BAUMÜLLER

CONTROLLER
BUS 6 T

Technical description and
operation manual

E	5.94017.06

Edition November 1995

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PLEASE READ AND PAY ATTENTION TO SAFETY INSTRUCTIONS AND OPERATING GUIDE PRIOR TO COMMISSIONING

This manual contains the necessary information for normal opteration of the products described therein. The drives may only be used, maintained and repaired by personnel familiar with the operation manual and the applicable regulations on working safety and accident prevention. The devices are manufactured to a high technical specification and are operationally safe. Provided that all safety instructions habe been adhered to, there will be no personal danger during the installation and commissioning stages.

The commisioning is prohibited until it has been positively determined that the machine, into which these components are to be incorporated, complies with EC machine regulations.

This technical description replaces and nullifies all provious description. In order to provide the best possible service, we reserve the right to alter information without notice.

Manufacturer and Supplier's address:	Baumüller Nürnberg GmbH Ostendstr. 80 90482 Nürnberg Germany Tel. (++49-911) 5432 - 0 Fax (++49-911) 5432 - 130

Country of origin:	Made in Germany
Date of manufacture:	Determined from the serial number on the machine/motor.

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ABBREVIATIONS

ϑ_{M1}	Temperature 1
ϑ_{M2}	Temperature 2
τ_R	Rotor time constant
AC	Alternating current
AM	Asynchronous motor control
BSA	Reference potential analog
BSD	Reference potential digital
DA	Asynchronous motor
DC	Direct current
DS	Synchronous motor
$f_{\vartheta M1}$	Slip frequency at motor temperature 1
f_{2N}	Slip frequency
MSP	Main spindle
$I_{\alpha G}$	Magnetising current limitation
$I_{\beta G}$	Active current limitation
$I_{\alpha N}$	Set magnetising current
$I_{\beta N}$	Set active current
ID no.	Identification number
I_N	Set apparent current
I_{NG}	Apparent current limitation
PI	Pulse inhibit
LP	Board
M	Torque
M_{dx}	Torque limit
M_N	Nominal torque
n	Speed
n_N	Nominal speed
NTC	Negative temperature coeffizient
n_x	Speed threshold
P	Power
P_{kzx}	Power threshold
P_N	Nominal power
PTC	Positive temperature coeffizient
PWM	Pulse width modulation
CI	Controller inhibit
SM	Synchronous controlling
t_B	Braking time in case of controller inhibit
t_e	$3 * \tau_R$
t_i	Window time
TM	Temperature motor
X	Plug

1 SAFETY NOTES

Foreword

Relatively high leakage to ground occurs in the converter and the motor, i.e. the drive may be incompatible with residual current protective devices.
In operation, the unit is protected against direct handling in such a way that it is suitable for installation in enclosed electrical operating areas (pr EN 50178: 1994, sect. 5.2.11.2 und appendix A 5.2.11.2 terminal 7).

A high-voltage test according to pr EN 50178:1994 is to be carried out during routine tests on this unit.

General notes

This manual contains the necessary information for normal operation of the products described therein. It is intended for technically-qualified personnel who are setially trained and are familiar in detail with all warnings and maintenance tasks.

The units/systems are finished to the highest standard and are safe and reliable. They can be installed and operated safely, and function without problem if the following cautionary notes are heeded.

WARNING

Due to the nature of electrical equipment, certain parts of this unit carry dangerous voltage during operation.

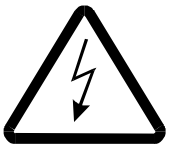
Serious injury and/or damage to property can result from non-compliance with these safety notes and warnings.

Only qualified personnel familiar with the safety instructions, and instructions regarding assembly, maintenance and operation are to work on this unit.

Hazard notes

The following notes are for your personal safety on the one hand, and on the other, the protection of the described product or connected equipment from damage.

The terms used have the following definitions both within the scope of this manual and in the notes on the product itself:



DANGER

DANGER means that death, serious injury or considerable material damage will occur if the safety precautions are not met.

WARNING

WARNING means that death, serious injury or considerable material damage can occur if the safety precautions are not met.

NOTE

NOTE points to important information on the product, the manipulation of the product, or a particular part of the documentation.

Qualified personnel

Qualified personnel, in the sense of the safety notes in this handbook or on the products themselves, are persons who are familiar with the installation, assembly, commissioning and operation of the product and are correspondingly qualified, i.e.

-are trained or authorised to commission, ground and designate electrical circuits and appliances according to the required safety standards.

-are trained or authorised in the care and operation of applicable safety equipment according to the required safety standards.

Normal use

WARNING

The unit/system may only be used as set in the system manual, and only with other units and components recommended or approved by BAUMÜLLER NÜRNBERG GmbH.

Unauthorised conversion of the unit/system is not permitted for safety reasons.

The user is obliged to report any changes which may affect the safety of the unit/system immediately.

For the best use of the equipment, operating instructions should be adhered to and regular service und insettions should be undertaken.

2 TECHNICAL DATA

2.1 General

This motor controller from the BMS series, referred to as Technology Controller, is particularly designed for high flexibility and highly demanding control tasks. A powerful 32-bit microprocessor is used for the computing tasks.

Control system:

- Field-oriented control for asynchronous motors with encoder system ROD 486 or synchronous motors with resolver
- Control types
  - asynchronous motor
    - speed control
    - torque control
    - reference run
    - position control
    - M19 spindle positioning
  - synchronous motor
    - speed control
    - torque control
- Digital control with 32-bit microprocessor using SMD technology components
- 4 parameter sets are deposited in the non-volatile memory and can be switched in online mode
- Digital control offers
  - drift-free operation
  - excellent concentricity properties
  - high control dynamic response and rigidity in the whole speed range
  - control range of asynchronous motor with encoder system ROD 486
    - digital set value setting (PC
    - 1 : 1 000 000 referring to nominal
    - analog set value setting:
    - MSP operation 1 : 250 referring to 8000
    - C axis 1 : 1000 (up to 100 rpm) referring to 8000 rpm
  - control range of synchronous motor with resolver
    - digital set value setting (PC):
    - 1 : 10 000 referring to nominal
    - analog set value setting:
    - MSP operation 1 : 250 referring to 8000 rpm
    - C axis 1 : 1000 (up to 100 rpm) referring to 8000 rpm

- Depending on requirements, the controller can be operated
  - analog set value settings and switching inputs
  - serial interface RS 232 for PC operation, parameter assignment, commissioning and service as well as for archiving the controller parameters on floppy disk

Inputs:

- 2 digital inputs for parameter set switching
- 1 digital input (programmable function by Baumüller)
- 1 digital input to delete error buffer
- RS 232 with a transmission rate of 9.6 kbaud

Outputs:

- programmable functions (2 digital outputs programmable by Baumüller)
- analog outputs (resolution 8 bit)
- 2 measuring channels (resolution 12 bit)
- 2 programmable functions by Baumüller

Encoder modules:

- sine incremental encoder ROD
- resolver
- incremental encoder emulation

I/O option board for analog interface:

- analog inputs
  - set speed value input for main spindle
  - set speed value input for C axis
  - torque limiter
  - additional set speed value input (for both MSP and for C axis)
- analog outputs
  - actual speed value
  - actual torque value
- digital inputs
  - switching between MSP/C axis operation
  - drive halt
  - controller enabling
  - pulse enabling
- digital outputs
  - error messages
  - warnings
  - programmable function by Baumüller
- relay outputs
  - torque limit reached
  - set speed value reached
  - speed = 0
  - ready for use

2.2 Electrical data

The electrical data varies according to the relevant basic unit and is described in the applicable documentation.

Technical data of the controller:

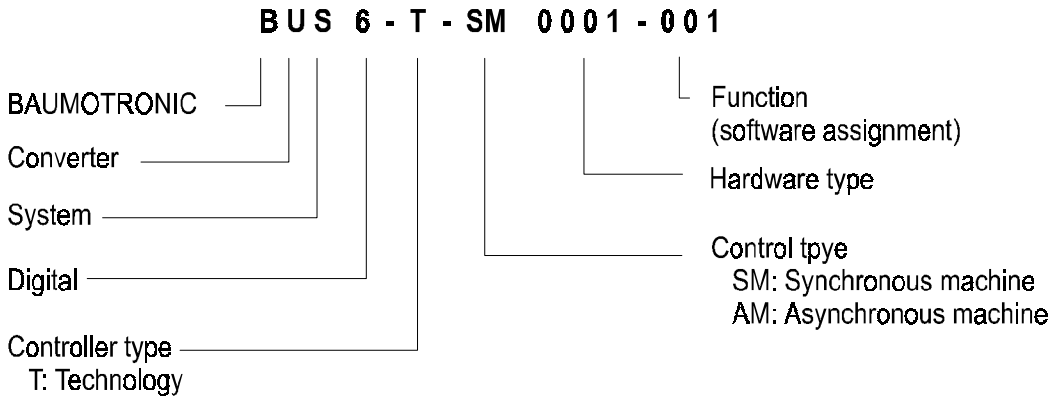
Accuracy of whole system	Calculation accuracy 16 bit
Resolver recording resolution	12 / 14 / 16 bit switchable
ROD 486 resolution	20 bit
Speed controller cycle rate	1 ms
Torque controller cycle rate	1 ms
4 analog inputs voltage range type input resistance resolution fo speed set value input	 -10 V ... +10 V differential input ca. 40 kΩ 12 bit
8 potential free inputs low level high level input resistance	 0 V ... +5 V +11 V ... +35 V > 5 kΩ
4 analog outputs (optional) voltage range maximum output current resolution	 -10 V ... +10 V 1 mA 12 Bit
4 relay outputs maximum contact load maximum potential against electronic ground	 24 V DC / 1 A 50 V
6 potential free outputs joint supply voltage joint ground output current	 + 24 V / 60 mA Masse der 24 V extern 20 mA
Interfaces	RS 232
Current consumption controller	+24 V/1.1 A

- **Cycle times if set value source is analog (ID no. 32818 = 0)**

ID no. 32818 = 0 (set value source is analog)			
ID no. 32819 (controlling)	**ID no. 32837 (set value additive)**	**Digital input X3:13 (MSP/C axis)**	**Cycle rates**
0 (n control)	0	Low (MSP range)	- MSP speed set value 4 ms - Speed limitation 4 ms - Digital inputs 8 ms - Digital outputs 8 ms - Display speed actual value 16 ms - Display torque actual value 16 ms
	1	Low (MSP range)	- MSP speed set value 4 ms - Additional speed set value 8 ms - Speed limitation 4 ms - Digital inputs 8 ms - Digital outputs 8 ms - Display speed actual value 16 ms - Display torque actual value 16 ms
	0	High (C axis range)	- C axis speed set value 4 ms - Limitation torque 4 ms - Digital inputs 8 ms - Digital outputs 8 ms - Display speed actual value 16 ms - Display torque actual value 16 ms
	1	High (C axis range)	- C axis speed set value 4 ms - Additional speed set value 8 ms - Limitation torque 8 ms - Digital inputs 8 ms - Digital outputs 8 ms - Display speed actual value 16 ms - Display torque actual value 16 ms
1 (M control)	0	without influence	- Torque set value 4 ms - Limitation torque 4 ms - Digital inputs 8 ms - Digital outputs 8 ms - Display speed actual value 16 ms - Display torque actual value 16 ms

ID no. 32818 = 0 (set value source analog) Software version: SV_03.05H (synchronous control) SV_03.07H (synchronous control) see terminal diagram II		
ID no. 32819 (controlling)	**Cycle times**	
0 (n control)	- MSP speed set value - Digital inputs - Digital outputs - Display speed actual value - Display torque actual value	1 ms 8 ms 8 ms 16 ms 16 ms
1 (M control)	- Torque set value - Digital inputs - Digital outputs - Display speed actual value - Display torque actual value	1 ms 8 ms 8 ms 16 ms 16 ms

2.3 Type code



Function:

001: Control of DA asynchronous motors

002: Control of VDOK asynchronous motors

003: Control of DS synchronous motors

Vorzugsversionen

004: Control of DA asynchronous motors, measurement of motor temperature with PTC Type: KTY84 598R/25[°C]

005: Control of DS synchronous motors, measurement of motor temperature with PTC Type: KTY84 598R/25[°C]

Hardware type:

0001: Encoder module for connection of sine-wave incremental encoder ROD 486

0002: Encoder module for resolver connection

0003: Encoder module for resolver connection and with incremental encoder emulation

3 TRANSPORT, REMOVAL OF THE PACKAGING

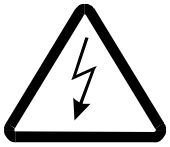
The devices are packed in the manufacturer´s works in accordance with ordering instructions.

Severe vibrations during transport are to be avoided.

Onse packaging is removed and the devices are checked for their completeness, assembly can follow.

Packaging material consists of cardboard, corrugated caroboard and/or wood. It can be disposed of in accordance with local disposal regulations.

Any transport damage should be reported.



DANGER

In the event of damage being sustained in transit, the device should no be connected to a supply without prior (high voltage) testing trained personnel.

Death, serious injury or considerable damage to equipment may result should this warning fail to be heeded.

4 ASSEMBLY

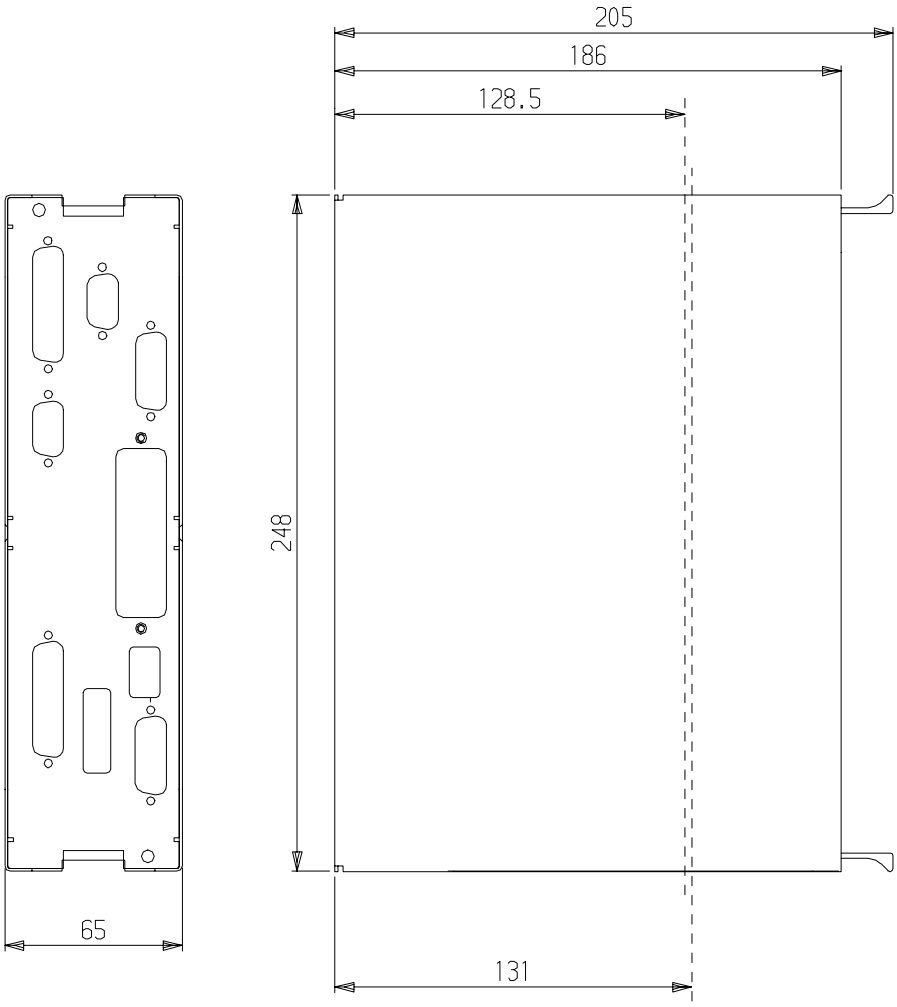
WARNING

The user is responsible for the assembly of the converter power unit, the motor, the transformer and the other components according to applicable safety standards (e.g. DIN, VDE) and all other relevant national or local regulations regarding conductor dimensions and fusing, grounding, circuit breakers, overcurrent protection etc.

It must be ascertained that unrestricted cooling air access and outlet is available.

In operation, the apparatus is protected against direct handling in such a way that it is suitable for installation in enclosed electrical operating areas (DIN VDE 0558 part 1, sect. 5.4.3.2.4).

4.1 Dimensions



Plug-in depth of cassette

- BUS 6 and BUM 62: 128.5 mm
- BUM 63/64: 131.0 mm

The total depth can only be determined in conjunction with the basic unit. In addition, it is necessary to take into account the dimensions of the connector to be used (approx. 40 mm).

4.2 Assembly notes

Plug the controller cassette into the appropriate recess in the basic unit and secure it with the two screws attached to it.

NOTE

Do not plug in the cassette under voltage.

The installation of the basic units is covered separately.

5 INSTALLATION

5.1 Hazard notes

WARNING

This unit carries dangerous voltage and contains dangerous rotating machine parts (ventilators). This means that death, serious injury or considerable material damage can occur if the safety and warning notes are not heeded.

The user is responsible for the assembly of the converter power unit, the motor, the transformer and the other components according to applicable safety standards (e.g. DIN, VDE) and all other relevant national or local regulations regarding conductor dimensions and fusing, grounding, circuit breakers, overcurrent protection etc.

Relatively high leakage to ground occurs in the converter and the motor, i.e. the drive may be incompatible with residual current protective devices (corresponding to DIN VDE 0160, sect. 5.5.3.4 and sect. 6.5.2.1).

The intermediate circuit carries electrical potential: it is imperative that the provided cover is used.

Variable-speed drives may only be used if they conform to valid VDE regulations.

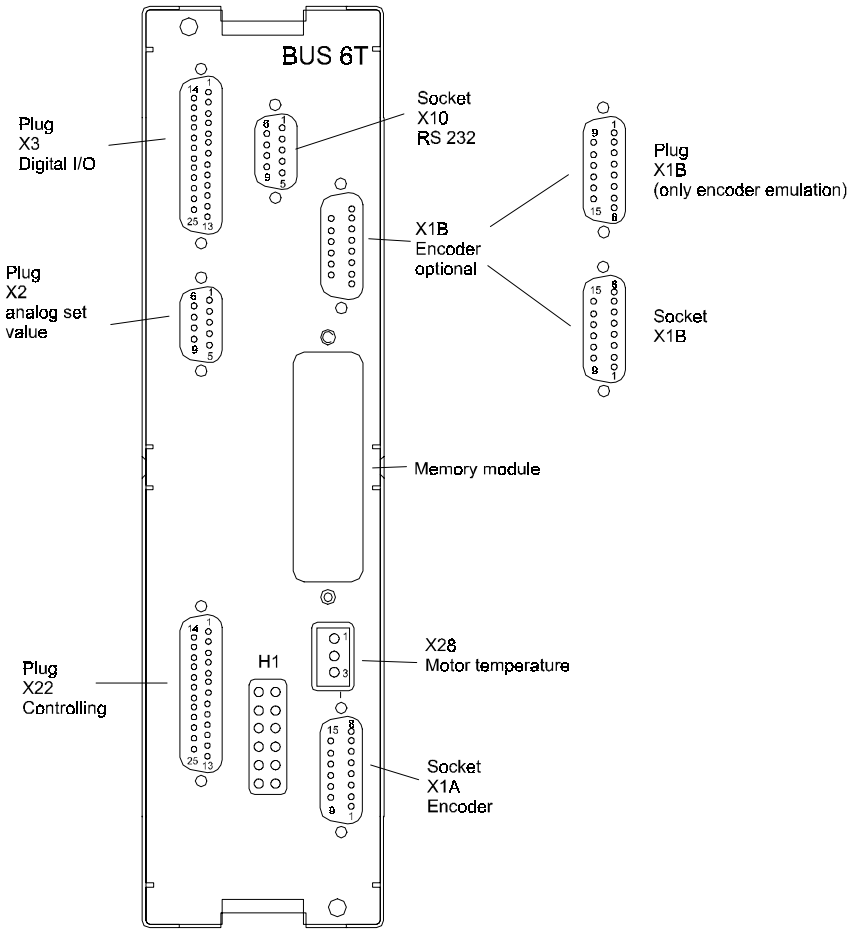
With equipment where speed is of critical importance, speed monitoring in the unit must be supplemented by autarchic monitoring of the motor. This speed check, independent from the control, can be carried out by inductive, optical or yield force-dependant encoders. See the operation and maintenance manual for the applicable motor.

Setial care is needed when touching the drive shaft, directly or indirectly (by hand). This should only be done in a voltage-free state and whilst the drive is stationary.

Safety equipment must under no circumstances be shut down.

5.2 Checks prior to installation

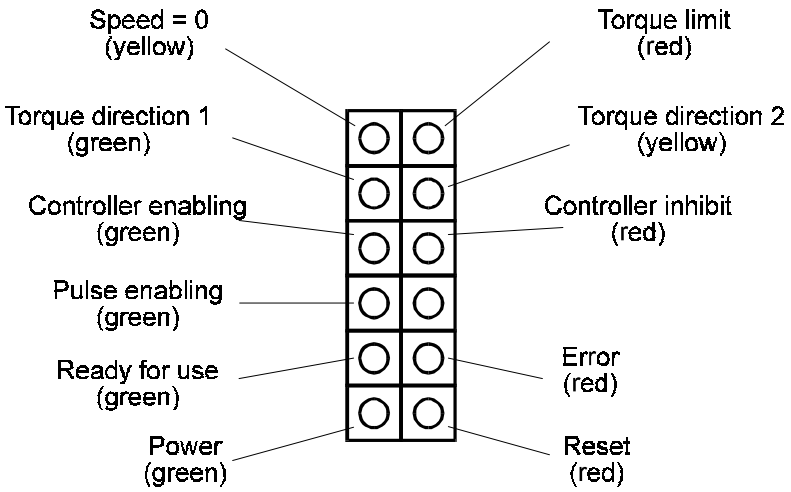
- Switch on controller
- Note down the type and no. of the unit and motor
- Check wether power unit type and motor type printed at memory module correspond to power module type and motor type
- Check the connections by means of the terminal diagram, particularly
  - clockwise rotating field of the mains terminals
  - correct connection of the motor winding
- Connection of plugs to the unit:



- PC connection via standard RS 232
- Enabling check - do not yet switch on unit
- Switch on power unit

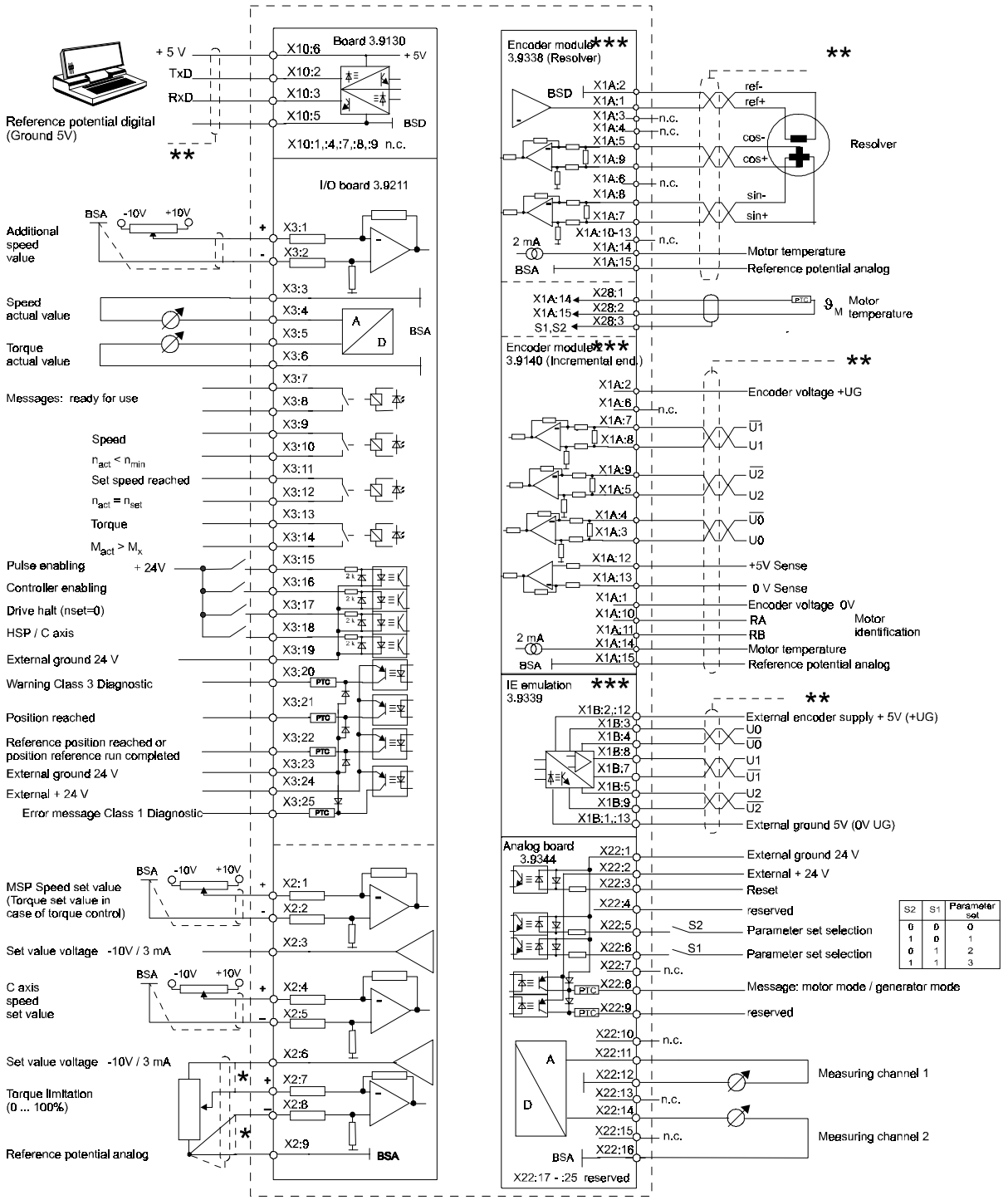
5.3 Display

LED display element



Speed = 0:	motor has stopped or motor speed below minimum speed
Torque limit:	torque has reached torque limit
Torque direction 1:	positive torque
Torque direction 2:	negative torque
Error:	error message present
Ready for use:	controller ready for use: no error status class 1 or manufacturer status class 1
Power:	mains on
Reset:	processor in reset

