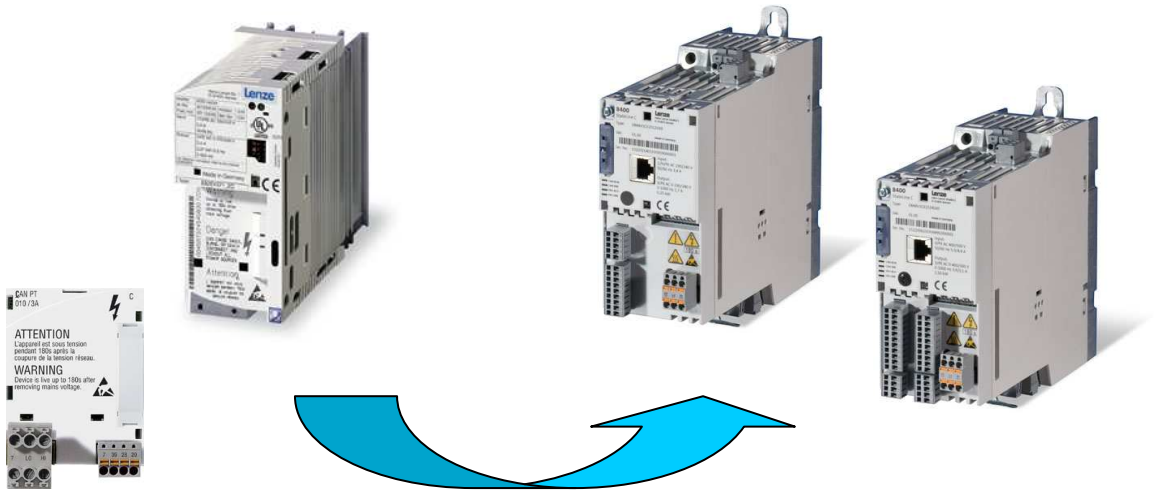
Differences in the inverter control via CAN bus between 8200vector and 8400 Inverter Drives

The improved usability and observance of different standards have led to several differences between the 8400 Inverter Drives and the 8200vector series. The differences concern the control and status word and the parameter setting of the devices. This document summarises the most important differences in the control of an 8400 Inverter Drive and the 8200vector with regard to CAN communication.

Comparison of components used so far and new components:

8200vector with CAN bus connection
via E82ZAFCC

8400 StateLine C / HighLine C
with CAN on-board



The 8200vector device series is replaced by the new 8400 device series

In the following sections, you will find a detailed description of the new system configuration with 8400 Inverter Drives compared to operation with the 8200vector:

- Control source configuration for connection to the CAN bus system.
- Part of the control and status word assignment has changed.
- Setpoint reference and normalisation have changed.
- Changes in the normalisation and shifts in the code list have led to basic changes in the parameter data transfer. The existing parameter setting program must be replaced.
- The EDS files required for integration into a higher-level control system are available in the Engineer and on the Lenze homepage.
  http://akb.lenze.de/akb/infopool.nsf/HTML/200413930

Control source configuration:

For a clear and easy signal configuration in the inverter, the parameters *Application* (L-C00005) and *Control source* (L-C00007) have been created. The parameter *Application* is used to select the core functionality (e.g. speed actuating drive). The parameter *Control source* contains a selection of signal sources that are used to control the application selected (e.g. via terminals or fieldbus). For the commissioning of the CAN bus connection, the *Control source* must be selected with L-C00007 = 30 *CAN*.

Setpoint selection:

For the 8400 series, the setpoint is selected in rpm. In this way, the user can see the direct speed without having to convert the output frequency under consideration of the number of pole pairs in a complicated way. Code L-C00011 remains the reference value for the setpoint. The percent normalisation (L-C00127=1) known from the 8200vector has been used as a basis for the 8400 Inverter Drives. Here, 16384 = 100% as with the 93xx drives. This way of percent processing leads to a higher resolution of the output frequency which means decisive advantages for the drive performance.

Parameters:

In the 8400 inverter, general commands effective for a limited period of time are summarised in a central parameter (L-C00002). They are divided into subcodes and contain, for instance, the commands "Load Lenze settings", "Save all parameters on memory module" or "Start motor identification run".

The parameter normalisation factors used for the parameter data transfer have changed.
For the 8200vector, 10000 often has been used as normalisation factor so far. Now, the parameters are transferred in the required value range.

- %-values with two decimal positions are multiplied by 100,
- selection values (e.g. operating mode) and bit-selection values are multiplied by 1,
- time data is, depending on the number of decimal positions, multiplied by the power of ten.

For the individual normalisation factors, please see the parameter list.

Device control:

The device control for the 8400 Inverter Drives is based on the DSP-402 specification. This leads to a different bit assignment in the control and status word (see below). For drive control via a fieldbus system, bits 0 (switch-on) and 3 (enable operation) must be set. For enabling the drive, the control word date must be entered as "0009". Then, the drive is actively enabled via the fieldbus. With the 8200vector, the drive so far has been enabled with the control word date "0000".

