ECODRIVE

Drive Controller DKC02.1

Functional Description: SSE 03VRS

DOK-ECODRV-SSE-03VRS**-FKB1-EN-P

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The purpose of this document

This document is the functional description of the FWA-ECODRV-SSE-03VRS firmware.

The document is used for

- describing all functional features
- setting the parameter values of the drive controller
- saving the drive parameter data
- error diagnosis and error elimination at the digital servo drive

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1 System Overview

1.1 ECODRIVE - the Economic Drive Solution for Automation

ECODRIVE, an intelligent digital automation system, is the high-functionality low-cost solution for single- and multi-axis drive and control tasks.

ECODRIVE can be used for implementing a large variety of drive solutions in the most different applications. Typical applications include:

- Handling systems
- Packaging machines
- Assembly systems

1.2 ECODRIVE - a Drive Family

An **ECODRIVE** drive consists of a drive controller and an MKD servo motor. Currently, four different drive controllers with different command interfaces are available:

- DKC01.1 with ANALOG, STEPPER MOTOR and POSITIONING interface
- DKC11.1 with ANALOG interface
- DKC02.1 with SERCOS interface
- DKC03.1 with PROFIBUS-DP interface

This Functional Description refers to the DKC02.1 unit. There are separate documents for the DKC01.1/DKC11.1 and DKC03.1 units.

1.3 Functions

ECODRIVE

ECODRIVE is an intelligent digital drive family for AC servo drives..

ECODRIVE AC servo drives are microprocessor-controlled brushless 3-phase drives with servo control properties.

Via a signal processor, drive control, monitoring, parameter selection and diagnosis are fully digital, measuring the rotor position at high resolution throughout the entire speed range.

ECODRIVE consists of

- a drive controller DKC
- an AC motor MKD

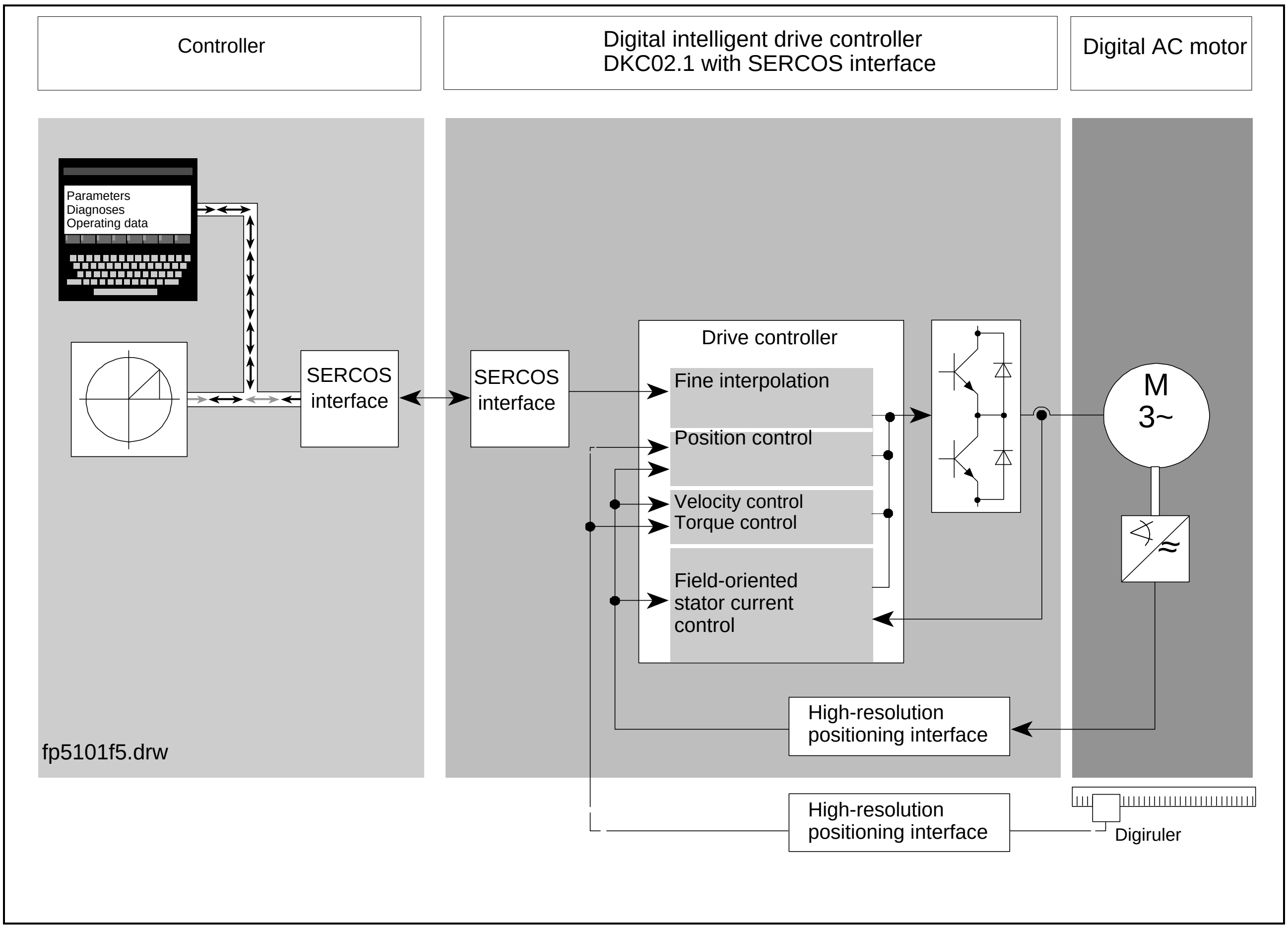

Fig. 1-1: Interaction of controller, digital drive controller, and AC motor

SERCOS interface

The DKC02.1 features a SERCOS interface towards the controller.

The SERCOS interface is a real-time serial communication system. Controller and drives are interconnected in a loop via fiber optic cables. Serial data exchange between controller and drives is performed via that fiber optic cable.

Since 1995, this drive interface is the international standard for CNC machines.

Features of the SERCOS interface

The SERCOS interface provides the user with the following features that are important for data transfer via a bus system:

- The loop structure reduces wiring work to a minimum. The fiber optics medium ensures maximum noise immunity at high baud rates.
- All data items, parameters and commands that must be exchanged during operation are standardized.
- SERCOS interface permits extensive diagnosis and parameterization of the drives to be performed via terminals that are connected to SERCOS-compatible controllers. This significantly reduces commissioning and standstill times.
- Any combination of drives and CNC controllers from different manufactures is possible.

Drive controller

The drive controller includes:

- SERCOS interface as the interface to the controller
- The modes: Position control, position control and interpolation in the drive (pre-set target position), velocity control, torque control.
- A drive-internal homing procedure is available to establish the reference dimensions.
- Travel limit switch inputs and selectable axis limit values are available for travel range limitation.
- Two sensor inputs are available for measurement.
- Mechanical transmission elements (such as gear ratio or feed constants) are adjusted in the drive.
- Depending on the axis kinematics, rotary or translatory scaling of all position, velocity or acceleration data items is possible.
- Connection for evaluating an external sensor (sinusoidal voltage signals 1Vpp) if a measuring element must directly be positioned at the machine element. The indirect position is always available via motor feedback.
- Connection to three-phase mains 3 x AC 380 ...480 V, 50...60 Hz

Drive specifications

Minimum SERCOS cycle time:	2 ms
Baud rate:	2 or 4 Mbits/s
Internal position control cycle time:	500 µs
Resolution of the signal period of an ext. meas. system	2048-fold
Max. frequency of 1Vpp signals from ext. meas. system:	200 kHz

Motor

Digital permanent-field MKD AC motor with electronic commutation.

MKD motors possess measuring systems (motor feedback) for indirect actual position measurement

Optionally, an MKD motor may be equipped with an absolute encoder measuring system.

The motor feedback contains a data storage unit that holds the motor parameters. Thus, it ensures adaptation to the drive controller without the risk of damaging the motor. In addition, it provides for easy and swift commissioning.

Please refer to the **"MKD Digital AC Motors"** Project Planning Manual for details about the motor.

2 Safety Instructions for Electrical Drives

2.1 General

These instructions must be read and understood before the equipment is used to minimize the risk of personal injury and /or property damage. Follow these safety instructions at all times.

Do not attempt to install, use or service this equipment without first reading all documentation provided with the product. Please read and understand these safety instructions, and all user documentation for the equipment, prior to working with the equipment at any time. You must contact your local Indramat representative if you cannot locate the user documentation for your equipment. A listing of Indramat offices is supplied in the back of this manual. Request that your representative send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the product is resold, rented and/or otherwise transferred or passed on to others, these safety instructions must accompany it.

WARNING

Improper use of this equipment, failure to follow the attached safety instructions, or tampering with the product, including disabling of safety device, may result in personal injury, severe electrical shock, death, or property damage!

INDRAMAT GmbH is not liable for damages resulting from failure to observe the warnings given in these instructions.

- Operating, maintenance and safety instruction in the appropriate language must be ordered and received before initial start-up, if the instructions in the language provided are not understood perfectly.
- Proper and correct transport,storage, assembly, and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Trained and qualified personnel in electrical equipment:

  Only trained and qualified personnel may work on this equipment or in its vicinity. Personnel are qualified if they have sufficient knowledge of the assembly, installation, and operation of the product as well as of all warnings and precautionary measures noted in these instructions.

  Furthermore, they should be trained, instructed, and qualified to switch electrical circuits and equipment on and off, to ground them, and to mark them according to the requirements of safe work practices and common sense. They must have adequate safety equipment and be trained in first aid.
- Use only spare parts approved by the manufacturer.
- All safety regulations and requirements for the specific application must be followed as practiced in the country of use
- The equipment is designed for installation on commercial machinery.
- Start-up is only permitted once it is sure that the machine in which the products are installed complies with the requirements of national safety regulations and safety specifications of the application.

  European countries: see Directive 89/392/EEC (Machine Guideline);

- Operation is only permitted if the national EMC regulations for the application are met.

  The instructions for installation in accordance with EMC requirements can be found in the INDRAMAT document „EMC in Drive and Control Systems“.

  The machine builder is responsible for the adherence of the limiting values as prescribed in the national regulations and specific regulations for the application concerning EMC.

  European countries: see Directive 89/336/EEC (EMC Guideline);

  U.S.A.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

- Technical data, connections, and operational conditions are specified in the product documentation and must be followed.

2.2 Protection against contact with electrical parts

Note: This section pertains to equipment and drive components with voltages over 50 Volts.

Touching live parts with potentials of 50 Volts and higher applied to them can be dangerous and cause severe electrical shock. In order for electrical equipment to be operated, certain parts must have dangerous voltages applied to them.

DANGER

High Voltage!

Danger to life, severe electrical shock and risk of injury!

⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and/or repair this equipment.

⇒ Follow general construction and safety regulations when working on electrical installations.

⇒ Before switching on power, the ground wire must be permanently connected to all electrical units according to the connection diagram.

⇒ At no time may electrical equipment be operated if the ground wire is not permanently connected, even for brief measurements or tests.

⇒ Before beginning any work, disconnect mains or the voltage source from the equipment. Lock the equipment against being switched on while work is being performed.

⇒ Wait 5 minutes after switching off power to allow capacitors to discharge before beginning work. Measure the voltage on the capacitors before beginning work to make sure that the equipment is safe to touch.

⇒ Never touch the electrical connection points of a component while power is turned on.

⇒ Before switching the equipment on covers and guards provided with the equipment must be installed to prevent contact with live parts. Before operating cover and guard live parts properly so they cannot be touched.

⇒ A leakage current protective device must not be used for an AC drive! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

European countries: according to EN 50178/ 1994;

⇒ Electrical components with exposed live parts must be installed in a control cabinet to prevent direct contact.

European countries: according to EN 50178/ 1994;

⇒ U.S.A: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

DANGER

High discharge current!

Danger to life, risk of severe electrical shock and risk of injury!

⇒ All units and the motors must be connected to a grounding point with the ground wire or must be grounded themselves before switching on power.

⇒ The discharge current is greater than 3.5 mA. A permanent connection to the supply system is therefore required for all units.

European countries: according to EN 50178/1994, section 5.3.2.3;

⇒ U.S.: See National Electrical Codes (NEC), National Electrical Manufacturers Association (NEMA), and local building codes. The user of this equipment must consult the above noted items at all times.

⇒ The ground wire must always be connected before start-up, even during the performance of tests. Otherwise, high voltages may be present at the unit housing, which can result in severe electrical shock and personal injury.

2.3 Protection by protective low voltage (PELV) against electrical shock

All connections and terminals with voltages ranging between 5 and 50 volts on INDRAMAT products are protective low voltages designed in accordance with the following standards on contact safety:

- International: IEC 364-4-411.1.5
- European countries within the EU: see EN 50178/1994, section 5.2.8.1.

WARNING

High electrical voltages due to incorrect connections!

Danger to life and limb, severe electrical shock and/or serious bodily injury!

⇒ Only that equipment or those electrical components and cables may be connected to all terminals and clamps with 0 to 50 volts if these are of the protective low voltage type (PELV = Protective Extra Low Voltage).

⇒ Only connect those voltages and electrical circuits that are safely isolated. Safe isolation is achieved, for example, with an isolating transformer, an optoelectronic coupler or when battery-operated.

2.4 Protection against dangerous movements

Dangerous movements can be caused when units have bad interfaces or motors are connected incorrectly.

There are various causes of dangerous movements:

- Improper or incorrect wiring or cable connections
- equipment is operated incorrectly
- probe parameters or encoder parameters are set incorrectly
- broken components
- errors in software or firmware

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

Although the monitoring circuits in the drive components make improper operation almost impossible, personnel safety requires that proper safety precautions be taken to minimize the risk of electrical shock, personal injury and/or property damage. This means that unexpected motion must be anticipated since safety monitoring built into the equipment might be defeated by incorrect wiring or other faults.

DANGER

Dangerous movements!
Danger to life, electrical shock and risk of injury or equipment damage!

⇒ In the drive component monitoring units, every effort is made to avoid the possibility of faulty operation in connected drives. Unintended machine motion or other malfunction is possible if monitoring units are disabled, by-passed or not activated.

⇒ Safe requirements of each individual drive application must be considered on a case-by-case basis by users and machine builders.

Avoiding accidents, electrical shock, personal injury and/or property damage:

⇒ Keep free and clear of the machine's range of motion and moving parts. Prevent people from accidentally entering the machine's range of movement:
- use protective fences
- use protective railings
- install protective coverings
- install light curtains

⇒ Fences should be strong enough to withstand maximum possible momentum.

⇒ Mount the Emergency Stop (E-Stop) switch in the immediate reach of the operator. Verify that the Emergency Stop works before start-up. Do not use if not working.

⇒ Isolate the drive power connection by means of an Emergency Stop circuit or use a safe lock-out system to prevent unintentional start-up.

⇒ Make sure that the drives are brought to standstill before accessing or entering the danger zone.

⇒ Disconnect electrical power to the equipment using a master lock-out and secure against reconnection for:
- maintenance and repair work

- cleaning of equipment
- long periods of discontinued equipment use

⇒ Avoid operating high-frequency, remote control, and radio equipment near equipment electronics and supply leads. If use of such equipment cannot be avoided, verify the system and the plant for possible malfunctions at all possible positions of normal use before the first start-up. If necessary, perform a special Electromagnetic Compatibility (EMC) test on the plant.

2.5 Protection against magnetic and electromagnetic fields during operations and mounting

Magnetic and electromagnetic fields in the vicinity of current-carrying conductors and permanent motor magnets represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

⇒ Persons with pacemakers and metal implants are not permitted to have access to the following areas:

- Areas in which electrical equipment and parts are mounted, operating or are being commissioned.
- Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.

⇒ If it is necessary for a person wearing a heart pacemaker to enter into such an area then a physician must be consulted prior to doing so.

⇒ Persons with metal implants or hearing aids must take care prior to entering into areas described above. It is assumed that metal implants or hearing aids will be affected by such areas and a physician must be consulted prior to doing so.

2.6 Protection during handling and installation

All INDRAMAT products should be handled and assembled according to the instructions in the documentation.

CAUTION

Risk of injury due to incorrect handling!

Bodily injury caused by crushing, shearing, cutting, and thrusting movements!

⇒ Observe installation instructions and safety regulations before handling and working on the product.

⇒ Use suitable installation in using lifting or moving equipment. Refer to the user manual for the product.

⇒ Take precautions to avoid pinching and crushing.

⇒ Only use suitable tools specified in the user manuals and use them according the instructions.

⇒ Use lifting devices and tools correctly and safely.

