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EDS9300U--REG
00398817

Manual

Global Drive

9300 Planning

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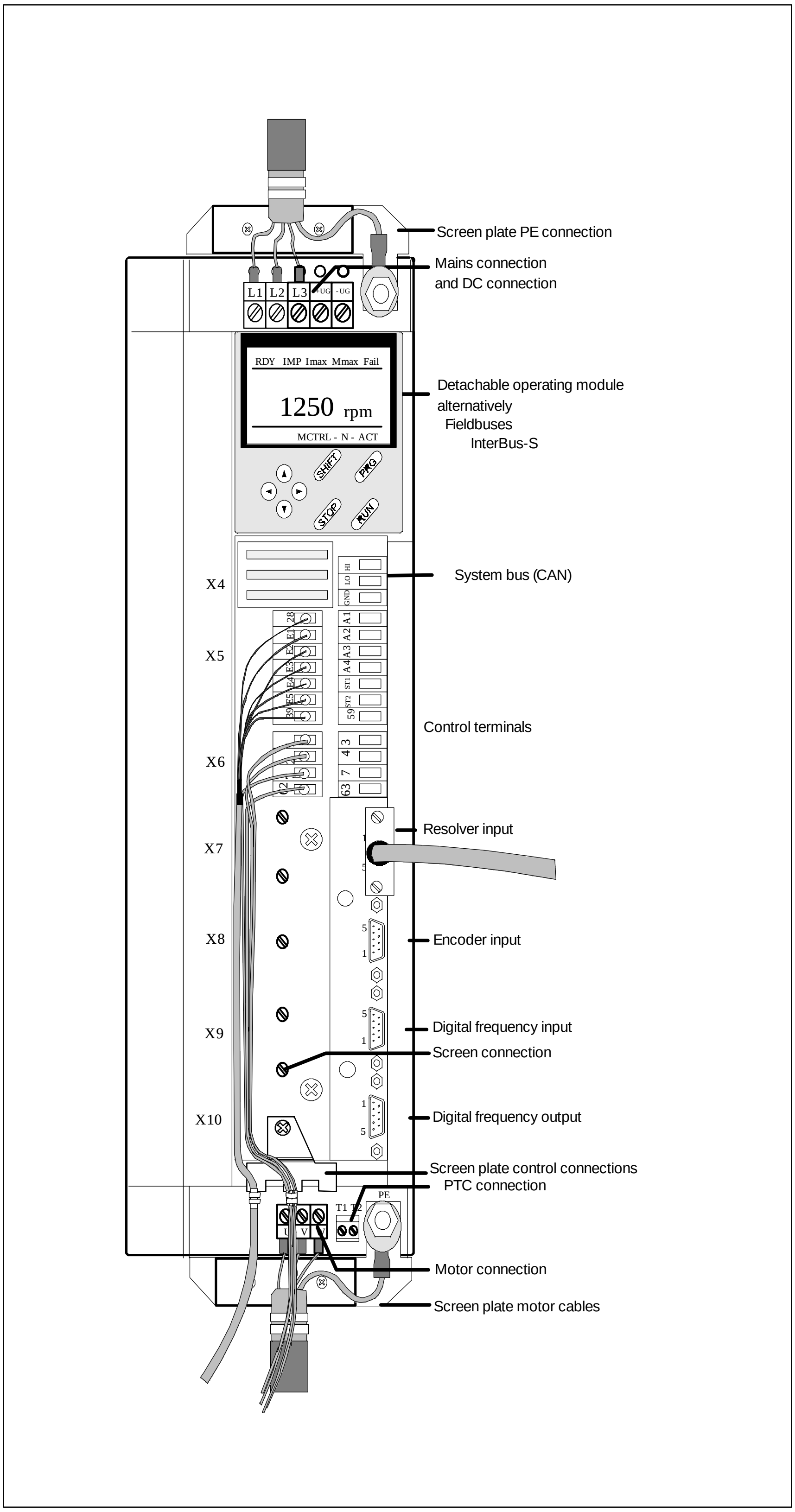
Contents of the 9300 Manual				
Part	Contents	Planning	Servo inverters	Servo position controller
A	Table of contents Preface and general information	●	●	●
	Safety information	●		
B	Technical data	●	●	●
	Installation			
C	Commissioning During operation		●	●
D	Configuration		D1.1	D2.1
	Code table		D1.2	D2.2
E	Troubleshooting and fault elimination Maintenance		●	●
F	Network of several drives	●		
	- Operating Instructions Supply and feedback modules 9340	●		
G	Application of brake units - Operating Instructions brake unit 9350	●		
H	Automation - Automation with system bus (CAN)	●		
	- Operating Instructions fieldbus module 2102 (RS232/RS485)	●		
	- Operating Instructions fieldbus module 2111 (InterBus)	●		
	- Operating Instructions fieldbus module 2131 (PROFIBUS)	●		
	- Flyer PC-software Global Drive Control	●		
I	Accessories and motors	●		
K	Help for selection	●		
	Application examples		●	●
L	Signal-flow charts		●	●
M	Glossary Table of keywords	●	●	●

Drawing explanation: ● is included in the corresponding Manual

All documentation mentioned are designated by a type code and a material number (top left corner of cover page).
Part M provides a complete list of these designations.

The features, data and versions indicated in this Manual met the state of the art at the time of printing.
(Printing date: inner cover pages of the parts).
In the event of deviations, please see the Operating Instructions or contact Lenze.


Screen plate PE connection
Mains connection
and DC connection
L1 L2 L3 +UG -UG
RDY IMP Imax Mmax Fail
1250 rpm
MCTRL - N - ACT
SHIFT
PRG
STOP
RUN
Detachable operating module
alternatively
Fieldbuses
InterBus-S
X4
System bus (CAN)
X5
Control terminals
X6
X7
Resolver input
X8
Encoder input
X9
Digital frequency input
Screen connection
X10
Digital frequency output
Screen plate control connections
PTC connection
PE
T1 T2
U V W
Motor connection
Screen plate motor cables

Contents

Contents

Contents

1 Preface and general information

1.1 How to use these Operating Instructions

- The present Operating Instructions are used for operations concerning safety measures on and with the 93XX servo position controllers resp. 93XX servo inverters .They contain safety information which must be observed.
- All persons working on and with the 93XX position controllers must have the Operating Instructions available and must observe the information and notes relevant for their work.
- The Operating Instructions must always be in a complete and perfectly readable state.

1.1.1 Terminology used

Controller

For ”93XX servo positioning controller” resp. “93XX servo inverters” the term ”controller” will be used in the following.

Drive system

For drive systems with 93XX servo position controllers resp. 93XX servo inverters and other Lenze drive components, the term ”drive system” is used in the following text.

1.2 Scope of supply

- The scope of supply includes:
  - 1 servo position controller 93XX or 1 servo inverters 93XX
  - 1 book of Operating Instructions
  - 1 accessory kit with plug-in terminals, screen plates, fixing material, bus terminator for system bus (CAN), dust protection covers
- After reception of the delivery, check immediately whether the scope of supply matches with the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently. Claim
  - visible transport damage immediately to the forwarder.
  - visible deficiencies/incompleteness immediately to your Lenze representative.

1.3 The 93XX controller

1.3.1 Labelling

- Lenze controllers are unambiguously designated by the contents of the nameplate.
- CE mark
  - Conformity to the EC Low Voltage Directive
  - Conformity to the EC Directive ”Electromagnetic Compatibility”
- Manufacturer:
  - Lenze GmbH & Co KG
    Postfach 101352
    D-31763 Hameln

1.3.2 Application as directed

- Operate the controller only under the conditions prescribed in this Manual.

Controllers of the 93XX series

- are components
  - for open- and closed-loop control of variable speed drives with PM synchronous motors, asynchronous servo motors or asynchronous standard motors.
  - for installation in a machine
  - for assembly with other components to form a machine.
- are electrical equipment for installation into control cabinets or similar closed operating rooms.
- meet the protection requirements of the EC Low Voltage Directive.
- are not machinery in the sense of the EC Machinery Directive.
- are not household appliances but are intended exclusively as components for further commercial use.

Drive systems with controllers of the 93XX series

- correspond to the EC Electromagnetic Compatibility Directive if they are installed according to the guidelines of CE-typical drive systems.
- can be operated
  - on public and non-public mains.
  - in industrial as well as residential and commercial premises.
- The compliance with the EC Directive of the machine application is in the responsibility of the user.

Any other use shall be deemed inappropriate!

1.3.3 Legal regulations

Liability

- The information, data, and notes in the Manual met the state of the art at the time of printing. Claims referring to drive systems which have already been supplied cannot be derived from the information, illustrations, and descriptions.
- The specifications, processes, and circuitry described in this Manual are for guidance only and must be adapted to your own specific application. Lenze does not guarantee the suitability of the processes and circuitry described.
- The specifications in this Manual describe the product features without guaranteeing them.
- Lenze does not accept any liability for damage and operating interference caused by:
  - Disregarding this Manual
  - Unauthorized modifications to the controller
  - Operating mistakes
  - Improper working on and with the controller

Warranty

- Terms of warranty: see terms of sales and delivery of Lenze GmbH & Co KG.
- Warranty claims must be made to Lenze immediately after detecting the deficiency or fault.
- The warranty is void in all cases where liability claims cannot be made.

Waste disposal

The controller consists of different materials.

The following table indicates which materials can be recycled and which must be separately disposed:

Material	recycle	dispose
Metal	●	-
Plastic	●	-
Assembled PCBs	-	●

1.4 EC Directives/Declaration of Conformity

1.4.1 What is the purpose of EC directives?

EC directives are issued by the European Council and are intended for the determination of common technical requirements (harmonization) and certification procedures within the European Community. At the moment, there are 21 EC directives of product ranges. The directives are or will be converted to national laws of the member states. A certification issued by one member state is valid automatically without any further approval in all other member states.

The texts of the directive are restricted to the essential requirements. Technical details are or will be determined by European harmonized standards.

1.4.2 What does the CE mark imply?

After a verification, the conformity according to the EC directives is certified by affixing a CE mark. Within the EC there are no commercial barriers for a product with the CE mark.

Controllers with the CE mark exclusively correspond to the Low Voltage Directive. For the compliance with the EMC Directive, recommendations are given.

1.4.3 EC Low Voltage Directive

(73/23/EEC)

amended by: CE Mark Directive (93/68/EEC)

General

- The Low-Voltage Directive is effective for all electrical equipment for use with a rated voltage between 50 V and 1000 V AC and between 75 V and 1500 V DC and with normal ambient conditions. The use of e.g. electrical equipment in explosive atmospheres and electrical parts in passenger and goods lifts are excepted.
- The objective of the Low-Voltage Directive is to ensure that only electrical equipment which does not endanger the safety of persons or animals is placed on the market. It should also be designed to conserve material assets.

EC Declaration of Conformity '96

in the sense of the EC Low Voltage Directive (73/23/EWG)

amended by: CE Mark Directive (93/68/EEC)

The 93XX controllers are developed, designed, and manufactured in compliance with the above mentioned EC directive under the sole responsibility of

Lenze GmbH & Co KG, Postfach 10 13 52, D-31763 Hameln

The compliance with the protective requirements of the above mentioned EC directive was confirmed by the award of the VDE label by:
VDE Prüf- und Zertifizierungsinstitut, Offenbach

Considered standards:

Standard	
DIN VDE 0160 5.88 + A1 / 4.89 + A2 / 10.88 prDIN EN 50178 Classification VDE 0160 / 11.94	Electronic equipment for use in electrical power installations
DIN VDE 0100	Standards for the erection of power installations
EN 60529	IP Degrees of protection
IEC 249 / 1 10/86, IEC 249 / 2-15 / 12/89	Base material for printed circuits
IEC 326 / 1 10/90, EN 60097 / 9.93	Printed circuits, printed boards
DIN VDE 0110 /1-2 /1/89 /20/ 8/90	Creepage distances and clearances

Hameln, 01 November,1997

(i. V. Langner)
Product Manager

(i. V. Lackhove)
Project Manager

1.4.4 EC Directive Electromagnetic Compatibility

(89/336/EEC)

amended by:	1. Amendment Directive (92/31/EEC)
	CE Mark Directive (93/68/EEC)

General

- The EC Electromagnetic Compatibility Directive is effective for ”devices” which may cause electromagnetic interference or the operation of which may be impaired by such interference.
- The aim is to limit the generation of electromagnetic interference such that an operation without interferences of radio and telecommunication systems and other equipment is possible.The devices must also show an appropriate resistance against electromagnetic interference to ensure the application as directed.
- Controllers cannot be operated on their own. Controllers cannot be evaluated on their own in terms of EMC. Only after the integration of the controllers into a drive system, can this system be tested concerning the objectives of the EC EMC Directive and the compliance with the ”Law about the Electromagnetic Compatibility of Devices”.

Preface and general information

Components of the CE typical drive system

System component	Specification
Controller	Controller types 93XX series For type designation see first cover page
Mains filter A/B	For data and filter assignment see chapter "Ratings"
Motor cable	Screened power cable with tinned E-CU braid with a minimum of 85 % optical coverage.
Mains cable between mains filter and controller	As from 300 mm cable length: Screened power cable with tinned E-CU braid with a minimum of 85 % optical coverage.
Control cables	Screened signal cable type LIYCY
Motor	Standard three-phase asynchronous motor, servo synchronous motor, servo asynchronous motor Lenze types DXRA, MDXKX or similar

- Controller and mains filter are located on a common mounting plate.

Application as directed/Scope of application

- The controller of type 93XX are designed for the use in control cabinets.
- The controllers of type 93XX are intended for the control of variable speed drives with three-phase asynchronous and synchronous motors for the installation of drive systems. The drive systems are intended for the installation into a machine or for the construction to form a machine or a plant together with other components.
- Drive systems with the 93XX controllers which are installed according to the guidelines of CE-typical drive systems, correspond to the EC Machinery Directive and the standards mentioned below.
- The CE-typical drive systems are suitable for the operation on public and non-public mains
- The CE typical drive systems are provided for the operation in industrial premises as well as for residential and commercial areas.
- Because of the earth potential reference of the mains filters, the CE-typical drive system described is not suitable for connection to IT-mains (mains without earth potential reference).
- The controllers are no domestic appliances, but they are intended as a part of drive systems for commercial use.

Generic standards:

Generic standard	
EN 50081-1 /92	Generic standard for the emission of noise Part 1: Residential area, commercial premises, and small businesses
EN 50081-2 /93 (used in addition to the requirements of IEC 22G)	Generic standard for the emission of noise Part 2: Industrial premises The emission of noise in industrial premises is not limited in IEC 22G.
prEN 50082-2 3/94	Generic standard for noise immunity Part 2: Industrial premises The requirements of noise immunity for residential areas were not considered, since these are less strict.

Basic standards for the emission of noise:

Basic standard	Test	Limit value
EN 55022 7/92	Radio interference housing and mains Frequency range 0.15 - 1000 MHz	Class B for use in residential areas and commercial premises
EN 55011 7/92 (used in addition to the requirements of IEC 22G)	Radio interference housing and mains Frequency range 0.15 - 1000 MHz The emission of noise in industrial premises is not limited in IEC 22G.	Class A for use in industrial premises
IEC 801-2 /91	Electrostatic discharge on housing and heatsink	Severity 3 6 kV for contact, 8 kV clearance
IEC 1000-4-3	Electromagnetic fields Frequency range 26 - 1000 MHz	Severity 3 10 V/m
ENV 50140 /93	High-frequency field Frequency range 80 - 1000 MHz, 80 % amplitude modulated	Severity 3 10 V/m
	Fixed frequency 900 MHz with 200 Hz, 100 % modulated	10 V/m
IEC 801-4 /88	Fast transients, burst on power terminals	Severity 4 4 kV / 2.5 kHz
	Burst on bus and control cables	Severity 4 2 kV / 5 kHz

1.4.5 EC Machinery Directive

(89/392/EEC)

amended by: 1st Amendment Directive (91/368/EEC)

2nd Amendment Directive (93/44/EEC)

CE Mark Directive (93/68/EEC)

General

For the purpose of the Machinery Directive, ”machinery” means an assembly of linked parts or components, at least one of which moves, with the appropriate actuators, control and power circuits, etc., joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material.

EC Manufacturer's Declaration

in the sense of the EC Machinery Directive (89/392/EWG)

amended by:	1st Amendment Directive (91/368/EWG)
	2nd Amendment Directive (93/44/EWG)
	CE Mark Directive (93/68/EWG)

The 93XX controllers are developed, designed, and manufactured under the sole responsibility of

Lenze GmbH & Co KG, Postfach 10 13 52, D-31763 Hameln

Commissioning of the controllers type 93XX is prohibited until it is proven that the machine where they are to be installed, corresponds to the EC Machinery Directive.

Hameln, 01 November,1997

(i. V. Langner)	(i. V. Lackhove)
Product Manager	Project Manager

2 Safety information

Safety and application notes for drive controllers

(according to: Low Voltage Directive 73/23/EWG)

1. General

During operation, drive controllers may have, according to their type of protection, live, bare, in some cases also movable or rotating parts as well as hot surfaces.
Non-authorized removal of the required cover, inappropriate use, or incorrect installation or operation, creates the risk of severe personal injury or damage to material assets.
Further information can be obtained from the documentation.
All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and national regulations for the prevention of accidents must be observed).
Qualified skilled personnel according to this basic safety information are persons who are familiar with the erection, assembly, commissiong, and operation of the product and who have the qualifications necessary for their occupation.

2. Application as directed

Drive controllers are components which are designed for installation to electrical systems or machinery.
When installing to machines, commissioning of the drive controllers (i.e. the starting of operation as directed) is prohibited until it is proven that the machine corresponds to the regulations of the EC Directive 89/392/EWG (Machinery Directive); EN 60204 must be observed.
Commissioning (i.e. starting of operation as directed) is only allowed when there is compliance with the EMC Directive (89/336/EWG).
The drive controllers meet the requirements of the Low Voltage Directive 73/23/EWG. The harmonized standards of the prEN 50178/ DIN VDE 0160 series together with EN 60439-1/DIN VDE 0660 part 500 and EN 60146/DIN VDE 0558 are applicable to drive controllers.
The technical data and information about the connection conditions must be obtained from the nameplate and must be observed in all cases.

3. Transport, storage

Notes on transport, storage and appropriate handling must be observed.
Climatic conditions must be observed according to prEN 50178.

4. Erection

The devices must erected and cooled according to the regulations of the corresponding documentation.
The drive controllers must be protected from inappropriate loads. Particularly during transport and handling, components must not be bent and/or insulation distances must not be modified.
Touching of electronic components and contacts must be avoided.
Drive controllers contain electrostatically sensitive components which can easily be damaged by inappropriate handling. Electrical components must not be damaged or destroyed mechanically (health risks are possible!).

5. Electrical connection

When working on live drive controllers the valid national regulations for the prevention of accidents (e.g. VBG 4) must be observed.
The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). More detained information is included in the documentation.
Notes concerning the installation in compliance with EMC - such as screening, grounding, arrangement of filters and laying of cables - are included in the documentation of the drive controllers. These notes must also be observed in all cases for drive controllers with the CE mark. The compliance with the required limit values demanded by the EMC legislation is the responsibility of the manufacturer of the system or machine.

6. Operation

Systems where drive controllers are installed must be equipped, if necessary, with additional monitoring and protective devices according to the valid safety regulations, e.g. law on technical tools, regulations for the prevention of accidents, etc.
Modifications of the drive controllers and the operating software are prohibited.
After disconnecting the drive controllers from the supply voltage, live parts of the controller and power connections must not be touched immediately, because of possibly charged capacitors. For this, observe the corresponding labels on the drive controllers.
During operation, all covers and doors must be closed.

7. Maintenance and servicing

The manufacturer's documentation must be observed.

This safety information must be preserved!

The product-specific safety and application notes in this Manual must also be observed!

2.1 Personnel responsible for safety

Operator

- An operator is any natural or legal person who uses the drive system or on behalf of whom the drive system is used.
- The operator or his safety officer are obliged
  - to check whether all relevant regulations, notes, and laws are observed.
  - to ensure that only qualified personnel work with and on the drive system.
  - to ensure that the personnel have the manual available for all corresponding operations
  - to prohibit non-qualified personnel from working with and on the drive system.

Qualified personnel

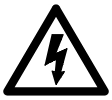
Qualified personnel are persons who are - because of their education, experience, instructions, and knowledge about corresponding standards and regulations, rules for the prevention of accidents, and operating conditions - authorized by the person responsible for the safety of the plant to perform the required actions and who are able to recognize and avoid potential hazards.
(see IEC 364, definition for qualified personnel)

2.2 General safety information

- This safety information is not claimed to be complete. In case of questions and problems please contact your Lenze representative.
- At the time of supply the controller meets the state-of-the-art and ensures basically safe operation.
- The information in this Manual refers to the indicated hardware and software versions of the controllers.
- The controller is a source of danger for persons, the controller itself and other material assets of the operator if
  - non-qualified personnel work with and on the controller,
  - the controller is used inappropriately.
- The specifications, processes, and circuitry described in this Manual are for guidance only and must be adapted to your own specific application.
- The controllers must be designed such that they perform their functions after proper erection and with application as directed in non-interfered operation and that they do not cause hazards for persons. This is also effective for the interaction with the complete plant.
- Take additional measures to limit consequences of malfunctions which may cause hazards for persons or material assets:
  - further independent equipment which can take over the function of the controller
  - electrical or non-electrical protection (latching or mechanical blocking)
  - measures covering the complete system
- Only operate the drive system in a perfect condition.
- Retrofitting or modifications are generally prohibited. In any case, Lenze must be contacted.

2.3 Layout of the safety information

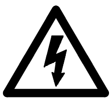
- All safety information in this Manual has a uniform layout:



Signal word
Note

- The icon designates the type of danger.
- The signal word designates the severity of danger.
- The note describes the danger and suggests how to avoid the danger.

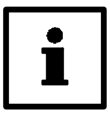
Warning of danger for persons

Icons used		Signal words	
	Warning of hazardous electrical voltage	**Danger!**	Warns of **impending danger**. Consequences if disregarded: Death or very severe injuries.
		Warning!	Warns of a **potential, very hazardous situation**. Possible consequences if disregarded: Death or very severe injuries.
	Warning of a general danger	**Caution!**	Warns of a **potentially hazardous situation**. Possible consequences if disregarded: Light or minor injuries.

Warning of material damage

Icons used	Signal words	
	**Stop!**	Warns of **potential material damage**. Possible consequences when disregarding: Damage of the controller/drive system or its environment.

Other notes

Icons used	Signal words	
	**Note!**	Designates a general, useful tip. If you observe it, handling of the controller/drive system is made easier.