5.4 Terminal diagram I



* Jumper
+/-10V =100% torque limitation

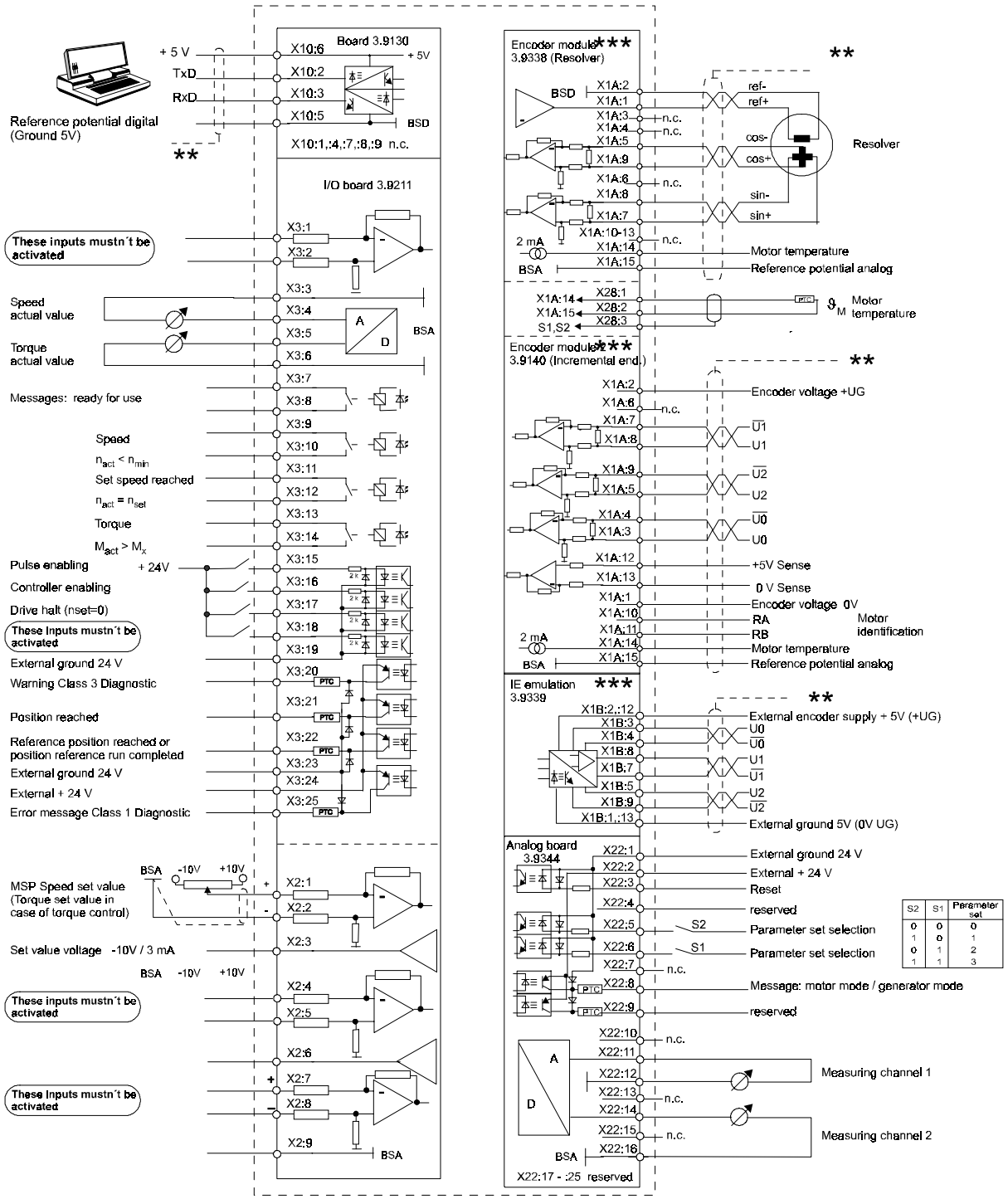
** The cable shieldings must be connected to the plug housing

*** Encoder module 1 is either equipped with resolver board or with incremental encoder board. The "motor temperature" terminal (X28) is available on encoder module 1 in both cases.

Encoder module 2 with incremental encoder emulation is only equipped if encoder module 1 is equipped with the resolver card.

Twisted-pair wires

5.5 Terminal diagram II (only SV 03.05H and SV 03.07H)



S2	S1	Parameter set
0	0	0
1	0	1
0	1	2
1	1	3

* Jumper
+/-10V =100% torque limitation

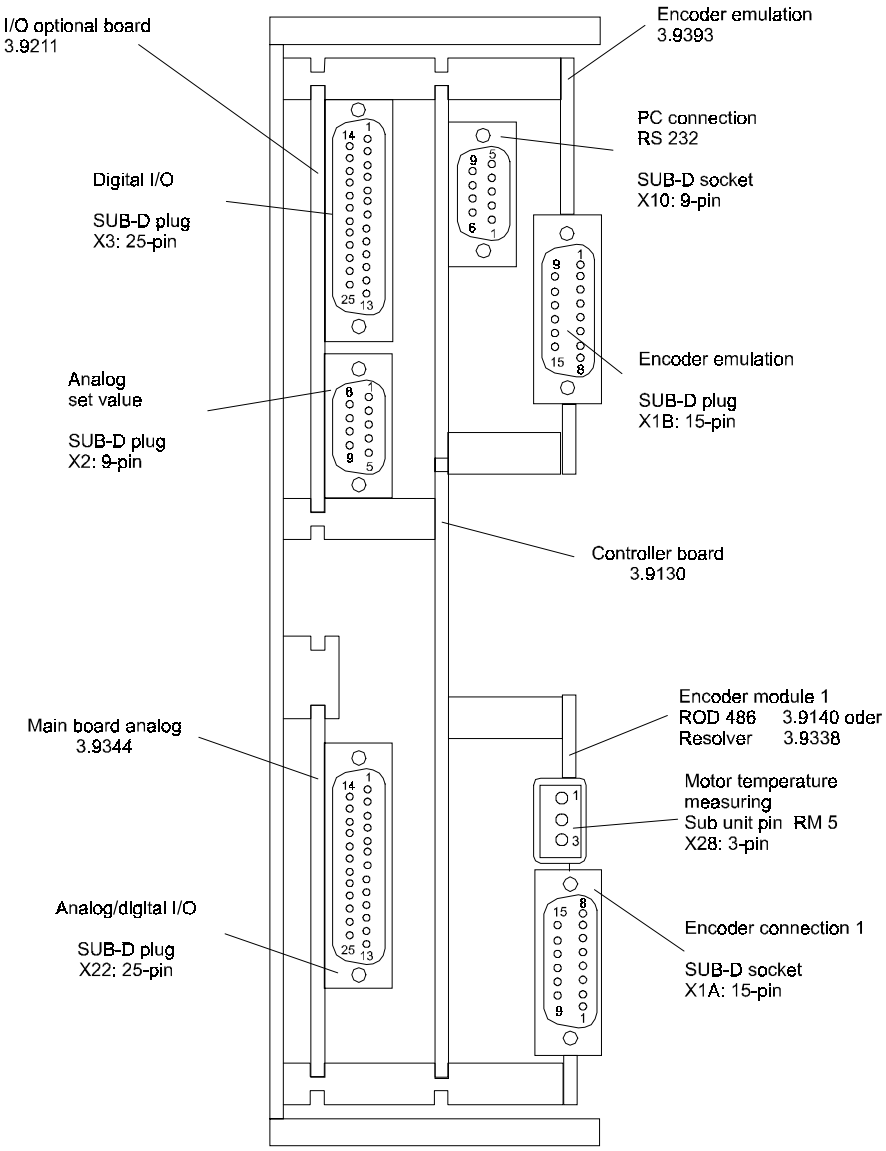
** The cable shieldings must be connected to the plug housing

*** Encoder module 1 is either equipped with resolver board or with incremental encoder board. The "motor temperature" terminal (X28) is available on encoder module 1 in both cases.

Encoder module 2 with incremental encoder emulation is only equipped if encoder module 1 is equipped with the resolver card.

Twisted-pair wires

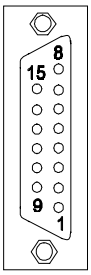
5.6 Connector location diagram



5.7 Connector pin assignment

- **Connection of ROD486 and resolver**

15-pin X1A SUB-D socket

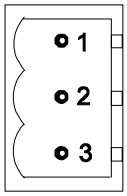


Pin no.	Assignment ROD 486	Assignment resolver
1	5V ground	+ ref
2	+5V encoder voltage	- ref
3	incremental encoder U0	not assigned
4	incremental encoder -U0	not assigned
5	incremental encoder U2	-cos
6	not assigned	not assigned
7	incremental encoder -U1	+sin
8	incremental encoder U1	-sin
9	incremental encoder -U2	+cos
10	RA (identification)	not assigned
11	RB (identification)	not assigned
12	5 V sense	not assigned
13	0 V sense	not assigned
14	Temperature motor TM1	Temperature motor TM1
15	BSA	BSA

Encoder cable X1 with Interconnectron plug at motor end and 15-pin sub-D plug connector at unit end.

- **Motor temperature recording**

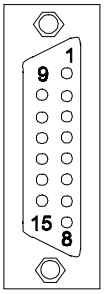
X28 sub-unit terminal RM 5



Pin no.	Assignment
1	motor temperature (connection 1)
2	BSA (analog ground)
3	shielding

- **Incremental encoder emulation (optional)**

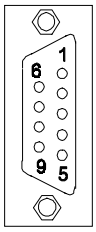
15-pin X1B SUB-D socket



Pin Nr.	Belegung
1	ground incr. emulation
2	+ 5 V incr. emulation
3	incr. emulation track 0
4	incr. emulation track $\overline{0}$
5	incr. emulation track B
6	not assigned
7	incr. emulation track $\overline{A}$
8	incr. emulation track A
9	incr. emulation track $\overline{B}$
10	not assigned
11	not assigned
12	+ 5 V incr. emulation
13	ground incr. emulation
14	not assigned
15	not assigned

- **Analog set value input**

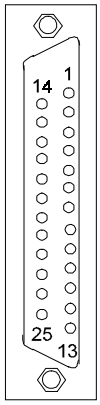
9-pin X2 SUB-D plug



Pin Nr.	Belegung
1	n_{set} + MSP (difference amplifier input)
2	n_{set} - MSP (difference amplifier input)
3	- 10 V / 2 mA output
4	n_{set} + C axis (difference amplifier input)
5	n_{set} - C axis (difference amplifier input)
6	+ 10 V / 2 mA output
7	M limitation + (difference amplifier input)
8	M limitation - (difference amplifier input)
9	BSA

- **Digital I/O**

25-pin X3 SUB-D plug

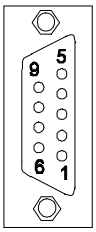


Pin no.	Assignment
1	additional + n_{soll} (difference amplifier input)
2	additional - n_{soll} (difference amplifier input)
3	BSA
4	n_{act} (0 .. +10V or 0 .. ±10V / 1 mA)
5	M_{act} (0 .. +10V or 0 .. ±10V / 1 mA)
6	BSA
7	ready for use (LED 404 green on 3.9211)
8	make contact 24 V / 0.1 A
9	$n_{act} < n_{set}$ (LED 403 yellow on 3.9211)
10	make contact 24 V / 0.1 A
11	$n_{act} = n_{set}$ (LED 402 yellow on 3.9211)
12	make contact 24 V / 0.1 A
13	$M_{act} > M_x$ (LED 401 red on 3.9211)
14	make contact 24 V / 0.1 A
15	pulse enabling (optocoupler input + 24 V, high active)
16	controller enabling (optocoupler input + 24 V, high active)
17	rapid halt (optocoupler input + 24 V, high active)
18	MSP/C axis (optocoupler input + 24 V), C axis active
19	common ground M 24 V for optocoupler inputs
20	warning status class 3 *
21	position reached *
22	reference point reached or reference run completed *
23	common ground M24V for optocoupler outputs
24	+ 24 V / 0.2 A; external power supply for optocoupler outputs
25	error status class 1 *

* Outputs suitable for relay control (no free-wheeling diodes necessary)

- **Interface RS 232**

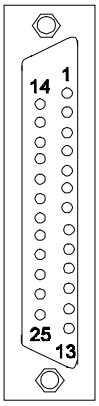
9-pin X 10 SUB-D socket



Pin no.	Assignment
1	not assigned
2	RS 232 txd signal
3	RS 232 rxd signal
4	not assigned
5	ground connection RS 232
6	supply voltage 5 V (+ 5V/0.1A if R316 on 3.9130 is equipped with 0 Ω)
7	not assigned
8	not assigned
9	not assigned

- **Analog/digital**

25-pin X22 SUB-D plug



Pin no.	Assignment
1	common ground 24 V for optocoupler inputs/outputs
2	24 V external voltage supply for optocoupler outputs
3	Reset*
4	funktion 2 (prog. by Baumüller) optocoupler input 2
5	S2 optocoupler input 3 (data set switching LOW byte)
6	S1 optocoupler input 4 (data set switching HIGH byte)
7	not assigned
8	optocoupler output 1 (LOW = mot. operation/ HIGH = gen. operation)
9	optocoupler output 2 (prog. by Baumüller)
10	not assigned
11	measuring channel 1
12	BSA
13	not assigned
14	measuring channel 2
15	not assigned
16	BSA
17	not assigned
18	not assigned
19	analog output 3 (function programmable by Baumüller)
20	BSA
21	not assigned
22	not assigned
23	analog output 4 (function programmable by Baumüller)
24	BSA
25	not assigned

Parameter set selection:

Input 3 (S2)	Input 4 (S1)	Parameter set
Low	Low	0
Low	High	1
High	Low	2
High	High	3

Reset:

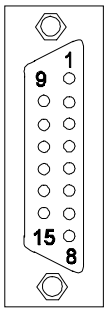
* Reset activ if +24 V edge
  This input corresponds with its function the command reset error status class 1 (ID no. 99).
  If this input is enabled, the output X3:25 (error status class 1) at the same time is high and the LED „Error“ lights. The „ready for use“ LED goes out and the relay output X3:7/8 is opened (not ready for use). This reset action lasts approximately 4 s.
  a) The controller´s status is „error“ if it is switched on. When the internal check was successfully, the ready for use signal is given.
  b) If there is no error and the reset signal is given, the controller´s status changed to „error“ and when the internal check was successfully the ready for use signal is given again.

5.8 Connection cable

5.8.1 Connection cable for resolver or incremental encoder

Cable sets are available for the connection of the resolver and the incremental encoder.
Serial number: 1901 8001 (lengths on request)

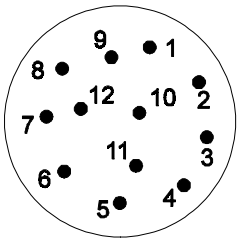
Unit end



View of mating side

15-pin SUB-D plug connector

Motor end



View of mating side

12-pin metal round plug,
socket contact (manufacturer Interconnectron)

Cable: LiYCY 5x(2x0.14)+2x0.5mm²; cores twisted in pairs, total shielding via copper.

The cable shield is connected to the round plug housing and the SUB-D plug connector shielding.

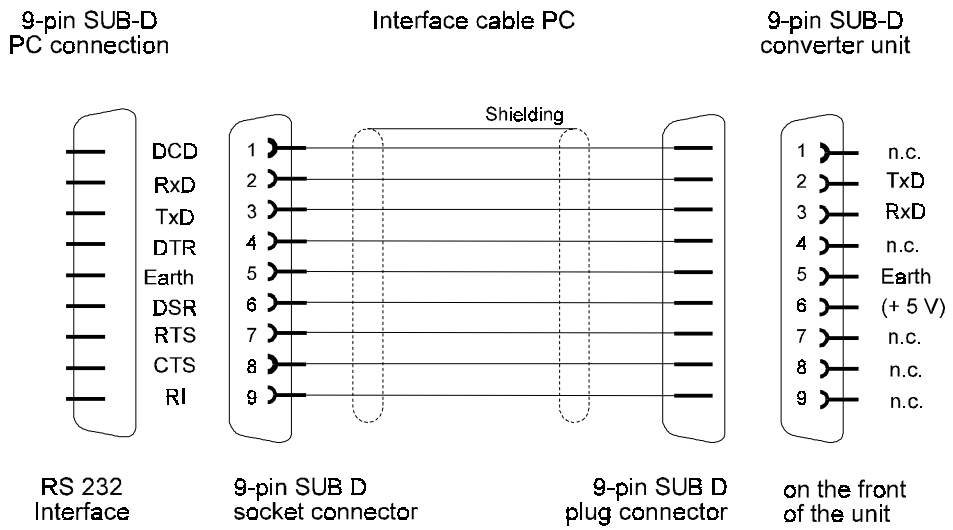
Pin no.	Connection	Pin no.
1	blue Æ 0.5mm²	10
2	red Æ 0.5mm²	12
3	purple	3
4	grey/pink	4
5	brown	8
6		
7	grey	6
8	yellow	5
9	green	1
10		
11		
12	pink	2
13	blue	11
14	red	9
15	black	7

5.8.2 Serial connection cable for PC

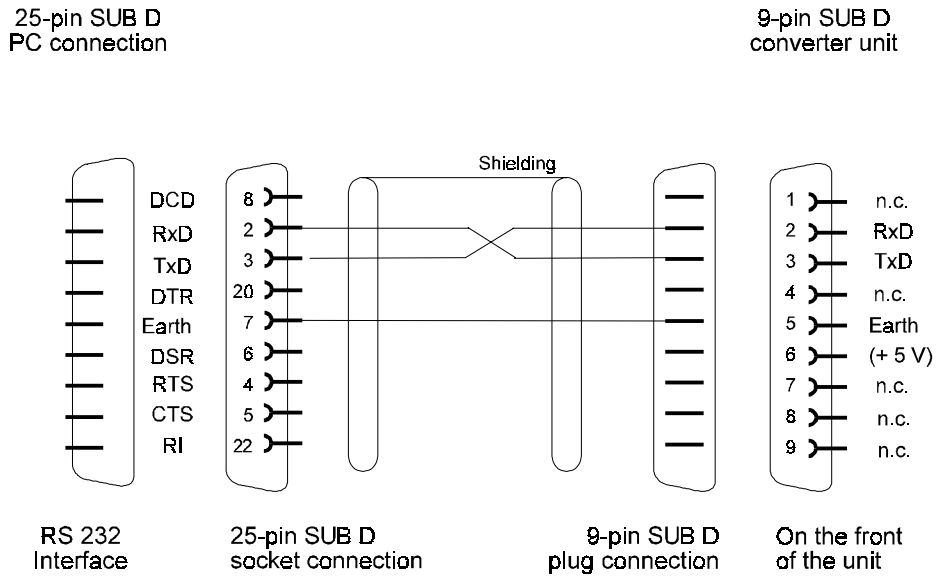
NOTE

Connect PC in control cabinet or via isolating transformer.
Refer to additional description operation software for explanation of operating program.
Refer to additional description of communication software for explanation of transmission procedure.

- 9-pin PC connection (interface cable PC, part no. 1901 8006)



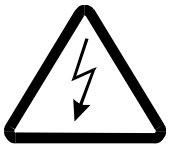
- 25-pin PC connection (not available)



5.9 Accessories

			Part no.
• PC cable (3 m)			
X10	RS 232		1901 8006
• encoder cable (cable length available on request)			
X1A	resolver / incremental encoder		1901 8001
• SUB-D plug:			
X2	analog set value input	9-pin socket connector	1900 6131
		housing	1901 2894
X3, X22	digital I/O	25-pin socket connector	1900 6135
	analog/digital I/O	housing	1901 2895
• sub-unit terminal Phönix			
X28	motor temperature recording	3-pin RM 5	1901 7596

6 COMMISSIONING



DANGER

Due to the nature of electrical equipment, certain parts of this unit carry dangerous voltage during operation. Serious injury and/or damage to property can result from non-compliance with these safety notes and warnings.

Only qualified personnel familiar with the safety instructions, and instructions regarding assembly, maintenance and operation are to work on this unit.

The user is responsible for the assembly of the converter power unit, the motor, the transformer and the other components according th applicable safety standards (e.g. VDE, DIN) and all other relevant national or local regulations regarding conductor dimensions and fusing, grounding, circuit breakers, overcurrent protection etc.

Relatively high leakage to ground occurs in the converter and the motor, i.e. the drive may be incompatible with residual current protective devices.
In operation, the unit is protected against direct handling in such a way that it is suitable for installation in enclosed electrical operating areas (DIN VDE 0558 part 1a, sect. 5.4.3.2.1 and 5.4.3.2.2).

Behaviour of the drive in the event of error
Faulty or uncontrolled drive and machine element movement can not be ruled out during initial commissioning. Hence setial care must be taken.
Prior to activation of the drive, all safety features should be checked through in order to avoid personal injury. Particular care should be taken with direct or indirect handling of the drive-shaft. This is only permissible if the shaft is perfectly static and the current converter is in a voltage-free condition. Freelyy-accessible machine parts (shafts, blowert etc.) must be covered once in operation.

Whilst in use, electrical potential is present in the power circuit, the intermediate circuit and in the motor windings. Do not touch these components during operation. Only connect measuring equipment when no voltage or current is present.

Handling protection according to §4 Para. 4 VBG 4
Protection against direct handling encompasses all measures against hazards which can result from the handling of active electrical parts. It is essential that such acitve parts are protected against direct handling via insulation, type of construction, position and arrangement, or via sturdy reinforcement. This refers to the fact that covers, seals and procedure should ensure that personnel are not able to handle parts subjected to voltage.

WARNING

Control cabinets must be furnished with emergency stop buttons by which all potentially dangerous voltages may be de-activated. Excluded from this are operating media, through whose de-activation a new hazard may arise. The trigger for the emergency stop should be incorporated in such a way that, in the event of an emergency, it may be reached as soon as possible. Procedures involving a conderably greater danger necessitate the precence of an additional person.

The user is to ensure that no unauthorised persons work on the machine.

The user is obliged to immediately report any changes which may affect the safety of the machine.

On dismantling safety equipment during commissioning, repair and maintenance, the machine is to be shut down exactly according to instructions. After completion of commissioning, repair and maintenance work the safety equipment is to be reinstalled immediately.

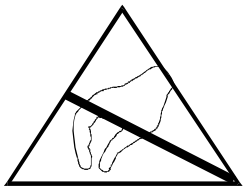
This list does not cover all necessary measures for the safe operation of the unit. If further information is required or if setial problems arise, please contact BAUMÜLLER NÜRNBERG ar a retail outlet.

Comply with the warning notes in chapter 1 of the operational manual.

NOTE

The operator must be electrostatically discharged directly before handling the modules, to protect them from high voltages which result from electrostatic charge. This can be achieved by simply touching a conductive, grounded object.

Equipment with components or modules likely to be damaged by electrostatic charge are marked by a sticker in a visible spot.



6.1 Identification power unit

SV 03.06H (SM) and 83.01H (AM)

- EEPROM not yet programmed or „Motor data acknowledged“ (ID no. 32917) = 0,
  but type of power unit correctly recognized.

  Consequence:
  The motor parameter are initialized with the data from boot-EPROM and because of the successfully recognition of the power unit´s type the parameter of the power unit are correctly initialized.

  Error message:
  - Software error BUS (ID no. 32908) wrong type of motor (bit no. 10)

    NOTE
    This error can´t be deleted!
    Motor parameter corresponding to the motor type must be inizialized and with the command „motor data acknowledged“ (ID no. 32917) = 1 confirmed. The new data has to be stored with the „command store“ (ID no. 32841).

- Change of a already programmed controller to another type of power unit.

  Consequence:
  If the new power unit type is recognized correctly, all data except of:
  - Nominal current amplifier ID no. 112
  - Maximum current amplifier ID no. 110
  - Amplifier warning temperature ID no. 200
  - Amplifier shut down temperature ID no. 203
  - Maximum intermediate circuit voltage ID no. 32831

  are read from the EEPROM (in software versions before, all data was replaced by boot data).

  Error message:
  - Error software BUS (ID no. 32908) wrong type of power unit (bit no. 11)

    NOTE
    Error can be deleted with „reset“!
    If the new data isn´t stored in the EEPROM this error appears at every new switch on.

- Power unit type isn´t recognizes at all.