⇒ Wear appropriate protective clothing, e.g., protective goggles, safety shoes, protective gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids form the floor to prevent personnel from slipping.

2.7 Battery safety

Batteries contain reactive chemicals. Incorrect handling can result in injury or equipment damage.

CAUTION

Risk of injury due to incorrect handling!

⇒ Do not attempt to reactivate dead batteries by heating or other methods (danger of explosion and corrosion).

⇒ Never charge batteries (danger from leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not take batteries apart.

⇒ Handle carefully. Incorrect extraction or installation of a battery can damage equipment.

Note: Environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air, and sea transport in the sense of the legal requirements (Danger of explosion). Dispose of batteries separately from other refuse. Observe the legal requirements in the country of installation.

Notes

3 General Commissioning Instructions

3.1 Definition of Terms

For a better understanding of the subject, we want to explain some of the terms that are used in this documents.

Parameter

But for only a few exceptions, communication with the drive is established via parameters. Parameters can be used for

- setting up the configuration
- setting up the controllers
- controlling the drive functions and commands
- cyclic or event-controlled transfer of command and actual values

A parameter is qualified by its ident number

All working data items are identified by ident numbers.

All ident numbers that exist in the drive are listed in the parameter **S-0-0017, IDN List of all Operation Data**.

Data status

Each parameter has a data status that may also be read. The data status is used for the following purposes:

- It shows the validity/invalidity of a parameter
- It contains the command acknowledgment if the parameter is used as a command (see also "Commands" on page 3-6).

Data block structure

There are seven different data block elements for each parameter. These elements may be read or written by an upstream controller or parameterization interface via a required data interface.

Data block structure: Element no.:	Name:	Comment:
1	Ident number	Parameter identification
2	Name	May be modified by language selection
3	Attribute	Contains data length, type, and fractional part digits
4	Unit	May be modified by language selection
5	Minimum input value	Contains the minimum input value of the operating data item
6	Maximum input value	Contains the maximum input value of the operating data item
7	Operating data	Parameter value proper

Fig. 3-1: Data block structure

Whether or not the operating data can be written to depends on the communication phase

Only the operating data can be written to. All other elements can merely be read. The operating data can temporarily or permanently be write-protected.

Error messages that may occur when the operating data is read or written to

Error:	Cause:
0x7004, Data item not editable	The operating data is always write-protected
0x7005, Data item temporarily write-protected	Writing to the operating data is not possible in that communication phase (see also Supplement A, Parameter Description)
0x7006, Data item smaller than minimum value	The entered operating data value is smaller than the related minimum input value
0x7007, Data item greater than maximum value	The entered operating data value is greater than the related maximum input value
0x7008, Data item incorrect	The written value could not be accepted since internal checks lead to a negative result

Fig. 3-2: Error messages that may occur when an operating data item is read or written to

Non-volatile parameter storage

All configuration and controller settings are buffered

The drive contains various non-volatile parameter storage elements that buffer the operating data that concern

- the configuration setting and/or
- the parameterization of the controller settings.

The data is buffered in each write access to the operating data concerned.

The following modules contain storage elements:

- Drive controller
- Motor feedback
- User parameter memory (plug-in EEPROM inside the unit)

Parameter storage in the drive controller

The operating data items that only refer to the drive controller are all stored in the drive controller. The data cannot be changed by the user. It includes the following parameters:

- **S-0-0110, Amplifier Peak Current**
- **S-0-0112, Amplifier Nominal Current**
- **S-0-0140, Controller Type**
- **P-0-0518, Amplifier Nominal Current-2**
- **P-0-0519, Amplifier Peak Current-2**
- **P-0-4002, Current Amplify Trim Phase U**
- **P-0-4003, Current Amplify Trim Phase V**
- **P-0-4015, Intermediate Voltage**
- **P-0-4035, Trim-Current**

Parameter storage in the motor feedback

With MDD and MKD motors, all motor-related parameters are buffered in the motor feedback.

In addition, parameters for the 'Initial program loading function and the motor feedback are stored there.

Application parameter storage

Depending on the parameter **S-0-0269, Parameter buffer mode**, all application parameters are kept in an internal storage medium (EEPROM), or are stored temporarily (RAM). Together with the parameters that are stored in the motor feedback of MDD and/or MKD motors, these parameters are listed in the ident number **S-0-0192, IDN-List of backup operation data**. In the event of a replacement of the drive controller, these parameters must be read so that they can be transferred to the new device after the replacement.

Storage mode

The drive controller is able to temporarily (RAM) or permanently (EEPROM) store all parameters that are listed in **S-0-0192, IDN-List of backup operation data**.

The parameter **S-0-0269, Parameter buffer mode** determines what is to be done with the parameters.

⇒ The EEPROM permits a maximum of 10,000 write cycles per memory location.

Modes

The modes define the command values that are to be processed and the mode in which this is to be done in order to yield the required drive motion. They do not define how these command values are transferred from the controller to the drive.

One of the four selected modes is active when the control and power stage is operational and a positive edge has appeared on the controller enable signal.

In this case, the H1 display of the drive shows **"AF".**

Errors

Various monitoring functions are performed that depend on the selected modes and parameter values. An error message is generated if the system detects a state that inhibits proper operation.

Error classes

The diagnosis shows the error class

Errors can be subdivided into four different error classes. The error class determines the response to the drive error.

Error class:	**Diagnosis:**	**Drive reaction:**
Fatal	F8xx	Torque release
Traverse range	F6xx	Setting command speed to zero
Interface	F4xx	According to selected best shutdown possible
Non-fatal	F2xx	According to selected best shutdown possible

Fig. 3-3: Error class structure

Drive error reaction

If an error state is detected in the drive, and if the drive is being controlled, a drive error reaction is started automatically. The H1 display blinks Fx / xx. The drive reaction to interface errors and non-fatal errors can be selected with **P-0-0119, Deceleration as best as possible**. At the end of each error reaction, the drive releases the torque.

Clearing errors

An error must be cleared from the outside

An error is not cleared automatically. It must be cleared from the outside by

triggering the command **S-0-0099, Reset class 1 diagnostic** (clears all errors in one single operation)

or

pressing the **"S1"** key (sequential clearing of the errors).

If the error state continues to exist, the error will immediately be detected again. A positive edge of the controller enable signal is required for re-activating the drive.

Clearing errors when drive enable signal is set

If a drive error occurs during operation while the drive enable signal is set, the drive performs an error reaction. The drive automatically de-activates itself at the end of each error reaction. This means that the output stage is switched off, and the drive transitions from an energized to a de-energized state.

To re-activate the drive,

- the error must be cleared, and
- a new 0-1 edge of the drive enable signal must be issued.

Note: To re-activate the drive after an error has occurred, a new 0-1 edge of the drive enable signal must be issued. Merely clearing the error is not sufficient.

Warnings

A warning does not lead to an automatic shutdown

Various monitoring functions are performed that depend on the selected modes and parameter values. A warning is generated if the system detects a state that still permits proper operation to be performed, but will, if it continues to exist, lead to the generation of an error and, consequently, to an automatic shutdown of the drive.

Warning classes

The diagnosis shows the warning class

Warnings can be subdivided into two different classes. One class performs an automatic reaction, the other doesn’t.

Warning class:	Diagnosis:	Drive reaction:
with drive reaction	E8xx	Setting command speed to zero
without drive reaction	E2xx	--

Fig. 3-4: Structure of the warning classes

A warning cannot be cleared from the outside.

Commands

Commands are employed for controlling more complex functions in the drive. The "drive-activated homing procedure" or "transition check command phase 3 to 4" functions, for example, are defined as commands.

Each started command must be cleared

A higher-order controller can start, interrupt, and delete a command.

Each command has a parameter allocated that permits the command to be controlled.

While a command is being executed, the diagnosis "Cx" or "dx" (x 0 command number) appears in the H1 display.

Command types

There are three different command types.

- **Drive control commands**
  - may lead to a automatic drive movement,
  - may only be started when drive enable is set,
  - de-activate the active mode while they are executed.
- **Monitor commands**
  - activate or de-activate monitoring activities or functions in the drive
- **Management commands**
  - perform management tasks. They cannot be interrupted.

Input and acknowledgment of a command

Command execution is controlled and monitored by the input and the acknowledgment of the command. The input tells the drive whether the command shall be started, interrupted, or terminated. The input is the operating data item of the associated parameter. Input may be

- not set and clear (0)
- interrupted (1)
- set and enabled (3)

In the acknowledgment, the drive returns the current state of command execution. The acknowledgment is contained in the data status of the command parameter.

The state can be

- not set (0)
- in progress (7)
- error, command execution not possible (0xF)
- command execution interrupted (5)
- command properly executed (3)

The **change bit command** in the **drive status word** enables the controller to recognize when the drive makes a change in the command acknowledgment. The drive sets the bit when the command acknowledgment transitions from the "in progress" (7) state to "error, command execution not possible" (0xF) or "command properly executed" (3). The bit is cleared when the master clears the input (0).

The controller recognizes that the drive has set the change bit. Then, it may read the corresponding data status of the command(s) it has set some time before, but not yet cleared. This enables the controller to determine whether the command has been terminated in the drive with or without an error. Subsequently, the controller must clear the command.

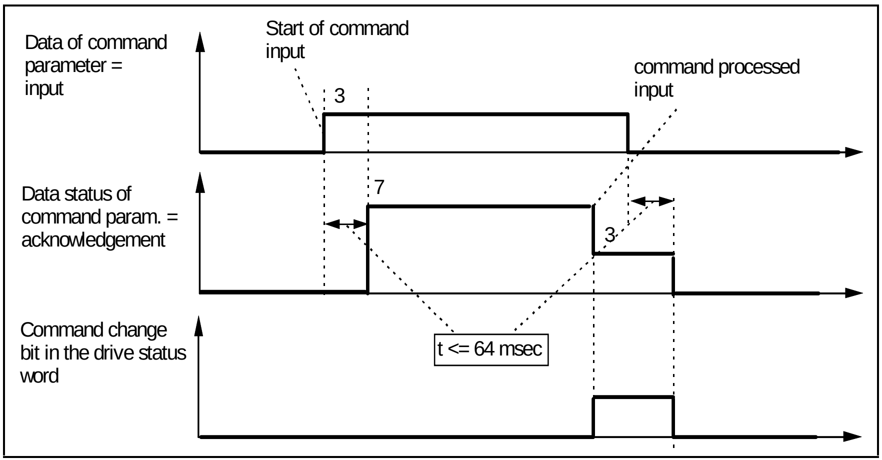

Fig. 3-5: Input, acknowledgment, and command change bit during faultless execution

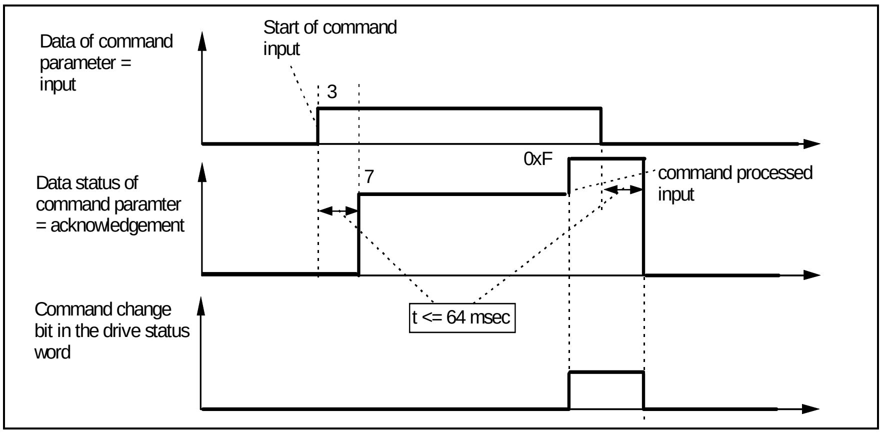

Fig. 3-6: Input, acknowledgment, and command change bit during faulty execution

Up to 64 ms may elapse in the drive between receiving the command input and setting the command acknowledgment.

3.2 Diagnosis

Diagnosis Overview

The diagnosis functions can be subdivided into two different groups:

- Functions that permit the current operating state of the priority-related drive-internal diagnostics to be recognized
- Common messages for various status messages

Furthermore, there are parameters for all important operating data items that can be transferred via command communication.

Drive-internal diagnosis generation

The drive's current operating state results from the existence of errors, warnings, commands, the "drive stop" and "starting lockout" signals, and the currently active mode. In addition, it shows whether the drive is ready for operation or in parameterization mode.

The operating state can be determined from

- the two-digit 7-segment display (H1 display)
- the diagnosis parameter **S-0-0095, Diagnostic Message**
- the parameter **S-0-0390, Diagnostic Message Number**
- the parameter **P-0-0009, Error Message Number**

H1 display, diagnosis **S-0-0095, Diagnostic Message**, and parameter **S-0-0390, Diagnostic Message Number** always show the current diagnosis with the highest priority. The parameter **P-0-0009, Error Message Number** only contains a value that is different from 0 if there is an error pending. Please refer to the Diagnosis Description in Supplement B for a summary of all diagnoses.

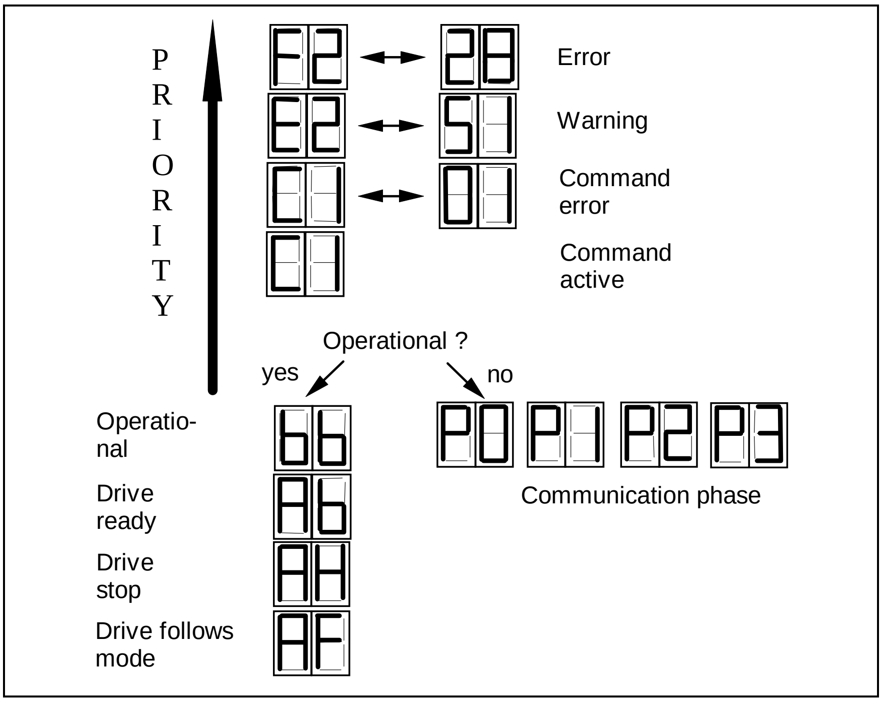

Fig. 3-7: Priority-related diagnosis generation of the H1 display

Diagnosis structure

Each operating state is characterized by a diagnosis that consists of

- diagnosis number and
- diagnosis text

The diagnosis of the non-fatal error "excessive deviation", for example, is represented as follows:

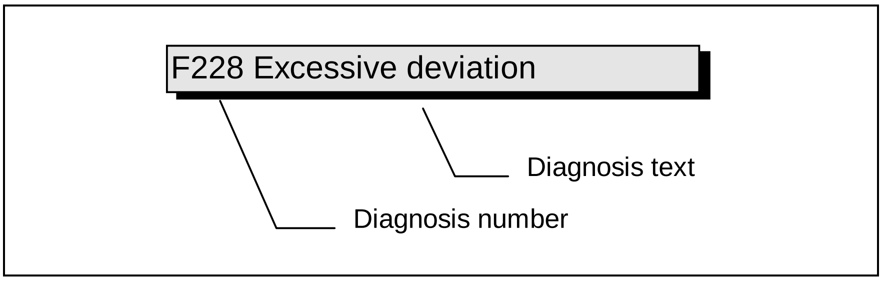

Fig. 3-8: Diagnosis structure with diagnosis number and diagnosis text

The H1 display alternately shows "F2" and "28". The diagnosis number appears in hexadecimal notation in the parameter **S-0-0390, Diagnostic Message Number** (this would be (0x)F228 in our example). The parameter **S-0-0095, Diagnostic Message** contains diagnosis number and diagnosis text as a string "F228, Excessive deviation".

H1-Display

This two-digit 7-segment display shows the diagnosis number in a symbolized form. The figure "Priority-related diagnosis display" below shows the representation.

