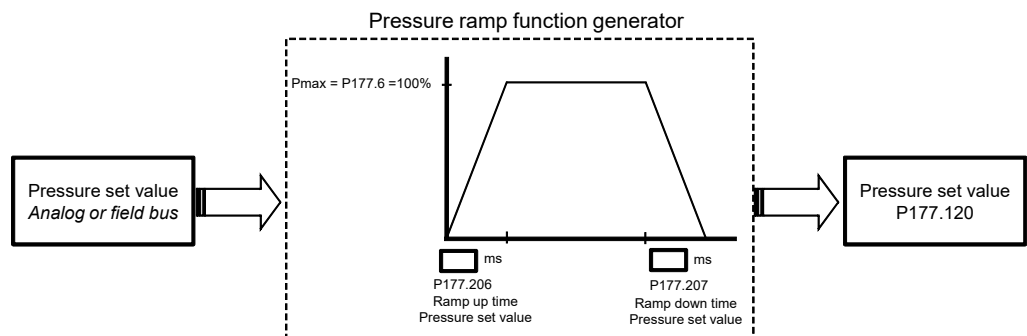


Figure 10: Pressure ramp-up and ramp-down time

2.6 Adaptation of the pressure controller parameters (kp, Tn)

Depending on control differences the pressure controller parameters can be dynamically changed during the operating time.

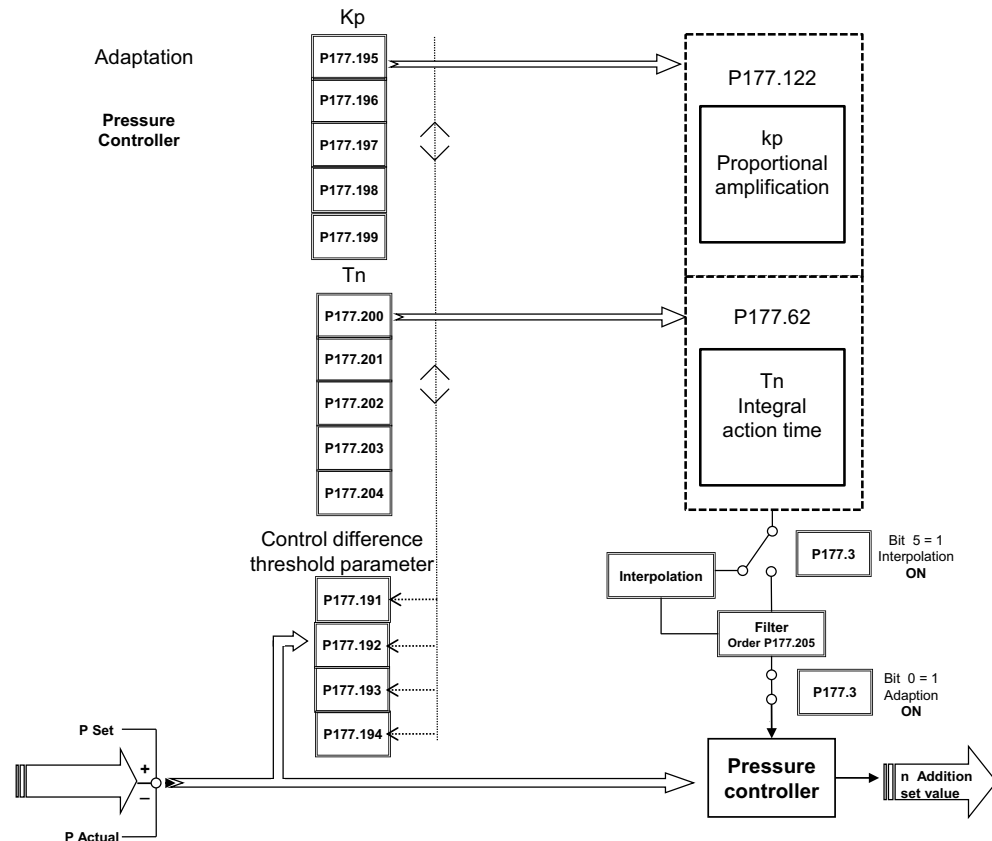


Figure 11: Adaptation of the pressure controller parameters

Enter the control differences for which there should be a change in the pressure control parameters.

The control differences must be entered in ascending order. If entered incorrectly, all parameters are set to 1111..4444 and have to be re-entered.

The other parameters assigned to the control differences such as kp or Tn can be entered.

It is possible to activate an interpolation between the values in order to provide a continuous adaptive function between all entered values.

Enable this function with bit 5 = 1 in [P177.3](#).

The filter order pressure controller adaption can be set to smooth the control deviation via [P177.205](#).

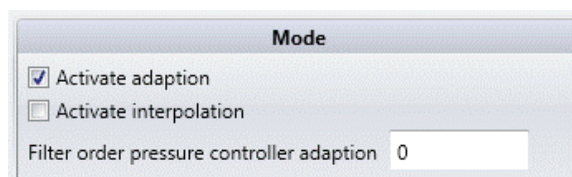


Figure 12: Activation of interpolation

2.7 Speed stop at minimum pressure values

If pressure actual value ([▶P177.119◀](#)) is smaller than P actual value minimum ([▶P177.145◀](#)) and pressure set value ([▶P177.120◀](#)) is smaller than P set value minimum ([▶P177.144◀](#)) speed limitations are set to 0. As a result in this low pressure area neither volume nor pressure controller are active.

The speed limitation is suspended, if the pressure set value is greater than P Set value minimum.

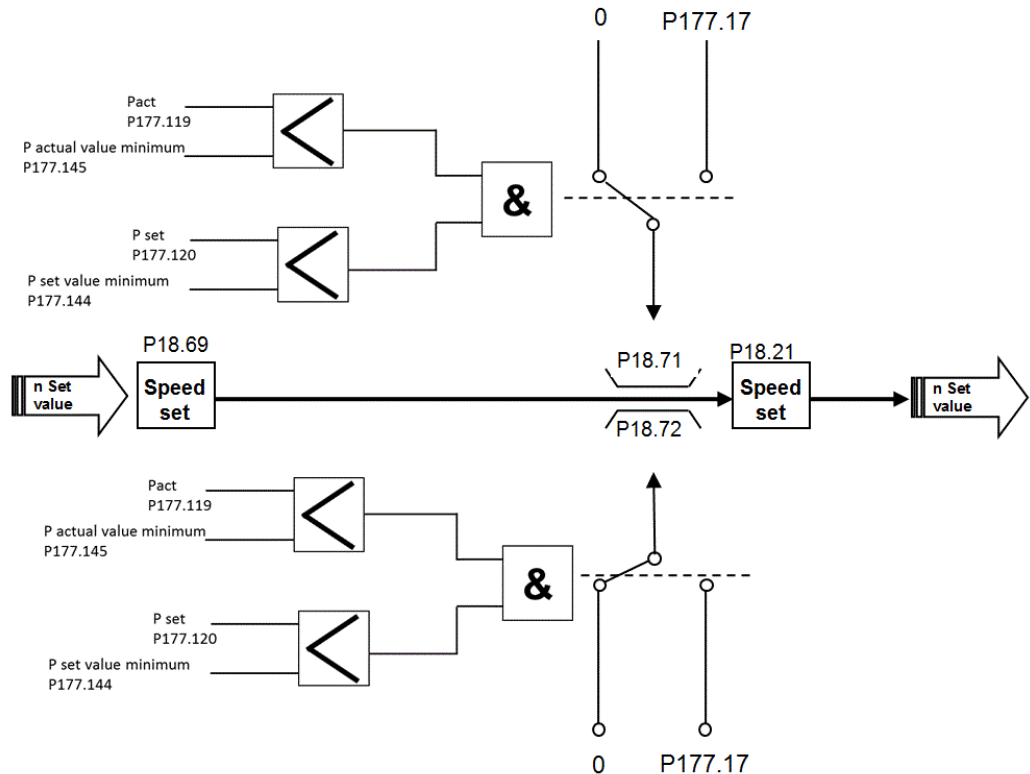


Figure 13: Speed stop at minimum pressure values

„P set value minimum“ and „P actual value minimum“ set pressure values stop the drive if actual values are falling below this threshold value

This function prevents the drive from drifting slowly during the pressure control procedure in the event of small set and actual pressure values.

The limit does not take effect until both (AND) limits have been underrun.

By setting the default values typical values were already entered.

The function is only activated in the pressure control system.

2.8 Basic pump protection

The pump protection functionality recognizes a missing oil flow or wrong rotating direction of the pump. If speed is greater than N/Q recognition threshold ([▶P177.167◀](#)), pressure actual value exceeds P actual value threshold ([▶P177.168◀](#)). If P actual is lower than the threshold drive error 1202 pump protection is generated.

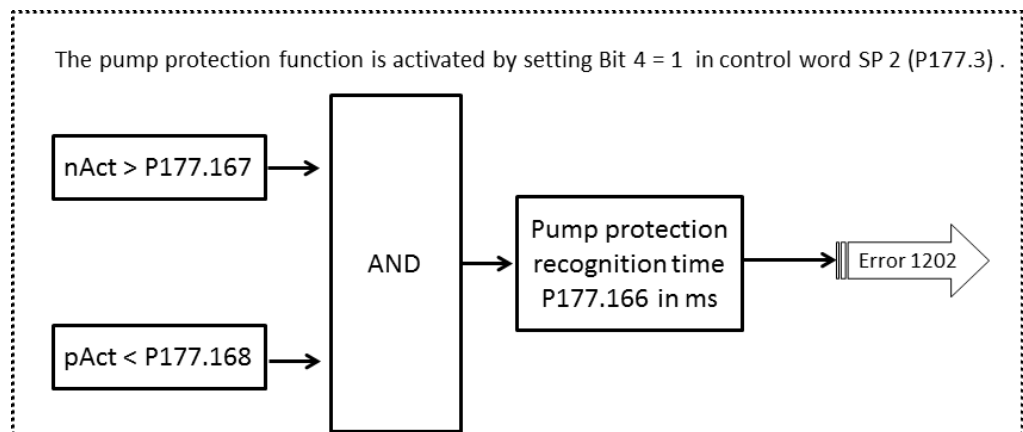


Figure 14: Pump protection

2.9 Dataset switching

Servo pump software V1 supports an online (drive enabled) switching of up to seven datasets. You can only switch to a valid dataset.

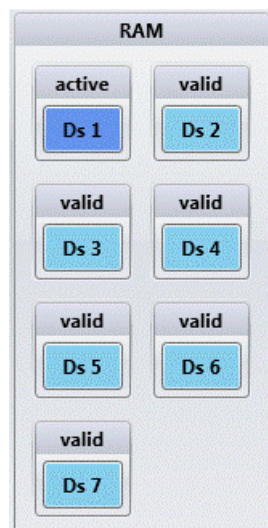


Figure 15: Dataset switching

The servo pump software V1 provides the parameter „Active Data Set“ ([▶P177.228◀](#), UINT) for switching drive datasets. This parameter can be written cyclically via field bus.

2.10 Switching pressure sensors

The servo pump software has the functionality to switch between two pressure sensors for pressure control.

If the used sensors have different pressure ranges, also scaling parameters must be adapted (dataset switch recommended).

Bit 7 in Control word 1 ([▶P177.3◀](#))

- False: Pressure control using sensor 2
- True: Pressure control using sensor 1

The default used pressure sensor has to be connected to analog input 4 of add-on module SVP or analog input 2 of standard module X6.

A second pressure sensor has to be connected at analog input 3 of add-on module SVP or analog input 1 of standard module X6.

2.11 Maximum positive speed

If the value is set to 0 rpm, the pump only rotates in an anticlockwise direction.

For quicker depressurization it may be necessary for the pump to rotate briefly in the other (clockwise) direction.

The maximum permissible (clockwise) speed must be calculated based on the pump manufacturer's documentation.

2.12 Master slave configuration

The servo pump software is capable of interacting with other drives by defining master and slave modes for each drive. Only the master drive is getting pressure- and volume set values (via fieldbus or analog) and the actual pressure value from the pressure sensor. As shown in figure 1 the slave is only following the master in speed control.

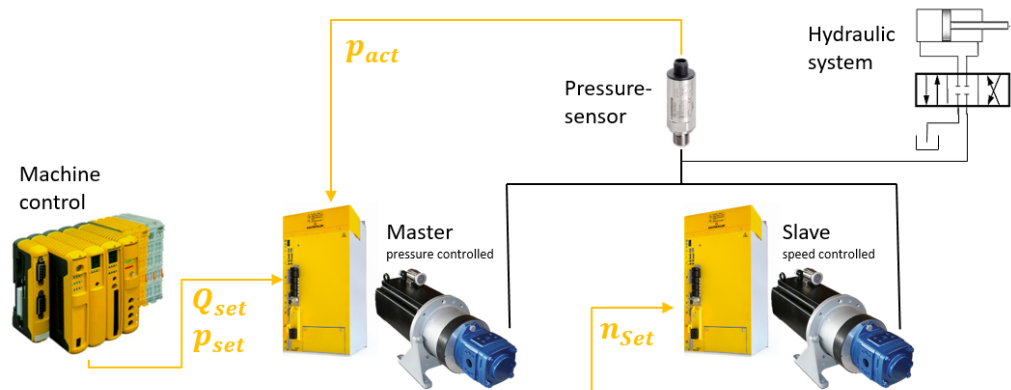


Figure 16: Connection of the pressure sensor in a master slave configuration

Attention:

The volume set value from the PLC and the master's flow rate ([▶P177.8◀](#)), which can be defined on ProDrive's general servo pump site, must always correspond together. If the flow rate ([▶P177.8◀](#)) is given by the displacement volume of one single pump, the total volume set value of all pumps, must be divided by the number of pumps, before sending it to the drive. If the flow rate ([▶P177.8◀](#)) is given by the total displacement volume of all pumps, the volume set value must also be given as the total value of all pumps.

2.12 Master slave configuration

2.12.1 Master and slave via analog inputs and outputs only

When using a master slave combination via analog inputs and analog outputs only, the master drive has to be equipped with a SVP module. The slave drive does not necessarily require a SVP module.

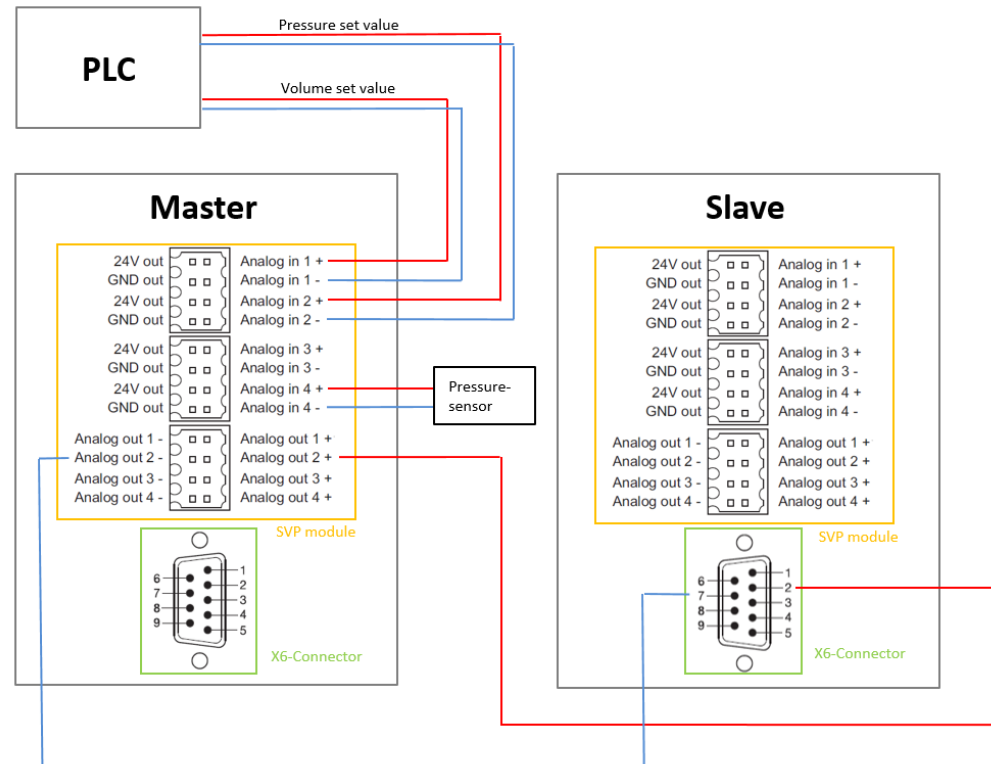


Figure 17: Connection of master and slave via analog inputs and outputs

In this configuration the master is controlling pressure and volume of the hydraulics according to analog set values, which are given by the PLC. The slave is only following the master in speed control. For this purpose the actual speed value from the master is sent directly via analog output 2 of the SVP module to the X6 analog input 2 of the slave. To enable the analog output linking of the actual values on the master, the bit 7 in Control word 3 ([▶P177.5](#)) has to be set to „1“.