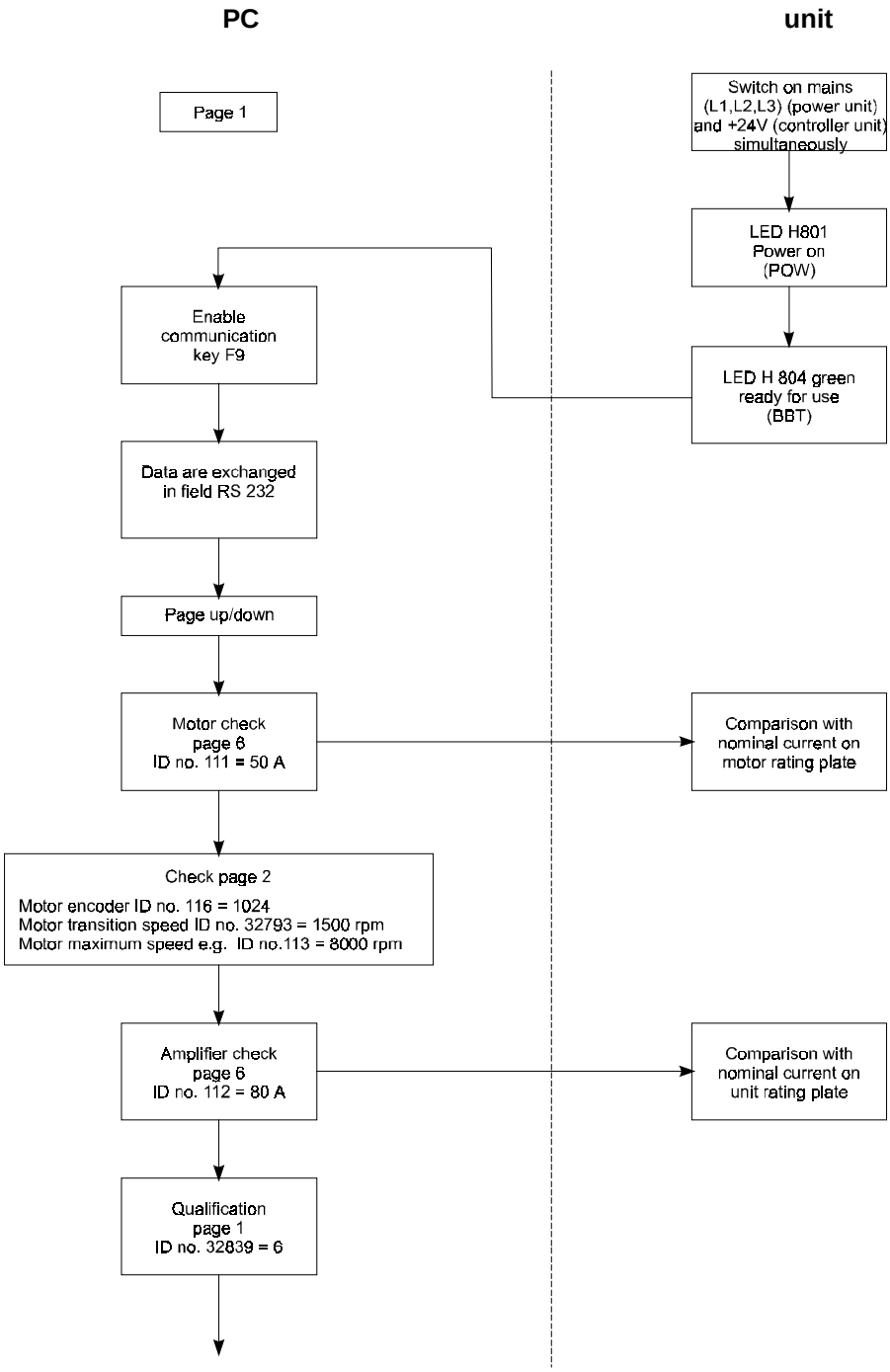
  Error message:
  - Error software BUS (ID no. 32908) wrong type of power unit (bit no. 11)
    power unit type not recognized (bit no. 2)
  - Error hardware BUS (ID no. 32907) Error in recognizing power unit type (bit no. 9)

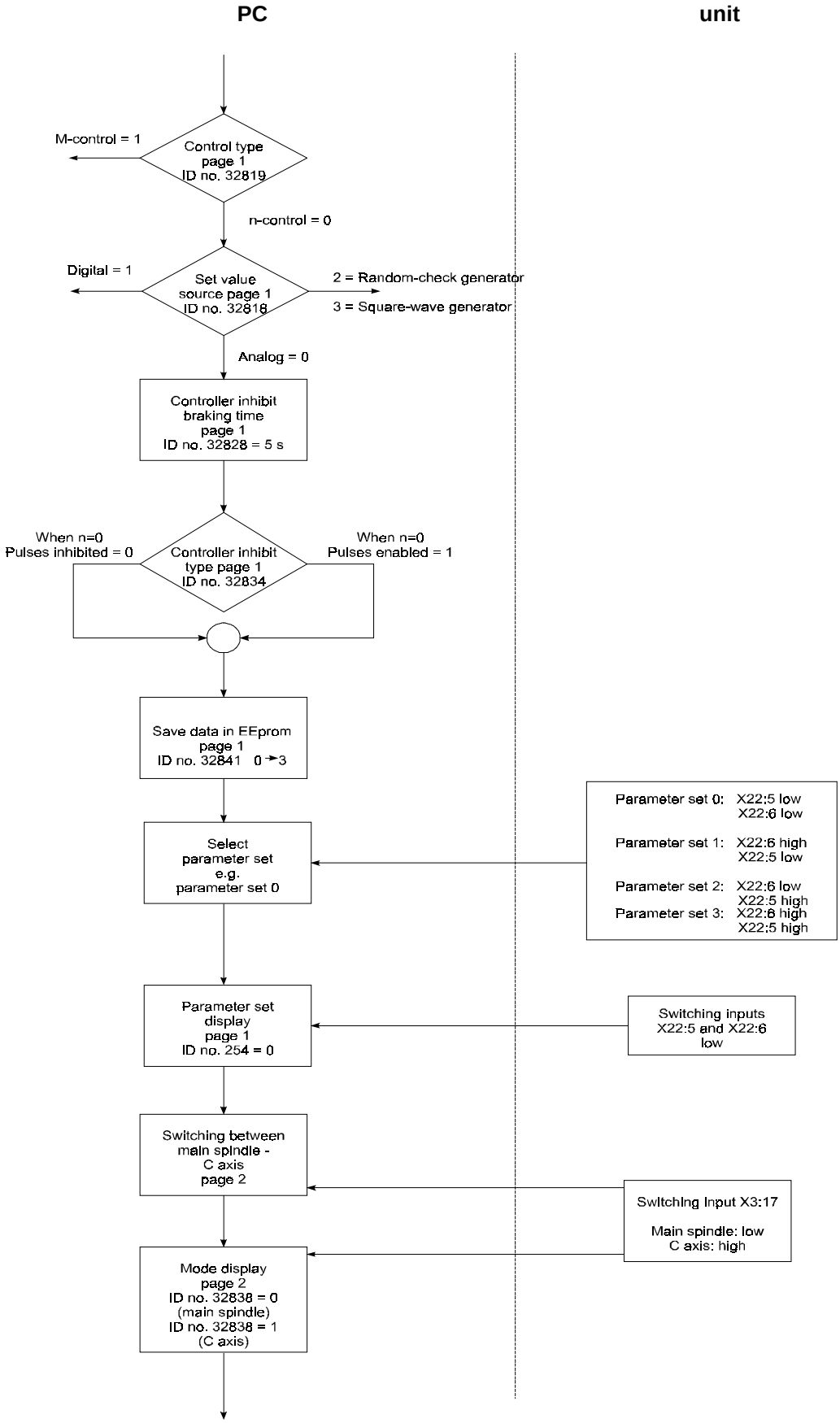
    NOTE
    This errors cann´t be deleted!

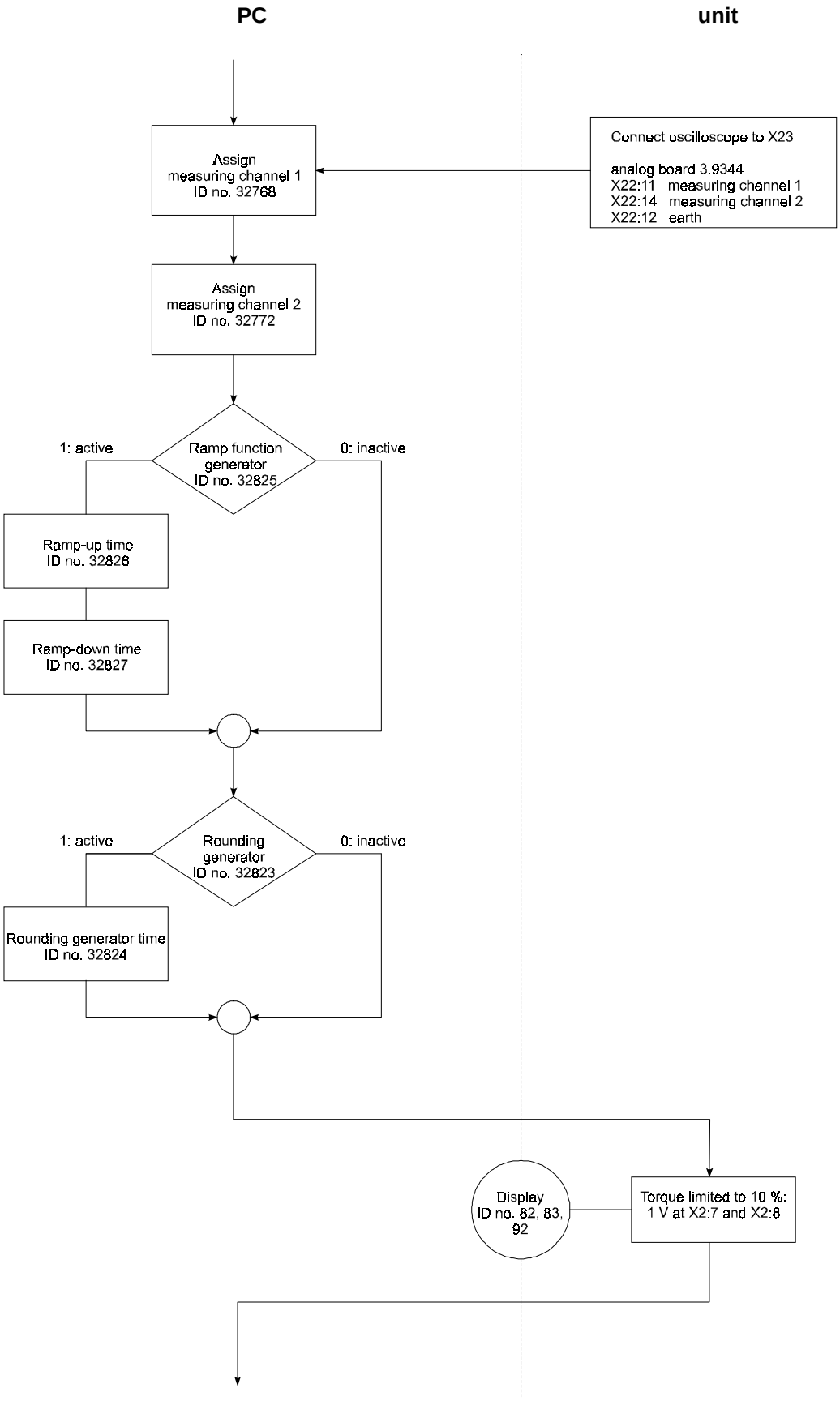
6.2 Initial commissioning of the drive system

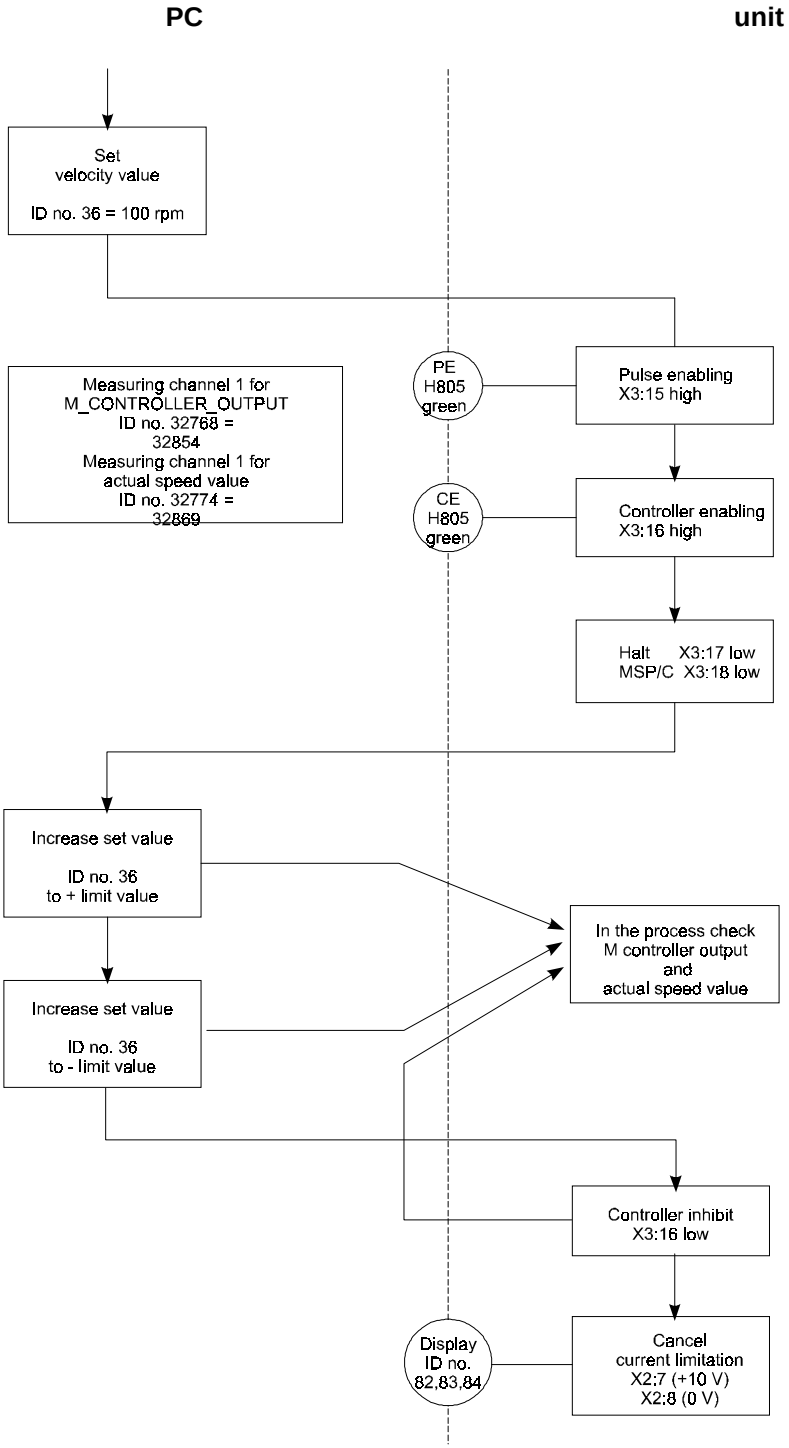
Make sure that external pulse enabling is inhibited before starting initial commissioning in order to avoid uncontrolled starting of the motor.
It is assumed that the individual controllers are set to default values which guarantee a perhaps not optimum, but controlled operation of the motor.
Subsequently the following parameters should be set or their values checked:

The description of the operation software is covered in a separate operation manual.

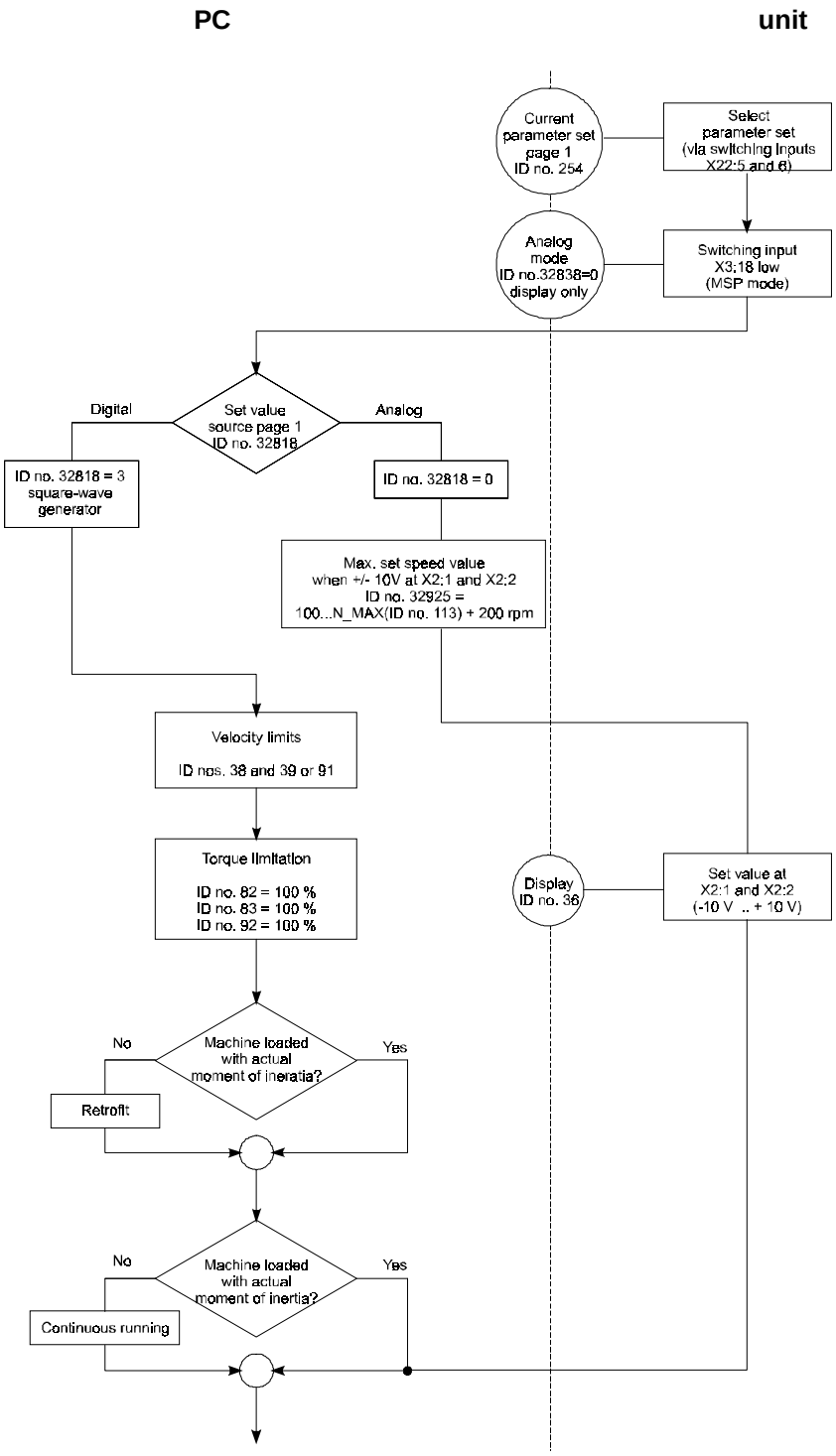


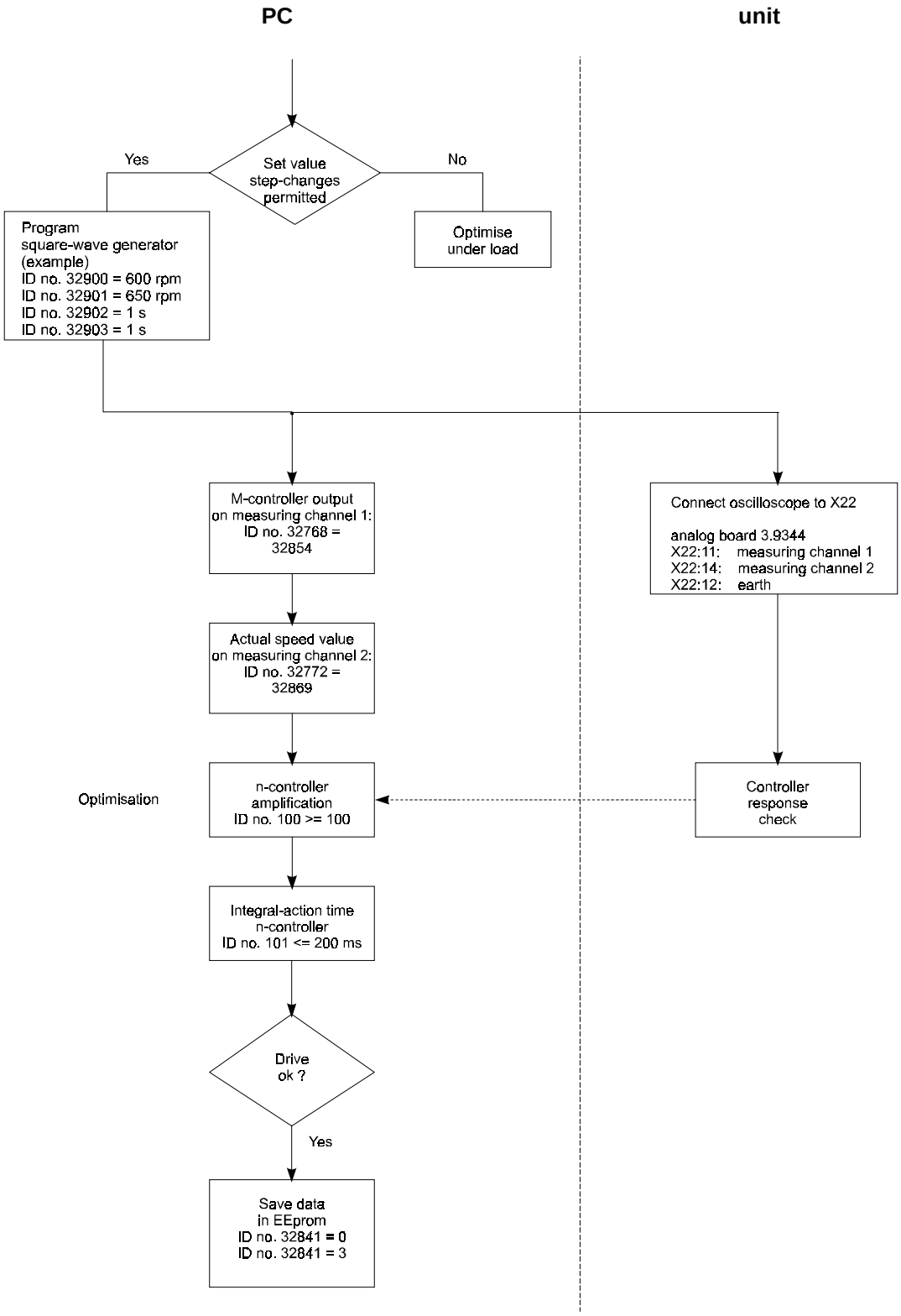

PC
unit
M-control = 1
Control type
page 1
ID no. 32819
n-control = 0
Digital = 1
Set value
source page 1
ID no. 32818
2 = Random-check generator
3 = Square-wave generator
Analog = 0
Controller inhibit
braking time
page 1
ID no. 32828 = 5 s
When n=0
Pulses inhibited = 0
Controller inhibit
type page 1
ID no. 32834
When n=0
Pulses enabled = 1
Save data in EEprom
page 1
ID no. 32841 0 → 3
Select
parameter set
e.g.
parameter set 0
Parameter set 0: X22:5 low
X22:6 low
Parameter set 1: X22:6 high
X22:5 low
Parameter set 2: X22:6 low
X22:5 high
Parameter set 3: X22:6 high
X22:5 high
Parameter set
display
page 1
ID no. 254 = 0
Switching inputs
X22:5 and X22:6
low
Switching between
main spindle -
C axis
page 2
Switching Input X3:17
Main spindle: low
C axis: high
Mode display
page 2
ID no. 32838 = 0
(main spindle)
ID no. 32838 = 1
(C axis)


PC
unit
Assign
measuring channel 1
ID no. 32768
Connect oscilloscope to X23
analog board 3.9344
X22:11 measuring channel 1
X22:14 measuring channel 2
X22:12 earth
Assign
measuring channel 2
ID no. 32772
1: active
Ramp function
generator
ID no. 32825
0: inactive
Ramp-up time
ID no. 32826
Ramp-down time
ID no. 32827
1: active
Rounding
generator
ID no. 32823
0: inactive
Rounding generator time
ID no. 32824
Display
ID no. 82, 83,
92
Torque limited to 10 %:
1 V at X2:7 and X2:8

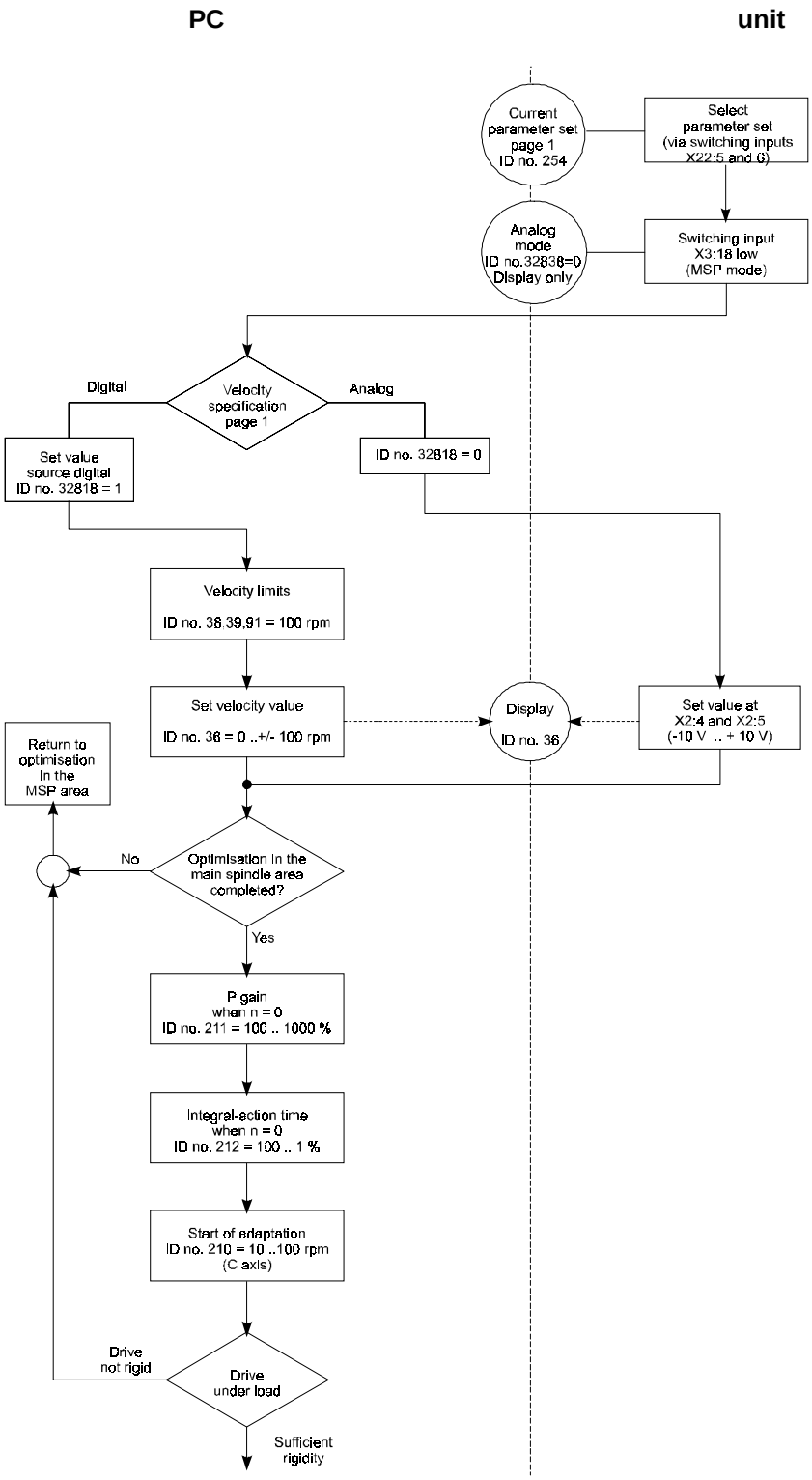

PC
unit
Set
velocity value
ID no. 36 = 100 rpm
Measuring channel 1 for
M_CONTROLLER_OUTPUT
ID no. 32768 =
32854
Measuring channel 1 for
actual speed value
ID no. 32774 =
32869
PE
H805
green
Pulse enabling
X3:15 high
CE
H805
green
Controller enabling
X3:16 high
Halt X3:17 low
MSP/C X3:18 low
Increase set value
ID no. 36
to + limit value
Increase set value
ID no. 36
to - limit value
In the process check
M controller output
and
actual speed value
Controller inhibit
X3:16 low
Display
ID no.
82,83,84
Cancel
current limitation
X2;7 (+10 V)
X2:8 (0 V)