That display permits the current operating state to be viewed swiftly and without employing a communication interface.

The H1 display does not show the mode. It shows "AF" if the drive follows the mode and if a command has not been activated.

Plaintext diagnosis

Plaintext diagnosis contains the diagnosis number, followed by the diagnosis text (see also example "Excessive deviation"). It can be read via the parameter **S-0-0095, Diagnostic Message**, and is used for directly displaying the drive state on a user interface.

Language selection sets plaintext diagnosis to the selected language.

Diagnosis number

Diagnosis number merely contains the diagnosis number without the diagnosis text. It can be read via the parameter **S-0-0390, Diagnostic Message Number**, and can therefore be employed by a user interface as a language-independent possibility of determining and displaying the drive status.

Error number

Error number merely contains the error number without the diagnosis text. It can be read via the parameter **P-0-0009, Error Message Number**, and can therefore be employed by a user interface as a language-independent possibility of determining and displaying an error state. The value in this parameter is only different from "0" if there is an error in the drive.

The error number is derived from the least significant three digits of the diagnosis number. For example: The error "F228, excessive deviation" with the diagnosis number "(0x)F228" would produce the error number "228".

Common messages

There are parameters that are used as common messages for displaying operating states. These are in detail:

- **S-0-0011, Class 1 Diagnostics**
- **S-0-0012, Class 2 Diagnostics**
- **S-0-0013, Class 3 Diagnostics**
- **S-0-0182, Manufacturer Class 3 Diagnostics**

S-0-0011, Class 1 Diagnostics

Parameter **S-0-0011, Class 1 Diagnostics** contains bits for the different errors. In the event of a drive error, a bit is set in this parameter. At the same time, the bit "Drive interlock, error in class 1 diagnostics" is set in the **drive status word**

All bits in class 1 diagnostics are cleared when the command **S-0-0099, Reset class 1 diagnostic** is executed.

(see also "Clearing errors" on page 3-5)

The following bits are supported in class 1 diagnostics:

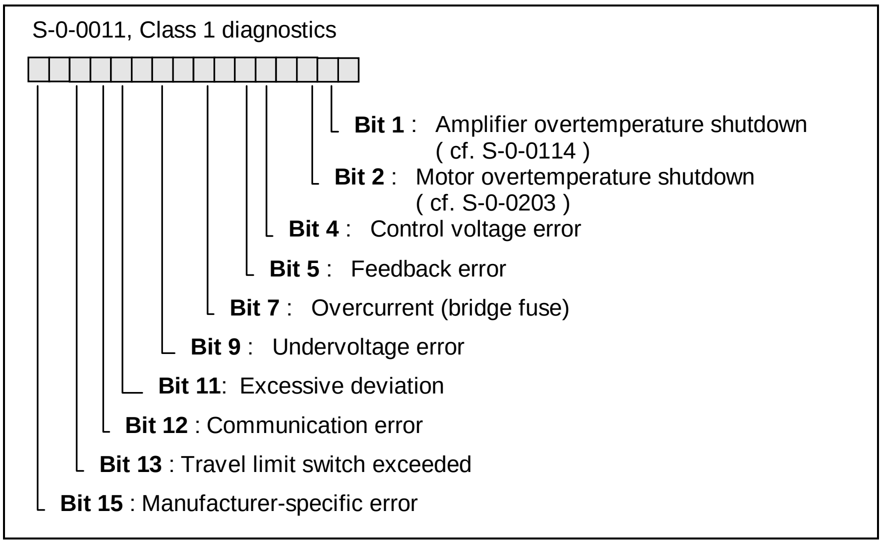

Fig. 3-9: S-0-0011, Class 1 diagnostics

S-0-0012, Class 2 diagnostics

A toggled bit is shown by a change bit in the drive status word

This parameter contains bits for the different warnings. In the event of a warning, a bit is set in this parameter. At the same time, the bit "Change bit class 2 diagnostics" is set in the **drive status word**. Reading **S-0-0012, Class 2 diagnostics** clears the change bit. The parameter **S-0-0097, Mask class 2 diagnostic** permits the effect of a warning with respect to the change bit to be masked out.

The following bits are supported in class 2 diagnostics:

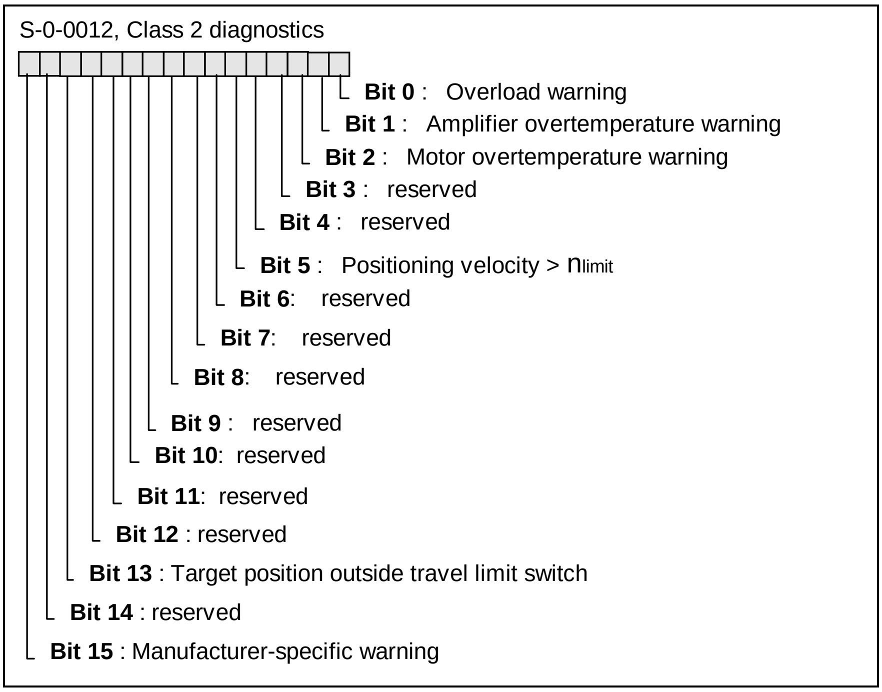

Fig. 3-10: Structure of the parameter S-0-0012, Class 2 diagnostics

S-0-0013, Class 3 diagnostics

Various operating state messages are stored here. A bit in the **drive status word** is set if the status of a message changes ("Change bit class 3 diagnostics"). Reading **S-0-0013, Class 3 diagnostics** clears the change bit. The parameter **S-0-0098, Mask class 3 diagnostic** permits the effect of a message with respect to the change bit to be masked out.

The following bits are supported in class 3 diagnostics:

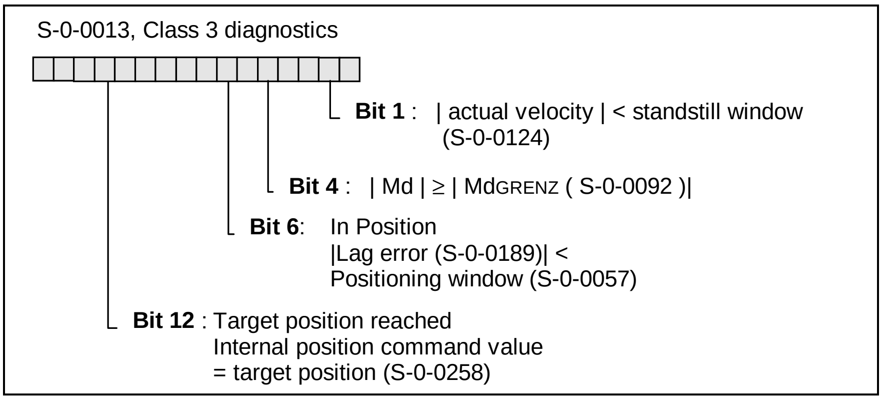

Fig. 3-11: Structure of the parameter S-0-0013, Class 3 diagnostics

Change bits of class 2 and 3 diagnostics in the drive status word

The class 2 or 3 diagnostics change bit is set in the drive status word if the state of a bit in **S-0-0012, Class 2 diagnostics** or in **S-0-0013, Class 3 diagnostics** changes. Read access to these parameters clears the change bit. Setting the change bit after a bit in S-0-0012 or S-0-0013 has been toggled can be masked out using the parameters **S-0-0097, Mask class 2 diagnostic** and/or **S-0-0098, Mask class 3 diagnostic**.

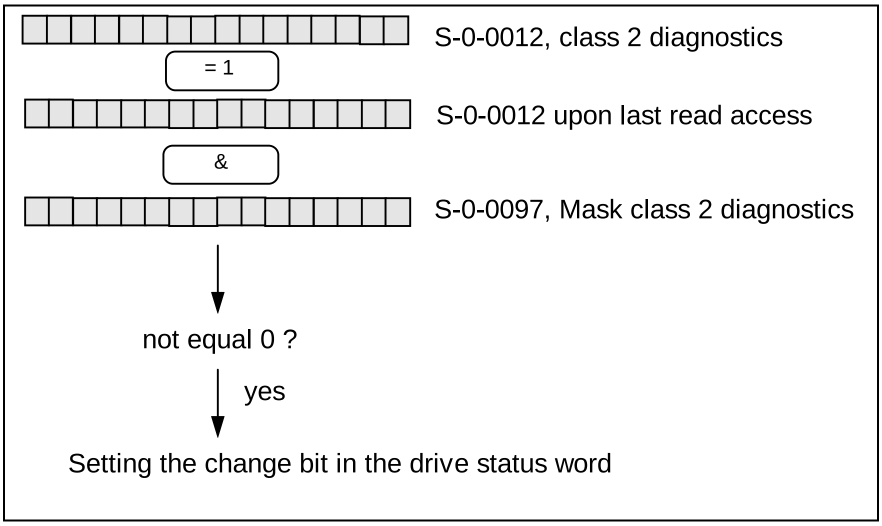

Fig. 3-12: Generating the change bit of class 2 diagnostics

S-0-0182, Manufacturer Class 3 Diagnostics

The parameter **S-0-0182, Manufacturer Class 3 Diagnostics** also contains various operating state messages. A change in the state of a message is not indicated by a change bit.

The following bits are supported in Manufacturer Class 3 Diagnostics:

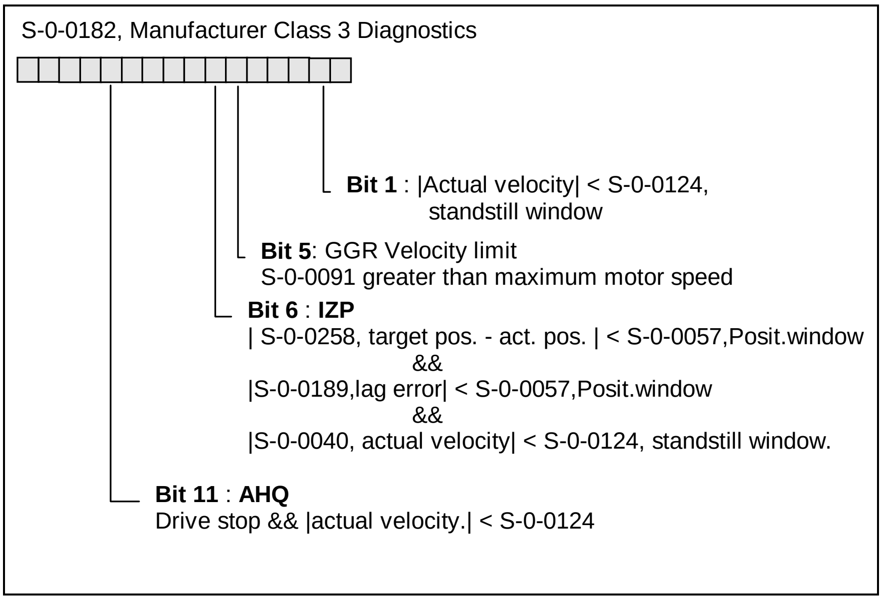

Fig. 3-13: Structure of S-0-0182, Manufacturer Class 3 Diagnostics

3.3 Parameter Setting Mode - Operating Mode

SERCOS Master specifies the communication phases and, consequently, parameter setting and operating mode

Once the drive controller has been switched on, it does not automatically transition to operating mode. Various actions of the SERCOS master are required to get it there.

This activity of switching the drive controller into operating mode is closely connected with establishing the readiness for operation of the SERCOS INTERFACE loop.

This sequence requires various steps to be performed. It is controlled by the master by specifying communication phase 0 through 4 and starting/terminating the commands **S-0-0127, C1 Communication phase 3 transition check** and **S-0-0128, C2 Communication phase 4 transition check**.

The H1 display shows "**bb**" if the drive reaches phase 4 without errors. The related diagnosis is: **A013 Ready for power ON**.

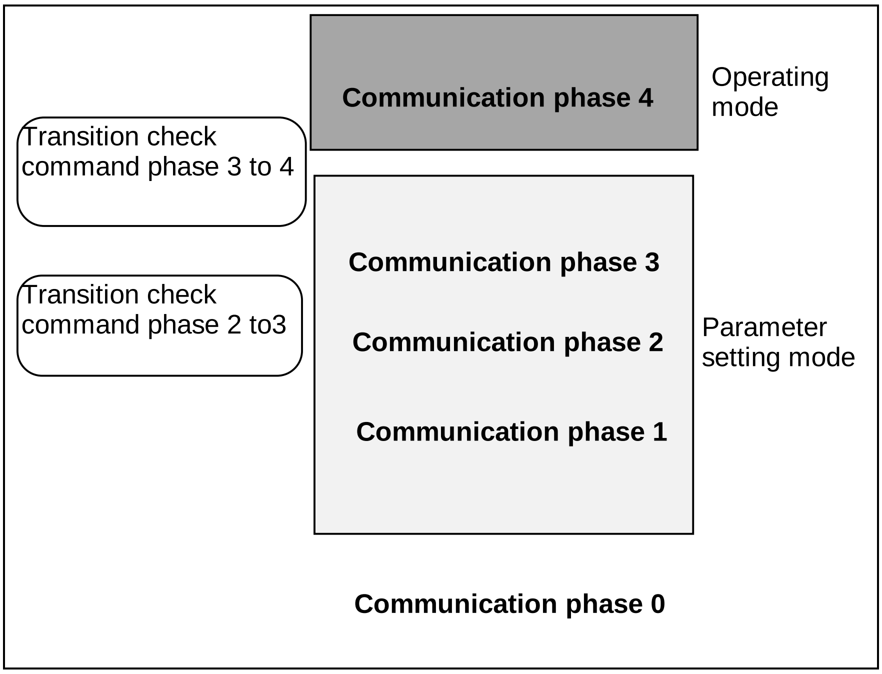

Fig. 3-14: Communication phases

Communication between the SERCOS master and the drive is not possible during phase 0. Parameter setting mode exists during the communication phases 1..3.

Verifications in the transition check commands

Switching the communication phase from 2 to 3 and from 3 to 4 requires transition check commands to be activated in the drive. These commands perform various verifications and parameter conversions.

S-0-0127, C1 Communication phase 3 transition check

Cause and elimination of transition command errors are described in Supplement B, Diagnosis Description

This command performs the following verifications:

Checking the message frame configuration, in particular with configured message frames. The system checks whether the parameters selected for the configurable data block in the MDT or AT may be configured and whether the permissible length of the configurable data blocks is not exceeded.

The following command errors may occur:
C104 config. IDN for MDT not configurable
C105 Configured Length > Max. Length for MDT
C106 config. IDN for AT not configurable
C107 Configured Length > Max. Length for AT

Verifying the validity of the parameters required for the transition in phase 3. The command error
C101 Invalid Communication Parameter (S-0-0021)
is generated if one of those parameter has never been written to or if it has incorrectly been buffered. The ident numbers of the faulty parameters are listed in **S-0-0021, IDN List of Invalid Op. Data for Comm. Ph. 2**. They must be validated by writing to them.

Verifying plausibility and adherence to the boundary condition of the timing parameters for SERCOS communication in phases 3 and 4. The following command errors may occur in this procedure:

C108 Time Slot Parameter > SERCOS Cycle Time
C109 Position of Data Record in MDT (S-0-0009) even
C110 Length of MDT (S-0-0010) odd
C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)
C112 TNcyc (S-0-0001) or Tscyc (S-0-0002) error
C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) error
C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)
C115 T2 too small

S-0-0128, C2 Communication phase 4 transition check

This command performs the following verifications:

- Verifying the validity of the parameters required for the transition in phase 4. The command error
  C201 Invalid Parameter (-> S-0-0022)
  is generated if one of those parameter has never been written to or if it has incorrectly been buffered. The ident numbers of the faulty parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3.** They must be validated by writing to them.
- Verifying the validity of the parameters **P-0-0513, Feedbacktyp** and **S-0-0116, Resolution of rotational feedback 1** in the existing feedback data storage. The command error **C217 Motor feedback data reading error** will be generated if those parameters are not valid or cannot be read.

