

Digital controller assembly for the secondary control of axial piston units Standard software: Version - S000

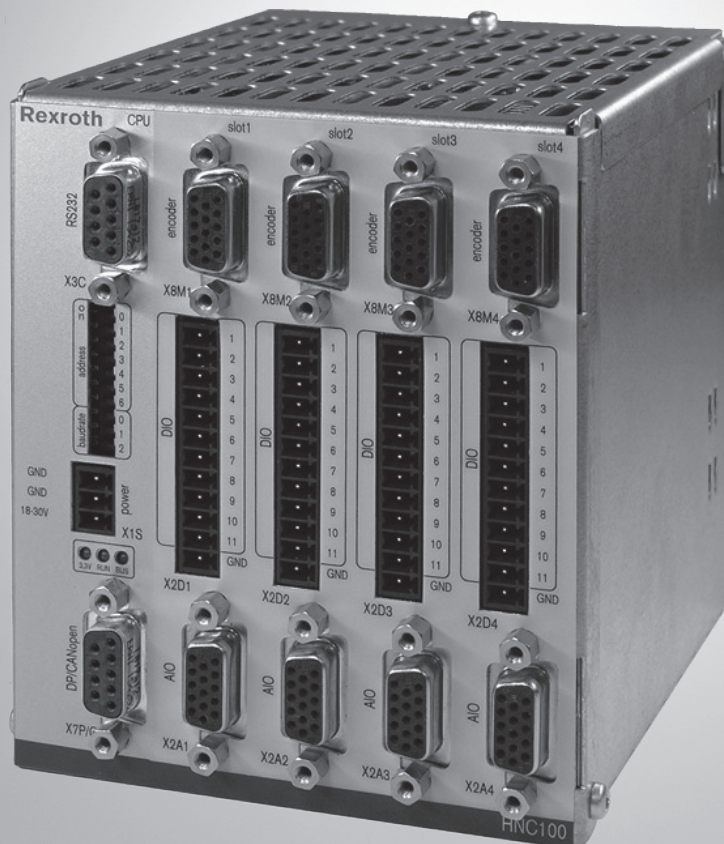
Type SYHNC100-SEK...3X...S000

RE 30162-01-Z/09.11

Replaces: -.-

English

Software description



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1 Introduction

1.1 Bosch Rexroth device designation

Description for Bosch Rexroth product:
SYHNC100-SEK-...-3X...**S000**

The subsequently described software version applies to electronic versions:

SYHNC100-SEK-2-3X/C-A-00/S000	R901293741
SYHNC100-SEK-2-3X/P-A-00/S000	R901293742
SYHNC100-SEK-4-3X/C-D-00/S000	R901267896
SYHNC100-SEK-4-3X/P-D-00/S000	R901278028

1.2 Documentation

Version: 1.0

Release record

Version 1.0 – 09.11

1.3 Software

Software version: S000

Release record

Version 1.0 – S000-V01-110726

1.4 Signs and symbols used

In these instructions, the following signs and symbols are used:

- Activity symbol: The text after this symbol describes activities. These activities are to be completed in the specified order from top to bottom.
- ✓ Result symbol: The text after this symbol describes the result of an action.

Warning sign

Special safety instructions are provided at the relevant positions. They are marked with the following symbol.



Safety instruction

This symbol precedes activities or procedures in which there is the risk of personal injury and/or extensive damage to property or which require a special procedure

1.5 Safety instructions



The SYHNC100-SEK..3X..S.. is used for the closed-loop control of speed and torque and for the open-loop control of the torque of up to four mechanically coupled secondary controlled drives. When using the unit, you moreover need superordinate control logics with corresponding I/O components that in connection with the SYHNC100-SEK-..3X ..S are responsible for the holistic control of the machine's motion sequence and also its monitoring as regards safety.

Personal protection is to be ensured by monitoring or measures which are superior to the system. The SYHNC100-SEK..3X..S.. itself is no safety-relevant component.

Secondary or further information will be found in data sheets:

- RE30162 – B ..
- RE30162 – U...

See latest issues of the data sheets at BoschRexroth Homepage
www.boschrexroth.de.

2 Overview of the system description

The digital control electronics after SYHNC100-SEK-3X serve the closed-loop speed/torque control of up to 4 secondary units at a joint axis.

Hardware set-up

Digital control electronics with integrated evaluation electronics for recording LVDT sensors and incremental position measurement systems.

Basically, two variants are offered:

- 2-axis variant "A" - SYHNC100-SEK-2-3X..A...S000
- 4-axis variant "D" - SYHNC100-SEK-4-3X..D...S000

Variant "A" for up to 2 secondary units:

- 1 CPU card
- 2 LVDT card
- 3 INK/SSI card

Variant "D" for up to 4 secondary units:

- 1 CPU card
- 2 LVDT card
- 3 LVDT card
- 4 INK/SSI card
- 5 INK/SSI card

For a detailed description of the electronics, please refer to the following data sheets:

- RE 30162 "Digital controller assembly SYHNC100-SEK-...-3X for secondary control of axial piston units"
- RE 30162-B "Digital controller assembly" operating instructions"

Software functions

- Scope of functions**
- PID speed controller
 - Speed command value ramp with adjustable acceleration and deceleration values
 - Friction compensation via parameterizable friction characteristic curve
 - Open-loop torque control (without actual torque value collection)
 - PID closed-loop torque control in connection with torque measuring shaft or load cell.
 - Torque ramp function with adjustable ramp values
 - Power limitation
 - 4 * PD swivel angle controller
 - Monitoring functions with error output (only with CANOpen/Profibus)
 - automatic swivel angle adjustment
 - automatic calibration of the LVDT evaluation electronics
 - Bus systems CANOpen or Profibus

Scanning times

The closed-loop and open-loop tasks are divided into 4 tasks (scanning times):

- Task0 = scanning time = 1ms**
- Actual value collection
- Task1 = scanning time = 1ms**
- Alternating processing of the swivel angle controllers; per scanning step, two swivel angle controllers are in each case processed.
 - Actuating variable output
- Task2 = scanning time = 4ms**
- Speed command value functions
 - Speed controller
 - Torque command value functions
 - Torque controller / open-loop torque control / friction characteristic curve
 - Digital inputs/outputs
 - Bus communication
- Task3 = scanning time = 10ms**
- Controller switch-on/switch-off routine
 - Monitoring functions
 - Controller parameter switch-over
 - Swivel angle adjustment

Communication program

For parameterizing the electronics and for visualizing process variables, particularly in the initial start-up of a system, the freely available "WinPed 6" communication program is used.

WinPED 6.06 <http://www.boschrexroth.com/hnc100/Winped>

For communicating with the electronics, the operation program needs project data that is available on request.

WinPed and the project data are exclusively offered in English!

**Connection cable
VT-HACD-1X/3,0/HACD-PC**

The connection between WinPED and the electronics is established via a serial interface with a connection cable:

e.g. length 3m: Mat. no: R900776897

3 System configuration



The system configuration specifies important system properties for the SYHNC100-SEK-3X. Before an initial start-up, all settings must imperatively be entered and/or checked according to the system.

If all the data has been configured and/or if individual data is changed afterwards, you must always carry out a voltage reset at the SYHNC100-SEK -3X.

The procedures described in this chapter imperatively require the use of the "WinPed 6" operation program and a related project file.

For a short introduction into the program please refer to chapter 20 .

All figures shown in the following are examples on the basis of version "SYHNC100-SEK-4-3X/P-D-00/S000"

WinPed parameter settings System configuration

A0 R-Parameter : Systemconfiguration {7}	
R508 Speed configuration 100% = xxxx [rpm]	2200
R509 Encoder 1 [INK/rev]	1000
R510 Encoder 2 [INK/rev]	1000
R511 Encoder 1 INV == 1	0
R512 Encoder 2 INV == 1	0
R513 cable break INK 1/2 check [0/1/2/3]	1
R514 Swivel angle Test SLOT1 [0/1/2/3]	1
R515 Swivel angle Test SLOT2 [0/1/2/3]	0
R516 LVDT cable break check SLOT1 [0/1/2/3]	1
R517 LVDT cable break check SLOT2 [0/1/2/3]	0
R518 Number of Swivel angle control [1-4]	1
R519 N command -> 0=analogue;1=Bus;2=const.	0
R520 M command -> 0=analogue;1=Bus	0
R521 M actual V/I -> 0=no;1=U;2=I	0
R522 P actual-> 0=parameter;1=U;2=I;3=Bus	0
R523 Pressure transducer 100% = xxx [Bar]	315
R524 Boost pressure [Bar]	0
R525 Nominal pressure [Bar]	315
R526 unit size [ccm]	71
R527 Brake feedback Yes == 1	0
R528 Bus system-> 0=no;1=CAN;2=Profibus	2
R529 HNC = Master = 1/2; Slave = 0	1
R530 CAN-Rex Monitoring enable == 1	0

Fig. 1 System configuration

The following information refers to the parameters from figure 1

3.1 System configuration – SYHNC100-SEK address/baud rate

Each SYHNC100-SEK electronic system must be marked by a fixed address. This address serves the exact marking of the electronic system in a network (CANOpen / Profibus) and the communication by means of the WinPed operation program.



The address of an SYHNC100-SEK electronic system can generally only be assigned in multiples of 4! I.e. the smallest address is "4", higher-value addresses include e.g. "8, 12, 16, etc..".

Particularly for the communication with WinPed it has to be ensured that the address set in the project complies with that of SYHNC100-SEK.

SYHNC100-SEK address setting



Examples of different address settings:

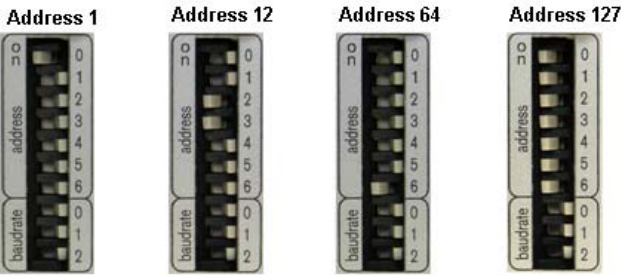


Fig. 2 SYHNC100-SEK address

Setting of the baud rate is only relevant for the CANOpen communication.

SYHNC100-SEK baud rate



bit rate setting			description
bit 2	bit 1	bit 0	Bit rate
0	0	0	10kbit/s
0	0	1	20kbit/s
0	1	0	50kbit/s
0	1	1	125kbit/s
1	0	0	250kbit/s
1	0	1	500kbit/s
1	1	0	800kbit/s
1	1	1	1000kbit/s

Fig. 3 SYHNC100-SEK Baud rate

3.2 System configuration - encoder

R508 Speed configuration 100% = XXX [rpm]

Configuration of the physical speed for a speed command value of 100%.

With an analog command value provision, $\pm 100\%$ speed command value correspond to $\pm 10V$ voltage provision.

With command value provision via bus connection +100% speed command value correspond to a hexadecimal value of 0x1FFF (positive). A command value provision of -100% corresponds to a provision of 0xE000 (negative).

It is pointed out that with an analog command value provision, a voltage value of +10V or -10V cannot be exactly achieved e.g. due to transmission errors. It is therefore recommended to select the speed range configuration so that the desired maximum command value in the voltage range $< 10V$ can be achieved.



If the value of R508 is changed, you must imperatively carry out a voltage reset at the SYHNC100-SEK!

R509 Encoder 1 [INK/rev]

R510 Encoder 2 [INK/rev]

Entry of the resolution of the connected incremental encoder. For the S000 standard software, the setting of parameter R509 is decisive.

Parameter R510 serves the configuration of a second incremental encoder which has already been provided for future and/or application-specific extensions. For SYHNC100-SEK-3X variants with code "D", the incremental encoder is connected to SLOT 3. For SYHNC100-SEK-3X variants with code "A", the incremental encoder is connected to SLOT 2.



If the value of R509 or R510 is changed, you must imperatively carry out a voltage reset at the SYHNC100-SEK!

R511 Encoder 1 INV = 1

R512 Encoder 2 INV = 1

Setting for the inversion of the incoming incremental encoder signals of the connected incremental encoder.

Parameter R512 serves the configuration of a second incremental encoder which has already been created for future and/or application-specific extensions.

For SYHNC100-SEK-3X variants with code "D", the incremental encoder is inverted at SLOT 3 by R511. For SYHNC100-SEK-3X variants with code "A", the incremental encoder is inverted at SLOT 2 by R511.

R513 cable break INK 1/2 check [0/1/2/3]

Settings for the cable break monitoring of the connected incremental encoder. In the S000 software version, parameter R513 is to be set to "1" as only one incremental encoder is actively processed.

The following settings are possible for R513.

- 0 No monitoring active (not recommended)
- 1 Monitoring incremental encoder 1 active (standard / recommended)
- 2 Monitoring incremental encoder 2 active (only special version)
- 3 Monitoring incremental encoder 1 and incremental encoder 2 active (only special version)

R514 Swivel angle Test SLOT1 [0/1/2/3]**R515 Swivel angle Test SLOT2 [0/1/2/3]**

Settings for monitoring the swivel angle difference of the connected LVDT sensors:

To SYHNC100-SEK-3X variants with code "A", only parameter R514 is applicable. Parameter R515 must then be set to "0".

In the SYHNC100-SEK-2-3X version with code "D", the settings for R514 and R515 are to be selected according to the connected LVDT sensors.

The following settings are possible for R514 and R515:

- 0 No monitoring active
- 1 Monitoring SLOT_X LVDT1 active
- 2 Monitoring SLOT_X LVDT2 active
- 3 Monitoring SLOT_X LVDT1 and LVDT2 active

R516 LVDT cable break check SLOT1 [0/1/2/3]**R517 LVDT cable break check SLOT2 [0/1/2/3]**

Settings for activation of the cable break monitoring of the connected LVDT sensors:

To SYHNC100-SEK-3X variants with code "A", only parameter R516 is applicable. Parameter R517 must then be set to "0".

In the SYHNC100-SEK-2-3X version with code "D", the settings for R516 and R517 are to be selected according to the connected LVDT sensors.

The following settings are possible for R516 and R517:

- 0 No monitoring active
- 1 Monitoring SLOT_X LVDT1 active
- 2 Monitoring SLOT_X LVDT2 active
- 3 Monitoring SLOT_X LVDT1 and LVDT2 active

R518 Number of Swivel angle control [1 – 4]

Specifies the number of active swivel angle control circuits in successive order.

- 1 SLOT1 LVDT1
- 2 SLOT1 LVDT1 and SLOT1 LVDT2
- 3 SLOT1 LVDT1/ LVDT2 and SLOT2 LVDT1
- 4 SLOT1 LVDT1 / LVDT2 and SLOT2 LVDT1 / LVDT2

3.3 System configuration - command values**R519 N command -> 0=analogue;1=Bus;2=const.**

There is the possibility to choose the speed command value from the following versions by setting parameter R519:

- 0 analog command value $\pm 10V$
- 1 Command value provision via CAN/Profibus connection
- 2 Specification of fixed command values (parameters); selection via switching signal

Analog command value provision

The pinout for the analog speed command value can be seen from the corresponding pin assignment depending on SYHNC100-SEK variant "A" or "D".

Command values bus system

Provision of a command value via an active bus system is, for Profibus, explained in chapter 0 or for CANOpen in chapter 15 .

Fixed command values

In the "Speedcommand settings {2}" menu, two fixed speed command values can be configured. The desired command value is selected at runtime via a digital switching input.

- R463 static speed command 1 [rpm]
- R464 static speed command 2 [rpm]

R520 M command -> 0=analogue;1=Bus

Selection of the torque provision:

- 0 analog command value $\pm 10V$
- 1 Command value provision via CAN/Profibus connection

The pinout for the analog torque command value can be seen from the corresponding pin assignment depending on SYHNC100-SEK variant "A" or "D".

3.4 System configuration - actual values

R521 M actual V/I -> 0=no;1=U;2=I

Selection of the actual torque value signal:

- 0 no actual torque value available
- 1 analog actual value voltage $\pm 10V = \pm 100\%$ measuring shaft
- 2 analog actual value current $4 - 20\text{ mA} = 0 - 100\%$ load cell

The connections for the analog actual torque value can be seen from the corresponding pin assignment depending on SYHNC100-SEK variant "A" or "D".

R522 P actual -> 0=parameter;1=U;2=I

Selection of the actual pressure value signal:

- 0 Actual pressure value as parameter R523 and R525
- 1 analog actual value voltage $0 - 10V$
- 2 analog actual value current $4 - 20\text{mA}$

The pinout for the analog actual pressure value can be seen from the corresponding pin assignment depending on SYHNC100-SEK variant "A" or "D".

R523 Pressure transducer 100% = xxx [Bar]

Configures the pressure range of the actual pressure value signal.

When using a pressure cell, the measuring range of the transducer is entered here, according to 10V or 20mA.

If no pressure cell is used, this value must be set as parameter R525 "Nominal pressure".



After entry of this value, you must imperatively carry out a voltage reset at the SYHNC100-SEK.

R524 Boost pressure [Bar]

Configures the actual pressure value of the system low-pressure (boost pressure).

R525 Nominal pressure [Bar]

Configures the nominal actual pressure value (working pressure) of the system high-pressure. If there is no external actual pressure value (pressure cell), R525 and R523 must be set to the same value.

3.5 System configuration - general

R526 unit size [ccm]

Configures the size as total of the secondary units which are connected to an SYHNC100-SEK.

R527 Brake feedback Yes == 1

Configures the feedback of a brake state signal. The feedback of the operating state of a brake can be used in the start/stop routine. Connection of a brake feedback signal can be seen from the corresponding pin assignment depending on the SYHNC100-SEK variant "A" or "D" used or - if a bus system is used - from the data profile.

The following settings are possible:

- 0 Brake without feedback
- 1 Brake with feedback

R528 Bus system -> 0=no; 1=CAN; 2=Profibus

Configures the use of a bus system for the SYHNC100-SEK if the SYHNC100-SEK has a bus system according to the ordering key. I.e. a bus system can only be switched off/activated, however not added retroactively using this parameter!

R529 HNC = Master = 1/2; Slave = 0

This parameter is intended for possible application-specific extensions and must in the S000 standard version always be assigned with "1".

R530 CAN-Rex Monitoring enable == 1

This parameter is intended for possible application-specific extensions and must in the S000 standard version always be assigned with "0".

4 Digital inputs and outputs

The configuration of the digital inputs/outputs is determined by the slot card type.

- LVDT slot cards only provide output signals
- INK/SSI slot cards only provide input signals

Even if a bus connection is used, all specified digital outputs are active according to their meaning.

4.1 Digital outputs

Digital outputs are available in version "A" at SLOT 1. In version "D", digital outputs are available at SLOT 1 and SLOT 2. The corresponding pin assignment is specified from chapter 18 .



For the digital output signals:

- Variant "A" Slot 1 Isolating Valve A1; Isolating Valve A2; Brake open request
- Variant "D" contains all signals from variant "A" and in addition, Slot 2 Isolating Valve A3; Isolating Valve A4

the subsequently listed basic conditions and safety considerations have to be observed and implemented in a form suitable for the application.

- The specified digital output signals do not supply the necessary current in order to directly switch valves. Relay circuits or the use of a power output at the superior control are possibilities to switch the valves.
- We recommend integrating the specified signals into the safety circuit (emergency stop chain) of the system.
- The specified signals are set or reset within the start/stop sequence and by the monitoring functions. In the opened condition, the on/off valves connected with the signals allow you to change the motion of the system. It must be ensured and checked by the superior control system and/or the machine operator that opened valves and related possible movement profiles of the system do not pose a danger to persons at any time.

When using a bus system, the information of the digital outputs is sent to the superior control system within the data profile. The signal designation and the meaning of the signals is identical for the wired signals and those sent via bus. In this connection, refer to chapter 17.2

Digital outputs at SLOT 1 – Variants "A" and "D"

WinPed display Digital outputs SLOT 1

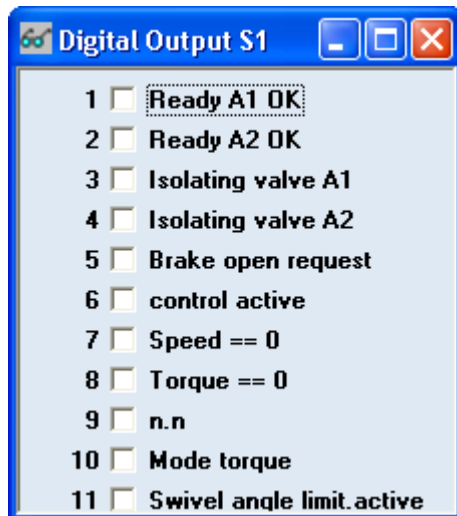


Fig. 4 Digital outputs SLOT 1

Ready A1 OK Displays readiness for operation for axis 1.

Ready A2 OK Displays readiness for operation for axis 2.

Isolating valve A1 Notifies the superior control system that the isolating valve connected with this signal is to be opened or closed.



- ✓ "24V" at this output indicates that the superior control system is to open the isolating valve connected with this signal.
- ✓ "0V" at this output indicates that the superior control system must close the isolating valve connected with this signal.

A closed isolating valve (solenoid de-energized) marks the safe condition!

Isolating valve A2 Notifies the superior control system that the isolating valve connected with this signal is to be opened or closed.



- ✓ "24V" at this output indicates that the superior control system is to open the isolating valve connected with this signal.
- ✓ "0V" at this output indicates that the superior control system must close the isolating valve connected with this signal.

A closed isolating valve (solenoid de-energized) marks the safe condition!

Brake open request

Notifies the superior control system that the brake connected with this signal is to be opened or closed.



- ✓ "24V" at this output indicates that the superior control system is to open the brake connected with this signal.
- ✓ "0V" at this output indicates that the superior control system must close the brake connected with this signal.

A closed brake (solenoid de-energized) marks the safe condition!

control active

Indicates that the speed/torque controller is active.

Speed == "0"

Indicates that the current actual speed value lies within an adjustable window around speed == "0".

Torque == "0"

Indicates that the current actual torque value lies within an adjustable window around torque == "0".

n.n.

Currently not assigned.

Mode torque

Indicates that the current "Closed-loop/open-loop torque control" mode of operation is active.

- ✓ "24V" at this output indicates that the "Closed-loop/open-loop torque control" mode of operation is active.
- ✓ "0V" at this output indicates that the "Closed-loop speed control" mode of operation is active.

Swivel angle limit. active

Indicates that the swivel angle limitation is active. Swivel angle limit values are determined by the closed-loop/open-loop torque control, the power limitation or by fixed value provision. An active swivel angle limitation in the "Closed-loop speed control" mode of operation automatically results in speed deviations from the speed command value.

Digital outputs at SLOT 2 – Variant "D"

WinPed display Digital outputs SLOT 2

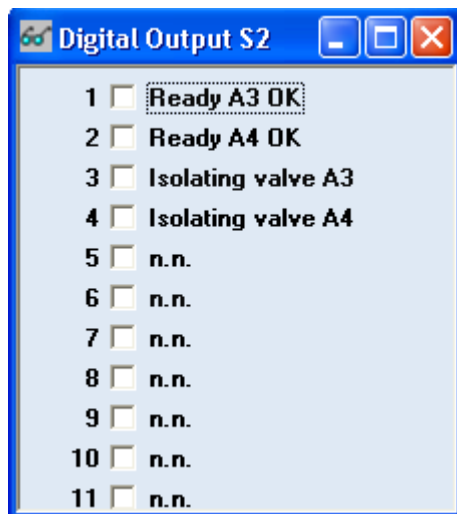


Fig. 5 Digital outputs SLOT 2

Ready A3 OK Displays readiness for operation for axis 3.

Ready A4 OK Displays readiness for operation for axis 4.

Isolating valve A3 Notifies the superior control system that the isolating valve connected with this signal is to be opened or closed.

- ✓ "24V" at this output indicates that the superior control system is to open the isolating valve connected with this signal.
- ✓ "0V" at this output indicates that the superior control system must close the isolating valve connected with this signal.



A closed isolating valve (solenoid de-energized) marks the safe condition!

Isolating valve A4 Notifies the superior control system that the isolating valve connected with this signal is to be opened or closed.

- ✓ "24V" at this output indicates that the superior control system is to open the isolating valve connected with this signal.
- ✓ "0V" at this output indicates that the superior control system must close the isolating valve connected with this signal.