6.3 Optimisation in the main spindle area



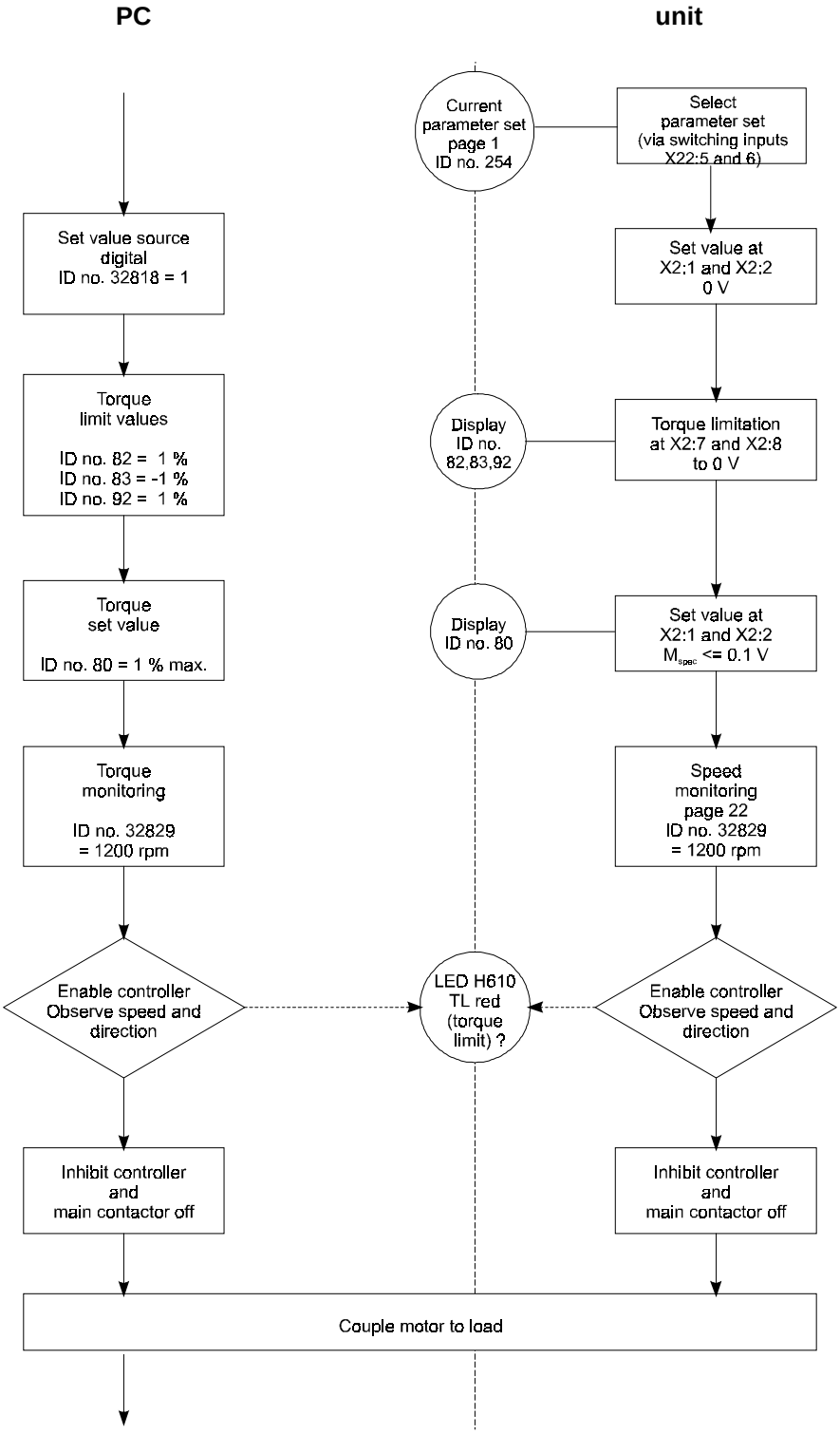

PC
unit
Set value step-changes permitted
Yes
No
Program square-wave generator (example) ID no. 32900 = 600 rpm ID no. 32901 = 650 rpm ID no. 32902 = 1 s ID no. 32903 = 1 s
Optimise under load
M-controller output on measuring channel 1: ID no. 32768 = 32854
Connect oscilloscope to X22
analog board 3.9344
X22:11: measuring channel 1
X22:14: measuring channel 2
X22:12: earth
Actual speed value on measuring channel 2: ID no. 32772 = 32869
Optimisation
n-controller amplification ID no. 100 >= 100
Controller response check
Integral-action time n-controller ID no. 101 <= 200 ms
Drive ok ?
Yes
Save data in EEprom ID no. 32841 = 0 ID no. 32841 = 3

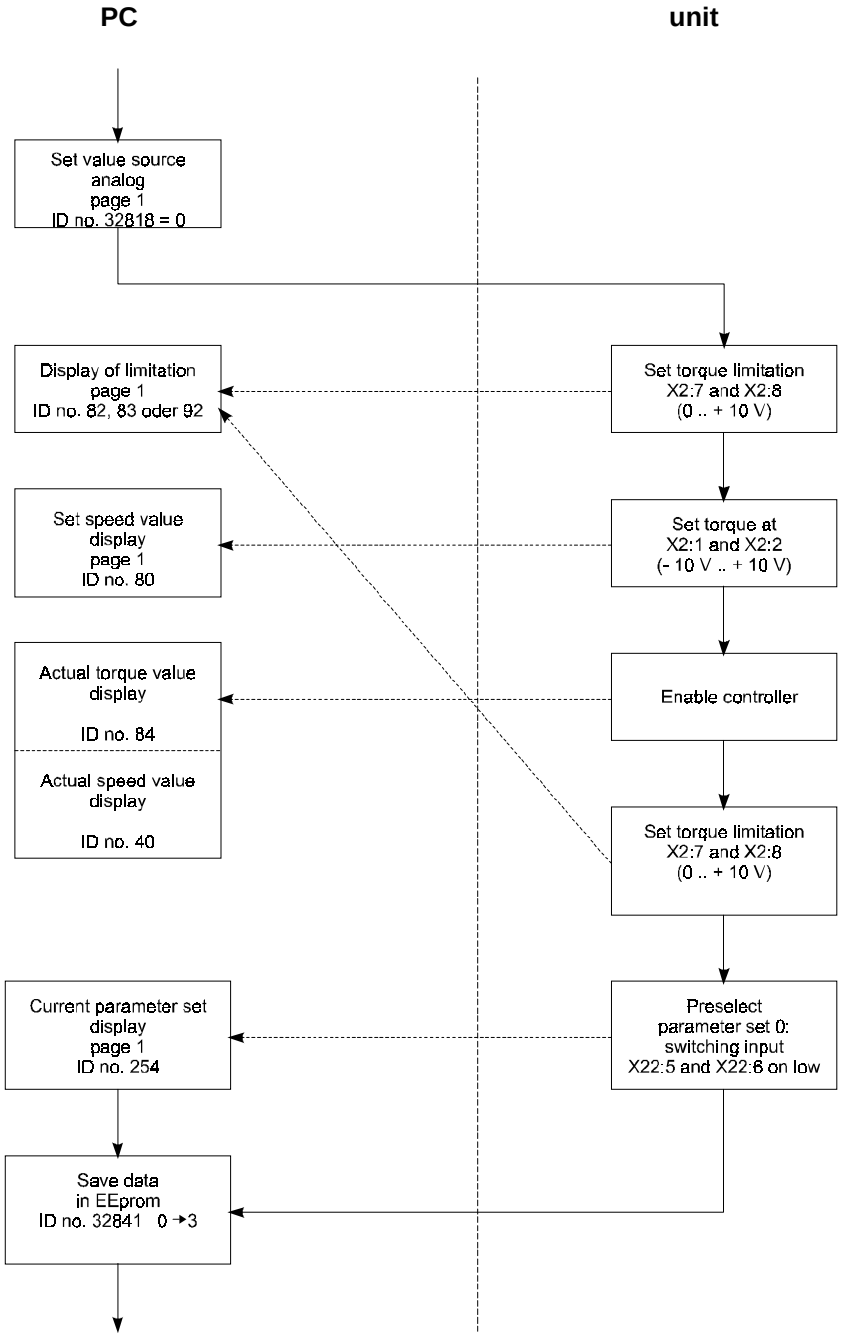
6.4 Optimisation in C axis mode



6.5 Torque control

NOTE: The motor may overspeed even with low set values. In this case the motor is automatically switched to speed control and decelerated on reaching the maximum speed value (ID no. 32829 of parameter set 0).

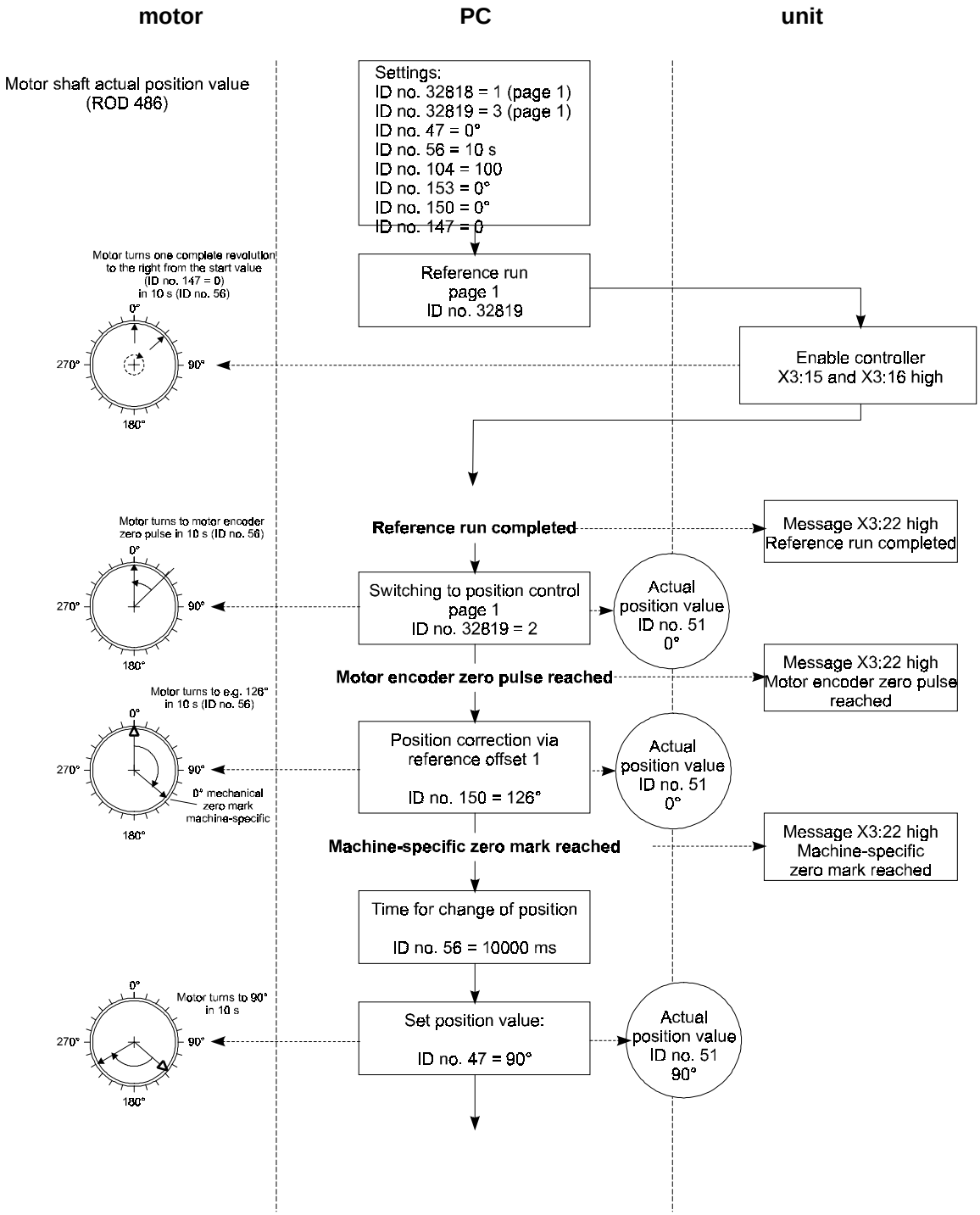



PC
unit
Set value source
analog
page 1
ID no. 32818 = 0
Display of limitation
page 1
ID no. 82, 83 oder 92
Set torque limitation
X2:7 and X2:8
(0 .. + 10 V)
Set speed value
display
page 1
ID no. 80
Set torque at
X2:1 and X2:2
(- 10 V .. + 10 V)
Actual torque value
display
ID no. 84
Actual speed value
display
ID no. 40
Enable controller
Set torque limitation
X2:7 and X2:8
(0 .. + 10 V)
Current parameter set
display
page 1
ID no. 254
Preselect
parameter set 0:
switching input
X22:5 and X22:6 on low
Save data
in EEprom
ID no. 32841 0 →3

6.6 Position control

Function can only be activated via PC.

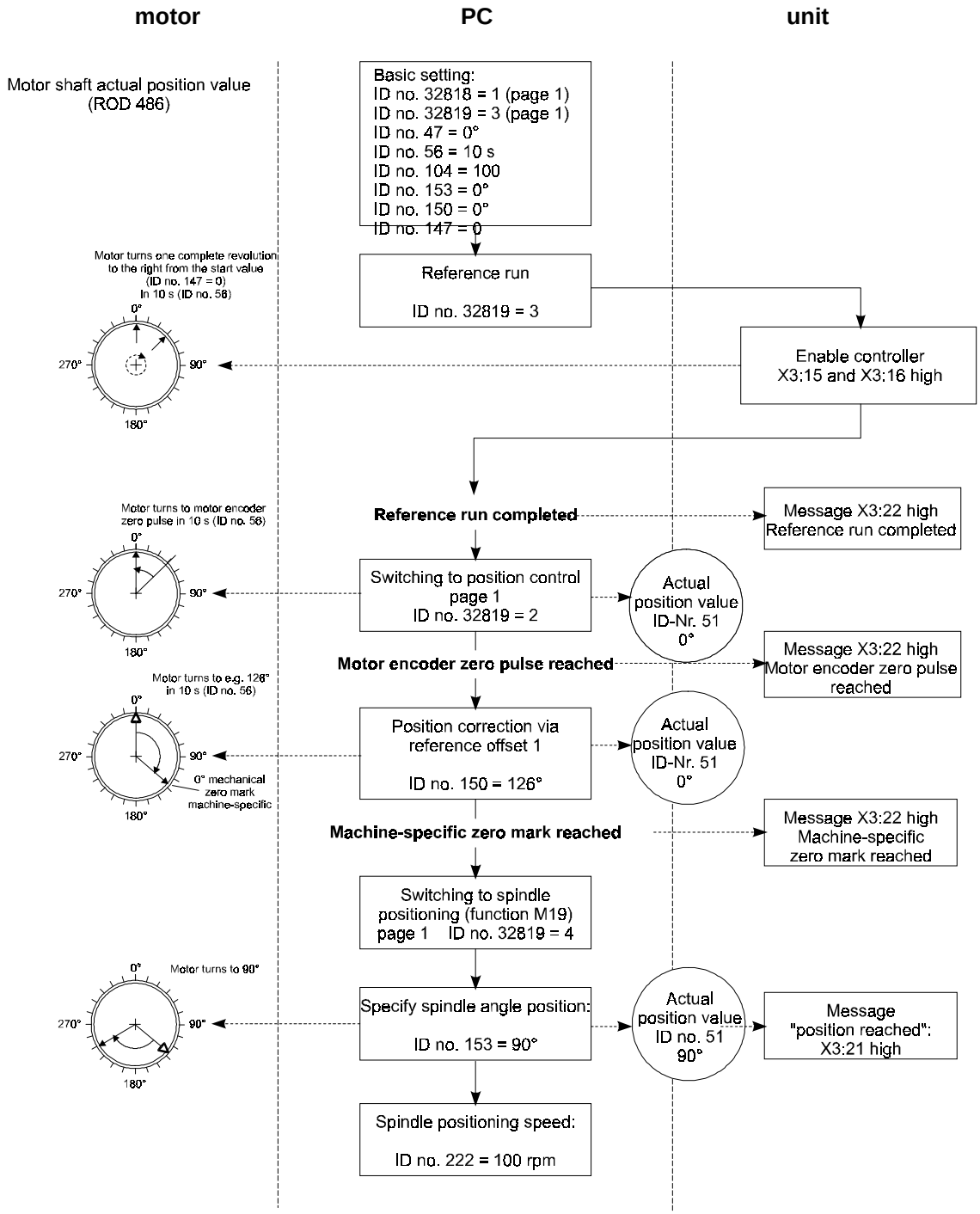
At present not yet implemented with synchronous motors.



6.7 Spindle positioning

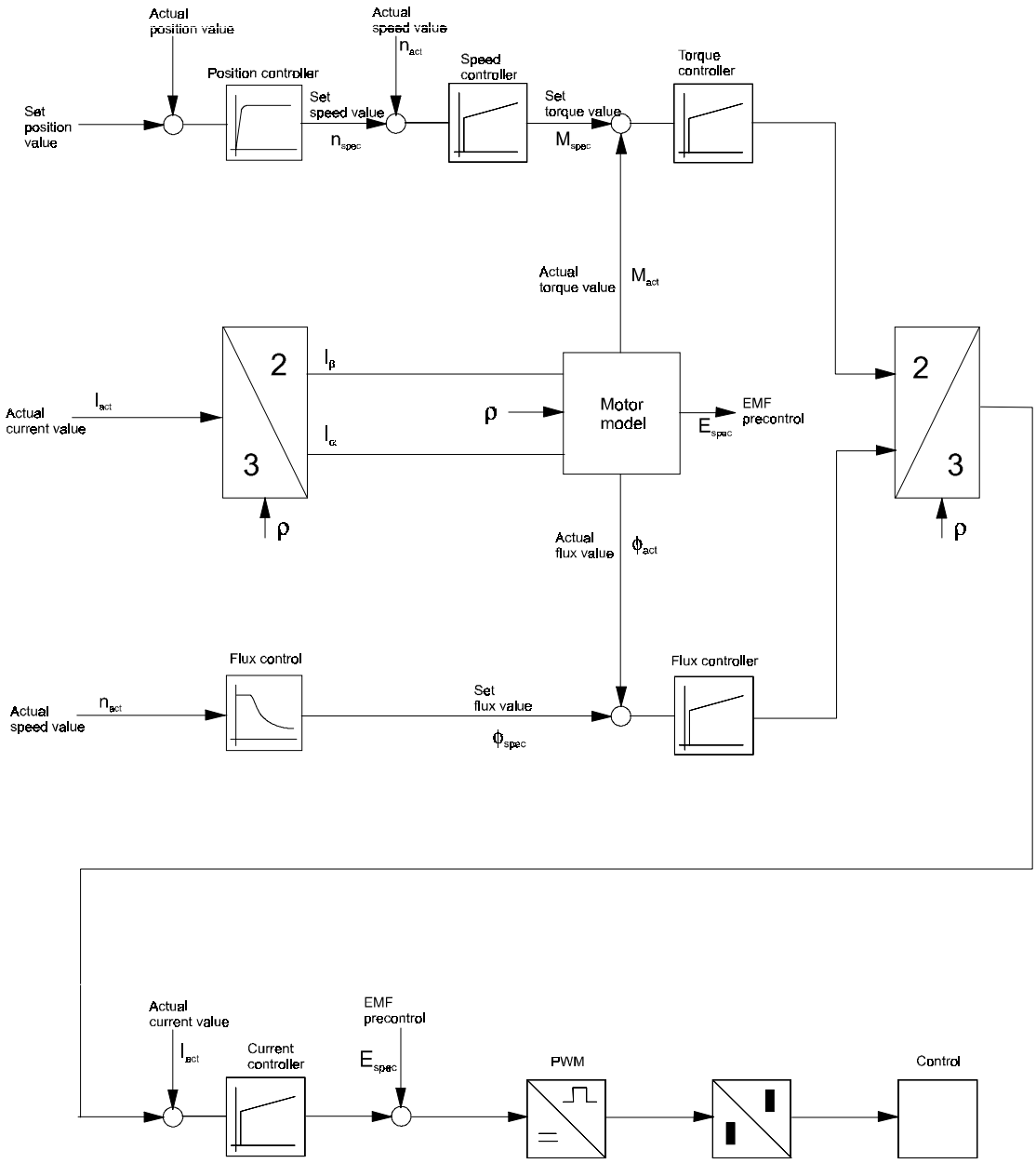
Function can only be activated via PC.

At present not yet implemented with synchronous motors.

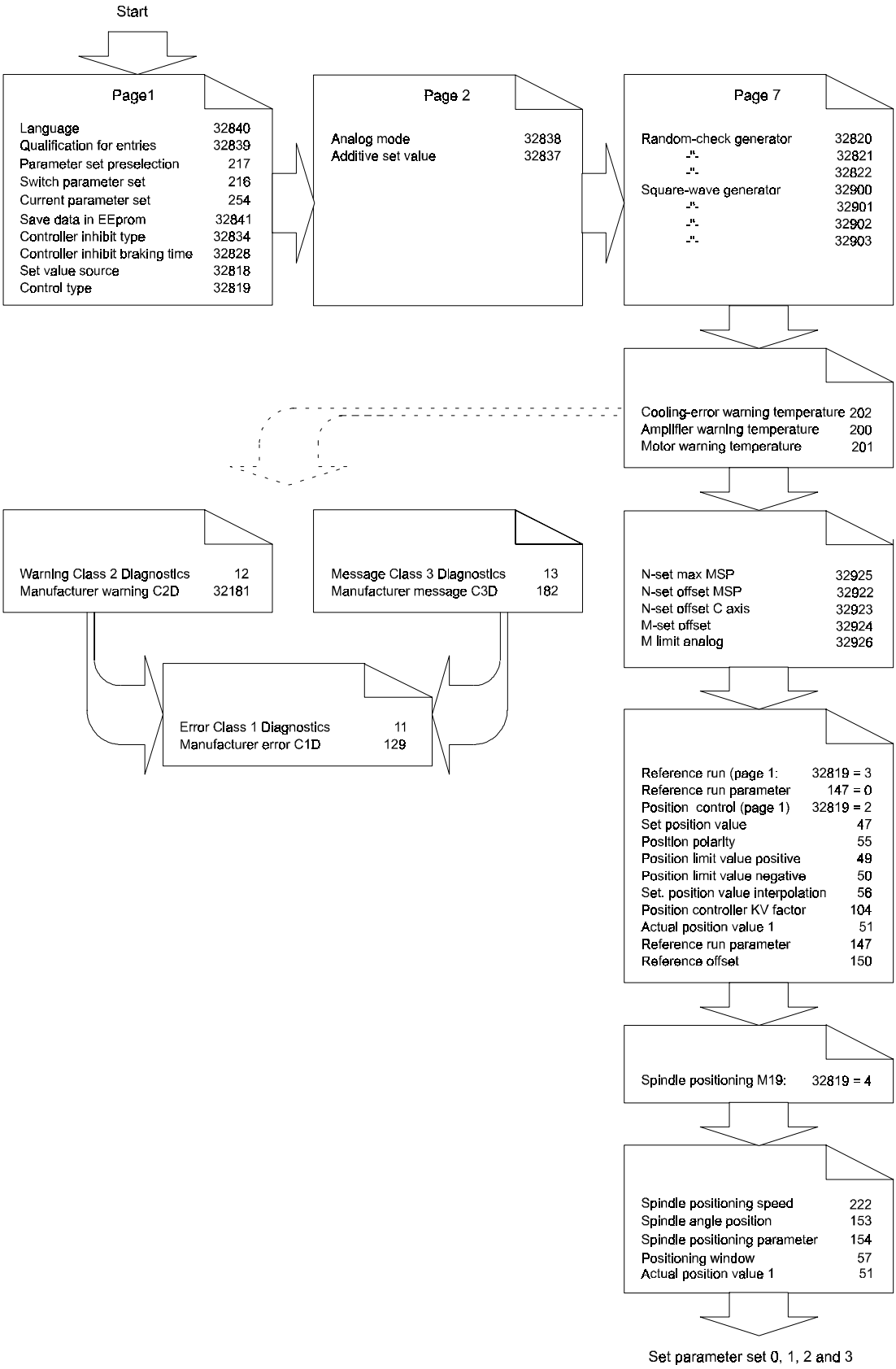


7 PARAMETERS

7.1 Function diagram



7.2 Basic settings



7.2.1 Basic settings (menu page 1 - 2)

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
menu page 1	**basic settings**				
32840	language	0 ... 3		0	
32839	qualification for entries	6 ... 7		0	
217	parameter set preselection	0 ... 3			X
216	command „switch parameter set“	via switching inputs X22:5/6 only			
254	current parameter set				X
32841	command save data in EEprom	0 ⇒ 3: speichern		0	
32834	controller inhibit type	0 ... 1		0	
32828	controller inhibit braking time	0.200 ... 20.000	s	5	
32818	set value source	0 ... 3		0	
32819	control type	0 ... 4		0	
menu page 2	**basic settings**				
32838	analog mode	0 ... 4			X
32837	additive set value	0 ... 1		0	
32790	encoder type	0 ... 2		1	
116	Motorgeber Strichzahl	500 ... 5000	Inc	1024	X
32791	number of motor encoder scale marks	1 ... 8			
32793	nominal motor speed	500.0000 ... 3000.0000	rpm		
32792	slip frequency at nominal speed	0.0000 ... 6.5000	Hz		
113	maximum motor speed	500.0000 ... 12000.0000	rpm		
32809	EMC set value	50 ... 400	V		

Parameter description

32840 language

This parameter displays the parameter name and possibly the corresponding unit in the appropriate language.