2.4 Residual hazards

Protection of persons

After mains voltage disconnection the power terminals U, V, W and $+U_G$, $-U_G$ carry hazardous voltages 3 minutes after mains disconnection.

Protection of devices

Cyclic connection and disconnection of the controller supply voltage at L1, L2, L3 or $+U_G$, $-U_G$ may overload the internal input current load:

- Allow at least 3 minutes between disconnection and reconnection.

Overspeeds

Drive systems may reach dangerous overspeeds (e. g. caused by active loads like hoists):

- The 93XX servo inverters do not offer any protection against these operating conditions. Use additional components for this.

Safety information

3 Technical data

3.1 Features

- Single axis in narrow design
  - thus space-saving installation
- Power range: 370 W to 75 kW
  - uniform control module and thus uniform connection for the control cables over the complete power range
- Heat sink can be separated
  - The cooling can be achieved outside the control cabinet (punching or ”Cold Plate”)
- Power connections from the top (supply) or from the bottom (motor)
  - simple connection for multi-axis applications
- Direct connection of resolver or encoder feedback
  - simple connection via prefabricated system cables (accessories)
  - connecting cables can be plugged
- Point-to-point positioning
  - with or without velocity changeover
- Touch probe positioning
- Absolute or relative positioning
- S-ramps
- Homing according to different modes
- Manual homing
- Manual positioning
- Manual positioning with intermediate stop
- Simple programming via PC
- Application configuration for control functions and input/output signals
  - comprehensive function block library
  - high flexibility in the adaptation of the internal control structure to the application
- Integrated automation interface
  - simple extensions of the controller functions
- System bus (CAN) for the connection of controllers and for the extension of input and output terminals
- Approval of standard devices UL 508, File No. 132659 (listed)
- Approval 9371 BB (BAE) UL 508, File No. 132659 (listed)

3.2 General data / Operating conditions

General data/Operating conditions	**Values**
Vibration resistance	Germanischer Lloyd, general conditions
Humidity	Humidity class F without condensation (medium relative humidity 85 %)
Permissible temperature ranges	during transport of the controller: -25 °C ...+70 °C during storage of the controller: -25 °C ...+55 °C during operation of the controller: 0 °C ... +40 °C without power reduction +40 °C ... +55 °C with power reduction
Permissible installation height h	h ≤ 1000 m a.m.s.l. without power reduction 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l. with power reduction
Degree of pollution	VDE 0110 part 2 pollution degree 2
Noise emission	Requirements acc. to EN 50081-2, EN 50082-1, IEC 22G-WG4 (Cv) 21 Limit value class A acc. to EN 55011 (industrial area) with mains filter A Limit value class B acc. to EN 55022 (residential area) with mains filter B and installation to control cabinet
Noise immunity	Limit values maintained using mains filter. Requirements acc. to EN 50082-2, IEC 22G-WG4 (Cv) 21 **Requirements** / **Standard** / **Severities** ESD / EN61000-4-2 / 3, i.e. 8 kV for air discharge and 6 kV for contact discharge RF interference(enclosure) / EN61000-4-3 / 3, i.e. 10 V/m; 27 to 1000 MHz Burst / EN61000-4-4 / 3/4, i.e. 2 kV/5 kHz Surge (on mains cable) / EN 61000-4-5 / 3, i.e. 1.2/50 µs 1 kV phase-phase, 2 kV phase-PE
Insulation strength	Overvoltage category III according to VDE 0110
Packing	according to DIN 4180 - 9321 to 9326: Dust-free packing - 9327 to 9332: Delivery packing
Type of protection	IP20 IP41 on the heat sink side for thermal separation (punching) NEMA 1: Protection against contact
Approvals	CE: Low Voltage Directive UL508: Industrial Control Equipment UL508C: Power Conversion Equipment

3.3 Ratings

3.3.1 Controllers 9321 to 9325

	Type	**EVS9321-EX**	**EVS9322-EX**	**EVS9323-EX**	**EVS9324-EX**	**EVS9325-EX**
	Order No.	EVS9321-EX	EVS9322-EX	EVS9323-EX	EVS9324-EX	EVS9325-EX
	Type	**EVS9321-CPV 003**	**EVS9322-CPV 003**	**EVS9323-CPV 003**	**EVS9324-CPV 003**	**EVS9325-CPV 003**
	Order No.	EVS9321-CPV0 03	EVS9322-CPV0 03	EVS9323-CPV0 03	EVS9324-CPV0 03	EVS9325-CPV0 03
Mains voltage	V_N [V]	$320\ V \pm 0\ \% \leq V_N \leq 528\ V \pm 0\ \%$; 45 Hz ...65 Hz ± 0 %				
Alternative DC supply	V_G [V]	$460\ V \pm 0\ \% \leq U_G \leq 740\ V \pm 0\ \%$				
Mains current with mains filter Mains current without mains filter	I_N [A]	1.5 2.1	2.5 3.5	3.9 5.5	7.0 -	12.0 16.8
Ratings for operation at a mains: 3 AC / 400 V / 50 Hz/60 Hz						
Motor power (4-pole ASM)	P_N [kW]	0.37	0.75	1.5	3.0	5.5
	P_N [hp]	0.5	1.0	2.0	4.0	7.5
Output power U, V, W (8 kHz*)	S_{N8} [kVA]	1.0	1.7	2.7	4.8	9.0
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	2.0	0.75	2.2	0.75	0
Output current (8 kHz*)	I_{N8} [A]	1.5	2.5	3.9	7.0	13.0
Output current (16 kHz*)	I_{N16} [A]	1.1	1.8	2.9	5.2	9.7
max output current (8 kHz*)1)	I_{max8} [A]	2.3	3.8	5.9	10.5	19.5
max output current (16 kHz*)1)	I_{max16} [A]	1.7	2.7	4.4	7.8	14.6
max. standstill current (8 kHz*)	I_{08} [A]	2.3	3.8	5.9	10.5	19.5
max. standstill current (16 kHz*)	I_{016} [A]	1.7	2.7	4.4	7.8	14.6
Ratings for operation at a mains: 3 AC / 480 V / 50 Hz/60 Hz						
Motor power (4-pole ASM)	P_N [kW]	0.37	0.75	1.5	3.0	5.5
	P_N [hp]	0.5	1.0	2.0	4.0	7.5
Output power U, V, W (8 kHz*)	S_{N8} [kVA]	1.2	2.1	3.2	5.8	10.8
Output power $+U_G$, $-U_G$ 2)	P_{DC} [kW]	2.0	0.75	2.2	0.75	0
Output current (8 kHz*)	I_{N8} [A]	1.5	2.5	3.9	7.0	13.0
Output current (16 kHz*)	I_{N16} [A]	1.1	1.8	2.9	5.2	9.7
max output current (8 kHz*)1)	I_{max8} [A]	2.3	3.8	5.9	10.5	19.5
max output current (16 kHz*)1)	I_{max16} [A]	1.7	2.7	4.4	7.8	14.6
max. standstill current (8 kHz*)	I_{08} [A]	2.3	3.8	5.9	10.5	19.5
max. standstill current (16 kHz*)	I_{016} [A]	1.7	2.7	4.4	7.8	14.6
Motor voltage	V_M [V]	$0 - 3 \times V_{mains}$				
Power loss (operation with I_{Nx})	P_V [W]	50	65	100	150	210
Power reduction	[%/K] [%/m]	40 °C < T_a < 55 °C: 2 %/K (no UL approval) 1000 m a.m.s.l. < h $\leq$ 4000 m a.m.s.l.: 5 %/1000 m				
Weight	m [kg]	3.5	3.5	5.0	5.0	7.5

1) The currents apply to a periodical load cycle with 1 minute overcurrent with the current mentioned here and 2 minutes base load with 75 % I_{Nx}

2) When operated under rated load the controller can supply this power in addition.

* Chopping frequency of the inverter (C0018)

X stands for P (Servo position controller) or S (Servo inverters).
The data is the same for both controllers.

3.3.2 Ratings types 9326 to 9332

	Type	**EVS9326-EX**	**EVS9327-EX**	**EVS9328-EX**	**EVS9329-EX**	**EVS9330-EX**	**EVS9331-EX**	**EVS9332-EX**
	Order No.	EVS9326-EX	EVS9327-EX	EVS9328-EX	EVS9329-EX	EVS9330-EX	EVS9331-EX	EVS9332-EX
	Type	**EVS9326-CPV003**	**EVS9327-CPV003**	**EVS9328-CPV003**				
	Order No.	EVS9326 CPV003	EVS9327 CPV003	EVS9328 CPV003				
Mains voltage	V_N [V]	320 V ± 0 % ≤ V_N ≤ 528 V ± 0 % ; 45 Hz …65 Hz ± 0 %						
Alternative DC supply	V_G [V]	460 V ± 0 % ≤ V_G ≤ 740 V ± 0 %						
Mains current with mains filter Mains current without mains filter	I_N [A]	20.5 -	27.0 43.5	44.0 -	53.0 -	78.0 -	100 -	135 -
Ratings for operation at a mains: 3 AC / 400 V / 50 Hz/60 Hz								
Motor power (4-pole ASM)	P_N [kW]	11.0	15.0	22.0	30.0	45.0	55.0	75.0
	P_N [hp]	15.0	20.5	30.0	40.0	60.0	73.5	100.0
Output power UVW (8 kHz*)	S_{N8} [kVA]	16.3	22.2	32.6	40.9	61.6	76.2	100.5
Output power +U_G, -U_G 2)	P_{DC} [kW]	0	10	4	0	5	0	0
Output current (8 kHz*) 1)	I_{N8} [A]	23.5	32.0	47.0	59.0	89.0	110.0	145.0
Output current (16 kHz*) 1)	I_{N16} [A]	15.3	20.8	30.6	38.0	58.0	70.0	90.0
max output current (8 kHz*)	I_{max8} [A]	35.3	48.0	70.5	88.5	133.5	165.0	217.5
max output current (16 kHz*)	I_{max16} [A]	23.0	31.2	45.9	57.0	87.0	105.0	135.0
max. standstill current (8 kHz*)	I_{08} [A]	23.5	32.0	47.0	52.0	80.0	110.0	126.0
max. standstill current (16 kHz*)	I_{016} [A]	15.3	20.8	30.6	33.0	45.0	70.0	72.0
Ratings for operation at a mains: 3 AC / 480 V / 50 Hz/60 Hz								
Motor power (4-pole ASM)	P_N [kW]	11.0	18.5	30.0	37.0	45.0	55.0	90.0
	P_N [hp]	15.0	25.0	40.0	49.5	60.0	73.5	120.0
Output power UVW (8 kHz*)	S_{N8} [kVA]	18.5	25.0	37.0	46.6	69.8	87.3	104.0
Output power +U_G, -U_G 2)	P_{DC} [kW]	0	12	4.8	0	6	0	6
Output current (8 kHz*)	I_{N8} [A]	22.3	30.4	44.7	56.0	84.0	105.0	125.0
Output current (16 kHz*)	I_{N16} [A]	14.5	19.2	28.2	35.0	55.0	65.0	80.0
max output current (8 kHz*) 1)	I_{max8} [A]	33.5	45.6	67.1	84.0	126.0	157.5	187.5
max output current (16 kHz*) 1)	I_{max16} [A]	21.8	28.8	42.3	52.5	82.5	97.5	120.0
max. standstill current (8 kHz*)	I_{08} [A]	22.3	30.4	44.7	49.0	72.0	105.0	111.0
max. standstill current (16 kHz*)	I_{016} [A]	14.5	19.2	28.2	25.0	36.0	58.0	58.0
Motor voltage	V_M [V]	0 - 3 × V_{mains}						
Power loss	P_v [W]	360	430	640	810	1100	1470	1960
Power reduction	[%/K] [%/m]	at 40 °C < T_a < 55 °C: 2.5 %/K (no UL approval) 1000 m a.m.s.l. < h ≤ 4000 m a.m.s.l.: 5 %/1000 m						
Weight	m [kg]	7.5	12.5	12.5	12.5	36.5	59	59

1) The currents apply to a periodical load cycle with 1 minute overcurrent with the current mentioned here and 2 minutes base load with 75 % I_{Nx}

2) When operated under rated load the controller can supply this power in addition.

* Chopping frequency of the inverter (C0018)

X stands for P (Servo position controller) or S (Servo inverters). The data is the same for both controllers.

3.3.3 Fuses and cable cross-sections

Type	Mains input L1, L2, L3, PE/Motor connection U, V, W										Input +UG, -UG		
	Operation without mains filter					Operation with mains filter							
	Fuse		E.l.c.b.	Cable cross-section [2]		Fuse		E.l.c.b.	Cable cross-section [2]		Fuse	Cable cross-section [2]	
	VDE	UL	VDE	mm^2	AWG	VDE	UL	VDE	mm^2	AWG		mm^2	AWG
9321	M 6A	5A	B 6A	1	17	M 6A	5A	B 6A	1	17	6.3A	1	17
9322	M 6A	5A	B 6A	1	17	M 6A	5A	B 6A	1	17	6.3A	1	17
9323	M 10A	10A	B 10A	1.5	15	M 10A	10A	B 10A	1.5	15	8A	1.5	15
9324	-	-	-	-	-	M 10A	10A	B 10A	1.5	15	12A	1.5	15
9325	M 32A	25A	B 32A	6	9	M 20A	20A	B 20A	4	11	20A	4	11
9326	-	-	-	-	-	M 32A	25A	B 32A	6	9	40A	6	9
9327	M 63A	63A	-	16	6	35A	35A	-	10	7	50A	10	7
9328	-	-	-	-	-	50A	50A	-	16	5	80A	16	5
9329	-	-	-	-	-	80A	80A	-	25	3	100A	25	3
9330	-	-	-	-	-	100A	100A	-	50	0	2 * 80A [1]	2 * 16	2 * 5
9331	-	-	-	-	-	125A	125 A	-	70	2/0	2 * 100A [1]	2 * 25	2 * 3
9332	-	-	-	-	-	160A	175 A	-	95	3/0	3 * 80A [1]	3 * 16	3 * 5

1) The DC bus fuses are connected in parallel

2) The valid local regulations have to be considered

For the operation of the controllers in a UL-approved plant:

- Use only UL-approved fuses and fuse holders:
  - 500 V to 600 V in the mains input (AC)
  - 700 V in the DC bus (DC)
  - Tripping characteristic ”H” or ”K5”
- Use only UL-approved cables.

Note!
UL approved fuses and fuse holders can be obtained from e.g. Bussmann or Ferraz.

Connection of the motor cables

- The protection of the motor cables is not necessary for functional reasons.
- The data in the table ”operation with mains filter” are applicable.

3.3.4 Mains filters

Type	Ratings (uk ≈ 6 %)		Lenze order number	
	Mains current	Inductance	for RFI degree A	for RFI degree B
9321	1.5 A	24 mH	EZN3A2400H002	EZN3B2400H002
9322	2.5 A	15 mH	EZN3A1500H003	EZN3B1500H003
9323	4 A	9 mH	EZN3A0900H004	EZN3B0900H004
9324	7 A	5 mH	EZN3A0500H007	EZN3B0500H007
9325	13 A	3 mH	EZN3A0300H013	EZN3B0300H013
9326	24 A	1.5 mH	EZN3A0150H024	EZN3B0150H024
9327	30 A	1.1 mH	EZN3A0110H030	EZN3B0110H030
9328	42 A	0.8 mH	EZN3A0080H042	EZN3B0080H042
9329	54 A	0.6 mH	EZN3A0060H054	EZN3B0060H054
9330	80 A	0.42 mH	EZN3A0042H080	EZN3B0042H080
9331	100 A	0.34 mH	EZN3A0034H100	EZN3B0034H100
9332	135 A	0.25 mH	EZN3A0025H135	EZN3B0025H135

The mains filters for RFI degree B contain additional RFI suppression components.

3.4 Dimensions

The dimensions of the controllers depend on the mechanical installation.

10 Network of several drives

In film-, textile-, wire-processing machines etc. the material is often unwound at the input side, processed, and rewound at the output side. The material is often processed in very different drive steps (e.g. unwinding, drawing, printing, cutting, drying, etc.).

If we look at the power requirements of individual drives in one machine, we can see that the power consumption differs considerably within a cycle and between the drives.

The drive power from the mains is very high in the acceleration phase only. If the set speed is reached the power requirement is considerably lower.

During operation, often one drive is braked while another one is accelerated.

During deceleration the kinetic energy of the moving mass has to be dissipated; this means that in total more power is generated than is consumed.

Because of the DC bus connection, energy is exchanged between all controllers which are coupled to the DC bus.

- The controllers exchange energy via the DC bus:
  - The braking energy to be dissipated is used for acceleration by other controllers or consumed centrally by a brake unit.
  - Only the difference in energy is drawn from or fed back to the mains.
  - Brake units or supply and regenerative modules of a smaller size can be used.
- Reduction of wiring:
  - Only a few mains supply points are necessary.

The number of controllers which can be connected is limited only by the total power (as a result of the power balance).

10.1 Calculation of the mains supply power required

Only drives in a DC bus connection are considered.

Estimate of the power requirement (quick determination of the mains power)

- Add together the power of all the connected motors (P_N from the table chapter 3.3 of the controller ratings)
- Select a supply and regenerative module 934X from table chapter 10.4 (ratings 934X) or one of the controllers 93XX used from table chapter 3.3 (ratings 93XX) corresponding to the total power.
  - Select the power of the supply and regenerative module or the DC power of the controller to be larger than the total power of the connected motors.

Closer examination of the power requirement (results generally in smaller component sizes and thus in reduced costs).

1. Calculate the electrical drive power of each motor (Pzu) from the nameplate data:

   $$P_{zu} = \sqrt{3} \cdot U_N \cdot I_N \cdot \cos \varphi$$

   - or from the effciency (η):

   $$P_{zu} = \frac{P_{ab}}{\bullet}$$

2. Determine the total power of the motors connected to the drive network from the electrical drive power of each motor.
   - The graphic representation generally results in the most accurate values.

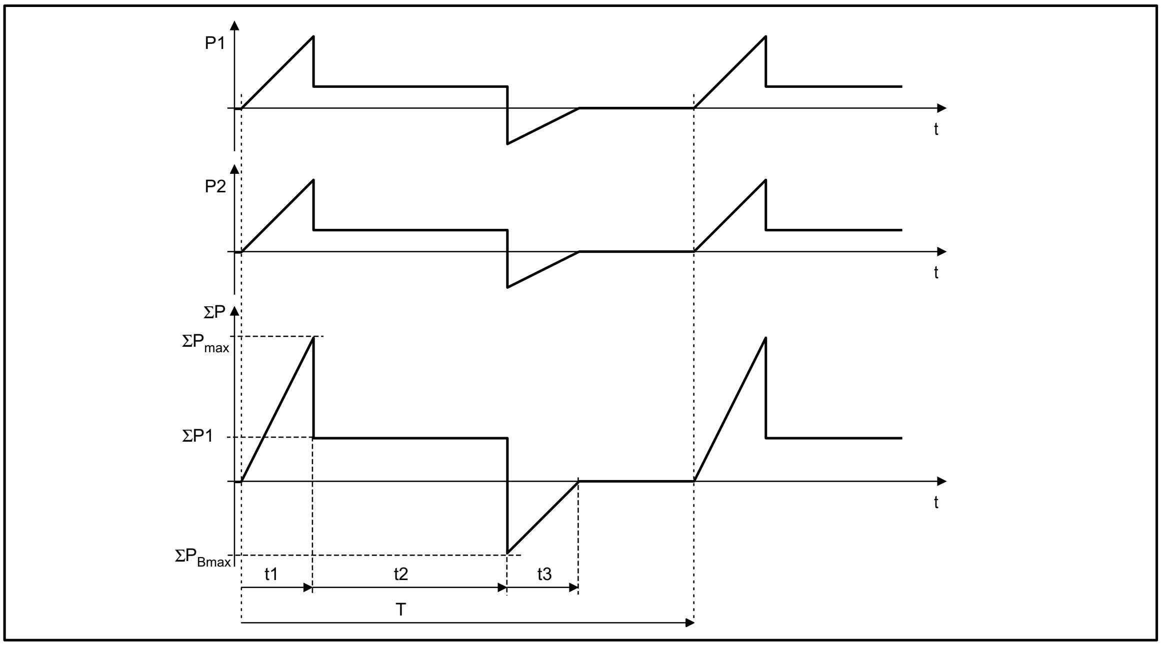


FIG 10-1 Example with two drives accelerated or decelerated at the same time

P1:	Power characteristic of the first drive
P2:	Power characteristic of the second drive
∑P:	Addition of the power characteristics
P_{Bmax}:	Peak brake power of the drive network
P_{max}:	Peak drive power of the drive network

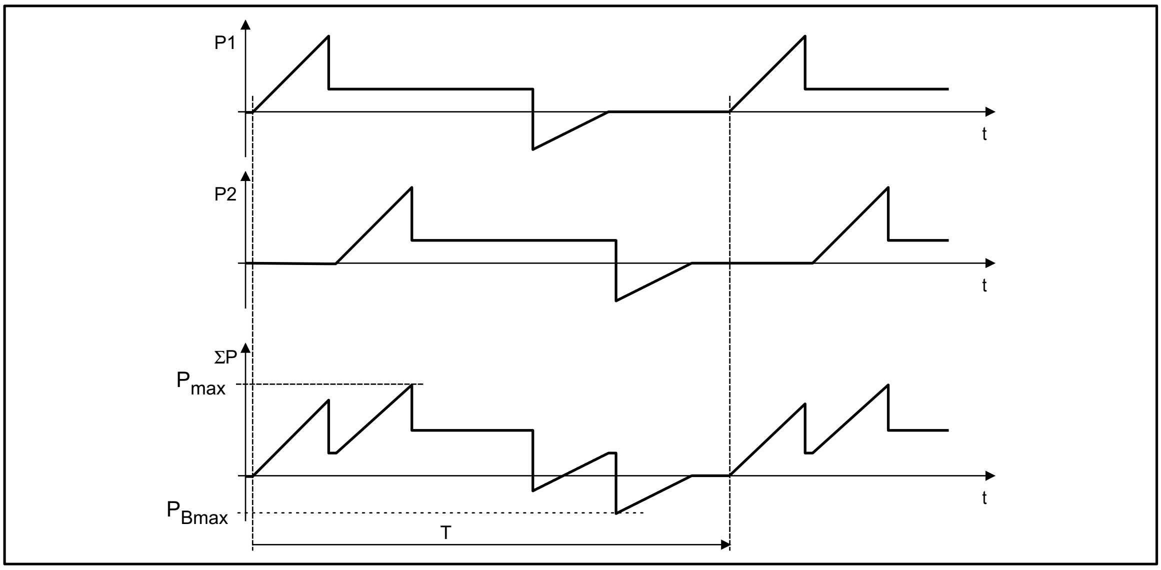


FIG 10-2 Example with drives accelerated or decelerated with a delay

P1:	Power characteristic of the first drive
P2:	Power characteristic of the second drive
∑P:	Total power of the drive network
P_{Bmax}:	Peak brake power of the drive network
Pmax:	Peak drive power of the drive network

In example FIG 10-2 the required peak power (P_{max} and P_{Bmax}) is higher than in example FIG 10-1.

