1.4 Assignment of the control bytes and status bytes (overview)

Assignment of the control bytes (overview)

CCON (all)	**B7** **OPM2**	**B6** **OPM1**	**B5** **LOCK**	**B4** **–**	**B3** **RESET**	**B2** **BRAKE**	**B1** **STOP**	**B0** **ENABLE**
	Select FHPP operating mode		Software access locked	–	Reset fault	Open brake	Stop	Drive enable
CPOS (Record selection and Direct mode)	**B7** **–**	**B6** **CLEAR**	**B5** **TEACH**	**B4** **JOGN**	**B3** **JOGP**	**B2** **HOM**	**B1** **START**	**B0** **HALT**
	–	Clear remaining position	Teach actual value	Jog negative	Jog positive	Start homing	Start positioning task	Halt
CDIR (Direct mode)	**B7** **FUNC**	**B6** **FGRP2**	**B5** **FGRP1**	**B4** **FNUM2**	**B3** **FNUM1**	**B2** **COM2**	**B1** **COM1**	**B0** **ABS**
	Execute function	Function group		Function number		Control mode (position, torque, velocity, ...)		Absolute/ Relative

Assignment of the status bytes (overview)

SCON (all)	**B7** **OPM2**	**B6** **OPM1**	**B5** **LOCK**	**B4** **24VL**	**B3** **FAULT**	**B2** **WARN**	**B1** **OPEN**	**B0** **ENABLED**
	Display FHPP operating mode		Drive control by software	Supply voltage is applied	Fault	Warning	Operation enabled	Drive enabled
SPOS (Record selection and Direct mode)	**B7** **REF**	**B6** **STILL**	**B5** **DEV**	**B4** **MOV**	**B3** **TEACH**	**B2** **MC**	**B1** **ACK**	**B0** **HALT**
	Axis is referenced	Standstill control	Drag (deviation) error	Axis is moving	Acknowledge teach/ sampling	Motion complete	Acknowledge start	Halt
SDIR (Direct mode)	**B7** **FUNC**	**B6** **FGRP2**	**B5** **FGRP1**	**B4** **FNUM2**	**B3** **FNUM1**	**B2** **COM2**	**B1** **COM1**	**B0** **ABS**
	Function is executed	Function group feedback		Function number feedback		Control mode feedback (position, torque, velocity)		Absolute/ Relative

1.5 Description of the control bytes

1.5.1 Control byte 1 (CCON)

Control byte 1 (CCON)

Bit	EN	Description
B0 ENABLE	Drive **Enable**	= 1: Enable drive (controller) = 0: Drive (controller) disabled
B1 STOP	**Stop**	= 1: Operation enabled. Any error will be deleted. = 0: STOP active (cancel emergency ramp + positioning task). The drive stops with maximum braking ramp, the positioning task is reset.
B2 BRAKE	Open **Brake**	= 1: Release brake = 0: Activate brake Note: it is only possible to release the brake if the controller is disabled. As soon as the controller is enabled, it has priority over the brake's control system.
B3 RESET	**Reset** Fault	With a rising edge a fault is acknowledged and the fault value is deleted.
B4 –	–	Reserved, must be at 0.
B5 LOCK	Software Access **Lock**ed	Controls access to the controller's local (integrated) diagnostic interface. = 1: The software can only observe the controller; the software cannot take over device control (HMI control) from the software. = 0: The software may take over the device control (in order to modify parameters or to control inputs).
B6 OPM1	Select **Op**erating **M**ode	Bit 7 6 Operating mode 0 0 Record selection 0 1 Direct mode 1 0 Reserved 1 1 Reserved
B7 OPM2		

CCON controls statuses in all FHPP operating modes. For more information, see the description of the drive functions in Chapter 2.

1.5.2 Control byte 2 (CPOS)

Control byte 2 (CPOS)		
Bit	**EN**	**Description**
B0 **HALT**	**Halt**	= 1: Halt is not active = 0: Halt activated (do not cancel braking ramp + positioning task). The axis stops with a defined braking ramp, the positioning task remains active (with B6 the remaining positioning distance can be deleted).
B1 **START**	**Start** Positioning Task	With a **rising edge** the current setpoint values will be transferred and positioning started (even if record 0 = homing, for example).
B2 **HOM**	Start **Hom**ing	With a **rising edge** homing is started with the set parameters.
B3 **JOGP**	**Jog p**ositive	The drive moves at the specified velocity or rotational speed in the direction of larger actual values, providing the bit is set. The movement begins with the rising edge and ends with the falling edge.
B4 **JOGN**	**Jog n**egative	The drive moves at the specified velocity or rotational speed in the direction of smaller actual values, see B3.
B5 **TEACH**	**Teach** Actual Value	At a **falling edge** the current actual value is imported into the setpoint register of the currently addressed positioning record; see section 2.5. The teach target is defined with PNU 520. The type is determined by the record status byte (RSB). See also section 2.5.
B6 **CLEAR**	**Clear** Remaining Position	In the “Halt” status a **rising edge** causes the positioning task to be deleted and transfer to the status “Ready.”
B7 **–**	–	Reserved, must be at 0.