Value	Meaning
0	German
1	English
2	French
3	Polish

32839 qualification for entries

This parameter specifies which parameters can be modified by the respective operator.

Value	Meaning
6	service
7	development

217 parameter set preselection

Preselection via switching inputs X22:5 and X22:6.

216 command "switch parameter set"

The drive switches to the parameter set programmed in the parameter preselection (ID no. 217).

254 current parameter set

The presently current parameter set in the drive can be interrogated via this parameter.

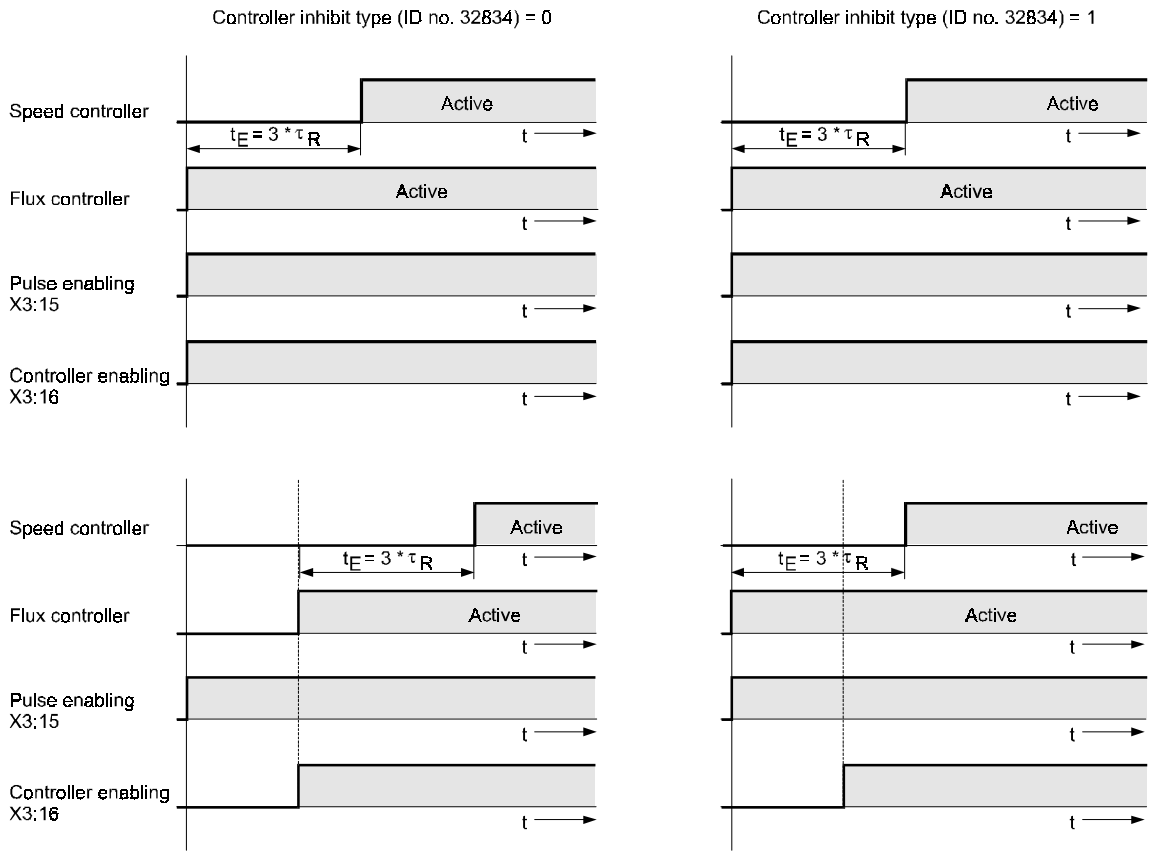
32841 command "save data in EEprom"

The current data are saved in the EEprom via the 0 ↵ and 3 ↵ command.

32834 controller inhibit type

This parameter specifies the type of controller inhibit after slowing down the motor.

Value	Meaning
0	brake down pulse inhibit when n=0
1	brake down no pulse inhibit when n=0

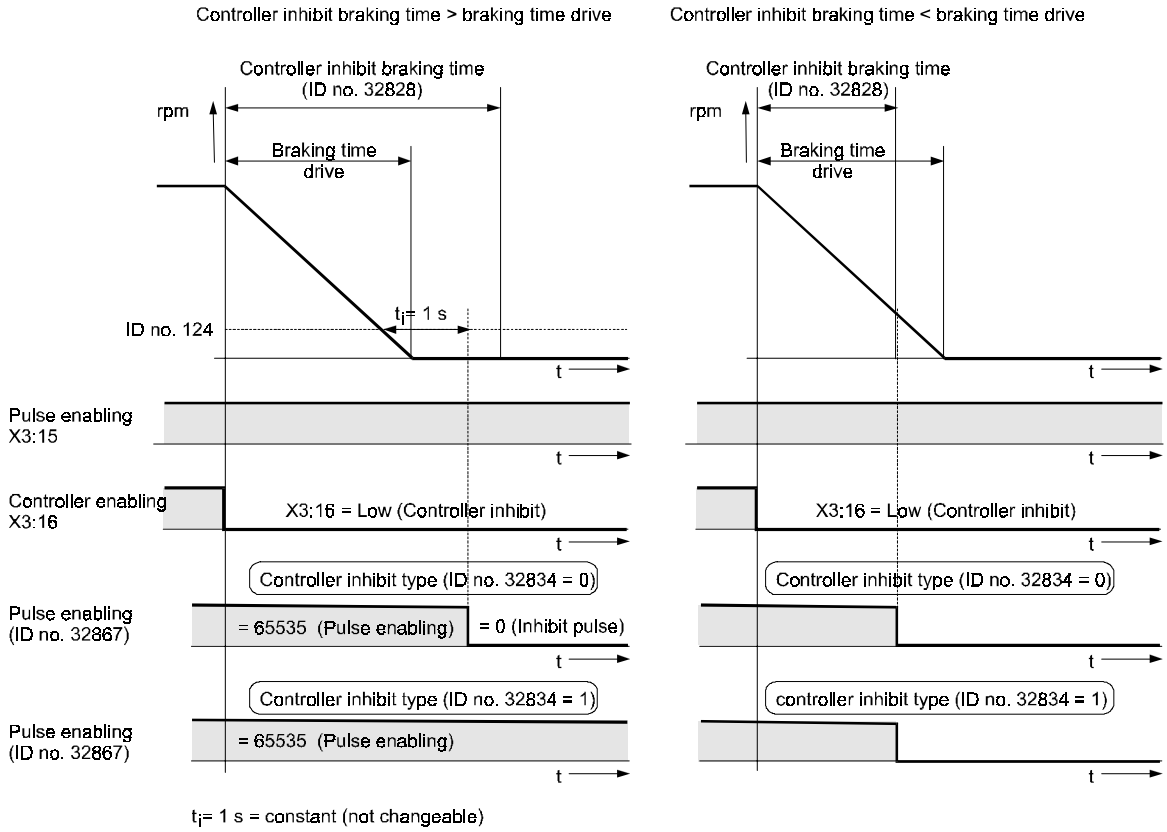


NOTE

In operation mode position control after pulse enabling and controller enabling is given, the position control enabling signal must be given delayed a minimum time of $t_E = 3 * \tau_R$, because the speed controller is enabled after this time.

32828 controller inhibit braking time (t_B)

After the preset time the pulses are automatically switched off; the drive slows to a standstill.



32818 Set value source

Via this parameter the service personnel can specify a set value source.

Value	Meaning
0	analog
1	digital (value see ID no.)
2	random-check generator (value see ID no.)
3	square-wave generator (value see ID no.)

32819 control type

Via this parameter the service personnel can specify the control type.
The torque limitation must be set to 0 % before switching to M control (0 V at X2:7 and X2:8).

Value	Meaning
0	speed control
1	torque control
2	position control
3	reference run
4	spindle positioning

The functions position control, reference run and spindle positioning are not yet implemented with synchronous motors.

32838 analog mode

This parameter displays the analog mode.

Value	Meaning
0	main spindle drive
1	C axis mode
2	main spindle mode with set correction value
3	C axis mode with set correction value
4	analog torque control

32837 set additive value

A set correction value can only be entered in analog mode.
Input: X3:1 and X3:2 from -10V .. +10V.

Value	Meaning
0	on
1	off

32790 encoder type

The encoder used is set via this parameter.

Value	Meaning
0	incremental encoder
1	incremental encoder (sine)
2	resolver

116 **Motorgeber-Strichzahl (number of motor encoder scale marks)**
The resolution for rotation feedback 1 (motor encoder) represents the pulses per motor revolution.

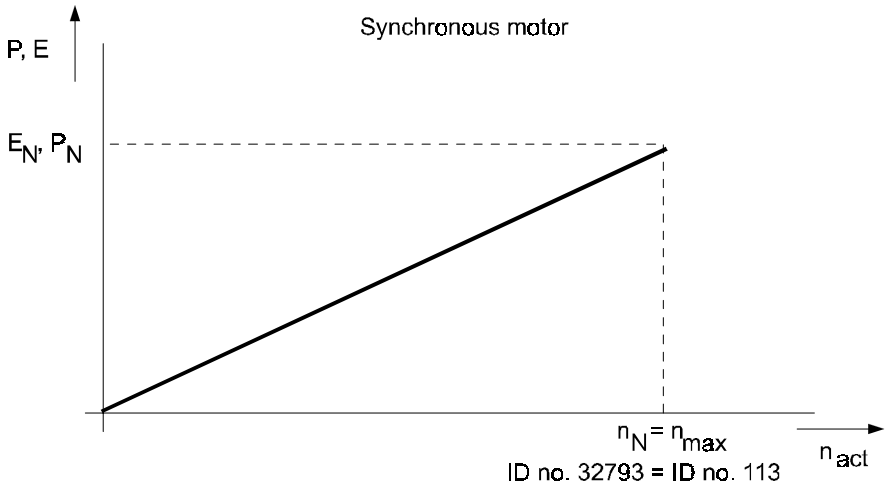
32791 **number of motor pole pairs (p)**
The number of motor pole pairs is set via this parameter.

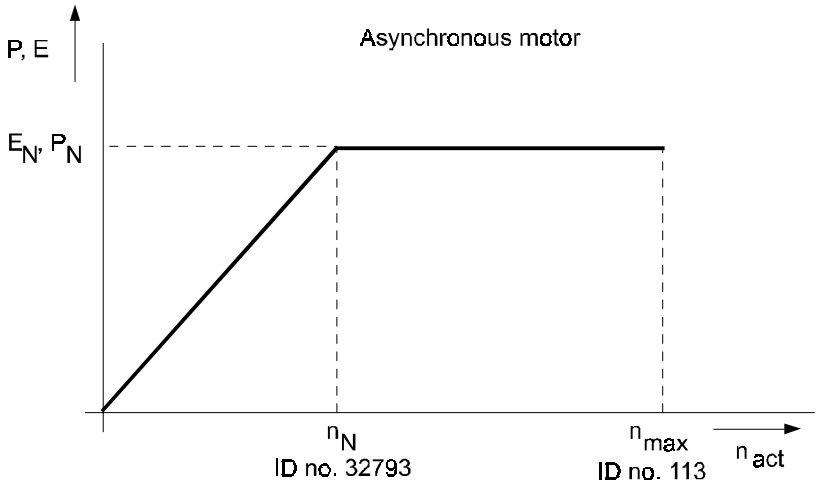
32793 **nominal motor speed (n_N)**
Via this parameter you specifiy the speed at which the motor reaches nominal power.

32792 **slip frequency at nominal speed (f_{2N})**
The slip frequency entry is only necessary for asynchronous motors.

113 **maximum motor speed (n_{max})**
The manufacturer specifies the maximum motor speed in the motor data sheet.

32809 **set EMF value(E_N)**
This parameter specifies the motor's nominal EMF value.





7.2.2 Motor-specific values (menu pages 3 - 5)

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
menu page 3	**motor-specific values**				
32897	temperature modell	0 ... 1		1	
32794	application speed for for motor nominal power	500.0000 ... 12000.0000	rpm		
32810	rotor time constant	100.0 ... 1000.0	ms		
32814	set magnetising current value	0.0 ... 500.0	A		
32815	magnetising current limitation	0.0 ... 500.0	A		
32804	set active current value	0.0 ... 500.0	A		
32805	active current limitation	0.0 ... 500.0	A		
32801	time constant of actual torque value	1.000 ... 10.000	ms		
32816	set apparent current value	0.0 ... 750.0	A		X
32817	apparent current limitation	0.0 ... 900.0	A		X
32933	time constant set torque value	0.0000 ... 10.000	ms	2	
menu page 4	**motor-specific values**				
32802	torque controller gain	0.10 ... 3.00			
32803	torque controller integral-action time	1.000 ... 6.000	ms		
32811	flux controller gain	1.00 ... 10.00			
32813	flux controller integral-action time	1.000 ... 30.000	ms		
32835	upper adaption limitation for current controller	0000.0000 ... 12000.0000	min^{-1}		
32927	I controller phase compensation stat.	0.00 ... 3.00			
32928	I controller phase compensation dyn.	0 ... 256			
32812	adaption flux controller gain	100.0 ... 1000.0	%		
menu page 5	**motor-specific values**				
32798	torque limitation for f<10Hz	0 ... 1			
32799	application speed for torque limitation	50.0000 ... 500.0000	rpm		
32800	maximum torque at rest	50.0 ... 100.0	%		
32806	torque limitation for high speeds	0 ... 1			
32807	application speed for torque limitation	1500.0000 ... 120000.0000	rpm		
32808	torque at maximum speed	10.0 ... 100.0	%		
32795	generator torque limitation	0 ... 1			
32796	generator torque limitation 1	80.0 ... 100.0	%		
32797	generator torque limitation 2	10.0 ... 79.0	%		

Parameter description

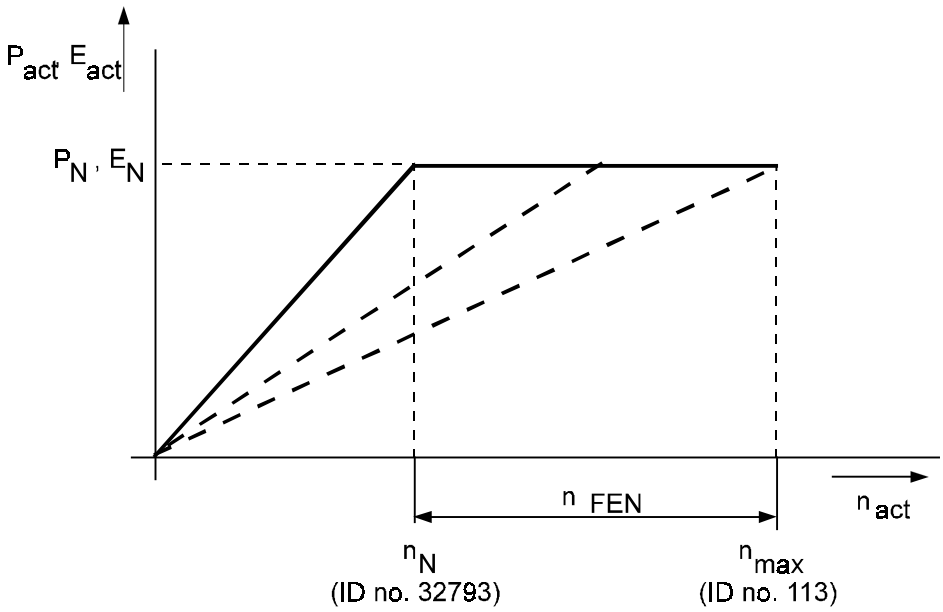
32897 temperature model

This parameter selects whether the operation is to take place with or without temperature correction.

Value	Meaning
0	inactive
1	active

32794 application speed for motor nominal speed

The constant torque of machine tools can be increased from 0 ... n_N to 0 ... n_{max}. The selected application speed must, however, not be smaller than the nominal motor speed.



32810 rotor time constant τ_R

Asynchronous motor: $\tau_R = \frac{L_{2\sigma}' + L_h}{R_2'}$

$L_{2\sigma}$ = inductance
L_h = main inductance
R_2' = resistance

Synchronous motor: typical value: 10 ms ... 50 ms

32814 set magnetising current value ($I_{\alpha N}$)

The magnetising current value is always 0 by synchronous motors.

32815 magnetising current limitation ($I_{\alpha G}$)

The maximum value of the magnetising current is entered via these parameters.

Sychronous motors:	typical value 5 A ... 20 A
Asynchronous motors:	1.2 x set magnetising current value (ID no. 32814)

32804 set active current value ($I_{\beta N}$)

$$I_{\beta N} = \sqrt{I_N^2 - I_{\alpha N}^2}$$

32805 active current limitation ($I_{\beta G}$)

The active current limitation is entered via this parameter.

Asynchronous motors:	1.2 x set active current value (ID no. 32804)

32801 time constant of actual torque value

This parameter specifies the time constant of the actual torque value.

Typical value 1 ms ... 3 ms.

32816 set apparent current value(I_N)

32817 apparent current limitation(I_{NG})

This parameter displays the set value and the limitation of the apparent current.

32802 torque controller gain

32803 torque controller integral-action time

These parameters indicate the torque controller's gain and its integral-action time.

32811 flux controller gain

32813 flux controller integral-action time

These parameters specify the flux controller's gain and its integral-action time.

32798 torque limitation for < 10 Hz

Via these parameters you can choose between torque limitation for low speeds and torque limitation for high speeds.

Value	Meaning
0	on
1	off

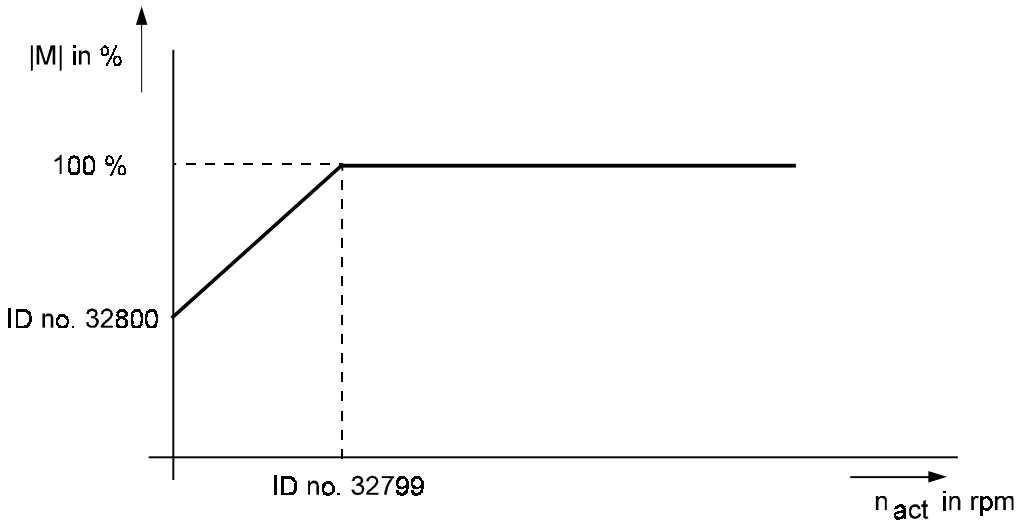
32799 application speed for torque limitation

The lower application speed for torque limitation is set via these parameters.

$$n = \frac{60 * 10Hz}{p} \text{ [rpm]}$$

32800 maximum torque at rest

It is possible to limit the torque when the motor is at rest.



32806 torque limitation for high speeds

Via these parameters you can choose torque limitation for high speeds.

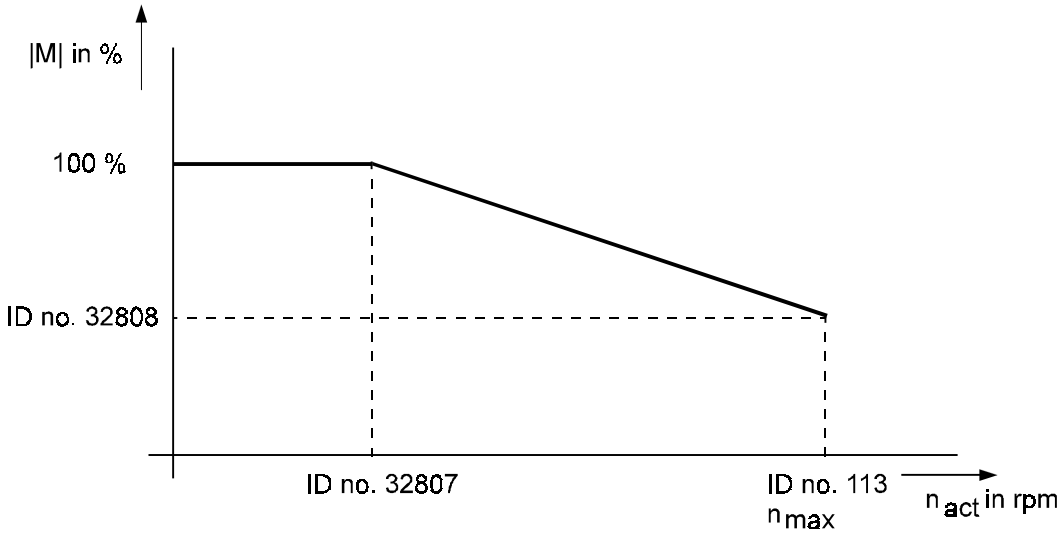
Value	Meaning
0	on
1	off

32807 application speed for torque limitation

The upper application speed for torque limitation is set via these parameters.

32808 torque at maximum speed

The torque value at maximum speed is entered via this parameter.



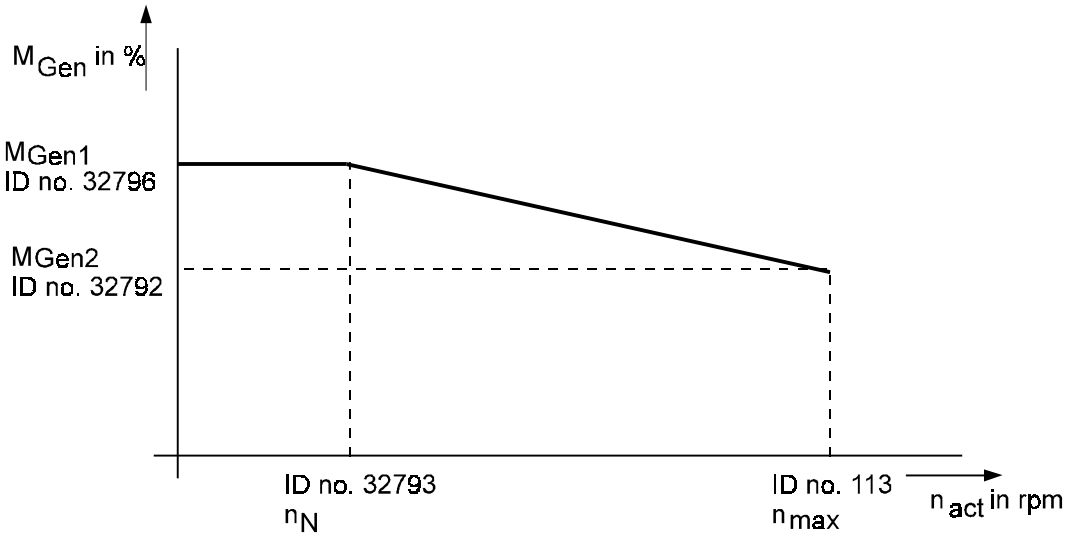
32795 generator torque limitation

This parameter specifies whether torque limitation in generator mode is desired.

Value	Meaning
0	on
1	off

32796 generator torque limitation 1(M_{Gen1})
32797 generator torque limitation 2(M_{Gen2})

The value of upper and lower torque limitation in generator mode can be set via these parameters.



7.3 Display and measuring parameters

7.3.1 Display of nominal and peak values (menu page 6)

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
menu page 6	**display of nominal and peak values**				
111	nominal motor current	1.000 ... 500.000	A		×
109	peak motor current	1.000 ... 500.000	A		×
112	nominal amplifier current	1.000 ... 500.000	A		×
110	peak amplifier current	1.000 ... 500.000	A		×
32780	actual value of intermediate circuit voltage	0 ... 700	V		×

Parameter description

111 **nominal motor current**

This parameter displays the nominal motor current. The displayed value must correspond to the value on the motor's rating plate.

This parameter should be set on the same value as apparent set current value (ID no. 32816) displayed.

109 **peak motor current**

This parameter is used as a memory for the maximum current of the motor.

This parameter should be set on the same value as apparent set current value (ID no. 32817) displayed.

112 **nominal amplifier current**

This parameter serves to display the permanently permissible nominal current of the converter for an ambient temperature of 35 °C.

110 **peak amplifier current**

Display of the temporarily permissible peak current of the converter. The amplifier's peak current is limited by measures on the unit itself, thus determining the current for the maximum attainable torque limit values.

32780 **actual value of intermediate circuit voltage**

Display parameter for the intermediate circuit voltage.