Note!
If the application allows a delayed acceleration or deceleration of the drives, it may be possible to use a less powerful supply.

3. Add together the power loss of all controllers connected to the DC bus connection (from the table in chapter 10.4) and the supply and regenerative module 934X, if any, to the total power.
4. Calculate the required peak drive power P_{max} (from the diagram).
   - Also take into account the starting of a machine.
5. Calculate the required peak brake power P_{Bmax} (from the diagram)
   - Please also take into account a possible emergency stop.

Evaluation

If the resulting brake power P_B appears in the calculation, you need:

- a supply and regenerative module, if:
  - a continuous brake power is generated or
  - a higher cyclic brake power is generated
- a brake unit 935X, if:
  - a lower cyclic brake power is generated
  - or a higher brake power is only rarely generated.

10.2 Dimensioning of a central mains supply

10.2.1 Central mains supply with power supply and regenerative module 934X

The mains is connected to the power supply and regenerative module 934X.

- The drive and brake power is fed via the power supply and regenerative module.

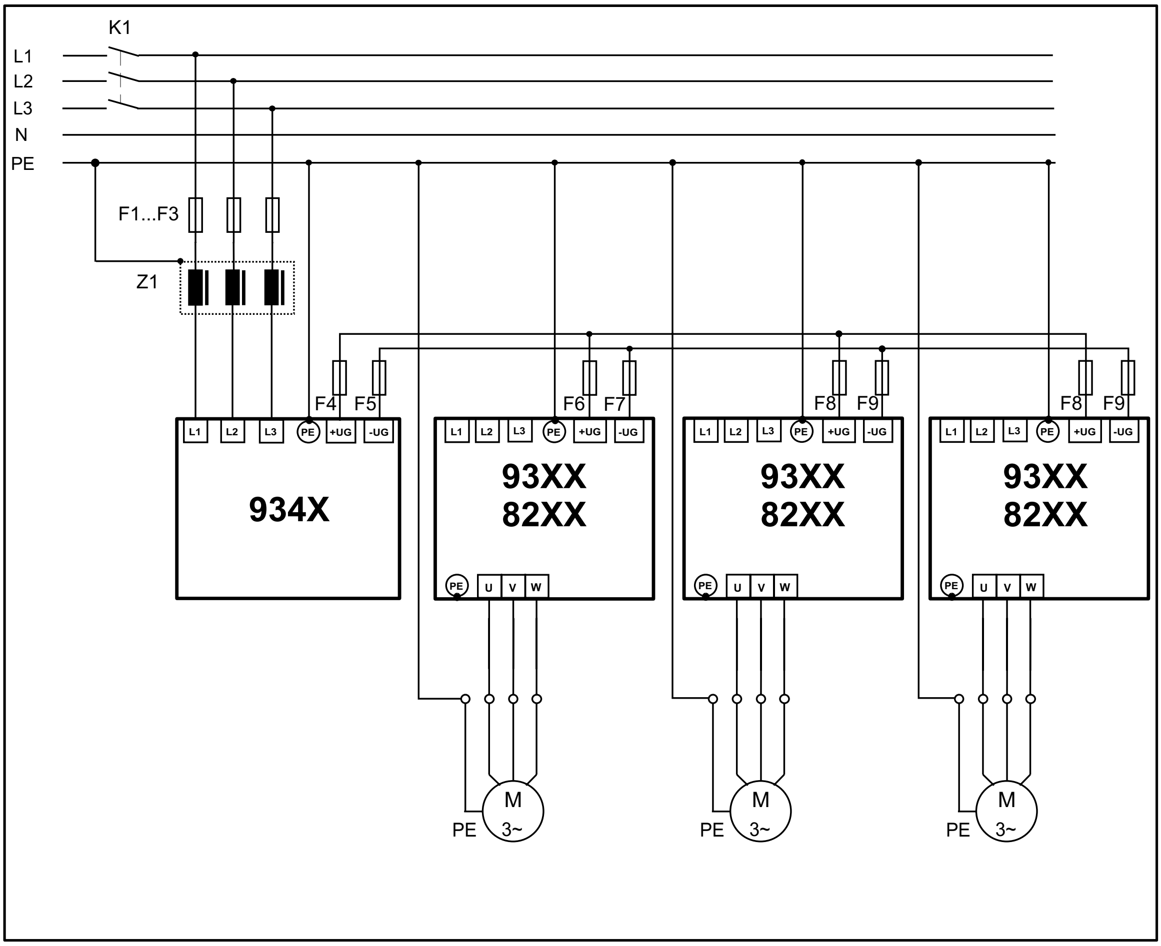


FIG 10-3 Block diagram for a central mains supply for the power supply and regenerative module 934X

Z1:	Mains filter for 934X
F1 - F3:	Mains fuses for 934X (see operating instructions 934X)
F4 - F9:	Fuse in the DC bus

Network of several drives

1. Calculation of the continuous power:
   - The continuous power is calculated over a complete cycle T.
   - Enter the individual powers without sign. In the diagram the drive power is positive, the brake power is negative.

$$P_d\ [W] = \frac{\sum_{i=1}^{i=n} P_i\ [W] \cdot t_i\ [s]}{T\ [s]}$$

Select a power supply and regenerative module using the tables in chapter 10.4.

Note!

If the actual brake power (P_B) ≪ drive power (P), a decentralized supply may result in a smaller size of the power supply and regenerative module 934X. The supply and regenerative module 934X is then dimensioned according to the brake power only (see chapter 10.3).

10.2.2 Central mains supply at the controller 93XX

The mains is connected to a controller with a correspondingly high mains power.

- The drive power is fed via a controller 93XX.
- The brake power is dissipated via a brake unit 935X.

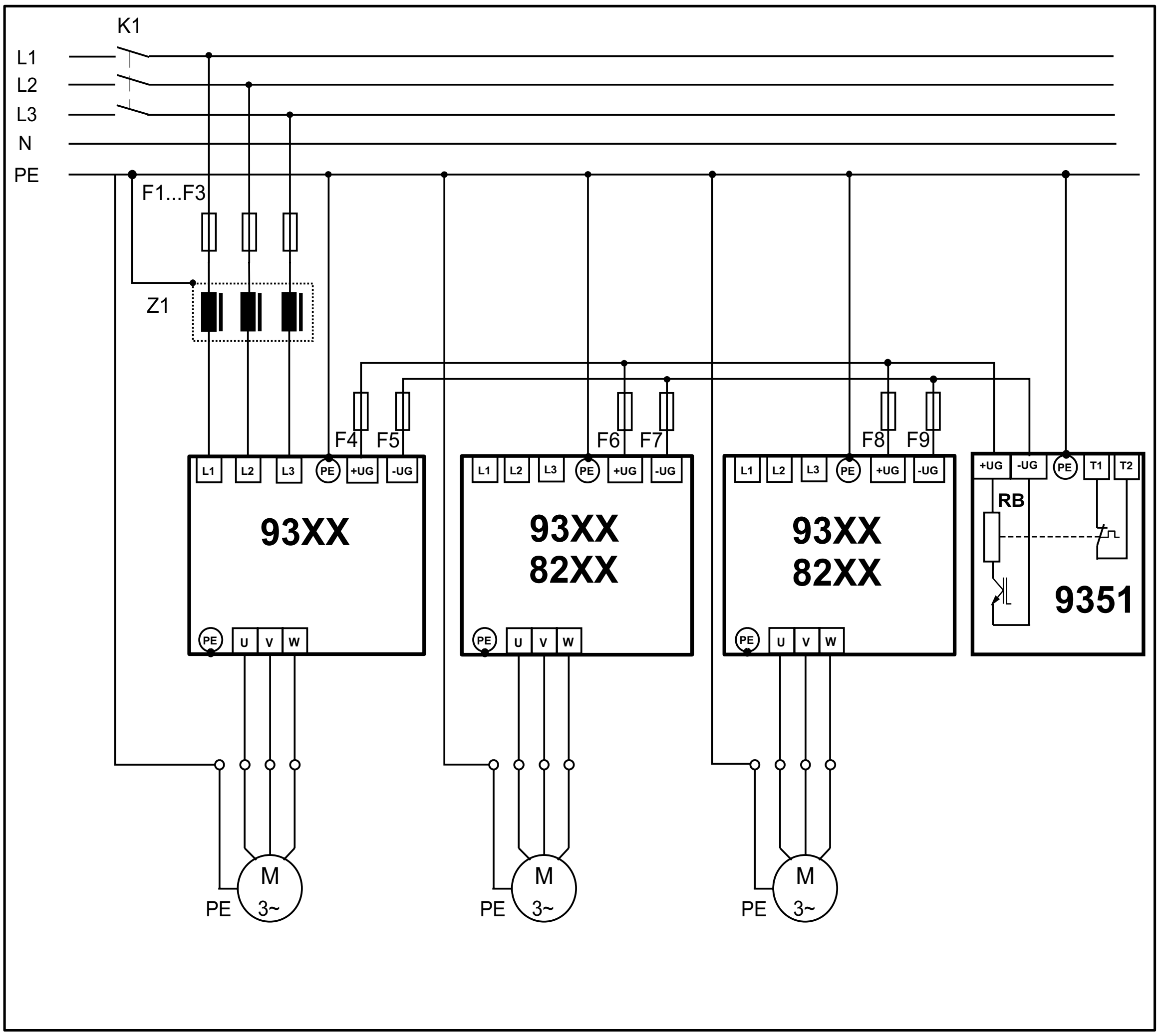


FIG 10-4 Block diagram for a central mains supply for the controller 93XX
Z1: Mains filter of TAB 2 in chapter 10.4
F1 - F3: Mains fuse of the first mains supply from chapter 3.3.3
F4 - F9: Fuse in the DC bus from chapter 3.3.3

1. Calculation of the continuous power for the controller 93XX
   - The continuous power is calculated over a total cycle T.
   - Consider the drive power only. In the diagram the drive power is positive, the brake power is negative. The brake power is not relevant here, since it is not fed via the mains input of the controller.

$$P_d\ [W] = \frac{\sum_{i=1}^{i=n} P_i\ [W] \cdot t_i\ [s]}{T\ [s]}$$

With the calculated data, select a controller for the mains supply (DC power (P_{DC}) = mains power) from the tables in chapter 10.4.

Selection of the controller for the mains supply

1. The peak power of the controller must be larger than the actual peak brake power (DC power (P_{DC}) = mains power)

$$P_{DC\ \max}\ [W] \geq P_{max}\ [W]$$

Please observe that the peak power P_{DCmax} can be drawn for max. 60 s. If the power is required for a longer time, select:

$$P_{DC}\ [W] \geq P_{max}$$

2. The continuous power P_{DC} of the controller must be larger than the actual (calculated) continuous power.

$$P_{DC}\ [W] \geq P_d\ [W]$$

If there is no suitable controller in the DC bus connection, select

- a controller with suitable DC power

or

- the decentral supply from chapter 10.3.

Calculation of the brake unit 935X

A brake unit is required only if brake power occurs in the operating cycle, or for an emergency stop function (total power in the diagram becomes negative).

1. Calculate the peak brake power P_{Bmax} from the diagram.
2. Calculate the continuous brake power P_{Bd}

$$P_{Bd}\ [W] = \frac{\sum_{i=1}^{i=n} P_{Bi}\ [W] \cdot t_{Bi}\ [s]}{T_B\ [s]}$$

Use the calculated data to determine the required brake unit.

10.3 Dimensioning of a decentral mains supply

If more drive power (P) is required than brake power (P_B) is generated, one or more additional mains supplies are possible in the DC bus connection. This may result in a power supply and regenerative module 934X of smaller size (dimensioned for the brake power).

Stop!
The controllers, as well as the supply and regenerative module, must be operated only with a corresponding mains filter (mains choke).

10.3.1 Decentral mains supply with power supply and regenerative module 934X

The operation of a DC bus connection with a decentral supply can be useful for drives with low brake power (P_B) but high drive power (P) ($P \gg P_B$).

This may make it possible to select a less expensive supply and regenerative module 934X.

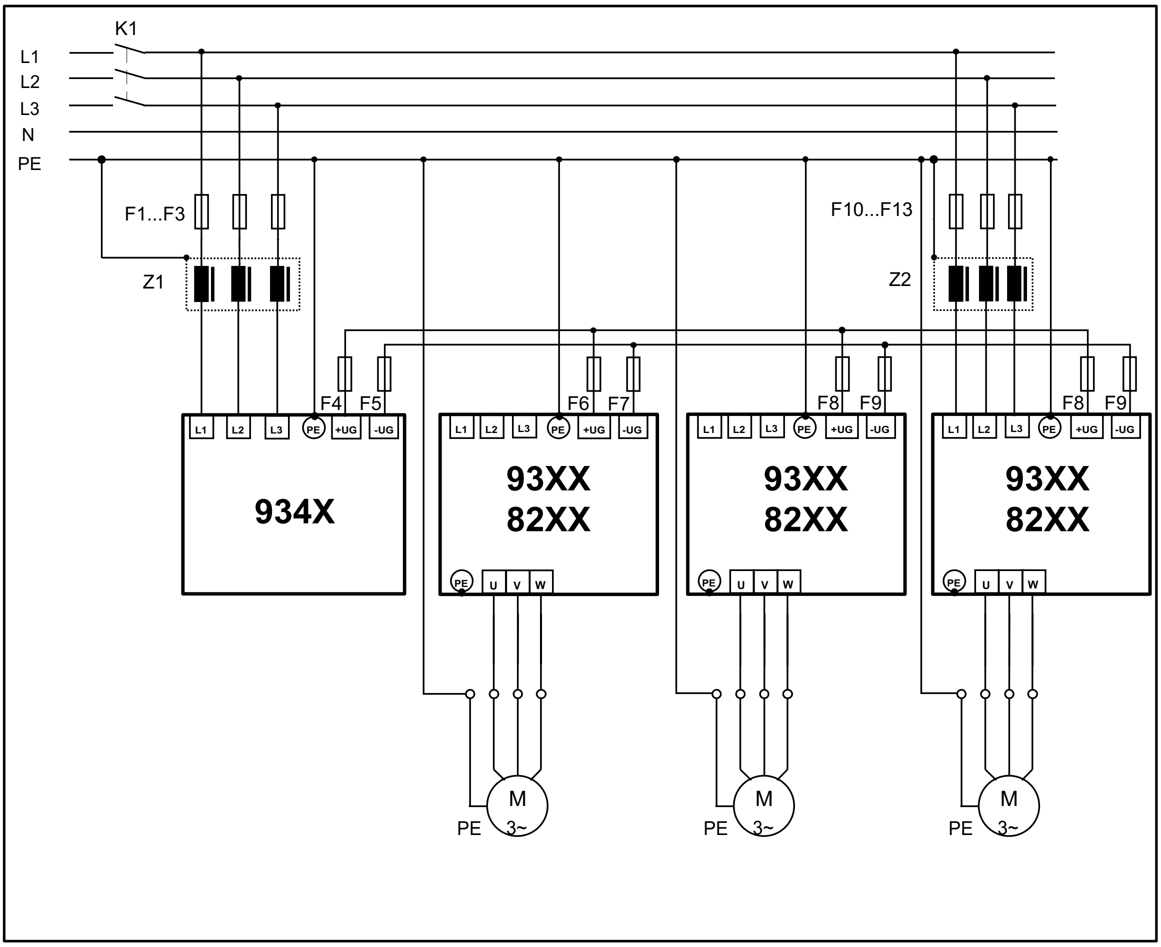


FIG 10-5 Block diagram for a decentral mains supply with supply and regenerative module 934X and controllers 93XX

Z1:	Mains filter for 934X from TAB 2 in chapter 10.4
Z2:	Mains filter for 93XX from TAB 2 in chapter 10.4
F1 - F3:	Mains fuses for 934X (see operating instructions 934X)
F10 - F13:	Mains fuse of the second mains supply at the controller 93XX from the ratings in chapter 3.3.3
F4 - F9:	Fuse in the DC bus

A bimetallic relay is required for the current monitoring!

Determine the power supply and regenerative module 934X

The brake power is considered only.

1. Calculate the peak brake power P_{Bmax} from the diagram.
2. Calculate the continuous brake power (P_{Bd}) from the diagram
   - The continuous power is calculated over a total cycle.
   - Enter the individual powers (brake power) without sign. In the diagram the drive power is positive, the brake power is negative.

$$P_{Bd}\ [W] = \frac{\sum_{i=1}^{i=n} P_{Bi}\ [W] \cdot t_i\ [s]}{T\ [s]}$$

With the calculated drive data, select a power supply and regenerative module from the tables in chapter 10.4 .

Dimensioning of the mains filter for 934X

1. Select the corresponding mains choke from the ratings of the power supply and regenerative module 934X (TAB 2 in chapter 10.4).

Determine to which controller 93XX the second mains supply is to be connected

1. Calculate the peak brake power (P_{max}) from the diagram
2. Calculate the continuous drive power (P_d) from the diagram:
   - The continuous drive power is calculated over a complete cycle T.
   - Enter only the drive power as individual powers. In the diagram, the drive power is positive and the brake power is negative.

$$P_d\ [W] = \frac{\sum_{i=1}^{i=n} P_i\ [W] \cdot t_i\ [s]}{T\ [s]}$$

3. Select a suitable combination from the table TAB 1 in chapter 10.4 of the corresponding supply and regenerative module 934X:
   - Determine the power supply and regenerative module.
   - In the rows under 934X, select a total mains power which is higher than the calculated mains power.
   - In the corresponding row you will find the controller to which the second mains supply has to be connected.
   - If the calculated controller is not included in the DC bus connection, select a controller with higher power.
   - If a second supply point cannot be found, please contact Lenze.

Network of several drives

4. The peak drive power ($P_{mains\ max}$) of the controller which is supplied must be larger than the peak drive power (P_{max} from the diagram)

$$P_{Netz\ max}\ [W] \geq P_{max}\ [W]$$

Please observe that the peak power P_{DCmax} can be drawn for max. 60s. If the power is required for a longer time, select:

$$P_{Netz}\ [W] \geq P_{max}$$

Dimensioning of the mains filters for 93XX

Stop!
Only use the mains choke specified in table TAB 2 in chapter 10.4. If other mains chokes are used, the controller, power supply and regenerative module can be overloaded and destroyed.

10.3.2 Decentral mains supply for the controller 93XX

The operation of a DC bus connection with decentral supply can be useful for drives with low brake power (P_B) but high drive power (P) ($P \gg P_B$).

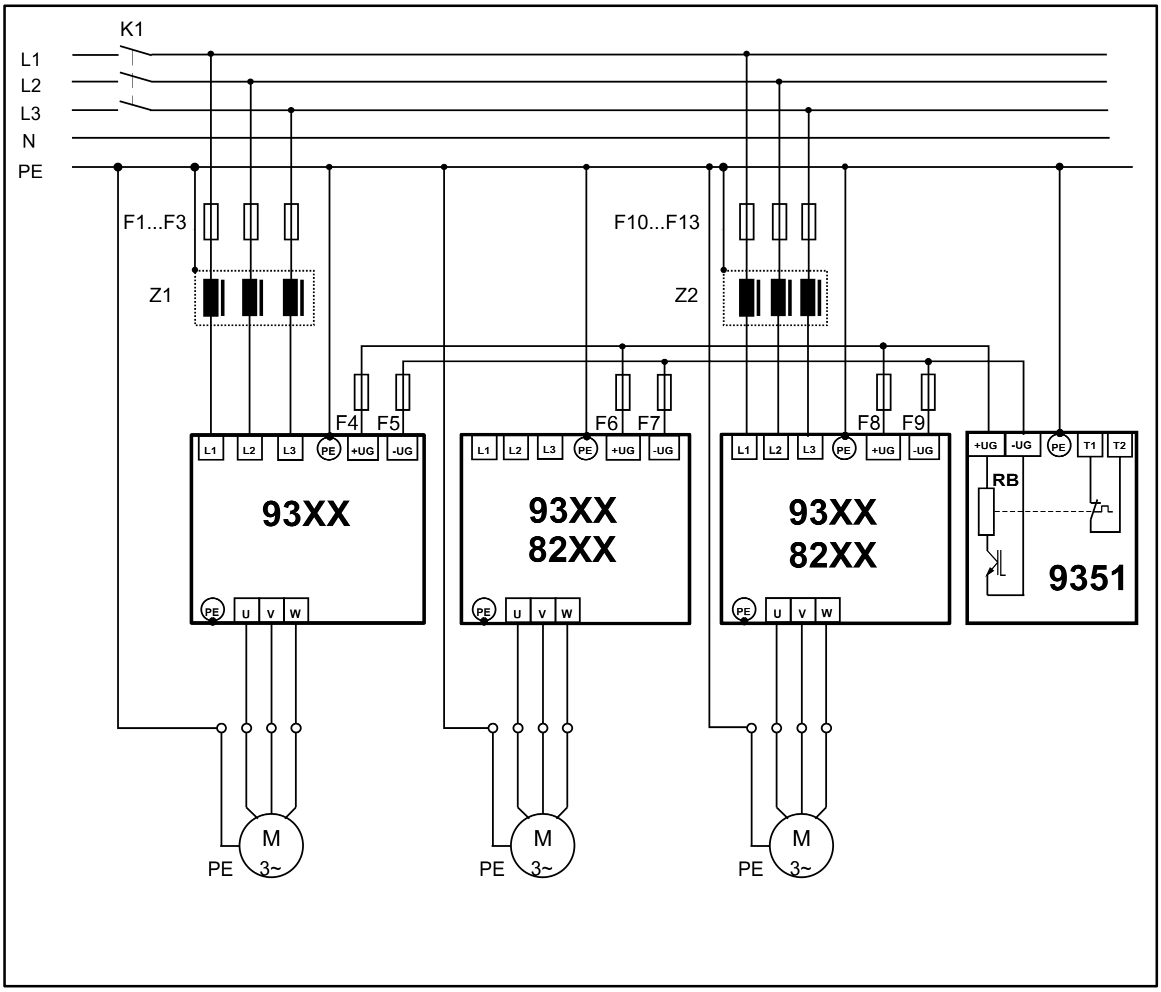


FIG 10-6 Block diagram for a decentral mains supply for the controller 93XX

Z1, Z2:	Mains filter from TAB 2 in chapter 10.4
F1 - F3:	Mains fuse of the first mains supply from chapter 3.3.3
F10 - F13:	Mains fuse of the second mains supply from chapter 3.3.3
F4 - F9:	Fuse in the DC bus from chapter 3.3.3

A bimetallic relay is required for the current monitoring of the mains supply!

