Lenze Frequency Inverter

8200 vector

User Information

Item # 608 655 87
Rev. 1.02

December 2003 / Printed in Germany

This document is to be used together with the appurtenant safety instructions.

Apart from this document, the manuals, installation instructions and other documentation published by Lenze GmbH & Co KG for the products described herein have to be followed.

Jetter AG reserves the right to make alterations to its products in the interest of technical progress. These alterations need not be documented in every single case.

This manual and the information contained herein have been compiled with due diligence. However, Jetter AG assumes no liability for printing or other errors, as well as for damages arising from such errors.

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History

Revision 1.00	First edition
Revision 1.01	I/O sum has been corrected
Revision 1.02	Chapter "Combination of Modules" has been removed.
	Chapter "Calculating the I/O Sum" has been removed.

1 Introduction

1.1 About this Manual

This user information ...

- gives a description on how to connect and commission frequency inverters of Lenze GmbH & Co KG connected to the Jetter AG system bus.
- is to be used along with the manuals on the used frequency inverter and Fieldbus function module published by Lenze GmbH & Co KG.

1.2 Product Description

Frequency Inverter 8200 Vector

The frequency inverter 8200 vector produced by Lenze GmbH & Co KG is used to achieve electronic speed variation of AC motors. The combination of a frequency inverter and a Lenze brand gearbox motor or AC motor results in a variable speed drive with excellent drive characteristics.
Additional features, such as compact design and high functionality, make the frequency inverter 8200 vector the ideal solution for nearly all applications, e.g. in the field of air conditioning or materials-handling technology, as well as industrial automation.

Fieldbus Function Module 2175

The Fieldbus Function Module 2175 is a component designed for the frequency inverter model 8200 vector. It is for connecting drive controllers directly to the Jetter brand system bus. The Fieldbus Function Module provides transparent access to process data contained in the drive controller directly from within the application program.
The Fieldbus Function Module 2175 is plugged onto the frequency inverter 8200 vector.

Software Tool "Global Device Control"

For configuring the frequency controller, the software tool "Global Device Control" developed by Lenze GmbH & Co KG is required. For communication between PC and the Fieldbus Function Module 2175, you will need a special adapter cable produced by Lenze GmbH & Co KG and referred to as EMF2173XXXX.

Note

When configuring the frequency inverter via "Global Device Control" there must be **no** connection between the Fieldbus Function Module 2175 and the Jetter controller.

1.3 System Requirements

Frequency inverters 8200 vector with plugged on Fieldbus Function Module 2175 can directly be connected to the Jetter system bus. Jetter brand JX2-I/O modules, JX2-Slave expansion modules and Smart I/O JX-SIO connected to the system bus can also be operated simultaneously.
The following table shows the minimum required software versions supporting operation of frequency inverters on the Jetter System Bus.

Software Versions of Controllers	
Controller	**Minimum Software Version**
JX6-SB / JX6-SB-I	V 2.10
JetControl JC24X	V 3.10
Nano-B	V 3.50
Nano-C	V 3.50
Nano-D	V 2.02

1.4 Technical Data

The following technical data have to be taken into account when connecting a frequency inverter to the system bus.

Technical Data	
Maximum number of frequency inverters connected to the system bus The maximum number of frequency inverters is limited by the maximum allowable I/O sum for the corresponding controller.	10
Number of I/Os	Nano-B / Nano-C / Nano-D 8 JC 24X/ JX6-SB / JX6-SB-I 16
Supported Fieldbus Function Modules	Type 2175, SW Version 1.0
Supported basic devices For the exact type designation of the supported basic devices please refer to the operator's manual of the Fieldbus function module.	8201 – 8204 8211 – 8218 8221 – 8227 8241 – 8246 8200 vector 8200 vector, Cold plate