7.3.2 Random-check generator - square-wave generator (menu page 7)

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
menu page 7	random-check- / square-wave generator				
32820	random-check generator time t1	1.000 ... 60.000	s		
32821	random-check generator time t2	15.000 ... 3600.000	s		
32822	random-check generator n_{set} max	0.000 ... 12000.000	s		
32900	set velocity value V1	-12000.0000 ... 12000.0000	rpm		
32901	set velocity value G2	-12000.0000 ... 12000.0000	rpm		
32902	time for set velocity value V1	0.002 ... 60.000	s		
32903	time for set velocity value V2	0.002 ... 60.000	s		

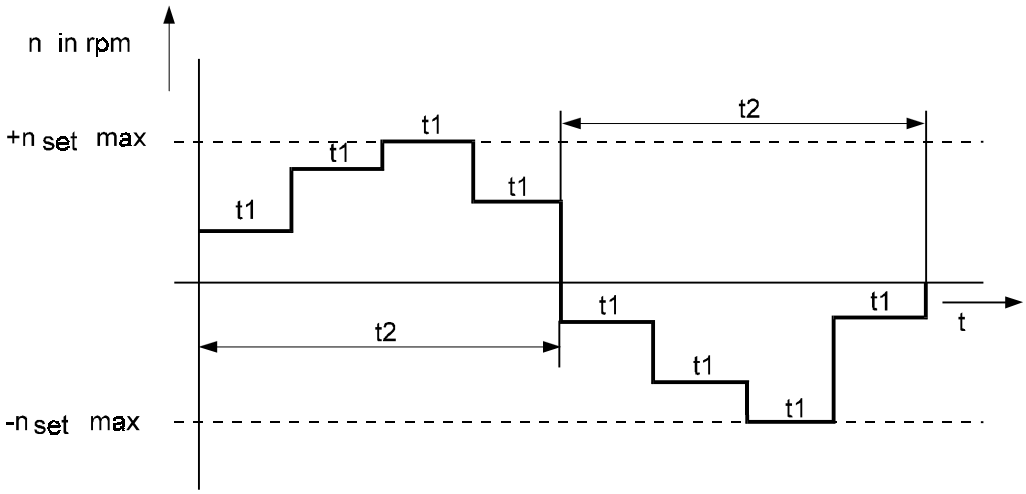
Parameter description

32820 **random-check generator time t1**
32821 **random-check generator time t2**

The random-check generator creates square-wave set value voltages.

32822 **random-check generator n_{set} max**

The set value voltage created by the random-check generator is bipolar and lies between $n_{set} = 0$ und n_{set} max.

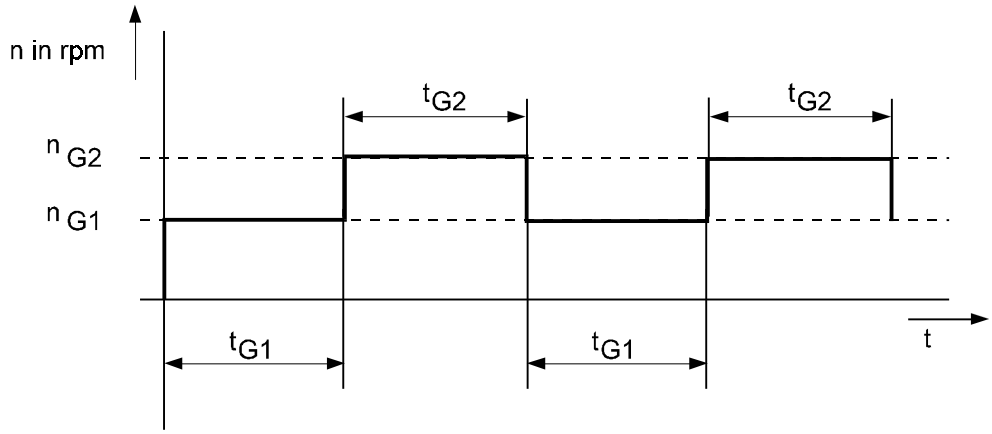


32900 set velocity value V1
32901 set velocity value V2

This parameter specifies the set velocity values of the square-wave generator.

32902 time for set velocity value V1
32903 time for set velocity value V2

The appropriate time for the respective set velocity values is entered via these parameters.



7.3.3 Characteristic curve of magnetisation (asynchronous machines only)

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	characteristic curve of magnetisation				
32872	N_1	0.0000 ... 10000.0000	rpm	1500	
32873	N_2	0.0000 ... 10000.0000	rpm	1700	
32874	N_3	0.0000 ... 10000.0000	rpm	2000	
32875	N_4	0.0000 ... 10000.0000	rpm	2500	
32876	N_5	0.0000 ... 10000.0000	rpm	3000	
32877	N_6	0.0000 ... 10000.0000	rpm	3750	
32878	N_7	0.0000 ... 10000.0000	rpm	4500	
32879	N_8	0.0000 ... 10000.0000	rpm	6000	
32880	N_9	0.0000 ... 10000.0000	rpm	7200	
32881	N_10	0.0000 ... 10000.0000	rpm	9600	
32882	N_11	0.0000 ... 10000.0000	rpm	12000	
32883	N_12	0.0000 ... 14400.0000	rpm	14400	
	characteristic curve of magnetisation				
32884	P_1	0.00 ... 140.00	%	100.00	
32885	P_2	0.00 ... 100.00	%	83.00	
32886	P_3	0.00 ... 100.00	%	70.00	
32887	P_4	0.00 ... 100.00	%	54.50	
32888	P_5	0.00 ... 100.00	%	46.00	
32889	P_6	0.00 ... 100.00	%	38.00	
32890	P_7	0.00 ... 100.00	%	31.00	
32891	P_8	0.00 ... 100.00	%	24.00	
32892	P_9	0.00 ... 100.00	%	20.00	
32893	P_10	0.00 ... 100.00	%	14.00	
32894	P_11	0.00 ... 100.00	%	12.00	
32895	P_12	0.00 ... 100.00	%	10.00	

Parameter description

32872 **N_1**
bis N_1 < N_2 < ... < N_12
32883 **N_12**

32884 **P_1**
bis P_1 > P_2 > ... < P_12
32895 **P_12**

The respective speed is set under N_1 to N_12, the appropriate factor for the description of the characteristic curve of magnetisation is set under P_1 to P_12.

7.3.4 Temperature monitoring

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	Temperature monitoring				
32782	actual circuitry housing temperature value	0.0 ... 100.0	°C		X
32783	actual amplifier temperature value	-100.0 ... 100.0	°C		X
32784	actual motor temperature value	0.0 ... 160.0	°C		X
202	cooling-error warning temperature	0 ... 100.0	°C	75	
205	cooling-error shutdown temperature	0 ... 100.0	°C	85	
200	amplifier warning temperature	0 ... 100.0	°C	75	
203	amplifier shutdown temperature	0 ... 100.0	°C	95	
201	motor warning temperature	0 ... 150.0	°C	130	
204	motor shutdown temperature	0 ... 160.0	°C	150	

Parameter description

32782 **actaul circuitry housing temperature value**

This parameter displays the temperature in the circuitry housing.

32783 **actual amplifier temperature value**

This parameter displays the power unit temperature.

32784 **actual motor temperature value**

Display of motor temperature.

202 **cooling-error warning temperature**

If the temperature inside the circuitry housing exceeds the cooling-error warning temperature, the drive sets the bit "cooling-error warning temperature" in Class 2 Diagnostics (see ID no. 12).

NOTE

Exceeding the temperature does not cause pulse or controller inhibit.

205 **cooling-error shutdown temperature**

If the temperature inside the circuitry housing exceeds the cooling-error shutdown temperature, the drive sets the bit "cooling-error shutdown temperature" in Class 1 Diagnostics (see ID no. 11).

NOTE

Exceeding the temperature causes controller inhibit.

200 **amplifier warning temperature**

If the amplifier temperature exceeds the amplifier warning temperature, the drive sets the bit "amplifier warning temperature" in Class 2 Diagnostics (see ID no. 12).

NOTE

Exceeding the temperature does not cause pulse or controller inhibit.

203 **amplifier shutdown temperature**

If the amplifier temperature exceeds the amplifier shutdown temperature, the drive sets the bit "amplifier shutdown temperature" in Class 1 Diagnostics (see ID no. 11).

NOTE

Exceeding the temperature causes controller inhibit.

201 **motor warning temperature**

If the motor temperature exceeds the motor warning temperature, the drive sets the bit "excess motor temperature warning" in Class 2 Diagnostics (see ID no. 12). With DS motors this function is not evaluated.

NOTE

Exceeding the temperature does not cause pulse or controller inhibit.

204 **motor shutdown temperature**

If the motor temperature exceeds the motor shutdown temperature, the drive sets the bit "excess motor temperature shutdown" in Class 1 Diagnostics (see ID no. 11).

NOTE

Exceeding the temperature causes controller inhibit.

7.3.5 Measuring channel 1 and 2

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	measuring channel 1 und 2				
32768	measuring channel 1	1 ... 32916			
32770	offset of measuring channel 1	-2047 ... +2047		0	
32769	scaling exponent of measuring channel 1	-16 ... +16		0	
32772	measuring channel 2	1 ... 32916			
32774	offset of measuring channel 2	-2047 ... +2047		0	
32773	scaling exponent of measuring channel 2	-16 ... +16		0	
32777	value 1 (32 bit)				
32778	value 2 (16 bit)				
32867	pulse enabled	0 ... 65535			X
32868	controller enabled	0 ... 65535			X

Parameter description

32768 **measuring channel 1**

Any parameter can be assigned to measuring channel 1. Output (-10 V ... + 10 V) plug X22:11, ground X22:12.

32770 **offset of measuring channel 1**

This value serves for the offset compensation of the converters and differential amplifiers.

32769 **scaling exponent of measuring channel 1**

Via this parameter exponential alteration of the gain is possible. The output is limited as of ± 10 V.

32772 **measuring channel 2**

Any parameter can be assigned to measuring channel 2. Output (-10 V ... + 10 V) plug X22:15, ground X22:15.

32774 **offset of measuring channel 2**

This value serves for the offset compensation of the converters and differential amplifiers.

32773 **scaling exponent of measuring channel 2**

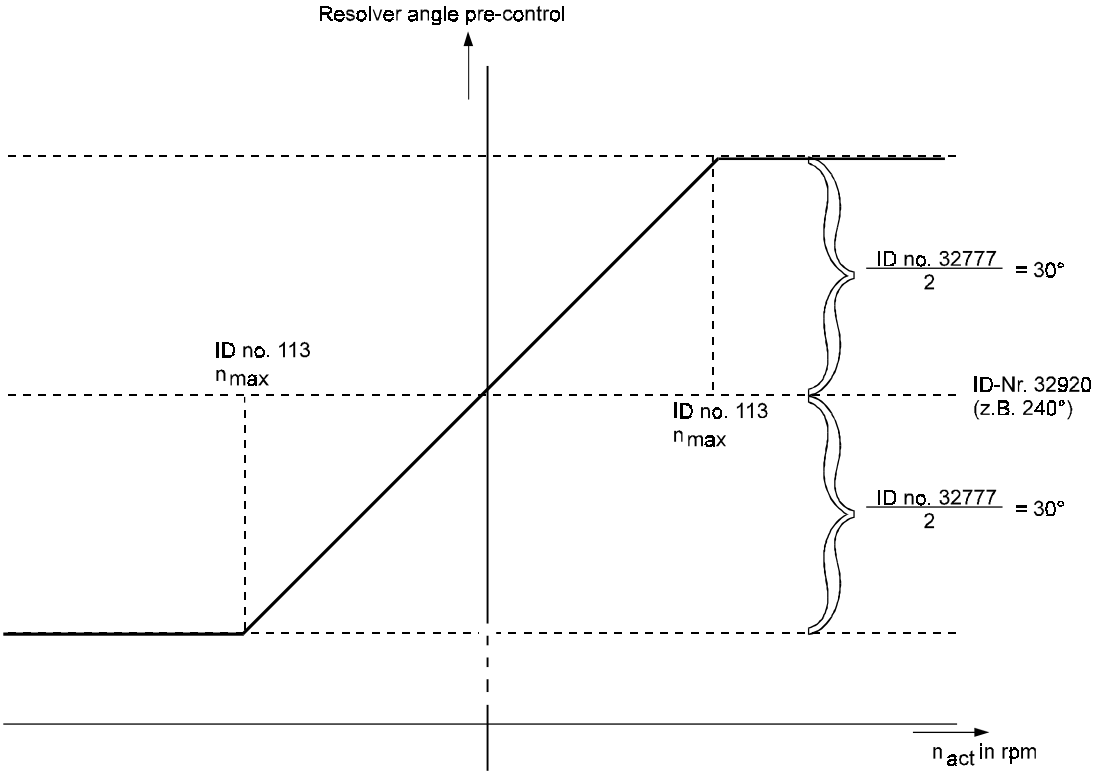
Via this parameter exponential alteration of the gain is possible. The output is limited as of ± 10 V.

32777 value 1 (32 bit)

Without function by asynchronous control.
SV_03.06H (synchronous control) followise meaning:

Value	Meaning
0	without resolver angle pre-control
> 0	without resolver angle pre-control

Example: value 1 = 60.000 ⇔ 60°



From n_{act} >= n_{max} the angle pre-control is constant.

32778 value 2 (16 bit)

value	Bedeutung
0001	controlling not changed (with torque controller) (boot data set setting)
0000	controlling without torque controller

32867 pulse enabled
32868 controller enabled

Value	Meaning
0	pulse inhibit or controller inhibit
65535	pulse enabling or controller enabling

7.3.6 Display of controller parameters

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	display of controller parameters				
32864	ramp function generator output	-2147483648 ... +2147483647			X
32865	rounding generator output	-2147483648 ... +2147483647			X
32863	set speed value	-2147483648 ... +2147483647			X
32856	speed controller output	-2147483648 ... +2147483647			X
32870	counter delete N_I_portion	0 ... 65535			X
32848	set active current	-2147483648 ... +2147483647			X
32846	actual torque value	-32768 ... +32767			X
32854	torque controller output	-32768 ... +32767			X
32896	set flux value	-32768 ... +32767			X
32847	actual flux value	-32768 ... +32767			X
32855	flux controller output	-32768 ... +32767			X
32869	actual speed value	-12000.0000 ... 12000.0000	rpm		X
32776	actual slip frequency value	-1000.0000 ... +1000.0000	Hz		X
32859	P gain speed controller	-2147483648 ... +2147483647			X
32860	integral action time speed controller	-2147483648 ... +2147483647			X
32850	P gain torque controller	-2147483648 ... +2147483647			X
32851	integral action time torque controller	-2147483648 ... +2147483647			X
32852	P gain flux controller	-2147483648 ... +2147483647			X
32853	integral action time flux controller	-2147483648 ... +2147483647			X
32861	real torque limitation positive	-2147483648 ... +2147483647			X
32862	real torque limitation negative	-2147483648 ... +2147483647			X
32842	cos(ωt)	-32768 ... +32767			X
32843	sin(ωt)	-32768 ... +32767			X
32844	I_U actual value	-512 ... +511			X
32845	I_V actual value	-512 ... +511			X
32866	set torque value by torque control	-2147483648 ... +2147483647			X
51	actual position value	-4×360.0000 ... +4×360.0000			X
32898	hardware verion	0000 ... 7FFF			X
32899	software version	0000 ... 7FFF			X
32785	boot initialisation error				X
32786	error bar of I/O component boot				X

Parameter description

These parameters display internal values of the controller.

51 **actual position value**

The actual position value displayed refers to the ROD encoder in the motor. 0 corresponds to the position of the reference signal after completion of the reference run.

32898 **hardware version**
32899 **software version**

These parameters display the hardware or software version of the controller used.
The software version contents 2 groups of figures
Example:

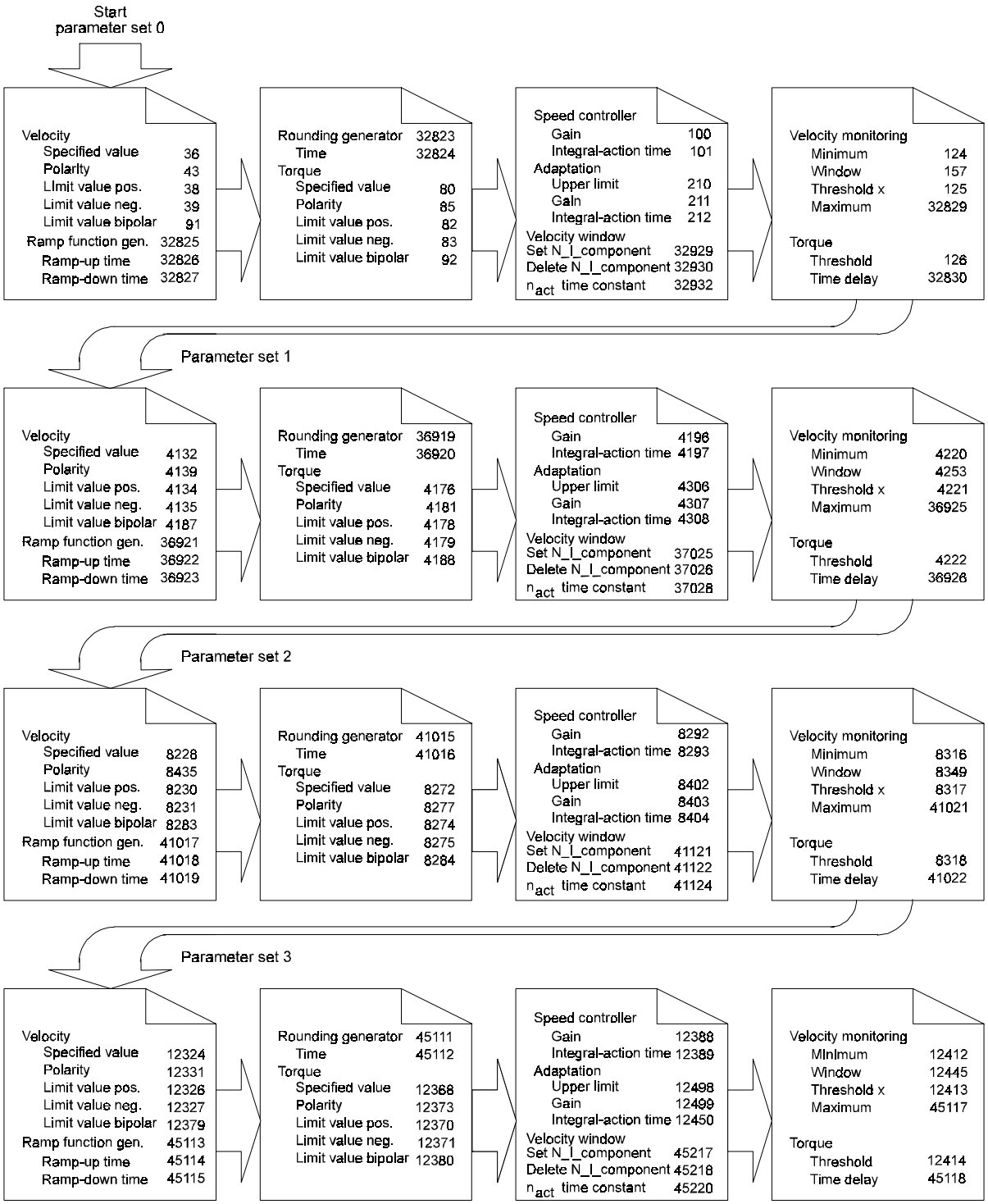
01 02
incompatible software version
compatible software version

Incompatible software version means, the new software isn´t able to read the data sets in the EEprom. Before the software is changed, the data from the EEprom has to be stored on disk or noted by hand.
An incompatible software e.g. originates from a new ID no. (additionally the file PCBASS.CFG must be supplemented by this number, see manual operation software).
Compatible software version means, the software is enlarged with additional functions or is changed for customer, without needing a new ID no.

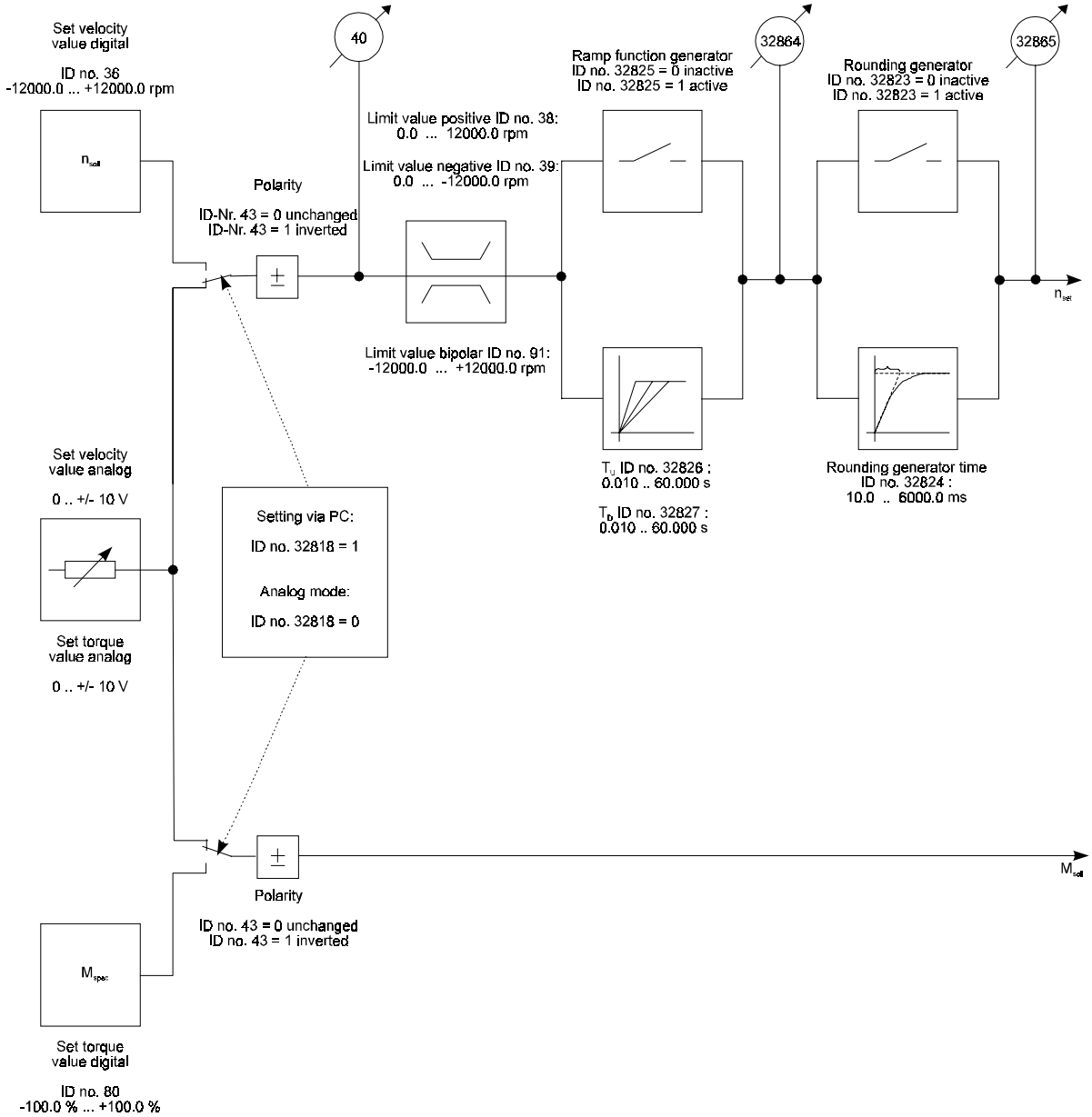
32785 **error bar of I/O component boot**
32786 **boot initialisation error**

If an error occurs during the controller's boot procedure, this error bar is activated and controller enabling is not possible (controller inhibit).
See chapter 7.2.1 Error messages.

7.4 Parameter set 0



7.4.1 Velocity and ramp function generator



Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	velocity and ramp function generator				
36	set velocity value	-12000.0000 ... 12000.0000	rpm	0	(X)
43	polarity of set velocity value			0	
38	positive velocity limit value	0.0000 ... 12000.0000	rpm		
39	negative velocity limit value	0.0000 ... 12000.0000	rpm		
91	bipolar velocity limit value	0.0000 ... 12000.0000	rpm		
40	actual velocity value	-12000.0000 ... 12000.0000	rpm		X
32825	ramp function generator	0 ... 1		0	
32826	ramp-up time	0.010 ... 60.000	s	0.01	
32827	ramp-down time	0.010 ... 60.000	s	0.01	

Parameter description

36 set velocity value

Set velocity value which can be set via the service PC. Switching of set value via ID no. 32818.

Clockwise rotation of the motor shaft (seen from the front) takes place if the set velocity value and the polarity are positive.

In the case of analog set value input this parameter serves for display purposes only.

Analog set value input (I/O option board 3.9211)

- MSP (-10 V .. + 10 V) at X2:2 and X2:1
- C axis (-10 V .. + 10 V) at X2:5 and X2:4
- additional n_{set} (-10 V .. + 10 V) at X3:2 and X3:1

43 polarity of set velocity value

This parameter corrects the polarity of the set/actual velocity value. Clockwise rotation of the motor shaft (seen from the front) takes place if the set velocity value and the polarity are positive.

Bit no.	Meaning
0	set velocity value 0: positive polarity 1: negative polarity
1 ... 2	reserved
3	analog actual velocity value 0: unipolar (clockwise and anti-clockwise speed [0 ... +10V] 1: bipolar (clockwise speed [0 ... +10V] anti-clockwise speed [0 ... -10V]) on PCB 3.9211 between X3:4 and X3:6
4 ... 15	reserved

38 **positive velocity limit value**

The positive velocity limit value describes the maximum permissible velocity in positive direction. If the limit value is exceeded, the message in Class 3 Diagnostics is displayed.

39 **negative velocity limit value**

The negative velocity limit value describes the maximum permissible velocity in negative direction. If the limit value is exceeded, the message in Class 3 Diagnostics is displayed.

91 **bipolar velocity limit value**

The bipolar velocity limit value describes the maximum permissible velocity in both directions. If the limit value is exceeded, the message in Class 3 Diagnostics is displayed.

40 **actual velocity value**

This parameter displays the current actual velocity value.

32825 **ramp function generator**

This parameter activates the ramp (ramp-up time/ramp-down time) in the main spindle area.

32826 **ramp-up time**

The acceleration of the machine can be set via the ramp-up time. The selected time refers to a set value alteration of 100 %.

32827 **ramp-down time**

The deceleration of the machine can be set via the ramp-down time. The selected time refers to a set value alteration of 100 %.

NOTE

If the drive is slowed down by activation of the controller inhibit (X3:16 low), the set ramp-down time does not apply. The drive slows down at the set torque limit.
If the halt command is activated (X3:17 high), the drive decelerates with the preselected ramp-down time.

7.4.2 Rounding generator and torque

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	rounding generator and torque				
32823	rounding generator	0 ... 1		0	
32824	rounding generator time	10.0 ... 6000.0	ms	10	
80	set torque value for M control	-100.0 ... 100.0	%	0	
85	polarity of set torque value			0	
82	positive torque limit value	0.0 ... 100.0	%	100	(X)
83	negative torque limit value	-100.0 ... 0	%	-100	(X)
92	bipolar torque limit value	0.0 ... 100.0	%	100	(X)
84	actual torque value	-100.0 ... 100.0	%		X

Parameter description

32823 **rounding generator**

The rounding generator prevents abrupt set value changes in the main spindle area.