The target number ([▶P144.15](#)) of the slave's analog input 2 needs to be set manually on ProDrive's analog input page. To achieve the fastest connection between master and slave the speed additional value ([▶P18.68](#)) has to be selected as target parameter. To calculate the scaling factor of the analog input 2 ([▶P144.11](#)) the „calculate scaling“ button can be used. Due to this parameter is an additional set value, the standard input value ([▶P110.5](#)) of the ramp function generator has to be set once to value „0“. In standard configuration a voltage range of -10 to 10V and a speed range from the negative max. speed to the positive max. speed ([▶P110.1](#)) of the master drive has to be used. Due to the slave is only running in speed control, it must be ensured that the servo pump is deactivated on the slave and that there is no PLC-Project running on the slave. Furthermore the checkboxes „Disable negative set values“ (Bit 0 of [▶P110.2](#)) and „Inverting input values“ (Bit 2 of [▶P110.2](#)) on the slave's ramp function generator page must be deactivated. In this configuration, it is not possible to switch master and slave roles during operation.

2.12.2 Master and slave via analog connection and set values via fieldbus

In this configuration the pressure set value ([▶P177.20◀](#)) and the volume set value ([▶P177.42◀](#)) are transferred via fieldbus to the master drive, but the speed value of the master is transferred to the slave via analog inputs and outputs.

If the master is equipped with a SVP module the connection of master and slave can be realized as given in chapter [▶Ramps pressure set values◀](#) on page 14. If the master is not equipped with an SVP module the connection of master and slave has to be carried out as shown in [▶Figure 18◀](#) on page 21, by using the master's analog output 1 of connector X6. In this case the analog output configuration must be set manually on Pro-Drive's analog output page by setting the source parameter id to the total speed set value ([▶P18.21◀](#)). To calculate the correction gain of the analog output ([▶P125.15◀](#)), the „calculate scaling“ button can be used. In standard configuration a voltage range of -10 V - +10 V and a speed range from the negative speed limit ([▶P177.215◀](#)) to the positive speed limit ([▶P177.214◀](#)) of the master drive should be used. In this configuration it is not possible to switch master and slave roles during operation.

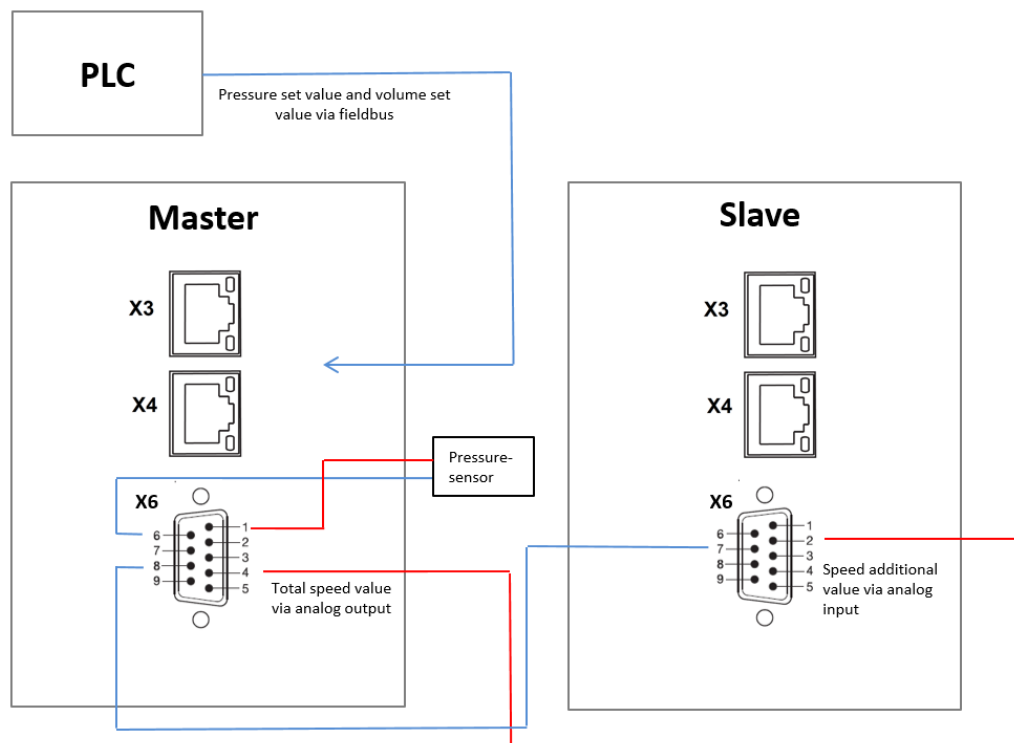


Figure 18: Connection of master and slave via analog inputs and outputs with fieldbus

2.12 Master slave configuration

2.12.3 Master and slave with fieldbus only

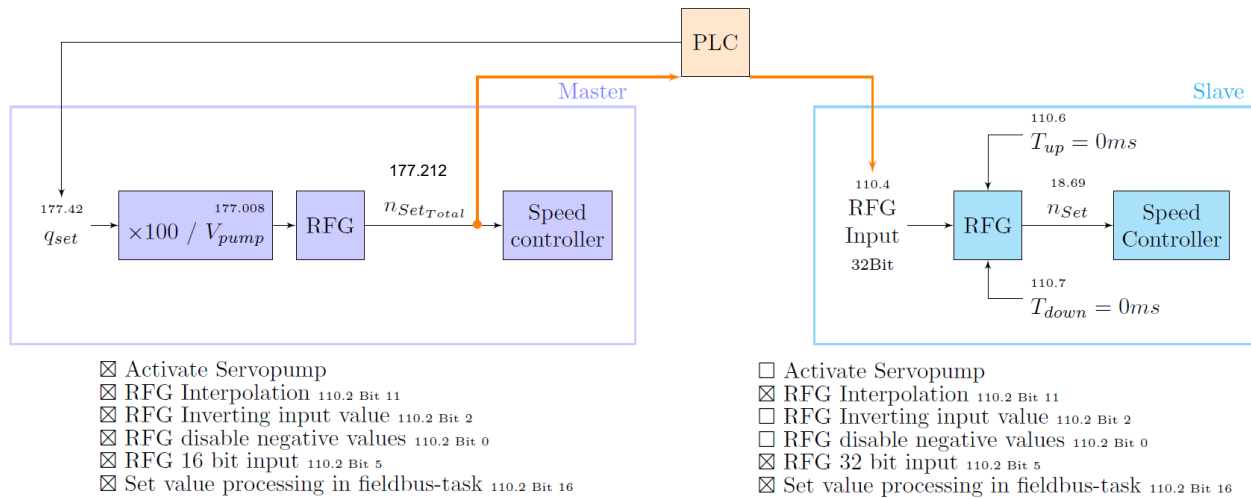


Figure 19: Parameter connection of master and slave with fieldbus only

As shown in [▶Figure 19◀](#), in this configuration the master is receiving the set values from an overlaid PLC and is sending back its total speed value ([▶P177.212◀](#)). The overlaid PLC is then sending the masters total speed value to the slave drives ramp function generator input ([▶P110.4◀](#)). The slave follows the master while bypassing its own pressure control. Due to no pressure control is running on the slave drive, the servo pump function needs to be activated on the master drive only, and must be deactivated on the slave drive (=stop SoftDrivePLC). The ramp function generator mode ([▶P110.2◀](#)) of master and slave has to be set as depicted in [▶Figure 19◀](#). In this configuration, it is not supported to switch the master and slave roles during operation.

2.13 Wire break monitoring

The wire break monitoring can detect an interruption/disconnection of the pressure sensor, when the drive is active.

- Wire break monitoring is activated by bit 8 = 1 in control word 2 ([▶P177.4◀](#)).
- The "P actual value" ([▶P177.119◀](#)) is filtered by a PT-1 filter.
- The time constant by default is 10 ms and can be set in [▶P177.160◀](#).
- If the "P actual value filtered" ([▶P177.162◀](#)) is lower than the "P actual value threshold" ([▶P177.163◀](#)) for the "recognition time" ([▶P177.164◀](#)), the wire break stops the drive after the rest time [▶P177.161◀](#) with error "wire break", code 1202.

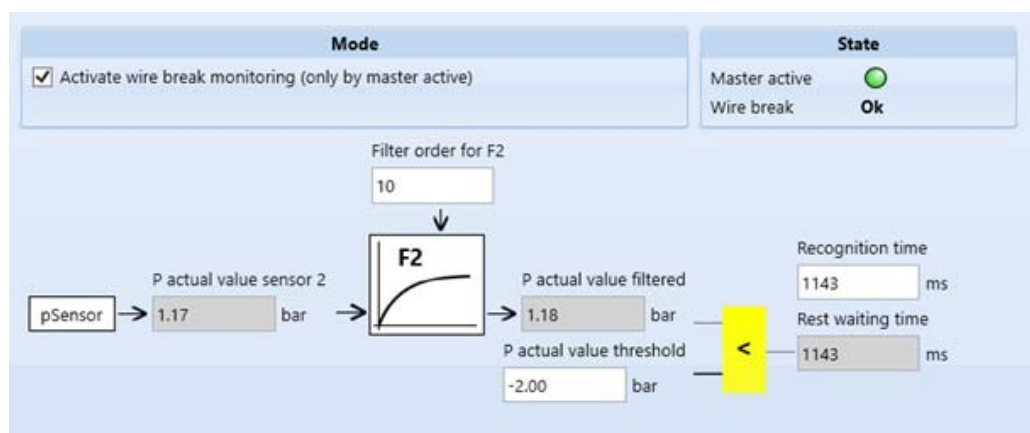


Figure 20: Wire break monitoring

In this case it is necessary to check the connection between the pressure sensor and the drive.

The recognition time counter stops and will be reset immediately as soon as the filtered pressure actual value is bigger than the pressure actual value threshold.



NOTE!

The wire break monitoring can only be used with sensors beginning with a voltage-/current-value > 0 for zero pressure.

For example: 1 - 10 V \Leftrightarrow 0 - 250 Bar

2.14 Controlled pump shutdown

Firmware Version 1.19 and newer the servo pump software is providing a controlled shut down function, that allows the servo pump by a delayed torque off to get into a defined low pressure condition before going into pulse inhibit status. This reduces the risk of an uncontrolled acceleration of the torque less pump due to a remaining back pressure.

The shut down can be enabled by bit 21 of parameter "function selection" ([▷P177.17◀](#)). It will be automatically initiated when the drive comes into the "delayed pulse inhibit condition". The "delayed pulse inhibit" drive reaction can be set for most drive error codes and as reaction for the standard commands: "Quickstop", "shutdown" and "disable operation". The assignment of the error reaction can be defined on the ProDrive page Management/Error-Reactions and the assignment of the reaction on the standard commands can be defined on the ProDrive page "Drive manager 2".

The delay time until the torque off occurs can be set via parameter "Time delay pulse inhibition" ([P108.22](#)). The set values which are present during the delay time are "P set values pulse inhibit" ([▷P177.235◀](#)) and "Q set value pulse inhibit" ([▷P177.236◀](#)).

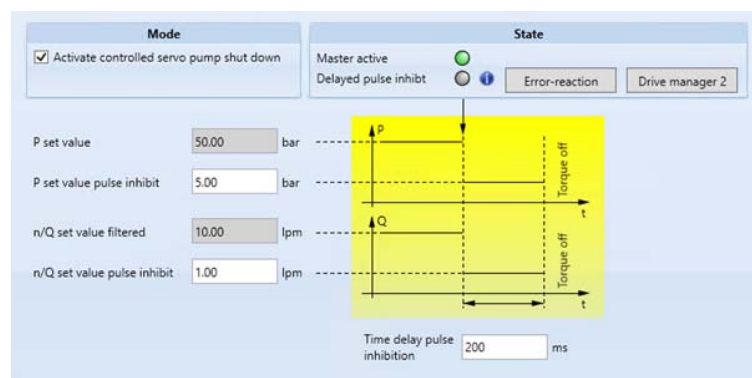


Figure 21: Controlled pump shutdown

INSTALLATION

This chapter describes the servo pump-specific controller connections. This is applicable, in particular, to the set and actual value sources.

For the connection of the b maXX 5000/b maXX 6000 device and the remaining control connections, see Instruction handbook b maXX 5000, 5.09022, b maXX 5500, 5.13008 or b maXX 6500, 5.22004.



WARNING!

All notes and in particular safety notes of the Instruction handbook b maXX 5000, b maXX 5500 or b maXX 6500 must be considered.



NOTICE!

It is important to ensure that the pump in every operating point is operated within its specifications. The limitation values for minimal-pressure, pressure-acceleration and the characteristic-lines for pressure and speed can be found in the technical documentation of the pump-manufacturer.

3.1 General information

In general there are different possibilities for reading in the set values for pressure and volume and the actual value of pressure:

- Analog
- Field bus with add-on module SVP
- Field bus with standard module X6

Furthermore a subdivision can be done depending on the signal form of analog signals. In this chapter the different possibilities are described in detail.

3.2 Reading in of pressure and volume set/actual values

3.2 Reading in of pressure and volume set/actual values

It is possible to switch the interface using the bit numbers 8 and 9 in [▶P177.3◀](#) according to the following table:

[▶P177.3◀](#) = XXXX **XXXX** XXXX XXXX

- 11 | Add-on module SVP as analog interface (see [▶page 26◀](#))
- 01 | Field bus combined with add-on module SVP (see [▶page 28◀](#))
- 10 | Field bus combined with standard analog IO X6 (see [▶page 30◀](#))

3.2.1 Add-on module SVP as analog interface

In this case the volume set value is set using analog module SVP-001-00X in slot B of the b maXX controller.

The set pressure value and actual value are also provided via analog module SVP-001-00X in slot B of the b maXX controller.

The pressure actual value can be read in from 0/4 - 20 mA or 0 - 10 V.

Overlaid Control

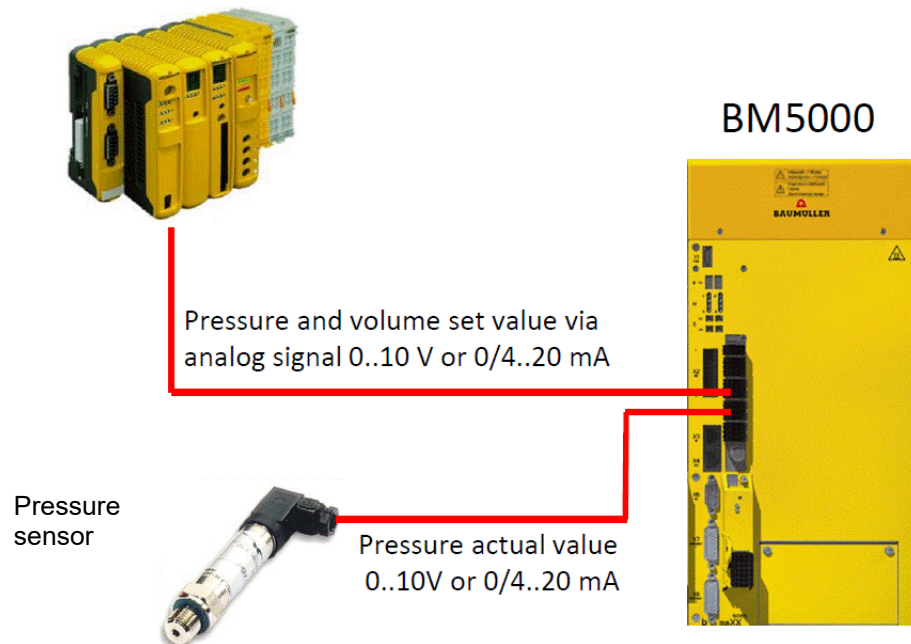


Figure 22: SVP as analog interface

Pin assignment

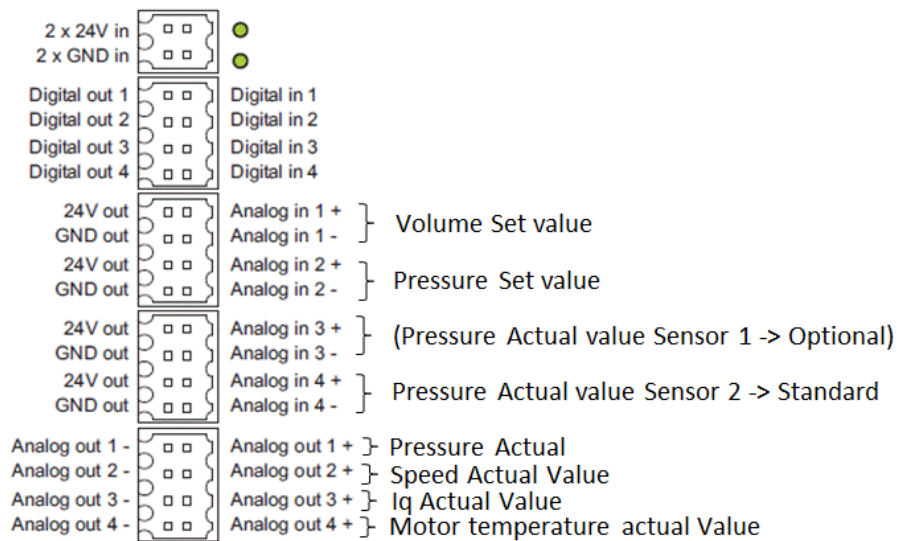


Figure 23: Pin assignment SVP-001-00X as analog interface

Depending on the used add-on module SVP the following signal forms are required:

- Volume set value interface (Analog input 1 of add-on module SVP):

SVP-001-001/2

Voltage input (0 - 10 V) ⇒ Volume set value from 0 - 10 V is required.