A closed isolating valve (solenoid de-energized) marks the safe condition!

n.n. Currently not assigned.

4.2 Digital inputs

Digital inputs are available in version "A" at SLOT 2. In version "D", digital outputs are available at SLOT 3 and SLOT 4. The corresponding pin assignment is specified from chapter 18 .

When using a bus system, the information of the digital inputs can also be received by the superior control system within the data profile. The signal designation and the meaning of the signals is identical for the wired signals and those sent via bus. In this connection, refer to chapter 17.1

Digital inputs at SLOT 2 – Variant "A"

WinPed display Digital inputs SLOT 2

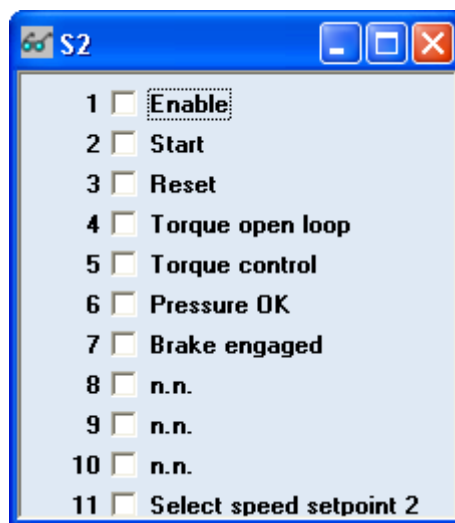


Fig. 6 Digital inputs SLOT 2

Enable Displays the "Enable" signal of the superior control system.

- ✓ "24V" at this input displays the external release.
- ✓ "0V" at this input indicates a missing external release

With the "Enable" signal, the SYHNC-SEK is granted a basic external release. The missing "Enable" signal is treated like an emergency stop. In this case, the emergency stop routine is processed. An SYHNC-SEK reset becomes necessary. Even if a bus system is used, the wired "Enable" signal must be connected and operated.

Start Displays the "Start" signal of the superior control system.

- ✓ The start procedure is initiated with a rising edge at this input.
- ✓ "0V" at this input initiates the "Stop" procedure.

Reset Displays the "Reset" signal of the superior control system.

If there is an active SYHNC100-SEK error, the "Reset" procedure is started with a rising edge at this input.



A "Reset" may only be carried out in the safe system state. For this purpose, at least the connected isolating valves have to be de-energized. Any brake that might be connected must be closed (active braking effect).

Torque OpenLoop Displays selection of the "Torque" mode of operation by the superior control system.

- ✓ "24V" at this input activates the "Torque" mode of operation.
- ✓ "0V" at this input activates the "Speed" mode of operation.

Torque control Displays selection of the "Closed-loop torque control" mode in the "Torque" mode of operation by the superior control system. The "Closed-loop torque control" mode can only be activated if an actual torque value collection for SYHNC100-SEK is available. In this connection, also refer to the pin assignment from chapter 18.

Pressure OK Indicates that sufficient system pressure for the secondary unit is available.

This signal influences the monitoring of the swivel angle difference. If the "Pressure OK" system pressure is not available, the swivel angle difference monitoring remains inactive.

Brake engaged Indicates the current operating state of the braking system.



- ✓ "24V" at this input indicate a closed brake.
Closed brake == active braking effect
- ✓ "0V" at this input indicate an open brake.
Open brake == no braking effect

The "Brake engaged" signal corresponds to the "Brake open request" output signal. Both signals can be used in the controller switch-on/switch-off routine.

Select speedsetpoint 2 Indicates that the external control has selected a parameterized fixed speed command value as command value provision. This signal may only be used if parameter R 519 in the system configuration has been set accordingly.

- ✓ "24V" at this input activates "R464 static speed command 2"
- ✓ "0V" at this input activates "R463 static speed command 1"

Digital inputs at SLOT 3 – Variant "D"

Digital inputs for SYHNC100-SEK-4-3X in variant "D" are specified in the same way as in chapter "Digital inputs at SLOT 2 – Variant "A" ". The pin assignment as specified from chapter 18 must be observed.

Digital inputs at SLOT 4 – Variant "D"

Currently, no digital inputs are assigned at SLOT 4.

5 Analog inputs and outputs

5.1 Analog inputs

Analog inputs are provided for encoders, actual values and command values. For related information please refer to the system configuration from chapter 3 and the pin assignment from chapter 18 .

5.2 Analog outputs

Analog outputs of the LVDT cards are used for the output of controller actuating variables. In this connection, refer to the pin assignment from chapter 18

For the presentation of selected system variables, analog outputs of the existing INK/SSI cards can be configured.

The diagnosis outputs are located on SLOT 2 for variant "A" and on SLOT 3 and SLOT 4 for variant "D".

Selection of the diagnosis variables

The diagnosis variables that are to be output are selected by specifying a code in parameter:

- R544 Select Diagnosis 1
- R545 Select Diagnosis 2

List of diagnosis variables

R544 == 0 -Actual swivel angle value SLOT 1 | LVDT 1
R544 == 1 -Actual swivel angle value SLOT 1 | LVDT 2
R544 == 2 -Actual swivel angle value SLOT 2 | LVDT 1
R544 == 3 -Actual swivel angle value SLOT 2 | LVDT 2

R545 == 0 -Actual speed value axis 1
R545 == 1 -Actual speed value axis 2

6 Start/stop sequence

Start sequence

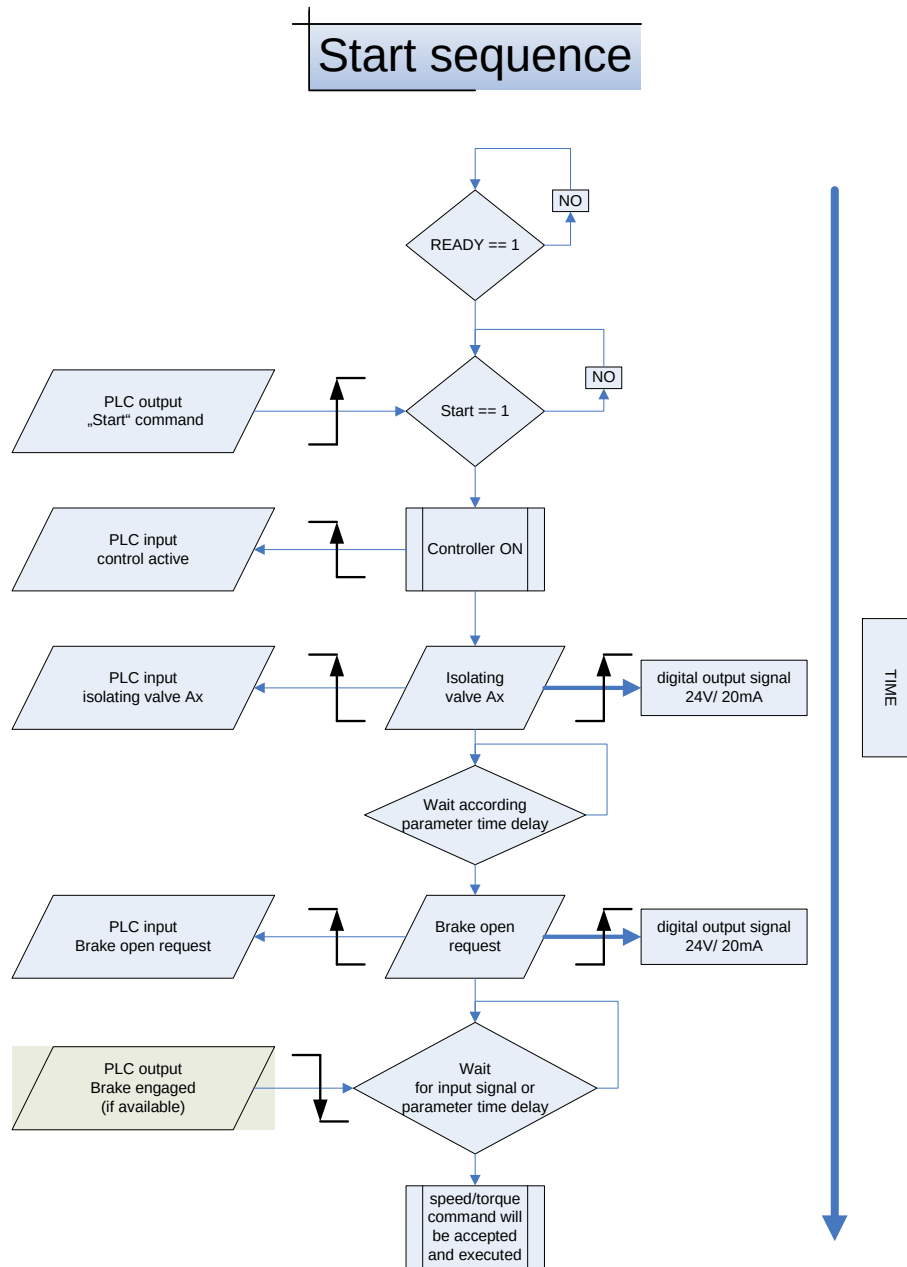


Fig. 7 Start sequence

Stop sequence

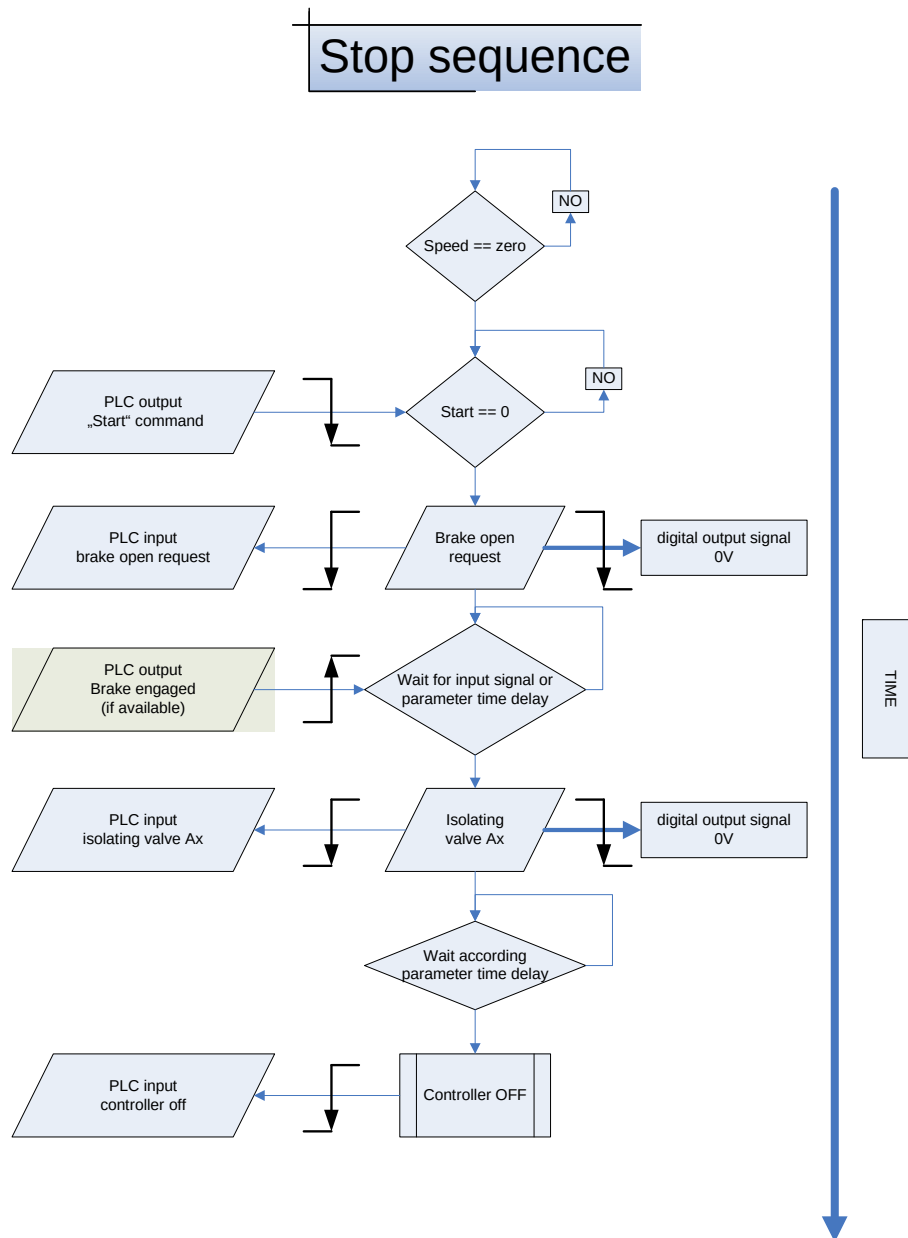
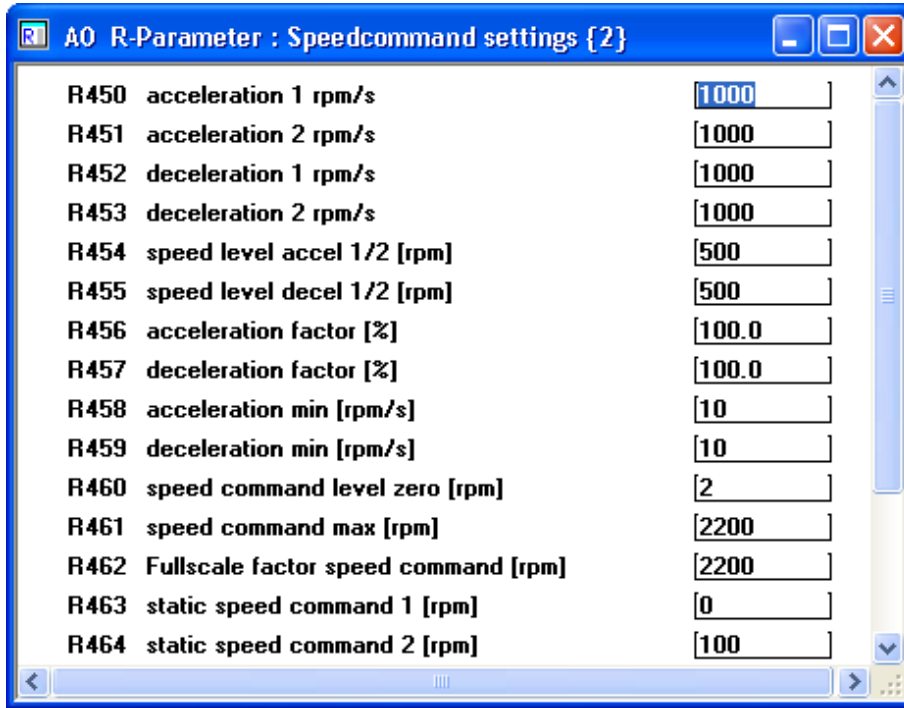


Fig. 8 Stop sequence

7 Speed provision and ramp function

The external speed provision is influence via an internal ramp function with adjustable ramp characteristic as well as limitation and gain factors.

WinPed parameter settings



Parameter	Description	Unit	Value
R450	acceleration 1	rpm/s	1000
R451	acceleration 2	rpm/s	1000
R452	deceleration 1	rpm/s	1000
R453	deceleration 2	rpm/s	1000
R454	speed level accel 1/2	rpm	500
R455	speed level decel 1/2	rpm	500
R456	acceleration factor	%	100.0
R457	deceleration factor	%	100.0
R458	acceleration min	rpm/s	10
R459	deceleration min	rpm/s	10
R460	speed command level zero	rpm	2
R461	speed command max	rpm	2200
R462	Fullscale factor speed command	rpm	2200
R463	static speed command 1	rpm	0
R464	static speed command 2	rpm	100

Fig. 9 Speedcommand settings{2}

7.1 Configuration settings

R460 speed command level zero [rpm]

Specifies a window around the speed command value "0" within which the external analog speed command value is set to "0". This parameter is a noise suppression for the analog speed command value.

R461 speed command max [rpm]

This parameter serves to limit the maximum value of the speed command value (amount).

R462 Fullscale factor speed command [rpm]

Adjustment factor for the external analog speed command value. This value refers to parameter R508 of the system configuration and adjusts the external speed command value according to the following calculation:

$$\text{Speed command value internal} = \text{speed command value external} * \left(\frac{R\ 462}{10\ V} \right)$$

7.2 Speed provision – ramp characteristic

Basic set-up of the ramp function and/or possibility to set the ramp characteristic. The characteristic applies to both, the positive and the negative direction of rotation.

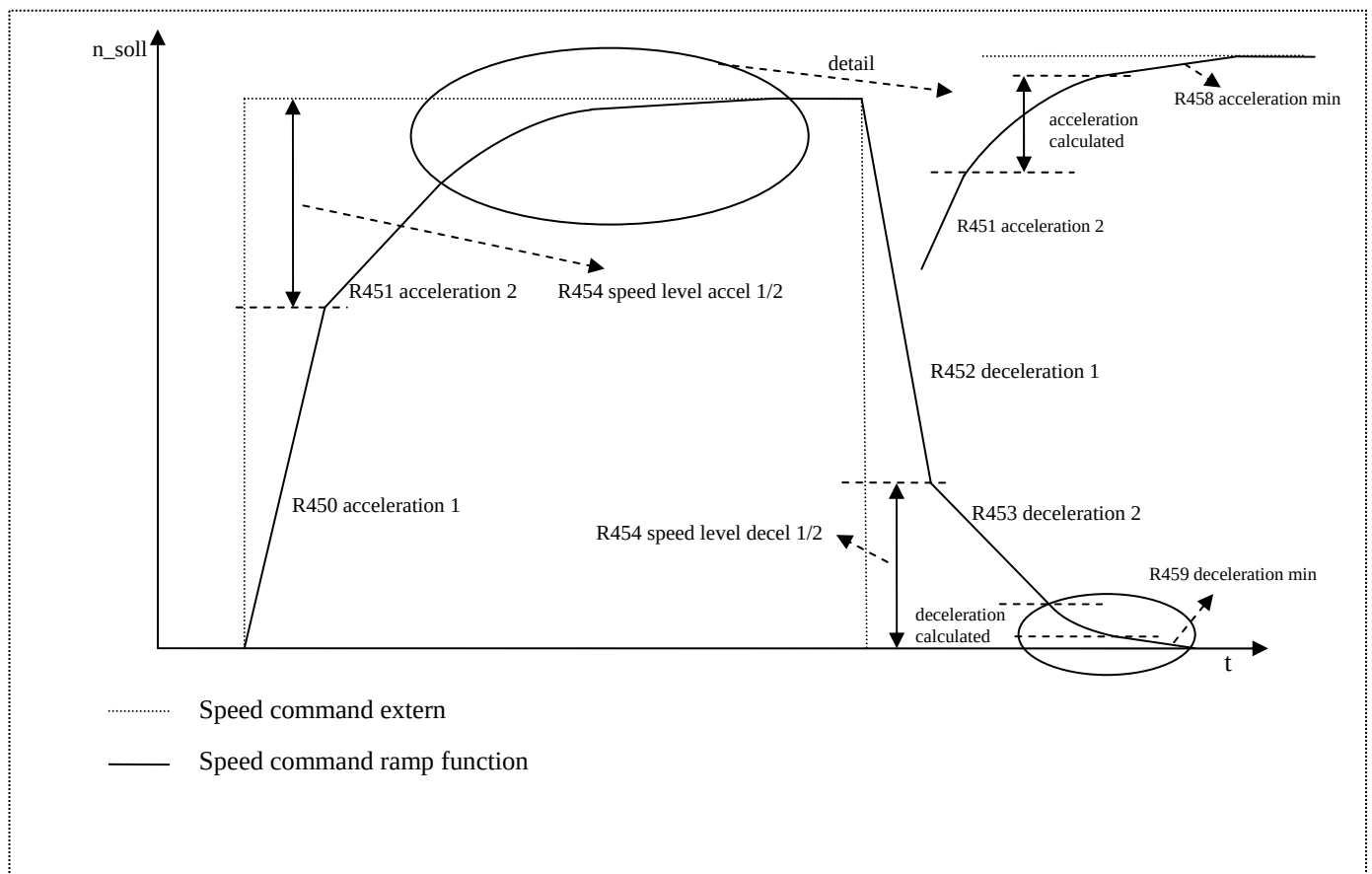


Fig. 10 Ramp characteristic

Acceleration 1**R450 acceleration 1 [rpm/s]**

Specification of the acceleration value until the switching threshold is reached

Acceleration 2**R451 acceleration 2 [rpm/s]**

Specification of the acceleration value after the switching threshold

Deceleration 1**R452 deceleration 1 [rpm/s]**

Specification of the deceleration value until the switching threshold is reached

Deceleration 2**R453 deceleration 2 [rpm/s]**

Specification of the deceleration value after the switching threshold

Accel. threshold**R454 speed level accel 1/2 [rpm]**

Specification of the switching threshold from acceleration 1 to acceleration 2

Decel. threshold**R455 speed level decel 1/2 [rpm]**

Specification of the switching threshold from deceleration 1 to deceleration 2

Ramp rounding settings – extract enlargement

Despite the inflected command value ramp, overshooting of the system may occur upon transition into constant drive.

By means of additional rounding of the command value ramp, the transition can be designed smoothly. This allows for an additional reduction of the overshooting.

Functional principle

The command value difference between the specified value and the internal ramp value is offset with an adjustable factor. As result, you get an internal "acceleration value".

R456 acceleration factor [%]

Specification of the factor for the acceleration range.

R458 acceleration min [rpm/s]

If the internal "acceleration value" falls below the limit value specified in this parameter, this limit value specifies the quantity of the minimum acceleration value.

R457 deceleration factor [%]**R459 deceleration min [rpm/s]**

The functional principle for the deceleration process corresponds to the acceleration adjustment.

8 Speed controller

The speed controller is an extended PID controller. The actuating variable of the speed controller is the input variable of the subordinate swivel angle controllers with active "Closed-loop speed control" mode of operation.