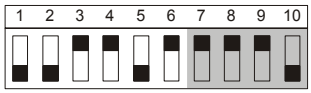
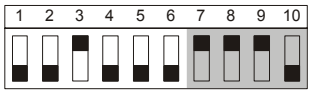
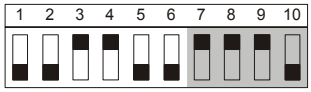
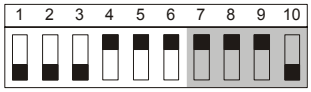
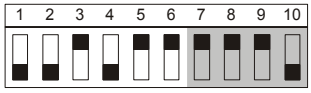
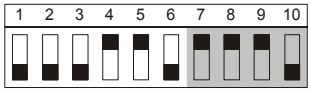
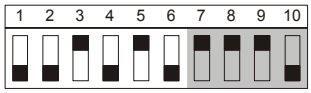
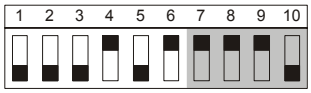
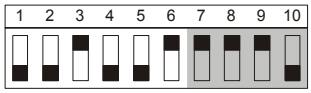
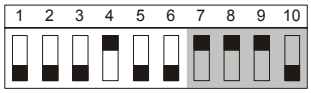
2 Installation

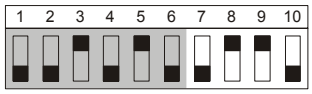
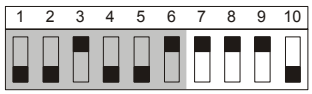
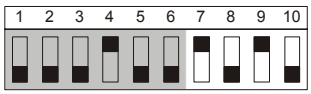
2.1 DIP Switch Settings

The DIP switch of the Fieldbus function module 2175 is for setting the address, baud rate and bus system. Through the address of the Fieldbus function module 2175 an I/O module number is assigned to the frequency inverter.

Note

The addresses actually set on the Fieldbus function module 2175 correspond to the values 50 through 59. During commissioning, these values are readdressed to the module numbers 70 through 79 by the Jetter controller.

Setting Address Numbers via S1 … S6			
Module #	**S1 ... S6**	**Module #**	**S1 ... S6**
70		75	
71		76	
72		77	
73		78	
74		79	

Setting Baud Rates and Bus System via S7 … S10			
Baud	**S7 ... S10**	**Baud**	**S7 ... S10**
1000k		250k	
500k		125k	

2.2 Connection to the System Bus

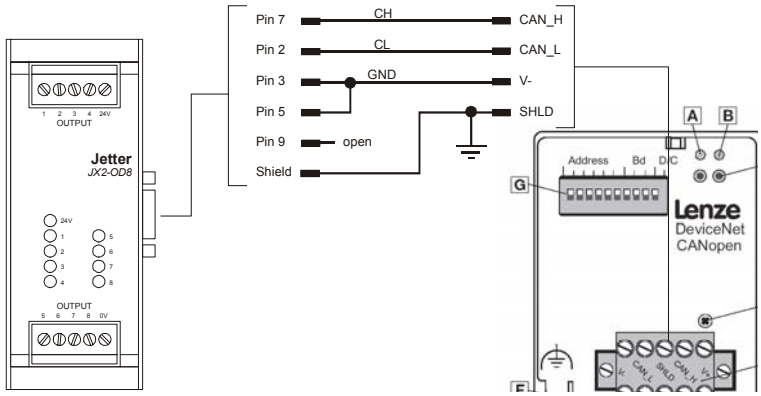


Fig. 1: Connecting the frequency inverter to the end of the system bus

The frequency inverter can be connected to the end of the system bus, or directly connected to a Jetter controller. When doing so, make sure that pin 3 is connected to pin 5 of the female connector X19 of the last JX2-I/O or JX2-Slave module.
On the frequency inverter which is connected to system bus last, a 120 Ω / 0.25 W resistor must be connected between the terminals CAN_H and CAN_L. A shielded cable is to be used to connect the frequency inverter.

The shield of the system bus line is to be connected to the pin "SHLD" of the frequency inverter. Additional shielding is not necessarily required.