- The parameters in the memory of a motor that is equipped with feedback data storage are read. If an error occurs during this procedure, the following command error is issued: **C211 Invalid feedback data (-> S-0-0022)**.
- The EEPROM on the drive unit is read after the control voltage has been switched on. The validity of these values is verified upon a transition from 3 to 4 (C2). If an error occurs during this procedure, the following command error is issued: **C212 Invalid amplifier data (-> S-0-0022)**.
- Verification of the internal representability of the conversion factors that are used for the display format of scaling-related data from and to internal representation. If an error occurs during this process, one of the following command errors will be generated:
  C213 Position data scaling error
  C214 Velocity data scaling error
  C215 Acceleration data scaling error
  C216 Torque/force data scaling error
- Verification of the extreme values and bit combinations of all parameters. All parameters are checked for staying inside their limits and using only valid bit combinations. If an error occurs during this process, the following command error will be generated: **C202 Limit Error Parameter (->S-0-0022)**. The ident numbers of the faulty parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**. Those parameter must be corrected.
- Checking whether the parameter **S-0-0103, Modulo Value** can be processed when modulo scaling is active. The command error **C227 Modulo range error** is generated if this is not the case.
- Encoder initialization is performed. Certain encoder-related errors may occur that cause the following command errors to be generated:
  C220 Mot. Feedback Initializing Error
  C221 Ext. Feedback Initializing Error.
- Absolute encoder monitoring. The error **F276 Absolute encoder error** will be generated if the actual position is outside the range of the actual position +/- **P-0-0097, Monitoring Window abs. Encoder** that was valid before the last shutdown of the unit. The switchover command will not be acknowledged as faulty; the error must be cleared by executing the command **S-0-0099, Reset class 1 diagnostic** (see also"Clearing errors" on page 3-5).

Notes

4 Command Communication via the SERCOS INTERFACE

4.1 SERCOS Communication - Overview

The DKC02 performs command communication via the SERCOS interface. The major features of that interface include:

- **Cyclic data exchange of command and actual values at exact time equidistance**
- **Synchronization of measuring time and command value utilization**
- **Overall synchronization of all connected drives with the controller**
- **2 ms minimum cycle time / 65 ms maximum cycle time**
- **Selectable baud rate of 2 or 4 Mbits/s**
- **Service channel for parameter setting and diagnosis**
- **Data transfer via fiber optics cable loop**
- **Configurable message frame contents**

The interface functionality will only be discussed briefly in this context. Please refer to the SERCOS INTERFACE Specifications for details.

4.2 Cyclic Data Transfer via SERCOS

To synchronize the drives in the loop, the **master synchronization message frame** (MST) is transmitted at the beginning of each SERCOS cycle. The only information it contains is the communication phase that has been specified by the master.

Configurable contents of master data and drive message frame

Once during a SERCOS cycle, a **master data message frame** (MDT) is sent from the controller to each drive. It contains the master control word, sections of the service channel, and a configurable data block. The data block mostly contains command and limit values that are to be transmitted from the controller to the drive. Those values are required for controlling the individual modes. The contents of the data block can be configured by the setting of the message frame.

All drives in the loop receive the master data message frame at the same time.

Likewise, once during a SERCOS cycle time, each drive sends a **drive message frame** (AT) to the controller. It contains the drive status word, sections of the service channel, and a configurable data block. In most cases, the data block contains the actual and status values which the controller needs from the drive for controlling the individual modes.

Master control word

The master control word is a part of the master data message frame. It contains all important control information items, such as

- **Drive ON and drive enabled**
- **Drive stop**
- **Interpolator cycle**

- **Command mode**
- **Real-time control bits 1 and 2**
- **Control information for the service channel**

The master control word is of the following structure:

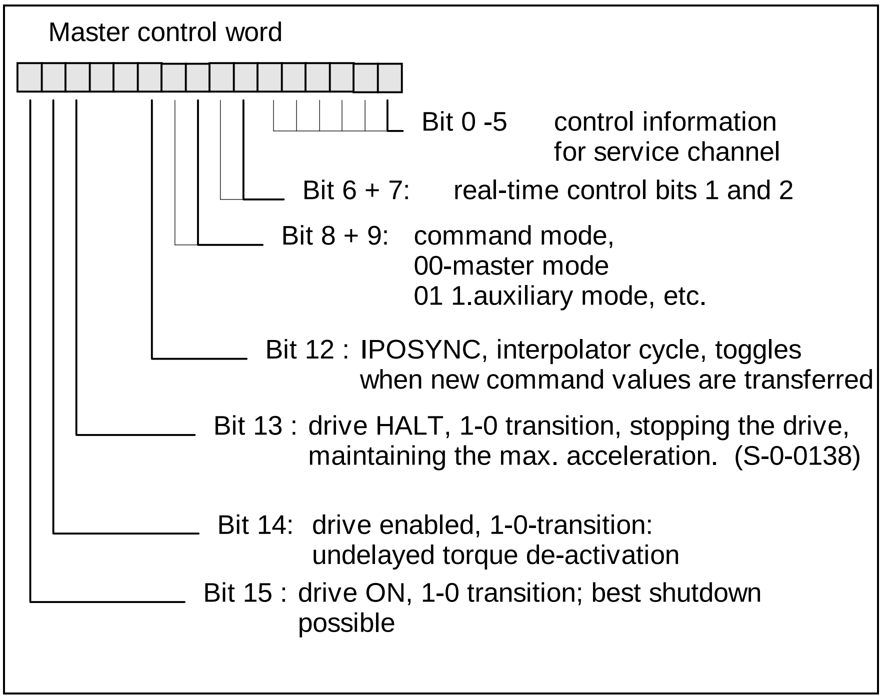

Fig. 4-1: Structure of the master control word

Drive enable signal

The drive is activated by a 0-1 edge of the drive enable signal. In a drive controller with SERCOS interface, the drive enable signal corresponds to bit 15 of the master control word in the master data message frame.

The drive enable signal is only accepted (i.e. the drive is switched from de-energized to energized state) if the following conditions are fulfilled:

- SERCOS interface is operational (communication phase 4)
- no drive errors
- power stage ON

In this state, the drive shows "**Ab**" on the 7-segment display. The drive diagnosis via the parameter **S-0-0095, Diagnostic Message** is **A012, Control and Power Sections Ready for Operation**.

Once the drive enable signal has been set, the 7-segment display changes to "**AF**", and the drive diagnosis shows the activated mode (e.g. **A101 Drive in Velocity Mode**).

The error **F226 Undervoltage Error** is issued if the drive enable signal is activated when there is no intermediate circuit voltage ("**Ab**" is not shown on the H1 display).

Drive status word

The drive status word is a part of the drive message frame. It contains all important status information items of the drive, such as

- **control and power section ready for operation**
- **drive error**
- **change bit class 2 and 3 diagnostic**
- **current mode**
- **real-time status bits 1 and 2**
- **status information for service channel**

The drive status word is of the following structure:

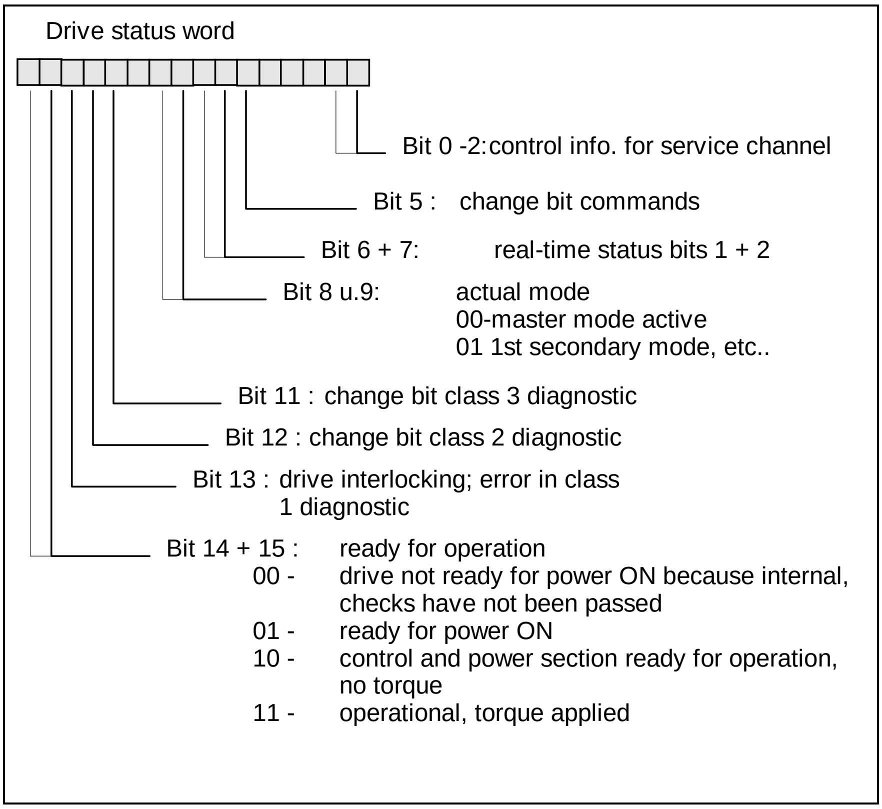

Fig. 4-2: Structure of the drive status word

Acknowledging the drive enable signal

The drive acknowledges the input of the drive enable signal in the drive status word of the drive message frame. Here, bits 14 and 15 change from "10" (control and power section ready for operation, no torque) to "11" (operational, torque applied) after the drive enable signal has been activated and accepted.

The time that is required by the controller for establishing its complete readiness for operation elapses between setting the drive enable signal and acknowledging the setting.

When the drive enable signal is switched off, the drive performs the response that has been selected via **P-0-0119, Deceleration as best as possible**. There, too, a certain time elapses between resetting and acknowledging the resetting. This time depends on

- the setting of the parameter **P-0-0119, Deceleration as best as possible**;
- the velocity of the axis at the time when the drive enable signal was reset.

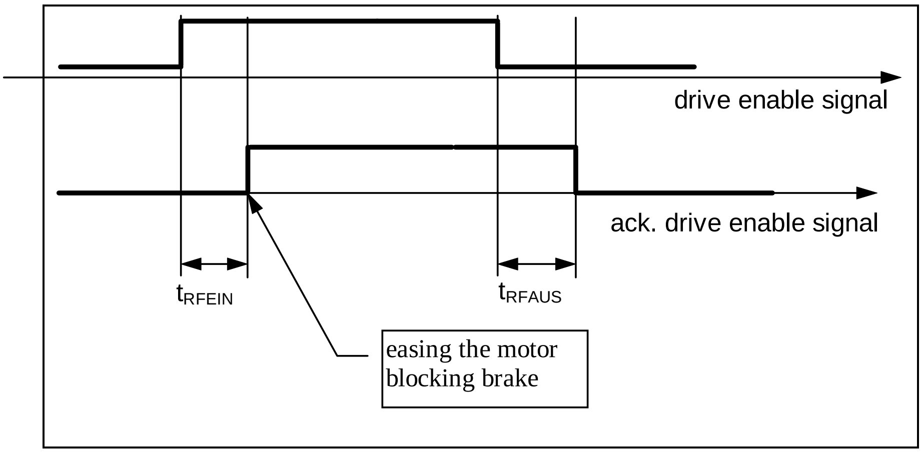

Fig. 4-3: Acknowledging the drive enable signal

A typical value of t_{RFEIN} is approximately 8 ms.

Note: During the t_{RFEIN} interval, the controller should output a command value that produces a command velocity 0. A motor blocking brake is only eased when the drive enable signal is acknowledged (0-1 edge of drive enable signal acknowledgment).

4.3 Real-Time Control and Status Bits

Master control and drive status word contain 2 configurable real-time bits each. The following parameters are used for configuring the binary signals:

- **S-0-0301, Allocation of Real-Time Control Bit 1**
- **S-0-0303, Allocation of Real-Time Control Bit 2**
- **S-0-0305, Allocation of Real-Time Status Bit 1**
- **S-0-0307, Allocation of Real-Time Status Bit 2**

These parameters specify which parameter maps bit 0 (LSB) in the corresponding real-time status bit, thus sending that bit cyclically to the master; and onto which parameters the real-time control bits are mapped.

4.4 Transfer of Required Data via SERCOS

The term "required data" describes parameters that are transferred via the service channel rather than being transmitted cyclically.

The transfer via the service channel is performed in small quantities and in sections in MDT and AT. The transfer of an element may take several SERCOS cycles.

Thus, the service channel can be used for

- **parameterization** and
- **diagnosis.**

4.5 Commissioning the SERCOS Interface

Commissioning the interface chiefly consists of the following activities:

- **connecting the fiber optic cables**
- **setting the drive address**
- **setting the baud rate**
- **setting the transmission power**

All selections can be made via switches on the unit's front panel.

The selections must be made before communications via the fiber optics loop is established.

See also Supplement B, Diagnosis Description: **E410 Slave not scanned or address 0**.

4.6 Selecting the Drive Address of the SERCOS Interface

Switch S2, S3
SERCOS address

The SERCOS address of the drive (any number between 1 and 99) is set at two decimal rotary switches.

Example:

Switch position S3 = 9 (tens)

Switch position S2 = 1 (units)

SERCOS address = 9 * 10 + 1 = 91

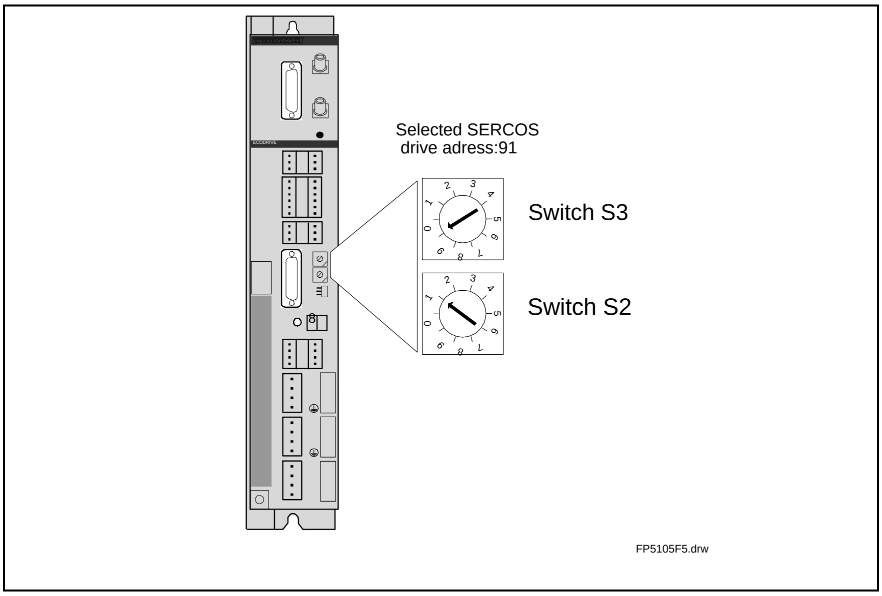

Fig. 4-4: Setting the drive address via decimal rotary switches

Setting baud rate / transmission power of the SERCOS interface

Baud rate, transmission power

Baud rate and transmission power of the SERCOS interface are selected at switch S4.

Upon delivery, the DKC is set to a medium transmission power (-4,5 dBm) and the lowest baud rate (2 Mbits/s).

Switch position

A switch is in its OFF position when the lever points to the rear towards the rear panel of the unit. The S4/1 switch is the bottom one (see also marking on the unit).