8.1 Control algorithm – process variables

Block diagram speed controller

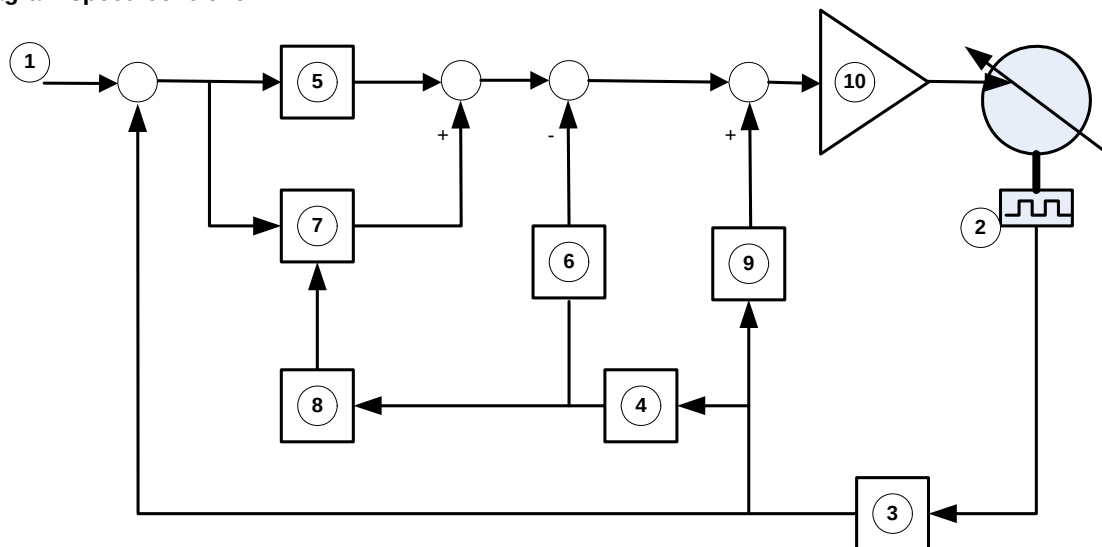


Fig. 11 Block diagram speed controller

WinPed process variables speed controller

A0 Diagnosis : Speed control values {1}		
A001	Speed command ramp	0.0 rpm
A002	Speed command control	0.0 rpm
A004	Speed actual shaft 1	0 rpm
A005	Speed actual shaft 2	0 rpm
A006	Speed actual value control	0 rpm
A007	Acceleration actual shaft 1	0 rpm/s
A008	Acceleration actual shaft 2	0 rpm/s
A009	Acceleration actual control	0 rpm/s
A080	Speed control Output	0.0 %

Fig. 12 Process variables speed controller

Description process variables speed controller

According to the elements labeled in "Fig. 11 Block diagram speed controller" with figures, the following variables apply to the process variables displayed in WinPed:

- 1
Speed command value – A002 Speed command control [rpm]
- 2
Incremental encoder increments – Setting from "System configuration"
- 3
Actual speed value – A004 Speed actual shaft 1 [rpm]

Calculation of the actual speed value = Increments/time = $\left[\frac{dX}{dT_v} / \frac{INK}{Umdr} \right]$
INK/rev. corresponds to the encoder resolution information from the system configuration
- 4
Actual acceleration value – A007 Acceleration actual shaft1 [rpm/s]

Calculation of the actual acceleration values $n_{act}/time = \left[\frac{\dot{dX}}{dT_a} \right]$
- 9
Friction characteristic curve and Start- Up integrator. See chapter 10
- 10
Actuating variable speed controller – A080 Speed control Output [%]

8.2 Control algorithm – parameter settings

According to the elements labeled in "Fig. 11 Block diagram speed controller" with figures, the following variables apply to the parameters displayed in WinPed:

WinPed parameter settings

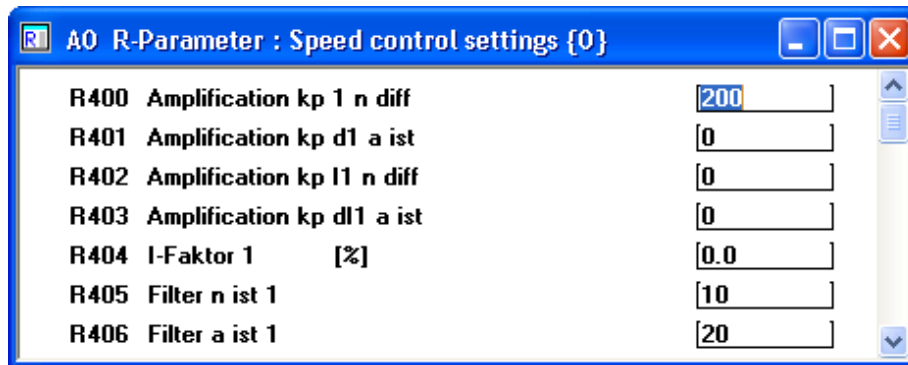


Fig. 13 Parameter settings speed controller

3

R405 Filter n_act 1

Time constant for the calculation of the actual speed value as:

$$[\text{Increments}(t) - \text{increments}(t-x \cdot T_0)] / x \cdot T_0$$
 with
 T_0 = basic scanning time = 1ms; x = entry under R405

4

R406 Filter a_act 1

Time constant for the calculation of the actual acceleration value as:

$$n_act(t) - n_act(t-x \cdot T_0) / x \cdot T_0$$
 with
 T_0 = basic scanning time = 1ms; x = entry under R406

5

R400 Amplification kp 1 n_diff

Gain factor for the calculated speed difference.

6

R401 Amplification kp d1 a_act

Gain factor for the return of the actual acceleration value.

7

R402 Amplification kp l1 n_diff

Gain factor for the switching integrator.

8

R403 Amplification kp dl1 a_act1

Gain factor for the return of the actual acceleration value within the integrator.

R404 I factor 1 [%]

Additional return within the integrator under special conditions like e.g. "Power limitation active"

9

Friction characteristic curve and Start- Up integrator. See chapter 10

10

Symbol of the swivel angle control subordinate to the speed controller, with valve output stage and high-response valve for adjustment of the swivel angle.

8.3 Controller parameter switch-over

The current control parameters can be switched dynamically if the closed-loop control is active. For that purpose, 2 parameter sets are available which are selected depending on the actual speed and the thresholds to be specified. In this connection, the individual parameters are continuously adjusted.

The parameter switch-over influences the following parameter pairs:

- Amplification kp x n_diff R400 <-> R410
- Amplification kp dx a_act R401 <-> R411
- Amplification kp lx n_diff R402 <-> R412
- Amplification kp dlx a_act R403 <-> R413

WinPed parameter settings

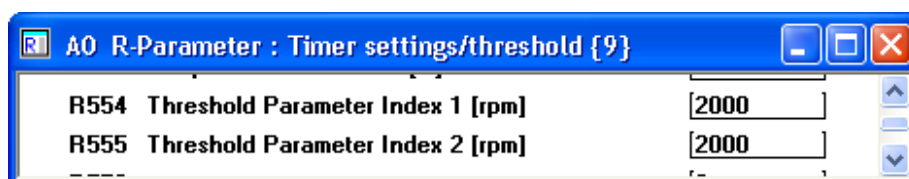


Fig. 14 Parameter switch-over speed controller

If the actual velocity is below the R554 threshold, parameters "R400, R401, R402, R403" are active.

If the actual velocity is above the R555 threshold, parameters "R410, R411, R412, R413" are active.

If the current actual velocity is within the thresholds R554 and R555, the valid controller parameters are interpolated between the corresponding parameters.

WinPed parameter settings

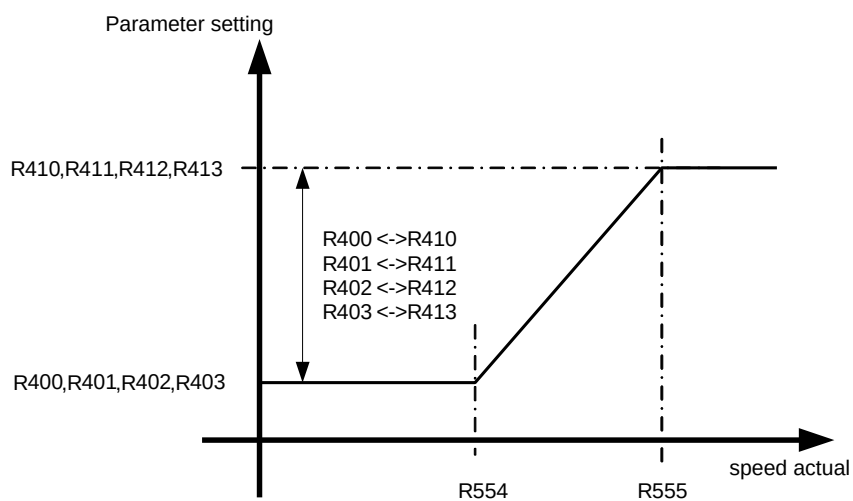


Fig. 15 Parameter switch-over speed controller

8.4 Disturbance feedforward

In the "Closed-loop speed control" mode of operation, the actuating variable determined by the controller can moreover be provided with the torque command value as actuating variable offset. For this purpose, the internal torque command value (ramp output) is amplified by a factor, added to the speed controller's actuating variable.

R588 Md CMD as offset in speed control [%]

Specification of the gain factor for the disturbance. The sign of the parameter value changes the effective direction of the feedforward.

9 Open-loop/closed-loop torque control

The "Torque" mode of operation can be operated in the "Closed-loop torque control" and "Open-loop torque control" variants.

"Closed-loop torque control" requires an actual torque value collection e.g. torque measuring shaft or load cell.

"Open-loop torque control" calculates a swivel angle command value corresponding to the torque provision. An actual torque value collection is not requested in this variant.

The "Closed-loop torque control" variant can be used in the "Swivel angle command value" and "Speed command value" modes. In the "Swivel angle command value" mode, the controller output of the torque controller is designed as swivel angle command value; in the "Speed command value" mode, the actuating variable of the torque controller is a speed command value.

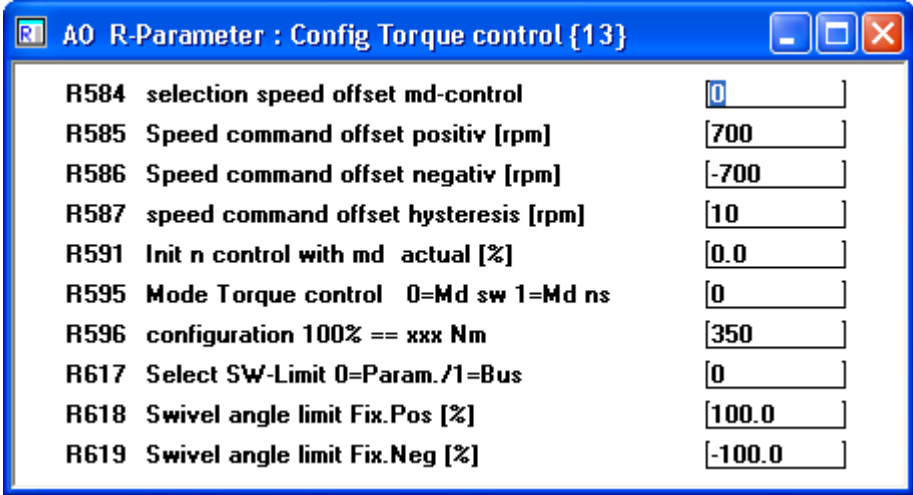
The "Swivel angle command value" mode is recommended for "torsionally stiff", i.e. less elastic applications. The "Speed command value" mode is rather to be preferred for elastic applications susceptible to oscillations.

In the "Closed-loop/open-loop torque control" mode of operation, the closed-loop speed control is always active in a superimposed form. The closed-loop speed control automatically performs the active closed-loop control when the detected actual speed value reaches an adjustable limit value.

9.1 Mode of operation torque – configuration settings

Apart from the system configuration settings, see chapter 3.4, more settings have to be configured for the "Torque" mode of operation.

WinPed parameter settings



The screenshot shows a window titled "A0 R-Parameter : Config Torque control {13}" with a list of parameters and their values:

R584	selection speed offset md-control	0
R585	Speed command offset positiv [rpm]	700
R586	Speed command offset negativ [rpm]	-700
R587	speed command offset hysteresis [rpm]	10
R591	Init n control with md actual [%]	0.0
R595	Mode Torque control 0=Md sw 1=Md ns	0
R596	configuration 100% == xxx Nm	350
R617	Select SW-Limit 0=Param./1=Bus	0
R618	Swivel angle limit Fix.Pos [%]	100.0
R619	Swivel angle limit Fix.Neg [%]	-100.0

Fig. 16 Torque configuration

R584 selection speed offset md-control [-]

Setting for selection of the speed limits. The following settings are possible for R584.

R584 == 0 Selection of the speed limits as parameterizable fixed values R585 and R586.

R584 == 1 Selection of the speed limits as bus variable. In this connection, refer to chapter 17.1

For information on the use of the speed limits, please refer to chapter 9.8

R585 Speed command offset positive [rpm]

Parameterizable fixed value for upper (positive) speed limit.

R585 Speed command offset negative [rpm]

Parameterizable fixed value for lower (negative) speed limit.

R587 Speed command offset hysteresis [rpm]

This parameter is not used at the moment.

R591 Init n control with md actual [%]

During the start procedure before the isolating valve is opened, the imported actual torque value / actual load cell value is multiplied by R591 and the result is preset as swivel angle command value.

This procedure is reasonable if e.g. a suspended load is to be compensated upon start-up by a corresponding motor torque.



This parameter can only be used if an actual torque value is available!

R595 Mode Torque control 0=Md sw 1=Md ns

In the "Closed-loop torque control" variant, the "Torque" mode of operation can be activated in two modes.

R595 == 0 == Md sw The "Closed-loop torque control" variant is carried out with a resulting swivel angle command value.

R595 == 1 == Md ns The "Closed-loop torque control" variant is carried out with a resulting speed command value with subordinate speed controller.

R596 configuration 100% == xxx Nm

Assignment rule of the torque command value.

R615 Torque transducer offset %

By means of this parameter, a torque offset that may be available at the analog torque actual value input can be compensated.

R617 Select SW-Limit 0=Param./1=Bus

Selects the specification for the swivel angle limit values

R618 Swivel angle limit Fix.Pos [%]

Specification of the fixed positive swivel angle limit value

R619 Swivel angle limit Fix.Neg [%]

Specification of the fixed negative swivel angle limit value

9.2 Parameters/process variables "torque" mode of operation

WinPed parameter settings

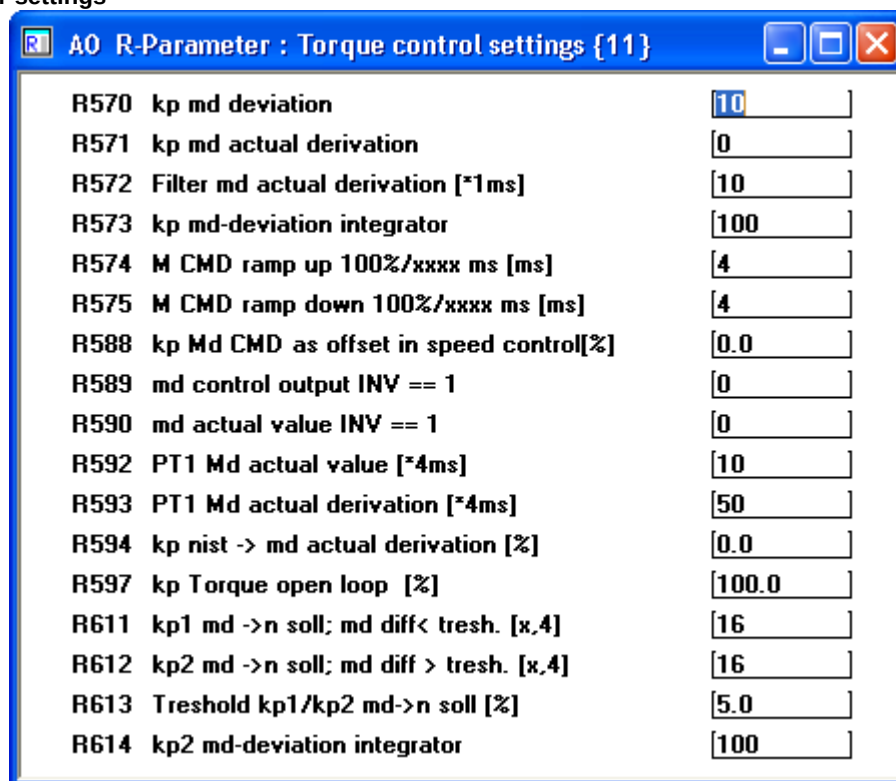
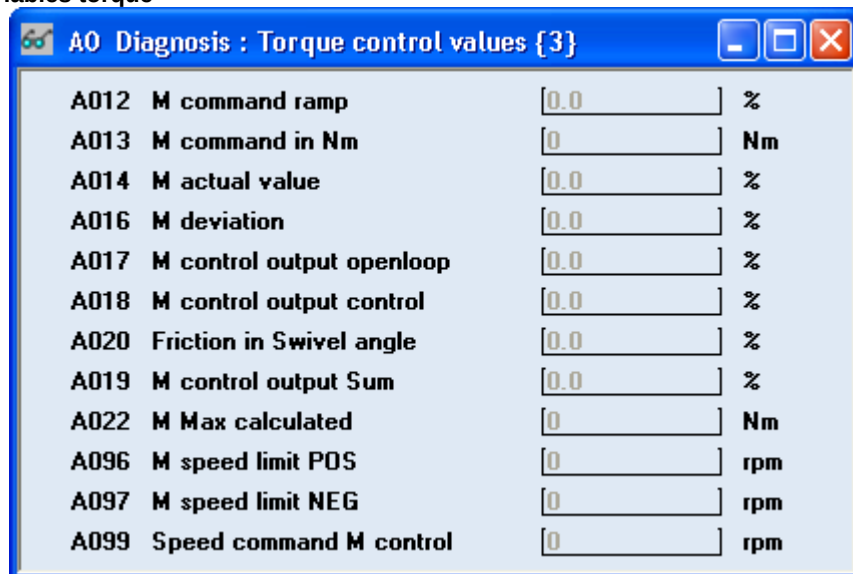


Fig. 17 Torque parameter menu

The parameters listed in "Fig. 17 Torque parameter menu" contain all setting options which can be used for the "Torque" mode of operation.

The individual parameters are described in a topic-related form in the following chapters.

WinPed process variables torque



Variable	Value	Unit
A012 M command ramp	0.0	%
A013 M command in Nm	0	Nm
A014 M actual value	0.0	%
A016 M deviation	0.0	%
A017 M control output openloop	0.0	%
A018 M control output control	0.0	%
A020 Friction in Swivel angle	0.0	%
A019 M control output Sum	0.0	%
A022 M Max calculated	0	Nm
A096 M speed limit POS	0	rpm
A097 M speed limit NEG	0	rpm
A099 Speed command M control	0	rpm

Fig. 18 Process variables torque

9.3 Selection of the "torque" mode of operation

You can generally only distinguish between the "Speed" and "Torque" modes of operation. You can change between these modes during operation in a shock-free way. The modes of operation can only be selected alternatively, i.e. one of the specified modes of operation is always selected.

For the "Torque" mode of operation, the desired mode in which the mode of operation is to be carried out must be specified in advance.

The mode of operation is either switched with digital input signals or via corresponding bus communication signals, depending on the configuration.

Selection of open-loop torque control

The "Open-loop torque control" variant, the controlled provision of a torque without use of an actual torque value collection always determines a resulting swivel angle command value as actuating variable.

Preconditions:

- Parameter configuration R 595 = 0
- The external "Torque control" signal must be set to "0"

Torque OpenLoop = "1" Activates the "Open-loop torque control" mode of operation if the specified preconditions are met.

Torque OpenLoop = "0" Activates the Speed mode of operation.

Selection of closed-loop torque control "Md_sw"

Preconditions:

- Parameter configuration R 595 = 0
- The external "Torque control" signal must be set to "1"

Torque OpenLoop" = "1" Activates the "Closed-loop torque control Md_sw" mode of operation if the specified preconditions are met.

Torque OpenLoop" = "0" Activates the Speed mode of operation.

Selection of closed-loop torque control "Md_ns"

Preconditions:

- Parameter configuration R 595 = 1
- The external "Torque control" signal must be set to "1"

Torque OpenLoop" = "1" Activates the "Closed-loop torque control Md_ns" mode of operation if the specified preconditions are met.

Torque OpenLoop" = "0" Activates the Speed mode of operation.

9.4 Torque provision and ramp function

The torque is basically provided according to the settings entered in the system configuration, see chapter 3.3 .

If the closed-loop control is active, the external torque command value is lead via an internal ramp function with adjustable ramp values.

R574 M CMD ramp up 100%/xxxx ms [ms]

The entered value specifies in which time a provided value of 100% is to be achieved with an output value of 0%. The scanning time within which the ramp function is processed is 4 ms. I.e. input values < 4 ms are processed like an entry of 4 ms.

R575 M CMD ramp up 100%/xxxx ms [ms]

The entered value specifies in which time a provided value of 0% is to be achieved with an output value of 100%. The scanning time within which the ramp function is processed is 4 ms. I.e. input values < 4 ms are processed like an entry of 4 ms.

9.5 Open-loop torque control

The torque of a secondary unit can be approximately calculated considering the "Size" and "System pressure" characteristics (see chapter 3 "System configuration"). The following calculation basis applies:

$$MD_{max} = (\text{size[ccm]} * \text{system pressure[bar]}) / 20\pi \text{ [Nm]}$$

See chapter 3 "System configuration"

A022 M Max calculated [Nm]

Displays the current maximum torque available as calculated variable considering the values set in the system configuration.
By specifying a proportional swivel angle, any torque up to the displayed maximum torque can be created.

R596 configuration 100% == xxx Nm

The conversion of a torque command value into a corresponding swivel angle command value depends on the amount of the command value configuration value specified here.

If the maximum torque possible (A022) and the command value configuration (R596) have been set to the same value, this means that with a maximum command value (100% = 10V / 0x1FFF) a maximum swivel angle of 100% will be specified.

R597 kp Torque open loop [%]

Multiplicative factor for adjusting the calculating actuating variable. This parameter will usually be set to the value 100%. System-specific properties can, however, be corrected by means of this parameter.

A017 M control output openloop [%]

Displays the actuating variable of the open-loop torque control.

9.6 Control algorithm in the "Md-sw" mode

Block diagram torque controller "Md-sw"

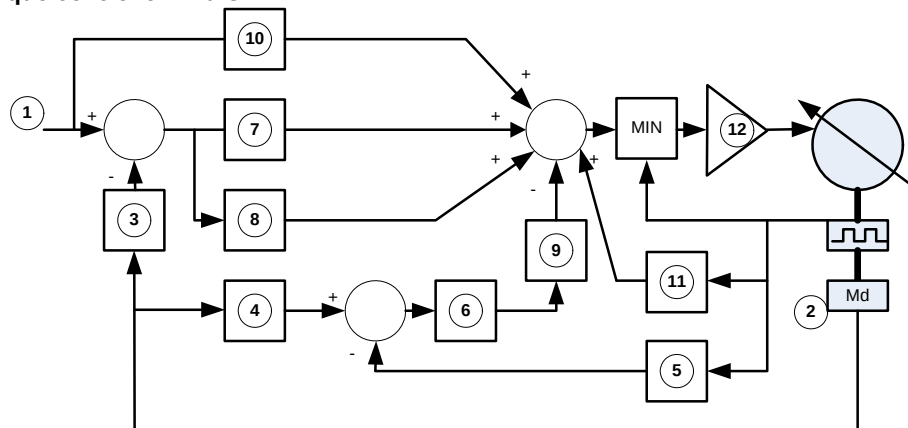


Fig. 19 Block diagram "Md-sw"

Description process variables torque controller "Md-sw"

According to the elements labeled in "Fig. 19 Block diagram "Md-sw" with figures, the following variables apply to the process variables displayed in WinPed:

1	Controller torque command value	A012	M command ramp	[%]
		A013	M command in Nm	[Nm]
3	Actual torque value –	A014	M actual value	[%]
6	Derivation Md- actual value (pure derivation only if POS.5 is set to "0")	A015	M derivation	[dig]
7 8 9	Actuating variable Md- controller (summarizes the components 7, 8, 9)	A018	M control output	[%]
10	Actuating variable Md Open Loop	A017	M control output openloop	[%]
11	Friction characteristic curve	A020	Friction in Swivel angle	[%]
MIN	Speed limits	A096	M speed limit POS	[rpm]
		A097	M speed limit NEG	[rpm]
12	Controller actuating variable total	A019	M control output Sum	[%]

Description parameter settings torque controller "Md_sw"

According to the elements labeled in " Fig. 19 Block diagram "Md-sw" with figures, the parameters that can be set in WinPed apply:

- 1
Torque command value controller after ramp function R574 / R575
- 2
Actual torque value from measuring shaft / load cell
- 3
R592 PT1 Md actual value[*4ms]
Actual torque value "PT1 Filter"
- 4
R572 Filter md actual derivation
Filter time constant for the calculation of the actual torque value derivation in multiples of T0 = basic scanning time = 1ms
- 5
R594 kp nact -> md actual derivation [%]
Gain factor for the return of the actual speed value.
- 6
R593 PT1 Md actual derivation [*4ms]
PT1 Filter Md actual derivation
- 7
R570 kp md deviation
Gain factor for the command-actual torque difference
- 8
R573 kp md deviation integrator
Gain factor for the switching integrator
- 9
R571 kp md actual derivation
Gain factor for the return of the actual torque value derivation

- 10
- Open-loop torque control
- 11
- Friction characteristic curve see chapter 10
- 12
- Swivel angle controller - Valve output stage - High-response valve

9.7 Control algorithm in the "Md-ns" mode

Block diagram torque controller "Md-ns"

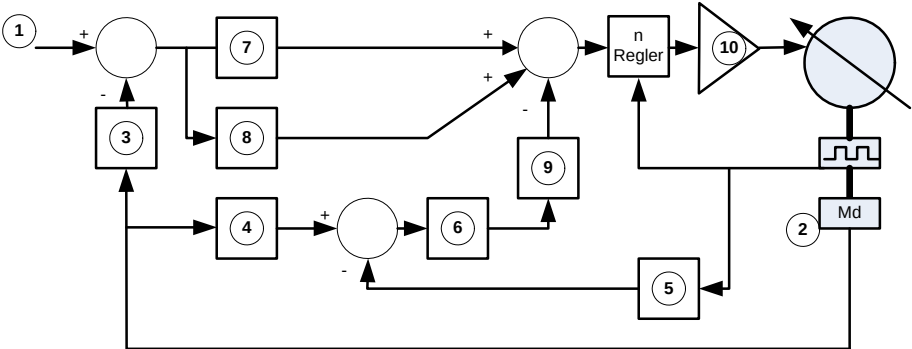


Fig. 20 Block diagram "Md-ns"

Description process variables torque controller "Md-ns"

According to the elements labeled in " Fig. 20 Block diagram "Md-ns" with figures, the following variables apply to the process variables displayed in WinPed:

1	Controller torque command value	A012	M command ramp	[%]
		A013	M command in Nm	[Nm]
3	Actual torque value	A014	M actual value	[%]
6	Derivation Md- actual value (pure derivation only if POS.5 is set to "0")	A015	M derivation	[dig]

7 8 9

Actuating variable Md- controller

A099 Speed command M control [rpm]

10

Actuating variable speed controller

Description parameter settings torque controller "Md_ns"

According to the elements labeled in " Fig. 20 Block diagram "Md-ns" with figures, the parameters that can be set in WinPed apply:

1

Torque command value controller after ramp function R574 / R575

2

Actual torque value from measuring shaft / load cell

3

R592 PT1 Md actual value[*4ms]

Actual torque value "PT1 Filter"

4

R572 Filter md actual derivation

Filter time constant for the calculation of the actual torque value derivation in multiples of T0 = basic scanning time = 1ms

5

R594 kp nact -> md actual derivation [%]

Gain factor for the return of the actual speed value.