Structure of control and status word - 8200vec

Control word (W0)	Name	Lenze function
Bit 0	NSET1-Jog1/3	Fixed frequency
Bit 1	NSET1-Jog2/3	Fixed frequency
Bit 2	DCTRL1-CW/CCW	Change current direction of rotation
Bit 3	FIF-CTRL1-QSP	Activate quick stop
Bit 4	NSET1-RFG1-Stop	Stop ramp function generator
Bit 5	NSET1-RFG1-0	Reset ramp function generator
Bit 6	MPOT1-Up	UP function of motor potentiometer
Bit 7	MPOT1-DOWN	DOWN function of motor potentiometer
Bit 8	reserved	
Bit 9	FIF-CTRL1-CINH	Set controller inhibit
Bit 10	FIF-CTRL1-Trip-Set	External fault
Bit 11	FIF-CTRL1-Trip-Reset	Fault reset
Bit 12	DCTRL1-Par 2/4	Parameter set changeover
Bit 13	DCTRL1-Par 3/4	Parameter set changeover
Bit 14	MCTRL1-DCB	Activate DC injection brake
Bit 15	reserved	

Status word (W0)	Name	Lenze function
Bit 0	DCTRL1-PAR-B0	Currently active parameter set
Bit 1	DCTRL1-IMP	Pulse inhibit active
Bit 2	MCTRL1-IMAX	Imax limit reached
Bit 3	DCTRL1-RFG1=NOUT	Output frequency = frequency setpoint
Bit 4	DCTRL1-RFG1-I=0	Ramp function generator input 1 = ramp function generator output 1
Bit 5	PCTRL1-QMIN	Frequency threshold (C0017) exceeded
Bit 6	DCTRL1-NOUT=0	Output frequency = 0
Bit 7	DCTRL1-CINH	Controller inhibit active
Bit 8	DCTRL1-STAT*1…-STAT*8	Device status bit1 (see below)
Bit 9	DCTRL1-STAT*1…-STAT*8	Device status bit2 (see below)
Bit 10	DCTRL1-STAT*1…-STAT*8	Device status bit3 (see below)
Bit 11	DCTRL1-STAT*1…-STAT*8	Device status bit4 (see below)
Bit 12	DCTRL1-OH-WARN	Overtemperature warning (ϑ_{max} -10°C)
Bit 13	DCTRL-OU	DC bus overvoltage
Bit 14	DCTRL-CCW	Direction of rotation
Bit 15	DCTRL-RDY	Ready for operation

Input words	Name	Normalisation
w 1	Setpoint 1	C0127 = 0: 24000 ≡ 480Hz (C0127 = 1: 2^{14} ≡ C0011)
w 2 -12		Pre-assignment for FIF module only

Output words	Name	Normalisation
w 1	Nout + Slip	
w 2 - 12		Pre-assignment for FIF module only

Structure of control and status word - 8400 Inverter Drives "Speed actuating drive"

Control word (W1)	Name	Lenze function
Bit 0	SwitchON	AND operation of wCANDriveControl_bit0 and wMCIDriveControl_bit0
Bit 1	Disable Voltage	TRUE: IMP pulse inhibit
Bit 2	SetQuickStop	TRUE: QSP quick stop
Bit 3	Enable Operation	TRUE: controller enable
Bit 4	ModeSpecific_1	Reserved, currently not assigned
Bit 5	ModeSpecific_2	Reserved, currently not assigned
Bit 6	ModeSpecific_3	Reserved, currently not assigned
Bit 7	Reset Fault	TRUE: TRIP reset
Bit 8	SetHalt	TRUE: activate stop function, RFG0 reset ramp function generator
Bit 9	reserved_1	-
Bit 10	reserved_2	-
Bit 11	LenzeSpecific_1	Depends on the application selected (for speed actuating drive: *bSetDCBreak*)
Bit 12	LenzeSpecific_2	Depends on the application selected (for speed actuating drive: *bJogSpeed1*)
Bit 13	LenzeSpecific_3	Depends on the application selected (for speed actuating drive: *bJogSpeed2*)
Bit 14	SetFail	TRUE: Error (Trip Set)
Bit 15	LenzeSpecific_4	Depends on the application selected (for speed actuating drive: *bSetSpeedCcw*)