Determine which of the two controllers has to be connected to the mains supply

1. Calculate the peak brake power (P_{max}) from the diagram
2. Calculate the continuous drive power (P_d) from the diagram
   - The continuous drive power is calculated over a complete cycle T.
   - Enter only the drive power as individual powers. In the diagram the drive power is positive and the brake power is negative.

$$P_d\ [W] = \frac{\sum_{i=1}^{i=n} P_i\ [W] \cdot t_i\ [s]}{T\ [s]}$$

3. Select a suitable combination from the table:
   - Select the largest controller which is part of the DC bus connection in column x. This controller is normally connected to the first mains supply.
   - In the row (left from the controller), select a total mains power (ΣP_{Netz}) > of the calculated mains power.
   - In the corresponding upper row you will find the controller where the second mains supply has to be connected.
   - If the calculated controller is not included in the DC bus connection, select a controller with higher power.
   - If a second supply point cannot be found, please contact Lenze.
4. The peak drive power ($P_{mains\ max}$) of the supplied controller must be larger than the peak drive power (P_{max} from the diagram)

$$P_{Netz\ \ max}\ [W] \geq P_{max}\ [W]$$

Please observe that the peak power P_{DCmax} can be drawn for max. 60s. If the power is required for a longer time, select:

$$P_{Netz}\ [W] \geq P_{max}$$

Dimensioning of the mains filters

Stop!
Only use the mains choke specified in table TAB 2 in chapter 10.4. If other mains chokes are used, the controller can be overloaded and destroyed.

Calculation of the brake unit 935X

A brake unit is required only if brake power occurs in the operating cycle or for an emergency stop function (total power in the diagram becomes negative).

1. Calculate the peak brake power P_{Bmax} from the diagram.
2. Calculate the continuous brake power P_{Bd}

$$P_{Bd}\ [W] = \frac{\sum_{i=1}^{i=n} P_{Bi}\ [W] \cdot t_{Bi}\ [s]}{T_B\ [s]}$$

Use the calculated data to determine the required brake unit (see operating instructions 935X).

10.3.3 Additional capacitance on the DC bus

Stop!
The operation of additional capacitance on the DC bus can overload the input rectifier of the controllers 93XX or of the power supply and regenerative module 94XX. Suitable charging and balancing resistors must be provided.

More detailed information about this subject can be obtained from Lenze.

10.3.4 Operation with additional brake units

Operation with additional brake units 935X can be necessary, if:

- the peak brake power of the drive network cannot be absorbed by the selected power supply and regenerative module 934X.
- the controller(s) no longer provide(s) the required brake torque or set(s) pulse inhibit (IMP) because of excessive brake power.
  - Select a more powerful supply and regenerative module 934X or
  - add brake unit(s) 935X.

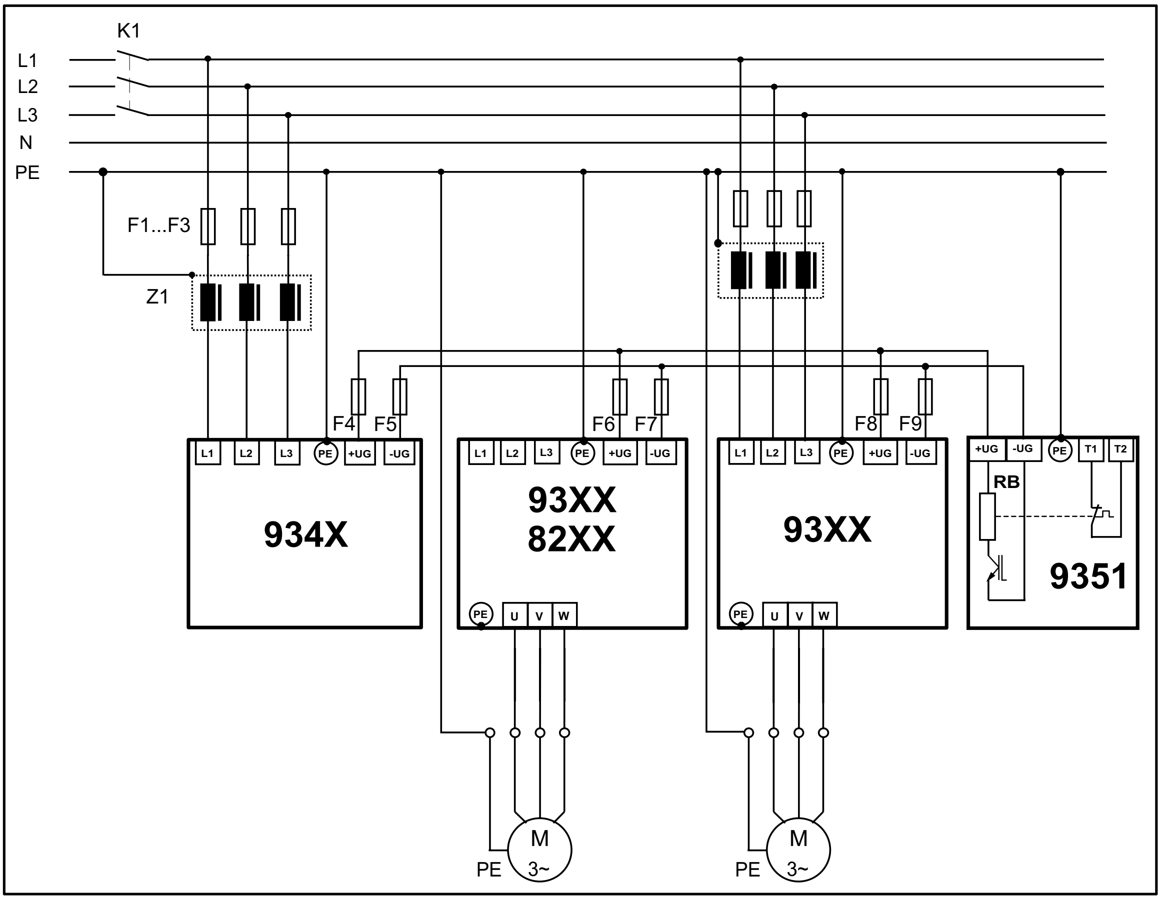


FIG 10-7 Block diagram with additional brake unit

Stop!

If brake units 935X are operated in parallel to the power supply and regenerative module 934X on the DC bus, set the DC bus voltage thresholds of the controllers and brake units to the same values:

- Controller 93XX: via code C0173
- Brake unit 935X: with the switches S1 and S2 on the brake unit

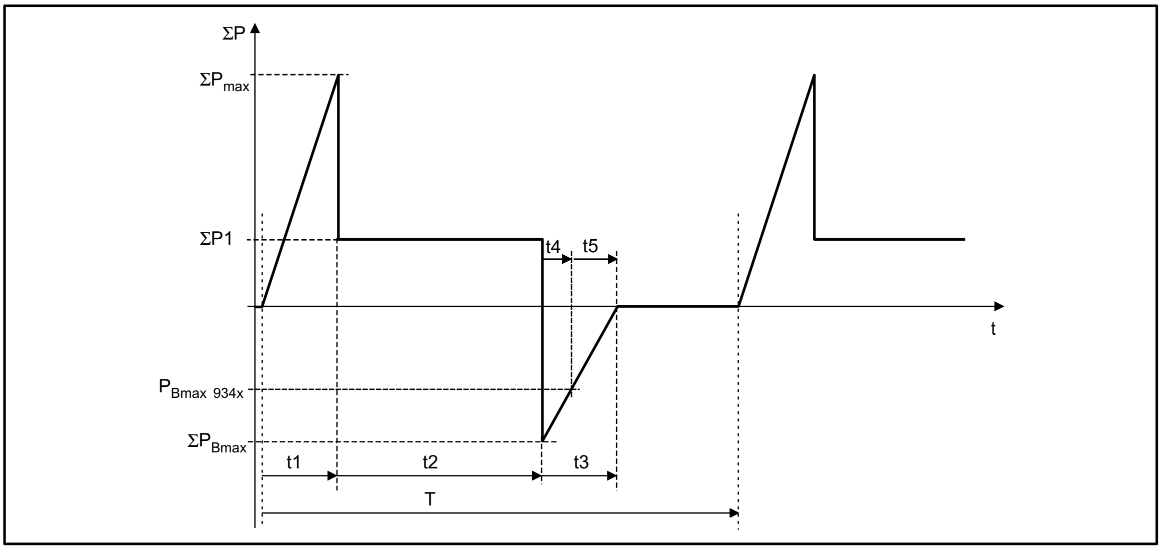


FIG 10-8 Example of a power balance

How it works

- The actual brake power (P_B) is fed back via the power supply and regenerative module 934X to the mains.
- If the brake power continues increase the power supply and regenerative module 934X will be overloaded.
  - Please observe that the power supply and regenerative module 934X can be operated with overload for max. 60 seconds.
- The brake unit 935X is activated, only if the peak brake power of the power supply and regenerative module 934X is exceeded and dissipates the additional brake power as heat.

Calculation of the brake unit 935X

1. Calculate the peak brake power $P_{Bmax\ 935X}$ from the diagram.

$$P_{Bmax\ 935X}\ [W] = P_{Bmax}\ [W] - P_{B\ max\ 934X}\ [W]$$

2. Calculate the continuous brake power P_{Bd} (for 935X)

$$P_{Bd}\ [W] = \frac{\sum_{i=1}^{i=n} P_{Bi}\ [W] \cdot t_{Bi}\ [s]}{T_B\ [s]}$$

The example FIG 10-8 shows that: $P_{Bi} = P_{Bmax\ 935X}$, $t_{Bi} = t4$

Use the calculated data to determine the required brake unit (see Operating Instructions 935X).

10.4 Ratings in the DC bus connection

In the following tables you will find basic data for the dimensioning of a DC bus connection.

Conditions

The controller powers listed in table TAB 1 are effective only if the following conditions apply for the DC bus connection:

- All power supplies are connected to the AC mains via the mains filters prescribed in tableTAB 2.
- Chopping frequencies:
  - 93XX: 8 kHz.
  - 821X/822X/824X: 4 kHz or 8 kHz.
- Motors (AC asynchronous motors, asynchronous servo motors, synchronous servo motors):
  - Simultaneity factor F_g = 1, i.e. all motors operate simultaneously with 100 % motor power.
  - Mains voltage U_{mains} = 400 V / 50 Hz
  - Ambient operating temperature : max. +40 °C

Network of several drives

Supply power in a DC bus connection																			
First supply connected to type	9341	9342	9343	9330 8224	9322 8242	8211	8212	8215	9326 8246 8218	8217	9328 8222	8213	8214	9329 8223	9323 8243	9325 8245 8216	9327 8221	9324 8244	9321 8241
Power loss P_V [kW]	0.1	0.2	0.4	1.1	0.065	0.0055	0.075	0.15	0.36 0.36 0.4	0.28	0.64	0.09	0.1	0.81	0.1	0.21 0.21 0.2	0.43	0.15	0.05
$P_{DC100\%}$ [kW]	8.3	16.6	31.2	51.8	2	2	2	6.2	13	13	32.7	4.1	4.1	34.5	4.2	7.2	28	4.6	2.7
Further supplies connected to type																			
9341																			
9342																			
9343																			
9330, 8224	22.9	33.5	39.3	42.4															
9322, 8242	0.9	1.3	1.5	1.6	1.6														
8211	0.9	1.3	1.5	1.6	1.6	1.6													
8212	0.9	1.3	1.5	1.6	1.6	1.6	1.6												
8215	2.6	3.8	4.5	4.8	4.9	4.9	4.9	5.1											
8326, 8246, 8218	5.2	7.6	8.9	9.6	9.7	9.7	9.7	10.2	10.6										
8217	5.2	7.6	8.9	9.6	9.7	9.7	9.7	10.2	10.6	10.6									
9328, 8222	12.9	19	22.3	24	24.3	24.3	24.3	25.4	26.6	26.6	26.8								
8213	1.6	2.3	2.7	2.9	2.9	2.9	2.9	3.1	3.2	3.2	3.2	3.4							
8214	1.6	2.3	2.7	2.9	2.9	2.9	2.9	3.1	3.2	3.2	3.2	3.4	3.4						
9329, 8223	13	19	22.3	24	24.3	24.3	24.3	25.4	26.6	26.6	26.8	27.9	27.9	28.2					
9323, 8243	1.5	2.3	2.7	2.9	2.9	2.9	2.9	3	3.2	3.2	3.2	3.3	3.3	3.4	3.4				
9325, 8245, 8216	2.6	3.8	4.5	4.8	4.9	4.9	4.9	5.1	5.3	5.3	5.4	5.6	5.6	5.7	5.8	5.9			
9327, 8221	9.7	14.3	16.7	18	18.2	18.2	18.2	19	20	20	20.1	20.9	20.9	21.2	21.6	22.1	22.9		
9324, 8244	1.5	2.3	2.7	2.9	2.9	2.9	2.9	3	3.2	3.2	3.2	3.3	3.3	3.4	3.4	3.5	3.6	3.8	
9321, 8241	0.9	1.3	1.5	1.6	1.6	1.6	1.6	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2	2	2.1	2.2

TAB 1 Supply powers in the DC bus connection

Filter assignment in the DC bus connection																			
Supply connected to type	9341	9342	9343	9330 8224	9322 8242	8211	8212	8215	9326 8246 8218	8217	9328 8222	8213	8214	9329 8223	9323 8243	9325 8245 8216	9327 8221	9324 8244	9321 8241
Filter inductance [mH]	1.2	0.88	0.55	0.34	9	9	9	3	1.5	1.5	0.6	5	5	0.6	5	3	0.8	5	9
Filter current [A]	17	35	55	100	4	4	4	13	24	24	54	7	7	54	7	13	42	7	4
Order No.	EZN3A0120H017	EZN3A0088H035	EZN3A0055H055	EZN3A0034H100	EZN3A0900H004	EZN3A0900H005	EZN3A0900H006	EZN3A0300H013	EZN3A0150H024	EZN3A0150H025	EZN3A0060H054	EZN3A0500H007	EZN3A0500H008	EZN3A0060H054	EZN3A0500H007	EZN3A0300H013	EZN3A0080H042	EZN3A0500H007	EZN3A0900H004

TAB 2 Prescribed mains filters for the supplies in a DC bus connection

12 Automation with 93XX

You can easily integrate the 93XX controller into a comprehensive automation concept.

The controllers can be controlled and parameterized via:

- terminals (analog, digital, digital frequency)
- the integrated system bus interface (CAN) X4
- a fieldbus module which is plugged on the automation interface (AIF) X1:
  - InterBus-S via Lenze fieldbus module 2111,

or

  - PROFIBUS DP via Lenze fieldbus module 2131

or

  - RS232, RS485, fiber optics via Lenze fieldbus module 2102 (LECOM A/B/Li)

The controller is able to communicate with superimposed hosts via the fieldbus modules or the system bus (CAN).

The system bus (CAN) can be used to establish an additional communication between the controllers. Setpoints, actual values, control and status information can be transmitted via the system bus.

Predefined signal configurations are stored, for operation via the system bus or fieldbus. These configurations can be activated by code C0005. They are used to adapt inputs, outputs, and the internal signal flow.

If an interface assignment other than those which can be selected by C0005 is desired, the controller can be adapted by using the "freely connectable function blocks" in the controller.

You can also adapt the controller to almost any type of "mixed control". This means that you can divide the control, according to your requirements, to the following interfaces:

- Terminals
- System bus (CAN)
- Automation interface (AIF)

12.1 System bus in 93XX

12.1.1 Contact assignment X4 system bus

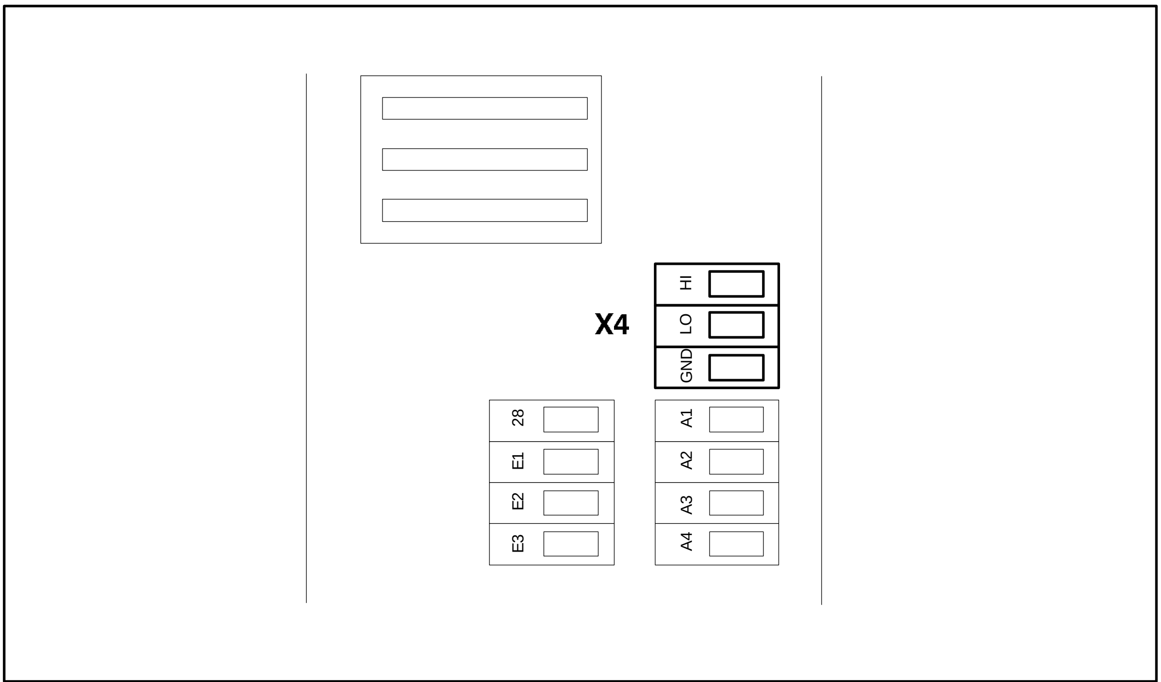


FIG 12-1 Contact assignment X4 system bus

Contact assignment of the connector X4 (3-pole plug-in terminal):

Name	Input/output	Explanation
X4 GND	-	CAN bus reference potential; with internal series resistor of 100 •and a maximum current load of 30 mA
X4 LO	Input/output	CAN bus LOW
X4 HI	Input/output	CAN bus HIGH

12.1.2 Wiring of the system bus

The following figure shows to connect the system bus.

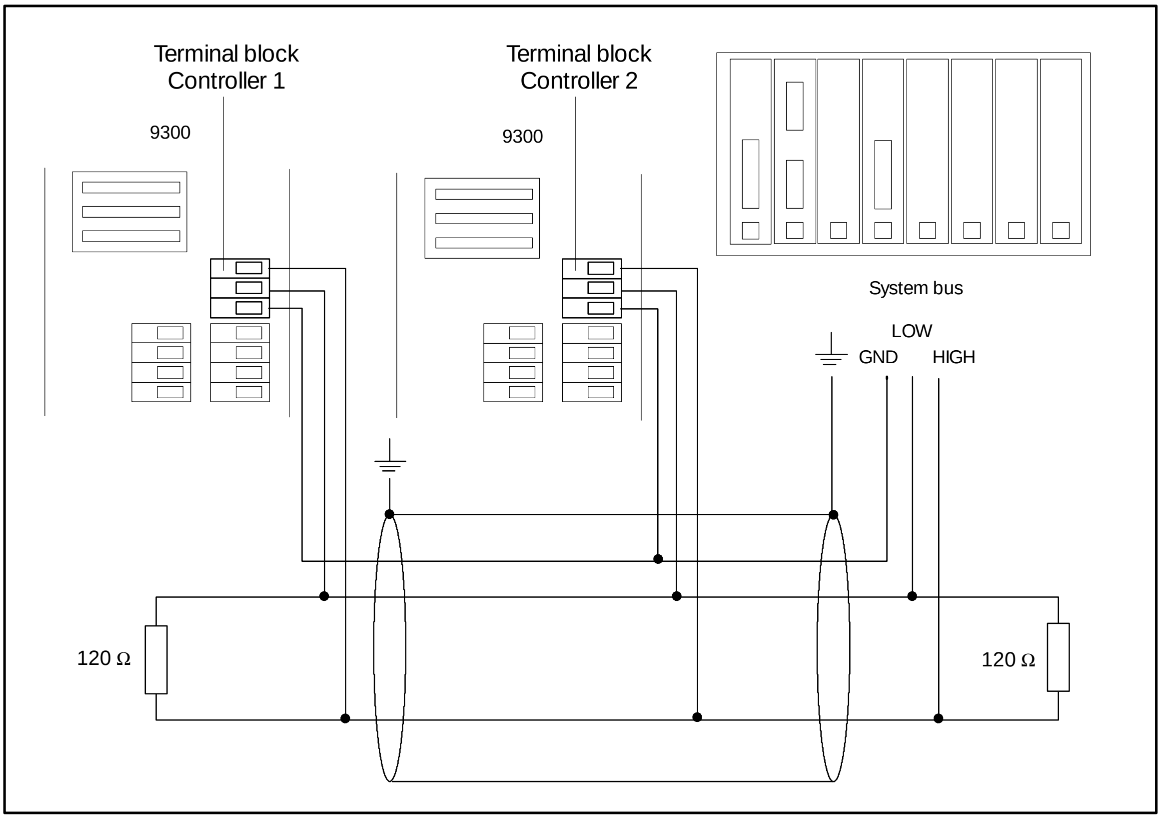


FIG 12-2 Wiring of the system bus

We recommend the following signal cable for the wiring:

Total length	up to 300 m	up to 1000 m
Cable type	LIYCY 2 x 2 x 0.5 mm^2 (twisted pair with screening)	CYPIMF 2 x 2 x 0.5 mm^2 (twisted pair with screening)
Cable resistance	≤ 40 Ω / km	≤ 40 Ω / km
Capacitance per unit length	≤ 130 nF/km	≤ 60 nF/km

Use the cable pairs as follows:

- Pair 1 (white/brown): LO and HI
- Pair 2 (green/yellow): GND

12.1.3 Technical data

12.1.3.1 General data of the system bus network

Communication media	DIN ISO 11898
Protocol	CANopen (CAL-based communication profile DS 301)
Baud rate [kBit/s]	• 50 • 125 • 250 • 500 • 1000

12.1.3.2 Possible bus length

The following bus lengths are possible, depending on the data transmission rate:

	Baud rate [kBits/s]				
	50	125	250	500	1000
Cable length [m]	1000	550	250	120	25

12.1.3.3 Communication times

The communication times on the system bus depend on

- the data priority
- the bus load
- the data transmission rate
- the processing time in the controller

Telegram runtimes

The telegram runtime for 8 Bytes of user data depends on the data transmission rate:

	Baud rate [KBits/s]				
	50	125	250	500	1000
Telegram runtime [ms]	2.7	1.05	0.52	0.26	0.13

Processing times in the controller

- Parameter: 30…50 ms typically
- Process data: 1…2 ms

12.1.4 Commissioning

1. Switch on the controller (mains or external 24 V supply).
2. Increase the baud rate or system bus baud rate (C0351) at the controller via the operating module 9371BB or the PC (factory setting: 500 kBaud).
   - This setting must be identical for all controllers which are connected.
3. For several connected controllers:
   Set system bus controller address (C0350) at the controller via operating module 9371BB or the PC (see also description of the codes for the system bus C0353, C0354).
   - Every controller must have a different controller address (factory setting = 1).
4. Now you can communicate with the controller. You can read all the codes and modify all the codes which can be written.