SVP-001-003

Current input (0/4 - 20 mA) ⇒ Volume set value from 0/4 - 20 mA is required.

- Pressure set value interface (Analog input 2 of add-on module SVP):

SVP-001-001/2

Voltage input (0 - 10 V) ⇒ Pressure set value from 0 - 10 V required.

SVP-001-003

Current input (0/4 - 20 mA) ⇒ Pressure set value from 0/4 - 20 mA required.

- Pressure actual value interface (Analog input 3 or 4 of add-on module SVP):

SVP-001-001

Voltage input (0 - 10 V) ⇒ Pressure sensor with voltage output (0 - 10 V) is required.

SVP-001-002/3

Current input (0/4 - 20 mA) ⇒ Pressure sensor with current output (0/4 - 20 mA) is required.

**NOTE!**

Add-on module SVP-001-00X requires an own 24 V-supply.

3.2 Reading in of pressure and volume set/actual values

3.2.2 Field bus combined with add-on module SVP

In the case the pressure and volume set value are set via field bus parameters:

- Volume set value interface:
>P177.42<Q Set value field bus DINT Scaling: ml/min
- Pressure set value interface:
>P177.20<P set value field bus DINTScaling: mBar

The pressure actual value is provided via analog module SVP-001-00X in slot B of the b maXX controller. The pressure actual value can be read in from 0/4 - 20 mA or 0 - 10 V.

Overlaid Control

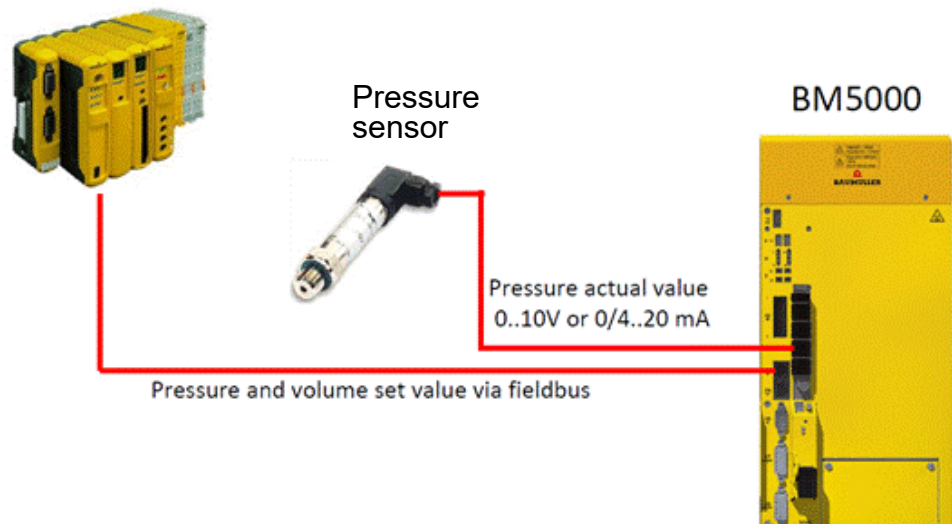


Figure 24: Field bus combined with add-on module SVP

Pin assignment

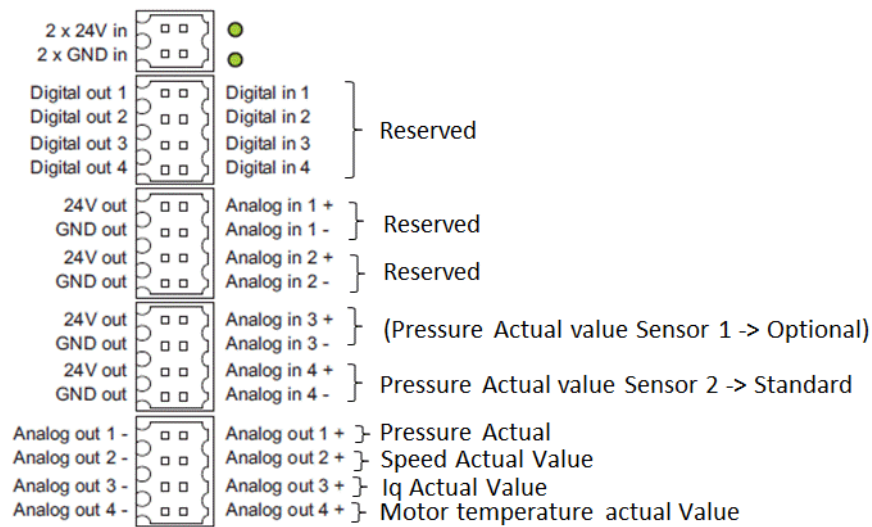


Figure 25: Pin assignment field bus combined with SVP-001-00X

Depending on the used add-on module SVP the following signal forms are required:

- Pressure actual value interface (analog input 3 or 4 of add-on module SVP):

SVP-001-001

Voltage input (0-10 V) ⇒
Pressure sensor with voltage output (0-10 V) is required.

SVP-001-002/3

Current input (0/4 - 20 mA) ⇒
Pressure sensor with current output (0/4 - 20 mA) is required.

**NOTE!**

add-on module SVP-001-00X requires an own 24 V-supply.

3.2 Reading in of pressure and volume set/actual values

3.2.3 Field bus combined with standard analog IO X6

In this case the pressure and volume set value is set via field bus parameter:

- Volume set value interface:
>P177.42<Q Set value field bus DINT Scaling: ml/min

Pressure set value interface :
>P177.20<P set value field bus DINTScaling: mBar

The pressure actual value can only be read in at analog input 1 or 2 of connector X6 range 0 - 10 V.

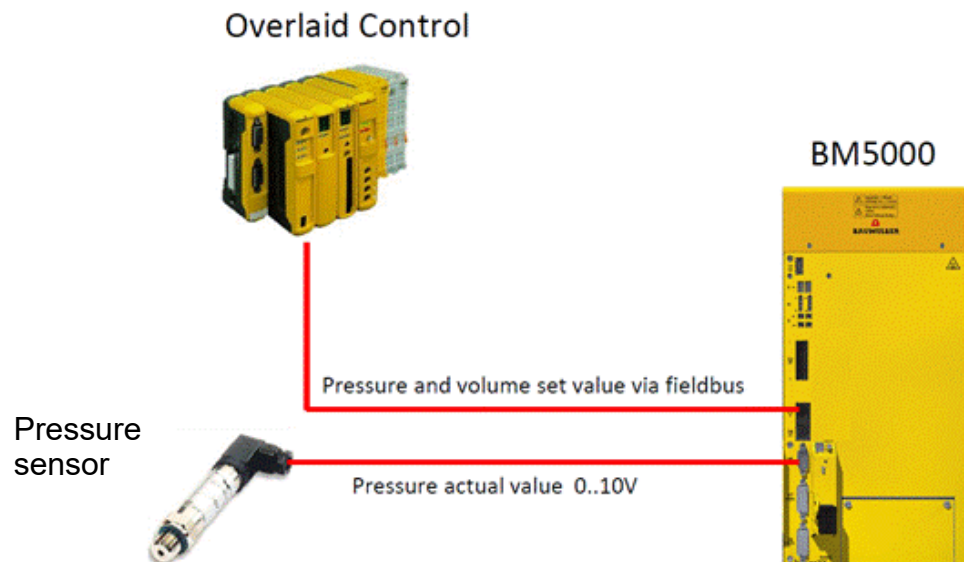


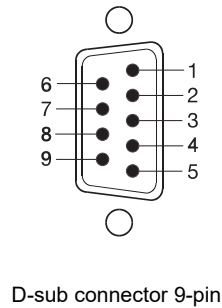
Figure 26: Field bus combined with standard analog IO X6



NOTE!

In this configuration no add-on module SVP is necessary.

Pin assignment



Pin No.	Assignment
1	Actual pressure value sensor 1 +
2	Actual pressure value sensor 2 +
3	OUT 1 -, OUT 2 -
4	OUT 1 +
5	OUT 2 +
6	Actual pressure value sensor 1 -
7	Actual pressure value sensor 2 -
8	OUT 1 -, OUT 2 -
9	OUT 1 -, OUT 2 -

Typical connection pressure sensor on standard analog IO X6 with extern 24 V supply

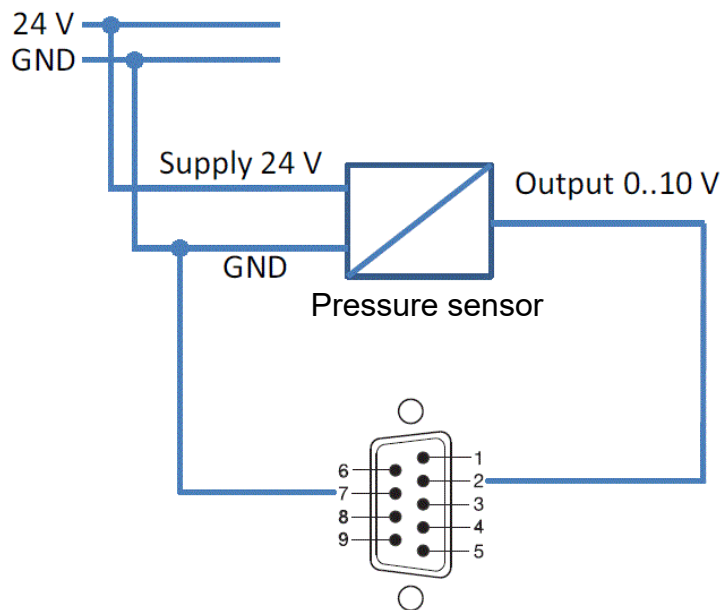


Figure 27: Typical connection pressure sensor on standard analog IO X6

3.3 Add-on module SVP (for b maXX 5000 only)

The add-on module SVP provides an I/O-extension. The add-on module SVP has to be mounted in production, it's not pluggable or can be retrofitted.

Up to now there are three types of add-on module SVP.

Module with additional analog/digital inputs/outputs,

BM53XX-XXXX-XX04

BM53XX-XXXX-XX05

BM53XX-XXXX-XX06

Types

Version	Analog in 1 / 2	Analog in 3 / 4	Analog out 1 ... 4	Digital in 1 ... 4 Digital out 1 ... 4
SVP-001-001 BM53XX-XXXX-XX04	Analog voltage inputs ± 10 V resolution 14 bit	Analog voltage inputs ± 10 V resolution 14 bit	4 analog voltage outputs ± 10 V resolution 12 bit	4 digital inputs 24 V /
SVP-001-002 BM53XX-XXXX-XX05	Analog voltage inputs ± 10 V resolution 14 bit	Analog current inputs (0) 4...20 mA resolution 14 bit		4 digital outputs 24 V
SVP-001-003 BM53XX-XXXX-XX06	Analog current inputs (0) 4...20 mA resolution 14 bit	Analog current inputs (0) 4...20 mA resolution 14 bit		

The add-on module is required at servo pump systems with

- Analog set value interface or
- Pressure sensor with current interface or
- High precision applications

With a SVP module manual firmware updates can only be done within the scope of compatibility. The following table shows an overview of the SVP module compatibility:

Firmware Version	SVP option module
Lower than 1.15.4	SVP-001-00X-0100
from 1.15.4	SVP-001-00X-0200

Digital inputs/outputs

Evaluation:	edges, programmable
Input current (per input):	2 mA digital input
Time delay input:	max. 4 ms,
Level:	Low (0 ... 5 V); High (12 ... 28 V)
Output current of each output:	max. 500 mA
Electrical isolation:	optocoupler
Short circuit proof:	current limited, switch-off via temperature

Analog outputs

Resolution	12 bit
Output voltage	-10 V to +10 V
Output current max.	1 mA
Updating rate	125 μ s
Short circuit proof	limited, max. 10 s

Analog inputs

	Voltage input	Current input
Resolution	14 bit	
Type	differential input	
Input resistance	ca. 50 k Ω	ca. 100 Ω
Input current	max. 250 μ A	min. (0) \rightarrow 4 A, max. 20 mA
Input voltage	-10 V to +10 V	max. 2 V
Sampling rate	125 μ s	
Power supply encoder	max. 250 mA per connection	

**NOTE!**

The connections of the cables of the analog channels must be done shielded.
Blade terminals with 6.3 mm width are available for connecting the shields.

3.3 Add-on module SVP (for b maXX 5000 only)

Pin assignment The pin assignment of the add-on module SVP is hard coded in servo pump software and cannot be changed:

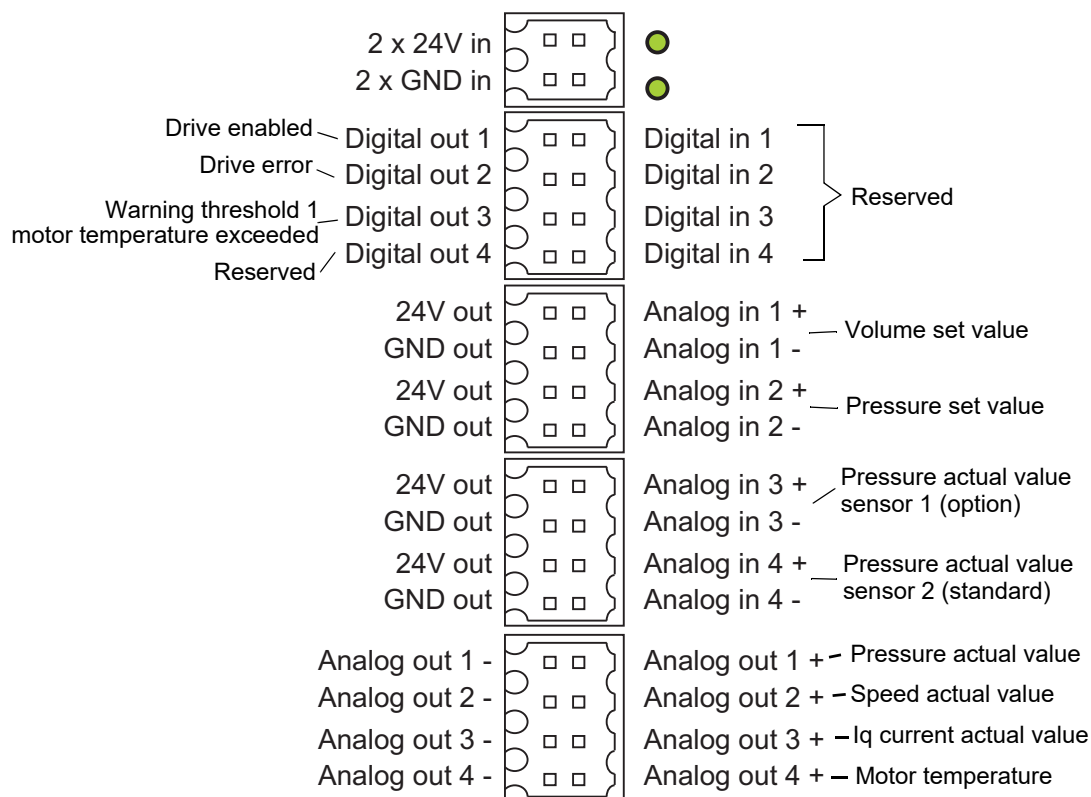


Figure 28: Pin assignment SVP

All analog inputs/outputs must be released via the SVP module mode [▶P176.1◀](#). In the analog input mode [▶P176.2◀](#) an oversampling can be set and furthermore the range of current signal (0 - 20 mA or 4 - 20 mA) can be selected.