6

R593 PT1 Md actual derivation [*4ms]

PT1 Filter Md actual derivation

7

R611 $kp1 \cdot md \rightarrow n \text{ command}; md_diff < thresh [x,4]$ R612 $kp2 \cdot md \rightarrow n \text{ command}; md_diff > thresh [x,4]$ R613 Threshold $kp1/kp2 \cdot md \rightarrow n_command [\%]$ Gain factor torque difference $kp1/kp2$.

Gain factor with inflected characteristic curve depending on a torque difference threshold.

8

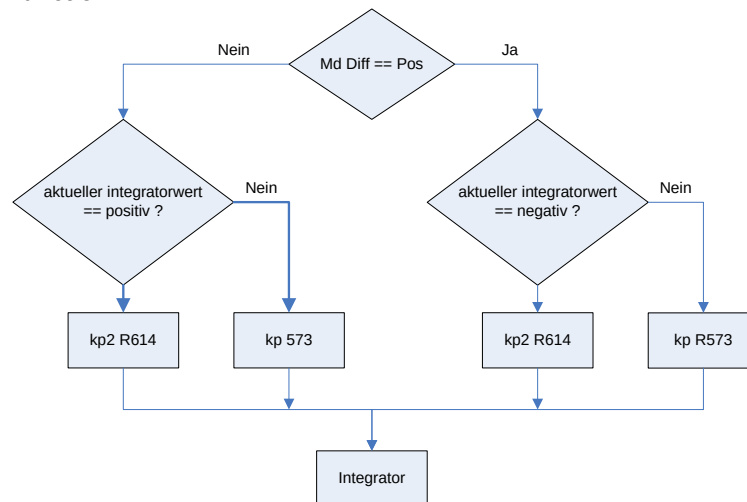
R573 $kp \cdot md\text{-deviation integrator}$ R614 $kp2 \cdot md\text{-deviation integrator}$ Gain factor integrator $kp1/kp2$ for the torque difference. Gain factors for the switching integrator.**Block diagram integrator function**

Fig. 21 Integrator function "Md-ns"

9

R571 $kp \cdot md \text{ actual derivation}$

Gain factor for the return of the actual torque value derivation

10

Swivel angle controller - Valve output stage - High-response valve

9.8 Speed limitation

In closed-loop/open-loop torque control there is always the risk that the speed of the secondary unit can increase very quickly if the counter torque is suddenly lost. Consequently, the "Maximum speed" monitoring function usually identifies an emergency stop situation. However, before this monitoring threshold is reached, there is the possibility to control the speed to a maximum value using the speed controller. For this purpose, an upper and a lower speed limit are determined the reaching of which will activate the closed-loop speed control. The currently active speed controller tries to control the speed to the limit value.

As soon as the speed lies within the thresholds again, the Torque mode of operation takes control again.

Value range of the limit value provision

Basically, a value range applies to the limit value provision as the value according to R508 specified in the "System configuration".

It is not admissible to set the limit values in positive and negative direction to an identical value. In this case, the limit value provision is automatically set to the currently set value R461 "speed command max [rpm]". I.e. the positive speed limit corresponds to the value of + R461, the negative speed limit corresponds to the value of – R461.

The speed limits are configured in the "Config Torque control{13}" menu. The possible settings are described in chapter 9.1.

10 Friction characteristic curve

For compensation of the friction shares of a secondary unit, a friction characteristic curve can be parameterized. The "Friction share" output variable constitutes a swivel angle offset depending on the sign and the size of the actual speed value. Apart from that, a "Startup integrator" can be parameterized taking effect in the speed zero crossing.

The following friction shares are considered:

- Coulomb friction
- Static friction
- Dynamic friction

Schematic diagram friction characteristic curve

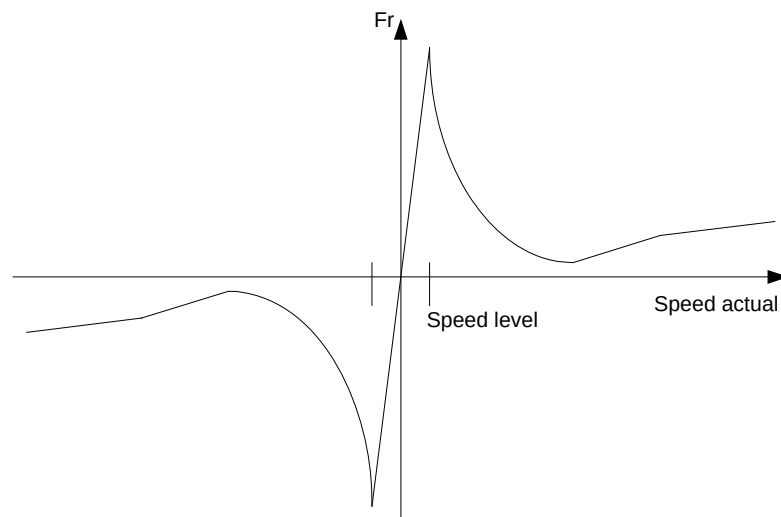


Fig. 22 Total friction characteristic curve

WinPed parameter settings

A0 R-Parameter : Friction settings {12} *		
R576	friction Coulomb [%]	0.0
R577	friction adhesion n == Null [%]	6.0
R578	friction adhesion speed limit [rpm]	170
R579	dynamic friction factor 1 [%]	0.0
R580	dynamic friction factor 2 [%]	0.0
R581	speed treshold dyn. friction 1/2 [rpm]	60
R582	Friction Maximum [%]	0.0
R583	Friction 100%→0% speed level [rpm]	8
R620	Startup Integrator speed limit [rpm]	10
R621	Startup Integrator up 100%/xxxx ms	200
R622	Startup Integrator down 100%/xxxx ms	650
R623	Startup Integrator Max [%]	0.0

Fig. 23 Parameter menu friction characteristic curve

Coulomb friction

It is assumed that the Coulomb friction is a constant friction share cross the entire speed range.

R576 friction Coulomb [%]

Provision of the Coulomb friction share

Static friction

The share of the static friction is approximated via a square curve.

Schematic diagram static friction

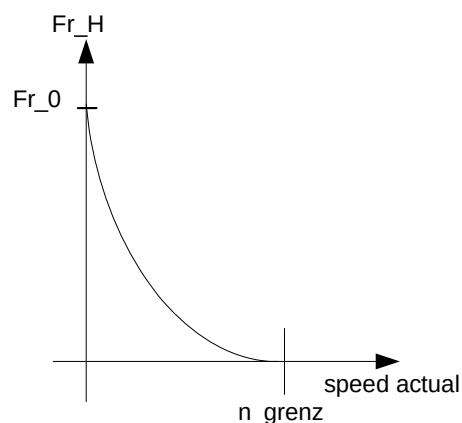


Fig. 24 Static friction

The following equation is used as calculation formula:

$$Fr_H = Fr_0 * [(n_{limit} - n_{act}) / n_{limit}]^2$$

R577 friction adhesion $n = 0$ [%]

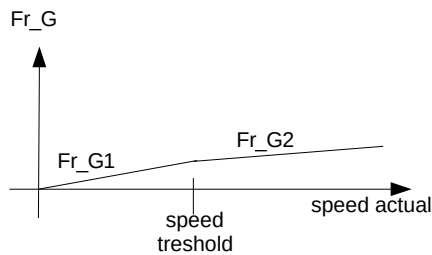
Fr_0 specification of the factor for the calculation of the static friction component

R578 friction adhesion speed limit [rpm]

Specification of the "n_limit" limit value.

Dynamic friction

The share of the dynamic friction is approximated via an inflected characteristic curve.

Schematic diagram dynamic friction*Fig. 25 Dynamic friction***R579 dynamic friction factor 1 [%]**

Fr_G1 specification for the dynamic friction component 1

R580 dynamic friction factor 2 [%]

Fr_G2 specification for the dynamic friction component 2

R581 speed threshold dyn friction 1/2 [rpm]

"speed threshold" limit value for switching the dynamic friction component 1 and 2

Characteristic curve adjustment with change in direction of rotation

So that when changing the direction or rotation or in case of velocities ± 0 , the rapid switch-over of the friction offset does not lead to disturbing influence, the friction characteristic curve can be adjusted around the speed zero point. For this purpose, the friction offset is adjusted by means of a straight characteristic curve through the zero point. The resulting figure for the friction characteristic curve will then look as shown in Fig. 22 Total friction characteristic curve .

R583 Friction 100%→0% speed level [rpm]

"Speed level" for determining the beginning of the straight characteristic curve.

R582 Friction maximum [%]

Maximum value limitation for the calculated friction share.

Startup integrator

If the current actual speed value == 0 (< threshold), but the speed command value is not 0, the conditions for the activation of the "Startup integrator" are met. As soon as actual speed value > threshold is identified, the integrator value is reset to 0. By means of this function, a short swivel angle impulse is generated, which should be enough to overcome the motor's "break away torque".

R620 Startup Integrator speed limit [rpm]

Actual speed values less than threshold R620 are assumed to be "0".

R621 Startup Integrator up 100%/xxxx ms

Startup integrator ramp UP. Specifies which time [ms] the "Startup integrator" value is to need from 0% to 100% (=100% swivel angle).

R622 Startup Integrator down 100%/xxxx ms

Startup integrator ramp DOWN. Specifies which time [ms] the "Startup integrator" value is to need from 100% to 0% (=0% swivel angle).

R623 Startup Integrator Max [%]

Startup integrator maximum value. Limits the maximum value of the "Startup integrator" possible.

11 Power limitation

The power limitation is to ensure that the pressure supply system is not overloaded. I.e. the secondary unit must not consume more oil than can be provided by the pressure supply. Losses of any kind have not been considered in the power limitation and must be adjusted by specifying a suitable power limit value, if necessary.

The current power of a secondary unit is calculated from the product of speed and swivel angle assuming that the system pressure is always constant. The maximum power of a secondary unit is evaluated as 100% if the current speed and the current swivel angle are in each case 100%.

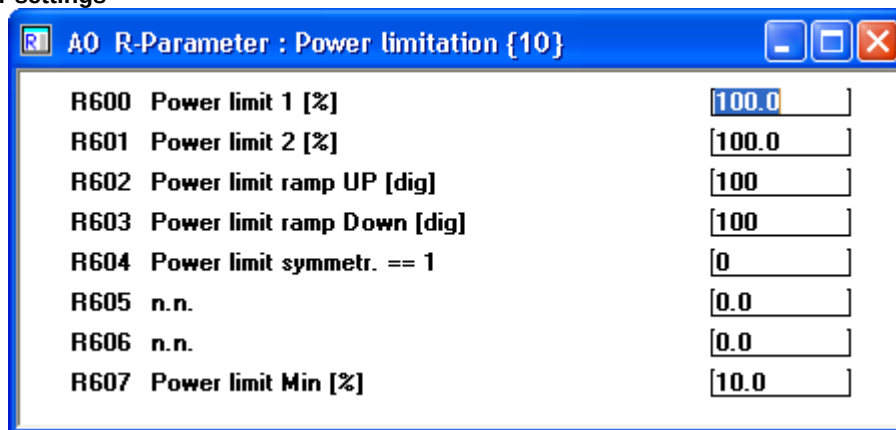
Provision of the speed = 100% refers to the parameter entered in the "System configuration" under R508. Provision of the swivel angle = 100% refers to the maximum adjustment stroke (=size) at the motor.

Provision of a power limit refers to the ratio of maximum power supplied (pump volume) to maximum power consumed (motor).

The power limitation works according to the principle that for a set power limit, a maximum admissible swivel angle value is calculated depending on the current speed. I.e. the necessary oil quantity through the motor is limited to a maximum value.

A simple form of power limitation is the specification of a maximum admissible swivel angle by means of parameter.

WinPed parameter settings



Parameter	Value
R600 Power limit 1 [%]	100.0
R601 Power limit 2 [%]	100.0
R602 Power limit ramp UP [dig]	100
R603 Power limit ramp Down [dig]	100
R604 Power limit symmetr. == 1	0
R605 n.n.	0.0
R606 n.n.	0.0
R607 Power limit Min [%]	10.0

Fig. 26 Power limitation parameter menu

Only the active parameters are described. All setting options that are not addressed are intended for future extensions.

R600 Power limit 1 [%]

Provision of the desired power limit



The characteristic calculated from the power limitation corresponds to a swivel angle limit value. Swivel angle limit values are moreover determined from the closed-loop torque control and specified via the fixed swivel angle limit values R618 and R619 (see chapter 9.1).

The resulting swivel angle limit value is determined according to the minimum value principle from the 3 possible components.

Power limitation Motor / Symmetric

If the power limitation has been activated by specifying a power limit, the calculated swivel angle limit value can be set so that it takes effect symmetrically or only in the motor direction. The related selection is made using parameters:

R604 Power limit symmetr. = 1

R604 = 1 The calculated swivel angle limit value is used with the same amount as positive and negative swivel angle limit.

R604 = 0 The calculated swivel angle limit value is only used in motor direction, sign of speed and swivel angle are identical. In the opposite direction, the limit value is set as 100% or -100%, depending on the current direction of rotation.

WinPed process variables power limitation

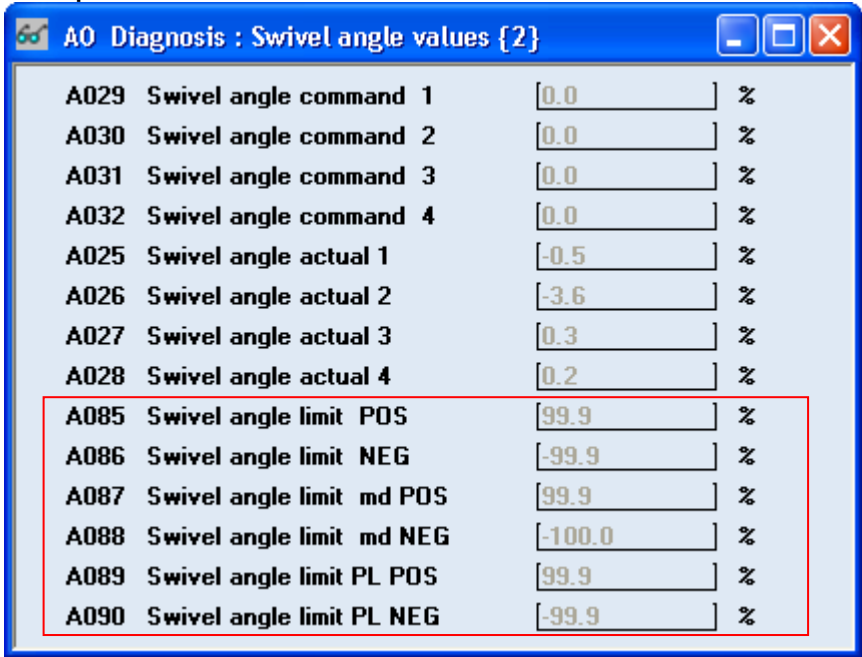


Fig. 27 Process variables power limitation

A085 Swivel angle limit POS[%]
A086 Swivel angle limit NEG[%]

The resulting swivel angle limit value from power limitation, closed-loop torque control or fixed value provision

A087 Swivel angle limit PL POS [%]
A088 Swivel angle limit PL NEG [%]

Swivel angle limit values positive and negative from the power limitation

A087 Swivel angle limit md POS [%]
A088 Swivel angle limit md NEG [%]

Swivel angle limit values positive and negative from the torque mode of operation

12 Swivel angle control

12.1 Configuration settings swivel angle

Configuration settings for the swivel angle control circuits are provided for the following areas.

- Inversions for actual values and actuating variables for adjusting the control direction
- Settings for the monitoring and completion of the automatic swivel angle adjustment as well as parameters for storing adjustment values by the automatic swivel angle adjustment.
- Selection options for the internal swivel angle provision

WinPed parameter settings

Parameter	Description	Value
R470	Swivel angle1 act.invert INV == 1	0
R471	Swivel angle2 act.invert INV == 1	0
R472	Swivel angle3 act.invert INV == 1	0
R473	Swivel angle4 act.invert INV == 1	0
R474	Swivel angle1 output INV == 1	0
R475	Swivel angle2 output INV == 1	0
R476	Swivel angle3 output INV == 1	0
R477	Swivel angle4 output INV == 1	0
R478	Adj.Swivel angle Max. Error [V]	9.50
R479	Adj.Swivel angle Min. Error [V]	6.00
R480	R480	0.00
R481	R481	0.00
R482	Timer Swivel angle adjustment	0
R483	R483	0
R484	R484	0
R485	Adj. Swivel angle Codeword	0
R486	R486	0
R487	R487	0
R488	Swivel angle Test	0
R489	Swivel angle Test command [%]	0.0
R490	Distorsion Swivel angle [%]	0.0
R495	Adj.Swivel angle 1 NP [V]	0.26
R496	Adj.Swivel angle 2 NP [V]	-0.30
R497	Adj.Swivel angle 3 NP [V]	0.00
R498	Adj.Swivel angle 4 NP [V]	0.00
R499	Adj.Swivel angle 1 FS [%]	114.5
R500	Adj.Swivel angle 2 FS [%]	122.5
R501	Adj.Swivel angle 3 FS [%]	110.0
R502	Adj.Swivel angle 4 FS [%]	100.0
R503	Adj.Valve offset 1 [V]	-0.06
R504	Adj.Valve offset 2 [V]	-0.40
R505	Adj.Valve offset 3 [V]	0.00
R506	Adj.Valve offset 4 [V]	0.00

Fig. 28 Swivel angle controller configuration

R470 Swivel angle 1 act.invert INV == 1**R470 = 1** Inverts SLOT 1 LVDT 1 swivel angle actual value signal**R470 = 0** No inversion SLOT 1 LVDT 1 swivel angle actual value signal**R471 Swivel angle 2 act.invert INV == 1****R471 = 1** Inverts SLOT 1 LVDT 2 swivel angle actual value signal**R471 = 0** No inversion SLOT 1 LVDT 2 swivel angle actual value signal**R472 Swivel angle 3 act.invert INV == 1****R472 = 1** Only for version "D"
Inverts SLOT 2 LVDT 1 swivel angle actual value signal**R471 = 0** Only for version "D"
No inversion SLOT 2 LVDT 1 swivel angle actual value signal**R473 Swivel angle 4 act.invert INV == 1****R473 = 1** Only for version "D"
Inverts SLOT 2 LVDT 2 swivel angle actual value signal**R473 = 0** Only for version "D"
No inversion SLOT 2 LVDT 2 swivel angle actual value signal**R474 Swivel angle 1 output INV == 1****R474 = 1** Inverts SLOT 1 LVDT 1 actuating variable swivel angle controller**R474 = 0** No inversion SLOT 1 LVDT 1 actuating variable swivel angle controller**R475 Swivel angle 2 output INV == 1****R475 = 1** Inverts SLOT 1 LVDT 2 actuating variable swivel angle controller**R475 = 0** No inversion SLOT 1 LVDT 2 actuating variable swivel angle controller**R476 Swivel angle 3 output INV == 1****R476 = 1** Only for version "D"
Inverts SLOT 2 LVDT 1 actuating variable swivel angle controller**R476 = 0** Only for version "D"
No inversion SLOT 2 LVDT 1 actuating variable swivel angle controller**R477 Swivel angle 4 output INV == 1****R477 = 1** Only for version "D"
Inverts SLOT 2 LVDT 2 actuating variable swivel angle controller**R477 = 0** Only for version "D"
No inversion SLOT 2 LVDT 2 actuating variable swivel angle controller**R478 Adj. Swivel angle Max.Error [V]**

Error threshold in the automatic swivel angle adjustment. If in the automatic swivel angle adjustment an actual value > R478 is identified, the adjustment is cancelled with an error message.

R479 Adj. Swivel angle Min.Error [V]

Error threshold in the automatic swivel angle adjustment. If in the automatic swivel angle adjustment an actual value < R479 is identified, the adjustment is cancelled with an error message.

R485 Adj. Swivel angle Codeword

- Parameter for activating the automatic swivel angle adjustment
- Parameter for activating the automatic LVDT potentiometer calibration

In this connection, refer to chapter 13

R488 Swivel angle Test**R488 = 1**

activates the release for an internal swivel angle command value. In this setting, the actuating variable from the "Speed" or "Torque" mode of operation is ignored.



- In this case, the system cannot be started!
- In this case, no closed-loop control is active!
- There is the risk caused by uncontrolled motor movements!

- ✓ Activation of this parameter simultaneously activates parameter R489 for the internal swivel angle command value provision in the range of $\pm 100\%$.

R488 = 0"

The actuating variable from the "Speed" or "Torque" mode of operation is accepted as command value for the swivel angle controller.

R489 Swivel angle Test command [%]

Provision of a swivel angle command value in the range of $\pm 100\%$.

R490 Distorsion Swivel angle [%]

Provides a distortion offset distorting the swivel angles connected to a SLOT. a distortion of 10% is e.g. converted into the following swivel angle offset:

- SLOT 1 LVDT 1 +5%
- SLOT 1 LVDT 2 -5%

If the closed-loop control requires a swivel angle of 100%, the offset of the previous swivel angle is reduced to "0".

R495- R506

Parameters R495 - R506 are part of the swivel angle calibration and are explained in more detail in chapter 13 .

12.2 Parameter settings swivel angle controller

Depending on the hardware type (ordering key), up to 4 swivel angle controllers can be operated at one SYHNC100-SEK-3X.

Selection and configuration are effected in the "System configuration" menu.

WinPed parameter settings

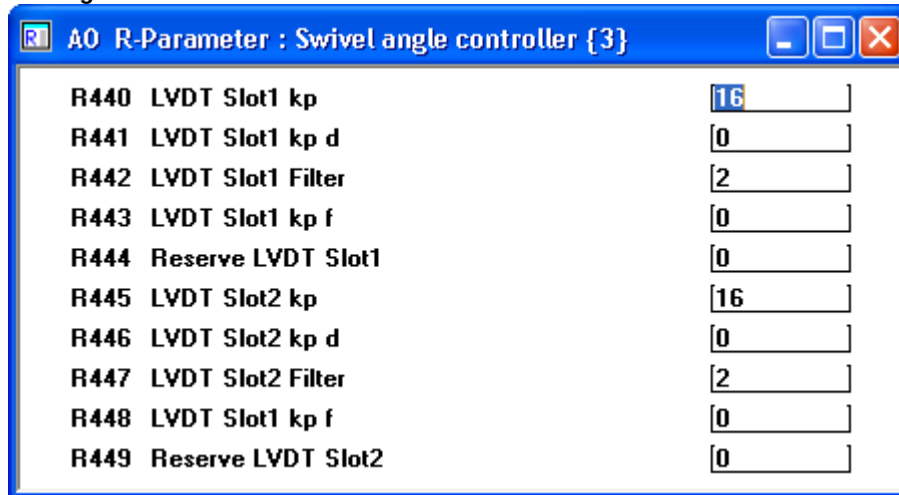


Fig. 29 Swivel angle controller parameter menu

The parameter settings can be individually selected for each active SLOT. In the hardware version "A" or "D", the parameters R440 – R444 are assigned to the LVDT sensors at SLOT 1.