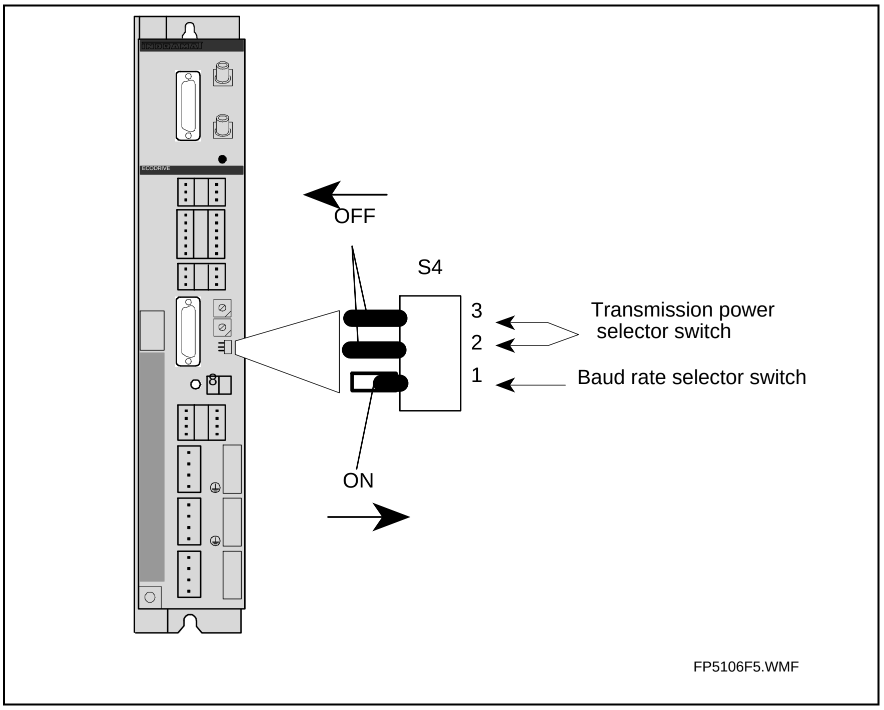

Fig. 4-5: Location of the switches for baud rate and transmission power and definition of the ON/OF position of the switches

Baud rate

The baud rate is selected via the S4/1 switch.

Position of the S4/1 switch	Baud rate in Mbits/s
OFF	2
ON	4

Tab. 4-1: Relationship between the position of the S4/1 switch and the baud rate

Transmission power

The transmission power is selected via the S4/2 and S4/3 switches.

The following table shows the relationship between switch position and transmission power:

Position of S4/2 switch	Position of S4/3 switch	Transmission power at opt. high level in dBm	Transmission power at opt. high level in µW
OFF	OFF	-7	200
OFF	ON	-4,5	350
ON	OFF	-1	800
ON	ON	0	1000

Tab. 4-2: Relationship between the position of the S4/2,S4/3 switches and the transmission power

Setting the drive address of the SERCOS interface

The drive address (range between 0 and 99) is set via the S2 and S3 switches.

The drive address is independent of the sequence in which the drives are connected to the fiber optics cable.

Connecting the fiber optics cable of the SERCOS interface

The loop structure requires the transmitter of the preceding device to be connected to the receiver of the subsequent device.

The fiber optics cable with the receive signal must be connected to Rx/X11. A red light shows if a signal is fed to it. The received light signal is amplified in the interface module and emerges at the transmitter (Tx/X10) if the control voltage of the drive controller has been switched on. The fiber optics cable to the receiver of the next device must be connected to Tx/X10.

Distortion LED (H3Err) of the SERCOS interface

The distortion LED is ON if the power of the received signal is too high or too low or if there are no edges on the received signal. Adjust the transmission power of the preceding loop device such that the signal level goes back into the valid range. The LED will then be OFF.

4.7 SERCOS Message Frame Configuration

Proper operation of the drive requires the SERCOS master to notify the drive of the specified transmit and receive times, length, and contents of the message frame.

Configuring the transmit and receive times of the message frames

For the computation of the time-slot parameters (transmit and receive times of the message frames), the boundary conditions that must be satisfied are stored in the drive in the form of the following parameters:

- **S-0-0003, Minimum AT Transmit Starting Time (T1min)**
- **S-0-0004, Transmit/Receive Transition Time (TATMT)**
- **S-0-0005, Minimum Feedback Acquisition Time (T4min)**
- **S-0-0088, Receive to Receive Recovery Time (TMTSG)**
- **S-0-0090, Command Value Transmit Time (TMTSG)**

The SERCOS master employs this information from all drives to compute the time slot parameters that are used for interface operation from communication phase 3 onwards. The following parameters are used for transferring those values to the drive in communication phase 2:

- **S-0-0002, SERCOS Cycle Time (Tscyc)**
- **S-0-0006, AT Transmission Starting Time (T1)**
- **S-0-0007, Feedback Acquisition Starting Time (T4)**
- **S-0-0008, Command Valid Time (T3)**
- **S-0-0009, Beginning Address in Master Data Telegram**

- **S-0-0010, Length of Master Data Telegram**
- **S-0-0089, MDT Transmit Starting Time (T2)**

The drive checks these inputs while the command **S-0-0127, C1 Communication phase 3 transition check**is being executed. This may produce the following command error messages:

- **C101 Invalid Communication Parameter (S-0-0021)**
- **C108 Time Slot Parameter > Sercos cycle time**
- **C109 Position of Data Record in MDT (S-0-0009) even**
- **C110 Length of MDT (S-0-0010) odd**
- **C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)**
- **C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error**
- **C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) Error**
- **C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)**
- **C115 T2 too small**

Configuration of the message frame contents

The following parameters are used for defining the message frame contents:

- **S-0-0015, Telegram Type Parameter**
- **S-0-0016, Custom Amplifier Telegram Configuration List**
- **S-0-0024, Config. List of the Master Data Telegram**

This requires the drive-related boundary conditions for type and number of the configurable data items to be satisfied. They are provided by the drive in the following parameters:

- **S-0-0185, Length of the config. data record in the AT**
- **S-0-0186, Length of the config. data record in the MDT**
- **S-0-0187, List of Configurable Data in the AT**
- **S-0-0188, List of Configurable Data in the MDT**

The drive checks these inputs while the command **S-0-0127, C1 Communication phase 3 transition check** is being executed. This may produce the following command error messages:

- **C104 config. IDN for MDT not configurable**
- **C105 Configured length > Max. Length for MDT**
- **C106 config. IDN for AT not configurable**
- **C107 Configured length > Max. Length for AT**

4.8 SERCOS Interface Errors

The drive returns to communication phase 0 (i.e. no more drive message frames are transmitted), automatically executes the programmed fault reactions (see also **P-0-0119, Deceleration as best as possible),** and waits for the master to perform a new initialization of the SERCOS if states are detected in the drive that inhibit proper operation of the interface or if incorrect inputs are detected during the initialization phase.

Possible errors include:

- **F401 Double MST Error Shutdown**
- **F402 Double MDT Error Shutdown**
- **F403 Invalid Communication Phase Shutdown**
- **F404 Error During Phase Progression**
- **F405 Error During Phase Regression**
- **F406 Phase Switching Without Ready Signal**

Diagnosis of the interface status

The parameter **S-0-0014, Interface Status** provides diagnosis information about existing interface errors and the current communication phase.

Error counter for message frame failures

The drive monitors each received master synchronization message frame and master data message frame for

- **the correct receive time,**
- **the agreed message frame length, and**
- **the correct CRC checksum**.

A message frame failure is registered by incrementing an error counter. The two parameters **S-0-0028, MST error counter** and **S-0-0029, MDT error counter** exist for this purpose.

The error counters are cleared upon the communication phase transition from 2 to 3 (S-0-0028) or from 3 to 4 (S-0-0029).

Notes

5 Motor Configuration

5.1 Properties of the Different Motor Types

The following INDRAMAT motor types can be used with the DKC02 unit:

- MDD
- MKD

Motor feedback data storage

The motor feedback data storage contains all motor-related parameters

MDD and MKD motors possess a motor feedback data storage element that contains all motor-related parameters. The drive controller automatically recognizes this and reads those parameters from the data storage element after it has been switched on or upon the command **S-0-0128, C2 Communication phase 4 transition check**.

The data storage unit contains the following parameters:

- **S-0-0109, Motor Peak Current**
- **S-0-0111, Motor Current at Standstill**
- **S-0-0113, Maximum Motor Speed (nmax)**
- **S-0-0141, Motor Type**
- **P-0-0018, Number of Pole Pairs**
- **P-0-0051, Torque Constant**
- **P-0-0510, Inertia of the rotor**

Thus, the parameters need not be entered for commissioning or after the motor has been replaced.

Temperature monitoring

The shutdown threshold of the motor temperature monitoring function for MDD and MKD motors is fixed.

Initial program loading function

MDD and MKD motors possess a data storage unit in their feedback. In addition to all motor-related parameters, the data storage also contains a set of default control parameters that are activated by the initial program loading function.

(See also "Initial program loading" function)

5.2 Motor Blocking Brake

The drive controllers of the ECODRIVE series permit a motor blocking brake to be triggered. Such a brake is employed for preventing unwanted axis movements when the drive enable signal is switched off.

Note: The motor blocking brake is not designed to be used as a service brake. It is worn out when it is applied for approximately 20,000 motor revolutions.

Connecting the motor blocking brake

The motor blocking brake connects to the X6 connector of the drive controller.

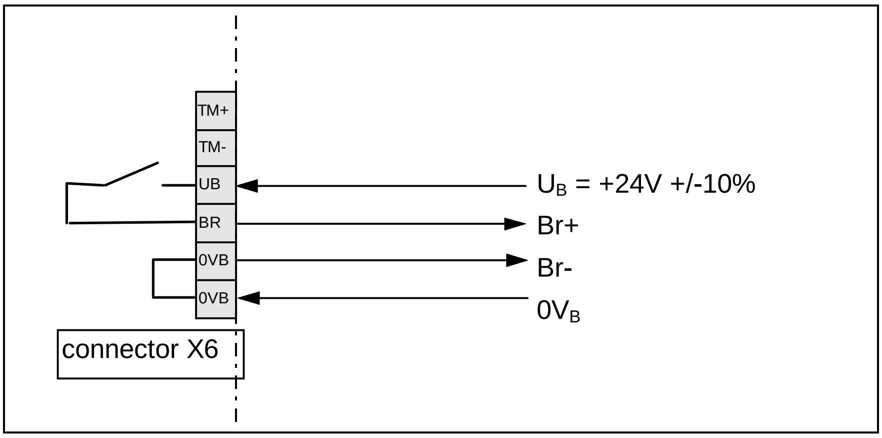

Fig. 5-1: Connecting the motor blocking brake

The brake controller requires an external voltage of +24 V. The brake is controlled via the contacts Br+ and Br-.

6 Modes

6.1 Modes - Definition

Modes define the command values and the way those values are processed. The following parameters can be used for pre-selecting four different modes at the same time:

- **S-0-0032, Primary Mode of Operation**
- **S-0-0033, Secondary Mode of Operation 1**
- **S-0-0034, Secondary Mode of Operation 2**
- **S-0-0035, Secondary Mode of Operation 3**

6.2 Basic Modes

Torque / force control

In **torque / force control** mode, a torque/force command value is specified for the drive. With active mode, the diagnosis is **A100 Drive in Torque Mode**.

The command value is specified in the parameter **S-0-0080, Torque/Force Command**.

Mode-related monitoring functions are:

- Monitoring the actual velocity for the 1.125-fold value of the parameter **S-0-0091, Bipolar Velocity Limit Value**.

(see also "Limitation to bipolar velocity limit")

The error **F879 Crossing velocity limit (S-0-0091) value** is generated if this value is exceeded.

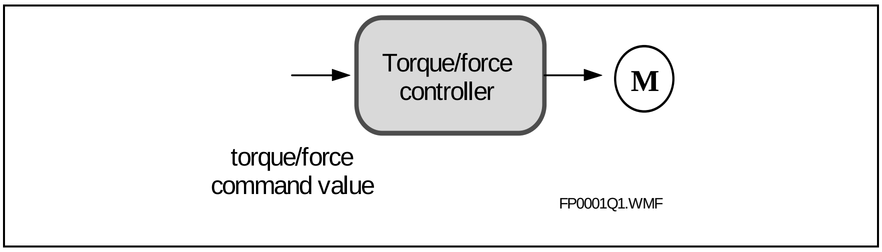

Fig. 6-1: Block diagram of torque/force controller

Torque/force controller

The parameter **P-0-4046, Active Peak Current** limits the command value in **S-0-0080, Torque/Force Command**. The effective peak current results from the current and torque/force limitation.

(See also "Current limitation" and "Torque/force limitation")

The "torque/power-forming current" Iqsoll results after these limitations. It is the command value for the (active) current controller.

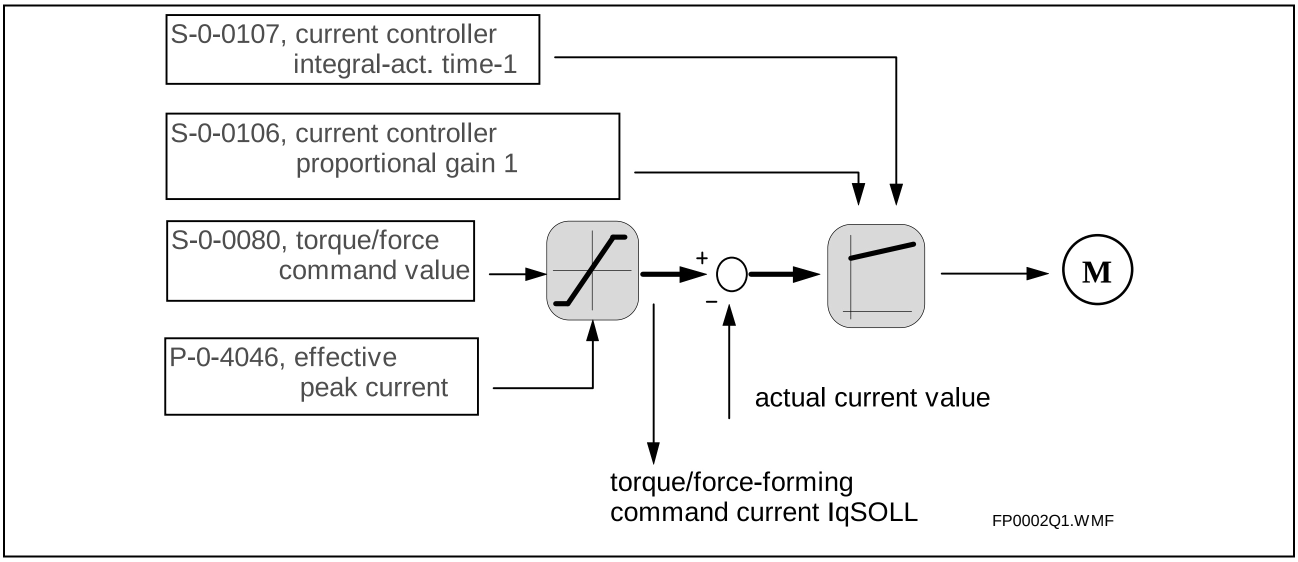

Fig. 6-2: Torque/force controller

Velocity control

In **velocity control** mode , a velocity command value is specified for the drive. With active mode, the diagnosis is **A101 Drive in Velocity Mode**.

The command values are specified in the parameters **S-0-0036, Velocity Command Value** and **S-0-0037, Additive velocity command value**.

Mode-related monitoring functions are:

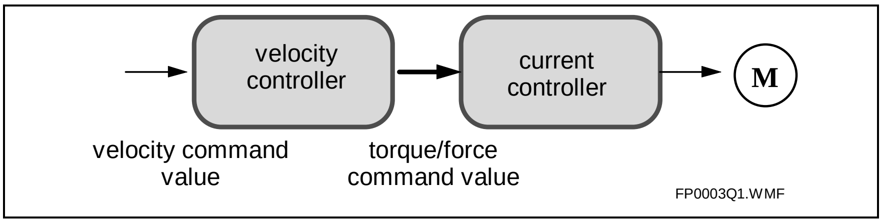

Fig. 6-3: Velocity control - block diagram

Velocity controller

The effective velocity command value results from adding the values of **S-0-0036, Velocity Command Value** and of **S-0-0037, Additive velocity command value**.

The effective velocity command value is limited to **S-0-0091, Bipolar Velocity Limit Value,** 10 rpm.

(See also "Limiting to bipolar velocity limit")

The warning **E259 Command velocity limitation active** is displayed if the resulting command value is in limitation.

A mixing point permits the raw actual velocities of the motor and, if available, the external measuring system to be merged to an actual velocity value that is used in controlling (see also "Setting the velocity mixing factor").

Using a low-pass filter, additional band-filtering is possible (selection via **S-0-0392, Velocity Feedback Filter time constant**) before it is output as actual control value to the velocity controller.

If a lag-free position control mode has been activated and if the parameter **S-0-0348, Acceleration Feedforward prop. Gain** is not equal "0", the precontrol component is added to the manipulated variable from the velocity controller.

Subsequently, this variable is fed to the current and torque/force limitation.

(See also "Current limitation " and "Torque/force limitation ").

P-0-0004, Smoothing Time Constant permits a band-width limitation of the command value for the current controller.