In the following table is defined which add-on module is required regarding set and actual value signal form.

Set values pressure and volume			Pressure actual value		Required add-on module SVP	Resolution pressure actual value	Dataset setting
Field bus	Voltage 0 – 10 V	Current 0/4 - 20 mA	Voltage 0 – 10 V	Current 0/4 - 20 mA			
x			x		-	12 Bit	Field bus with standard module X6
x			x		SVP-001-001	14 Bit	Field bus with add-on module SVP
x				x	SVP-001-002/3	14 Bit	Field bus with add-on module SVP
	x		x		SVP-001-001	14 Bit	Analog
	x			x	SVP-001-002	14 Bit	Analog
		x		x	SVP-001-003	14 Bit	Analog

3.3.1 Connection pressure sensor with current interface

Connection example for a pressure sensor with current output (2-wire version):

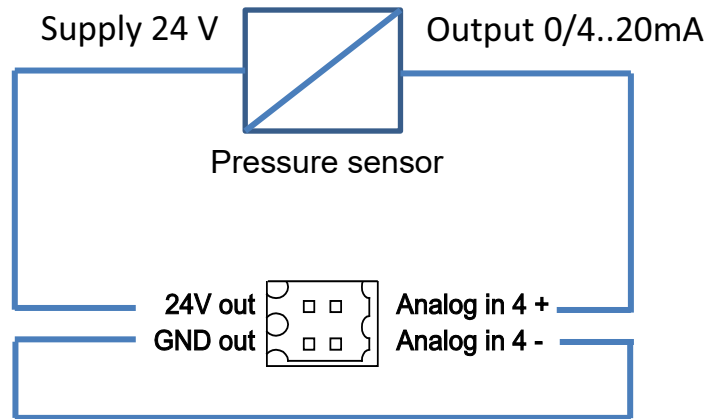


Figure 29: Typical connection pressure sensor with current interface

The 24 V supply of pressure sensor is directly supplied by the add-on module SVP.

3.3.2 Connection pressure sensor with voltage interface

Connection example for a pressure sensor with voltage output (3-wire version):

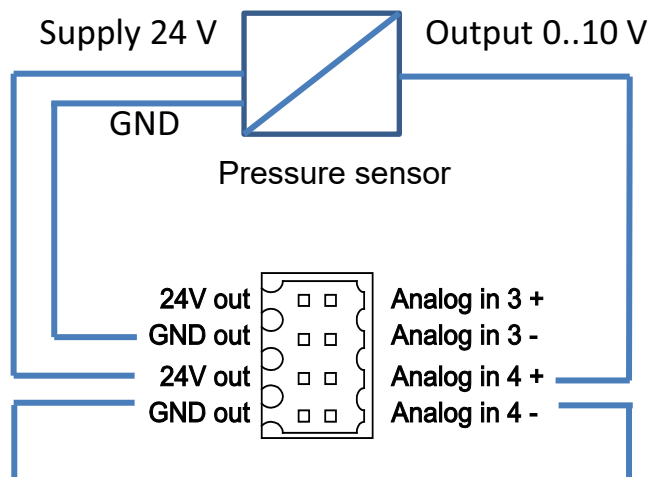


Figure 30: Typical connection pressure sensor with voltage interface

The 24 V supply of pressure sensor is directly supplied by the add-on module SVP.

3.3 Add-on module SVP (for b maXX 5000 only)

GUIDED COMMISSIONING

This chapter describes the guided commissioning function of the servo pump in the b maXX 5000 or b maXX 6500. The guide is described using graphics and a short of explanation.

4.1 Start

- Start the guided commissioning by clicking on „Start guided commissioning“ at the „Applications → Servo pump V1 → SP v1 general“ tab.

Follow this assistant.

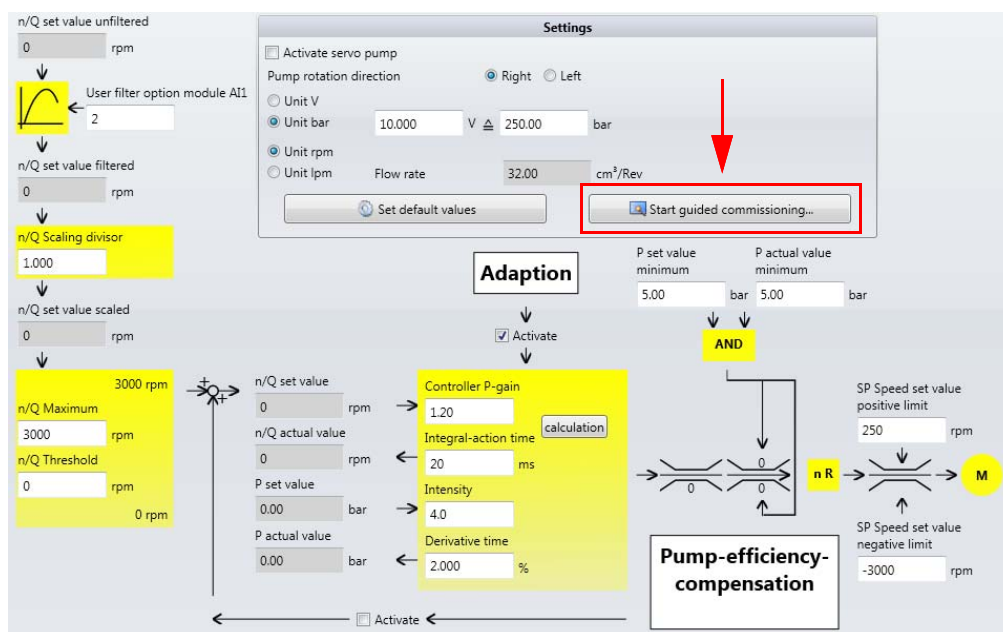


Figure 31: Servo pump start guided commissioning

- ▶ Select the desired add-on to begin the commissioning.

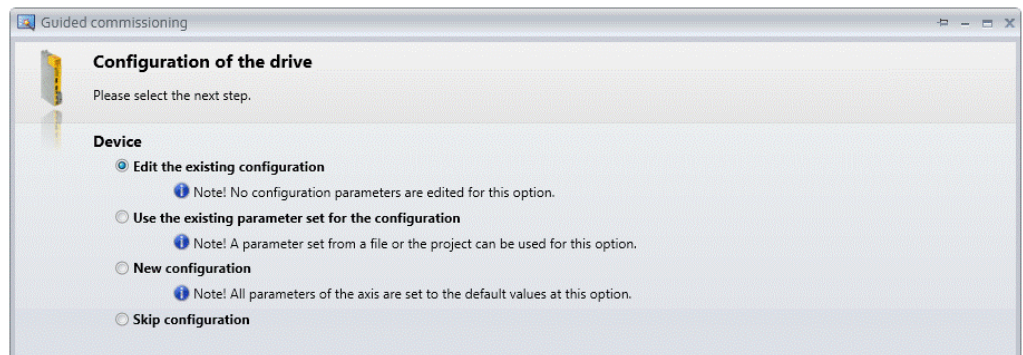


Figure 32: Guided commissioning: First window

- ▶ Click on „Continue“

- Device data:** The actual drive-type.
- PWM frequency:** Select the desired PWM frequency for running the motor.
- DC link voltage:** Shows you the actual DC link voltage.

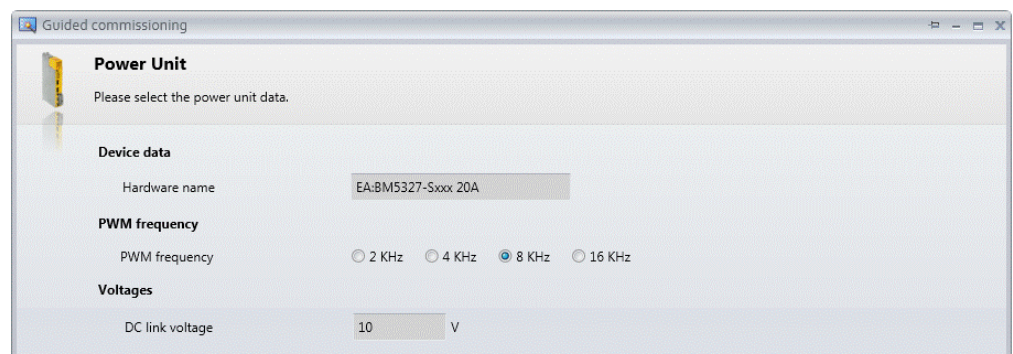


Figure 33: Guided commissioning: Power unit

- ▶ Click on „Continue“

- ▶ Select the used encoder type by clicking on „Encoder database“. Please ensure you select the right encoder to prevent any damage to the used encoder due to overvoltage.

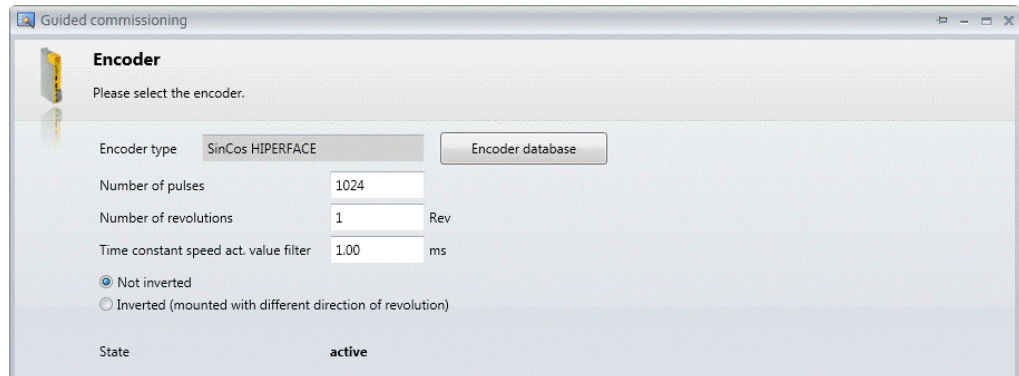


Figure 34: Guided commissioning: Selecting the encoder

- ▶ Click on „Continue“
- ▶ Select a motor either from the „Motor database“ or enter motor data manually if your motor is not listed in the database.

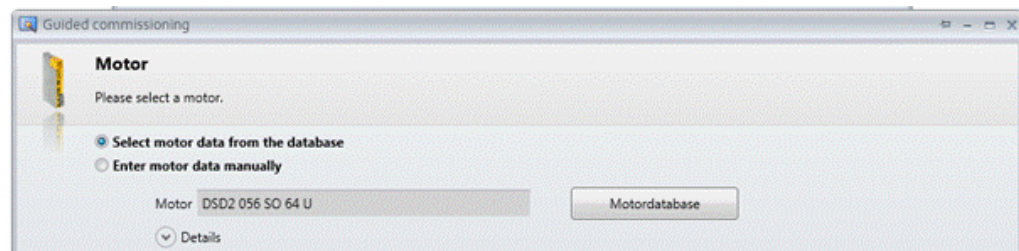


Figure 35: Guided commissioning: Selecting the motor

- ▶ Click on „Continue“
- ▶ If connected, select the type of temperature sensor connected to the controller and check values.

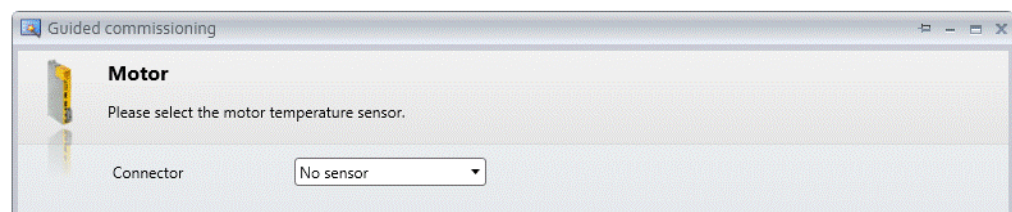


Figure 36: Guided commissioning: Selecting the temperature sensor

- ▶ Click on „Continue“
- ▶ Check, and if necessary change values.



NOTE!

It is advised to set the „**Speed set value positive limit**“ on beginning to zero, to prevent any damage on the servo pump.

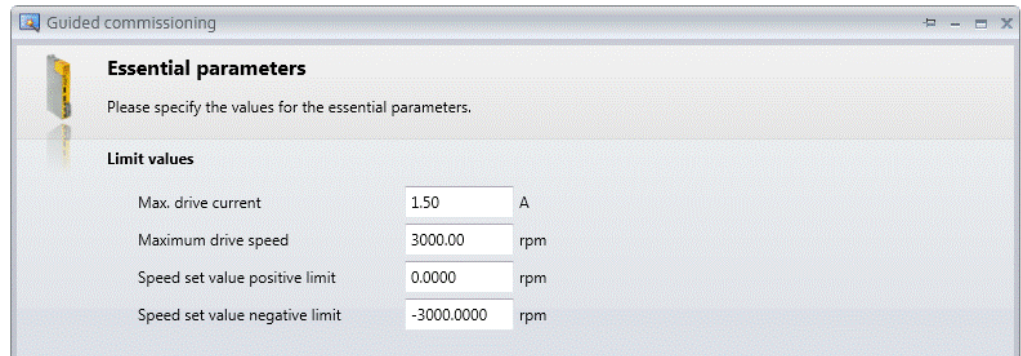


Figure 37: Guided commissioning: Essential parameter settings

- ▶ Click on „**Continue**“

- ▶ If known, set the load inertia.
 Set the controller settings to „**hard**“.
 The controller calculates the Kp, Tn and Ks values which can be accepted by clicking on „**Download data**“.

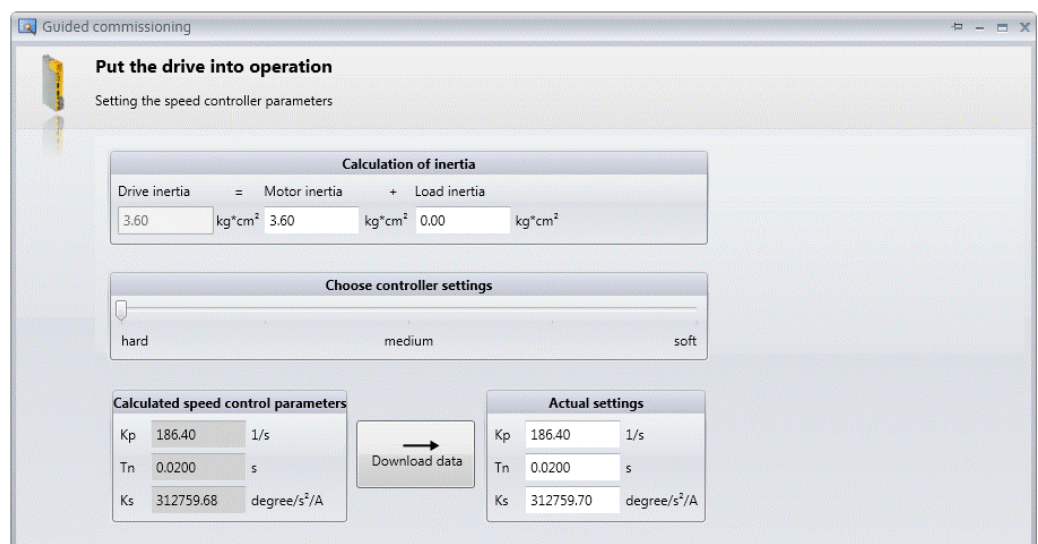


Figure 38: Guided commissioning: Speed controller parameters

- ▶ Click on „**Continue**“

- Click on „Accept operator's control“ and click on „Yes“ on the occurred dialog.