CPOS controls the positioning sequences in the “Record selection” and “Direct mode” FHPP operating modes, as soon as the drive is enabled.

1.5.3 Control byte 3 (CDIR) – Direct mode

Control byte 3 (CDIR) – Direct mode

Bit	EN	Description
B0 **ABS**	**Abs**olute/ Relative	= 0: Setpoint value is absolute = 1: Setpoint value is relative to last setpoint value
B1 **COM1** **B2** **COM2**	**Co**ntrol **M**ode	Bit 2 1 Control mode 0 0 Profile Position mode 0 1 Profile Torque mode (torque, current) 1 0 Profile Velocity mode (speed) 1 1 Reserved Only Profile Position mode can be used for the camming function.
B3 **FNUM1** **B4** **FNUM2**	**F**unction **Num**ber	Without camming function (CDIR.B7, FUNC = 0): no function, = 0! If the camming function is used (only with CMMP, CDIR.B7, FUNC = 1): No. Bit 4 3 Function number [1)] 0 0 0 Reserved 1 0 1 Synchronisation with an external input 2 1 0 Synchronisation with an external input with camming function 3 1 1 Synchronisation with a virtual master with camming function
B5 **FGRP1** **B6** **FGRP2**	**F**unction **Grou**p	Without camming function (CDIR.B7, FUNC = 0): no function, = 0! If the camming function is used (only with CMMP, CDIR.B7, FUNC = 1): No. Bit 6 5 Function group 0 0 0 Synchronisation with/without cam disk All other values (No. 1 ... 3) are reserved.
B7 **FUNC**	**Func**tion	= 0: Normal task = 1: Execute camming function (only permissible with CMMP, Bit 3 ... 6 = function number and group)

[1)] With function numbers 1 and 2 (Synchronisation with an external input), bits CPOS.B0 to CPOS.B2 are not relevant. With function number 3 (Virtual master, internal) bits CPOS.B0 to CPOS.B2 determine the reference and the closed-loop control mode of the master.

In Direct mode, CDRI specifies the type of positioning task more precisely.

1.5.4 Bytes 4 and 5 ... 8 – Direct mode

Control byte 4 (setpoint value 1) – Direct mode		
Bit	**EN**	**Description**
B0 ... B7		preselection depends on the closed-loop control mode (CDIR.B1/B2):
	Velocity	– Profile Position mode: Velocity as percentage of base value (PNU 540)
	–	– Profile Torque mode: No function, = 0!
	Velocity ramp	– Profile Velocity mode: Velocity ramp as percentage of base value (PNU 560)

Control bytes 5... 8 (setpoint value 2) – Direct mode		
Bit	**EN**	**Description**
B0...B31		Preselection depends on closed-loop control mode (CDIR.B1/B2), in each case a little-endian 32-bit number:
	Position	– Profile Position mode: Position in positioning unit (see appendix A.1)
	Torque	– Profile Torque mode: Torque setpoint as percentage of the rated torque (PNU 1036)
	Velocity	– Profile Velocity mode: Speed in unit of velocity (see appendix A.1)

1.5.5 Bytes 3 and 4 ... 8 – Record selection

Control byte 3 (record number) – Record selection		
Bit	**EN**	**Description**
B0 ... B7	Record number	Preselection of record number for record selection.

Control bytes 4 ... 8 – Record selection		
Bit	**EN**	**Description**
B0 ... B7	–	Reserved (= 0)

1.6 Description of the status bytes

1.6.1 Status byte 1 (SCON)

Status byte 1 (SCON)