Parameters R445 – R449 are assigned to the LVDT Sensors at SLOT 2 if the hardware version "D" is used.

In the following, only the active parameters are described.

R440 LVDT Slot1 kp

Gain factor swivel angle difference command / actual

R441 LVDT Slot1 kp d

Gain factor swivel angle actual value derivation

R442 LVDT Slot1 Filter

Filter constant for determining the derivation of the actual swivel angle value. The value corresponds to the basic scanning time T0 of 1ms.

R443 LVDT Slot1 kp f

Gain factor swivel angle command value provision

Meaning of R445 – R449 synonymous with R440 – R444

13 Swivel angle calibration

Every secondary unit is equipped with an LVDT sensor for detecting the current swivel angle position. Calibration of the sensor is necessary in order to achieve the best conversion of the mechanical adjustment position into an equivalent electric signal possible.

The calibration is divided into 2 basic parts:

- Determination of the suitable resolution for the LVDT evaluation
- Calibration of the conversion of the swivel angle position into an equivalent electric signal - swivel angle adjustment

Each part of the calibration can only be completed if the following conditions are met:

- Swivel angle control circuit is closed;
i.e. the entire wiring between SYHNC-SEK – valve amplifier – high-response valve – swivel angle sensor has been connected in a functional form
- No LVDT cable break fault
- System pressure for the swivel angle adjustment is available



Determination of the LVDT evaluation resolution requires the use of the "WinPed 6" operation program with a valid related "Project".

There must be an online connection between WinPed and SYHNC.

13.1 Determining the LVDT evaluation resolution

According to the LVDT sensor used (e.g. IW9/AWX), a suitable setting must be found for the LVDT evaluation electronics for the signal adjustment. For this purpose, a digital potentiometer is to be adjusted to the evaluation electronics by means of a software-based setting procedure. The setting procedure can only be started by means of WinPed, by entering corresponding parameters. The adjustment procedure will then be completed automatically.

Procedure for determining the resolution

A constant output voltage is provided as actuating variable for the connected valve amplifier. Via the opened high-response valve, the swivel angle is pressed against a mechanical stop. In this maximum position, the value of the digital potentiometer will be reduced starting from a maximum value until a perfect setting has been found.

Start of the adjustment procedure – LVDT resolution

R485 Adj. Swivel angle Codeword

Parameter R485 is used to select the LVDT input to be adjusted and start of the procedure

The following settings apply to selection of the resolution determination:

LVDT sensor	R485
SLOT 1 LVDT 1	1
SLOT 1 LVDT 2	2
SLOT 2 LVDT 1 (variant "D")	3
SLOT 2 LVDT 2 (variant "D")	4

WinPed process variables LVDT resolution

Parameter	Value	Unit
G830 S1.LVDT1.VMax	0.000	Volt
G832 S1.LVDT1.VMin	0.000	Volt
G828 DigiPoti1 S1.LVDT1	0.00	%
G831 S1.LVDT2.VMax	0.000	Volt
G833 S1.LVDT2.VMin	0.000	Volt
G829 DigiPoti2 S1.LVDT2	0.00	%
H830 S2.LVDT1.VMax	0.000	Volt
H832 S2.LVDT1.VMin	0.000	Volt
H828 DigiPoti1 S2.LVDT1	0.00	%
H831 S2.LVDT2.VMax	0.000	Volt
H833 S2.LVDT2.VMin	0.000	Volt
H829 DigiPoti2 S2.LVDT2	0.00	%

Fig. 30 Process variables LVDT resolution

G828 DigiPoti1 S1.LVDT1 [%]

Potentiometer value for connection SLOT 1 – LVDT1

G829 DigiPoti1 S1.LVDT2 [%]

Potentiometer value for connection SLOT 1 – LVDT2

H828 DigiPoti1 S2.LVDT1 [%]

Potentiometer value for connection SLOT 2 – LVDT1 | only variant "D"

H828 DigiPoti1 S2LVDT2 [%]

Potentiometer value for connection SLOT 2 – LVDT2 | only variant "D"

Cancellation of the adjustment procedure – Error message

If during the adjustment the software detects invalid values, the adjustment is cancelled and an error message is displayed in the WinPed diagnosis. No error message is output to a superior control!

In case of error, the commissioning notes specified for the commissioning of the swivel angle control in chapter 20 must be worked through!

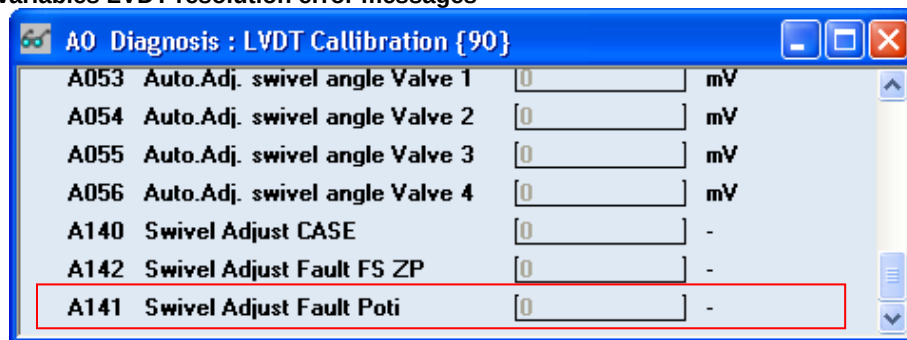
WinPed process variables LVDT resolution error messages

Fig. 31 Process variables LVDT resolution
Error messages

A141 Swivel Adjust Fault Poti

displays the error state that occurred during the potentiometer adjustment. The error states are described as follows:

A141	Description
0	No error
1	Zero point shifted > 10%
2	Measured values Vmax/Vmin do not correspond
8192	Cable break during the adjustment
32768	Timeout

Securing adjustment values

So that the determined potentiometer values can be permanently stored and are also available after a voltage reset, the machine data has to be requested via WinPed and subsequently stored.

I.e. you must open the "Machine data" button; if the connection is active, new machine data, if any, will be detected. Calling "UPLOAD" retrieves the machine data and stores them in the project.

WinPed process variables LVDT resolution - securing values

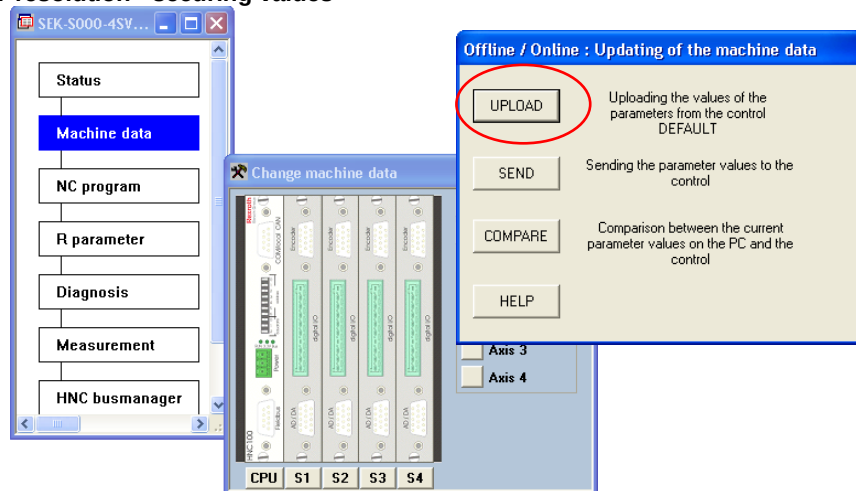


Fig. 32 Process variables LVDT resolution
Securing values

If the machine data window is closed, you will be asked whether you want to save the new data. If you answer the question with yes, the data will be saved within the project. You should always save the data.

13.2 Automatic swivel angle adjustment



The automatic swivel angle adjustment may only be activated if the "Determining the LVDT evaluation resolution" procedure, see chapter 13.1 has been completed successfully.

The automatic swivel angle adjustment determines a zero point offset and a gain factor for an LVDT position transducer so that the mechanical swivel angle position is mapped with an equivalent electric signal in the range from +100% to -100%.

In addition, an actuating variable offset is created so that in the static state, there is hardly any difference between actual swivel angle value and swivel angle command value.

Start of the adjustment procedure – LVDT adjustment

R485 Adj. Swivel angle Codeword

The automatic swivel angle adjustment can be selected using a parameter and using the bus communication.

The following settings apply to selection of the adjustment by means of the parameter:

LVDT sensor	R485
SLOT 1 LVDT 1	11
SLOT 1 LVDT 2	12
SLOT 2 LVDT 1 (variant "D")	13
SLOT 2 LVDT 2 (variant "D")	14

If the bus communication is active, the sensor for the automatic swivel angle adjustment is selected as specified in the following:

	Bus_CMD_0 Bit14	Bus_CMD_0 Bit13
SLOT_1 LVDT_1	0	0
SLOT_1 LVDT_2	0	1
SLOT_2 LVDT_1 (variant "D")	1	0
SLOT_2 LVDT_2 (variant "D")	1	1

The adjustment is started by BUS_CMD_0 bit 15 to "1". In this connection, also refer to chapter 15 or 0

WinPed parameter settings LVDT adjustment

Parameter	Value
R485 Adj. Swivel angle Codeword	0
R486 R486	0
R487 R487	0
R488 Swivel angle Test	0
R489 Swivel angle Test command [%]	0.0
R490 Distorsion Swivel angle [%]	0.0
R495 Adj. Swivel angle 1 NP [V]	-0.05
R496 Adj. Swivel angle 2 NP [V]	-0.30
R497 Adj. Swivel angle 3 NP [V]	0.00
R498 Adj. Swivel angle 4 NP [V]	0.00
R499 Adj. Swivel angle 1 FS [%]	119.5
R500 Adj. Swivel angle 2 FS [%]	122.5
R501 Adj. Swivel angle 3 FS [%]	110.0
R502 Adj. Swivel angle 4 FS [%]	100.0
R503 Adj. Valve offset 1 [V]	-0.01
R504 Adj. Valve offset 2 [V]	-0.40
R505 Adj. Valve offset 3 [V]	0.00
R506 Adj. Valve offset 4 [V]	0.00

Fig. 33 Swivel angle adjustment parameter menu

The value determined in the LVDT adjustment are displayed and saved in the form of parameter settings.

If LVDT adjustment parameters are changed by re-entry, they will only take effect after a voltage reset.

R495 Adj. Swivel angle 1 NP [V]
 R499 Adj. Swivel angle 1 FS [%]
 R503 Adj. Valve offset 1 [V]

LVDT adjustment values from sensor SLOT 1 LVDT 1

R496 Adj. Swivel angle 2 NP [V]
 R500 Adj. Swivel angle 2 FS [%]
 R504 Adj. Valve offset 2 [V]

LVDT adjustment values from sensor SLOT 1 LVDT 2

R497 Adj. Swivel angle 3 NP [V]
 R501 Adj. Swivel angle 3 FS [%]
 R505 Adj. Valve offset 3 [V]

LVDT adjustment values from sensor SLOT 2 LVDT 1; only variant "D"

R498 Adj. Swivel angle 4 NP [V]
 R502 Adj. Swivel angle 4 FS [%]
 R506 Adj. Valve offset 4 [V]

LVDT adjustment values from sensor SLOT 2 LVDT 2; only variant "D"

WinPed process variables LVDT adjustment

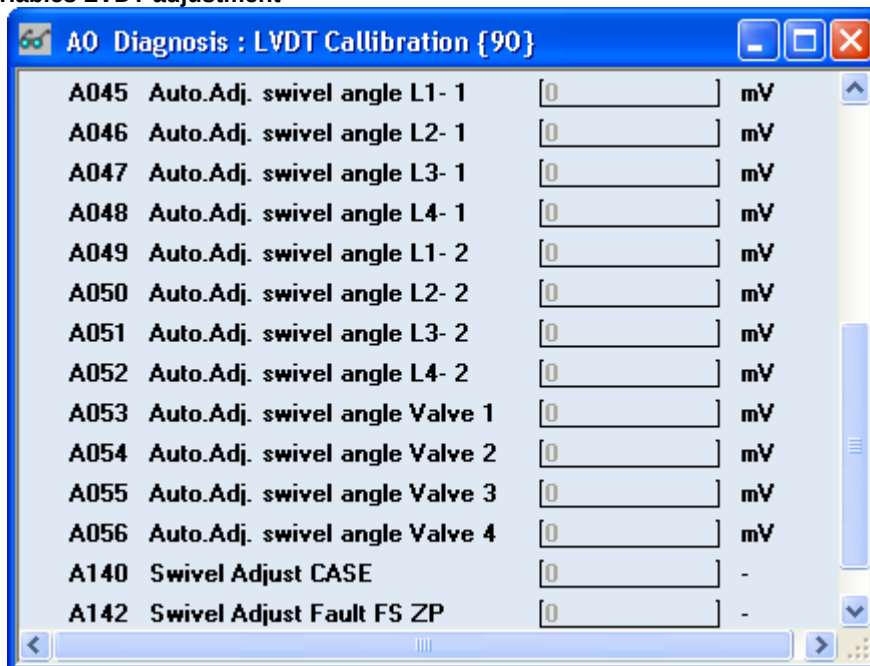


Fig. 34 Process variables LVDT adjustment

The maximum measured values for left and right stop of the adjustment determined by the electronics during the adjustment are displayed in the diagnosis:

Maximum values adjustment direction 1

A045 / A046

Maximum values adjustment direction 1 for SLOT 1 LVDT 1 and LVDT 2

Only variant "D" A047 / A048

Maximum values adjustment direction 1 for SLOT 2 LVDT 1 and LVDT 2

Maximum values adjustment direction 2

A049 / A050

Maximum values adjustment direction 2 for SLOT 1 LVDT 1 and LVDT 2

Only variant "D" A051 / A052

Maximum values adjustment direction 2 for SLOT 2 LVDT 1 and LVDT 2

Valve offset

A053 / A054

Valve zero point offset for valve at SLOT 1 LVDT 1 and LVDT 2

Only variant "D" A055 / A056

Valve zero point offset for valve at SLOT 2 LVDT 1 and LVDT 2

Cancellation of the adjustment procedure – Error message

If during the adjustment the software detects invalid values, the adjustment is cancelled and an error message is displayed in the WinPed diagnosis. An error message is output to a superior control!

The error message is part of the monitoring functions that are described in chapter 14.

For monitoring the adjustment, error thresholds can be defined.

WinPed parameter setting LVDT adjustment

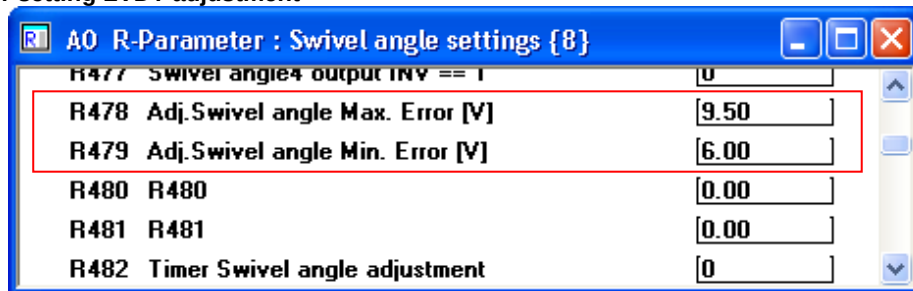


Fig. 35 Process variables LVDT adjustment

R478 Adj.Swivel angle Max. Error [V]

Error threshold for maximum values within the swivel angle adjustment.

R479 Adj.Swivel angle Min. Error [V]

Error threshold for minimum values within the swivel angle adjustment.

If within the adjustment procedure measures above/below the set limit values are detected, an error message will be output.

Upon start of the automatic adjustment, a time monitoring is started monitoring the individual steps of the adjustment. If after expiry of this fixedly programmed period the adjustment has not been completed, an error message will be output.

14 Monitoring functions

All error options are generally detected and processed by means of a corresponding software function.

Hardware signals and error states only determined via software will e.g. be evaluated.

In monitoring functions, you distinguish between axis-spanning, general and axis-specific errors.



The error reaction to detected errors can basically be described as:

- The "READY Ax" signal is removed
- The signal for the isolating valve of the defective axis is set to "0V"
- The swivel angle command value of the axis concerned is set to "0" (neutral)
In case of errors in the swivel angle system this is, however, not possible!
- An error message is output to the superior control via a bus system. Each error message is generally also displayed by WinPed in the diagnosis.

With general errors or in case the system can no longer be controlled, the following measures will moreover be taken:

- The "brake open" signal is removed
- The swivel angle command values for all connected axes are set to "0" (neutral).
! In case of errors in the swivel angle system positioning in the neutral position is, however, not possible.

14.1 Monitoring - error display

The error monitoring is assigned to 4 axes. If the bus connection is active, the error messages of all axes are displayed to the outside via two "error arrays". Every "error array" shows one error per bit in binary form. The error bit is specified with "1" per bit. The individual SLOT cards and their software use and/of functionality form the basis for the compilation of the error arrays.

Error array shaft 1

"Error array shaft 1" contains error messages on the following areas:

- General errors
- Errors at sensors or functions on SLOT 1 (LVDT)
- Only variant "A" - Errors at sensors or functions on SLOT 2 (INK/SSI)
- Only variant "D" - Errors at sensors or functions on SLOT 3 (INK/SSI)

Error array shaft 2

"Error array shaft 2" contains error messages on the following areas:

- General errors
- Only variant "D" - Errors at sensors or functions on SLOT 2 (LVDT)
- Only variant "D" - Errors at sensors or functions on SLOT 4 (INK/SSI)

Set-up of "Error array shaft 1"

Error array shaft 1	Bit0	Cable break encoder A1
	Bit1	Cable break SLOT 1 LVDT 1
	Bit2	Cable break SLOT 1 LVDT 2
	Bit3	Maximum speed exceeded – A1
	Bit4	Maximum acceleration exceeded – A1
	Bit5	Swivel angle difference SLOT 1 LVDT 1
	Bit6	Swivel angle difference SLOT 1 LVDT 2
	Bit7	Speed difference command/actual – A1
	Bit8	Cable break Md- measuring shaft
	Bit9	Cable break pressure cell
	Bit10	Bus error
	Bit11	CAN Rex Watchdog
	Bit12	CAN Rex Hard – Soft
	Bit13	Swivel angle adjustment error SLOT 1 LVDT 1
	Bit14	Swivel angle adjustment error SLOT 1 LVDT 2
	Bit15	No release (enable)

Set-up of "Error array shaft 2"

Error array shaft 2	Bit0	Cable break encoder A2
	Bit1	Cable break SLOT 2 LVDT 1
	Bit2	Cable break SLOT 2 LVDT 2
	Bit3	Maximum speed exceeded – A2
	Bit4	Maximum acceleration exceeded – A2
	Bit5	Swivel angle difference SLOT 2 LVDT 1
	Bit6	Swivel angle difference SLOT 2 LVDT 2
	Bit7	Speed difference command/actual – A2
	Bit8	
	Bit9	
	Bit10	Bus error
	Bit11	CAN Rex Watchdog
	Bit12	CAN Rex Hard – Soft
	Bit13	Swivel angle adjustment error SLOT 2 LVDT 1
	Bit14	Swivel angle adjustment error SLOT 2 LVDT 2
	Bit15	No release (enable)

WinPed status display variant "A" and "D"

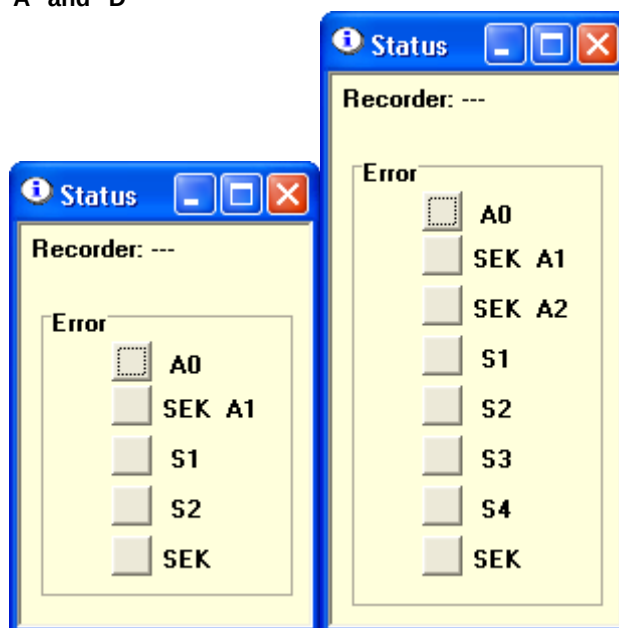


Fig. 36 WinPed status display "A"-"D"

Starting in the status window, use the "SEK A1" and/or "SEK A2" buttons to open the display for the axis error messages.

WinPed status display variant "A" and "D"

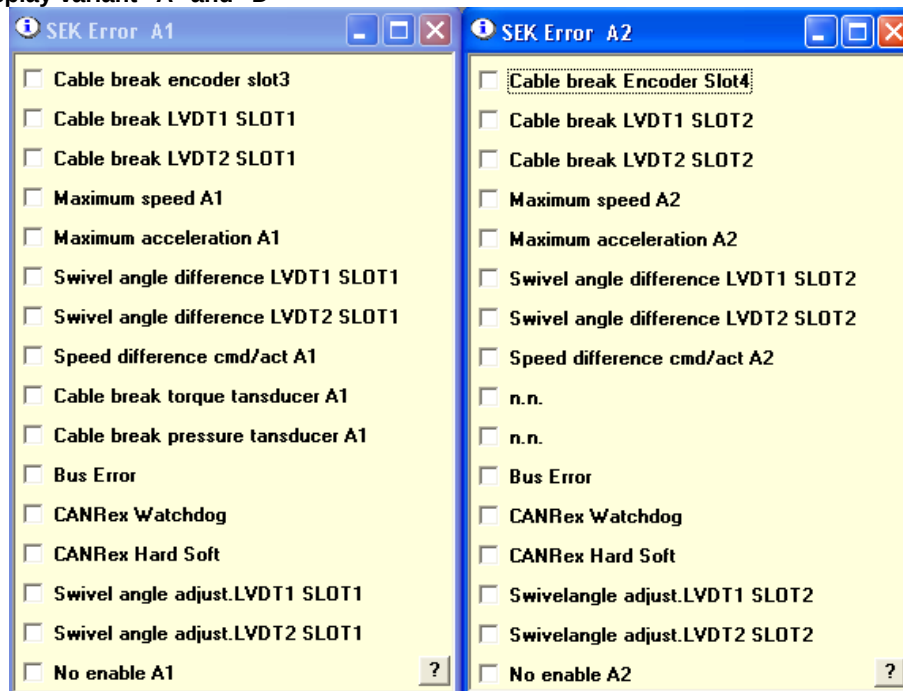


Fig. 37 WinPed status display "A"-"D"

14.2 Configuration of the monitoring functions

Apart from the configuration settings described in chapter 3 which activate the monitoring, more parameter settings are to be adjusted to the circumstances of the system and its function.

WinPed parameter settings - monitoring

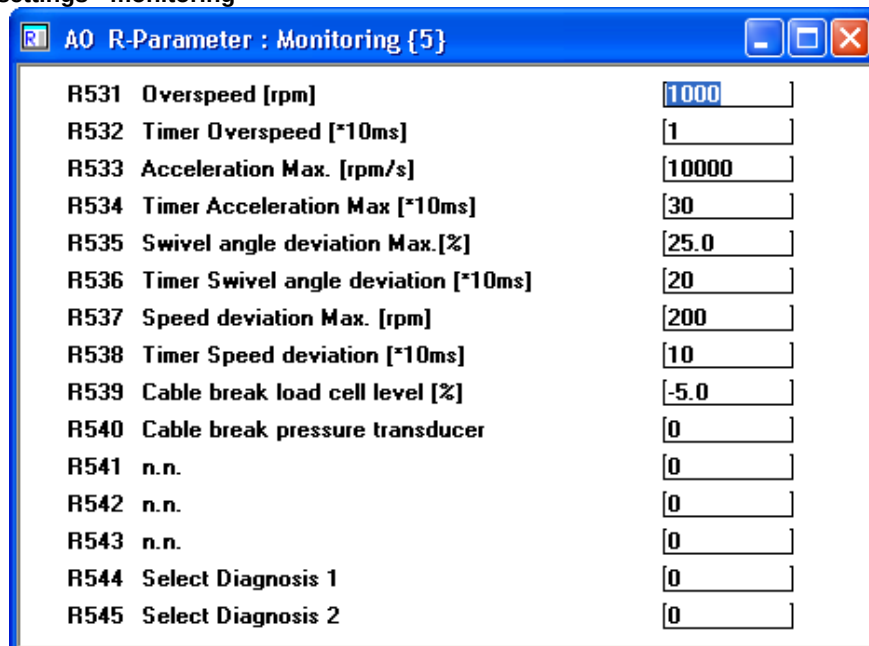


Fig. 38 Monitoring parameters

Maximum speed monitoring

If the current actual speed determined by means of the software exceeds an adjustable maximum value for a certain time interval, the software triggers an error message.