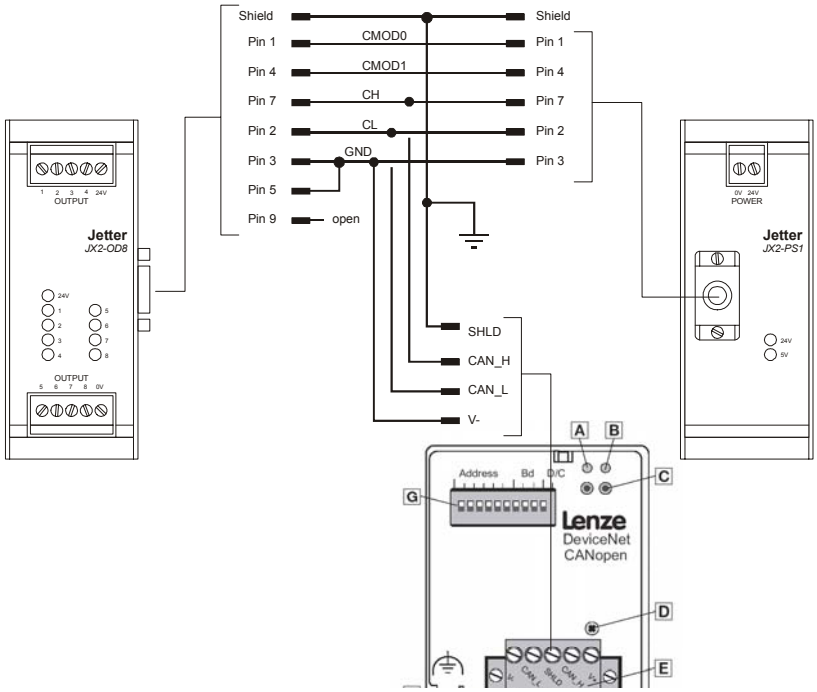


Fig. 2: Connecting the frequency inverter via tap line

When connecting the frequency inverter via tap line, jack X19 on the JX2-I/O or JX2-Slave module and connector X18 on the JX2-PS1 module have to be connected as shown above.
As tap line leading to the frequency inverter a shielded cable is to be used. Make sure not to exceed the maximum tap line length.

A tap line represents an open end of the system bus line. To reduce noise injection by the open end of the line, only one frequency inverter must be connected to each tap line.

The shield of the system bus line is to be connected to the pin "SHLD" of the frequency inverter. Additional shielding is not necessarily required.

2.3 System Bus - Baud Rate

The system bus of Jetter AG can be operated at baud rates between 125 kBaud and 1 MBaud. Generally, the max. permissible line length of the system bus becomes shorter with increasing baud rate. At the same time, however, the data transmission speed on the system bus increases with increasing baud rate. Whether the system bus is operated with max. data transmission speed or with long line length must be decided individually depending on the application.
The permissible baud rates of the system bus also depend on the modules connected to it.

Permissible Baud Rates					
JX2-I/O Modules **JX2-Slave Modules**	**Fieldbus Module 2175**	**125 kBaud**	**250 kBaud**	**500 kBaud**	**1000 kBaud**
✓		✓	✓	✓	✓
	✓	✓	✓	✓	✓
✓	✓	✓			✓

2.4 System Bus Cable

The following minimum requirements apply to the manufacture of the system bus cable:

System Bus Cable - Technical Data		
Core cross-sectional area	1 MBaud	0.25 – 0.34 mm^2
	500 kBaud	0.34 – 0.50 mm^2
	250 kBaud	0.34 – 0.60 mm^2
	125 kBaud	0.50 – 0.60 mm^2
Cable capacitance per unit length	Maximum 60 pF / m	
Resistivity	1 MBaud	maximum 70 Ω / km
	500 kBaud	maximum 60 Ω / km
	250 kBaud	maximum 60 Ω / km
	125 kBaud	maximum 60 Ω / km
Number of cores	5	
Shield	Complete shielding, no paired shielding	

The maximum cable length depends on the baud rate used and on the number of modules connected to the bus. The following rule of thumb applies to the system bus cable: Each JX2-I/O module connected to the bus reduces the maximum cable length by approx. 1 m.