12.1.5 Programming

12.1.5.1 General

The functionality of the controller can be extended with the integrated system bus in the 93XX controller. These are:

- Parameter settings
- Extensions by decentral terminals
- Data exchange between the controllers
- Operating and input devices
- External controls and hosts

The user can, for example, exchange data between the controllers with digital control, speed, and torque signals, without having a knowledge of the bus system. If the user is familiar with the configuration of function blocks, the prerequisites are given (see chapter ”Working with function blocks”).

A total of 5 input channels and 5 output channels are available, which can be used independently of each other. Two of them are parameter channels (SDO = Service Data Object).

12.1.5.2 Parameter channels

Parameters are values which are stored under a code in Lenze controllers. Parameters are used, for instance, for system setups or a material change in a machine. Parameters are transmitted with low priority.

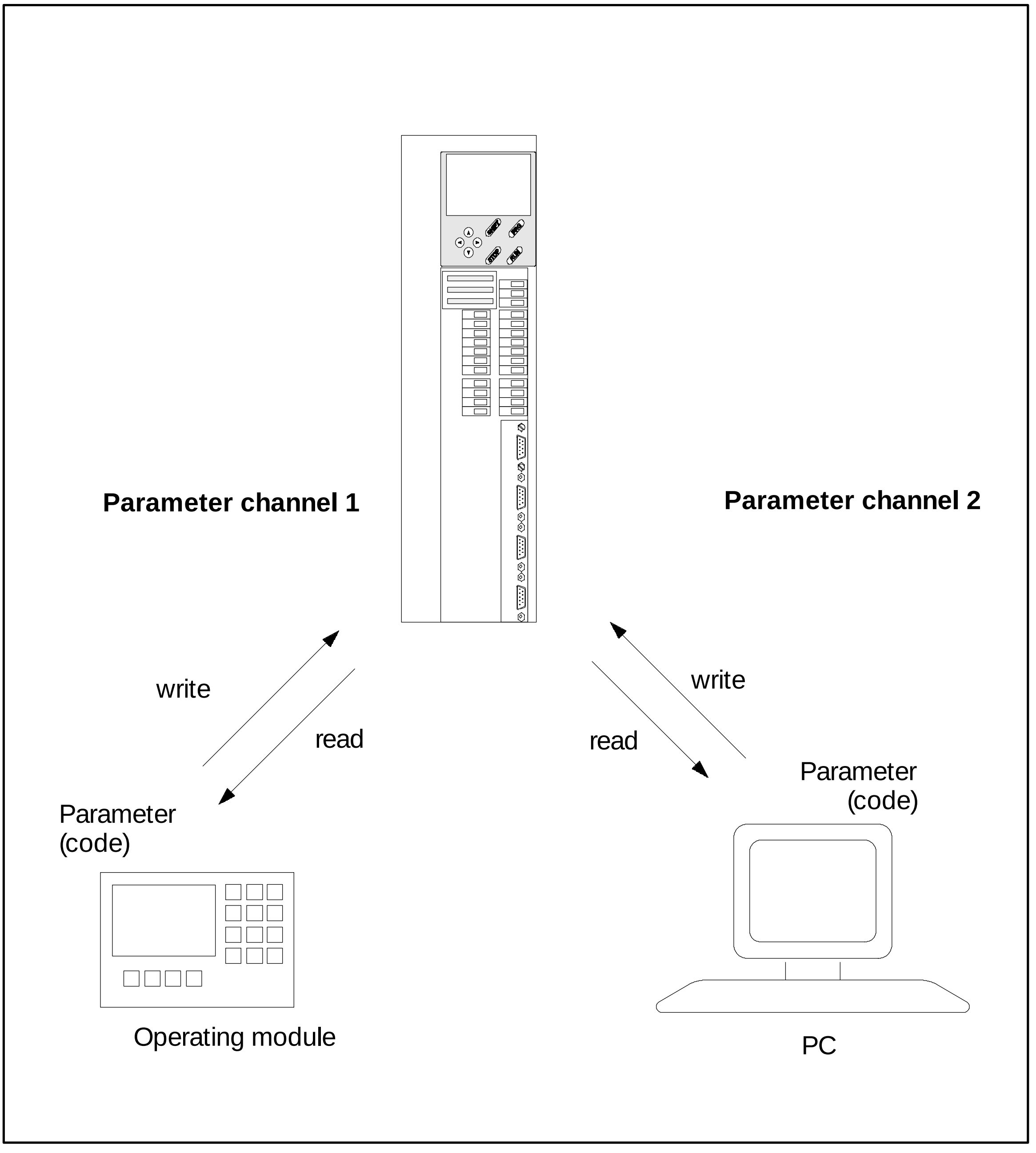


FIG 12-3 Connection of controllers via two parameter channels

With two parameter channels, two different devices can be connected for parameterization, e.g. simultaneous connection of a PC and an operating module (see FIG 12-3, page 12-6).

12.1.5.3 Process data channels

Process data are data with high priority, and are optimized for high speed in terms of the transmission and processing.

A cyclic process data channel CAN-IN1 and CAN-OUT1 (PDO = Process Data Object)

The process data via CAN-IN1 and CAN-OUT1 are to be used for a superimposed host.

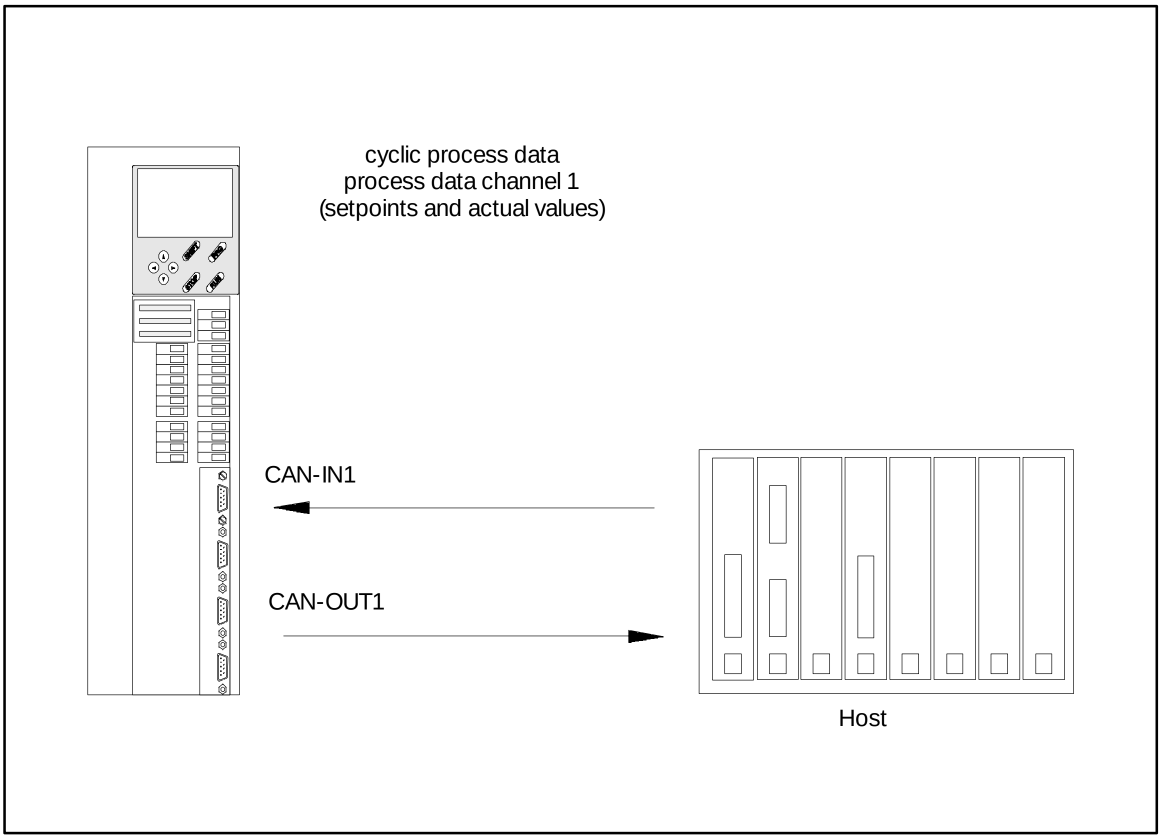


FIG 12-4 Process data CAN-IN1 and CAN-OUT1 for a superimposed host

Two event-triggered process data channels with cycles to be set (PDOs) CAN-IN2, CAN-OUT2, CAN-IN3, CAN-OUT3

These process data channels are used for a data exchange between the controllers. Another application of this process data is decentral input and output terminals. Superimposed hosts can also use these channels.

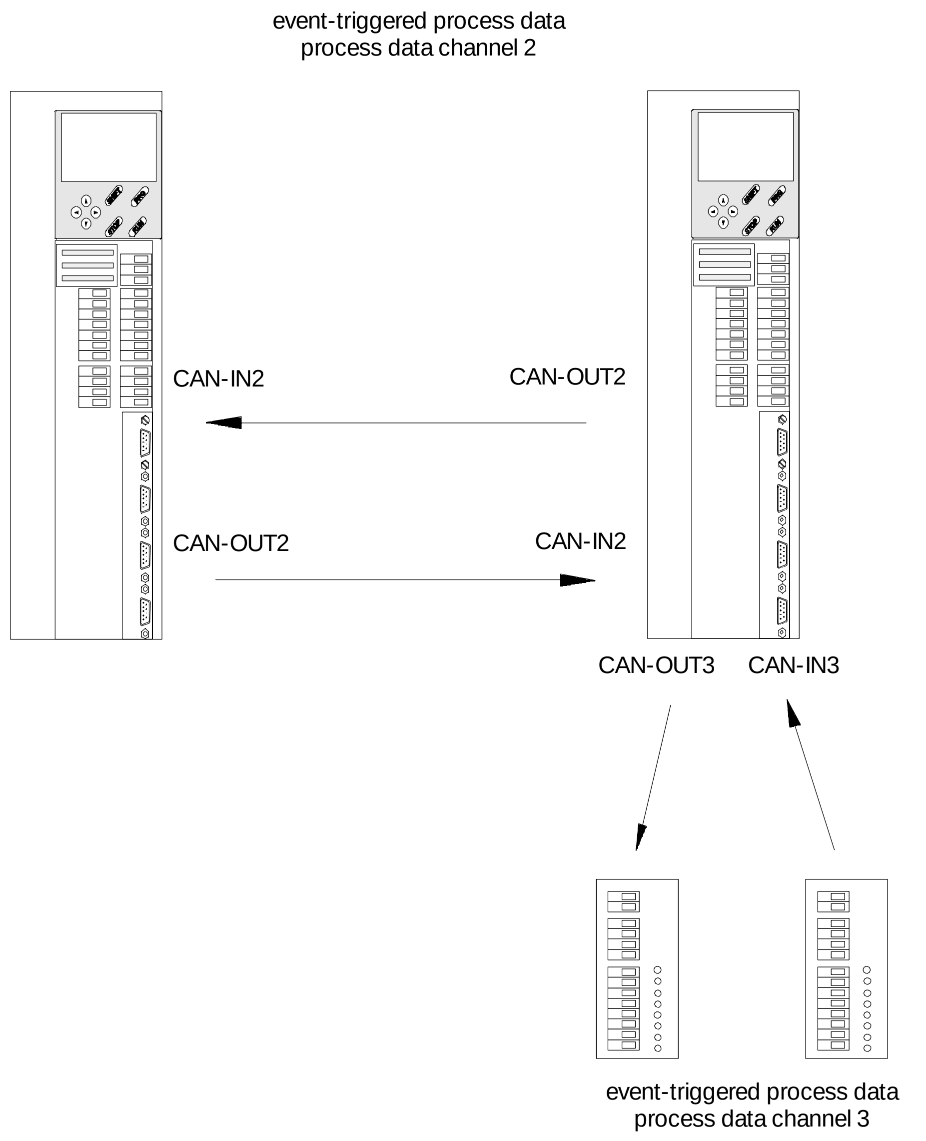


FIG 12-5 Event-triggered process data channels with cycles to be set

12.1.6 Description of the function blocks for the system bus

12.1.6.1 Function input block CAN-IN1

Purpose

The function block CAN-IN1 is used for the cyclic data traffic with superimposed hosts. A special telegram, the sync telegram (see chapter 12.1.13.1), has to be generated for the transmission.

You cannot use these function blocks for the data exchange between the controllers.

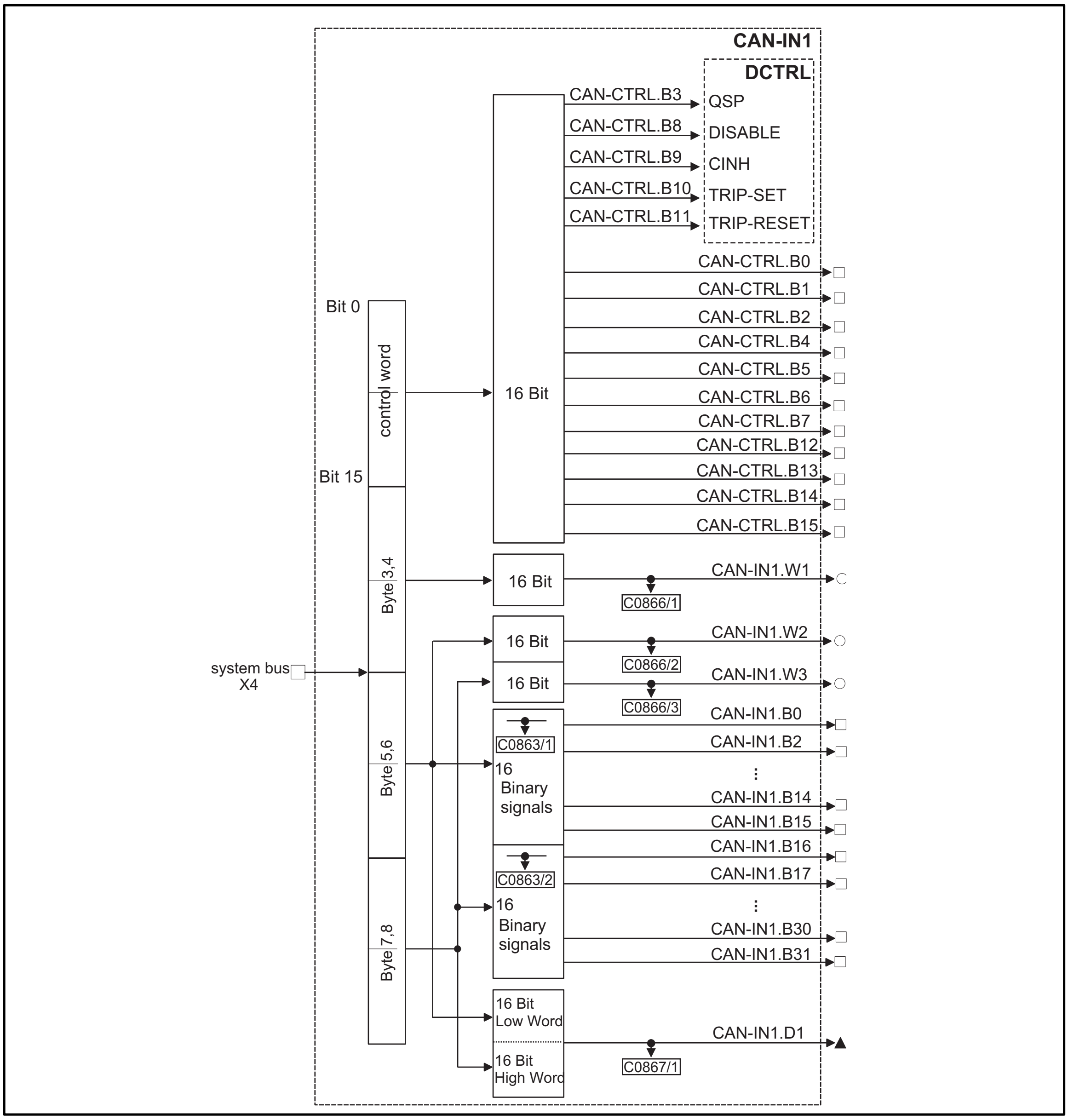


FIG 12-6 Function block CAN-IN1

Function

Eight Bytes are available for data traffic to the controller.

The controller-internal control word is fixed on the first two Bytes. A signal selection of the free binary signals of the control word can be assigned with every single configuration code for binary signals (e.g. with the configuration code for quick stop C0900 MCTRL-QSP).

The Bytes 3 and 4 can be selected with the individual configuration codes for quasi-analog signals as a 16-Bit data word (e.g. with the configuration code C0890 speed setpoint).

The Bytes 5, 6 and 7, 8 can be used simultaneously with up to 32 binary signals (value 1 or 0) as two quasi-analog values and as phase information. The function is assigned via the configuration codes, where the input signals can be selected from the selection lists.

12.1.6.2 Function output block CAN-OUT1

Purpose

The function block CAN-OUT1 is used for cyclic data traffic with superimposed hosts. A special telegram, the sync telegram (see chapter 12.1.13.1), has to be generated for the transmission. You cannot use these function blocks for the data exchange between the controllers.

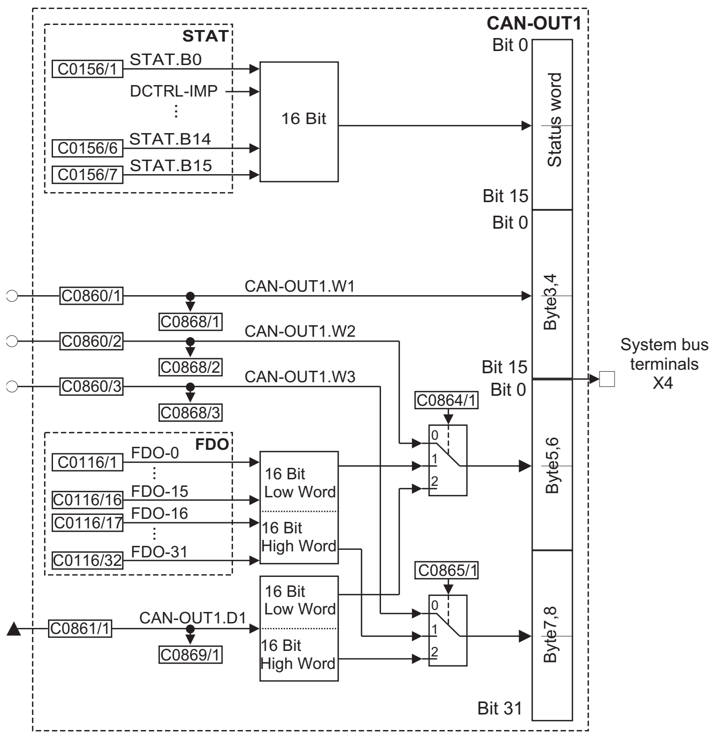


FIG 12-7 Function block CAN-OUT1

Function

Eight Bytes are available for data traffic from the controller.

The controller-internal status word (function block STAT) is mapped to the first two Bytes. The free binary signals of the status word are configured with the codes C0156/1 ... C0156/7 (see description of the function block STAT).

The Bytes 3 and 4 can be freely assigned to a signal from the selection list as a 16-Bit data word (quasi-analog signal) (e.g. with C0860 for the actual speed).

With the codes C0864/1 and C0865/1 you can select whether 16 Bits are transmitted as data words (quasi-analog signals) or as 16 binary output signals (e.g. CW-CCW rotation) or as a 32-Bit double-word (phase information).

Mixed forms are possible, using the switch setting of C0864/1 and C0865/1 (see function block CAN-OUT1).

The controller provides a total of 32 signals for the free programming for the transmission of binary output signals (32 Free programmable Digital Outputs, FDO).

These outputs are the same as those described below in the function output blocks for the CAN bus and for the automation interface (AIF).

12.1.6.3 Function input block CAN-IN2

Purpose

The function block CAN-IN2 is used for data traffic between the controllers and the data exchange to decentral input and output terminals. A data exchange with superimposed hosts is also possible.