Figure 39: Guided commissioning: Operator's control

- Click on „Continue“
- Click on „Reset errors“ if necessary (errors displayed under „Error“).

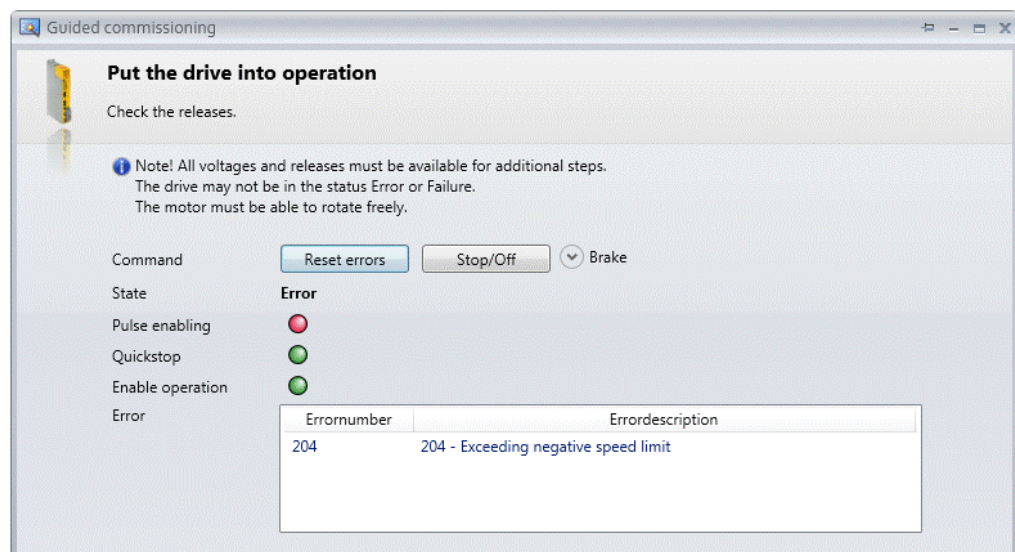


Figure 40: Guided commissioning: Check the releases

- Click on „Continue“

- Click on „**Start**“ to begin the Self-optimization of the current controller.
The stator resistance, inductance Lq and the inductance Ld of the motor is measured.
Wait until the measurement is done.

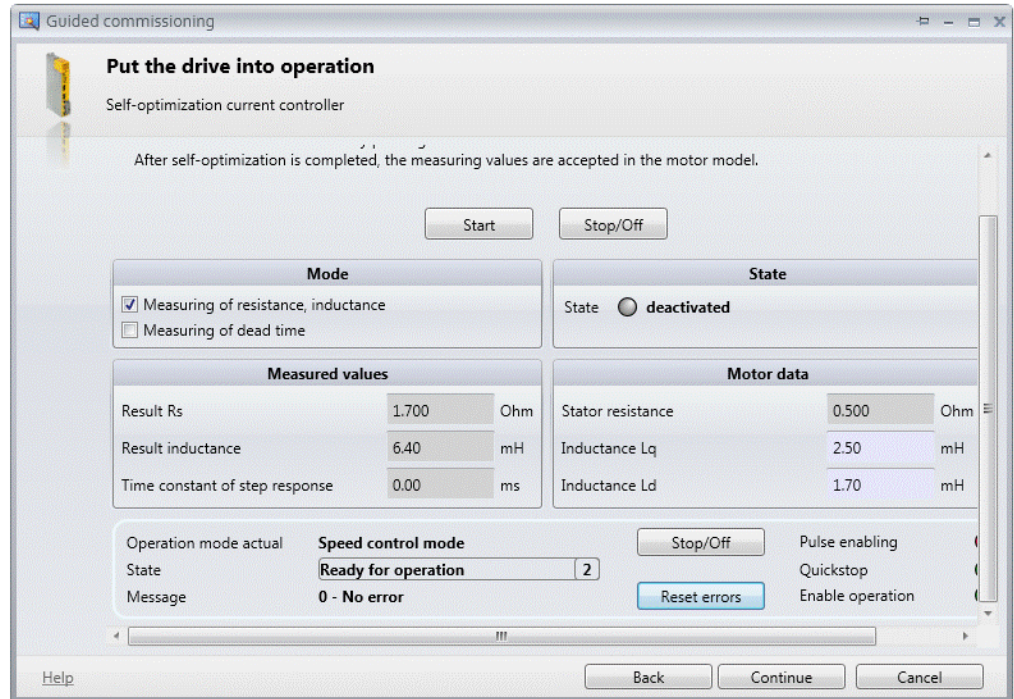


Figure 41: Guided commissioning: Self-optimization

- Click on „**Continue**“

- Find the notch position if not known.
Click on „**Start**“ and wait until the notch position has been found.

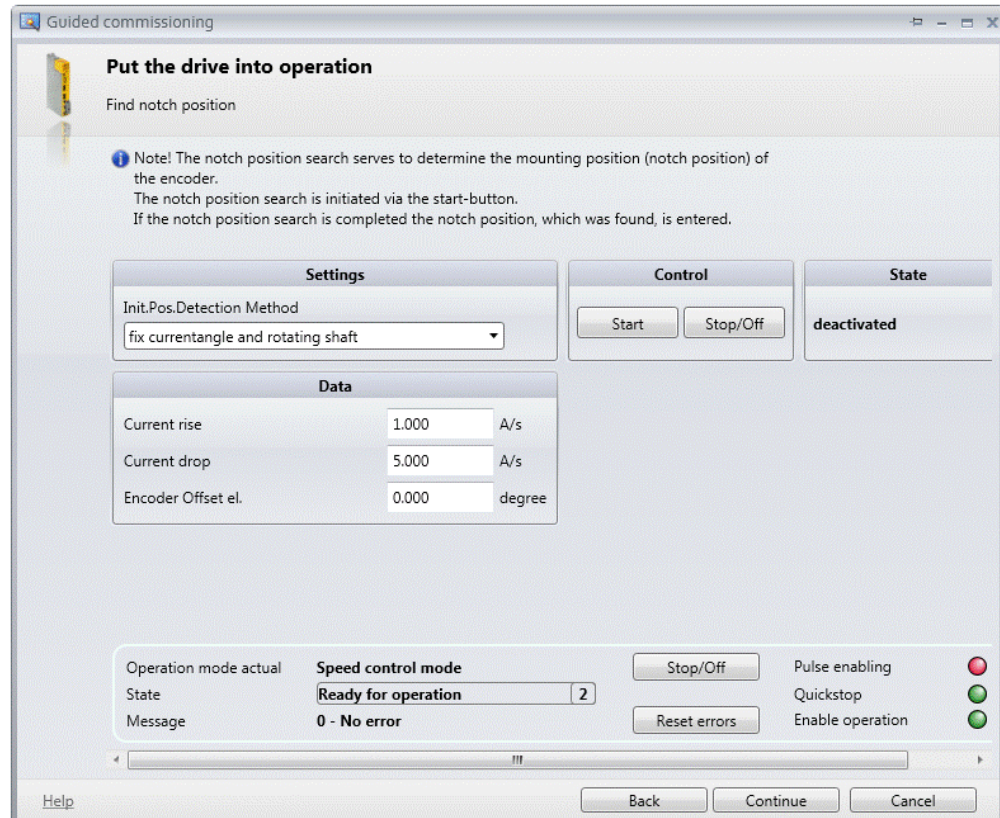


Figure 42: Guided commissioning: Finding the notch position

- Click on „**Continue**“

- ▶ Check now whether the motor is rotating or not.



NOTICE!

Make sure that the valves are turned in the way that the pump delivers directly into the tank. Otherwise damage may occur.

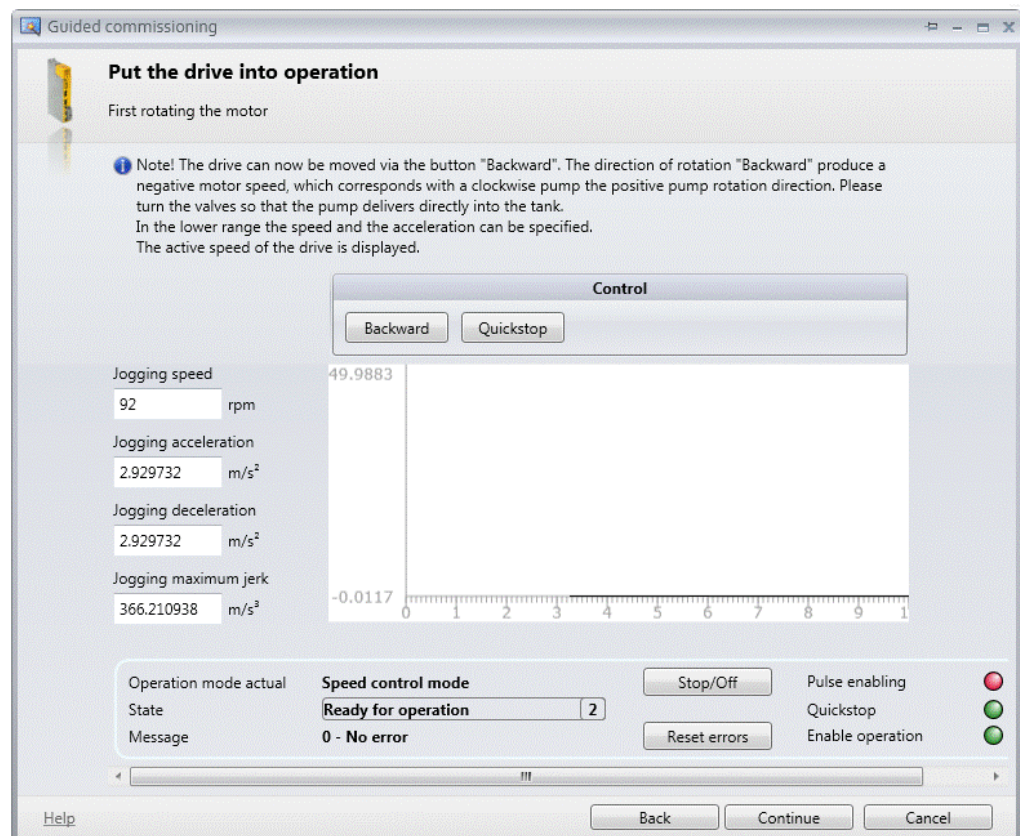


Figure 43: Guided commissioning: Rotating the motor

- ▶ Click on „Continue“

- ▶ Click on „**Activate servo pump**“.
Check whether the PLC state is running (green) or not.
- ▶ If there are any error's, please contact the Application-Department of Baumüller.

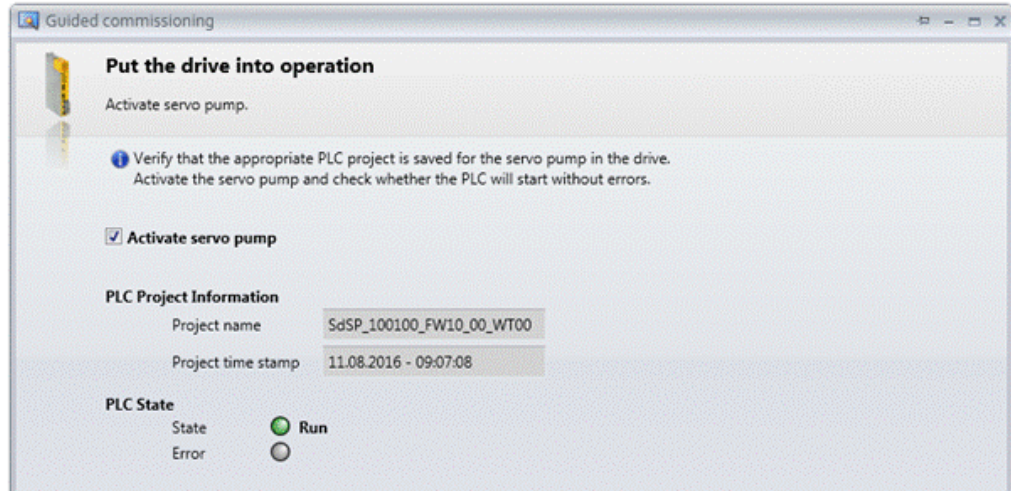


Figure 44: Guided commissioning: Activate the servo pump

- ▶ Click on „**Continue**“
- ▶ Set the pressure range for the pressure sensor and the flow rate of the pump.

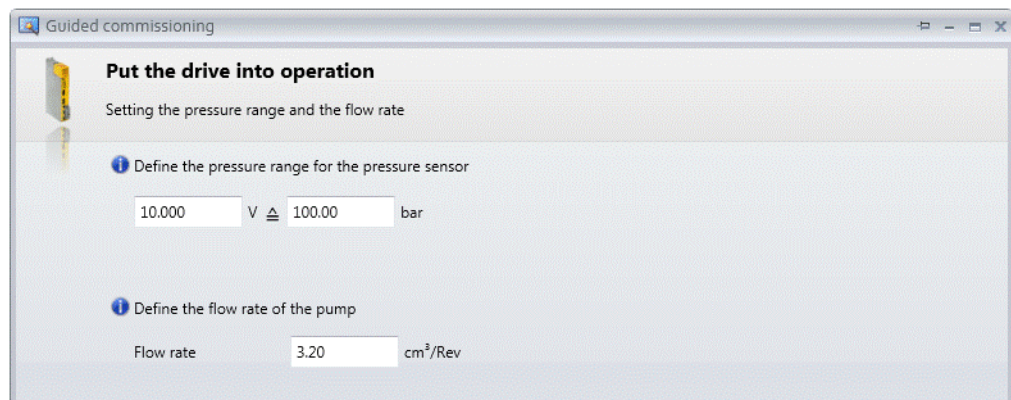


Figure 45: Guided commissioning: Pressure range and flow rate

- ▶ Click on „**Continue**“

- Set here the „SP Speed set value positive limit“ and the „SP Speed set value negative limit“.