This error is a general error!

R531 Overspeed [rpm]

Error threshold for maximum speed monitoring.

R532 Timer Overspeed [*10ms]

Time interval for the tripping delay for the maximum speed error.

In variant "A", only SLOT 2 encoder axis 1 is monitored.

The error is displayed in "Errorarray shaft 1" bit 3.

In variant "D", SLOT 3 "Encoder axis 1" and SLOT 4 "Encoder axis 2" are monitored.

The error is displayed in "Errorarray shaft 1" bit 3 and/or "Errorarray shaft 2" bit 3.

Maximum acceleration monitoring

If the current actual acceleration determined by means of the software exceeds an adjustable maximum value for a certain time interval, the software triggers an error message.

This error is a general error!

R533 Acceleration Max. [rpm/s]

Error threshold for maximum acceleration monitoring.

R532 Timer Acceleration Max [*10ms]

Time interval for the tripping delay for the maximum acceleration error.

In variant "A", only SLOT 2 encoder axis 1 is monitored.

The error is displayed in "Errorarray shaft 1" bit 4.

In variant "D", only SLOT 3 "Encoder axis 1" and SLOT 4 "Encoder axis 2" are monitored.

The error is displayed in "Errorarray shaft 1" bit 4 and/or "Errorarray shaft 2" bit 4.

Swivel angle difference monitoring

If the current swivel angle difference determined by means of the software exceeds an adjustable maximum value for a certain time interval, the software triggers an error message.

R535 Swivel angle deviation Max. [%]

Error threshold for swivel angle difference monitoring.

R536 Timer Swivel angle deviation [*10ms]

Time interval for the tripping delay for the swivel angle difference error.

In variant "A", SLOT 1 LVDT 1 and SLOT 1 LVDT 2 are monitored.
The error is displayed in "Errorarray shaft 1" bit 5 and bit 6.

In variant "D", SLOT 2 LVDT 1 and SLOT 2 LVDT 2 are also monitored in addition to variant "A".
The error is displayed in "Errorarray shaft 2" bit 5 and bit 6.

Command / actual speed difference monitoring

If the current command/actual speed difference determined by means of the software exceeds an adjustable maximum value for a certain time interval, the software triggers an error message.

This error is a general error!

R537 Speed deviation Max. [rpm]

Error threshold for command / actual speed difference monitoring

R538 Timer Speed deviation [*10ms]

Time interval for the tripping delay for the command/actual speed difference error.

In variant "A", only SLOT 2 encoder axis 1 is monitored.
The error is displayed in "Errorarray shaft 1" bit 7.

In variant "D", SLOT 3 "Encoder axis 1" and SLOT 4 "Encoder axis 2" are monitored.
The error is displayed in "Errorarray shaft 1" bit 7 and/or "Errorarray shaft 2" bit 7.



The speed difference monitoring is only active in the "Speed" mode of operation. In the "Torque" mode of operation, the speed difference monitoring is inactive.

R537 Cable break load cell level [%]

Error threshold for the cable break detection of the actual torque value collection (load cell).

This monitoring is only active if the connected sensor works in the range from 4 - 20 mA. See R521 in chapter 3.4

R537 Cable break pressure transducer [%]

Error threshold for the cable break detection of the actual pressure value collection.

Bus system monitoring

The bus systems supported by the SYHNC-SEK are checked for errors by means of software query. If an invalid state is detected, the software triggers an error message.

This error is a general error!

CANRex Watchdog monitoring

The "CANRex Watchdog" function is not activated in the standard software!

CANRex Hard Soft monitoring

The "CANRex Hard Soft" function is not activated in the standard software!

Swivel angle adjustment error

If the automatic swivel angle adjustment is canceled as described in chapter 13.2 due to inadmissible measured values, the software triggers an error message. Depending on the selection of the chosen LVDT sensor, the following axis-specific message is generated:

Variant "A" "Errorarray shaft 1" bit 13 or "Errorarray shaft 1" bit 14

Variant "D" in addition to variant "A" "Errorarray shaft 2" bit 13 or "Errorarray shaft 2" bit 14

No release

The digital "Enable" input signal with variant "A" at SLOT 2 input IN1, with variant "D" at SLOT 3 Input IN1 and/or with active bus communication the "Enable CMD_0 bit 0" signal are cyclically checked for "24V" or "1". If "0V" or "0" is detected, an error message is generated.

This error is a general error!

This error is displayed in "Errorarray shaft 1" bit 15 and "Errorarray shaft 2" bit 15.

14.3 Error reset

Every error can only be reset via a "reset signal". The error reset is achieved with a rising edge at the "Reset" input signal for variant "A" at SLOT 2 input IN3, with variant "D" at SLOT 3 Input IN3 or with active bus communication via the "Reset" signal CMD_0 bit 2.

With an error reset, all output variables of the SYHNC-SEK are set to default settings. Those are in general:

- Internal swivel angle provision in "neutral" position (no torque)
- Signals for the isolating valve activation to "OFF" ("0")
- Signals for the brake activation to "OFF" ("0")
- Command values for speed and torque are internally set to "0"

An error reset may only be activated if the system is in a safe state! I.e. at least the connected isolating valves for the high-pressure supply of the secondary units must be switched off. If applicable, an existing service brake has to be activated.

After each error reset, the "Ready Ax OK" outputs of the individual axes are set to "1" (digital outputs = 24V) and the monitoring functions are re-started with the set limit values and time elements. Especially in case of monitoring with time elements, you must - after an error reset - wait for the set time element until readiness for operation can be referred to as finally restored.

15 CANOpen communication profile

The CAN profile according to "Draft CiA DS-301" forms the basis of the CANOpen communication.

Basic parameters of the CANOpen interface are listed below. For more far-reaching information please refer to the description of the DS-301 CAN profile.

RxD – PDO Default settings for messages from the external control -> SYHNC100-SEK. According to the CANOpen profile, the PDO-ID will be assigned for the SYHNC100-SEK after a voltage reset as follows.

- RxD- PDO1 == $0x200 + \text{NodeID}$
- RxD- PDO2 == $0x300 + \text{NodeID}$
- RxD- PDO3 == $0x400 + \text{NodeID}$
- RxD- PDO4 == $0x500 + \text{NodeID}$

TxD – PDO Default settings for messages from SYHNC100-SEK -> external control. According to the CANOpen profile, the PDO-ID will be assigned for the SYHNC100-SEK after a voltage reset as follows.

- TxD- PDO1 == $0x180 + \text{NodeID}$
- TxD- PDO2 == $0x280 + \text{NodeID}$
- TxD- PDO3 == $0x380 + \text{NodeID}$
- TxD- PDO4 == $0x480 + \text{NodeID}$

SYNC According to the CANOpen profile, the SYNC message will be assigned for the SYHNC100-SEK after a voltage reset as follows.

- SYNC == $0x80 + \text{NodeID}$

NMT According to the CANOpen profile, the NMT message will be assigned for the SYHNC100-SEK after a voltage reset as follows.

- NMT „Node guarding“ == $0x700 + \text{NodeID}$

Synchronous/asynchronous PDO messages are preset via WinPed “HNC busmanager”

- TxD- PDO “Cyclic Synchronous”
- RxD- PDO “Asynchronous”

15.1 Data variables - Receive RxD

All data variable settings is to be done in the „HNC busmanager“. The standard configuration on variant „A“ and „D“ is shown below. Additional data variables are not available! Reducing the standard configuration is possible at any time!

Datenprofil Variante „A“ und „D“ - RxD

WinPed Parametereinstellung – HNC Busmanager - CANOpen

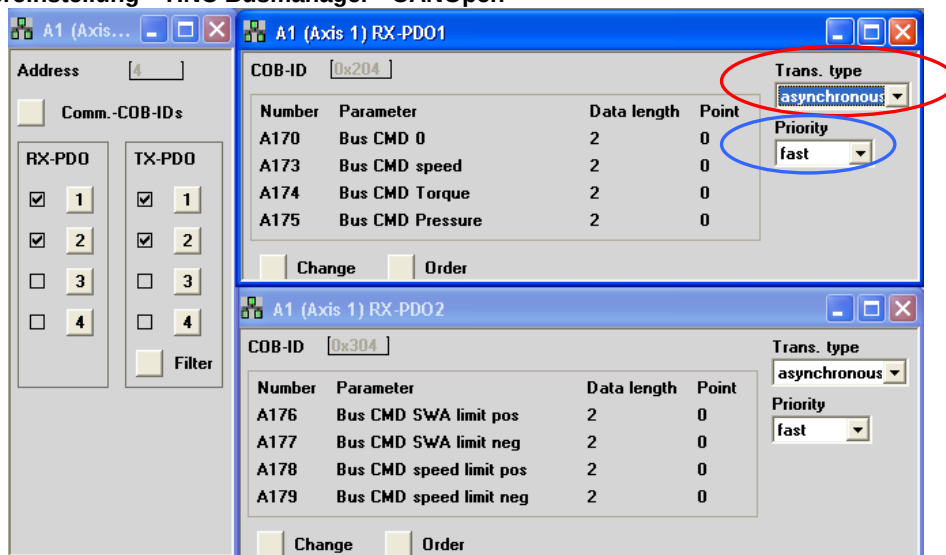


Abb. 39 HNC Busmanager RxD Variante „A,D“

Transmission type

Transmission types are available as type „asynchron“ and „synchron“.

Type „asynchron“ executes RxD- Data with the at „Priority“ given scanning time. The transmission type „asynchron“ is recommended as standard.

Type „synchron“ executes RxD- Data after SYNC- message is detected.

Scanning time RxD - Priority

Priority on transmission type asynchron“ is available as „Fast“, „Middle“ or „Slow“.

- Fast** Scanning time = 4 ms.
Priority „Fast“ is recommended as standard
- Middle** Scanning time = 12 ms
- Slow** Scanning time = 20 ms

15.2 Data variables - Transmit TxD

All data variable settings is to be done in the „HNC busmanager“. The standard configuration on variant „A“ and „D“ is shown below. Additional data variables are not available! Reducing the standard configuration is possible at any time!

Data profile variant „A“ - TxD

WinPed parameter settings – HNC Busmanager - CANOpen

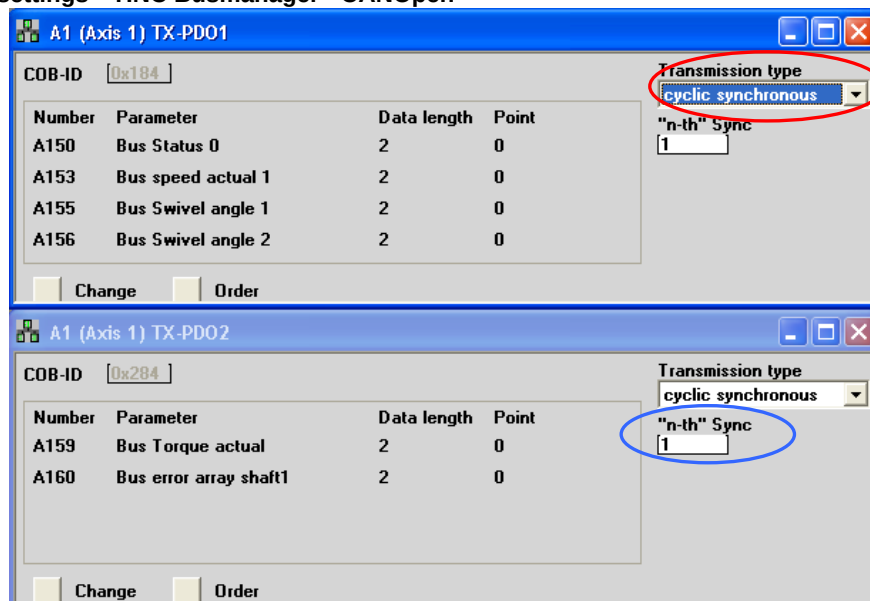


Abb. 40 HNC Busmanager TxD Variant „A“

Data profile variant „D“ - TxD

WinPed parameter settings – HNC Busmanager - CANOpen

The image displays three screenshots of the WinPed parameter settings for HNC Busmanager - CANOpen, showing TX-PDO1, TX-PDO2, and TX-PDO3 configurations. Each screenshot shows a table of parameters and their settings, with a red circle highlighting the 'cyclic synchronous' transmission type and a blue circle highlighting the 'n-th Sync' value of 1.

A1 (Axis 1) TX-PDO1 *

Number	Parameter	Data length	Point
A150	Bus Status 0	2	0
A153	Bus speed actual 1	2	0
A155	Bus Swivel angle 1	2	0
A156	Bus Swivel angle 2	2	0

COB-ID: [0x184] Transmission type: cyclic synchronous "n-th" Sync: 1

A1 (Axis 1) TX-PDO2 *

Number	Parameter	Data length	Point
A157	Bus Swivel angle 3	2	0
A158	Bus Swivel angle 4	2	0
A160	Bus error array shaft1	2	0
A161	Bus error array shaft2	2	0

COB-ID: [0x284] Transmission type: cyclic synchronous "n-th" Sync: 1

A1 (Axis 1) TX-PDO3 *

Number	Parameter	Data length	Point
A159	Bus Load Cell actual	2	0

COB-ID: [0x384] Transmission type: cyclic synchronous "n-th" Sync: 1

Abb. 41 HNC Busmanager TxD Variante „D“

15.3 Scanning time - CANOpen TxD

Scanning time on CANOpen- TxD communication is defined through the „Transmission type“.

Transmission type „Synchronous“

WinPed parameter settings – HNC Busmanager - CANOpen

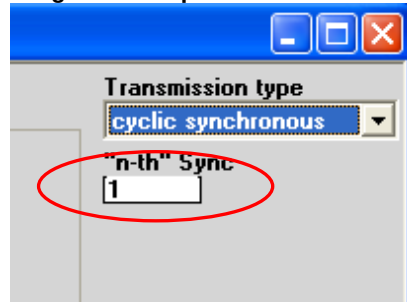


Abb. 42 HNC Busmanager TxD synchron

SYHNC100-SEK answers with a TxD- Nachricht once a SYNC- message was recognized. The property „n-th“ Sync an amount of incomming SYNC- messages can be defined, till a TxD- message is sent from the SYHNC100-SEK. Scanning time in this mode will be 20 ms.

Transmission type „COS asynchronous“

WinPed parameter settings – HNC Busmanager - CANOpen

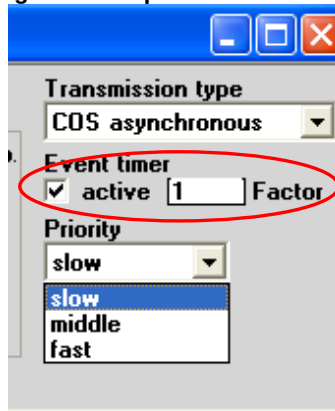


Abb. 43 HNC Busmanager TxD asynchron

SYHNC100-SEK will send a TxD- message in case one of the data variables has changed its state. In the case a change of state will not appear, an „Event timer“ can be set to force a TxD- message.

Priority

On setting „Priority“ a scanning time can be set:

Slow	scanning time= 20 ms
Middle	scanning time= 12 ms
Fast	scanning time= 4 ms

16 Profibus communication profile

For the connection of a SYHNC100-SEK to a Profibus network the address of the SYHNC100-SEK is to be defined and set using the setting options via the address switch. A baud rate is automatically set by the Profibus master.

16.1 Data variables

All data variable settings is to be done in the „HNC busmanager“. The standard configuration on variant „A“ and „D“ is shown below. Additional data variables are not available! Reducing the standard configuration is possible at any time!

Variant „A“

WinPed parameter settings – HNC Busmanager

The screenshot displays the HNC Busmanager interface with three main sections:

- Profibus Settings:**
 - Address: []
 - ☒ Check configuration data
 - ☒ Togglebit UDC active
 - Data from DP-master:**
 - ☒ Open
 - ☐ Change
 - ☐ Order
 - [8] Number high priority
 - Data to DP-master:**
 - ☒ Open
 - ☐ Change
 - ☐ Order
 - [6] Number high priority
- Data from DP-master Table:**

No.	Prio.	Number	Parameter	Data length	Point
1	H	A170	Bus CMD 0	2	0
2	H	A173	Bus CMD speed	2	0
3	H	A174	Bus CMD Torque	2	0
4	H	A175	Bus CMD Pressure	2	0
5	H	A176	Bus CMD SWA limit pos	2	0
6	H	A177	Bus CMD SWA limit neg	2	0
7	H	A178	Bus CMD speed limit pos	2	0
8	H	A179	Bus CMD speed limit neg	2	0
- Data to DP-master Table:**

No.	Prio.	Number	Parameter	Data length	Point
1	H	A150	Bus Status 0	2	0
2	H	A153	Bus speed actual 1	2	0
3	H	A155	Bus Swivel angle 1	2	0
4	H	A156	Bus Swivel angle 2	2	0
5	H	A159	Bus Torque actual	2	0
6	H	A160	Bus error array shaft1	2	0

Abb. 44 HNC Busmanager Variant „A“

Variant „D“

WinPed parameter settings – HNC Busmanager

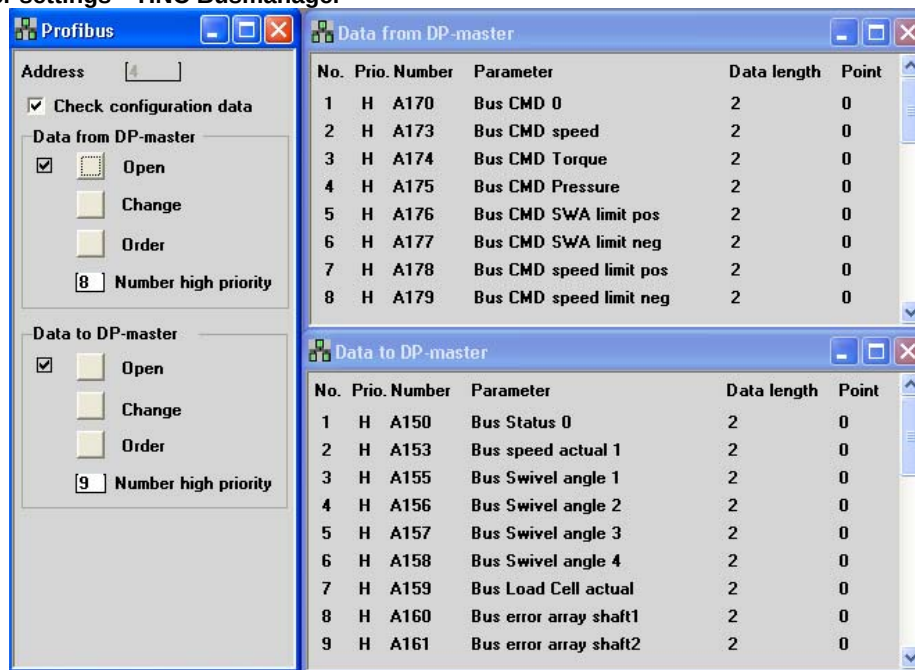


Abb. 45 HNC Busmanager Variant „D“

The data profile between Profibus master and SYHNC100-SEK must exactly comply

16.2 Scanning times

Scanning times for Profibus communication is available on 2 priority settings.

Possible scanning times:

- Scanning time Task 2 = 4 ms
- Scanning time Task „SLOW“ = 20 ms

Specification scanning time

WinPed parameter settings – scanning time

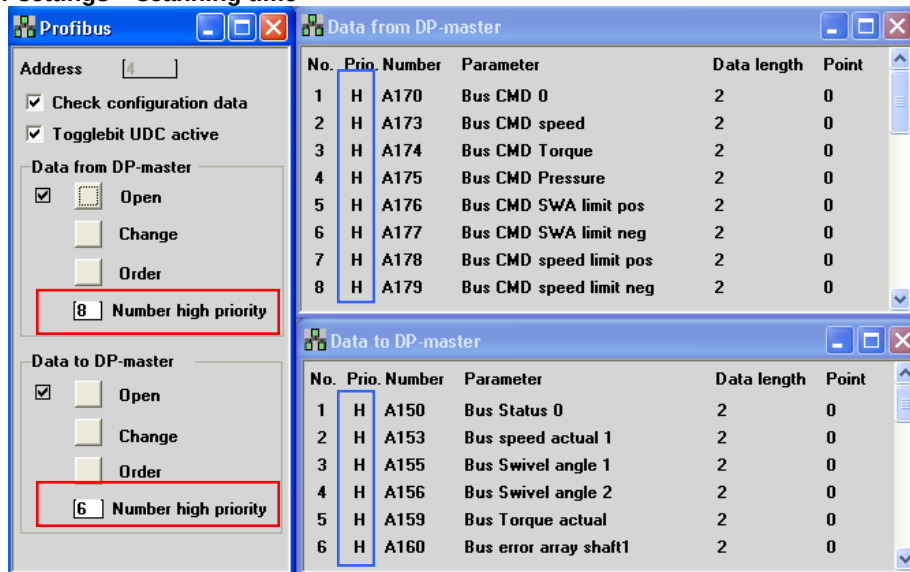


Abb. 46 HNC Busmanager scanning time

High priority All variables with identifier „H“ -Blue marked areas - will be handled with scanning time of 4 ms.

Depending on the given number – Red marked areas – all data variables will be consecutively set on priority „H“.

Data variables which have not the priority „H“ will be automatically set on scanning time „SLOW“ = 20 ms.

Low priority All variables which will have no identifier „H“ -Blue marked area- will be handled with scanning time of 20 ms.

17 Bus communication variables

The SYHNC100-SEK can be operated in the "CANOpen" or "Profibus" bus variants. The data exchange within these variants is based on pre-defined variables some of which must be used and some of which can be used due to the settings in the "System configuration".

The subsequently described variables are indicated in the order in which they are also listed and entered in the project for WinPed6 as default. Adjustments can be made via the "Bus manager" function in WinPed6.

17.1 Data variables PLC->SYHNC-SEK

Variable list for the data exchange from an external control (PLC) to the SYHNC100-SEK:

Denomination	Description
BUS_CMD_0	Signal inputs IN1 – IN16
Bus_CMD_speed	Speed command value
Bus_CMD_torque	Torque command value
Bus_CMD_Pressure	Actual pressure value (system pressure)
Bus_CMD_SWA_limit_pos	Positive swivel angle limit value
Bus_CMD_SWA_limit_neg	Negative swivel angle limit value
Bus_CMD_speed_limit_pos	Positive speed limit value
Bus_CMD_speed_limit_neg	Negative speed limit value

The variables are used as follows:

CMD_0	2-byte block bit information
Bus_CMD_speed	2-byte block hexadecimal information
Bus_CMD_torque	2-byte block hexadecimal information
Bus_CMD_Pressure	2-byte block hexadecimal information
Bus_CMD_SWA_limit_pos	2-byte block hexadecimal information
Bus_CMD_SWA_limit_neg	2-byte block hexadecimal information
Bus_CMD_speed_limit_pos	2-byte block hexadecimal information
Bus_CMD_speed_limit_neg	2-byte block hexadecimal information

CMD_0

CMD_0 Bit no.	Description	WinPed Denomination
Bit 0	enable / no enable 1 = Enable	Enable
Bit 1	Start / Stop 1 = start / 0 = Stop	Start
Bit 2	Error reset 1 = rising edge = reset	Reset
Bit 3	Mode pre-selection 1 = Torque mode of operation 0 = Speed mode of operation	Torque Open loop
Bit 4	Mode of operation torque "Mode" 1 = Closed-loop torque control 0 = Open-loop torque control	Torque control
Bit 5	System pressure 1 = System pressure available	Pressure OK
Bit 6	Brake feedback 1 = Brake active (closed) 0 = Brake open (not active)	Brake engaged
Bit 7	n.n.	n.n.
Bit 8	n.n.	n.n.
Bit 9	n.n.	n.n.
Bit 10	n.n.	n.n.
Bit 11	n.n.	n.n.
Bit 12	n.n.	n.n.
Bit 13	Axis selection swivel angle adjustment Bit 0	SW adjust Bit0
Bit 14	Axis selection swivel angle adjustment Bit 1	SW adjust Bit1
Bit 15	Swivel angle adjustment selection 1 = rising edge starts adjustment	Auto swivel adjustm.