Allowed Line Lengths			
Baud Rate	**Max. line length**	**Max. tap line length**	**Max. overall tap line length**
1000 kBaud	30 m	0.3 m	3 m
500 kBaud	100 m	1 m	39 m
250 kBaud	200 m	3 m	78 m
125 kBaud	200 m	-	-

The potential difference between the controller and all expansion modules must not exceed 0.5 Volt. A constant ground potential must always be guaranteed.

If there are long lines between two modules on the system bus, the line shield must be connected with functional earth (FE) approximately every 10 m because of EMI precautions. This connection should be laid out with the greatest possible surface area.

3 CANopen Services

The CANopen services referred to in this chapter are the sole responsibility of the relevant Jetter controller. Data that are transferred between frequency inverter and Jetter controller according to CANopen standard can directly be accessed via registers.

Network Management

After power-up, the Jetter controller automatically starts frequency inverters connected to it. When doing so, the frequency inverter is put into the state "operational".
The system bus module JX6-SB will commission expansion modules connected to it only after a command has been issued.

Node Guarding Protocol

Jetter controllers monitor the connection to a frequency inverter in regular time intervals which can be set by the user (Node Guarding Protocol). If the controller does not receive a response from the frequency inverter, the controller issues a timeout error message. In addition to this, during Node Guarding the controller checks whether the frequency inverter is in "operational" state. If this is not the case, a timeout error message is issued, too. In both cases no exchange of process data between controller and frequency inverter will take place.

Parameter Data Channel

The code places of the frequency inverter cannot be accessed by the Jetter controller via parameter data channel.

Process Data Channel

The Jetter controller stores data of the process data channel to registers. Thus, the user has direct access to all data transferred via process data telegram.
During commissioning of the frequency inverter, the Jetter controller sets the Lenze code place L-C0001 to "3", thus defining the process data channel as setpoint source.

Process Data Synchronization

In adjustable time intervals, the Jetter controller broadcasts a SYNC telegram to all connected frequency inverters.

4 Software and Programming

4.1 Register Areas

Register Areas of Lenze Frequency Inverters		
Register Area	**Description**	**Remanent registers**
5x60 – 5x63	Process data from the frequency inverter	-
6x60 – 6x63	Process data to the frequency inverter	-
7x09, 7x29 7x90 – 7x99	Diagnostics and adminstration registers	-

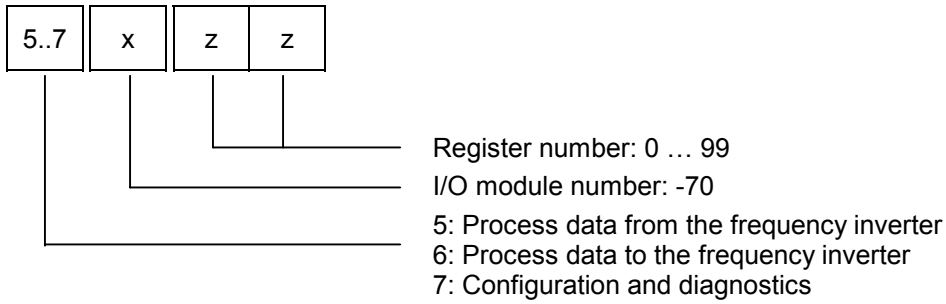
4.2 Register Addressing

Process data can be pulled from the frequency inverter or pushed to it via registers. The process data are assigned to certain register numbers depending on the address set at the Fieldbus Function Module 2175.

The programming language JetSym allows direct access to registers.

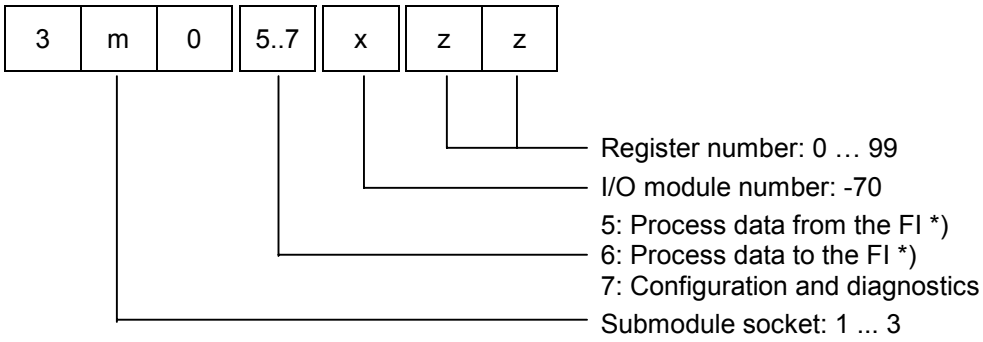
Coding of register numbers with NANO and JC 24X controllers