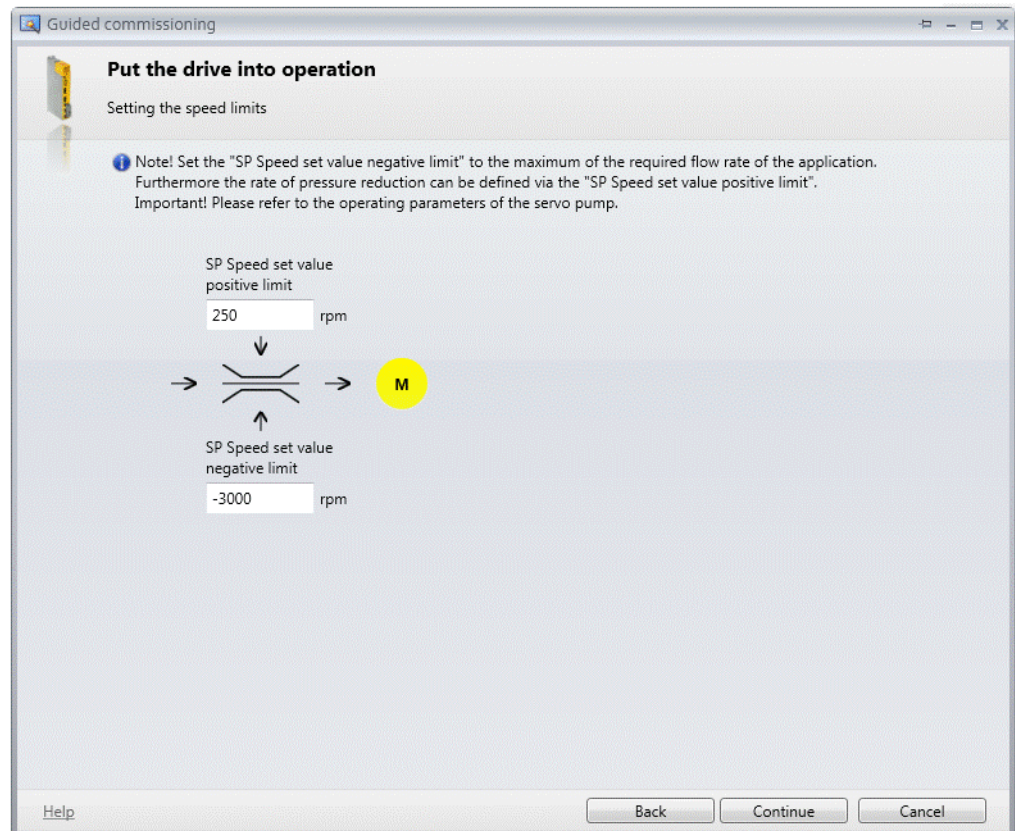


Figure 46: Guided commissioning: Speed limits

- Click on „Continue“

- Select the set value and actual value interface

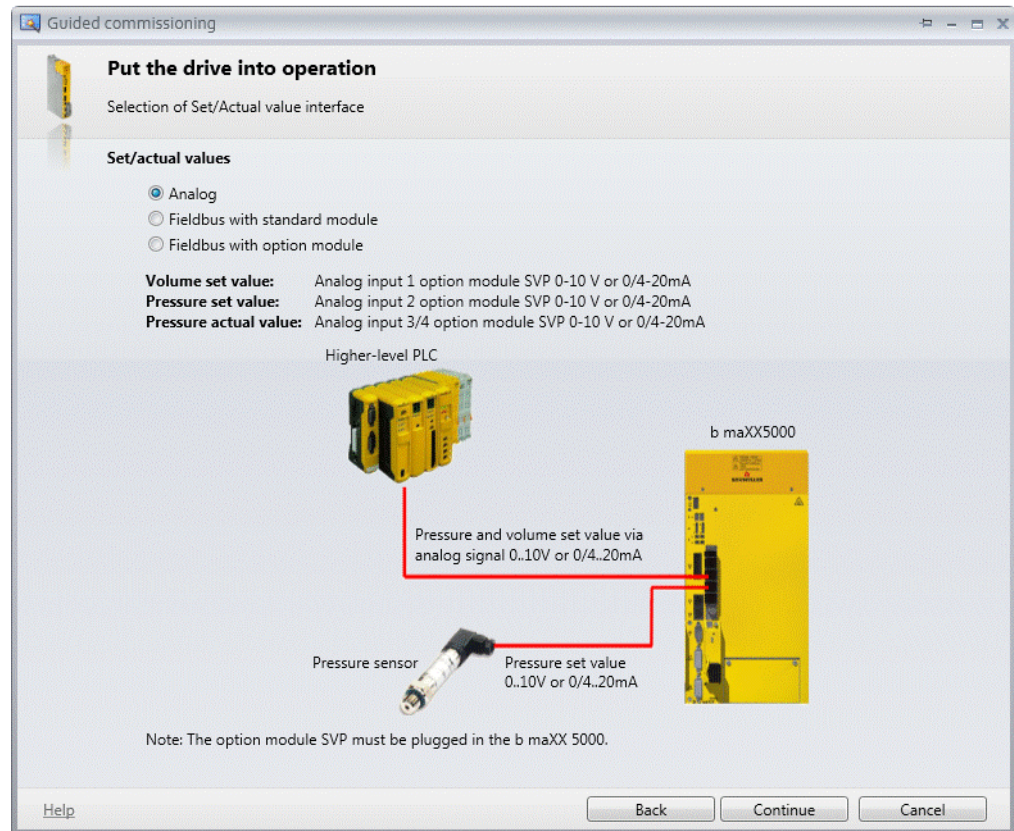


Figure 47: Guided commissioning: Set value and actual value interface

- Click on „Continue“
- If your choice is „Analog“, continue reading [▶page 51◀](#).

4.2 Commissioning set /actual values via fieldbus

- Select „**Synchronizing off or on**“ as needed and set the Fieldbus values depending on your application.

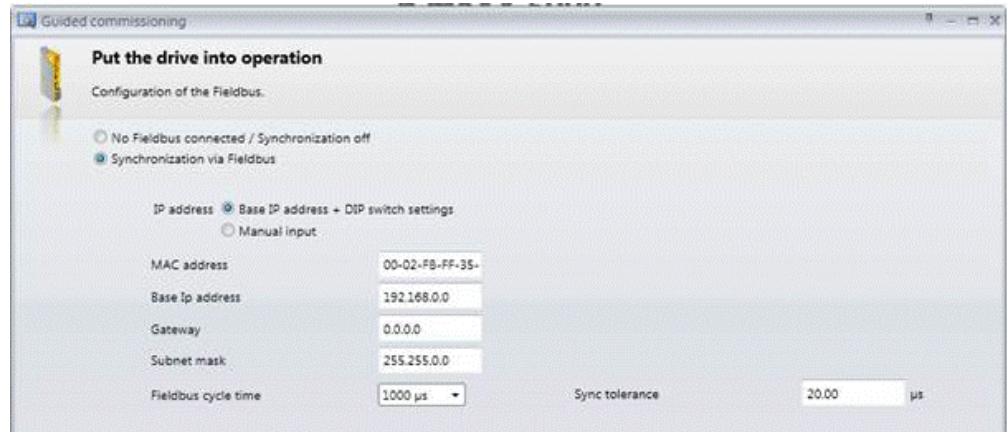


Figure 48: Guided commissioning: Fieldbus configuration

- Click on „**Continue**“
- Check the fieldbus process data mapping.

Set values			Actual values		
Control word 1	0x0006	108.001.0.0	Status word 1	0x0437	108.003.0.0
Q set value bus	6.138	l/min 177.042.0.0	x2 speed actual value	-133.2382	rpm 018.022.0.0
P set value bus	12.121	bar 177.020.0.0	I _{sq} actual value	-2.49	A 047.003.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0
switched off		000.000.0.0	switched off		000.000.0.0

Figure 49: Guided commissioning: Data mapping

- Click on „**Continue**“

- ▶ Reset the operator's control by clicking on it.

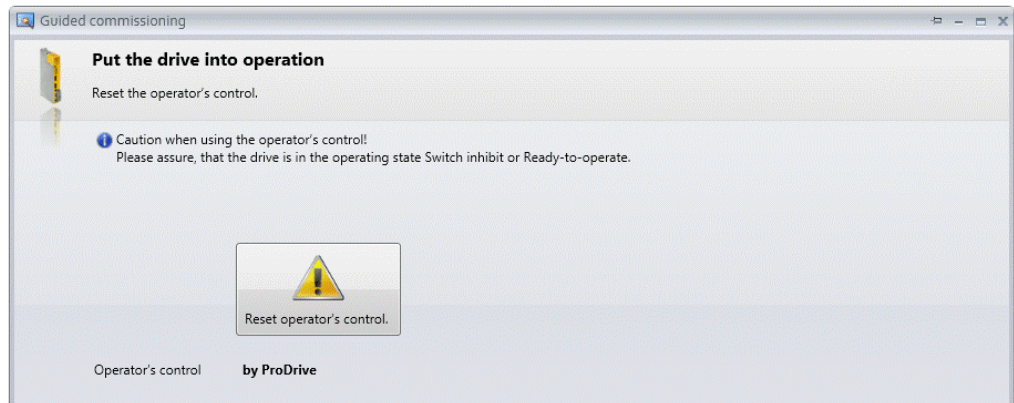


Figure 50: Guided commissioning: Operation control

- ▶ Click on „Continue“

- ▶ Set the scaling of the volume set value.

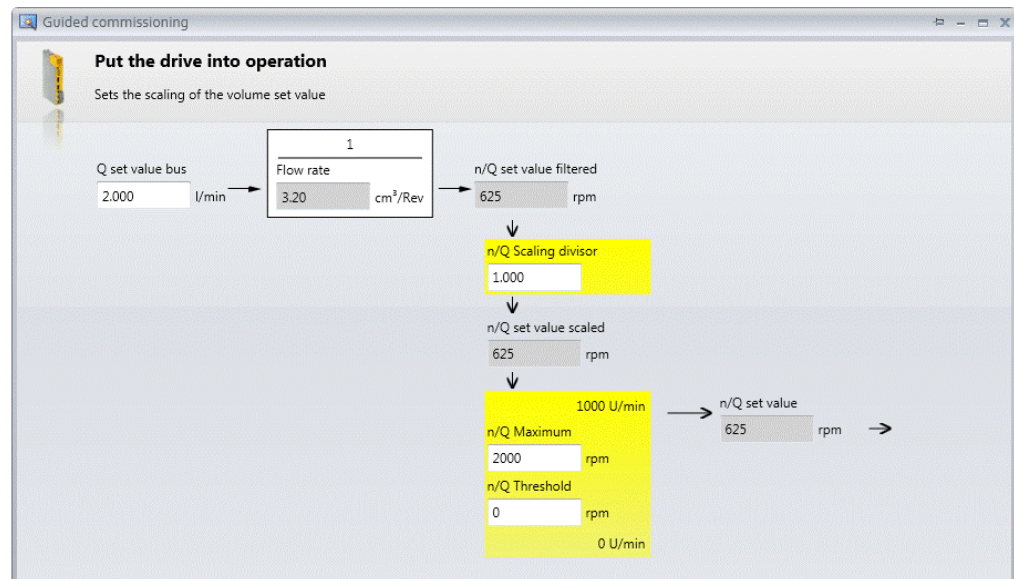


Figure 51: Guided commissioning: Scaling volume set value

- ▶ Click on „Continue“

4.2 Commissioning set /actual values via fieldbus

- ▶ Set the scaling of the pressure set value.

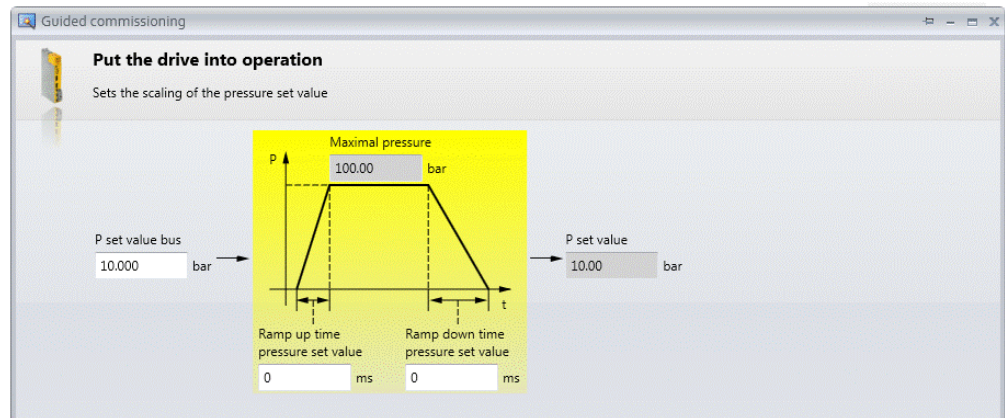


Figure 52: Guided commissioning: Scaling pressure set value

- ▶ Click on „Continue“

If you have set either „Fieldbus with standard module“ or „Fieldbus with add-on module“, continue reading [▶page 53◀](#).

4.3 Commissioning set /actual values via analog interface

- ▶ Set the scaling of the „Volume set value“.

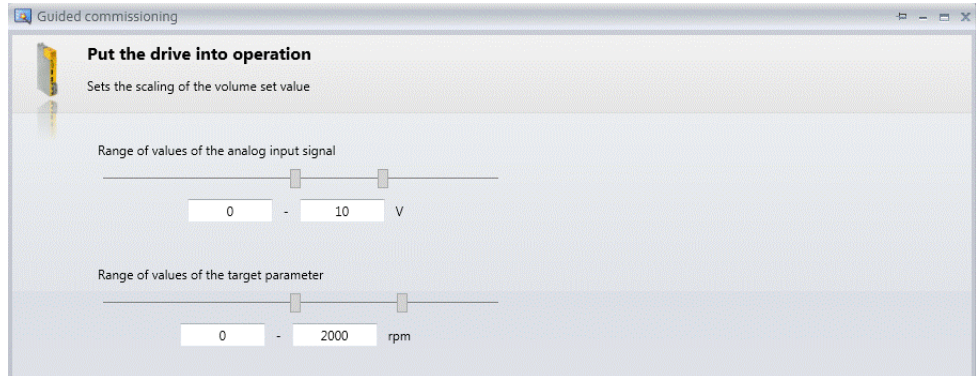


Figure 53: Guided commissioning: Scaling pressure set value

- ▶ Click on „Continue“

Here you can check the previous made scaling settings for the „Volume set value“.

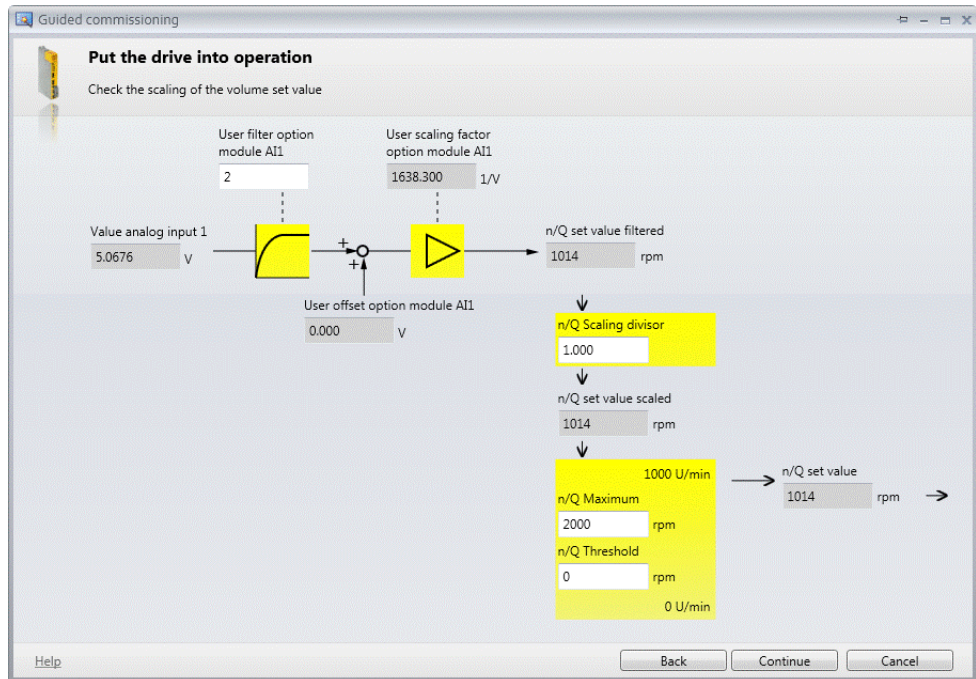


Figure 54: Guided commissioning: Check volume set scaling

- ▶ Click on „Continue“

4.3 Commissioning set /actual values via analog interface

- ▶ Set the scaling of the „Pressure set value“.

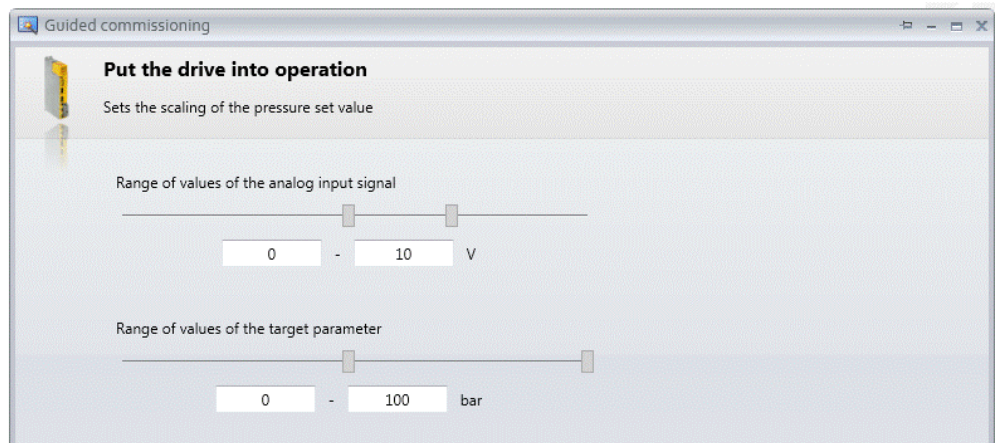


Figure 55: Guided commissioning: Scaling pressure set value

- ▶ Click on „Continue“

- ▶ Here you can check the previous made scaling settings for the „Pressure set value“.