Bit	EN	Description
B0 ENABLED	Drive **Enable**d	= 0: Drive disabled, controller not active = 1: Drive (controller) enabled
B1 OPEN	**Op**eration **En**abled	= 0: STOP active = 1: Operation enabled, positioning possible
B2 WARN	**Warn**ing	= 0: Warning not registered = 1: Warning registered
B3 FAULT	**Fault**	= 0: No fault = 1: There is a fault or fault reaction is active. Fault code in the diagnostic memory.
B4 24VL	**S**upply **V**oltage is **A**pplied	= 0: No load voltage = 1: Load voltage applied
B5 LOCK	Drive Control by Software	Control sovereignty, meaning which device or system has higher control priority (see PNU 125, section 4.4.4) = 0: Device control unassigned (software, fieldbus, DIN) = 1: Device control by software (FCT or DIN) (PLC control is **Lock**ed)
B6 OPM1 **B7 OPM2**	Display **Op**erating **M**ode	Bit 7 6 Operating mode acknowledgment 0 0 Record selection 0 1 Direct mode 1 0 Reserved 1 1 Reserved

1.6.2 Status byte 2 (SPOS)

Status byte 2 (SPOS)		
Bit	**EN**	**Description**
B0 **HALT**	**Halt**	= 0: HALT is active = 1: HALT is not active, axis can be moved
B1 **ACK**	**Ack**nowledge Start	= 0: Ready for start (homing, jog) = 1: Start carried out (homing, jog)
B2 **MC**	**M**otion **C**om-plete	= 0: Positioning task active = 1: Positioning task completed, where applicable with error Note: MC is set for the first time after switch-on (status “Drive disabled”).
B3 **TEACH**	Acknowledge **Teach / Sampling**	Depending on the setting in PNU 354: – PNU 354 = 0: **Display of the teach status** SPOS.B3 = 0: Ready for teaching SPOS.B3 = 1: Teaching carried out, actual value is transferred – PNU 354 = 1: **Display of the sampling status** SPOS.B3 = 0: No edge. SPOS.B3 = 1: An edge has appeared. New position value available. For position sampling: see section 2.9.
B4 **MOV**	Axis is **mov**ing	= 0: Speed of the axis ‹ limit value = 1: Speed of the axis ›= limit value
B5 **DEV**	Drag (**dev**i-ation) Error	= 0: No drag error (also called “following error”) = 1: Drag error active
B6 **STILL**	Stand**still** control	= 0: After MC, axis remains in tolerance window = 1: Axis has left the tolerance window after MC
B7 **REF**	Axis is **ref**er-enced	= 0: Homing must be carried out = 1: Reference information present, homing not necessary

1.6.3 Status byte 3 (SDIR) – Direct mode

The SDIR status byte acknowledges the positioning mode.

Status byte 3 (SDIR) – Direct mode

Bit	EN	Description
B0 **ABS**	**Abs**olute/ Relative	= 0: Setpoint value is absolute = 1: Setpoint value is relative to last setpoint value
B1 **COM1** **B2** **COM2**	**Co**ntrol **M**ode feedback	Bit 2 1 Control mode feedback 0 0 Profile Position mode 0 1 Profile Torque mode (torque, current) 1 0 Profile Velocity mode (speed) 1 1 Reserved
B3 **FNUM1** **B4** **FNUM2**	**F**unction **Num**ber feedback	Only if the camming function is used (SDIR.B7, FUNC = 1): No. Bit 4 3 Function number 0 0 0 CAM-IN / CAM-OUT / Change active 1 0 1 Synchronisation with an external input 2 1 0 Synchronisation with an external input with camming function 3 1 1 Synchronisation with a virtual master with camming function
B5 **FGRP1** **B6** **FGRP2**	**F**unction **Grou**p feedback	Only if the camming function is used (SDIR.B7, FUNC = 1): No. Bit 6 5 Function group 0 0 0 Synchronisation with/without cam disk All other values (No. 1 ... 3) are reserved.
B7 **FUNC**	**Func**tion feedback	= 0: Normal task = 1: Camming function is executed (bits 3 ... 6 = function number and group)

1.6.4 Bytes 4 and 5 ... 8 – Direct mode

Status byte 4 (actual value 1) – Direct mode		
Bit	**EN**	**Description**
B0 ... B7		Feedback depends on the closed-loop control mode (CDIR.B1/B2):
	Velocity	– Profile Position mode: Velocity as percentage of base value (PNU 540)
	Torque	– Profile Torque mode: Torque as percentage of the rated torque (PNU 1036)
	–	– Profile Velocity mode: no function, = 0

Status bytes 5 ... 8 (actual value 2) – Direct mode		
Bit	**EN**	**Description**
B0 ... B31		Feedback depends on closed-loop control mode (CDIR.B1/B2), in each case a little-endian 32-bit number:
	Position	– Profile Position mode: Position in positioning unit, see appendix A.1
	Torque	– Profile Torque mode: Position in positioning unit, see appendix A.1
	Velocity	– Profile Velocity mode: Speed as an absolute value in unit of velocity