Enable	The "Enable" signal to "1" indicates that there are no external errors. The Enable CMD_0 bit 0 signal and the digital "Enable" input signal with variant "A" SLOT 2 IN 1, with variant "D" SLOT 3 IN1 are used as logic AND link.
Start	A positive edge at this signal starts the controller switch-on routine. The preselected controller is activated. The start procedure as specified in chapter 6 is run through. The signal must always be available in ongoing operation. If this signal is "0", the stop procedure as described in chapter 6 is run through.
Reset	A rising edge at this signal starts the reset procedure.
Torque Open loop	Pre-selection for the mode of operation. "1" selects the Torque mode of operation, "0" selects the Speed mode of operation.
Torque control	In the "Torque" mode of operation, "1" at this signal activates the closed-loop torque control mode. In the "Torque" mode of operation, "0" at this signal activates the open-loop torque control mode.
Pressure OK	"1" at this signal indicates that the system pressure for operating the system is available.
SW adjust bit 0 SW adjust bit 1	Selection of the axis for which the automatic swivel angle adjustment is to be activated.
Auto swivel adjustm.	A rising edge at this signal activates the automatic swivel angle adjustment for the selected axis.

Digital command value provision PLC -> SYHNC100

Bus_CMD_speed Digital speed command value in the range from:

negative maximum: 0xE000 = -100%
positive maximum: 0x1FFF = +100%

The conversion of the digital command value into rotations/min of the motor is effected on the basis of the settings made in the system configuration (R508).

Bus_CMD_torque Digital torque command value in the range from:

negative maximum: 0xE000 = -100%
positive maximum: 0x1FFF = +100%

The conversion of the torque command value is based on the characteristics set in the system configuration.

In case of the closed-loop torque control it has to be noted that the provision of 100% refers to an actual value of 100% == 10V – (signal of the actual torque value collection).

Bus_CMD_Pressure Digital actual pressure value in the range from:

positive minimum: 0x0000 = 0 bar
positive maximum: 0x1FFF = configuration pressure transducer

Bus_CMD_SWA_limit_pos

Bus_CMD_SWA_limit_neg

Digital swivel angle limit values

positive minimum: 0x0000
positive maximum: 0x1FFF
negative minimum: 0x0000
negative maximum: 0xE001

Bus_CMD_Speed_limit_pos

Bus_CMD_Speed_limit_neg

Digital speed limits for the "Torque" mode of operation

positive minimum: 0x0000
positive maximum: 0x1FFF
negative minimum: 0x0000
negative maximum: 0xE001

The conversion of the digital speed limit values into rotations/min of the motor is effected on the basis of the setting made in the system configuration (R508).

17.2 Data variables SYHNC-SEK -> PLC

Variable list for the data exchange from an SYHNC100-SEK to an external control (PLC):

Denomination	Description
Status_0	Signal outputs bit 0 – bit 15
Bus_speed actual_1	Actual speed value axis 1
Bus_swivel angle_shaft1	Actual swivel angle value axis 1
Bus_load_cell_actual	Actual torque value
error array shaft 1	error code 16 bit
error array shaft 2	error code 16 bit

A complete listing of the available variables:

Status_0	2-byte block bit information
Status_1	2-byte block bit information
Status_2	2-byte block bit information
Bus_speed actual_1	2-byte block hexadecimal information
Bus_speed actual_2	2-byte block hexadecimal information
Bus_swivel angle_1	2-byte block hexadecimal information
Bus_swivel angle_2	2-byte block hexadecimal information
Bus_swivel angle_3	2-byte block hexadecimal information
Bus_swivel angle_4	2-byte block hexadecimal information
Bus_load_cell_actual	2-byte block hexadecimal information
error array shaft 1	2-byte block bit information
error array shaft 2	2-byte block bit information

STATUS_0

Status_0 Bit no.	Description	WinPed Denomination
Bit 0	Ready for operation axis 1 1 = ready for operation	Ready A1 OK
Bit 1	Ready for operation axis 2 1 = ready for operation	Ready A2 OK
Bit 2	Isolating valve axis 1 OPEN / CLOSE 1 = open isolating valve	Isolating valve A1
Bit 3	Isolating valve axis 2 OPEN / CLOSE 1 = open isolating valve	Isolating valve A2
Bit 4	Open brake 1 = open brake	open brake request
Bit 5	Controller active 1 = active	controller active
Bit 6	Speed < limit value 1 = speed < limit value	actual speed == 0
Bit 7	Torque < limit value 1 = torque < limit value	actual torque == 0
Bit 8	n.n.	n.n.
Bit 9	Mode of operation display 1 = torque 0 = speed	torque mode active
Bit 10	Swivel angle limitation active 1 = limitation active	swivel angle lim. active
Bit 11	n.n.	n.n.
Bit 12	n.n.	n.n.
Bit 13	n.n.	n.n.
Bit 14	Swivel angle adjustment potentiometer 1 = adjustment active	SW adjust. Poti. active
Bit 15	Swivel angle adjustment FS/NP 1 = adjustment active	SW adjust.FS/NP active

Ready A1 Ok	"1" indicates that axis 1 is ready for operation. No error detected.
Ready A2 Ok	"1" indicates that axis 2 is ready for operation. No error detected.
Isolating valve shaft A1	"1" indicates that the isolating valve axis 1 is to be opened. "0" indicates that the isolating valve axis 1 must be closed.
Isolating valve shaft A2	"1" indicates that the isolating valve axis 2 is to be opened. "0" indicates that the isolating valve axis 2 must be closed.
open brake request	"1" indicates that a brake that might exist is to be opened. "0" indicates that a brake that might exist must be closed.
controller active	"1" indicates that the controller (speed/torque) is active
actual speed == 0	"1" indicates that the current speed is < limit value.
actual torque == 0	"1" indicates that the current torque is < limit value.
torque mode active	"1" indicates that the current mode of operation is "Torque". "0" indicates that the current mode of operation is "Speed".
swivel angle lim. active	"1" indicates that the swivel angle limitation is active.
SW adjust.poti active	"1" indicates that the automatic adjustment function for the setting of the digital potentiometer is active.
SW adjust. FS/NP active	"1" indicates that the automatic adjustment function for the swivel angle calibration is active.



The "Isolating valve shaft A1" and "Isolating valve shaft A2" signals correspond to the digital output signals at SLOT 1 OUT3 and OUT 4. We recommend using the digital wired signals for controlling the valves. On the one hand, this allows for the direct connection of the signals within the safety chain (relay circuit) and on the other hand prevents delay of the signals due to the computing time of the superior control. In this connection, also refer to chapter 4.1

It should be individually checked for each system whether the "open brake request" signal for controlling a possibly available brake can also be transmitted via the digital wired signal!

STATUS_1

Status_1 Bit no.	Description	WinPed Denomination
Bit 0	Ready for operation axis 3 1 = ready for operation	Ready A3 OK
Bit 1	Ready for operation axis 4 1 = ready for operation	Ready A4 OK
Bit 2	Isolating valve axis 3 OPEN / CLOSE 1 = open isolating valve	Isolating valve A3
Bit 3	Isolating valve axis 4 OPEN / CLOSE 1 = open isolating valve	Isolating valve A4
Bit 4		
Bit 5		
Bit 6		
Bit 7		
Bit 8		
Bit 9		
Bit 10		
Bit 11		
Bit 12		
Bit 13		
Bit 14		
Bit 15	Status of the CANRex connection	Status CAN internal

Ready A3 Ok	"1" indicates that axis 3 is ready for operation. No error detected.
Ready A4 Ok	"1" indicates that axis 4 is ready for operation. No error detected.
Isolating valve shaft A3	"1" indicates that the isolating valve axis 3 is to be opened. "0" indicates that the isolating valve axis 4 must be closed.
Isolating valve shaft A4	"1" indicates that the isolating valve axis 3 is to be opened. "0" indicates that the isolating valve axis 4 must be closed.
Status CAN internal	internal CAN communication – not activated!



In variant "D", the Isolating valve shaft A3" and "Isolating valve shaft A4" signals correspond to the digital output signals at SLOT 2 OUT3 and OUT 4. We recommend using the digital wired signals for controlling the valves. On the one hand, this allows for the direct connection of the signals within the safety chain (relay circuit) and on the other hand prevents delay of the signals due to the computing time of the superior control. In this connection, also refer to chapter 4.1

Error array shaft 1

Error array shaft 1	Bit0	cable break encoder A 1
	Bit1	cable break SLOT 1 LVDT 1
	Bit2	cable break SLOT 1 LVDT 2
	Bit3	maximum speed exceeded - A 1
	Bit4	maximum acceleration exceeded - A 1
	Bit5	swivel angle difference exceeded LVDT 1 SLOT 1
	Bit6	swivel angle difference exceeded LVDT 2 SLOT 1
	Bit7	speed difference cmd./act. A 1
	Bit8	cable break load cell transducer A1
	Bit9	cable break pressure transducer A1
	Bit10	bus error
	Bit11	CANRex Watchdog
	Bit12	CANRex Hard Soft
	Bit13	swivel angel adjustment fault LVDT 1 SLOT 1
	Bit14	swivel angel adjustment fault LVDT 2 SLOT 1
	Bit15	no release A1

Error array shaft 2

Error array shaft 1	Bit0	cable break encoder A 2
	Bit1	cable break LVDT 1 SLOT 2
	Bit2	cable break LVDT 2 SLOT 2
	Bit3	maximum speed exceeded - A 2
	Bit4	maximum acceleration exceeded - A 2
	Bit5	swivel angle difference exceeded LVDT 1 SLOT 2
	Bit6	swivel angle difference exceeded LVDT 2 SLOT 2
	Bit7	speed difference cmd./act. A 2
	Bit8	
	Bit9	
	Bit10	bus error
	Bit11	CANRex Watchdog
	Bit12	CANRex Hard Soft
	Bit13	swivel angel adjustment fault LVDT 1 SLOT 2
	Bit14	swivel angel adjustment fault LVDT 2 SLOT 2
	Bit15	no release A2

Actual Values SYHNC100 -> PLC

Bus_speed actual 1

Bus_speed actual 2 The current actual speed value of axis 1 and axis 2 is indicated as:

negative maximum: 0xE001 = -100%
positive maximum: 0x1FFF = +100%

The conversion of the digital actual value into the physical unit rotations/min is effected on the basis of the settings made in the system configuration (R508).

Bus Swivel angle 1

Bus Swivel angle 2

Bus Swivel angle 3

Bus Swivel angle 4

The current actual swivel angle value of an axis is indicated as:

negative maximum: 0xE001 = -100%
positive maximum: 0x1FFF = +100%

With correctly adjusted swivel angle sensors, the following assignments apply:

0xE000 = -100% = -15°
0x1FFF = +100% = +15°

Bus_load_cell_actual

The current value of the torque collection lies within the range:

negative maximum: 0xE001 = -100%
positive maximum: 0x1FFF = +100%

The assignment of the digital value to a specification in [Nm] results from the technical specifications of the torque collection.

18 Pin assignment SYHNC100-SEK- 2..-A..-S000

18.1 Controller CPU – card

CPU RS232		
signal	Pin no.	Description
LCAN_H	1	CAN – internal
TxD	2	RS232
RxD	3	RS232
res	4	reserved
GND	5	GND
res	6	reserved
res	7	reserved
res	8	reserved
LCAN_L	9	CAN – internal

CPU X1S power		
signal	Pin no.	Description
GND	1	Power supply
GND	2	Power supply
18-30V	3	Power supply

CPU X7P – PROFIBUS DP		
signal	Pin no.	Description
res	1	reserved
res	2	reserved
RxD/TxD-P	3	PROFIBUS DP
CNTR-P	4	PROFIBUS DP
DGND	5	PROFIBUS DP
VP	6	PROFIBUS DP
res	7	reserved
RxD/TxD-N	8	PROFIBUS DP
res	9	reserved

18.2 SLOT 1 – LVDT evaluation

SLOT 1 | LVDT - sensor

SLOT1 X8M1 ENCODER [IW9 AWX]			
signal	Pin no.	Description of IW9	Description of AWX
LVDT1	1	IW9 GND axis 1	AWX Pin 1 axis 1
LVDT1	2	IW9 Pin 2 axis 1	AWX Pin 2 axis 1
LVDT1	3	IW9 Pin 1 axis 1	AWX Pin 3 axis 1
LVDT1	4	Bridge to pin 5	
LVDT1	5	Bridge to pin 4	AWX Pin 4 axis 1
res	6		
LVDT2	7	IW9 Pin 1 axis 2	AWX Pin 3 axis 2
LVDT2	8	Bridge to pin 9	
LVDT2	9	Bridge to pin 8	AWX Pin 4 axis 2
res	10		
LVDT2	11	IW9 GND axis 2	AWX Pin 1 axis 2
res	12		
res	13		
res	14		
LVDT2	15	IW9 Pin 2 axis 2	AWX Pin 2 axis 2

SLOT 1 | digital I/O

SLOT1 X2D1 digital I/O		
signal	Pin no.	Description
OUT 1	1	Ready for operation / axis 1 sum error
OUT 2	2	Ready for operation / axis 2 sum error
OUT 3	3	Axis 1 isolator valve control
OUT 4	4	Axis 2 isolator valve control
OUT 5	5	open brake
OUT 6	6	Controller active
OUT 7	7	Speed == 0
OUT 8	8	Torque == 0
OUT 9	9	reserved
OUT 10	10	Operating mode „0“ = n-control „1“ = md-control
OUT 11	11	Swivel angle limitation active

SLOT 1 | analogue I/O

SLOT1 X2A1 analogue I/O		
signal	Pin no.	Description
Vin 1+	1	Torque command value $\pm 10V$
Vin 1 -	2	Torque command value voltage reference
Vin 2+	3	Actual torque value $\pm 10V$
Vin 2 -	4	Actual torque value voltage reference
Cin 1+	5	reserved
Cin 1 -	6	reserved
Cin 2+	7	Actual torque value 4-20 mA / load cell
Cin 2 -	8	Actual torque value current reference
n.c.	9	reserved
AGND	10	Analog GND
Vout 1	11	Analog OUT1 $\pm 10V$ / actuating variable 1-> module amp.
Vout 2	12	Analog OUT2 $\pm 10V$ / actuating variable2 -> module amp.
Cout1	13	reserved
+24V	14	24V output voltage
n.c.	15	reserved

18.3 SLOT 2 – incremental encoder

SLOT 2 | encoder

SLOT2 X8M2 ENCODER [incremental sensor]			
signal	Pin no.	Description INK	Description SSI
-B	1	-Ua2 / GEL293 Pin G	
+ Clk	2		+ CLK
+R	3		reserved
-R	4		reserved
+A	5	+Ua1 / GEL293 Pin C	
-A	6	-Ua1 / GEL293 Pin H	
- Clk	7		- CLK
+B	8	+Ua2 / GEL293 Pin B	
- DATA	9		- DATA
GND	10	0V / GEL293 Pin A	Ground
+ DATA	11		
+5Venc	12	5V / GEL293 Pin F	
+10Vref	13	reserved	reserved
+24V enc	14		+24V
n.c.	15	reserved	reserved

SLOT 2 | digital I/O

SLOT2 X2D2 digital I/O		
signal	Pin no.	Description
IN 1	1	Enable
IN 2	2	Start
IN 3	3	Reset
IN 4	4	Open-loop torque control
IN 5	5	Closed-loop torque control
IN 6	6	Pressure OK
IN 7	7	Brake open
IN 8	8	reserved
IN 9	9	reserved
IN 10	10	reserved
IN 11	11	Select speed setpoint intern 2

SLOT2 | analogue I/O

SLOT2 X2A2 analogue I/O		
signal	Pin no.	Description
Vin 1+	1	Speed command value $\pm 10V$
Vin 1 -	2	Speed command value voltage GND
Vin 2+	3	Actual pressure value 0 – 10V / pressure tapping point
Vin 2 -	4	Actual pressure value voltage GND
Cin 1+	5	reserved
Cin 1 -	6	reserved
Cin 2+	7	Actual pressure value 4 – 20mA / pressure tapping point
Cin 2 -	8	Actual pressure value current GND
nc	9	reserved
AGND	10	AGND
Vout 1	11	Diagnosis 1
Vout 2	12	Diagnosis 2
Cout1	13	reserved
+24V	14	+24V output voltage
nc	15	reserved

19 Pin assignment SYHNC100-SEK- 4..-D..-S000

19.1 Controller CPU – card

CPU RS232		
signal	Pin no.	Description
LCAN_H	1	CAN – internal
TxD	2	RS232
RxD	3	RS232
res	4	reserved
GND	5	GND
res	6	reserved
res	7	reserved
res	8	reserved
LCAN_L	9	CAN – internal

CPU X1S power		
signal	Pin no.	Description
GND	1	Power supply
GND	2	Power supply
18-30V	3	Power supply

CPU X7P – PROFIBUS DP		
signal	Pin no.	Description
res	1	reserved
res	2	reserved
RxD/TxD-P	3	PROFIBUS DP
CNTR-P	4	PROFIBUS DP
DGND	5	PROFIBUS DP
VP	6	PROFIBUS DP
res	7	reserved
RxD/TxD-N	8	PROFIBUS DP
res	9	reserved

19.2 SLOT 1 – LVDT evaluation

SLOT 1 | LVDT - sensor

SLOT1 X8M1 ENCODER [IW9 AWX]			
signal	Pin no.	Description of IW9	Description of AWX
LVDT1	1	IW9 GND axis 1	AWX Pin 1 axis 1
LVDT1	2	IW9 Pin 2 axis 1	AWX Pin 2 axis 1
LVDT1	3	IW9 Pin 1 axis 1	AWX Pin 3 axis 1
LVDT1	4	Bridge to pin 5	
LVDT1	5	Bridge to pin 4	AWX Pin 4 axis 1
res	6		
LVDT2	7	IW9 Pin 1 axis 2	AWX Pin 3 axis 2
LVDT2	8	Bridge to pin 9	
LVDT2	9	Bridge to pin 8	AWX Pin 4 axis 2
res	10		
LVDT2	11	IW9 GND axis 2	AWX Pin 1 axis 2
res	12		
res	13		
res	14		
LVDT2	15	IW9 Pin 2 axis 2	AWX Pin 2 axis 2

SLOT 1 | digital I/O

SLOT1 X2D1 digital I/O		
signal	Pin no.	Description
OUT 1	1	Ready for operation / axis 1 sum error
OUT 2	2	Ready for operation / axis 2 sum error
OUT 3	3	Axis 1 isolator valve control
OUT 4	4	Axis 2 isolator valve control
OUT 5	5	open brake
OUT 6	6	Controller active
OUT 7	7	Speed == 0
OUT 8	8	Torque == 0
OUT 9	9	reserved
OUT 10	10	Operating mode „0“ = n-control „1“ = md-control
OUT 11	11	Swivel angle limitation active

SLOT 1 | analogue I/O

SLOT1 X2A1 analogue I/O		
signal	Pin no.	Description
Vin 1+	1	Torque command value $\pm 10V$
Vin 1 -	2	Torque command value voltage reference
Vin 2+	3	Actual torque value $\pm 10V$
Vin 2 -	4	Actual torque value voltage reference
Cin 1+	5	reserved
Cin 1 -	6	reserved
Cin 2+	7	Actual torque value 4-20 mA / load cell
Cin 2 -	8	Actual torque value current reference
n.c.	9	reserved
AGND	10	Analog GND
Vout 1	11	Analog OUT1 $\pm 10V$ / actuating variable 1-> module amp.
Vout 2	12	Analog OUT2 $\pm 10V$ / actuating variable2 -> module amp.
Cout1	13	reserved
+24V	14	+24V output voltage
n.c.	15	reserved

19.3 SLOT 2 – LVDT evaluation

SLOT 2 | LVDT - sensor

SLOT2 X8M2 ENCODER [IW9 AWX]			
signal	Pin no.	Description of IW9	Description of AWX
LVDT1	1	IW9 GND axis 3	AWX Pin 1 axis 3
LVDT1	2	IW9 Pin 2 axis 3	AWX Pin 2 axis 3
LVDT1	3	IW9 Pin 1 axis 3	AWX Pin 3 axis 3
LVDT1	4	Bridge to pin 5	
LVDT1	5	Bridge to pin 4	AWX Pin 4 axis 3
res	6		
LVDT2	7	IW9 Pin 1 axis 4	AWX Pin 3 axis 4
LVDT2	8	Bridge to pin 9	
LVDT2	9	Bridge to pin 8	AWX Pin 4 axis 4
res	10		
LVDT2	11	IW9 GND axis 4	AWX Pin 1 axis 4
res	12		
res	13		
res	14		
LVDT2	15	IW9 Pin 2 axis 4	AWX Pin 2 axis 4

SLOT 2 | digital I/O

SLOT2 X2D2 digital I/O		
signal	Pin no.	Description
OUT 1	1	Ready for operation / axis 3 sum error
OUT 2	2	Ready for operation / axis 4 sum error
OUT 3	3	Axis 3 isolator valve control
OUT 4	4	Axis 4 isolator valve control
OUT 5	5	reserved
OUT 6	6	reserved
OUT 7	7	reserved
OUT 8	8	reserved
OUT 9	9	reserved
OUT 10	10	reserved
OUT 11	11	reserved

SLOT 2 | analogue I/O

SLOT2 X2A2 analogue I/O		
signal	Pin no.	Description
Vin 1+	1	reserved
Vin 1 -	2	reserved
Vin 2+	3	reserved
Vin 2 -	4	reserved
Cin 1+	5	reserved
Cin 1 -	6	reserved
Cin 2+	7	reserved
Cin 2 -	8	reserved
n.c.	9	reserved
AGND	10	Analog GND
Vout 1	11	Analog OUT1 $\pm 10V$ / actuating variable 1-> module amp.
Vout 2	12	Analog OUT2 $\pm 10V$ / actuating variable2 -> module amp.
Cout1	13	reserved
+24V	14	+24V output voltage
n.c.	15	reserved

19.4 SLOT 3 – incremental encoder

SLOT 3 | encoder

SLOT3 X8M3 ENCODER [incremental sensor]			
signal	Pin no.	Description INK	Description SSI
-B	1	-Ua2 / GEL293 Pin G	
+ Clk	2		+ CLK
+R	3		reserved
-R	4		reserved
+A	5	+Ua1 / GEL293 Pin C	
-A	6	-Ua1 / GEL293 Pin H	
- Clk	7		- CLK
+B	8	+Ua2 / GEL293 Pin B	
- DATA	9		- DATA
GND	10	0V / GEL293 Pin A	Ground
+ DATA	11		
+5Venc	12	5V / GEL293 Pin F	
+10Vref	13	reserved	reserved
+24V enc	14		+24V
nc.	15	reserved	reserved

SLOT 3 | digital I/O

SLOT3 X2D3 digital I/O		
signal	Pin no.	Description
IN 1	1	Enable
IN 2	2	Start
IN 3	3	Reset
IN 4	4	Open-loop torque control
IN 5	5	Closed-loop torque control
IN 6	6	Pressure OK
IN 7	7	Brake open
IN 8	8	reserved
IN 9	9	reserved
IN 10	10	reserved
IN 11	11	Select speed setpoint intern 2

SLOT 3 | analogue I/O

SLOT3 X2A3 analogue I/O		
signal	Pin no.	Description
Vin 1+	1	Speed command value $\pm 10V$
Vin 1 -	2	Speed command value voltage GND
Vin 2+	3	Actual pressure value 0 – 10V / pressure tapping point
Vin 2 -	4	Actual pressure value voltage GND
Cin 1+	5	reserved
Cin 1 -	6	reserved
Cin 2+	7	Actual pressure value 4 – 20mA / pressure tapping point
Cin 2 -	8	Actual pressure value current GND
n.c.	9	reserved
AGND	10	
Vout 1	11	Diagnosis 1 Actual swivel angle value axis 1
Vout 2	12	reserved
Cout1	13	reserved
+24V	14	+24V output voltage
n.c.	15	reserved

19.5 SLOT 4 – incremental encoder

SLOT 4 | encoder

SLOT4 X8M4 ENCODER [incremental sensor]			
signal	Pin no.	Description INK	Description SSI
-B	1	-Ua2 / GEL293 Pin G	
+ Clk	2		+ CLK
+R	3		reserved
-R	4		reserved
+A	5	+Ua1 / GEL293 Pin C	
-A	6	-Ua1 / GEL293 Pin H	
- Clk	7		- CLK
+B	8	+Ua2 / GEL293 Pin B	
- DATA	9		- DATA
GND	10	0V / GEL293 Pin A	Ground
+ DATA	11		
+5Venc	12	5V / GEL293 Pin F	
+10Vref	13	reserved	reserved
+24V enc	14		+24V
n.c..	15	reserved	reserved

SLOT 4 | digital I/O

SLOT4 X2D4 digital I/O		
signal	Pin no.	Description
IN 1	1	reserved
IN 2	2	reserved
IN 3	3	reserved
IN 4	4	reserved
IN 5	5	reserved
IN 6	6	reserved
IN 7	7	reserved
IN 8	8	reserved
IN 9	9	reserved
IN 10	10	reserved
IN 11	11	reserved

SLOT 4 | analogue I/O

SLOT4 X2A4 analogue I/O		
signal	Pin no.	Description
Vin 1+	1	reserved
Vin 1 -	2	reserved
Vin 2+	3	reserved
Vin 2 -	4	reserved
Cin 1+	5	reserved
Cin 1 -	6	reserved
Cin 2+	7	reserved
Cin 2 -	8	reserved
n.c.	9	reserved
AGND	10	AGND
Vout 1	11	Diagnosis 2
Vout 2	12	reserved
Cout1	13	reserved
+24V	14	+24V output voltage
n.c.	15	reserved

20 Commissioning notes

The commissioning notes refer to the basic work steps necessary which have to be completed so that the functions of a SYHNC100-SEK can be used.