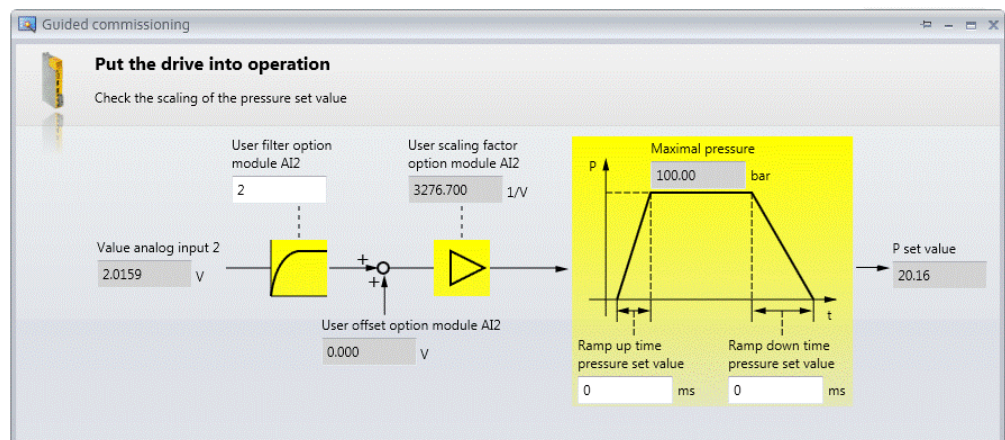


Figure 56: Guided commissioning: Check scaling pressure set value

- ▶ Click on „Continue“

4.4 Setting the pressure sensor inputs

- ▶ Select the input on which the pressure Sensor is connected to.

Sensor input 1 with add-on module:	SVP, analog input	3
Sensor input 1 without add-on module SVP:	Standard-IO X6, analog input	1
Sensor input 2 with add-on module:	SVP, analog input	4
Sensor input 2 without add-on module SVP:	Standard-IO X6, analog input	2

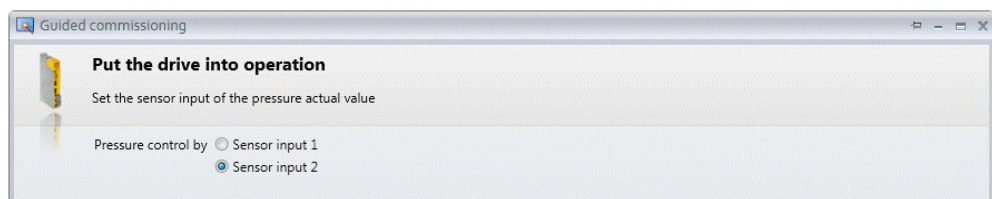


Figure 57: Guided commissioning: Sensor input

- ▶ Click on „Continue“

- ▶ Set the scaling of the „Pressure actual value“.

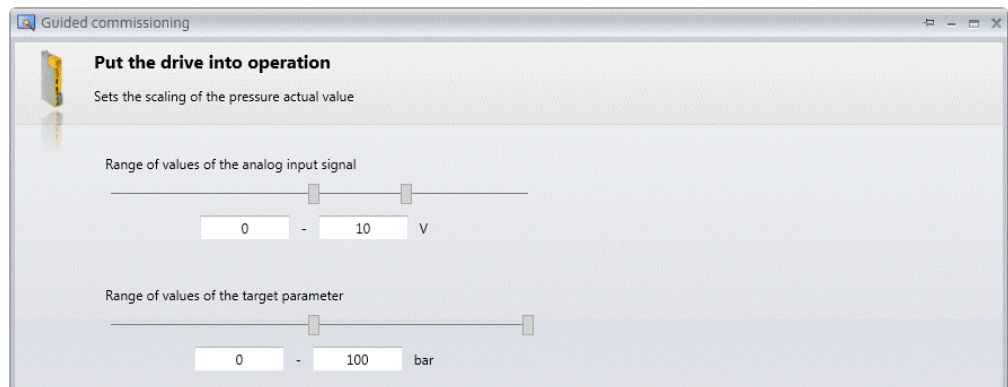


Figure 58: Guided commissioning: Scaling pressure actual value

- ▶ Click on „Continue“

4.4 Setting the pressure sensor inputs

- ▶ Check the scaling of the „Pressure actual value“.

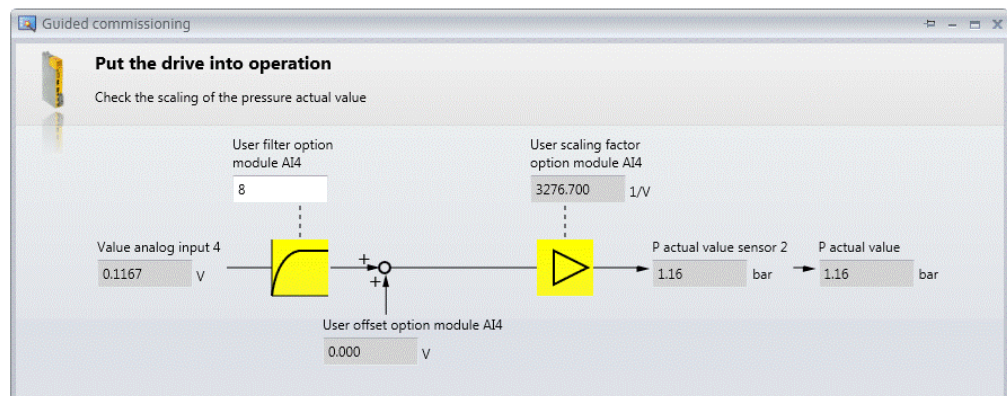


Figure 59: Guided commissioning: Check scaling pressure actual value

- ▶ Click on „**Continue**“
- ▶ Set the pressure control parameters between soft and hard for the Kp and Tn values.
- ▶ Download the data to the controller.

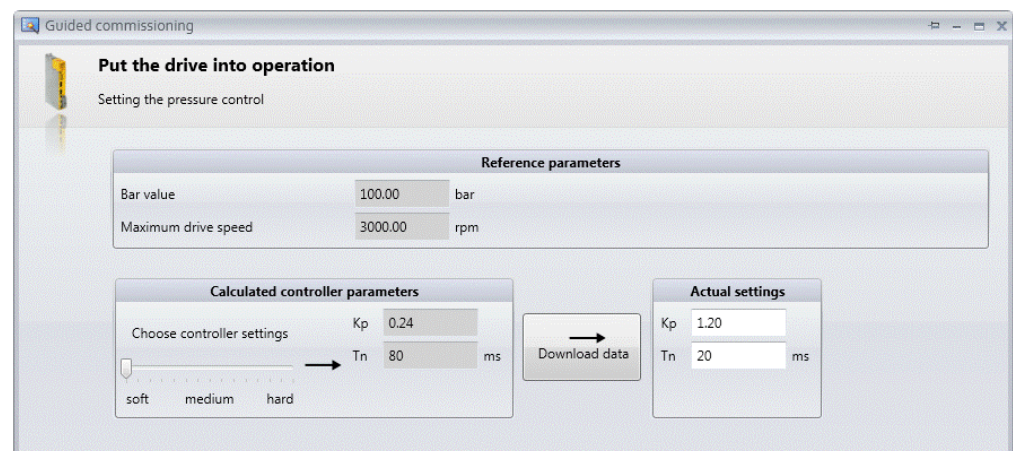


Figure 60: Guided commissioning: Setting the pressure control

- ▶ Click on „**Continue**“

- ▶ Only if necessary, activate the pump protection and set the pump protection values.

If the „**N/Q actual value**“ is greater than the threshold value AND if the „**P actual value**“ is smaller than the threshold value, an error will be generated after the set „**recognition time**“ has elapsed.

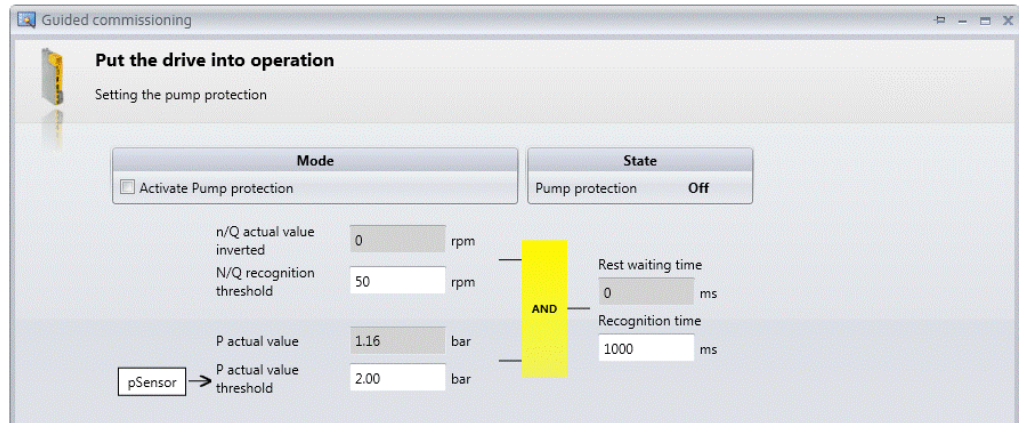


Figure 61: Guided commissioning: Setting pump protection

- ▶ Click on „**Continue**“

- ▶ Click on reset operator's control.

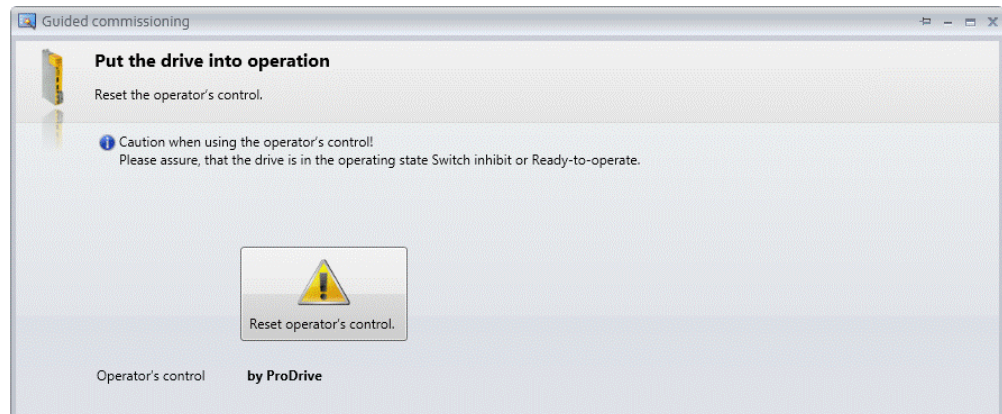


Figure 62: Guided commissioning: Operator control

- ▶ Click on „**Continue**“

4.4 Setting the pressure sensor inputs

- By clicking on „**Save all**“ you can now save your settings in the Flash.
- By clicking on „**Upload**“ you are able to save all your settings on a local computer.

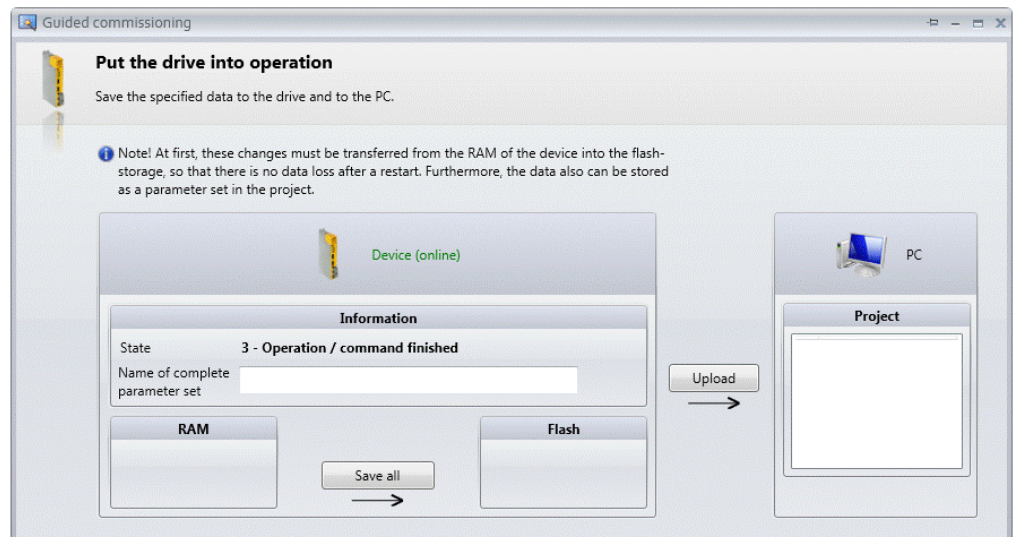


Figure 63: Guided commissioning: Save data

- Click on „**Continue**“

An overview of all modified parameters is displayed.

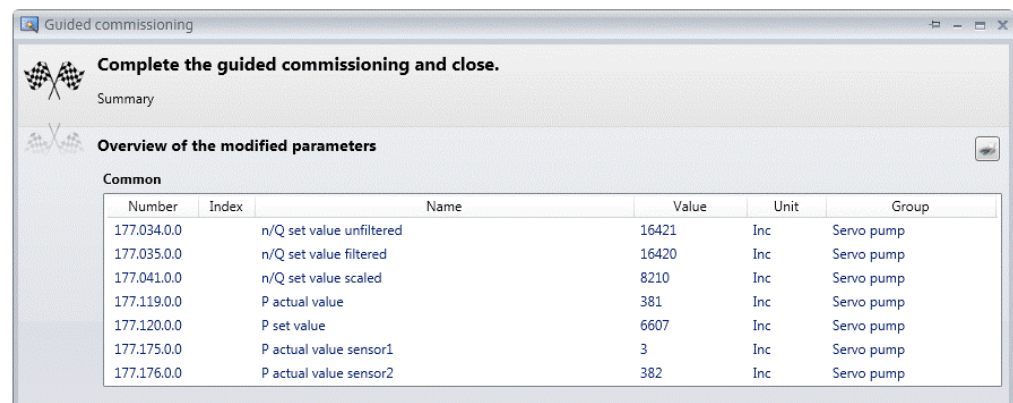


Figure 64: Guided commissioning: Summary

- Click on „**Finish**“

The servo pump should now be able to run.

ERROR MESSAGES

The following table shows all Servo pump related errors with the Code, RC value, reaction and description:

Code	RC	Description
1200	RC_INCOMPATIBLE_PLC_PRJ	PLC Versions does not match. Info 1: PLC Version code Info 2: Error Reason 2 - Firmware version conflict 3 - Hardware conflict b maXX 3000 4 - Hardware conflict double axis
1201	RC_WIRE_BRAKE	Sensor wire brake occurred. Info 1: Actual pressure in Inc Info 2: Sign 0 positive, 1 negative
1202	RC_PUMP_PROTECTION	Missing oil flow. Info 1: Actual pressure in Inc Info 2: Absolute actual speed in Inc



6

PARAMETERS

In this chapter we describe the parameters which are available, sorted by numbers.



WARNING!

Danger from modification of the parameter settings!

The danger is: **mechanical and electrical danger**

- The change of parameters affects the behavior of the Baumüller-unit and consequently the behavior of the construction and its components. If you change the adjustments of the parameters, you may cause a dangerous behavior of the construction and/or of its components.
- After each modification of the parameter settings, a commissioning with consideration to all safety instructions and safety regulations must be executed.



NOTE

Parameters, which are perhaps signaled by the drive, but are not specified, are not supported. The use of this parameter can lead to undefined behavior of the drive.

6.1 Structure of the parameters

Every parameter has

- a name,
- an unique number,
- a data type,
- and fixed attributes or characteristics.

6.2 Reserved bits

In the description of parameters, especially in mode parameters and status parameters, some bits are identified as reserved. In future additions the bits may have a meaning. The following is applicable to these reserved bits.

- In setting parameters these bits may not be changed.
- In status parameters these bits do not have to be assessed.