Status word (W1)	Name	Lenze function
Bit 0	FreeStatusBit0	Not assigned, can be freely used
Bit 1	PowerDisabled_IMP	Inverter control is inhibited (IMP)
Bit 2	FreeStatusBit2	Not assigned, can be freely used
Bit 3	FreeStatusBit3	Not assigned, can be freely used
Bit 4	FreeStatusBit4	Not assigned, can be freely used
Bit 5	FreeStatusBit5	Not assigned, can be freely used
Bit 6	ActSpeedIsZero	Current speed < threshold of C00024
Bit 7	ControllerInhibit	Controller inhibit active
Bit 8	StatusCodeBit0	Device status: see below
Bit 9	StatusCodeBit1	
Bit 10	StatusCodeBit2	
Bit 11	StatusCodeBit3	
Bit 12	Warning	Drive indicates "Warning"
Bit 13	Trouble	Drive indicates "Trouble", e.g. if an overvoltage occurs
Bit 14	FreeStatusBit14	Not assigned, can be freely used
Bit 15	FreeStatusBit15	Not assigned, can be freely used

Input words	Name	Normalisation
W 2	MainSetValue	16384 (2^{14}) ≡ 100% (ref. to L-C00011)

Output words	Name	Normalisation
W 2	MotorSpeedAct	16384 (2^{14}) ≡ 100% (ref. to L-C00011)

Direct comparison of control and status words

Control word	8400	8200vector
Bit 0	SwitchON	NSET1-Jog1/3
Bit 1	Disable Voltage	NSET1-Jog2/3
Bit 2	SetQuickStop	DCTRL1-CW/CCW
Bit 3	Enable Operation	FIF-CTRL1-QSP
Bit 4	ModeSpicific_1	NSET1-RFG1-Stop
Bit 5	ModeSpicific_2	NSET1-RFG1-0
Bit 6	ModeSpicific_3	MPOT1-Up
Bit 7	Reset Fault	MPOT1-DOWN
Bit 8	SetHalt	reserved
Bit 9	reserved_1	FIF-CTRL1-CINH
Bit 10	reserved_2	FIF-CTRL1-Trip-Set
Bit 11	LenzeSpecific_1	FIF-CTRL1-Trip-Reset
Bit 12	LenzeSpecific_2	DCTRL1-Par 2/4
Bit 13	LenzeSpecific_3	DCTRL1-Par 3/4
Bit 14	SetFail	MCTRL1-DCB
Bit 15	LenzeSpecific_4	reserved

Status word	8400	8200vector
Bit 0	FreeStatusBit0	DCTRL1-PAR-B0
Bit 1	PowerDisabled_IMP	DCTRL1-IMP
Bit 2	FreeStatusBit2	MCTRL1-IMAX
Bit 3	FreeStatusBit3	DCTRL1-RFG1=NOUT
Bit 4	FreeStatusBit4	DCTRL1-RFG1-I=0
Bit 5	FreeStatusBit5	PCTRL1-QMIN
Bit 6	ActSpeedIsZero	DCTRL1-NOUT=0
Bit 7	ControllerInhibit	DCTRL1-CINH
Bit 8	StatusCodeBit0	DCTRL1-STAT*1…-STAT*8
Bit 9	StatusCodeBit1	DCTRL1-STAT*1…-STAT*8
Bit 10	StatusCodeBit2	DCTRL1-STAT*1…-STAT*8
Bit 11	StatusCodeBit3	DCTRL1-STAT*1…-STAT*8
Bit 12	Warning	DCTRL1-OH-WARN
Bit 13	Trouble	DCTRL-OU
Bit 14	FreeStatusBit14	DCTRL-CCW
Bit 15	FreeStatusBit15	DCTRL-RDY

Device states corresponding to the status bits

Device status (DCTRL1-Stat*1...-Stat*8)

11	10	9	8	
0	0	0	0	Controller initialisation
0	0	1	0	Switch-on inhibit
0	0	1	1	Operation inhibited
0	1	0	0	Flying-restart circuit active
0	1	0	1	DC-injection brake active
0	1	1	0	Operation enabled
0	1	1	1	Message active
1	0	0	0	Fault active
1	1	1	1	No communication with basic device possible

8200vec device status bits

State priority	State designation	ID	Status bits				Meaning
			Bit 11	Bit 10	Bit 9	Bit 8	
Prio 11	SystemFail	11	1	0	1	1	System fault is active
Prio 10	SafeTorqueOff	10	1	0	1	0	Safe torque off is active
Prio 5	TroubleQSP	9	1	0	0	1	TroubleQSP is active
Prio 6	Fault	8	1	0	0	0	Fault is active
Prio 7	Trouble	7	0	1	1	1	Trouble is active
-	Warning	6	0	1	1	0	Warning / warning locked is active
Prio 4	OperationEnabled	5	0	1	0	1	Operation
Prio 8	SwitchedON	4	0	1	0	0	Device is switched on
Prio 9	ReadyToSwitchON	3	0	0	1	1	Device is ready to switch on
-	MotorIdent	2	0	0	1	0	Motor parameter identification is active
-	Init	1	0	0	0	1	Initialisation is active
-	FirmwareUpdate	0	0	0	0	0	Firmware download function is active

8400 device status bits