(See also "Setting the velocity controller)

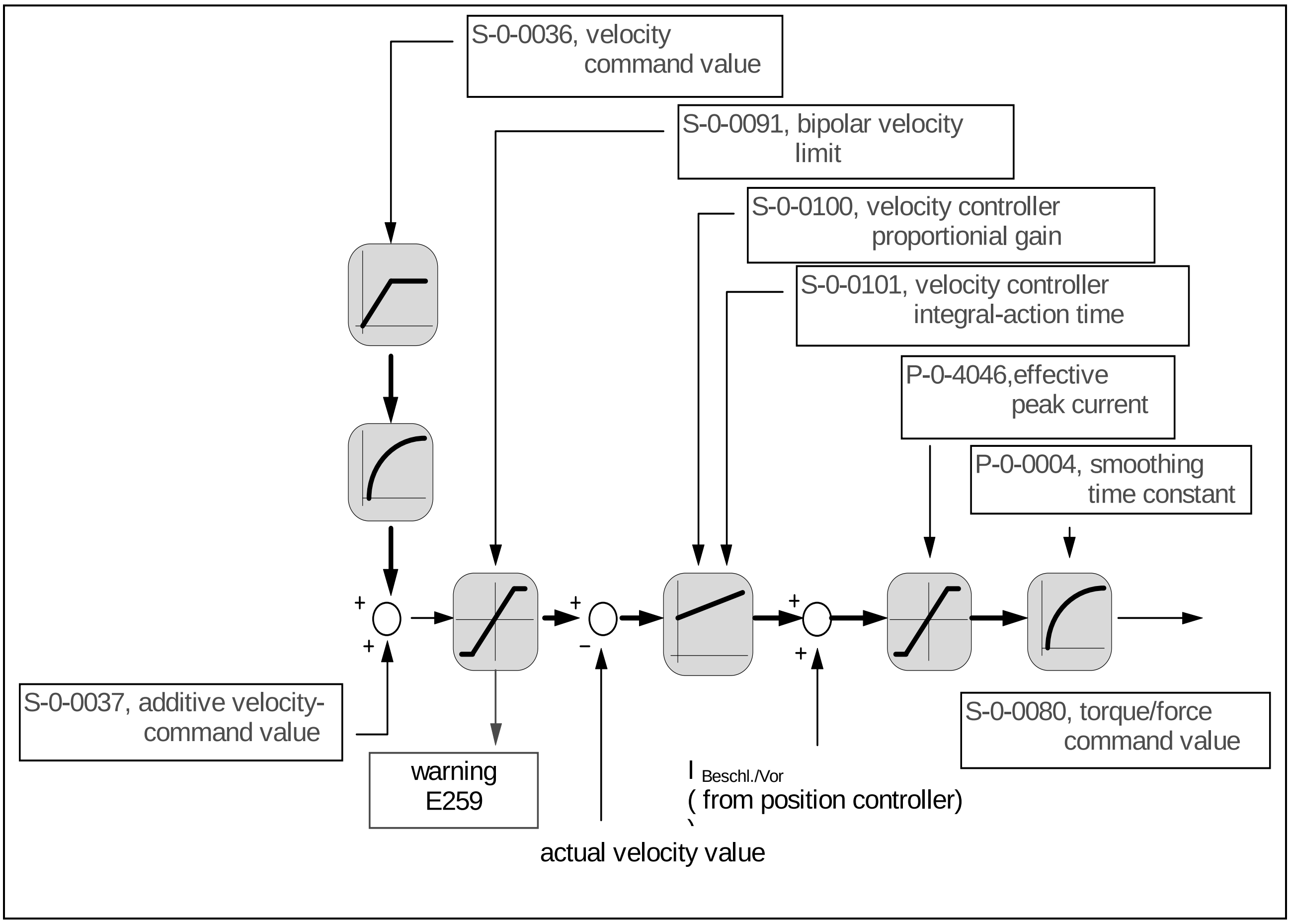

Fig. 6-4: Velocity controller

See also "Current controller" on page 6-4

Current controller

The current controller is parameterized through the parameters **S-0-0106, Proportional Gain 1 Current Regulator 1** and **S-0-0107, Current Regulator 1 Integral Action Time**.

(See also "Setting the current controller)

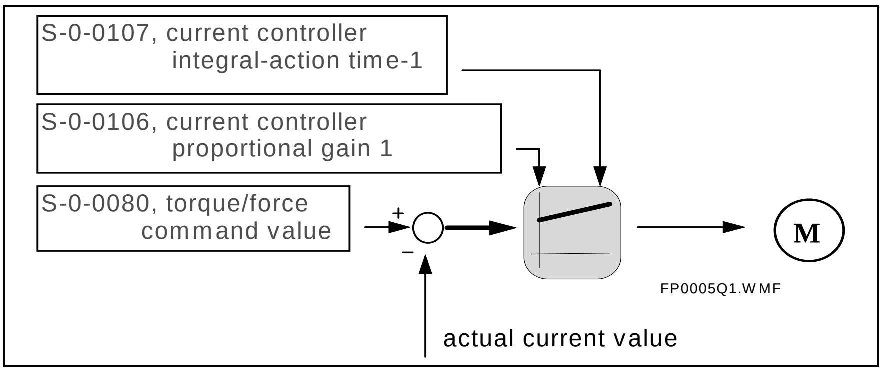

Fig. 6-5: Current controller

Position control

In **position control** mode, a position command value is specified for the drive in the NC cycle clock. One of the following diagnoses is possible when this mode is active:

- **A102 Position Mode Encoder 1,**
- **A103 Position Mode Encoder 2,**
- **A104 Position Mode Encoder 1 / lagless positioning,**
- **A105 Position Mode Encoder 2 / lagless positioning**

The command value is specified in the parameter **S-0-0047, Position Command Value**.

Mode-related monitoring functions are:

- Monitoring the command velocity for the value of the parameter **S-0-0091, Bipolar Velocity Limit Value**.
  (see also "Position command value monitoring" on page 6-6)

Error **F237 Excessive Position Command Difference** is generated if that value is exceeded.

The command value specified in **S-0-0047, Position Command Value** first goes through an interpolator before it is fed to the position controller.

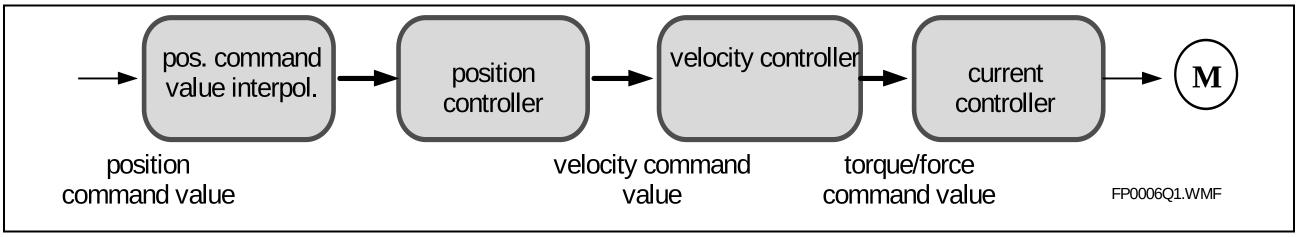

Fig. 6-6: Position control - block diagram

Generator function: Position command value interpolator

An actual velocity is generated from the values of two consecutive position command values. **S-0-0001, NC Cycle Time (TNcyc)** is used as time base for this purpose.

The formula for generating the command velocity is

$$Vsoll = \frac{poscommandvalue(k) - poscommandvalue(k-1)}{S-0-0001}$$

Vsoll: command velocity

Fig. 6-1: Computing the command velocity

This velocity is monitored for not exceeding **S-0-0091, Bipolar Velocity Limit Value** (see also "Position command value monitoring" on page 6-6). The error **F237 Excessive Position Command Difference** is generated if **S-0-0091** is exceeded.

Using the parameter **P-0-0099, Position Command Smoothing Time Constant**, jerk limitation of the specified position command value profile is possible.

The position controller is closed every 500 µs. The position command value in the NC cycle clock is fine-interpolated for this purpose.

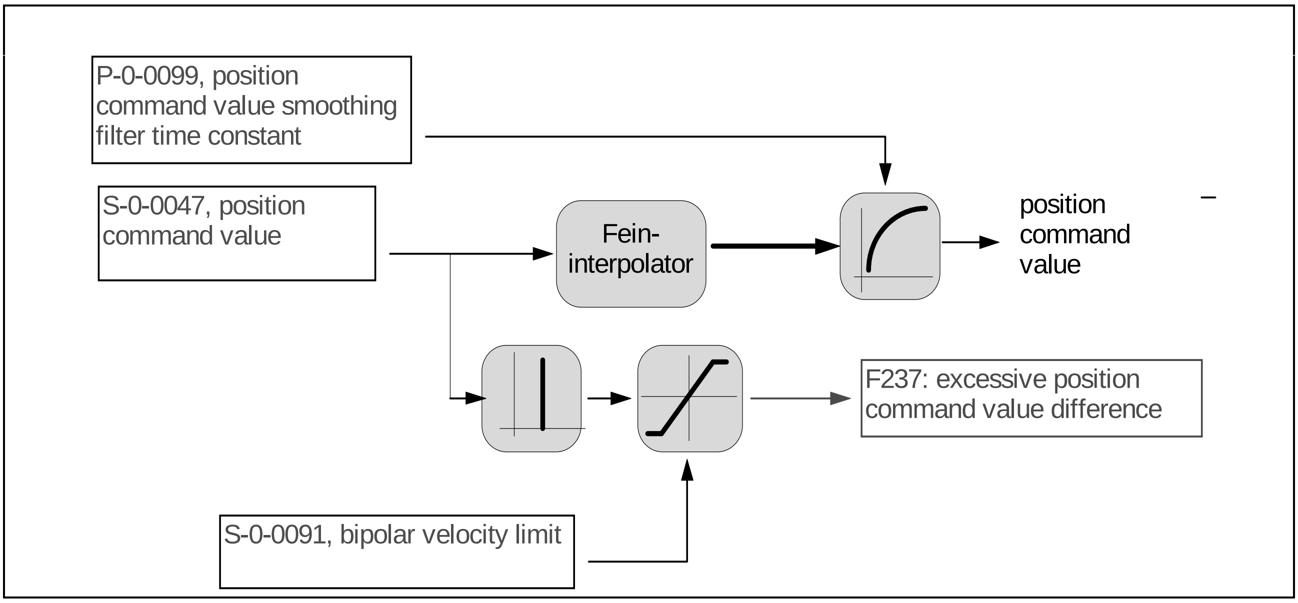

Fig. 6-7: : Generator function position command value interpolator

See also "Position controller" on page 6-5

See also "Velocity controller" on page 6-2

See also "Modes" on page 6-1

Position controller

The position control deviation is generated from the effective position control value (that is generated from the currently active mode) and the actual position value that is used for control (motor encoder or external encoder).

The position control deviation is fed to the position controller, whose gain is selected via **S-0-0104, Position Loop prop. Gain KV**. (See also "Position controller settings".)

Bit 3 in the mode parameters (S-0-0032..35) specifies whether operation shall be with or without lag error.

In position control without lag error, the parameter **S-0-0348, Acceleration Feedforward prop. Gain** can be used for applying a precontrol component that is proportional to the acceleration.

(See also "Acceleration precontrol setting)

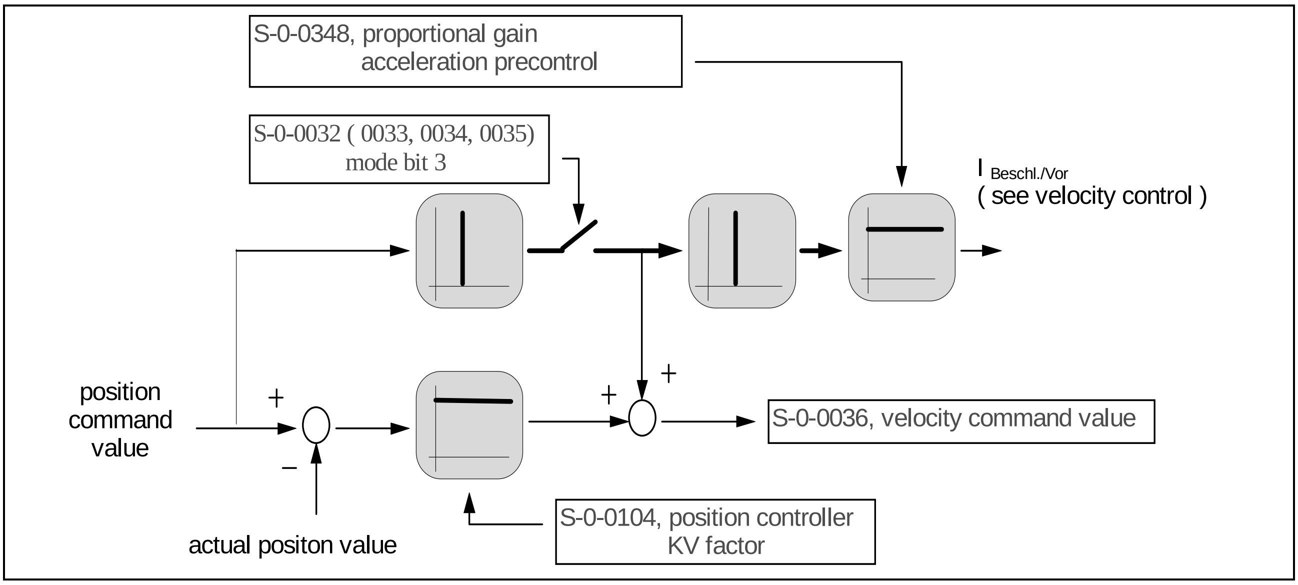

Fig. 6-8: Position controller - block diagram

See also "Velocity controller" on page 6-2
See also "Current controller" on page 6-4

Position command value monitoring

If the drive is used in position control mode with cyclic position command value input, the drive is provided with new position command values in each SERCOS cycle. The difference between the current and the last position command value is determined and checked for plausibility.

Possible causes for the monitoring function to respond include:

- incorrect command value input from the controller
- errors in the command value transfer

If **position control** mode is active, the velocity that results from the specified position command values of the parameter **S-0-0047, Position Command Value** is compared with

- **S-0-0091, Bipolar Velocity Limit Value**

S-0-0001, NC Cycle Time (TNcyc) is used as the time basis for converting the position command value differences into a velocity. Thus, it is assumed that position command values are specified cyclically in the rhythm of the NC cycle. This is usually the case in position control mode.

The following error is generated if the command velocity that results from the specified position command value exceeds **S-0-0091, Bipolar Velocity Limit Value**:

- **F237, Excessive Position Command Difference**

The following two parameters are stored for diagnosis purposes.

- **P-0-0010, Excessive Position Command**
- **P-0-0011, Last valid Position Command Value**

The velocity that results from the difference between the two values leads to generating an error.

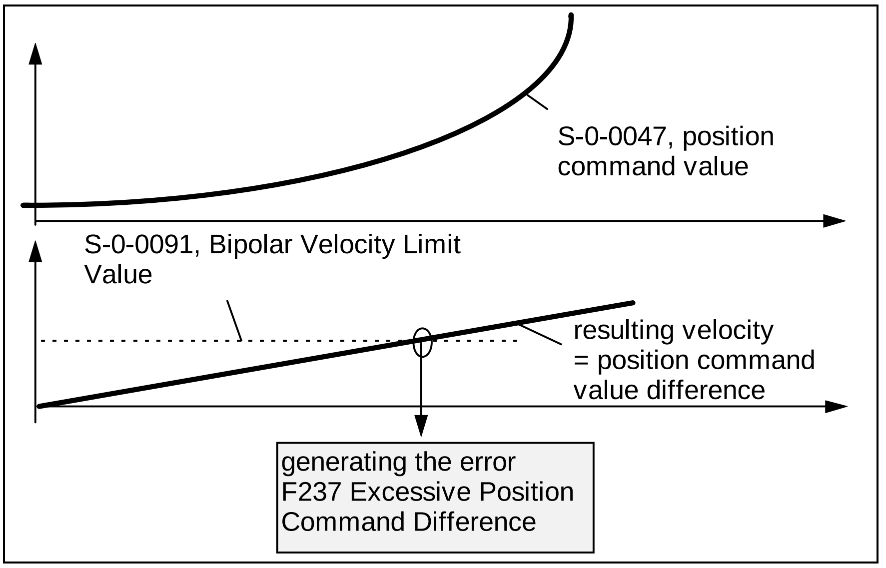

Fig. 6-9: Monitoring the position command value differences and generating the **F237 error, Excessive Position Command Difference**

Position command value monitoring - selections

Position command value monitoring employs the parameter **S-0-0091 Bipolar Velocity Limit Value.** S-0-0091 should be set to a value that is approximately 5...1% higher than the planned maximum axis velocity.