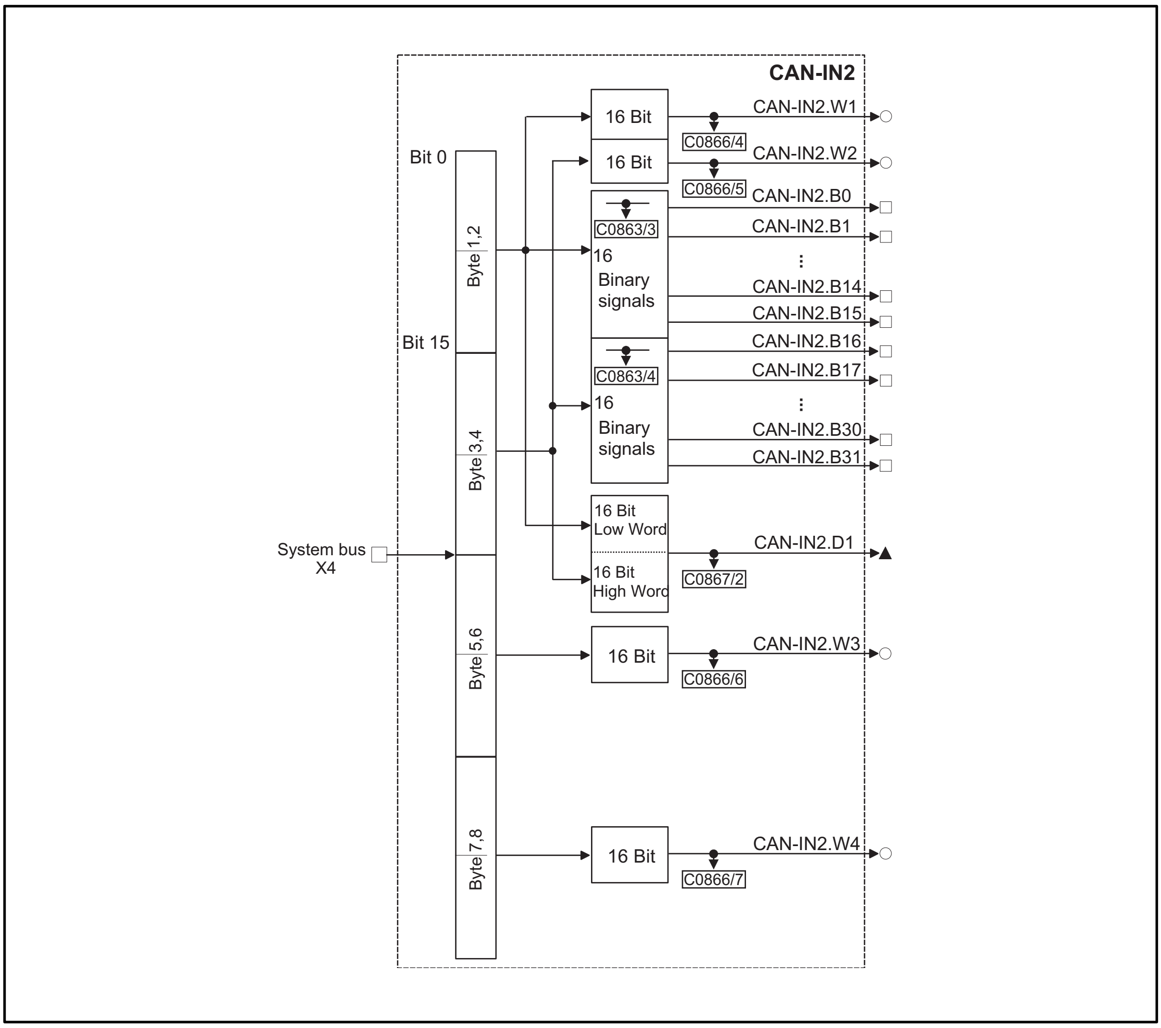


FIG 12-8 Function block CAN-IN2

Function

2 x 8 Bytes are available for data traffic to the controller.

The Bytes 1, 2 and 3, 4 can be used simultaneously with up to 32 binary signals as two quasi-analog values and as phase information. The function is assigned via the configuration codes, where the input signals can be selected from the selection lists.

The Bytes 5, 6 and 7, 8 can be selected as quasi-analog signals (16-Bit data word) (e.g. with the configuration code C0890 setpoint speed).

12.1.6.4 Function output block CAN-OUT2

Purpose

The function block CAN-OUT2 is used for data traffic between the controllers and the data exchange with decentral input and output terminals. A data exchange with superimposed hosts is also possible.

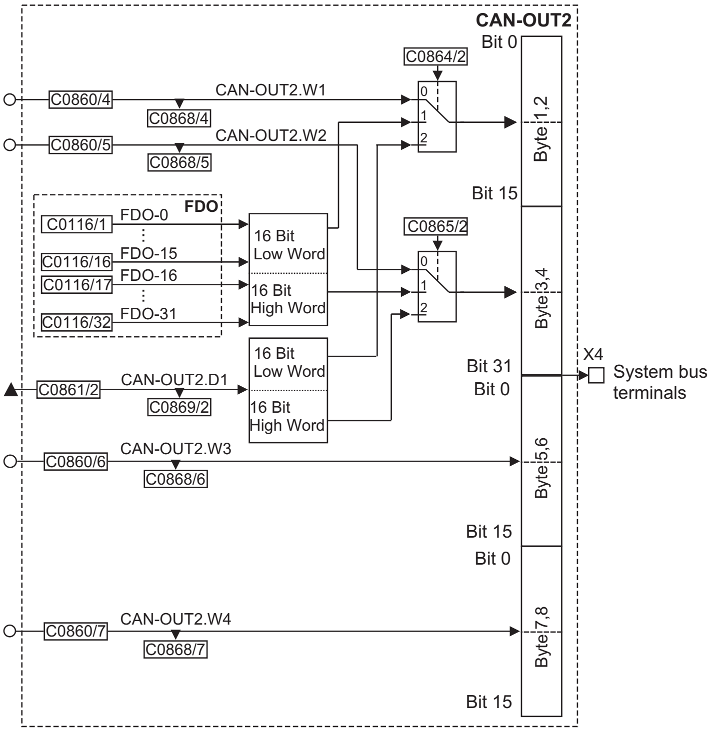


FIG 12-9 Function block CAN-OUT2

Function

2 x 8 Bytes are available for data traffic from the controller. The Bytes 1, 2 and 3, 4 can be freely assigned to a signal from the selection list as a 16-Bit data word (quasi-analog signal) (e.g. with C0860 for the actual speed).

With the codes C0864/2 and C0865/2, you can select whether 16 Bits are transmitted as data words (quasi-analog signals) or as 16 binary output signals (e.g. CW-CCW rotation) or as 32-Bit double-word (phase information).

Mixed types are possible with every switch setting of C0864/2 and C0865/2 (see function blocks CAN-OUT2 and CAN-OUT3).

The controller provides a total of 32 signals for the free programming for the transmission of binary output signals (32 Free programmable Digital Outputs, FDO).

These outputs are the same for CAN-OUT1, CAN-OUT2 and CAN-OUT3 and for the automation interface (AIF).

12.1.6.5 Function input block CAN-IN3

Purpose

The function block CAN-IN3 is used for data traffic between the controllers and the data exchange to decentral input and output terminals. A data exchange with superimposed hosts is also possible.

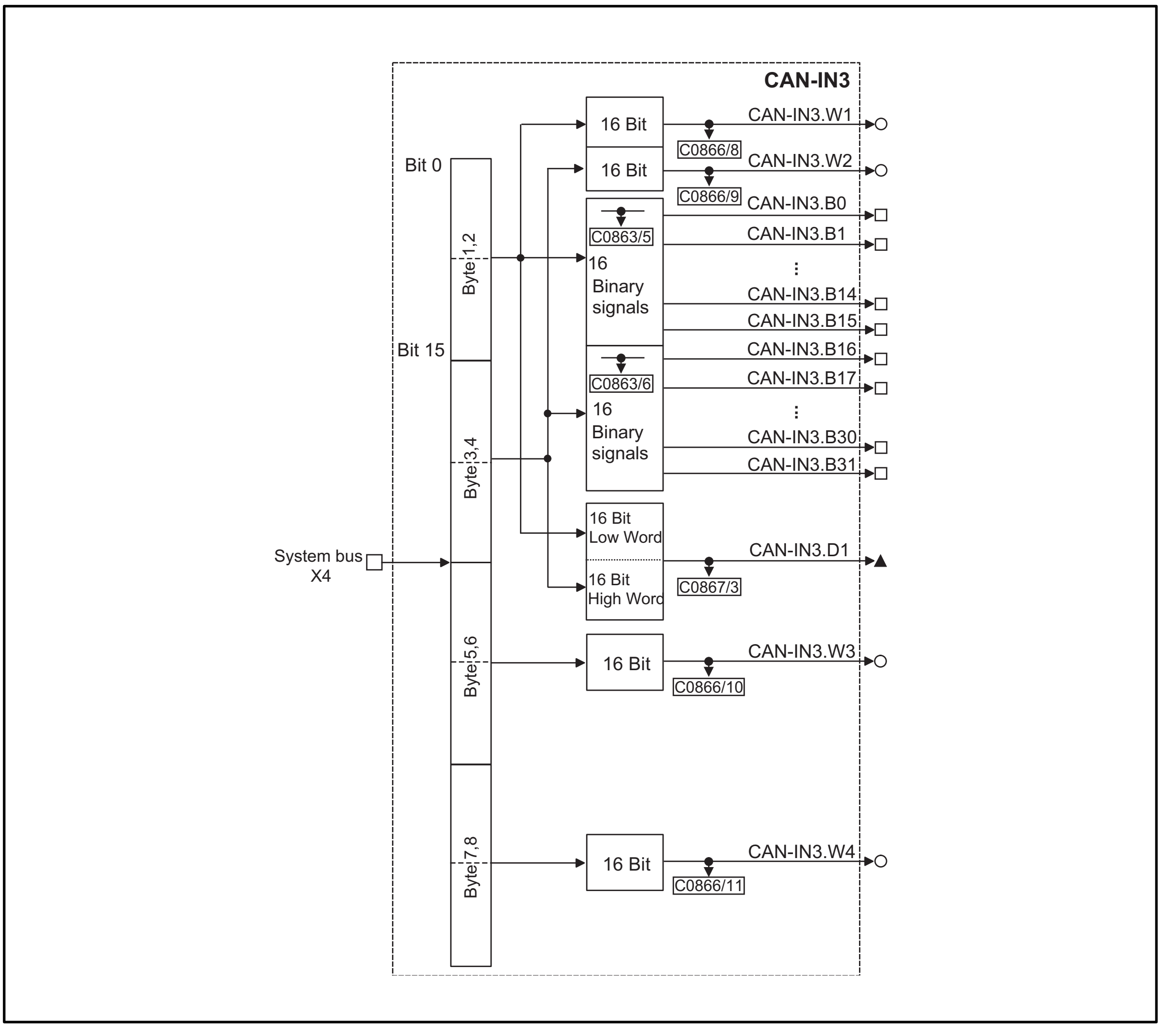


FIG 12-10 Function block CAN-IN3

Function

2x 8 Bytes are available for data traffic to the controller.

The Bytes 1, 2 and 3, 4 can be used simultaneously with up to 32 binary signals as two quasi-analog values and as phase information.The function is assigned via the configuration codes, where the input signals can be selected from the selection lists.

The Bytes 5, 6 and 7, 8 can be selected as quasi-analog signals (16-Bit data word) (e.g. with the configuration code C0890 setpoint speed).

12.1.6.6 Function output block CAN-OUT3

Purpose

The function block CAN-OUT3 is used for data traffic between the controllers and the data exchange to decentral input and output terminals. A data exchange with superimposed hosts is also possible.

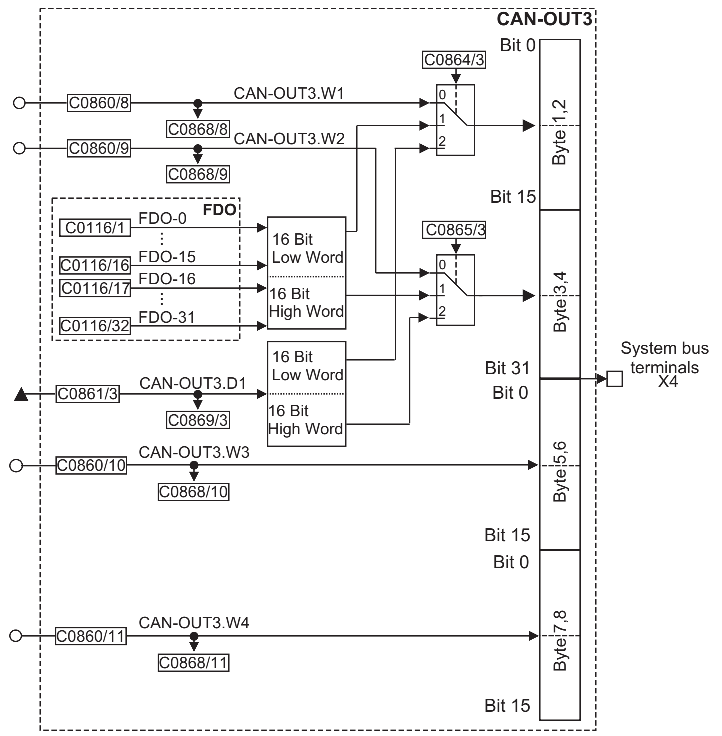


FIG 12-11 Function block CAN-OUT3

Function

2 x 8 Bytes are available for data traffic from the controller. The Bytes 1, 2 and 3, 4 can be assigned freely to a signal from the selection list as a 16-Bit data word (quasi-analog signal) (e.g. with C0860 for the actual speed).

With the codes C0864/3 and C0865/3, you can select whether 16 Bits are transmitted as data words (quasi-analog signals) or as 16 binary output signals (e.g. CW-CCW rotation) or as 32-Bit double-word (phase information).

Mixed types are possible with every switch setting of C0864/3 and C0865/3 (see function blocks CAN-OUT2 and CAN-OUT3).

The controller provides a total of 32 signals for the free programming for the transmission of binary output signals (32 Free programmable Digital Outputs, FDO).

These outputs are the same for CAN-OUT1, CAN-OUT2 and CAN-OUT3 and for the automation interface (AIF).

12.1.7 Application example

The setpoint integrator of drive 1 is to provide the speed for the drives 1 and 2 (compare FIG 12-12, connect X4 of controller 1 to X4 of controller 2)

Settings:

Controller 1		Controller 2	
C0350 = 1	Node = 1; i.e. output address for CAN-OUT2 = C0350 + 1 = 2	C0350 = 2	Node = 2; i.e. input address for CAN-IN2 = 2
C0352 = 2	Master	C0890 = 20201	CAN-IN2.W1 points to MCTRL-N-SET (CAN bus input to speed controller input)
C0860/4 = 5600	RFG1-OUT points to CAN-OUT2.W1 (setpoint integrator output to CAN bus)	-	-
C0890 = 5600	RFG1-OUT points simultaneously to MCTRL-N-SET (setpoint integrator output to speed controller input)	-	-

12.1.8 Address parameters (Codes/Index)

The controller parameters are addressed by the index. The index for Lenze codes is between 20567 (5060_{hex}) and 24575 ($5FFF_{hex}$)

Conversion:
Index = 24575 - Lenze code number
(relevant input parameters for the bus system).

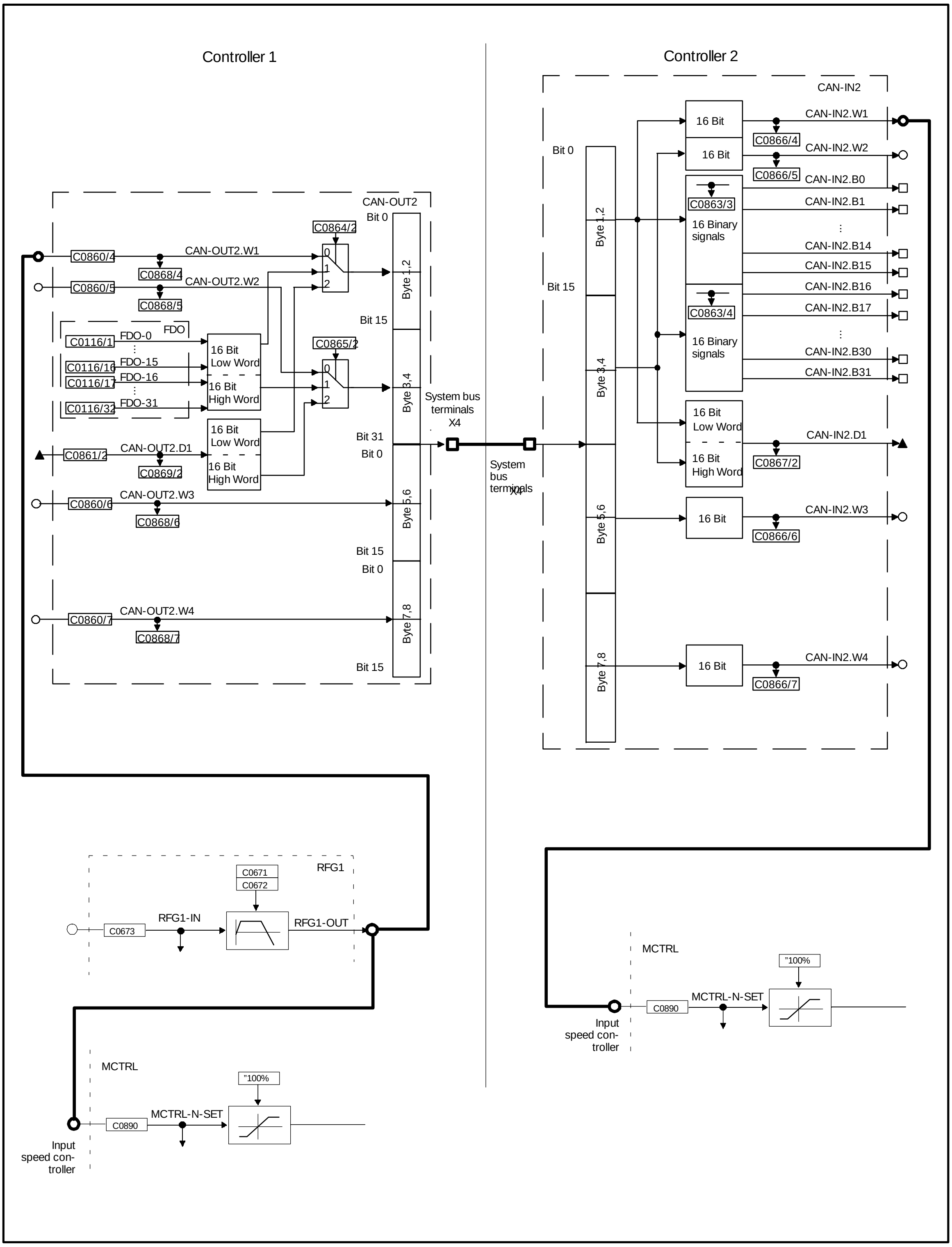


FIG 12-12 Wiring: Connect X4 of controller 1 to X4 of controller 2

12.1.9 Code description for the system bus

12.1.9.1 Baud rate setting C0351

The following settings are possible:

C0351	Value [kBit/s]
0	500 (factory setting)
1	250
2	125
3	50
4	1000

Save changes under C0003.

The effects of the settings are saved only after the following actions:

- a mains reconnection
- a command "Reset Node" via the bus system
- a "reset node" by code C0358

12.1.9.2 Determination of a master in the drive network C0352

If data are to be exchanged between the controllers without a host as a master, a controller has to be defined as the master.
The following assignments are valid:

- C0352 = 0: Drive is slave (factory setting)
- C0352 = 1: Drive is master

The master functionality is required only for the initialization phase of the drive system.

The master causes a state change from pre-operational to operational.

A data exchange via the process data objects is possible only in the operational state (see also chapter 12.1.9.7; section Bus status).

A boot-up time for the master can be set for the initalization phase (see time settings C0356/1, page 12-24).

12.1.9.3 General address assignment C0350

The addresses for all data objects (parameter and process data channels) can be set under C0350.

Save changes under C0003.

The effects of the settings are saved only after the following actions:

- a mains reconnection
- a command "Reset Node" via the bus system
- a reset node by code C0358

If the controllers are assigned to continuously rising addresses, the event-triggered data objects are connected such that a communication between the controllers is possible (see also application example).

Example:
Controller 1: Address C0350 = 1
Controller 2: Address C0350 = 2
Controller 3: Address C0350 = 3

Within the drive network, the data are thus assigned as follows:

- The output information of controller 1 is input information of controller 2
  CAN-OUT2 controller 1 → CAN-IN2 controller 2
  CAN-OUT3 controller 1 → CAN-IN3 controller 2
- The output information of controller 2 is input information of controller 3
  CAN-OUT2 controller 2 → CAN-IN2 controller 2
  CAN-OUT3 controller 2 → CAN-IN3 controller 3

The cyclic process data CAN-IN1 and CAN-OUT1 cannot be exchanged between the controllers.

Save changes under C0003.

Setting changes are accepted after

- a mains reconnection
- a command "Reset Node" via the bus system
- a reset node by code C0358

12.1.9.4 Selective addressing of individual process data objects C0353, C0354

If the data cannot be distributed as desired under C0350, every process data input and process data output object can be assigned to an individual address. For this, the data input objects to be requested must coincide with the identifier of the data output object. The identifier is a CAN-specific assignment critierion for a message. If third-party devices, such as decentral digital inputs and outputs are used, the resulting identifiers have to be observed. The identifiers can be called by code C0355.

For the selective assignment of the data objects three subcodes are available under C0353. These three subcodes select whether the address is assigned under C0350 or C0354. This is effective for all process data objects as follows:

C0353/x	C0353/x = 0 or 1	Meaning
C0353/1; Address preselection for the cyclic process data CAN-IN1 and CAN-OUT1	C0353/1 = 0 C0353/1 = 1	Addresses are determined by C0350 (factory setting) Address for CAN-IN1 is determined by C0354/1, address for CAN-OUT1 is determined by C0354/2
C0353/2; Adress preselection for the event-triggered process data CAN-IN2 and CAN-OUT2	C0353/2 = 0 C0353/2 = 1	Addresses are determined by C0350 (factory setting) Address for CAN-IN2 is determined by C0354/3, address for CAN-OUT2 is determined by C0354/4
C0353/3; Adress preselection for the event-triggered process data CAN-IN3 and CAN-OUT3	C0353/3 = 0 C0353/3 = 1	Addresses are determined by C0350 (factory setting) Address for CAN-IN3 is determined by C0354/5, address for CAN-OUT3 is determined by C0354/6

Save changes under C0003.

Setting changes are accepted after

- a mains reconnection
- a command ”Reset Node” via the bus system
- a reset node by code C0358

12.1.9.5 Display code of the resulting identifier C0355

C0355 is a display code for the resulting identifier. No values can be entered here.

The identifiers are calculated from the basic identifier and the valid address for the individual process data objects (see chapter CANopen, addressing of drives).

The following assignments are valid:

- C0355/1: Identifier CAN-IN1
- C0355/2: Identifier CAN-OUT1
- C0355/3: Identifier CAN-IN2
- C0355/4: Identifier CAN-OUT2
- C0355/5: Identifier CAN-IN3
- C0355/6: Identifier CAN-OUT3

12.1.9.6 Boot-up setting C0356/1

The times required for the data exchange can be modified under code C0356.

C0356/x	Meaning
C0356/1	Time setting for the master boot-up (valid only, if C0352 = 1) Normally, the factory setting is sufficient. If several controllers are connected in a network without a superimposed host initializing the CAN network, the initialization mut be done by a controller. For this, the master activates the complete CAN network once at a certain time and thus starts the process data transmission. (State change from pre-operational to operational). Here the time is set when this activation is carried out after mains switch-on.

Setting of the time cycle for CAN output data:

C0356/x	Meaning
C0356/2	Cycle time for the process data output object CAN-OUT2. • C0356/2 = 0: event-triggered process data transmission; the process data output object is sent only if a value changes in the output object. • C0356/2 > 0: the process data object CAN-OUT2 is sent with the cycle time set under this code
C0356/3	Cycle time for the process data output object CAN-OUT3. • C0356/3 = 0: event-triggered process data transmission; the process data output object is sent only if a value changes in the output object. • C0356/3 > 0: the process data object CAN-OUT3 is sent with the cycle time set under this code

12.1.9.7 Diagnostics codes

You can follow the actions on the bus via these diagnostics code:

- C359 Bus status
- C360 Telegram counter
- C361 Bus load

C359 Bus status

This code shows the momentary operating state of the bus system. Four states are distinguished:

- Operational -0-

In this state the bus system is operational.