32824 **rounding generator time**

This parameter indicates the degree of rounding. The value must not exceed 20 % of ramp-up time or ramp-down time.

80 **set torque value for M control**

In the torque control mode the drive generates torque corresponding to the set value.
Positive values result in clockwise torque.
Analog set value input (I/O option board LP 3.9211)
(-10 V .. + 10 V) at X2:2 and X2:1

WARNING

Without load torque the drive will overspeed.

85 **polarity of set torque value**

Clockwise rotation of the motor shaft (seen from the front) takes place if the set torque value and the polarity are positive.

Bit no.	Meaning
0	set torque value 0: positive polarity 1: negative polarity
1	reserved
2	actual torque value 0: positive polarity 1: negative polarity
3	analog actual torque value 0: unipolar pos. and neg. actual torque value [0 ... +10V] 1: bipolar pos. actual torque value (bit no. 2 = 0) [0 ... +10V] neg. actual torque value (bit no. 2 = 1) [0 ... -10V] on PCB 3.9211 between X3:5 und X3:6
4 ... 15	reserved

82 **positive torque limit value**
83 **negative torque limit value**
92 **bipolar torque limit value**

Display of torque limitation. With M control a value < 1 % should be set.
The torque limit values limit torque either in positive or negative direction or symmetrically.
With analog set value input (I/O option board 3.9211)

a) X2:7 = +10 V or -10 V X2:8 = 0 V ID no. 32926 = 0
⇨ ID no. 82 = 100 %
ID no. 83 = -100 %
ID no. 92 = 100 %

b) X2:7 = +10 V X2:8 = 0 V ID no. 32926 = 1
⇨ ID no. 82 = 100 %
ID no. 83 = 0 %
ID no. 92 = 100 %

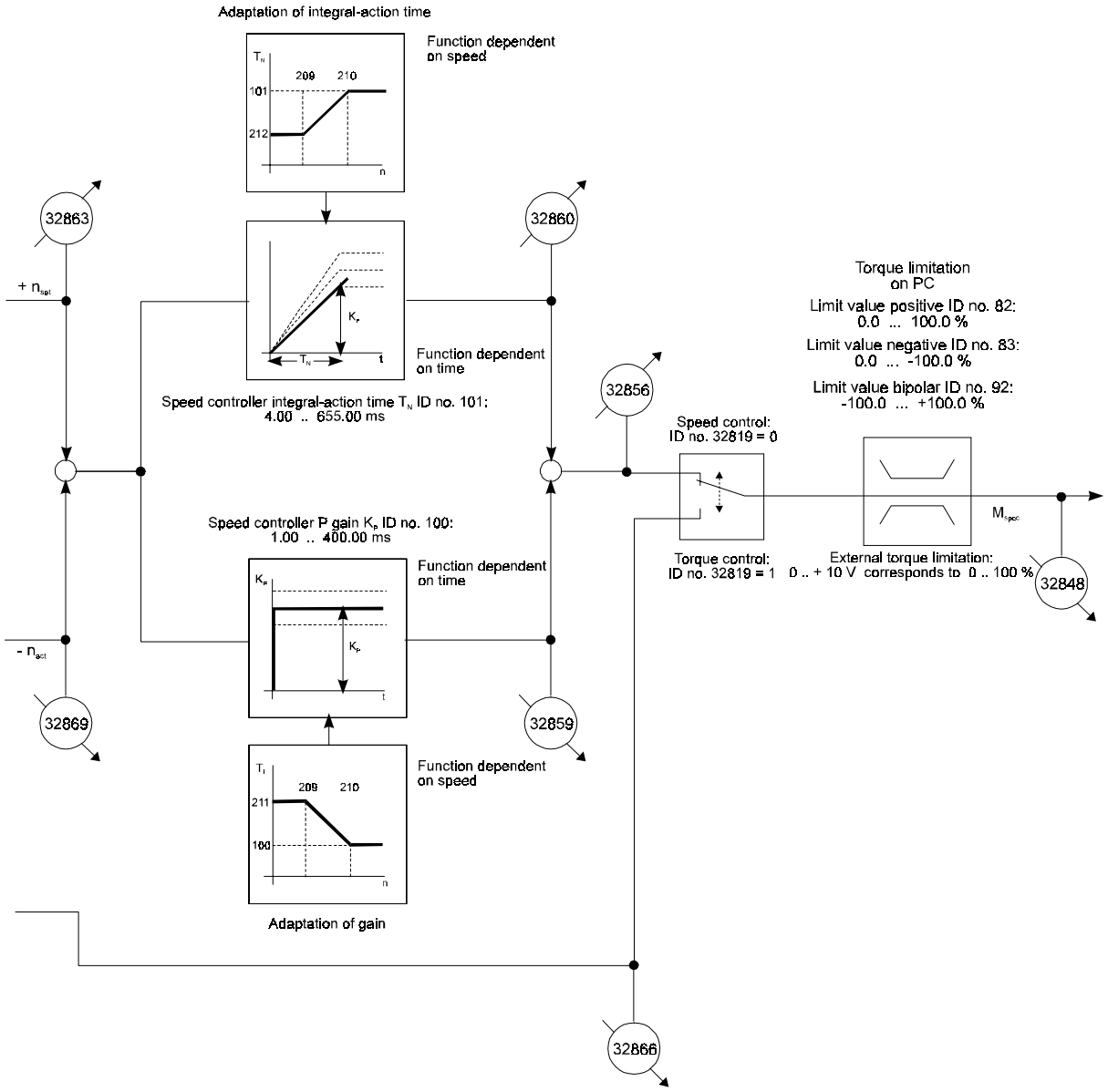
c) X2:7 = -10 V X2:8 = 0 V ID no. 32926 = 1
⇨ ID no. 82 = 0 %
ID no. 83 = -100 %
ID no. 92 = 100 %

On exceeding the torque limit value the drive sets the message in Class 3 Diagnostics.

84 **actual torque value**

This parameter displays the current actual torque value.

7.4.3 Speed controller



Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	speed controller				
100	speed controller gain	0.10 ... 400.00			
101	speed controller integral-action time	0.00 ... 655.00	ms		
209	lower adaptation limit for speed controller	0 ... 0	rpm	0	
210	upper adaptation limit for speed controller	10.0000 ... 1000.0000	rpm	200	
211	proportional gain adaptation	100.0 ... 1000.0	%		
212	integral-action time adaptation	1.0 ... 100.0	%		
32929	set velocity window KI counter N_I_component)	1.0000 ... 600.0000	rpm		
32930	delete velocity window N_I_component	1.0000 ... 600.0000	rpm		
32932	actual speed value time constant	0.0 ... 60.0	ms	0	

Parameter description

100 speed controller gain

This parameter specify the gain (proportional component) of the speed controller.

101 speed controller integral-action time

This parameter specify the integral-action time (integral-action component) of the speed controller.
Is this parameter set to 0 the controller works as a P-controller.

209 lower adaptation limit for speed controller
210 upper adaptation limit for speed controller

Below the lower adaptation limit and above the upper adaptation limit the adaptation of the proportional gain (ID no. 211) and the adaptation of the integral-action time (ID no. 212) is active. Within the adaptation limits the speed controller proportional gain and the speed controller integral-action time change linearly. At the upper adaptation limit they reach the values set in the speed controller proportional gain (ID no. 100) and the speed controller integral-action time (ID no. 101).

211 proportional gain adaptation

Below the lower adaptation limit the adaptation of the proportional gain indicates the percentage value referring to the speed controller proportional gain (ID no. 100). Above the upper adaptation limit the speed controller proportional gain changes linearly taking the adaptation of the proportional gain and the current speed into account.

212 integral-action time adaptation

Below the lower adaptation limit the integral-action time adaptation indicates the percentage value referring to the speed controller integral-action time (ID no. 101). Above the upper adaptation limit the speed controller proportional gain changes linearly taking the adaptation of the integral-action time and the current speed into account.

32929 set velocity window KI counter N_I_component)

The KI counter is set at a preset difference between set speed value and actual speed value.

If this parameter is set to 1000 rpm, the speed controller's integral-action component is not deleted.

32930 delete velocity window N_I_component

This parameter specifies the difference between set speed value and actual speed value at which the KI counter is counted back and the speed controller's integral-action component deleted.

32932 actual speed value time constant

For smoothing the actual speed value a time constant can be set here.

7.4.4 Messages - monitoring

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	messages - monitoring				
124	speed threshold n_{min}	6.0000 ... 600.0000	rpm	100	
157	velocity window	6.0000 ... 600.0000	rpm	120	
125	velocity threshold n_x	6.0000 ... 1200.0000	rpm	100	
32829	velocity threshold n_{max}	1200.0000 ... 12000.0000	rpm		
32831	maximum intermediate circuit voltage threshold	20 ... 800	V		
126	torque threshold M_{dx}	10.0 ... 100.0	%		
32830	response time Pzkx (M_{dx})	0.100 ... 30.000	s		
32931	voltage failure time	0.000 ... 60.000	s	0	

Parameter description

124 **speed threshold n_{min}**

The zero-speed window describes the velocity deviation from n = 0 as an absolute value. If the actual velocity value is inside the zero-speed window the drive sets the message n_{act} = 0 (ID no. 331).
Display via LED H403 yellow or via relay contacts X3:9 and X3:10 on printed circuit board 3.9211.

157 **velocity window**

The drive sets the velocity-dependent messages whenever the measured velocity value exceeds or falls below the respective velocity comparison value and is inside the velocity window.

125 **velocity threshold n_x**

If the actual velocity value falls below the velocity threshold n_x, the drive sets the message $n_{act} < n_x$ (ID no. 332) in Class 3 Diagnostics.

32829 **velocity threshold n_{max}**

The maximum permissible velocity + 10 % is set via this parameter. On exceeding the threshold the controller is inhibited and and the Class 1 Diagnostics error message set.

32831 **maximum intermediate circuit voltage threshold**

This parameter is set to the maximum intermediate circuit voltage as standard. On exceeding the maximum threshold, pulse inhibit takes place.

126 **torque threshold M_{dx}**

If the actual torque value exceeds torque threshold M_{dx}, the drive sets the message M_d ³ M_{dx} (ID no. 333) in Class 3 Diagnostics.

Display via LED H 401 red and via relay contacts X3:13 and X3:14 on printed circuit board 3.9211.

32830 **response time Pzkx (M_{dx})**

The response time specifies for how long the torque threshold must be exceeded before a message is displayed.

32931 **voltage failure time**

After a voltage failure that lasts not longer than the set voltage failure time, the drive starts independently if the power supply of the controller isn´t disturbed and the pulse enable and controller enable is given. After a voltage failure that lasts longer the drive sets a message in Class 1 Diagnostics.

7.5 Parameter set 1

7.5.1 Velocity and ramp function generator

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	velocity and ramp function generator				
4132	set velocity value	-12000.0000 ... 12000.0000	rpm	0	(X)
4139	polarity of set velocity value			0	
4134	positive velocity limit value	0.0000 ... 12000.0000	rpm		
4135	negative velocity limit value	0.0000 ... 12000.0000	rpm		
4187	bipolar velocity limit value	0.0000 ... 12000.0000	rpm		
40	actual velocity value	-12000.0000 ... 12000.0000	rpm		X
36921	ramp function generator	0 ... 1		0	
36922	ramp-up time	0.010 ... 60.000	s	0.01	
36923	ramp-down time	0.010 ... 60.000	s	0.01	

6.5.2 Rounding generator and torque

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	rounding generator and torque				
36919	rounding generator	0 ... 1		0	
36920	rounding generator time	10.0 ... 6000.0	ms	10	
4176	set torque value for M control	-100.0 ... 100.0	%	0	
4181	polarity of set torque value			0	
4178	positive torque limit value	0.0 ... 100.0	%	100	(X)
4179	negative torque limit value	-100.0 ... 0	%	-100	(X)
4188	bipolar torque limit value	0.0 ... 100.0	%	100	(X)
84	actual torque value	-100.0 ... 100.0	%		X

7.5.3 Speed controller

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	speed controller				
4196	speed controller gain	0.10 ... 400.00			
4197	speed controller integral-action time	0.00 ... 655.00	ms		
4305	lower adaptation limit for speed controller	0 ... 0	rpm	0	
4306	upper adaptation limit for speed controller	10.0000 ... 1000.0000	rpm	200	
4307	proportional gain adaptation	100.0 ... 1000.0	%		
4308	integral-action time adaptation	1.0 ... 100.0	%		
37025	set velocity window KI counter N_I_component)	1.0000 ... 600.0000	rpm		
37026	delete velocity window N_I_component	1.0000 ... 600.0000	rpm		
37028	actual speed value time constant	0.0 ... 60.0	ms	0	

7.5.4 Messages - monitoring

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	messages - monitoring				
4220	speed threshold n_{min}	6.0000 ... 600.0000	rpm	100	
4253	velocity window	6.0000 ... 600.0000	rpm	120	
4221	velocity threshold n_x	6.0000 ... 1200.0000	rpm	100	
36925	velocity threshold n_{max}	1200.0000 ... 12000.0000	rpm		
36927	maximum intermediate circuit voltage threshold	20 ... 800	V		
4222	torque threshold M_{dx}	10.0 ... 100.0	%	90	
36926	response time Pzkx (M_{dx})	0.100 ... 30.000	s	0.5	

Parameter description

Parameter description see parameter set 0.

7.6 Parameter set 2

7.6.1 Velocity and ramp function generator

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	velocity and ramp function generator				
8228	set velocity value	-12000.0000 ... 12000.0000	rpm	0	(X)
8235	polarity of set velocity value			0	
8230	positive velocity limit value	0.0000 ... 12000.0000	rpm		
8231	negative velocity limit value	0.0000 ... 12000.0000	rpm		
8283	bipolar velocity limit value	0.0000 ... 12000.0000	rpm		
40	actual velocity value	-12000.0000 ... 12000.0000	rpm		X
41017	ramp function generator	0 ... 1		0	
41018	ramp-up time	0.010 ... 60.000	s	0.01	
41019	ramp-down time	0.010 ... 60.000	s	0.01	

7.6.2 Rounding generator and torque

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	rounding generator and torque				
41015	rounding generator	0 ... 1		0	
41016	rounding generator time	10.0 ... 6000.0	ms	10	
8272	set torque value for M control	-100.0 ... 100.0	%	0	
8277	polarity of set torque value			0	
8274	positive torque limit value	0.0 ... 100.0	%	100	(X)
8275	negative torque limit value	-100.0 ... 0	%	-100	(X)
8284	bipolar torque limit value	0.0 ... 100.0	%	100	(X)
84	actual torque value	-100.0 ... 100.0	%		X

7.6.3 Speed controller

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	speed controller				
8292	speed controller gain	0.10 ... 400.00			
8293	speed controller integral-action time	0.00 ... 655.00	ms		
8401	lower adaptation limit for speed controller	0 ... 0	rpm	0	
8402	upper adaptation limit for speed controller	10.0000 ... 1000.0000	rpm	200	
8403	proportional gain adaptation	10.0 ... 1000.0	%		
8404	integral-action time adaptation	1.0 ... 100.0	%		
41121	set velocity window KI counter N_I_component)	1.0000 ... 600.0000	rpm		
41122	delete velocity window N_I_component	1.0000 ... 600.0000	rpm		
41124	actual speed value time constant	0.0 ... 60.0	ms	0	

7.6.4 Messages - monitoring

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	messages - monitoring				
8316	speed threshold n_{min}	6.0000 ... 600.0000	rpm	100	
8349	velocity window	6.0000 ... 600.0000	rpm	120	
8317	velocity threshold n_x	6.0000 ... 1200.0000	rpm	100	
41021	velocity threshold n_{max}	1200.0000 ... 12000.0000	rpm		
41023	maximum intermediate circuit voltage threshold	20 ... 800	V		
8318	torque threshold M_{dx}	10.0 ... 100.0	%	90	
41022	response time Pzkx (M_{dx})	0.100 ... 30.000	s	0.5	

Parameter description

Parameter description see parameter set 0.

7.7 Parameter set 3

7.7.1 Velocity and ramp function generator

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	velocity and ramp function generator				
12324	set velocity value	-12000.0000 ... 12000.0000	rpm	0	(X)
12331	polarity of set velocity value			0	
12326	positive velocity limit value	0.0000 ... 12000.0000	rpm		
12327	negative velocity limit value	0.0000 ... 12000.0000	rpm		
12379	bipolar velocity limit value	0.0000 ... 12000.0000	rpm		
40	actual velocity value	-12000.0000 ... 12000.0000	rpm		X
45113	ramp function generator	0 ... 1		0	
45114	ramp-up time	0.010 ... 60.000	s	0.01	
45115	ramp-down time	0.010 ... 60.000	s	0.01	

7.7.2 Rounding generator and torque

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	rounding generator and torque				
45111	rounding generator	0 ... 1		0	
45112	rounding generator time	10.0 ... 6000.0	ms	10	
12368	set torque value for M control	-100.0 ... 100.0	%	0	
12373	polarity of set torque value			0	
12370	positive torque limit value	0.0 ... 100.0	%	100	(X)
12371	negative torque limit value	-100.0 ... 0	%	-100	(X)
12380	bipolar torque limit value	0.0 ... 100.0	%	100	(X)
84	actual torque value	-100.0 ... 100.0	%		X

7.7.3 Speed controller

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	speed controller				
12388	speed controller gain	1.00 ... 400.00			
12389	speed controller integral-action time	4.00 ... 655.00	ms		
12497	lower adaptation limit for speed controller	0 ... 0	rpm	0	
12498	upper adaptation limit for speed controller	10.0000 ... 1000.0000	rpm	200	
12499	proportional gain adaptation	100.0 ... 1000.0	%		
12500	integral-action time adaptation	1.0 ... 100.0	%		
45217	set velocity window KI counter N_I_component)	1.0000 ... 600.0000	rpm		
45218	delete velocity window N_I_component	1.0000 ... 600.0000	rpm		
45220	actual speed value time constant	0.0 ... 60.0	ms	0	

7.7.4 Messages - monitoring

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	messages - monitoring				
12412	speed threshold n_{min}	6.0000 ... 600.0000	rpm	100	
12445	velocity window	6.0000 ... 600.0000	rpm	120	
12413	velocity threshold n_x	6.0000 ... 1200.0000	rpm	100	
45117	velocity threshold n_{max}	1200.0000 ... 12000.0000	rpm		
45119	maximum intermediate circuit voltage threshold	20 ... 800	V		
12414	torque threshold M_{dx}	10.0 ... 100.0	%	90	
45118	response time Pzkx (M_{dx})	0.100 ... 30.000	s	0.5	

Parameter description

Parameter description see parameter set 0.

7.8 Encoder evaluation

Parameter overview

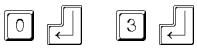
ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	encoder evaluation				
32917	motor data saved	0 ... 1			
32918	incremental encoder emulation	0 ... 10		3	
32919	resolver resolution	0 ... 9		2	
32920	resolver position correction	- 360.0000 ... 360.0000	degree		
32921	application speed M generator	1000.0000 ... 12000.0000	rpm		
32934	slip frequency at motor temperature 1	0.0100 ... 6.5000	Hz		
32935	temperature 1	0.0 ... 200.0	°C		
32936	temperature 2	0.0 ... 200.0	°C		

Parameter description:

32917 motor data saved

Value	Meaning
0	the selected motor data have not been confirmed
1	the motor data have been selected and are confirmed

The data are saved via the "save data in the EEPROM command".

ID no. 32841 

32918 incremental encoder emulation (with synchronous motors only)

Via this parameter the resolution of the incremental encoder emulation can be set, i.e. the number of emulated increments per physical motor revolution. The permissible value depends among other things on the respective operating status.

Value	Resolution
0	128 increments
1	256 increments
2	512 increments
3	1024 increments
4	2048 increments
5	4096 increments
6	8192 increments
7	16384 increments

$$\text{Maximum resolution} = \frac{\text{Resolver resolution}}{4}$$

e.g. if the resolver resolution is set to 12 bit, the maximum resolution of the incremental encoder emulation is only 1024 increments.

32919 resolver resolution (with synchronous motors only)

This parameter specifies the resolution or speed-dependent dynamic switching between different resolutions.

Value	Meaning
0	interlocks 16 bit resolution (n_{act} < 500 rpm)
1	interlocks 14 bit resolution (n_{act} < 2500 rpm)
2	dynamic switching between 14 bit and 16 bit
3	interlocks 12 bit resolution (n_{act} < 10000 rpm)
4	dynamic switching between 12 bit and 14 bit
5	dynamic switching between 12 bit, 14 bit and 16 bit
6	8192 increments
7	16384 increments

32920 resolver position correction (with synchronous motors only)

This parameter sets the zero position of the resolver evaluation to the motor's rotor position.

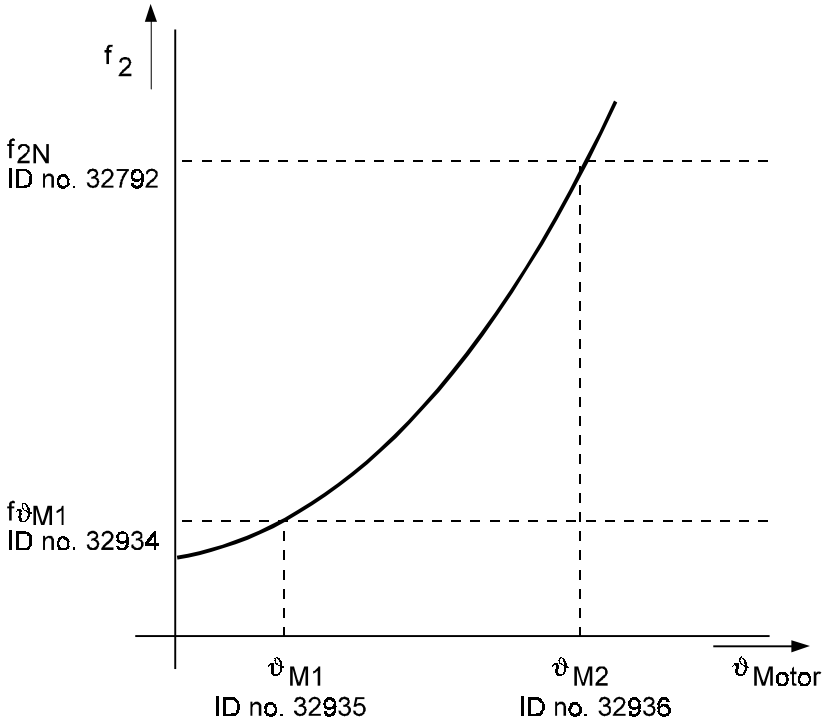
32921 application speed for generator M reduction and flux controller P component adaptation (with synchronous motors only))

This parameter selects the speed for the generator torque reduction and for the P adaptation of the flux controller.

32934 **slip frequency at motor temperature 1 ($f_{\vartheta M1}$)**
32933 **temperature 1 (ϑ_{M1})**
32934 **temperature 2 (ϑ_{M2})**

These parameters are only effective with asynchronous controlling.

Temperature 2 > temperature 1.



7.9 Set value adaptation

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	set value adaptation				
32922	n_{set} main spindle offset	- 100.0000 ... 100.0000	rpm		
32923	n_{set} C axis offset	- 100.0000 ... + 100.0000	rpm		
32924	M_{set} offset	- 2 ... + 2	%	0	
32925	n_{set}-max MSP	- 100.0000 ... 12000.0000	rpm		
32926	M limitation analog	0 ... 2		0	

Parameter description:

32922 **n_{set} main spindle offset**
32923 **n_{set} C axis offset**
32924 **M_{set} offset**

With analog set value input these parameters serve for offset correction.

32925 **n_{set} max MSP**

This parameter sets the maximum speed by ±10 V at X2:1/2.

±10 V ⇔ ± n_{soll} max MSP (rpm)

min. value: 100 rpm
max. value: n_{max} (ID no. 113) + 200 rpm

32926 **M limitation analog**

This parameter sets the torque threshold (ID no. 32818 = 0).

Value	Meaning
0	symmetric limitation of both torque directions X2:7=+10 V or -10 V torque limitation positive = +100 % torque limitation negative = -100 % torque limitation bipolar = 100 %
1	not symmetric X2:7=+10 V torque limitation positive = +100 % torque limitation negative = 0 % torque limitation bipolar = 100 % X2:7=-10 V torque limitation positive = 0 % torque limitation negative = -100 % torque limitation bipolar = 100 %
2	torque limitations the same as set digital value

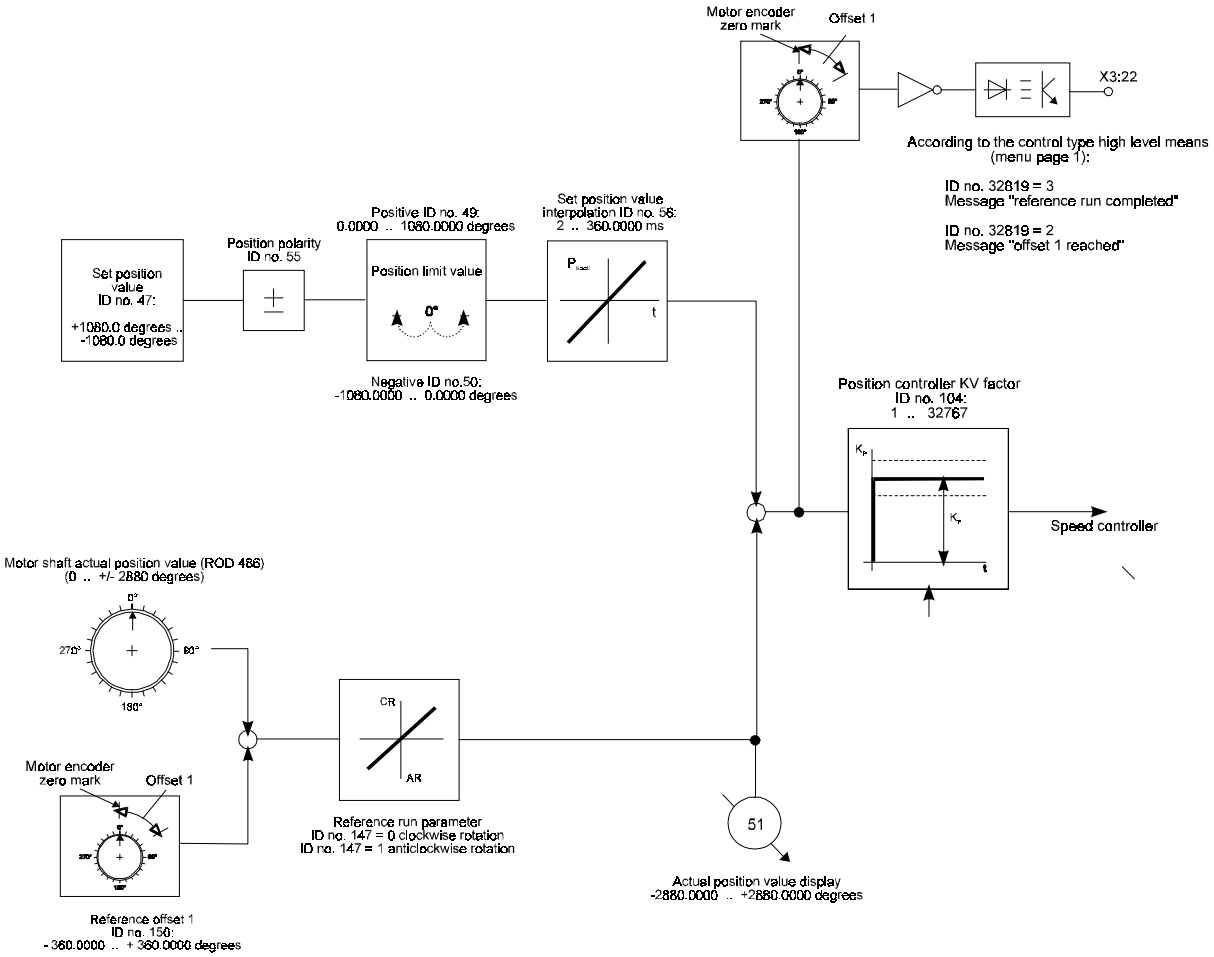
7.10 Position control (asynchronous motors)

The functions position control, reference run and spindle positioning are currently implemented for the operation of asynchronous motors only.