Drive-internal interpolation

In **drive-internal interpolation** mode, a target position is specified for the drive. One of the following diagnoses is possible when that mode is active:

- **A106 Drive controlled interpolation / Encoder 1**
- **A107 Drive controlled interpolation / Encoder 2**
- **A108 Drive controlled interpolation / Encoder 1, Lagless**
- **A109 Drive controlled interpolation / Encoder 2, Lagless**

The following verifications are performed:

- The parameter S-0-0258, Target Position is monitored for remaining inside the travel limit switches if axis limit value monitoring has been activated (bit 4 of **S-0-0055, Position Polarity Parameter** has been set) and if the measuring system that is employed for the mode is in reference. If it is exceeded, the warning **E253 Target position out of travel zone** will be generated.

  The specified target position will not be accepted.
- If the specified positioning velocity **S-0-0259, Positioning velocity** exceeds the maximum permissible value (**S-0-0091, Bipolar Velocity Limit Value)**, the warning **E249, Positioning vel. (S-0-0259) greater S-0-0091** is generated.

  The drive approaches the new target position at the velocity **S-0-0091, Bipolar Velocity Limit Value.**

The binary signal "Target position reached" in **S-0-0013, Class 3 Diagnostics** (see also S-0-0013, Class 3 Diagnostics) and the IZP signal in **S-0-00182, Manufacturer Class 3 Diagnostics** (see also "S-0-0182, Manufacturer Class 3 Diagnostics" exist specifically for the present mode.

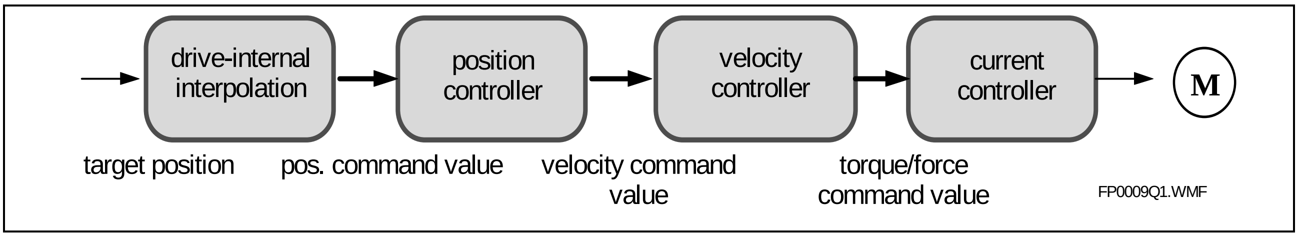

Fig. 6-10: Drive-internal interpolation - block diagram

Generator function: Drive-internal interpolation

The command value is specified in parameter **S-0-0258, Target Position**. Taking the boundary conditions into account, the drive generates the position command value profile that is required for approaching the target position in

- **S-0-0259, Positioning velocity**
- **S-0-0260, Positioning acceleration**
- **S-0-0193, Positioning jerk**
- **S-0-0108, Feedrate override**

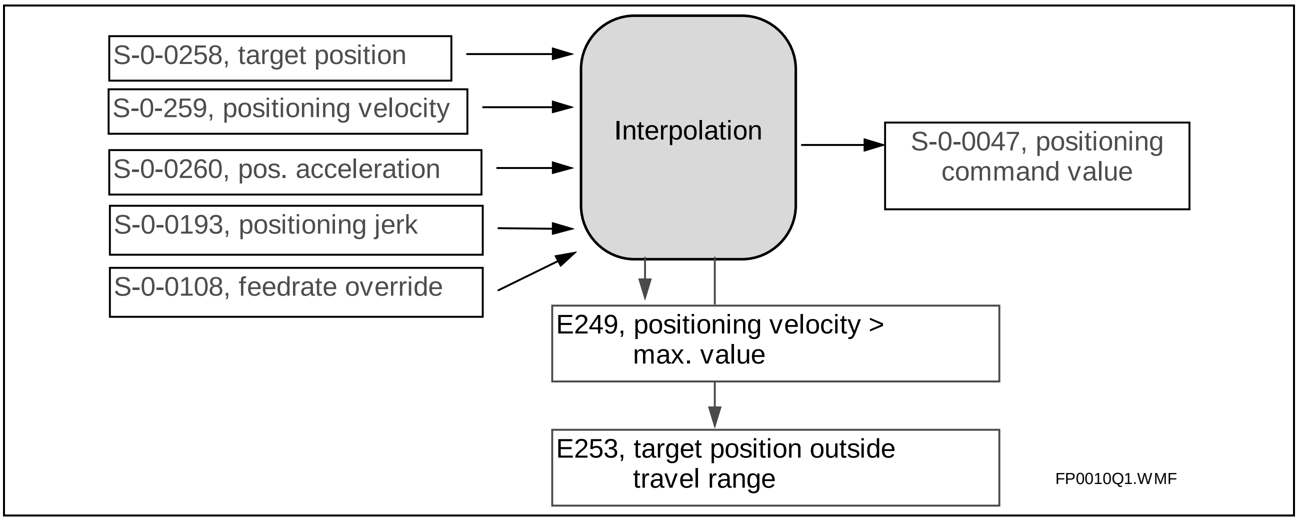

Fig. 6-11: Generator function: Drive-internal generator function

The warning **E255 Feedrate-Override(S0-0108) = 0** is output if drive-internal interpolation mode is active and if zero has been entered in the parameter **S-0-0108, Feedrate override**.

See also "Position controller" on page 6-5
See also "Velocity controller" on page 6-2
See also "Modes" on page 6-1

6.3 Setting the Mode Parameters

Using the parameters

- **S-0-0032, Primary Mode of Operation**
- **S-0-0033, Secondary Operation Mode 1**
- **S-0-0034, Secondary Operation Mode 2**
- **S-0-0035, Secondary Operation Mode 3**,

four different modes can be pre-selected at the same time.

Bits 8 and 9 of the master control word define the actual active mode. Changing between those modes during operation is possible.

The modes are selected in the parameters S-0-0032..35. The mode is selected by entering a bit string.

Certain positions have invariably been defined in that bit string.

Bit 3 must be used for specifying whether position control shall be with or without lag error.

The following selections are possible :

Bit 3 (x) = 0 position control with lag error
Bit 3 = 1 position control without lag error

Bit string:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2

Fig. 6-12: Setting the mode parameters

6.4 Defining the Active Mode

Bits 8 and 9 of the master control word determine which of the four pre-selected modes will actually be effective

Bits 8 and 9 in master control word:	Effective mode:
0 0	Primary mode
0 1	1st secondary mode
1 0	2nd secondary mode
1 1	3rd secondary mode

Fig. 6-13: Defining the active mode

Error **F207 Switching to uninitialized Operating Mode** is generated if "0" is entered in the effective mode parameters.

7 Basic Drive Functions

7.1 Display Format of Physical Values

Data exchange between drive and higher-level control unit is performed by reading and writing parameters of the drive. Interpreting the operating data of a parameter requires information about unit and number of fractional part digits (see also parameter). The LSB significance of the operating data also results from these specifications. The example in the following figure explains this.

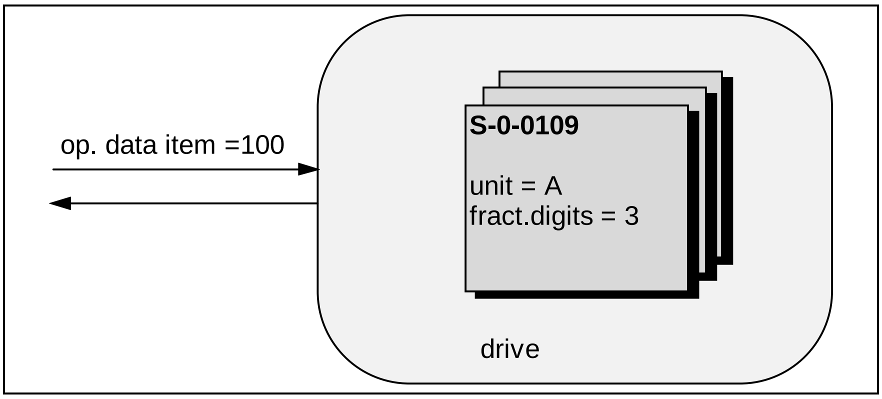

Fig. 7-1: Typical interpretation of an operating data item in the drive

The term ’scaling’ stands for the combination of unit and number of fractional part digits.

In the figure above, the operating data of the S-0-0109 parameter is described by the value 100. Together with the unit A(mpère) and three fractional part digits, this value describes the physical quantity of 0.100 Amps. Thus, each parameter has its own unit and a number of fractional part digits. The combination of these two criteria is known as 'scaling'. To interpret the operating data, these criteria must always be included in the consideration. Together with all other parameter attributes, unit and number of fractional part digits of each parameter are listed in Supplement A, Parameter Description.

Selectable Scaling for Position, Velocity, and Acceleration Data

Selectable scaling permits the LSB significance of position, velocity and acceleration data to be adjusted

The user can employ scaling parameters to set the scaling of the parameters for

- position data,
- velocity data, and
- acceleration data

Thus,

1. the significance of that data for the exchange between controller and drive can be declared. This means that the data can be exchanged in the controller-internal format. The data need not be converted in the controller.

2. the data can be matched to the kinematics characteristics of the machine. A translatory movement, for example, can be described using translatory units, while a rotation can be described by rotary units.

Selection between translatory and rotary scaling, preferred and parameter scaling, and motor or load reference is possible.

Translatory - rotary scaling

For selectable scaling, distinction can be made between translatory and rotary scaling. For linear motors, translatory scaling is usually selected. For a rotary motor either rotary or translatory scaling is possible (the latter one if the rotary movement is converted into a translatory movement, via a recirculating ball screw, for example).

Preferred scaling - parameter scaling

For selectable scaling, distinction can be made between preferred scaling and parameter scaling. If preferred scaling is selected, the corresponding scaling factor and scaling exponent parameters in **S-0-0128, C2 Communication phase 4 transition check** are overwritten with preferred values. Thus, pre-defined scaling is selected. Scaling factor and scaling exponent parameters need not be entered. The actual preferred scaling depends on the selected scaling (translatory or rotary).

The following preferred scalings exist:

Physical quantity:	**Rotary preferred scaling:**	**Translatory preferred scaling (mm):**	**Translatory preferred scaling (inches):**
Position data	0.0001 degrees	0.0001 mm	0.001 in
Velocity data	0.0001 rpm or 10^-6 revs/sec	10^-6 m/min	10^-5 in/min
Acceleration data	0,001 rad/sec²	10^-6 m/sec²	--

Fig. 7-2: Preferred scaling - parameter scaling

Motor reference - load reference

When scaling is selected, distinction can be made between motor and load reference scaling.

With rotary load reference, the gear transmission ratio **S-0-0122, Output revolutions of load gear / S-0-0121, Input revolutions of load gear** is used for converting the scaled data from a motor-related format into a gear output format.

With translatory load reference, gear transmission ratio **S-0-0122, Output revolutions of load gear** / **S-0-0121, Input revolutions of load gear** and **S-0-0123, Feed constant** are used for converting the scaled data from a motor-related format into a leadscrew format.

The following motor-type-related restrictions exist:

- Rotary motor reference cannot be selected for linear motors.
- Translatory motor reference cannot be selected for rotary motors.

Position data display format

The drive's position data scaling is selectable. The following parameters exist for this purpose:

- **S-0-0076, Position Data Scaling Type**
- **S-0-0077, Linear Position Data Scaling Factor**
- **S-0-0078, Linear Position Data Scaling Exponent**
- **S-0-0079, Rotational position resolution**

Distinction is made between translatory and rotary scaling. **S-0-0079, Rotational position resolution** is used for selecting rotary position scaling; **S-0-0077, Linear Position Data Scaling Factor** and **S-0-0078, Linear Position Data Scaling Exponent** are used for selecting translatory position scaling.

The scaling method is selected in **S-0-0076, Position Data Scaling Type**.

The parameter is defined as follows:

S-0-0076, Position Data Scaling Type

Bits 2 - 0: Scaling type
0 0 0: no scaling
0 0 1: translatory scaling
0 1 0: rotary scaling

Bit 3 :
0 : preferred scaling
1 : parameter scaling

Bit 4 : **Unit of translatory scaling**
0 : Meter [m]
1 : Inch [in]
Unit of rotary scaling
0 : Degree
1 : reserved

Bit 5 : reserved

Bit 6: **Data reference**
0 : at motor shaft
1 : at load

Bit 7: **Processing format**
0 : Absolute format
1 : Modulo format

Bits 15 - 8: reserved

Fig. 7-3: Parameter S-0-0076

The scaling type is selected in bits 0..2.

Bit 3 permits selection to be made between preferred scaling (i.e. the parameters **S-0-0077, Linear Position Data Scaling Factor, S-0-0078, Linear Position Data Scaling Exponent, and S-0-0079, Rotational position resolution** have default values assigned that cannot be modified), and parameter scaling (i.e. scaling is performed by specifying these parameters (see also "Preferred scaling - parameter scaling" on page 7-2).

Bit 4 specifies the length unit. With translatory scaling, mm or inch can be selected here.

Bit 6 defines motor or load reference.

Bit 7 decides on the processing format (see also "Modulo function" on page 7-9).

The plausibility of the scaling type selection is checked in **S-0-0128, C2 Communication phase 4 transition check**. If necessary, the command error message **C213 Position data scaling error** is generated.

Velocity data display format

The drive's velocity data scaling is selectable. The following parameters exist for this purpose:

- **S-0-0044, Velocity data scaling type**
- **S-0-0045, Velocity data scaling factor**
- **S-0-0046, Velocity data scaling exponent**

The scaling method is selected in **S-0-0044, Velocity data scaling type**. The parameter is defined as follows:

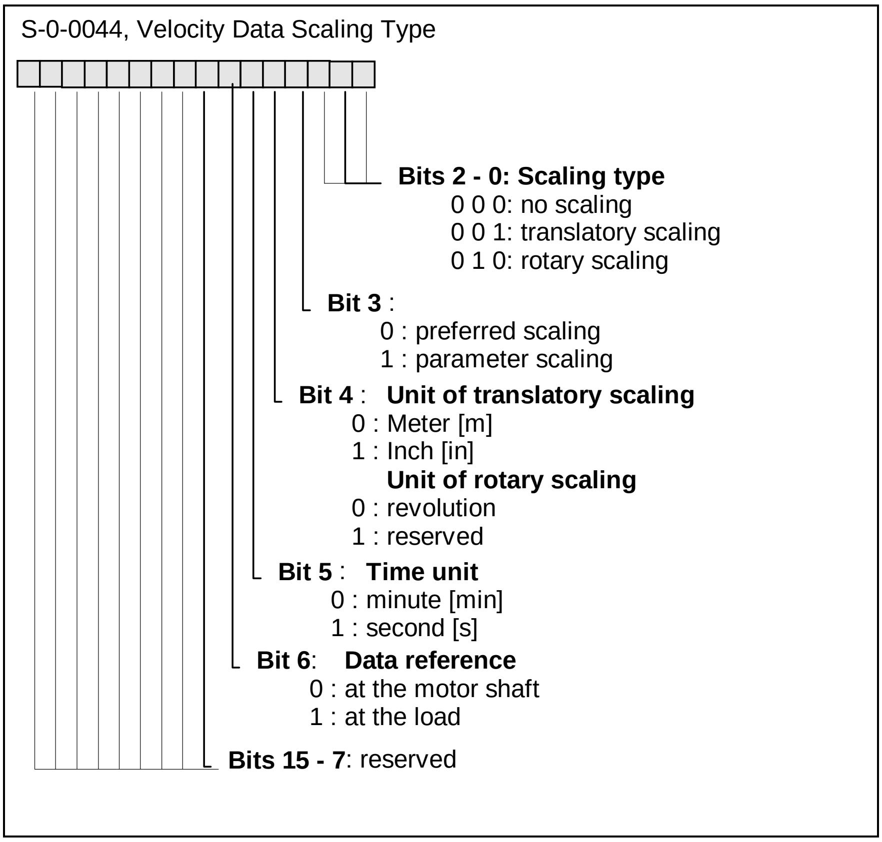

Fig. 7-4: Parameter S-0-0044

The scaling type is selected in bits 0..2.

Bit 3 permits selection to be made between preferred scaling (i.e. the parameters **S-0-0045, Velocity data scaling factor** and **S-0-0046, Velocity data scaling exponent** have default values assigned that cannot be modified), and parameter scaling (i.e. scaling is performed by specifying these parameters (see also "Preferred scaling - parameter scaling" on page 7-2)

Bit 4 specifies the length unit. With translatory scaling, mm or inch can be selected here.

Bit 5 specifies the time unit (minutes or seconds)

Bit 6 defines motor or load reference.