- Pre-Operational -1-

Only parameters (codes) can be transmitted via the bus system. A data exchange between the controllers is not possible. To reach the operational status, a special signal has to be sent to the bus.
The following actions cause the state to change from operational to pre-operational:

- A drive is determined to be the master with code C0325. The state for the complete drive network is changed automatically when the boot-up time C356/1 has elapsed after mains connection.
- With code C0358 "reset node".
- With the binary input signal "reset node" which can be set with code C0364 via a terminal with corresponding configuration.
- A node reset via a connected host system.

- Warning -2-

In the warning state, faulty telegrams have arrived. The controller has only a passive function; the controller no longer sends data. The cause may be:

- no bus terminating resistor
- insufficient screening
- potential difference of the ground connection of the control electronics
- excessive bus load
- controller is not connected to the bus

- Bus Off -2-

The frequency of the faulty telegrams has caused the controller to disconnect from the bus. A connection is possible by:

- a trip reset
- a node reset
- mains reconnection

C360 Telegram counter

The telegrams which are valid for the controller are counted for all function blocks and also for all parameter channels. The counters have a width of 16 bits, i.e. if a value of 65535 is exceeded, the counting starts again at 0.

The following messages are counted:

C0360/x	Meaning
C360/1	All telegrams sent
C360/2	All telegrams received
C360/3	Telegrams sent by CAN-OUT1
C360/4	Telegrams sent by CAN-OUT2
C360/5	Telegrams sent by CAN-OUT3
C360/6	Telegrams sent by parameter channel 1
C360/7	Telegrams sent by parameter channel 2
C360/8	Telegrams received by CAN-IN1
C360/9	Telegrams received by CAN-IN2
C360/10	Telegrams received by CAN-IN3
C360/11	Telegrams received by parameter channel 1
C360/12	Telegrams received by parameter channel 2

C361 Bus load

This code is used to find out the bus load of the controllers in percent, or which load is used by every individual data channel or function block. Faulty telegrams are not considered here.

The subcodes show the following bus loads:

C0361/x	Meaning
C361/1	All telegrams sent
C361/2	All telegrams received
C361/3	Telegrams sent by CAN-OUT1
C361/4	Telegrams sent by CAN-OUT2
C361/5	Telegrams sent by CAN-OUT3
C361/6	Telegrams sent by parameter channel 1
C361/7	Telegrams sent by parameter channel 2
C361/8	Telegrams received by CAN-IN1
C361/9	Telegrams received by CAN-IN2
C361/10	Telegrams received by CAN-IN3
C361/11	Telegrams received by parameter channel 1
C361/12	Telegrams received by parameter channel 2

The data transmission is limited by the number of telegrams per time unit and data transmission rate.

For a data exchange in a dedicated drive network, you can determine these limits by adding code C0361/1 of all drives concerned.

Example:
3 drives are interconnected via CAN.

Controller 1: Code C361/1	= 23.5 %
Controller 2: Code C361/1	= 12.6 %
Controller 3: Code C361/1	= 16.0 %
Total bus load:	= 52.1 %

Note!

- The bus load of all connected controllers should not exceed 80 %.
- If other devices such as decentral inputs and outputs are connected, these telegrams have also to be considered.
- A bus overload can be caused for instance, by an event-triggered transmission of continuously changing signals.

Remedy: Set a cycle time for the corresponding function block (CAN-OUT2 and CAN-OUT3) under code C356/2 and C356/3 to a value such that the total of all bus loads is not exceeded.

12.1.9.8 Monitoring

Monitoring times C357

Every single process data input object can monitor whether a telegram has arrived within a defined time. If a telegram has arrived, the set monitoring time is restarted (function of a retriggerable monostable).

The following assignments are valid:

C357/1	Monitoring time CAN-IN1
C357/2	Monitoring time CAN-IN2
C357/3	Monitoring time CAN-IN3

The reaction to this monitoring is set by:

- C0591 Monit CE1 for CAN-IN1
- C0592 Monit CE2 for CAN-IN2
- C0593 Monit CE3 for CAN-IN3

The following can be set:

0 = Trip (the controller sets controller inhibit)

1 = Warning

2 = Monitoring is switched off

The signals can also be used as binary output signals, for instance for the assignment of output terminals.

Bus Off

If the controller has disconnected from the bus because of faulty telegrams, the signal Monit CE4 is set.

This signal can release a trip or a warning or can be deactivated just like the signals CE1, CE2, and CE3. Under code C0595 you can select a reaction. A terminal output can also be assigned here.

Reset node C358

Entries of other baud rates or address changes of the process data objects or the controller address because effective after a node reset.

A node reset can be carried out by

- mains reconnection
- ”Reset node” via the bus system
- ”Reset node” by code C0358

12.1.10 Communication profile of the system bus

Description of the CAL- based communication profile DS 301 (CANopen) for the 93XX servo inverter

Simplified representation of a CAN telegram structure:

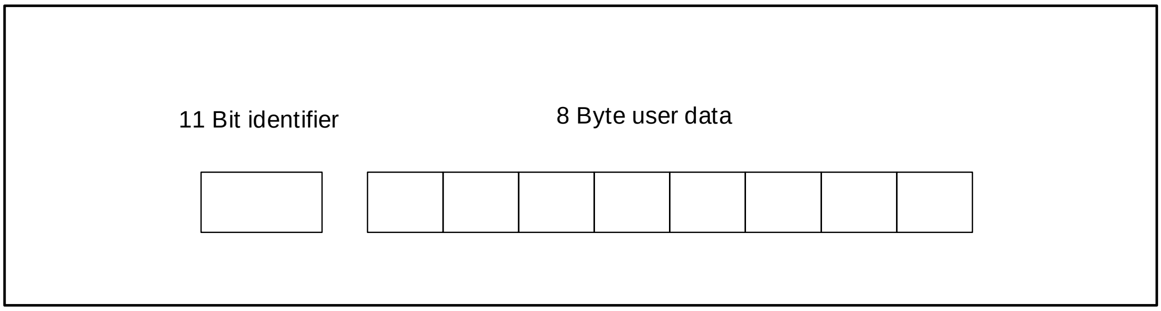


FIG 12-13 Structure of a CAN telegram (simplified representation)

12.1.10.1 Data description

Identifier

The identifier defines the priority of the message. In CANopen is also coded:

- The controller address (see also chapter 12.1.10.2).
- the user data to be transmitted.

User data

User data can be used as three different types:

- Initialization:
  User data are used to establish the communication via the CAN bus.
- Parameterization:
  User data are used for the parameterization of the controllers. For Lenze controllers, the parameters are saved in the codes (e.g. C0012 acceleration time).
- Process data:
  User data are used for fast, often cyclic procedures (e.g. setpoint speed and actual speed).

12.1.10.2 Addressing of the drives

The CAN bus system is message-oriented and not device-oriented. Every message has a unique identification, the identifier. In CANopen every message has only one sender so that a device orientation is achieved. The identifiers are calculated by the addresses entered in the controller. This does not apply however, to the identifiers of the network management.

Identifier = basic identifier + address to be set

The identifiers are defined as follows:

Identifier	Value
Network management Sync telegram	0 128
Parameter channel 1 to the drive Parameter channel 2 to the drive	1536 + address in C0350 1600 + address in C0350
Parameter channel 1 from the drive Parameter channel 2 from the drive	1408 + address in C0350 1472 + address in C0350
cyclic process data channel to the drive (CAN-IN1) cyclic process data channel from the drive (CAN-OUT1)	512 + address in C0350 384 + address in C0350
event-triggered process data channel to the drive (CAN-IN2) event-triggered process data channel from the drive (CAN-OUT2)	640 + address in C0350 641 + address in C0350
event-triggered process data channel to the drive (CAN-IN3) event-triggered process data channel from the drive (CAN-OUT3)	768 + address in C0350 769 + address in C0350

Selective identifier definition for the process data objects

Every process data object (function blocks CAN-IN1, CAN-IN2, CAN-IN3, CAN-OUT1, CAN-OUT2, CAN-OUT3) can be assigned an address of its own. For this, select under C0353 whether the identifiers for the process data of C0350 are derived, or whether the code C0354 determines the identifier.

The following can be set:

C0353/x	Meaning
C0353/1 = 0 (C0350) C0353/1 = 1 (C0354)	Addresses of CAN-IN1 and CAN-OUT1 are determined by C0350 Address of CAN-IN1 is determined by C0354/1 Address of CAN-OUT1 is determined by C0354/2
C0353/2 = 0 (C0350) C0353/2 = 1 (C0354)	Addresses of CAN-IN2 and CAN-OUT2 are determined by C0350 Address of CAN-IN2 is determined by C0354/3 Address of CAN-OUT2 is determined by C0354/4
C0353/3 = 0 (C0350) C0353/3 = 1 (C0354)	Addresses of CAN-IN3 and CAN-OUT3 are determined by C0350 Address of CAN-IN3 is determined by C0354/5 Address of CAN-OUT3 is determined by C0354/6

For all process data input and output objects is valid:

Identifier = basic identifier + value under C0354/x
(x = subcode 1 to 6, assignment see above)

Identifier = 384 + value under C0354/x

12.1.11 The communication phases of the CAN network

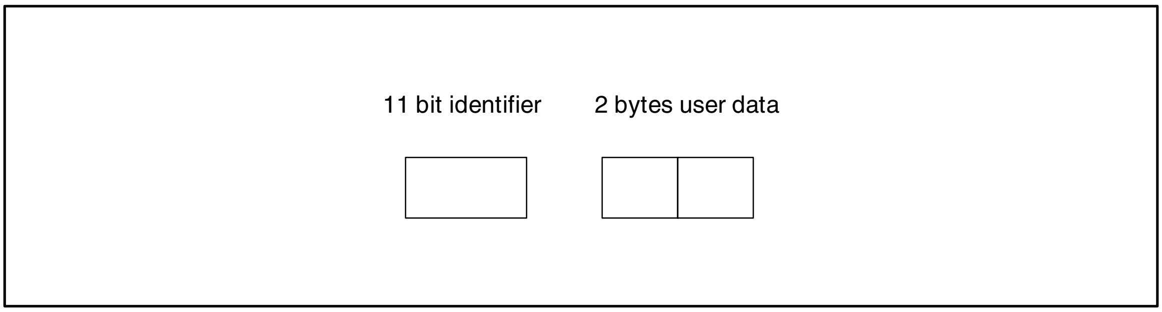


FIG 12-14 Telegram to change the communication phase

To change between the different communication phases, telegrams with the identifier 0 and 2 bytes user data are used.

In terms of communication the controller can adopt three states:

State	Explanation
a	**"Initialization" state** The drive is excluded from the data traffic on the bus. This state is achieved after switching-on the controller. It is also possible to run through a part of the initalization or the complete initialization by the transmission of diverse telegrams. All parameters already set are written again with their default values. After completion of the initialization the drive is automatically in the "pre-operational" state.
b	**"Pre-Operational" state (prior to "ready")** The drive can receive parameterization data. Process data are ignored.
c	**"Operational" state (ready for operation)** The drive can receive parameterization and process data.

The communication phases are changed over for the complete network by one controller, the network master.

This can also be carried out by a 93XX controller. This controller has to be defined as the master under code C0352.

With a delay after mains connection, a telegram is sent once which sets the complete drive network to the "operational" state.

The delay time can be set under code C0356/1.

If certain telegrams are transmitted, the system changes to another state:

from	to	Data (hex)	Note
Pre-Operational	Operational	01xx	Process and parameterization data active
Operational	Pre-Operational	80xx	Only parameterization data active
Operational	Initialisation	81xx	Resets the drive; all parameters are written with default values
Pre-Operational	Initialisation	81xx	
Operational	Initialisation	82xx	Resets the drive; only parameters relevant for communication are reset
Pre-Operational	Initialisation	82xx	

For the assignment of the Bytes marked ”xx” in the column, the following applies:

- xx = 00_{hex}:
  In this assignment, all connected controllers are requested by the telegram. The state can be changed for all controllers at the same time.
- xx = controller address:
  If a controller address is specified, the state is changed only for the controller with this address.

Note:
A communication via the process data is possible only when the state has changed to operational!

12.1.12 Parameterization

Two separate software channels which are defined by the controller address are available for the parameterization.

The telegram structure for the parameterization is as follows:

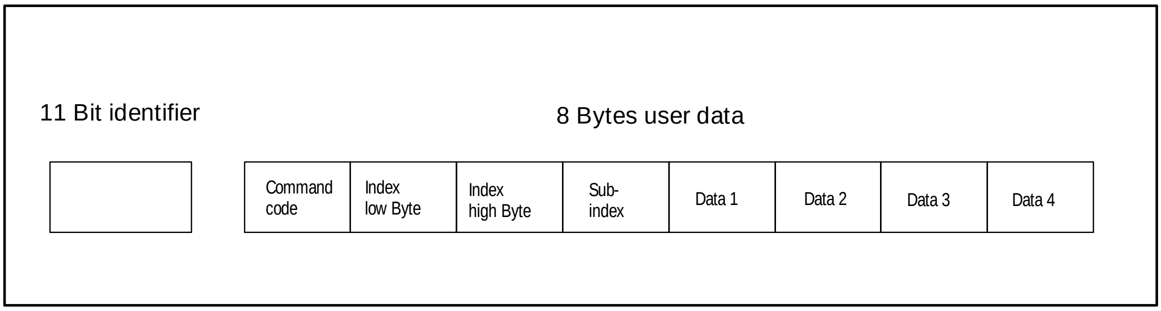


FIG 12-15 Telegram structure for the parameterization

Command code:
In the command code, services must be or are entered for example for the way in which a parameter is to be sent or written, and the length of these data.

Structure of the command code:

Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Command Specifier (cs)			0	Length		e	s

	cs				Length		e	s
Write Request	0	0	1	0	x	x	1	1
Write Response	0	1	1	0	x	x	0	0
Read Request	0	1	0	0	x	x	0	0
Read Response	0	1	0	0	x	x	1	1
Error Response	1	0	0	0	0	0	0	0

The user data length for these services are coded in Bit 2 and Bit 3 as follows:

- 00 = 4 Bytes
- 01 = 3 Bytes
- 10 = 2 Bytes
- 11 = 1 Byte

The most frequent parameters are data with a data length of 4 Bytes (32 Bits) and 2 Bytes (16 Bits).

Thus, the following values result for these parameters in the command code:

Services	4 Bytes (32 Bits) data		2 Bytes (16 Bits) data		Meaning
	hex	dez	hex	dez	
Write Request	23_{hex}	35	$2B_{hex}$	43	Send parameters to the drive
Write Response	60_{hex}	96	60_{hex}	64	Response of the controller to the Write Request (acknowledgement)
Read Request	40_{hex}	64	40_{hex}	64	Request to read a parameter by the controller
Read Response	43_{hex}	67	$4B_{hex}$	75	Response to a read request with momentary value
Error Response	80_{hex}	128	80_{hex}	128	The controller indicates a communication error

Index LOW Byte, Index HIGH Byte

The parameter or the Lenze code is selected with these two Bytes according to the formula:

Index = 24575 - Lenze code number

Example:
Parameter C0012 (acceleration time) is to be requested

24575 - 12 = 24563 = $5FF3_{hex}$

According to the left-justified Intel data format the entries are as follows (see description of the data format on the CAN bus):
Index LOW Byte = $F3_{hex}$
Index HIGH Byte = $5F_{hex}$

Subindex

A subindex is a position of a parameter below the index.

Example:
Terminal X5/A1, subcode 1 under parameter C0117 is to be requested.

Index = 24575 - 117 = $5F8A_{hex}$ (index LOW Byte = 8A, index HIGH Byte = 5F)

Subindex = 1

If a parameter is requested which has no subindex, 0 must be entered.

Data 1 to data 4

The value to be transmitted is up to 4 Bytes.
The parameters of the 93XX controller series are stored in different formats. The most common is the Fixed-32 format. This is a fixed point format with 4 decimals behind the point. The user has to observe here that these parameters have to be multiplied with 10,000. The description and assignment of the individual formats are listed in the code table.

Error

Command code = 128 = 80_{hex}
The drive generates an error response in case of an error. This means that in the user data part of data 4 always a 6 and in data 3 an error code is transmitted.

Possible error codes:

Command code	Data 3	Data 4	Meaning
80_{hex}	6	6	Incorrect index
80_{hex}	5	6	Incorrect subindex
80_{hex}	3	6	Access denied

Example: Description of a data format

The user data are represented left-justified in the Intel format.
The following telegram will serve as an example for the left-justified Intel data format:

The value 20 s is to be transmitted for code C0012.

Index = 24575 - Lenze code = 24575 - 12 = 24563 = $5FF3_{hex}$

Value (Data 1 - Data 4) = 20 s x 10,000 = 200,000 = 00 03 0D 40_{hex}

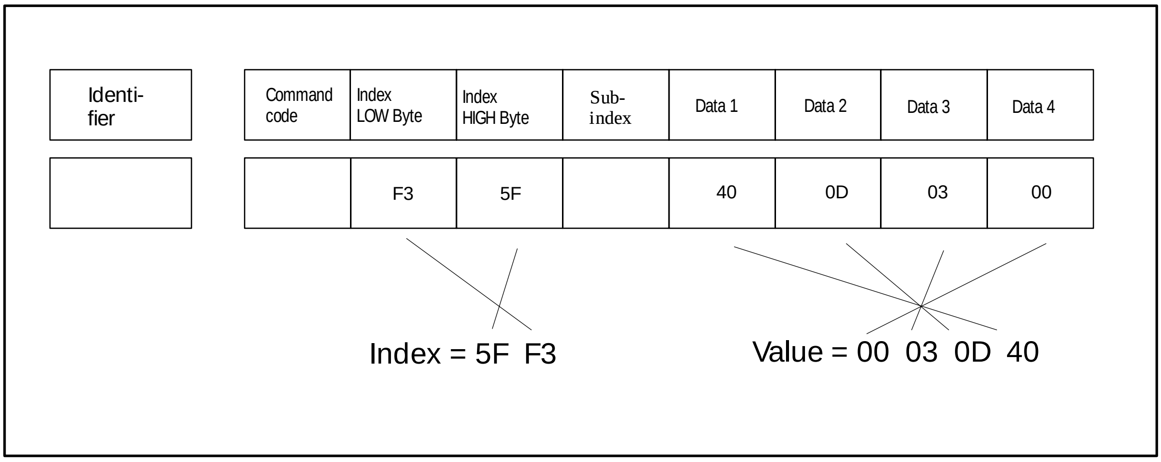


FIG 12-16 Example for a description of a data format

12.1.12.1 Example: Write parameter

The acceleration time C0012 of the controller with the address 1 is to be changed to 20 s via the parameter channel 1.

Calculation identifier:
Identifier of parameter channel 1 to controller =
1536 + controller address = 1536 + 1 = 1537

Command code = Write Request (send parameter to the drive) = 23 $_{hex}$

Calculation of the index:
Index = 24575 - code No. = 24575 - 12 = 24563 = 5FF3$_{hex}$
Subindex at C0012 = 0

Calculation of the value for the acceleration time
20 s * 10,000 = 200,000 = 00030D40$_{hex}$

Telegram to the drive:

Identifier	Command code	Index LOW Byte	Index HIGH Byte	Sub-index	Data 1	Data 2	Data 3	Data 4
1537	23	F3	5F	00	40	0D	03	00

FIG 12-17 Telegram to the drive

Response of the drive when performing without errors:

Identifier	Command code	Index LOW Byte	Index HIGH Byte	Sub-index	Data 1	Data 2	Data 3	Data 4
1409	60	F3	5F	00	00	00	00	00

FIG 12-18 Response of the drive when performing without errors

Identifier parameter channel 1 from the controller: 1408 + controller address = 1409
Command code = Write Response (response of the controller (acknowledgement)) = 60$_{hex}$

12.1.12.2 Example: Read parameter

The heatsink temperature (value of 43 °C) C0061 is to be read by the controller with address 5 via parameter channel 1.

Calculation identifier:
Identifier from parameter channel 1 to the controller = 1536 + controller address = 1536 + 5 = 1541

Command code = Read Request (Request to read a parameter from the controller) = 40_{hex}

Calculation of the index:
Index = 24575 - code No. = 24575 - 61 = 24514 = $5FC2_{hex}$

Telegram to the drive:

Identifier	Command code	Index LOW Byte	Index HIGH Byte	Sub-index	Data 1	Data 2	Data 3	Data 4
1541	40	C2	5F	00	00	00	00	00

FIG 12-19 Telegram to the drive

Telegram from the drive:

Identifier	Command code	Index LOW Byte	Index HIGH Byte	Sub-index	Data 1	Data 2	Data 3	Data 4
1413	43	C2	5F	00	B0	8F	06	00

FIG 12-20 Telegram from the drive

Identifier parameter channel 1 from the controller = 1408 + controller address = 1413

Command code = Read Response with the momentary value = 43_{hex}

Index of the read request = $5FC2_{hex}$
Subindex = 0 (no subindex for C0061)

Data 1 to Data 4 = 43 °C x 10,000 = 430,000 = $00068FB0_{hex}$

12.1.13 Process data

Three process data objects for input information and three process data objects for output information are available for the fast data exchange between the controllers.

These process data objects are used to transmit simple binary signals such as states of digital input terminals or complete values in 16 and 32 Bit, e.g. analog signals.

These data objects are stored as function blocks in the inputs and outputs.

(The "Process data objects" (PDO) are implemented in the 93XX controller in the form of funtion blocks CAN-INx and CAN-OUTx).

Cyclic process data objects

One process data object for input signals and one process data object for output signals with 8 Bytes user data each is available for fast cyclic data traffic.

These data are provided for superimposed hosts, e.g. a PLC (function blocks CAN-IN1 and CAN-OUT1).

Event-triggered process data objects

Two process data objects for input signals and two process data objects for output signals with 8 Bytes user data each are available for event-triggered data traffic.

The data are transmitted if a value changes in the user data. These process data objects are particularly suitable for the data exchange between the controllers and for decentral terminal extensions.

They can also be used by a host, however (function blocks CAN-IN2, CAN-IN3 and CAN-OUT2, CAN-OUT3).

12.1.13.1 Cyclic process data objects

An additional special telegram, the synch telegram, is necessary for the cyclic process data to be read and accepted by the controller.

The synch telegram is the trigger point for the data acceptance in the controller, and starts the transmission from the controller. The synch telegram has to be generated for a cyclic process data processing.