6.3 Parameter description

176.1

Mode

DWORD

0x00000000 to 0xFFFFFFFF

Activation of the analog input and output channels:

Bit	Meaning
0	1: Switch on channel analog input 1 0: Switch off channel analog input 1
1	1: Switch on channel analog input 2 0: Switch off channel analog input 2
2	1: Switch on channel analog input 3 0: Switch off channel analog input 3
3	1: Switch on channel analog input 4 0: Switch off channel analog input 4
4 ... 7	Reserved
8	1: Switch on channel analog output 1 0: Switch off channel analog output 1
9	1: Switch on channel analog output 2 0: Switch off channel analog output 2
10	1: Switch on channel analog output 3 0: Switch off channel analog output 3
11	1: Switch on channel analog output 4 0: Switch off channel analog output 4
12 ... 31	Reserved

176.2

Mode analog inputs

DWORD

0x00000000 to 0xFFFFFFFF

Configuration of the analog inputs

Bit	Meaning
	Bit 0 ... 23: Oversampling Oversampling factor: 0 ... 8
3 ... 0	Oversampling factor analog input 1
7 ... 4	Oversampling factor analog input 2
11 ... 8	Oversampling factor analog input 3
15 ... 12	Oversampling factor analog input 4
16 ... 23	Reserved
	Only if the relevant analog input is a current input: Bit 24 ... 27: Current input range 0: 0 ... 20 mA (⇒ no wire break detection) 1: 4 ... 20 mA (⇒ wire break detection active)
24	Analog input 1
25	Analog input 2
26	Analog input 3
27	Analog input 4
28 ... 31	Reserved

176.6

Status digital inputs

WORD

0x0000 to 0xFFFF

Status of the digital inputs

Bit	Meaning
0	Status digital input 1: 0: Disabled 1: Active
1	Status digital input 2: 0: Disabled 1: Active
2	Status digital input 3: 0: Disabled 1: Active
3	Status digital input 4: 0: Disabled 1: Active
4 ... 15	Reserved

176.7**Status digital outputs****WORD****0x0000 to 0xFFFF**

Status of the digital outputs

Bit	Meaning
0	Status digital output 1: 0: Disabled 1: Active
1	Status digital output 2: 0: Disabled 1: Active
2	Status digital output 3: 0: Disabled 1: Active
3	Status digital output 4: 0: Disabled 1: Active
4 ... 15	Reserved

The digital outputs of add-on module SVP are fixed linked:

Output 1: 24 V Drive enabled

Output 2: 24 V No error on the drive

Output 3: 24 V Motor temperature warning threshold 1 exceeded

176.8**Value analog input 1****FLOAT****-25 to +25**

Volume set value in case of analog set values.

Scaling:

Voltage input: 1 V = 1,0

Current input: 1 mA = 1,0

176.9**Value analog input 2****FLOAT****-25 to +25**

Pressure set value in case of analog set values.

Scaling:

Voltage input: 1 V = 1,0

Current input: 1 mA = 1,0

176.10 **Value analog input 3** **FLOAT** **-25 to +25**

Sensor 1 Pressure actual value from add-on module SVP.

Scaling:

Voltage input: 1 V = 1,0

Current input: 1 mA = 1,0

176.11 **Value analog input 4** **FLOAT** **-25 to +25**

Sensor 2 Pressure actual value from add-on module SVP.

Scaling:

Voltage input: 1 V = 1,0

Current input: 1 mA = 1,0

176.16 **Value analog output 1** **FLOAT** **-11 V to +11 V**

Analog output 1 of add-on module SVP is hard-linked to pressure actual value ([▶P177.119◀](#)).

Scaling: 1073741824 Inc = Maximum pressure ([▶P177.6◀](#))

176.17 **Value analog output 2** **FLOAT** **-11 V to +11 V**

Analog output 2 of add-on module SVP is hard-linked to speed actual value (P18.22).

Scaling: 1073741824 Inc = Maximum speed of drive (P110.13)

176.18 **Value analog output 3** **FLOAT** **-11 V to +11 V**

Analog output 3 of add-on module SVP is hard-linked to Iq actual value (P47.3).

Scaling: 1073741824 Inc = Maximum drive current (P119.6)

6.3 Parameter description

176.66	User scaling factor add-on module AI3 FLOAT	-1000000000.000 to 1000000000.000
	Scaling factor pressure actual value sensor 1 from add-on module SVP.	
176.67	User offset add-on module AI3 FLOAT	-10 V to +10 V
	Offset pressure actual value sensor 1 from add-on module SVP.	
176.68	User filter add-on module AI3 INT	0 to 3000
	Filter pressure actual value sensor 1 from add-on module SVP.	
176.69	User scaling factor add-on module AI4 FLOAT	-1000000000.000 to 1000000000.000
	Scaling factor pressure actual value sensor 2 from add-on module SVP.	
176.70	User offset add-on module AI4 FLOAT	-10 V to +10 V
	Offset pressure actual value sensor 2 from add-on module SVP.	
176.71	User filter add-on module AI4 INT	0 to 3000
	Filter pressure actual value sensor 2 from add-on module SVP.	

177.2

Status word

DWORD

0x00000000 to 0xFFFFFFFF

Status word of servo pump.

Bit	Meaning
0 ... 10	Reserved
11	FW Initialization finished
12	PLC initialization finished
13	Pump protection: 0: Disabled 1: Active
14	Checking the firmware: 0: Correct Firmware 1: Wrong Firmware
15	Wire break detection: 0: No error 1: Wire break error
16 ... 21	Reserved
22	b maXX 3000 found
23	Module check okay
24	SVP module recognition: 0: Error 1: No error
25	SVP module found: 0: Not found 1: Found
26	Option/add-on module: 0: Correct 1: Wrong
27	Reserved
28	No option/add-on module found, checking: 0: Not done 1: Done
29	No option/add-on module found, checking: 0: Not in progress 1: In progress
30 ... 31	Reserved

177.3

Controlword 1
DS-support

WORD

0x0000 to 0xFFFF

Control word 1 of servo pump.

Bit	Meaning
0	Adaption of pressure controller parameter 0: Disabled 1: Active
1 ... 4	Reserved
5	Interpolation of adaption parameter 0: Disabled 1: Active
6	Speed set value 0 in case of pressure limits are fallen below 0: Disabled 1: Active
7	Switching pressure sensor 0: Sensor 2 (input 2 standard X6 / input 4 add-on module SVP) 1: Sensor 1 (input 1 standard X6 / Input 3 add-on module SVP)
8 ... 9	Interface set and actual values 00: Reserved 01: Set values via field bus, pressure actual value via add-on module SVP 10: Set values via field bus, pressure actual value via standard X6 11: Set values and pressure actual value via add-on module SVP
10	0: ProDrive assigns the standard analog inputs according to bits 8..9. 1: The standard analog inputs are not assigned by ProDrive (the inputs must be assigned by user manually).
11 ... 12	Reserved
13	Version conflict between controller firmware and servo pump software 0: No version conflict 1: Version conflict detected
14	Display pressure 0: Volt 1: Bar
15	Display Volume 0: rpm 1: liters / min

177.4**Controlword 2**
DS-support**WORD****0x0000 to 0xFFFF**

Control word 2 of servo pump.

Bit	Meaning
1 ... 3	Reserved
4	Pump protection 0: Disabled 1: Active
5	Dataset change 0: Disabled 1: Active
6 ... 7	Reserved
8	Wire break monitoring for pressure sensor 0: Disabled 1: Active
9 ... 11	Reserved
12	Negative volume set values 0: Prohibited 1: Allowed
13 ... 15	Initiate servo pump specific errors

177.5**Controlword 3**
DS-support**WORD****0x0000 to 0xFFFF**

Control word 3 of servo pump.

Bit	Meaning
1 ... 6	Reserved
7	Connecting actual values to the SVP-Module outputs
8 ... 15	Reserved

177.6**Bar value**
DS-support**DINT****1 to 100000**

Maximum pressure value of pressure sensor.

Scaling: 100000 Inc = 1000 Bar

- 177.35** **n/Q set value filtered**
DINT -32768 to 32767
- Input value of the volume set value. Display in the ProDrive depending on the settings of page „Servo pump - general“ in rpm or in l/min.
Scaling: 32767 Inc = Motor maximum speed * 2
- 177.38** **n/Q Threshold**
DS-support DINT 0 to 16383
- As from this threshold the input value starts to function. Display in the ProDrive depending on the settings of page „Servo pump - general“ in rpm or in l/min.
Scaling: 32767 Inc = Motor maximum speed * 2
- 177.39** **n/Q Maximum**
DS-support INT 0 to 16383
- Upper limit in order to reach the maximum speed. Display in ProDrive depending on the settings of page „Servo pump - general“ in rpm or in l/min.
Scaling: 32767 Inc = Motor maximum speed * 2
- 177.40** **n/Q scaling divisor**
DS-support INT 1 to 16383
- Scaling divisor for „n/Q set value scaled“ ([▶P177.41◀](#)). When scaling ensure that in the case of max. volume set value default the „n/Q set value scaled“ ([▶P177.41◀](#)) does not exceed the maximum motor speed of the drive.
Scaling: 1000:1
- 177.41** **n/Q set value scaled**
DINT -32768 to +32767
- Set volume value according to scaling through the scaling divisor parameter [▶P177.40◀](#)
Display in the ProDrive depending on the settings on page „Servo pump - general“ in rpm or in l/min.
Scaling: 32767 Inc = Motor maximum speed * 2

177.42 **n/Q set value bus**
DINT **-2147483.648 to +2147483.647**

Set volume value from a field bus chart.

Scaling: 1 Inc = 1 ml/min

177.62 **Integral action time nominal**
DS-support **UINT** **0 to 1000 ms**

Integral action time of pressure controller.

177.119 **P actual value**
INT **-32768 to +32767**

Actual pressure value for PI pressure controller.

Depending on the active sensor for pressure control (compare bit 7 in [▶P177.3◀](#)) „P actual value“ is written by „P actual value sensor 1“ or „P actual value sensor 2“.

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.120 **P set value**
INT **-32768 to +32767**

Set pressure value for PI pressure controller

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.122 **P-gain**
DS-support **UINT** **0 to 65535**

P-Gain value of PI pressure controller

Scaling: 100:1

177.125 **Integral part PI controller**
DINT **-2147483648 to +2147483647**

Integral part PI pressure controller

Scaling: 1073741824 Inc = Max. drive Speed ([▶P110.13◀](#))

177.144	P Set value minimum	INT	0 to 32767
	Limit for Pressure set value. If actual Pressure is smaller than „P Act value minimum“ and set pressure is smaller than „P Set value minimum“ then speed set value is set to 0.		
	Scaling: 32767 Inc = ▶P177.6◀ or ▶P177.7◀		
177.145	P Act value minimum	INT	0 to 32767
	Limit for Pressure actual value. If actual Pressure is smaller than „P Act value minimum“ and set pressure is smaller than „P Set value minimum“ then speed set value is set to 0.		
	Scaling: 32767 Inc = ▶P177.6◀ or ▶P177.7◀		
177.160	Wire break monitoring time constant	INT	0 to 65535
		10	
	Time constant filter.		
	Scaling: 1 Inc $\hat{=}$ 1 ms		
177.161	Wire break monitoring rest waiting time	INT	0 to 65535
		0	
	Time until wire break error is generated.		
	Scaling: 1 Inc $\hat{=}$ 1 ms		
177.162	Wire break monitoring P actual value filtered	INT	-65535 to +65535
		0	
	Filtered P actual value for wire break monitoring.		
	Scaling: 32767 Inc $\hat{=}$ ▶177.6◀ or ▶177.7◀		

177.168	Pump protection P actual value threshold DS-support	DINT	-32768 to +32767
	Actual pressure threshold for pump protection.		
	Scaling: 32767 Inc = ▶P177.6◀ or ▶P177.7◀		
177.169	n/Q actual value inverted	UDINT	0 to 4294967295
	Absolute value of actual speed.		
	Scaling: 1073741824 Inc = Max. drive speed (▶P110.13◀)		
177.173	SP Speed set value positive limit DS-support	FLOAT	0 to 166666.6667 rpm
	Positive Speed Limit. This parameter overwrites ▶P18.71◀ „Speed Set value positive limit“.		
177.174	SP Speed set value negative limit DS-support	FLOAT	-166666.6667 to 0 rpm
	Negative Speed Limit. This parameter overwrites ▶P18.72◀ „Speed Set value negative limit“.		
177.175	P actual value sensor 1	INT	-32768 to +32767
	Pressure actual value of Sensor 1. Hardware-connection to input 1 of standard analog IO (connector X6) or input 3 of add-on module SVP. The active sensor for pressure control can be selected via bit 7 of control word SP 1 (▶P177.3◀).		
	Scaling: 32767 Inc = ▶P177.6◀ or ▶P177.7◀		

177.176 **P actual value sensor 2** **-32768 to +32767**

Pressure actual value of Sensor 2.
Hardware-connection to input 2 of standard analog IO (connector X6) or input 4 of add-on module SVP.
The active sensor for pressure control can be selected via bit 7 of control word SP 1 ([▶P177.3◀](#)).

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.191 **Actuating variable 1** **DINT** **0 to 32767**
DS-support

Control difference of the adaption point 1.

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.192 **Actuating variable 2** **DINT** **0 to 32767**
DS-support

Control difference of the adaption point 1.

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.193 **Actuating variable 3** **DINT** **0 to 32767**
DS-support

Control difference of the adaption point 1.

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.194 **Actuating variable 4** **DINT** **0 to 32767**
DS-support

Control difference of the adaption point 1.

Scaling: 32767 Inc = [▶P177.6◀](#) or [▶P177.7◀](#)

177.195	P-gain 0 DS-support	DINT	0 to 65535
	P-gain 0 (control difference < actuating variable 1). Scaling: 100:1		
177.196	P-gain 1 DS-support	DINT	0 to 65535
	P-gain 1 (control difference > Actuating variable 1 AND Control difference < Actuating variable 2) Scaling: 100:1		
177.197	P-gain 2 DS-support	DINT	0 to 65535
	P-gain 2 (Control difference > Actuating variable 2 AND Control difference < Actuating variable 3). Scaling: 100:1		
177.198	P-gain 3 DS-support	DINT	0 to 65535
	P-gain 3 (Control difference > Actuating variable 3 AND Control difference < Actuating variable 4). Scaling: 100:1		
177.199	P-gain 4 DS-support	DINT	0 to 65535
	P-gain 4 (Control difference > Actuating variable 4). Scaling: 100:1		
177.200	Integral-action time 0 DS-support	DINT	0 to 7200000 ms
	Integral-action time 0 (Control difference < Actuating variable 1).		

6.3 Parameter description

177.201	Integral-action time 1 DS-support	DINT	0 to 7200000 ms
	Integral-action time 1 (Control difference >Actuating variable 1 AND Control difference < Actuating variable 2).		
177.202	Integral-action time 2 DS-support	DINT	0 to 7200000 ms
	Integral-action time 2 (Control difference > Actuating variable 2 AND Control difference < Actuating variable 3).		
177.203	Integral-action time 3 DS-support	DINT	0 to 7200000 ms
	Integral-action time 3 (Control difference > Actuating variable 3 AND Control difference < Actuating variable 4).		
177.204	Integral-action time 4 DS-support	DINT	0 to 7200000 ms
	Integral-action time 4 (Control difference > Actuating variable 4).		
177.205	Filter order pressure controller adaption DS-support	DINT	0 to 30000
	Filter for interpolation of pressure control adaption.		
177.206	Ramp up time pressure set value DS-support	DINT	0 to 4096 ms
	Ramp up time for pressure ramp function generator of set values. Ramp up time is related to a change from 0 Bar to maximum pressure.		

177.207	Ramp down time pressure set value DS-support	DINT	0 to 4096 ms
	Ramp down time for pressure ramp function generator of set values. Ramp down time is related to a change from maximum pressure to 0 Bar.		
177.212	Speed set value total	DINT	0x00000000 to 0x40000000 0x00000000
	Total speed set value in 32Bit increment scale.		
177.214	Speed set value positive limit	DINT	-1073741824 to 1073741823 1073741823
	This parameter overwrites P18.71 „Speed set value positive limit“. Scaling: 1073741823 Inc $\hat{=}$ Max. drive speed (▶P110.13◀)		
177.215	Speed set value negative limit	DINT	-1073741824 to 1073741823 -1073741824
	This parameter overwrites P18.72 „Speed set value negative limit“. Scaling: 1073741823 Inc $\hat{=}$ Max. drive speed (▶P110.13◀)		
177.228	Active Data Set	UINT	1 to 7
	Parameter for dataset switching. This parameter can be cyclically written via field bus.		
177.235	P set value pulse inhibit	INT	1 to 32767 655
	Set pressure for delayed pulse inhibit condition.		

6.3 Parameter description

177.236	Q set value pulse inhibit	0 to 16380
	INT	273

Set speed for delayed pulse inhibit condition.



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Revision Survey

Version	Status	Changes
5.17002.01	15-Feb-2017	First edition Servo pump V1.3
5.17002.02	3-May-2018	Error messages added
5.17002.03	31-May-2021	New Version
5.17002.04	17-Apr-2024	New devices added
5.17002.05	07-Apr-2025	New Version

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