It is explicitly stated that the work steps described do not claim to be complete. You must rather always consider the application and the function of the overall system within the commissioning procedure and insert work steps that might possibly not be described, if necessary.

20.1 Commissioning prerequisites

- Hydraulic commissioning of the system is completed. High pressure and possible pilot oil pressure are available and ready for operation
- The electrical connection to the existing isolating valves must be interrupted. – Pull the isolating valve plug
- The setscrew for the volume limitation at the isolating valve must be closed completely. – Screw the setscrew in
- Electrical connection of all necessary sensors, amplifiers and external control units for the operation of the SYHNC100-SEK is completed
- WinPed is installed, the corresponding project is available. The communication between WinPed and the SYHNC100-SEK can be activated via the serial connection cable

20.2 Sequence of the commissioning steps

Editing the SYHNC100-SEK project

- Open project and edit system configuration
- The configured project is to be loaded in the SYHNC100-SEK
- ✓ The LED displays of the SYHNC100-SEK must be illuminated according to their function
- Open the WinPed "status" window and check the error messages. Remove pending errors. You must particularly check all error messages constituting a cable break monitoring.
- ✓ No cable break error messages active

Testing the cable break error messages

All sensors that are connected to the SYHNC-SEK and equipped with a cable break monitoring must be tested for the "Cable break" error message.

We recommend proceeding as described in the following:

- Perform an error reset
- ✓ There is no cable break error message pending in the system

The cable break error messages are to be tested individually for all connected sensors.

- Separate the connection cable from the sensor
- ✓ Check the error message in the WinPed status display
- ✓ In case of bus connection, check the corresponding error message in the superior control system

The following cable break error messages are possible and must be checked depending on the system design:

- Cable break incremental encoder
For secondary control, at least one incremental encoder has to be used.
- Cable break LVDT sensor
For secondary control, at least one LVDT sensor has to be used.
- Cable break torque transducer (load cell)
- Cable break actual pressure value transducer

Commissioning the swivel angle sensors

If the swivel angle control circuit is connected correctly, the actual swivel angle value is in neutral position if high pressure/pilot oil pressure is available and the closed-loop control (speed / torque) is switched off:

- Swivel angle command value and actual value are "0"
- "0" = central position at the motor – "Swivel angle indicator"

The listed procedures must be individually performed for all connected LVDT sensors!

- With a functional swivel angle control, you must now complete the sections from chapter 13 .
If the swivel angle adjustment procedure cannot be completed without errors, we recommend completing the subsequently described procedure, "Manual adjustment of a swivel angle sensor".
- Possibly existing control circuits working in an inverted form can be corrected by settings in the WinPed "Swivel angel settings {8}" menu. In this case it is, however, imperatively necessary to check the correct wiring of LVDT sensor, high-response valve and amplifier.
- ✓ The next commissioning step for parameterizing the swivel angle control can be performed.

Manual adjustment of a swivel angle sensor

The electrical connections necessary for the swivel angle control and control of the LVDT signals can be carried out manually.

For that purpose, the two diagnosis windows are to be opened:

WinPed diagnosis window "Select DAC



Fig. 47 Diagnosis window Select DAC

WinPed diagnosis window "LVDT Analogue Values {91}

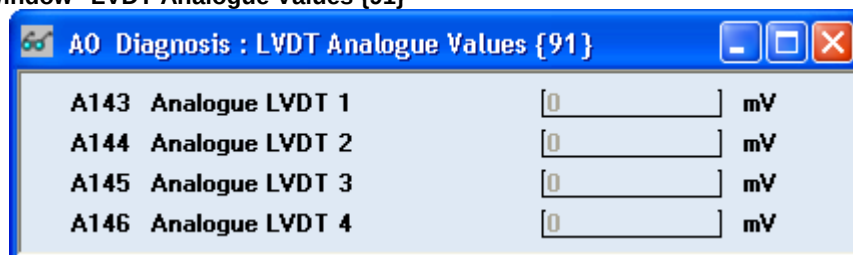


Fig. 48 Diagnosis window LVDT Analogue Values

Assignment of the DAC channels

The analog outputs are fixedly assigned to the connected LVDT sensors:
The following applies to SLOT 1 with variant "A" and variant "D"

- Output S1.A0.1 Sensor SLOT1 LVDT 1 A143 Analogue LVDT 1
- Output S1.A0.2 Sensor SLOT1 LVDT 2 A144 Analogue LVDT 2

Only for version "D"

- Output S2.A0.1 Sensor SLOT2 LVDT 1 A145 Analogue LVDT 1
- Output S2.A0.2 Sensor SLOT2 LVDT 2 A146 Analogue LVDT 2

- Approach**
- The desired DAC channel is to be provided with a value of e.g. 2V.
 - The "Off" button is to be operated. The display switches to "On"
 - As long as the "Start" button is pressed, the specified output voltage is output at the selected analog output.
 - The corresponding feedback of the LVDT sensor signal has to be checked in the diagnosis.
 - By changing the polarity of the output signal, both (left, right) maximum values of the LVDT sensor can be evaluated.
 - ✓ Symmetry of the sensor signals between positive and negative maximum value has to be ensured by corresponding adjustment at the sensor.

If the setting has been completed, the selected DAC channels are to be reset to "Off".
The window must be closed.

The calibration according to chapter 13 has to be performed.

The next commissioning step for parameterizing the swivel angle control can be processed.

Parameterization of the swivel angle control

By means of internal provision of a swivel angle command value, the swivel angle control circuit can be set if system pressure is available. For that purpose, the parameters R488 and R489 are to be used, see chapter 12.1.



During the parameterization of the swivel angle control circuits, the superior closed-loop speed/torque control is not active!

R488 == 1 activates the internal swivel angle provision

R489 = XX% sets the internal swivel angle command value

We recommend setting the swivel angle control circuit with command value jumps in the range of $\pm 20\%$.

The control quality can be checked by means of the WinPed "Measurement" function.

Commissioning closed-loop speed control

Prerequisites

- Commissioning of the closed-loop speed control requires set and functional active swivel angle control circuits.
- There must be now SYHNC100-SEK error messages.
I.e. the "Ready Ax" signals for all active axes must be available.
- The signal sequence for the implementation of the start/stop sequence with the signal provisions for "Brake" and "Isolating valve" must be functional.
- It must be ensured that by operating an external "emergency stop", the system can be switched off irrespective of the SYHNC100-SEK.



In the initial start-up, proper functioning of the connected incremental encoder is not ensured. An incorrect wiring may, e.g. result in inverted actual values can, however, not cause a cable break notification.

Approach

- The parameters for the monitoring of the maximum speed and the speed difference are to be set to small values.
- The electrical connection to the existing isolating valves is to be re-established. – Connect the isolating valve plug.
- The mechanical volume limitation at the isolating valve must be opened by ca. 2 - 4 rotations.
- Using the external command value provision, a speed command value of ca. 200 rpm (observe system specification) is to be set.
- The WinPed diagnosis for displaying speed information is to be opened

WinPed diagnosis window "Speed control Values {1}"

A0 Diagnosis : Speed control values {1}		
A001	Speed command ramp	0.0 rpm
A002	Speed command control	0.0 rpm
A004	Speed actual shaft 1	0 rpm
A005	Speed actual shaft 2	0 rpm
A006	Speed actual value control	0 rpm
A007	Acceleration actual shaft 1	0 rpm/s
A008	Acceleration actual shaft 2	0 rpm/s
A009	Acceleration actual control	0 rpm/s
A080	Speed control Output	0.0 %
A185	Position1 INK	0 INK
A186	Position2 INK	0 INK

Fig. 49 Diagnosis window Speed control Values

- The "Start" signal is to be set. The "controller active" message must be set by the SYHNC-100-SEK.
"Isolating valve and brake signal are set by the SYHNC100-SEK. The connected valves must be switched.

The closed-loop control generates a rising swivel angle command value. From a certain swivel angle value, the static friction of the system is overcome and a speed unequal "0" is achieved.

The actual speed value in the WinPed diagnosis is to be observed and polarity between command value and actual value is to be checked. If the signs of the two signals correspond, a functional closed-loop speed control has been achieved. If the signal signs differ, the control direction is inverted! The wiring of the incremental encoder and/or the settings in the system configuration must be checked.

With active closed-loop speed control, polarity of the actual value signals has to be set so that there is a positive actual speed value with a positive actual swivel angle value.

Test of the monitoring functions

The setting for monitoring the maximum speed is to be set to a small (observe system specification) value.

The system is to be started and a speed command value > monitoring value is to be set. In this way, the "Maximum speed" error message is forced. The system shut-off – isolating valve signal == OFF; brake signal == OFF; error message to external control - is to be checked!

Finish

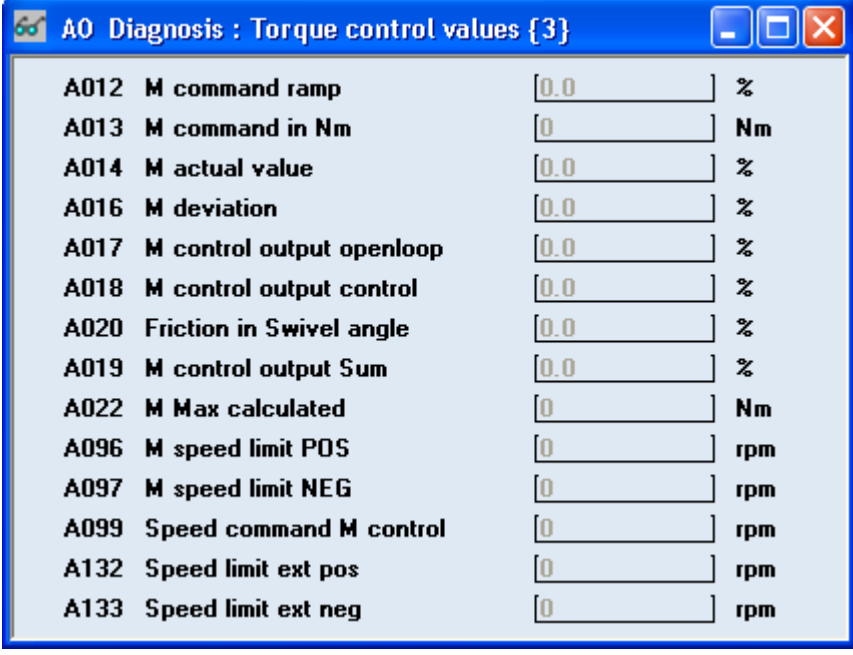
With the final test of the monitoring functions, the volume limitation of the isolating valve block can be completely canceled.

Commissioning closed-loop torque control

Prerequisites

- Commissioning of the closed-loop torque control requires set and functional active swivel angle control circuits and closed-loop speed control.
- There must be no SYHNC100-SEK error messages.
I.e. the "Ready Ax" signals for all active axes must be available.
- The signal sequence for the implementation of the start/stop sequence with the signal provisions for "Brake" and "Isolating valve" must be functional
- It must be ensured that by operating an external "emergency stop button", the system can be switched off irrespective of the SYHNC100-SEK
- We recommend only operating the closed-loop torque control in the "open-loop torque control" mode in a first step until the actual torque value collection function has been checked
- The WinPed diagnosis for displaying speed information is to be opened

WinPed diagnosis window "Torque control Values {3}"



Code	Description	Value	Unit
A012	M command ramp	0.0	%
A013	M command in Nm	0	Nm
A014	M actual value	0.0	%
A016	M deviation	0.0	%
A017	M control output openloop	0.0	%
A018	M control output control	0.0	%
A020	Friction in Swivel angle	0.0	%
A019	M control output Sum	0.0	%
A022	M Max calculated	0	Nm
A096	M speed limit POS	0	rpm
A097	M speed limit NEG	0	rpm
A099	Speed command M control	0	rpm
A132	Speed limit ext pos	0	rpm
A133	Speed limit ext neg	0	rpm

Fig. 50 Diagnosis window Torque control Values

- Using the external command value provision, a low torque command value (observe system specification) is to be set.
- The "Start" signal is to be set. The "controller active" message must be set by the SYHNC-100-SEK.
"Isolating valve and brake signal are set by the SYHNC100-SEK. The connected valves must be switched.
- The closed-loop control reaction must be designed so that with a positive torque command value a positive actual torque value must be achieved with positive swivel angle.

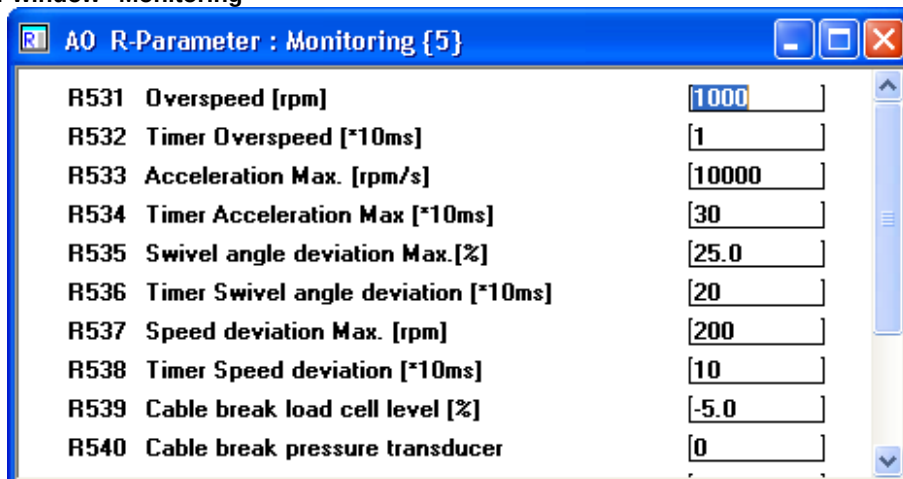
Commissioning monitoring

After successful commissioning of the different modes of operation, all monitoring functions possible must be checked for their operational safety and function. I.e. the system reaction is to be determined for every possible error and adjusted to the expected or necessary emergency stop reaction.

Main topics monitoring

- Monitoring of all sensors: e.g. cable break - pull connecting plug at the sensor
- Test of all monitoring functions with adjustable limit values

WinPed parameter window "Monitoring



A0 R-Parameter : Monitoring {5}

R531	Overspeed [rpm]	1000
R532	Timer Overspeed [*10ms]	1
R533	Acceleration Max. [rpm/s]	10000
R534	Timer Acceleration Max [*10ms]	30
R535	Swivel angle deviation Max. [%]	25.0
R536	Timer Swivel angle deviation [*10ms]	20
R537	Speed deviation Max. [rpm]	200
R538	Timer Speed deviation [*10ms]	10
R539	Cable break load cell level [%]	-5.0
R540	Cable break pressure transducer	0

Fig. 51 Parameter window Monitoring

21 "WinPed 6" short instructions

For parameterizing the electronics and for visualizing process variables, particularly in the initial start-up of a system, the freely available communication program is used.

WinPED 6.06 <http://www.boschrexroth.com/hnc100/Winped>

For communicating with the electronics, the operation program needs project data that is available on request.

WinPed and the project data are exclusively used in English!

Connection cable The connection between "WinPed" and the electronics is established via a serial inter-
VT-HACD-1X/3,0/HACD-PC face with a connection cable:

e.g. length 3m: Mat. no: R900776897

Settings for the serial interface The settings of the COM port used are to be configured in WinPed

WinPed COM port

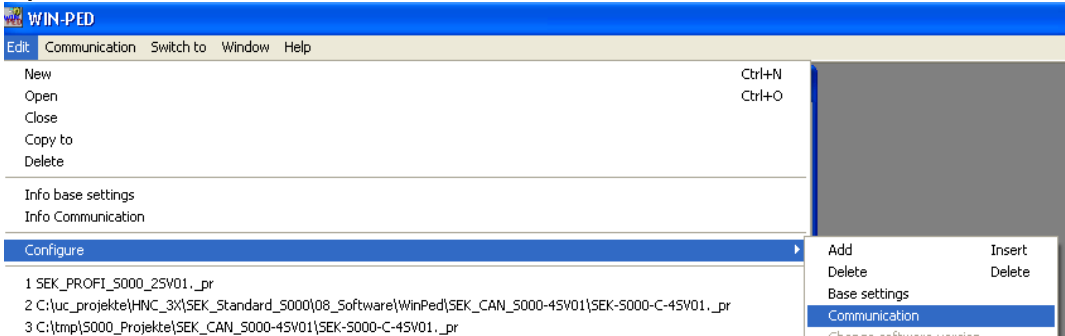


Fig. 52 WinPed COM port

21.1 Software download / version information

Initialize control The "Initialize control F10" menu item starts the download of software and parameter settings of an existing project into SYHNC100-SEK electronics.

The subsequently displayed menu item starts the software download

WinPed software download

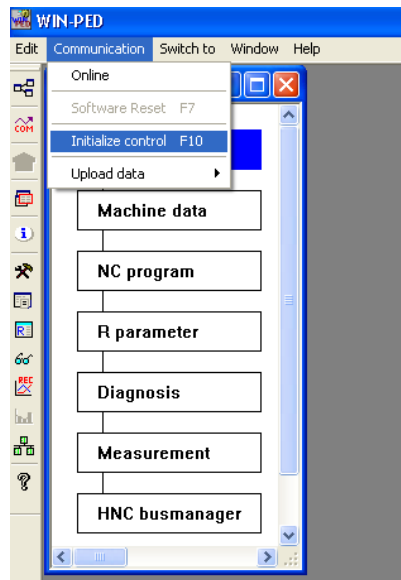


Fig. 53 Software download

Get version information From an SYHNC100-SEK, you can read out the currently used software version and superior project data.

This data can also be read out without an existing project.

The settings in the "Settings" submenu are to be checked for suitable values

WinPed version info

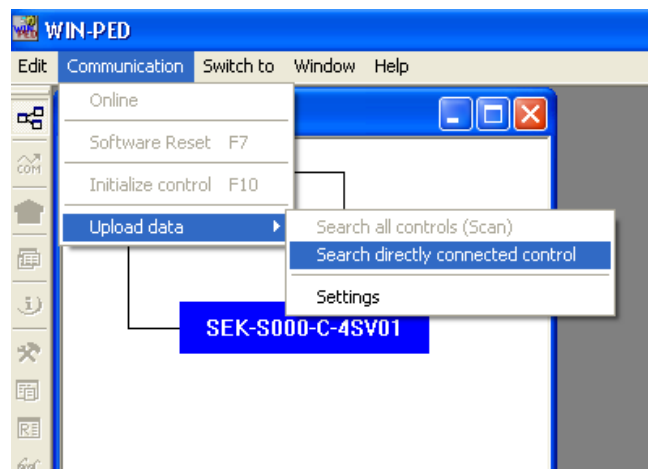


Fig. 54 Software version info

The data is read out with the following call

WinPed version info upload

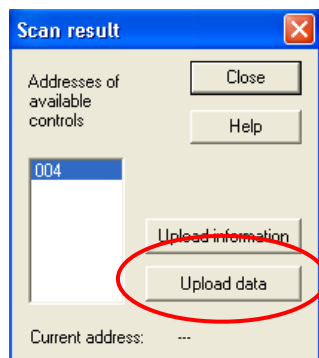


Fig. 55 Software version info upload

WinPed version info data project

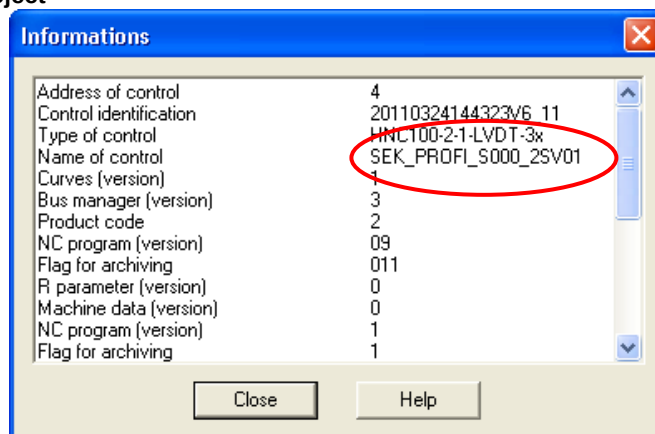


Fig. 56 Software version info project

WinPed version info data software

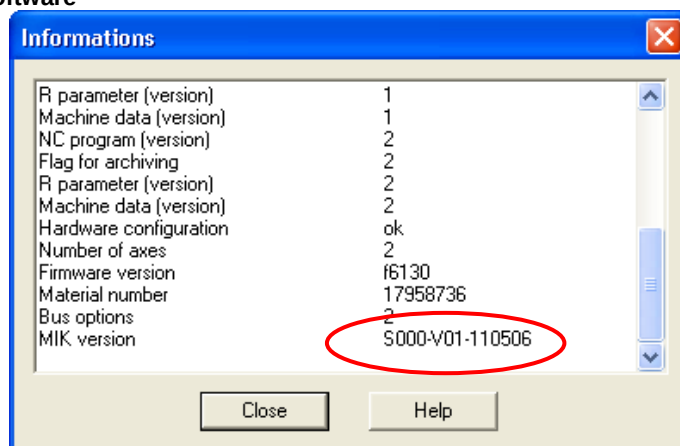


Fig. 57 Software version info software

The information on the "MIK version" refers to the software version active in this control system.

21.2 Changing parameters

Parameters can be changed at any time, even with active control system.

- Entry approach**
- Mark the parameter to be changed in the entry box
 - Enter the new value and confirm it with "Return"
The parameter gets the "#" character as prefix

Parameter entry



Fig. 58 Parameter entry

- Transmit approach**
- After entry, the value entered using the keyboard is not active in the control, yet. The parameter is only transmitted to the SYHNC100-SEK and saved there by operating the "F10" button. The "#" character in front of the changed parameter will then disappear.

A transmitted parameter is immediately active in the SYHNC100-SEK!

- Saving parameters in the project**
- Changed parameters can be saved in the project. If all R parameter windows are closed, the user will be asked whether the changed values are to be stored within the project, as well.

We always recommend saving parameter values within the project in order to also have the current settings available as data back-up.

In case the SYHNC100-SEK electronics are exchanged, the existing project with all set parameter values can be loaded into the new electronics.

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