The synchronization of the cyclic process data

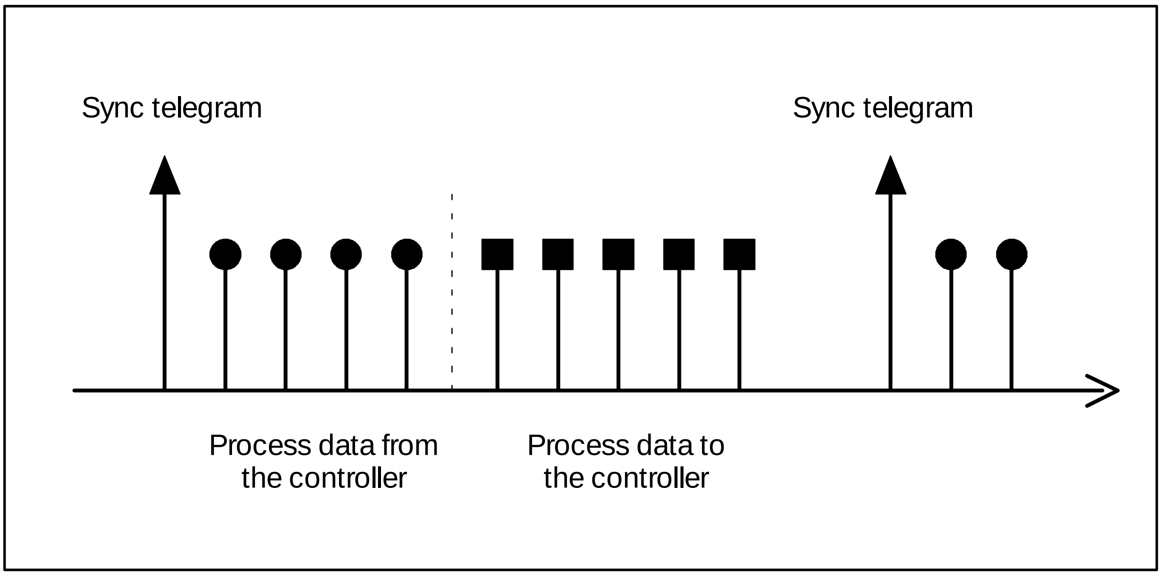


FIG 12-21 Sync telegram

After the synch telegram, the cyclic process data are sent by the controllers. Then, the data are transferred to the controllers. The data are then accepted by the individual controllers with the next synch telegram.

All following telegrams, e.g. parameters or event-triggered process data are accepted asynchronously after the transmission by the controllers.

The asychronous data are not considered in the above representation.

Cyclic process data telegram to the drive CAN-IN1

The process data telegram to the drive has a user data length of 8 Bytes. It has the following structure:

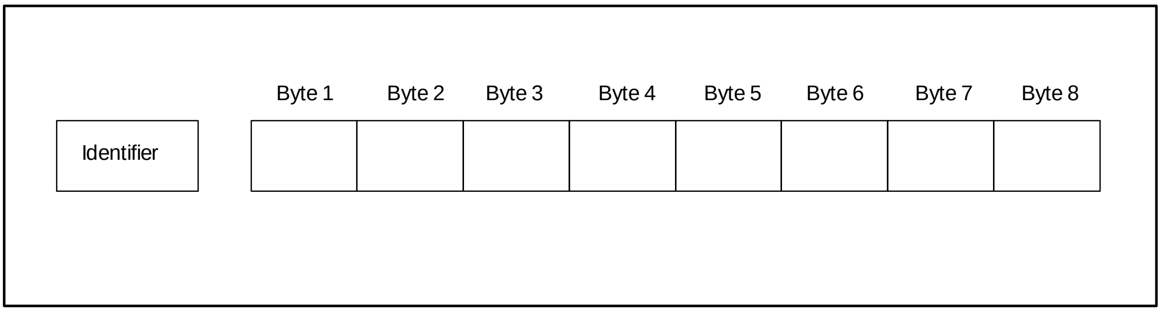


FIG 12-22 Cyclic process data telegram to the drive

Assignment of the user data:

Byte	Word assignment (16 Bit)	Individual Bit assignment	Double-word assignment (32 Bit)
1	Control word (LOW Byte)		
2	Control word (HIGH Byte)		
3	CAN-IN1.W1 (LOW Byte)		
4	CAN-IN1.W1 (HIGH Byte)		
5	CAN-IN1.W2 (LOW Byte)	CAN-IN1.B0 … CAN-IN1.B15	CAN-IN.D1
6	CAN-IN1.W2 (HIGH Byte)		
7	CAN-IN1.W3 (LOW Byte)	CAN-IN1.B16 … CAN-IN1.B31	
8	CAN-IN1.W3 (HIGH Byte)		

The Bytes 5 and 6 or 7 and 8 can be used simultaneously as

- 32 individual binary signals
- 2 individual 16-Bit values (”quasi-analog signal”)
- a double-word (32 Bit)

For the assignment of the function blocks see chapter 12.1.6 ”Working with function blocks” and chapter 12.1.6.1 ”System bus CAN-IN1”.

Cyclic process data telegram from drive CAN-OUT1

The structure of the process data telegram is as follows:

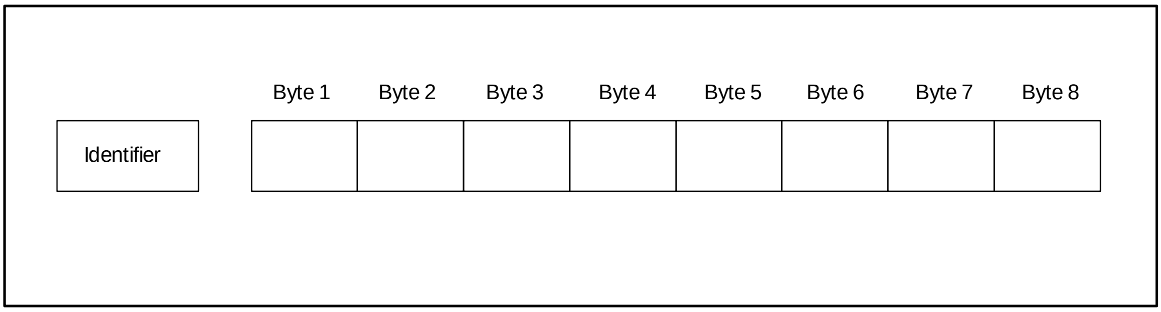


FIG 12-23 Cyclic process data telegram from the drive

Assignment of the user data:

Byte	Word assignment (16 Bit)	Individual Bit assignment	Double-word assignment (32 Bit)
1	Status word (LOW Byte)		
2	Status word (HIGH Byte)		
3	CAN-OUT1.W1 (LOW Byte)		
4	CAN-OUT1.W1 (HIGH Byte)		
5	CAN-OUT1.W2 (LOW Byte)	CAN-OUT1.B0 … CAN-OUT1.B15	CAN-OUT1.D1
6	CAN-OUT1.W2 (HIGH Byte)		
7	CAN-OUT1.W3 (LOW Byte)	CAN-OUT1.B16 … CAN-OUT1.B31	
8	CAN-OUT1.W3 (HIGH-Byte)		

For the Bytes 5, 6, or 7, 8 you can decide whether you wish a word assignment ("quasi-analog signal") as e.g. the actual speed or an individual Bit assignment with 16 individual binary signals or a double-word assignment (32 Bit) as e.g. the actual phase.

For the assignment of the function blocks see chapter 12.1.6 "Working with function blocks" and chapter 12.1.6.2" System bus CAN-OUT1".

12.1.13.2 Event-triggered process data objects with cycle time to be set

The event-triggered process data are to be assigned, as the cyclic process data, with the individual function blocks.

Here are also 8 Bytes available for a data object.

The output data are transmitted always when a value changes with the 8 Byte user data or the cycle time set under code C0356/1 for CAN-OUT2 and 356/2 for CAN-OUT3.

For the inputs, corresponding monitoring times can be set under code C0357/2 for CAN-IN2 and C0357/3 for CAN-IN3.

Event-triggered process data telegrams CAN-IN1 and CAN-IN2 to the drive

The process data telegrams to the drive have a user data length of 8 Bytes and have the following structure:

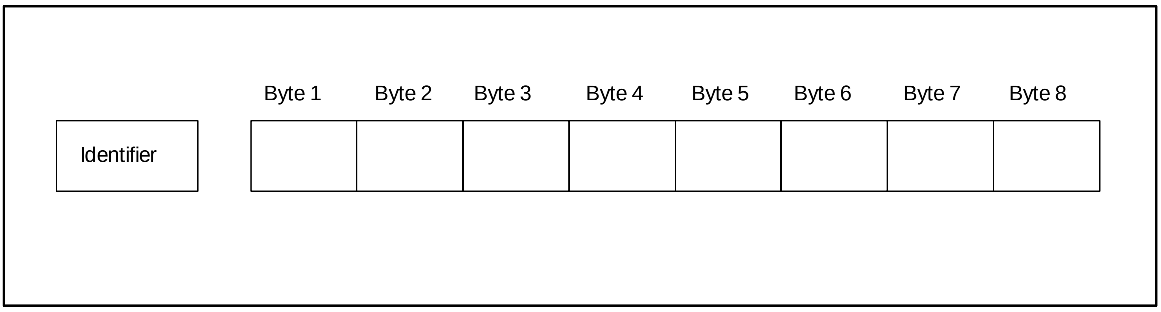


FIG 12-24 Event-triggered process data telegram to the drive

Assignment of the user data:

Byte	Word assignment (16 Bit)	Individual Bit assignment	Double-word assignment (32 Bit)
1	CAN-IN2.W1 (LOW Byte)	CAN-IN2.B0 ...	CAN-IN2.D1
2	CAN-IN2.W1 (HIGH Byte)	CAN-IN2.B15	
3	CAN-IN2.W2 (LOW Byte)	CAN-IN2.B16 ...	
4	CAN-IN2.W2 (HIGH Byte)	CAN-IN2.B31	
5	CAN-IN2.W3 (LOW Byte)		
6	CAN-IN2.W3 (HIGH Byte)		
7	CAN-IN2.W4 (LOW Byte)		
8	CAN-IN2.W4 (HIGH Byte)		

The Bytes 1 and 2 or 3 and 4 can be used simultaneously as 32 individual binary signals, as two individual 16-Bit data words (”quasi-analog signal”) and as a double-word (32 Bit).

For the assignment of the function blocks see chapter 12.1.6 ”Working with function blocks” and chapter 12.1.6.3 ”System bus CAN-IN2”.

Event-triggered process data telegrams to the drive CAN-IN3

The process data telegrams to the drive have a user data length of 8 Bytes and have the following structure:

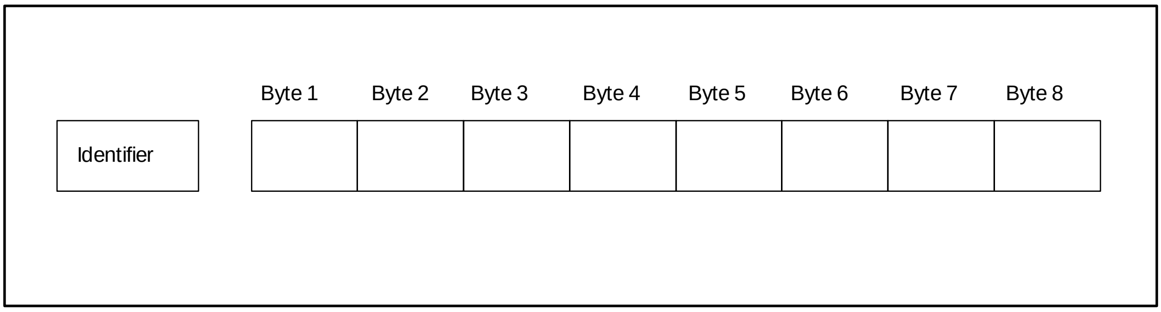


FIG 12-25 Event-triggered process data telegram to the drive

Assignment of the user data:

Byte	Word assignment (16 Bit)	Individual Bit assignment	Double-word assignment (32 Bit)
1	CAN-IN3.W1 (LOW Byte)	CAN-IN3.B0 …	CAN-IN3.D1
2	CAN-IN3.W1 (HIGH Byte)	CAN-IN3.B15	
3	CAN-IN3.W2 (LOW Byte)	CAN-IN3.B16 …	
4	CAN-IN3.W2 (HIGH Byte)	CAN-IN3.B31	
5	CAN-IN3.W3 (LOW Byte)		
6	CAN-IN3.W3 (HIGH Byte)		
7	CAN-IN3.W4 (LOW Byte)		
8	CAN-IN3.W4 (HIGH Byte)		

The Bytes 1 and 2 or 3 and 4 can be used simultaneously as

- 32 individual binary signals
- 2 individual 16-Bit data words ("quasi-analog signal")
- a double-word (32 Bit)

For the assignment of the function blocks see chapter 12.1.6 "Working with function blocks".

Event-triggered process data telegrams CAN-OUT2 and CAN-OUT3 from the drive

The process data telegrams from the drive have a user data length of 8 Bytes and have the following structure:

Event-triggered process data telegram CAN-OUT2

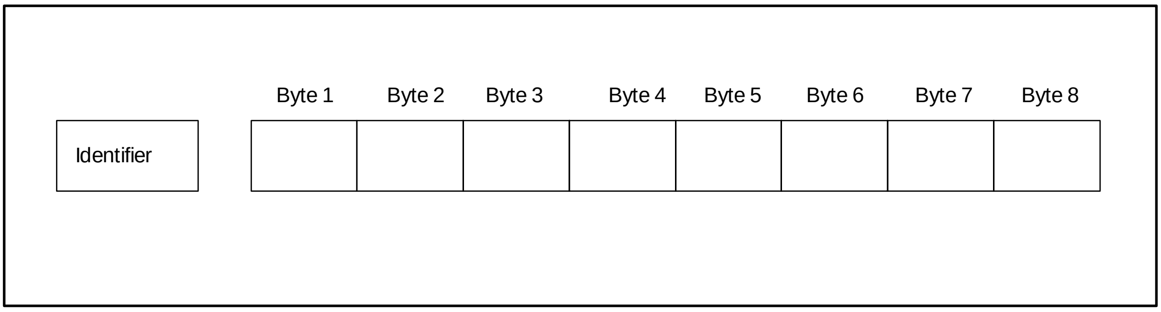


FIG 12-26 Event-triggered process data telegram from the drive

Assignment of the user data:

Byte	Word assignment (16 Bit)	Individual Bit assignment	Double-word assignment (32 Bit)
1	CAN-OUT2.W1 (LOW Byte)	FDA 0 …	CAN-OUT2.D2
2	CAN-OUT2.W1 (HIGH Byte)	FDA 15	
3	CAN-OUT2.W2 (LOW Byte)	FDA 16 …	
4	CAN-OUT2.W2 (HIGH Byte)	FDA 31	
5	CAN-OUT2.W1 (LOW Byte)	-	-
6	CAN-OUT2.W1 (HIGH Byte)		
7	CAN-OUT2.W2 (LOW Byte)		
8	CAN-OUT2.W2 (HIGH Byte)		

Event-triggered process data telegram CAN-OUT3

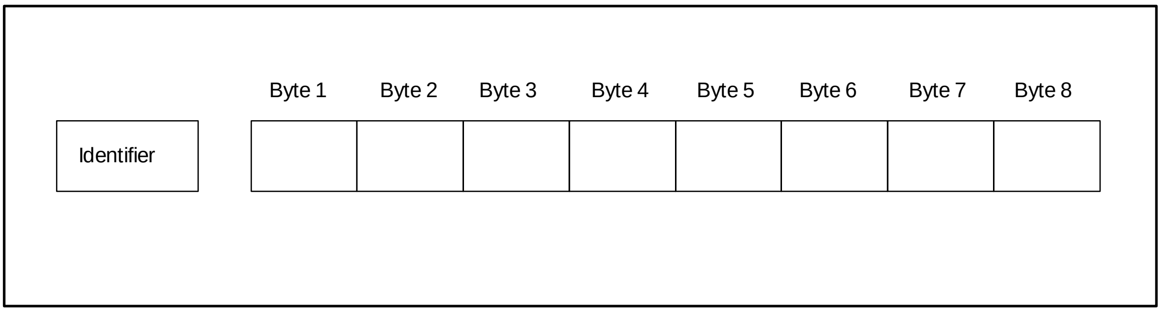


FIG 12-27 Event-triggered process data telegram from the drive

Assignment of the user data:

Byte	Word assignment	Individual Bit assignment	Double-word assignment (32 Bit)
1	CAN-OUT3.W1 (LOW Byte)	FDA 0 ...	CAN-OUT3.D2
2	CAN-OUT3.W1 (HIGH Byte)	FDA 15	
3	CAN-OUT3.W2 (LOW Byte)	FDA 16 ...	
4	CAN-OUT3.W2 (HIGH Byte)	FDA 31	
5	CAN-OUT3.W1 (LOW Byte)	-	-
6	CAN-OUT3.W1 (HIGH Byte)		
7	CAN-OUT3.W2 (LOW Byte)		
8	CAN-OUT3.W2 (HIGH Byte)		

For the assignment of the function blocks see chapter 12.1.6 ”Working with function blocks” and chapter 12.1.6.6 ”System bus CAN-OUT3”.

12.1.13.3 Special features of the binary output signals FDO1 to FDO 32

If the outputs are preselected in the binary data transmission, the values for the AIF, the cyclic process data and the two event-triggered process data are identical.

Automation

14 Help for selection

Type	**8200** **Frequency inverter** U/F, Autoboost, Vector	**9300** **Servo inverter** sensorless control (SSC)	 Servo
Application examples	Pumps, blowers, conveyor belts, traversing and transport drives Textile machines	Conveyor belts, traversing and transport drives, hoists, lists, extruders	Packing, wire draw, winding, textil processing and printing machines, cross cutters, storage and retrieval units for high-bay warehouses
General requirements	Standard applications	higher response extended applications	highest response extended applications
Mains voltage	820X: 190 - 260 V 50/60 Hz ± 0 % 821X: 320 - 510 V 50/60 Hz ± 0 % 822X, 824X: 320 - 528 V 50/60 Hz ± 0 %	320 - 528 V 50/60 Hz ± 0 %	320 - 528 V 50/60 Hz ± 0 %
Power	0.37 kW - 90.0 kW	0.37 kW - 90.0 kW	0.37 kW - 90.0 kW
Motors	Asynchronous inverter motor	Asynchronous servo motor Asynchronous inverter motor	Synchronous servo motor Asynchronous servo motor Asynchronous inverter motor
Operating modes Single drive Group drive 1)	 yes yes	 yes no	 yes no
Speed control Accuracy Setting range Cycle time, controller Dynamics	 0.5 % 6 ms 	 0.5 % 1 : 20 	 quartz-precise, 200 ppm 1 : 8000, with phase control 250 µs 7 ms/1000 rpm typical
Smooth running $n/n_{N\,[\%]}$ (Speed ripple)	1 %	1 %	0.135 phase seconds
Torque control Setting range Linearity Cycle time, controller Dynamics t_{rise}	 4 ms	 1 : 50 5 %, temp. error 20 - 30 % 62.5 µs 1 ms	 1 : 100 5 %, temp. compensated 62.5 µs 1 ms
Phase control Resolution Cycle time, controller			 0.005°, 16 Bit 500 µs
Pulse train coupling Pulse train input Pulse train output		(4096 inc., 7324 rpm) 0 - 500 kHz 0 - 500 kHz	(4096 inc., 7324 rpm) 0 - 500 kHz 0 - 500 kHz
Setpoint resolution analog digital, motor pot	 10 Bit 16 Bit	 11 Bit + VZ 16 Bit	 11 Bit + VZ 16 Bit
Actual value resolution Resolver Encoder with sine/cos 512 inc.	 no no		 16 Bit internal 14 Bit + sign external 17 Bit internal 14 Bit + sign external

Help for selection

Type	8200 **Frequency inverter** U/F, Autoboost, Vector	9300 **Servo inverter** sensorless control (SSC)	 Servo
Process controller		yes	yes
Brake logic		yes	yes
Digital inputs	5 PLC comp.	4 + 1 interupt, PLC comp.	4 + 1 interupt, PLC comp.
Digital outputs	1 relay	4 PLC comp.	4 PLC comp.
Analog outputs	1	2.9 Bit + sign	2.9 Bit + sign
Bus systems [2)] CAN RS232, RS485 InterBus S PROFIBUS DP	 Fieldbus module type: 2171 Fieldbus module type: 2102 Fieldbus module type: 2111 Fieldbus module type: 2131	 integrated Fieldbus module type: 2102 Fieldbus module type: 2111 Fieldbus module type: 2131	 integrated Fieldbus module type: 2102 Fieldbus module type: 2111 Fieldbus module type: 2131
Costs	very favourable	favourable	favourable

1) Group drives consist of a controller, which operates several motors

2) See chapter 12

17 Glossary

Name	Meaning
AIF	Automation interface (X1)
CAN	Controller Area Network
CE	Communauté Européenne (English: European Community)
Code	For the input and display (access) of parameter values. Addressing of variables according to the "code/subcode" format (Cxxxx/xx). All variables can be addressed via the code designation.
Contouring error	Deviation between momentary position setpoint and actual position. Display for a momentary Contouring error under C0908.
Contouring error monitoring	Monitors the momentary contouring error if the contouring error tolerance is exceeded and releases a fault indication, if necessary.
Contouring error tolerance	If the contouring error reaches a defined contouring error tolerance, a fault indication is released.
Fieldbus	For the data exchange between superimposed control and position control, e.g. InterBus-S or PROFIBUS DP.
FPDA	freely programmable digital output
FPDE	freely programmable digital input
GDC	Global Drive Control (PC program for Lenze controllers under Windows)
HLG	Ramp generator
InterBus-S	Industrial communication standard according to DIN E19258
JOG	Fixed speed or input for fixed speed
LECOM	Lenze Communication
LEMOC2	PC program for Lenze controllers under DOS
LU	Undervoltage
Master	Masters are hosts such as PLC or PC.
OU	Overvoltage
PC	Personal Computer
PLC	Programmable logic controller
PM	Permanent magnet
Position-target	The target which is to be reached with a defined profile.
Process data	e.g. setpoints and actual values of controllers which must be exchanged within a minimum of time. These are small amounts of data, which are transmitted cyclically. For PROFIBUS, these data are transmitted in the logic process data channel.
PROFIBUS	Communication standard DIN 19245, consisting of part 1, part 2 and part 3
QSP	Quick stop
RFR	Controller enable
RSP	Controller inhibit (= $\overline{\text{controller enable}}$)
Slave	Bus participant which can only send after request of the master. Controllers are slaves.
SSC	Sensorless control
SSI	Synchronous serial interface

Glossary

18 Table of keywords

Table of keywords

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