Register numbers with NANO and JC 24X controllers consist of a four-digit number. The register number is made up of the I/O module number and the respective register number:



Coding of register numbers with JX6-SB / JX6-SB-I modules

JX6-SB register numbers consist of a seven-digit number. The register number is made up of the socket number, I/O module number and the respective register number:
Throughout this document the four-digit register number for NANO, or JetControl 24X controllers is used. For applications with a JX6-SB / JX6-SB-I module, the number has to be preceded by the prefix "3m0".



*) FI = Frequency Inverter

4.3 Description of Registers

4.3.1 Status Word and Control Word

Register 5x60: Status Word of the Frequency Inverter	
Function	**Description**
Read	**Lenze code place L-C0150** Present status word from the frequency inverter
Write	Illegal
Value range	0 ... 65535
Value after reset	Present state

Register 6x60: Control Word of the Frequency Inverter	
Function	**Description**
Read	**Lenze code place L-C0135** Present control word from the frequency inverter
Write	New control word to the frequency inverter
Value range	0 ... 65535
Value after reset	0

4.3.2 Setpoint Value and Actual Value

Register 5x61: Actual Value of the Frequency Inverter	
Function	**Description**
Read	**Lenze code place L-C0050** Present actual value from the frequency inverter
Write	Illegal
Value range	-32768 ... 32767
Value after reset	Present actual value

Register 6x61: Setpoint Value of the Frequency Inverter	
Function	**Description**
Read	**Lenze code place L-C0046** Present setpoint value from the frequency inverter
Write	New setpoint value to the frequency inverter
Value range	-32768 ... 32767
Value after reset	0

Register 7x09: Value Range of Actual Value	
Function	**Description**
Read	Present value range
Write	New value range. This register is bit-oriented. Bit 1: 0 = Actual value LC-0050 0 ... 65535 1 = Actual value LC-0050 –32768 ... +32767
Value range	0 – 4095
Value after reset	2

Register 7x29: Value Range of Setpoint Value	
Function	**Description**
Read	Present value range
Write	New value range. This register is bit-oriented. Bit 1: 0 = Setpoint value LC-0046 0 ... 65535 1 = Setpoint value LC-0046 –32768 ... +32767
Value range	0 – 4095
Value after reset	2

Notation with or without sign is allowed for setpoint and actual values. Thus, the value range 0 … 65535 (without sign) can be converted to –32768 … +32767 (with sign).

4.3.3 Diagnostics and Adminstration

The controllers produced by Jetter AG offer a host of registers designed for system bus administration and diagnostics. A detailed description of these registers is given in the documentation belonging to the corresponding controller.
In general, Lenze frequency inverters are treated as Jetter brand Smart I/O JX-SIO modules.

Overview over System Bus Administration and Diagnostic Registers	
Register	**Description**
2008	System Bus Status
2011	I/O-Module Timeout
2012	Timeout of JX2-Slave Module
2013	Amount of I/O modules
2014	Amount of JX2-Slave Modules
2015	Index to Module Array
2016	Module array 2015 = 0 -> 2016 = Amount of modules 2015 = 1 -> 2016 = Code of the first module 2015 = 2 -> 2016 = Code of the second module **Code:** 70 Lenze Frequency Inverter 8200 Vector
2029	System Bus Baud Rate
2070	Amount of JX-SIO modules
2071	Present I/O Size on the System Bus

Register 7x90: Error Register	
Function	**Description**
Read	Present value of the fault register
Write	Illegal
Value range	0 – 255
Value after reset	0 in faultless condition