7.10.1 Position control and reference run

Can only be activated via PC.

Not implemented with synchronous motors.



Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	Lageregelung und Referenz fahren				
47	set position value	-1080.0000 ... +1080.0000	degree	0	
55	position polarity parameter				
49	positive position limit value	0.0000 ... +1080.0000	degree	1080.0	
50	negative position limit value	-1080.0000 ... 0.0000	degree	-1080.0	
56	position interpolation auxiliary value	2 ... 3600000	ms	1000	
104	position controller KV factor	1 ... 32767		1	
51	actual position value 1	-2880.0000 ... +2880.0000	degree	0.0000	
147	reference run parameter	0 ... 1		0	
153	spindle angle position	-360.0000 ... +360.0000	degree	0	

Parameter description

47 **set position value**

If the drive is in the position control mode the set position values are transmitted from the NC to the drive in the timing code of the NC cycle time.

55 **position polarity parameter**

This parameter serves to switch the polarities of the set position data according to the application.

The polarities are not switched inside a closed loop system. They are only switched outside (at the input and output).

Clockwise rotation of the motor shaft (seen from the front) takes place if the set position value difference and the polarity are positive.

49 **positive position limit value**

50 **negative position limit value**

The position limit value describes the maximum traverse path in positive or negative direction. The position limit value is only active if all position data refer to the reference point.

If the position limit value is exceeded, the drive sets an error bit in Class 1 Diagnostics (ID no. 11) and/or a warning in Class 2 Diagnostics (ID no. 12) depending on the internal function.

56 **position interpolation auxiliary value**

In control systems with variable set position value cycle time the position interpolation auxiliary value informs the drive about the number of cycles on which the set position value alteration of an assigned set position value is to be distributed.
The intermediate interpolation required is carried out by the drive itself.

104 **position controller KV factor**

The KV factor sets the position control circuit's gain throughout the whole velocity range.

51 **actual position value 1**

The actual position value 1 is transmitted from the drive to the NC in order to enable record stepping and position display if necessary. The actual position value 1 always refers to the motor encoder.

147 **reference run parameter**

Value	Meaning
0	clockwise reference run of 360° (search for motor encoder zero mark)
1	anti-clockwise reference run of 360° (search for motor encoder zero mark)

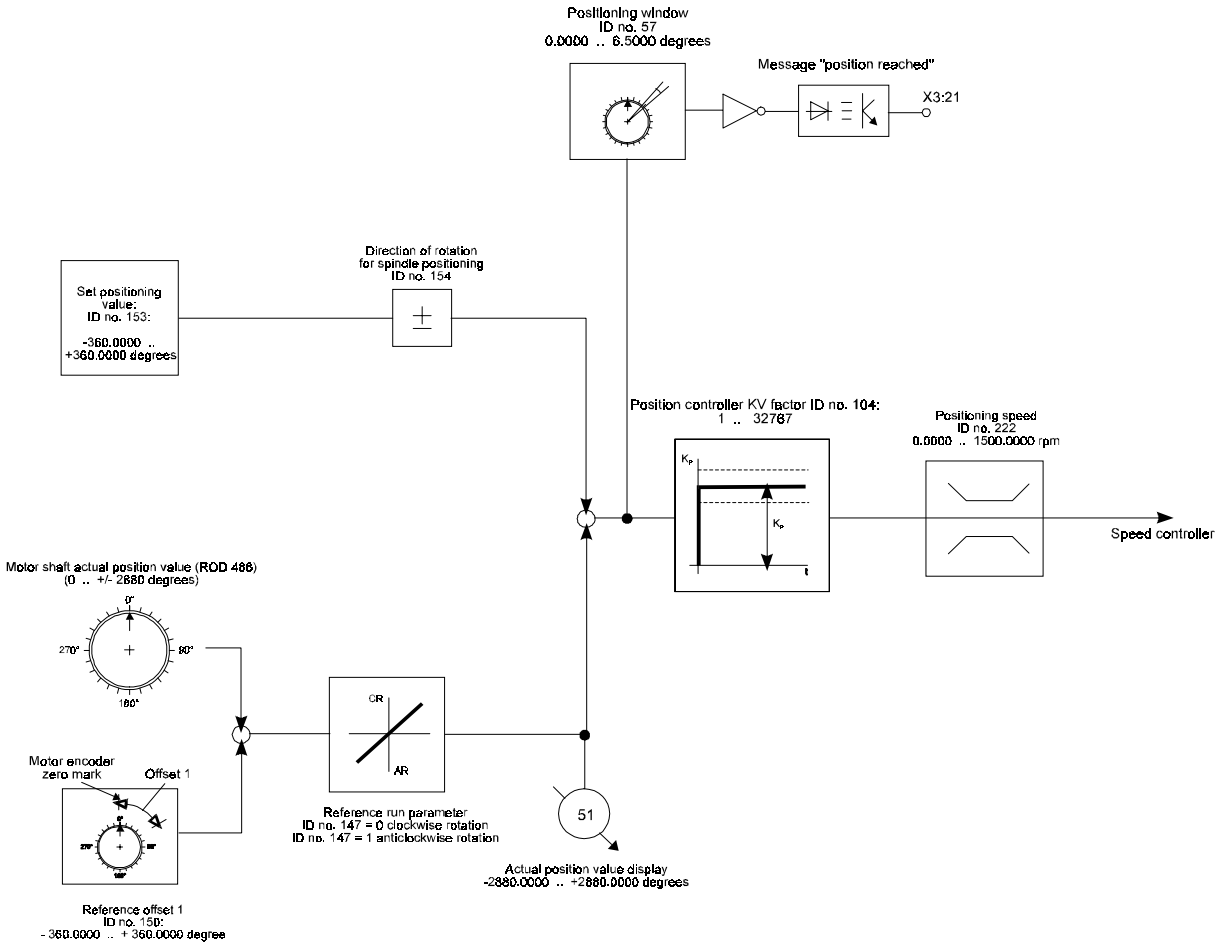
153 **spindle angle position**

Absolute spindle angle position referred to the reference point. The parameter only becomes effective in conjunction with the command "spindle positioning (M19)" (ID no. 32819 = 4).

7.10.2 Spindle positioning

Can only be activated via PC.

Not implemented with synchronous motors.



Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	spindle positioning				
222	spindle positioning speed	0.0000 ... 1500.0000	rpm	150.0	
57	positioning window	0.0000 ... 6.500	degree		
150	reference offset	-360.0000 ... +360.0000	degree	0.000	

Parameter description

222 **spindle positioning speed**

If the command "spindle positioning" is given, the drive either slows down to the spindle positioning speed or retains the set speed.
If the command "spindle positioning from standstill" is given, the drive accelerates to the spindle positioning speed.

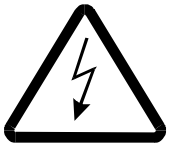
57 **positioning window**

If the absolute value difference between final position value and actual position value becomes smaller than the positioning window, this is signalled to the NC for continued processing according to mode.

150 **reference offset**

This parameter describes the distance between the position encoder zero mark and reference mark 1 (thus it is not necessary to mechanically turn the motor encoder to the machine-specific zero mark).

8 MAINTENANCE



DANGER

This unit carries dangerous voltage and contains dangerous rotating machine parts (ventilators). This means that death, serious injury or considerable material damage can occur if the safety and warning notes are not heeded.

Maintenance work on the equipment may only be carried out in a voltage-free state.

Work on the power unit, intermediate circuit and motor terminals may only be undertaken when it is ascertained that there is neither potential nor voltage (remainder) present.

Wait at least 2 minutes after switching off until the intermediate circuit is completely discharged.

On dismantling safety equipment during commissioning, repair and maintenance, the machine is to be shut down exactly according to instructions. After completion of commissioning, repair and maintenance work the safety equipment is to be reinstalled immediately.

After all work on the drive, the machine operator must inspect the machine and document all work in the machine log chronologically, irrespective of whether it was on the motor, actual value recording or converter. In cases of non-compliance the operator carries full legal responsibility for the consequences.

Motors or devices may have components which contain dangerous substances for technical reasons.

Only manufacturer-approved spare parts may be used.

8.1 Maintenance notes

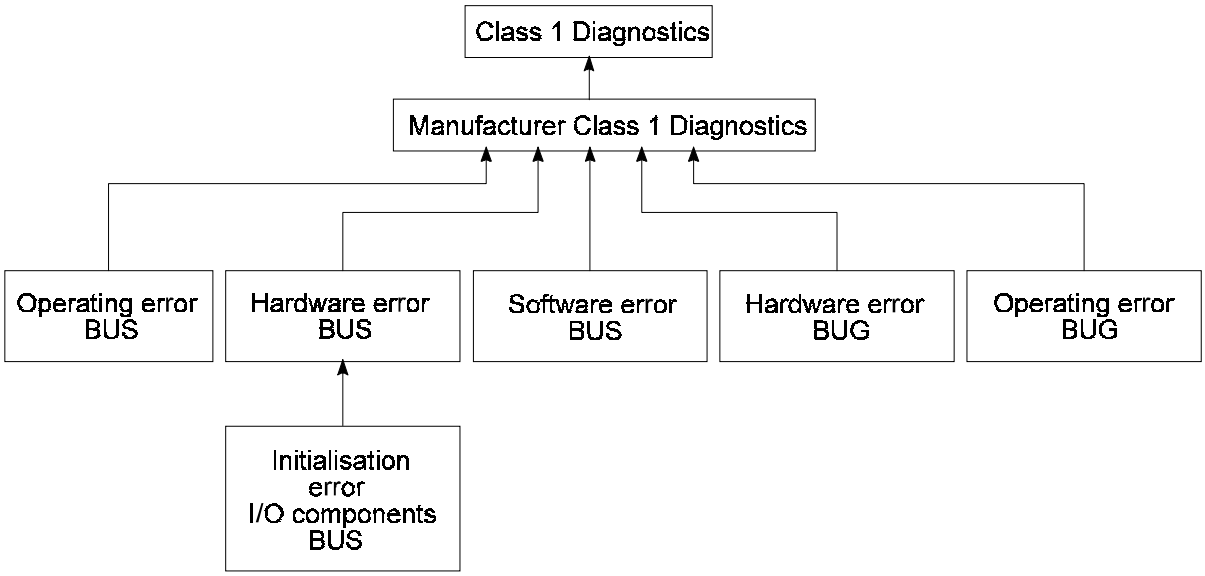
The delivered equipment is maintenance-free.

Prohibition of unauthorised conversion

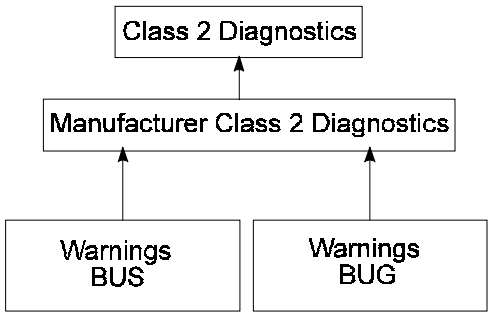
Unauthorised conversion and alteration of the drive are prohibited for safety reasons. In cases of doubt, contact the manufacturer.

8.2 Status messages

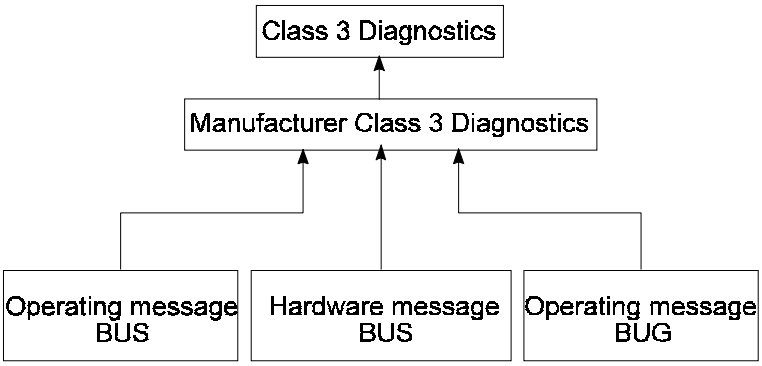
Error messages



Warnings



Messages



8.2.1 Error messages

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	error messages				
11	Class 1 Diagnostics				X
129	Manufacturer Class 1 Diagnostics				X
99	command "reset Class 1 Diagnostics"				
32906	BUS operating error				X
32907	BUS hardware error				X
32908	BUS software error				X
32909	initialisation error of BUS I/O components				X
32910	supply operating error				X
32911	BUG hardware error				X
32785	error init				X
32786	error IO				X

Parameter description

11 **Class 1 Diagnostics**

Display of drive interlocking. A Class 1 Diagnostics error situation detected by the drive leads to:

- controller inhibit with brake down or pulse inhibit
- output X3:25 switches to high.
- setting of error bit.
  Delete the error bit (after remedying the fault) with the reset command (ID no. 99). When switching on again a reset signal is automatically generated.

Bit no.	Meaning
0	always 0
1	1: amplifier shutdown temperature exceeded (CI)
2	1: motor shutdown temperature exceeded (CI)
3	1: cooling error shutdown temperature exceeded (CI)
4	1: control voltage error (PI)
5	reserved
6	1: error in electronic commutation system (PI)
7	1: excess current (PI)
8	1: overvoltage (PI)
9 ... 14	reserved
15	1: bit set in Manufacturer Class 1 Diagnostics

PI (pulse inhibit) CI (controller inhibit)

129 Manufacturer Class 1 Diagnostics

Display of drive interlocking. A Class 1 Diagnostics error situation detected by the drive leads to:

- controller inhibit with brake down or pulse inhibit
- setting of error bit.

Bit no.	Meaning
0	1: operating error BUS (PI or CI)
1	1: hardware error BUS (PI)
2	1: software error BUS (PI)
3 ... 7	reserved
8	1: operating error BUG supply (PI)
9	1: hardware error BUG supply (PI)
10 ... 15	reserved

PI (pulse inhibit) CI (controller inhibit)

Delete the error bit (after remedying the fault) with the reset command (ID no. 99). When switching on again a reset signal is automatically generated.

99 command "reset Class 1 Diagnostics"

If the drive receives this command via the service channel, Class 1 Diagnostics, Manufacturer Class 1 Diagnostics and drive interlocking are deleted provided no more errors are present.
The current error messages are deleted via the command 0 ↵ and 3 ↵ .
If an error in the BUG supply is present, the error must be deleted by switching the entire supply voltage off and then on again (wait for the intermediate circuit capacitors to discharge).
Additionally this command can be activated with digital input X22:3 (+24 V necessary).

Bit no.	Meaning
0	0: delete command in drive 1: set command in drive
1	0: interrupt command execution 1: enable command execution
2 ... 15	reserved

32906 BUS operating error

An operating error of the servo unit leads to pulse inhibit (PI) or controller inhibit (CI).

Bit no.	Meaning
0	1: power unit ready for use (PI)
1	1: communication not enabled (PI)
2	1: power unit error (PI)
3	1: auxiliary voltage failure (PI)
4	1: excess current error (PI)
5	1: fault current (PI)
6	1: reference voltage error (PI)
7	1: overvoltage error (PI)
8	1: transistor error V1l BUS (PI)
9	1: transistor error V1u BUS (PI)
10	1: transistor error V2l BUS (PI)
11	1: transistor error V2u BUS (PI)
12	1: transistor error V3l BUS (PI)
13	1: transistor error V3u BUS (PI)
14	1: BUG ready for use (PI)
15	1: actual speed > limit speed (CI)

32907 BUS hardware error

According to the error type a hardware error of the servo unit either leads to pulse inhibit (PI) or to controller inhibit (CI).

Bit no.	Meaning
0	1: error of internal RAM
1	1: error of external RAM
2	1: memory submodule EPROM not available
3	1: memory submodule EEPROM faulty
4	1: memory submodule EEPROM not available
5	1: timeout at upper A/D converter (CI)
6	1: timeout at lower A/D converter (CI)
7	1: offset error at upper A/D converter (CI)
8	1: offset error at lower A/D converter (CI)
9	1: error during power unit recognition (PI)
10	1: error during motor recognition (PI)
11	1: encoder module 1 not available (PI)
12	1: break of amplifier temperature sensor (CI)
13	1: break of circuitry housing temperature sensor (CI)
14	1: break of motor temperature sensor (CI)
15	1: initialisation error of I/O components (PI)

32908 BUS software error

A software error of the servo unit leads to pulse inhibit of the controller.

Bit-Nr.	Meaning
0	1: watchdog error (PI)
1	1: task length exceeded (CI)
2	1: power unit not recognized at all
3 ... 7	reserved
8	1: incompatible hardware version (PI)
9	1: incompatible software version (PI)
10	1: wrong motor type (PI)
11	1: wrong power unit type (PI)
12	1: error when reading data memory (PI)
13 ... 15	reserved

PI (pulse inhibit) CI (controller inhibit)

32909 initialisation error of BUS I/O components

An initialisation error of the servo unit leads to pulse inhibit of the controller.

Bit no.	Meaning
0	1: error data D502 digital motherboard
1	1: error command data D502 digital motherboard
2	1: error data D504 digital motherboard
3	1: error command data D504 digital motherboard
4	1: error data D503 digital motherboard
5	1: error command data D503 digital motherboard
6	1: error data D101 analog motherboard
7	1: error command data D101 analog motherboard
8	1: error data D102 analog motherboard
9	1: error command data D102 analog motherboard
10	1: error data D103 analog motherboard
11	1: error command data D103 analog motherboard
12	1: error data D104 analog motherboard
13	1: error command data D104 analog motherboard
14 ... 15	reserved

32910 supply operating error

An operating error of the supply leads to pulse inhibit of the controller.

Bit no.	Meaning
0	always 0
1	1: supply not ready for use

32911 BUG hardware error

A hardware error leads to pulse inhibit of the controller.

Bit no.	Meaning
0	reserved
1	1: supply not ready for use

32785 error bar of I/O component boot

If an error occurs during the controller's boot procedure this error bar is activated and controller enabling is not possible (controller inhibit).

NOTE

This ID no. can only be read by activation of key F4 on PC. Only the LED´s „Power“ (green) and „controller inhibit“ (red) light on the unit.

Bit no.	Meaning
0	1: error of internal RAM
1	1: error of external RAM
2	1: memory submodule EPROM not available
3	1: memory submodule EEPROM faulty
4	1: memory submodule EEPROM not available
5	1: timeout at upper A/D converter
6	1: timeout at lower A/D converter
7	1: timeout at upper A/D converter
8	1: timeout at lower A/D converter
9	1: offset error at lower A/D converter
10	1: offset error at upper A/D converter
11	1: encoder module 1 not available
12	1: encoder module 2 not available
13	1: option board 1 not available
14	1: option board 2 not available
15	1: option board 3 not available

32786 boot initialisation error

If an error occurs during the controller's boot procedure this error bar is activated and controller enabling is not possible (controller inhibit).

NOTE

This ID no. can only be read by activation of key F4 on PC. Only the LED´s „Power“ (green) and „controller inhibit“ (red) light on the unit.

Bit no.	Meaning
0	1: error data D502(D802) digital motherboard
1	1: error command data D502(D802) digital motherboard
2	1: error data D504 digital motherboard
3	1: error command data D504 digital motherboard
4	1: error data D503 digital motherboard
5	1: error command data D503 digital motherboard
6	1: error data D101 analog motherboard
7	1: error command data D101 analog motherboard
8	1: error data D102 analog motherboard
9	1: error command data D102 analog motherboard
10	1: error data D103 analog motherboard
11	1: error command data D103 analog motherboard
12	1: error data D104 analog motherboard
13	1: error command data D104 analog motherboard
14 ... 15	reserved

8.2.2 Warnings and messages

Parameter overview

ID no.	Name	Range min. ... max.	Unit	Standard value	Display only
	warnings and messages				
12	Class 2 Diagnostics				X
181	Manufacturer Class 2 Diagnostics				X
32912	BUS warning				X
32913	supply warning				X
13	Class 3 Diagnostics				X
183	Manufacturer Class 3 Diagnostics				X
32914	BUS operating message				X
32915	BUS hardware message				X
32916	supply operating message				X

Parameter description

12 **Class 2 Diagnostics**

Shutdown advance warning - does not lead to controller inhibit or pulse inhibit.

Bit no.	Meaning
0	reserved
1	1: amplifier warning temperature exceeded
2	1: motor warning temperature exceeded
3	1: cooling error warning temperature exceeded
4 ... 14	reserved
15	bit set in Manufacturer Class 2 Diagnostics

Class 2 Diagnostics is read via the service channel.
Output X3:20 switches to high.

181 **Manufacturer Class 2 Diagnostics**

In Manufacturer Class 2 Diagnostics the manufacturer of the drive can define additional shutdown advance warnings. If a warning is set or deleted in Manufacturer Class 2 Diagnostics, this leads to the setting of the manufacturer-specific warning in Class 2 Diagnostics.

Bit no.	Meaning
0	1: BUS warning
1 ... 5	reserved
6	1: BUG supply warning
7 ... 15	reserved

32912 BUS warning

Bit no.	Meaning
0	1: error encoder evaluation 1
1	1: error encoder evaluation 2
2 ... 15	reserved

32913 supply warning

Bit no.	Meaning
0	1: BUS warning
1 ... 15	reserved

13 Class 3 Diagnostics

Operating status messages. Class 3 Diagnostics is read via the service channel. The bits set in Class 3 Diagnostics are additionally defined by ID numbers.

Bit no.	Meaning
0	1: $n_{act} = n_{set}$
1	1: $n_{act} < n_{min}$
2	1: $n_{act} < n_x$
3	1: $M_d > M_{dx}$
4	1: $M_d > M_{dlimit}$
5	1: $n_{soll} > N_{limit}$
6	1: in position
7	1: $P > P_x$
8 ... 14	reserved
15	1: bit set in Manufacturer Class 3 Diagnostics

182 Manufacturer Class 3 Diagnostics

In Manufacturer Class 3 Diagnostics the manufacturer of the drive can define additional shutdown advance warnings. If a warning is set or deleted in Manufacturer Class 3 Diagnostics, this leads to the setting of the manufacturer-specific warning in Class 3 Diagnostics.

Bit no.	Meaning
0	1: BUS operating message
1	1:BUS hardware message
2 ... 7	always 0
8	1: BUG supply message
9 ... 15	always 0

Manufacturer Class 3 Diagnostics is read via the service channel.

32914 BUS operating message

Bit no.	Meaning
0	1: BUS pulse inhibit
1	1: BUS controller inhibit
2 ... 15	reserved

32915 BUS hardware message

Bit no.	Meaning
0	1: encoder module 2 not available
1	1: option board 1 not available
2	1: option board 2 not available
3	1: encoder module 3 not available
4 ... 15	reserved

32916 supply operating message

This parameter is not used since it is evaluated in the program.

8.3 Disposal

The units consist essentially of the following components and materials

Components	Material
Housing, various intermediate plates, fan coil, support plates	Steel plate
Heat sinics in power unit	Aluminium
Various distance bolts	Steel
Various distance bolts, current converter hausing and fan housing	Plastic
Power unit rails	Copper
Cable looms	PVC insulated calbe leads
Power electronics	Metal base plate: Semiconductor chip, plastic housing, various insulation material.
Cunductor plates, accomodating the complete control and regulation electronic	Base material: EPOXY resin (filled with GRP). Copperplated on both sides and with interconnected channels. Various electronic components such as capacitors, resistors, relays and semi-conductor components, etc.

The electronic components can, on account of technical demands, contain dangerous materials.

In normal use the various components da not represent a danger to humans or environment.

In the event of fire dangerous materials may be released

The electrical components should not be opened since, for the purpose of internal insulation, (e.g. on various power semi-conductor) beryllium oxide has been used. The beryllium dust caused by opening represents a health hazard.

The disposal of the units should conform to the recycling regulations of the country und region in which they are disposed.

9 APPENDIX

9.1 Manufacturer´s declaration

Manufacturer Declaration in Accordance with the EC–Machine Guidelines 89/392/EEC, Appendix II B

We herewith declare that this delivery includes the following specified machine component and that its putting into operation is prohibited until the declaration is made that the machine, in which this component is built in, complies with the regulations of the EC–machine guideline 89/392/EWG, appendix II B.

Specification of the machine component:	**Type:**
Controller	BUS 6 T

Signature of the Manufacturer:

Information regarding the Undersigned: Head Division Electronics

9.2 Index

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