Meaning of the error register bits

`Bit 0` : Error present

Register 7x92: Index to Error Array	
Function	**Description**
Read	Present index
Write	New index
Value range	0 – 1
Value after reset	0

Register 7x93: Error Array	
Function	**Description**
Read	7x92 = 0 -> 7x93 = Number of entries in the error array 7x92 = 1 -> 7x93 = Newest error
Write	Illegal
Value range	32 bits, bit-oriented
Value after reset	Number of entries in the error array

Meaning of the error array bits

`Bit 0..7` : Error register

`Bit 16..31` : Emergency code

Register 7x97: Serial Number	
Function	**Description**
Read	Serial number
Write	Illegal
Value range	32 bits
Value after reset	Serial number

Register 7x99: Software Version	
Function	**Description**
Read	Software version
Write	Illegal
Value range	24 bits or 32 bits
Value after reset	Software version

From this register the firmware version number of the frequency inverter can be read out. The value that has been read equals the product of the version number times a hundred. Thus, value 100, for example, refers to version 1.00.

4.4 Monitoring Interval

Monitoring telegrams are periodically exchanged between controller and frequency inverter via system bus. By doing so, the control system can detect whether the connection to the module is interrupted. In case of an interruption, register 2008 bit 4 “Timeout of IO Module” is set and the number of the relevant module is entered into register 2011. Connection to the faulty module can be re-established only after a restart of the control system.

Register 2028: Monitoring Interval for I/O Modules	
Function	**Description**
Read	Monitoring interval for I/O modules in 10 ms increments
Write	New monitoring interval
Value range	0 – 255
Value after reset	20

The interval between two monitoring telegrams can be set in register 2028.

Register 7x98: Monitoring Interval of the Frequency Inverter	
Function	**Description**
Read	Present monitoring interval of the frequency inverter in 100 ms increments
Write	New monitoring interval of the frequency inverter 0 : Disabling the monitoring function
Value range	0 – 255
Value after reset	20 (2000 ms)

4.5 Process Data Synchronization

Register 2074: Sync Telegram Interval	
Function	**Description**
Read	Present interval in 1 ms steps
Write	New interval
Value range	0 – 255
Value after reset	25

The Jetter controller broadcasts a SYNC telegram to all connected frequency inverters in adjustable time intervals.

5 Diagnostic Indicators (LEDs)

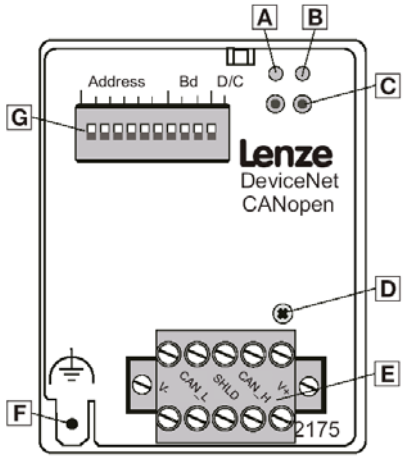
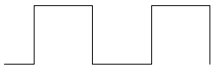
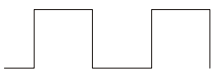


Fig. 3: Fieldbus Function Module 2175 – Front View

Diagnostic LEDs of the Fieldbus Function Module			
LED	**Signal Sequence**	**Color**	**Meaning**
A ○		off	The Fieldbus module 2175 is not supplied with power
A ✸		green; flashing	The Fieldbus module 2175 is supplied with power, but there is no connection to the frequency inverter 8200 vector.
A ●		green; lit	The Fieldbus module 2175 is supplied with power, and is connected to the frequency inverter 8200 vector.
B ○		off	No communication with the Fieldbus module 2175 The Fieldbus module 2175 is not supplied with power
B ✸		green; flashing	The Fieldbus module 2175 has been commissioned by the Jetter controller
B ●		red; lit	Internal error of the Fieldbus module 2175
C			Operating condition indicators of the frequency inverter 8200 vector

A. Index of Illustrations

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