The plausibility of the scaling type selection is checked in **S-0-0128, C2 Communication phase 4 transition check**. If necessary, the command error message **C214 Velocity data scaling error** is generated.

Acceleration data display format

The drive's velocity data scaling is selectable. The following parameters exist for this purpose:

- **S-0-0160, Acceleration data scaling type**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**

The scaling method is selected in **S-0-0160, Acceleration data scaling type**. The parameter is defined as follows:

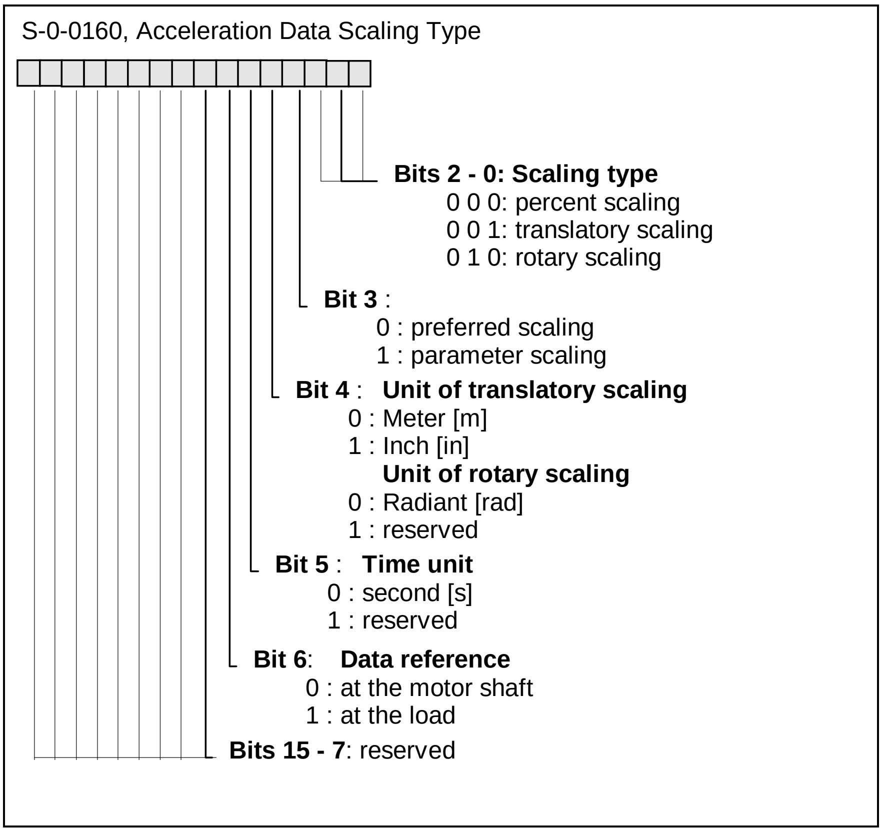

Fig. 7-5: Parameter S-0-0160

The scaling type is selected in bits 0..2.

Bit 3 permits selection to be made between preferred scaling (i.e. the parameters **S-0-0161, Acceleration data scaling factor** and **S-0-0162, Acceleration data scaling exponent** have default values assigned that cannot be modified), and parameter scaling (i.e. scaling is performed by specifying these parameters (see also "Preferred scaling - parameter scaling" on page 7-2)

Bit 4 specifies the length unit. With translatory scaling, mm or inch can be selected here.

Bit 6 defines motor or load reference.

The plausibility of the scaling type selection is checked in **S-0-0128, C2 Communication phase 4 transition check**. If necessary, the command error message **C215 Acceleration data scaling error** is generated.

Polarity of command and actual values

The drive-internal polarities of command and actual position, velocity and torque/force values have invariably been defined. The following applies:

Motor type:	Definition of drive-internal positive direction:
rotary motor	Clockwise rotation when looking at the motor shaft

Fig. 7-6: Definition of the drive-internal positive direction

The positive direction of MDD and MKD motors is specified at the factory.

The following parameters can be used for inverting the polarities of the command and actual values if the drive-related definition of the positive direction does not satisfy the machine requirements:

- **S-0-0055, Position Polarity Parameter**
- **S-0-0043, Velocity Polarity Parameter**
- **S-0-0085, Torque/Force Polarity Parameter**

Note: Always invert all three parameters at the same time. Thus, the polarities of position, velocity, and torque/force always have the same sign.

The following figure shows the effect of the polarity parameters:

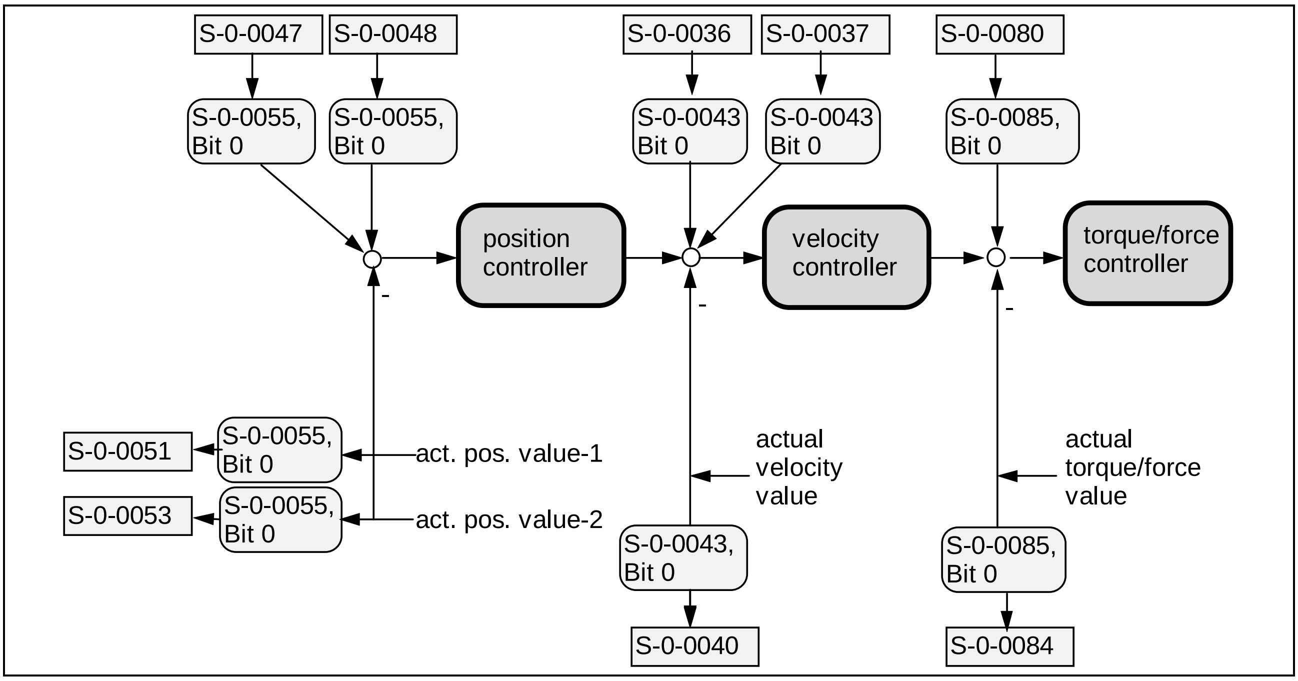

Fig. 7-7: Effect of the polarity parameters

The polarity parameters only have an effect on the displayed values, not on the actual control values.

The drive software only permits all bits within a polarity parameter to be inverted. If bit 0 is inverted, all other bits of that parameter will automatically be inverted, too. Thus, there is no risk of producing positive feedbacks in the control loops due to incorrectly selected command and actual value polarities.

Mechanical transmission elements

"Mechanical transmission elements" are gear and feed mechanisms between motor shaft and load. Entering that data is necessary for a load-related conversion of the physical quantities position, velocity, and acceleration if those values are scaled at the load side (see also Selectable Scaling for Position, Velocity, and Acceleration Data" on page 7-2. Moving the axis and comparing the position feedback value and the actually traveled distance permits the correct entry of the parameters to be checked.

Reduction ratio

The following parameters are used for defining the reduction ratio:

- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**

The transmission ratio between input and output of the gearbox is defined here.

Example:

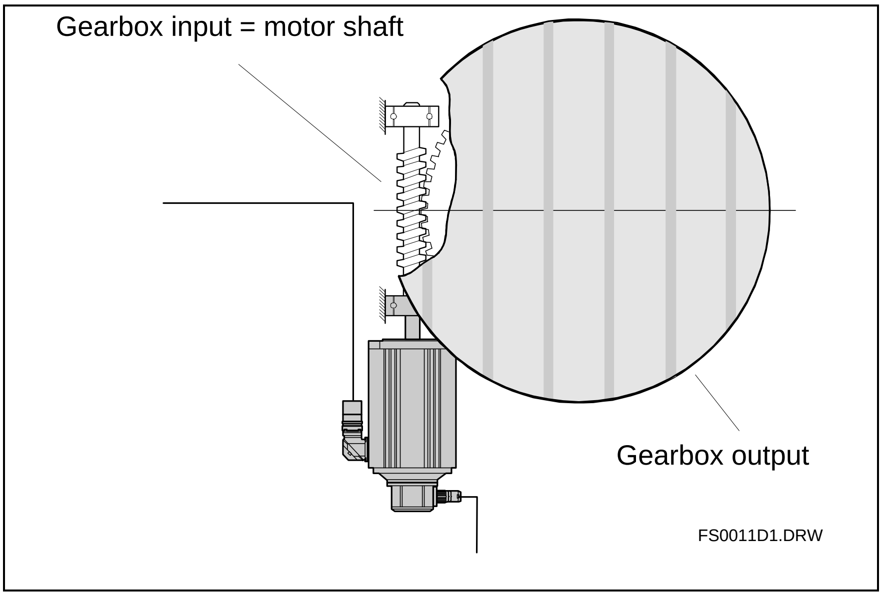

Fig. 7-8: Selecting the transmission ratio parameter values

In the figure above, five revolutions of the gearbox input (= motor revolutions) correspond to two revolutions of the gearbox output. The correct setting of the parameter values is:

S-0-0121, Input revolutions of load gear	= 5
S-0-0122, Output revolutions of load gear	= 2

Feed constant

The feed constant defines the linear distance which the load covers in each output revolution of the gearbox. It is specified in the parameter **S-0-0123, Feed constant**.

In addition to transmission ratio, the value that is programmed here also influences the conversion of position, velocity, and acceleration data from motor reference to load reference.

Example:

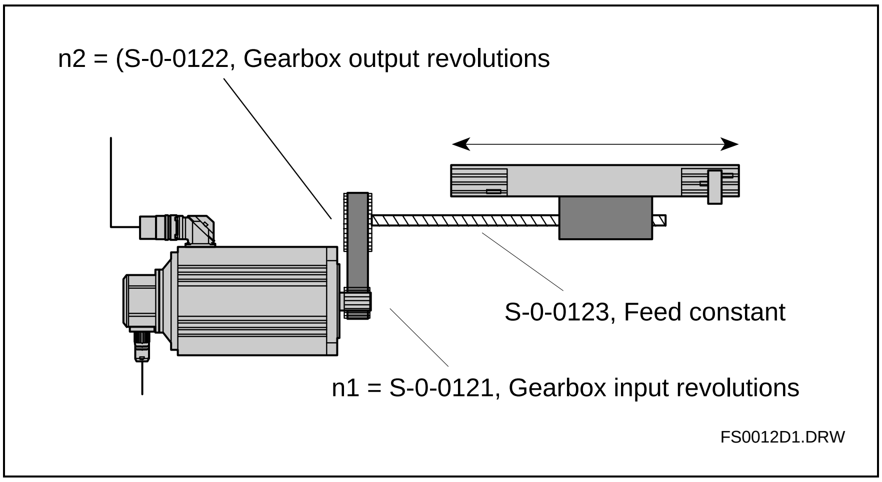

Fig. 7-9: Selecting the feed constant parameter values

In the figure above, each revolution of the gearbox output moves the feed module by 10 mm. The correct parameter value setting in that example would be:

S-0-0123, Feed constant = 10 mm/rev

Modulo function

When the modulo function is active, all position data items must be represented inside the modulo range.

When the modulo function is activated, all position data items are represented in the range 0..(modulo value -1). This permits axes to be implemented that move endlessly in one direction without causing an overflow in the position data.

The modulo value can be selected via the parameter **S-0-0103, Modulo value**.

The modulo function is activated in the parameter **S-0-0076**, **Position Data Scaling Type**.

(See also "Position data display format" on page 7-3)

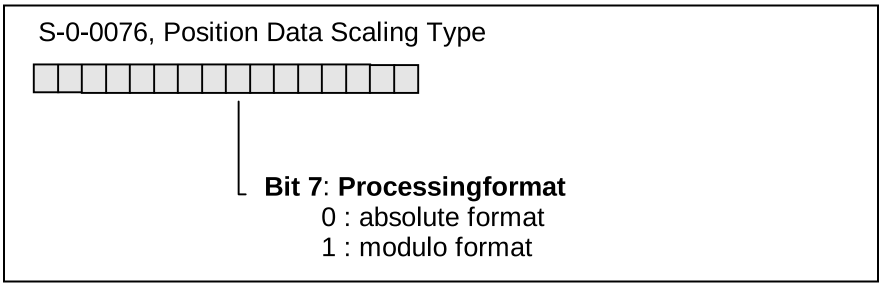

Fig. 7-10: Selection of absolute format / modulo format

Note: Modulo processing of the position data is only permitted for rotary motors. This is checked in **S-0-0128, Communication phase 4 transition check**, and may result in a command error **C213 Position data scaling error**.

The following figure shows the difference in the position data representation of absolute format and modulo format:

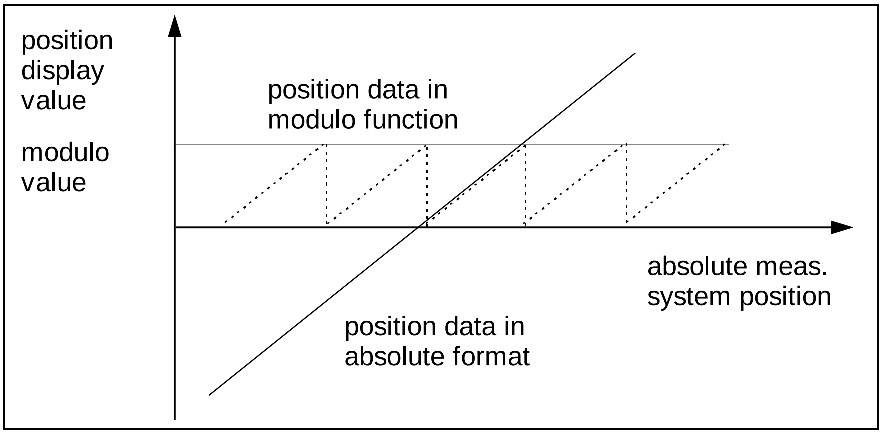

Fig. 7-11: Displayed values of the positions in the absolute format and modulo format

Modulo processing - boundary conditions

If position data modulo processing is selected, faultless processing of the position data requires the following boundary conditions to be satisfied. These boundary conditions depend on

- the active mode, and
- the selected position scaling

Adherence to the boundary conditions is checked in **S-0-0128, Communication phase 4 transition check**. If necessary, the command is terminated with an error **C227 Modulo range error.**

The boundary conditions for faultless module value processing are:

- The modulo range **S-0-0103, Modulo Value** may not be greater than half the maximum travel range. The maximum travel range depends on the employed motor sensor (see also "Maximum representable travel ranges" on page 7-12).
- If the employed mode is rotary or translatory position scaling with load reference and no angular synchronization, the product of **S-0-0103, Modulo Value, S-0-0116, Resolution of rotational feedback 1, and S-0-0121, Input revolutions of load gear** must be less than 2^63.
- If the employed mode is rotary position scaling with load reference and angular synchronization, the product of **S-0-0237 Slave drive 1 revs, S-0-0116, Resolution of rotational feedback 1**, and **S-0-0121, Input revolutions of load gear** must be less than 2^63.
- Translatory position scaling must not be selected if angular synchronization mode has been selected.

The following requirements must additionally be observed if an external measuring system is used:

- If the employed mode is rotary position scaling with motor reference and no angular synchronization, the product of **S-0-0103, Modulo Value, S-0-0117, Resolution of rotational feedback 2,** and **S-0-0122, Output revolutions of load gear** must be less than 2^63.
- If the employed mode is rotary position scaling with motor reference and angular synchronization, the product of **S-0-0237 Slave drive 1 revs, S-0-0117, Resolution of rotational feedback 2** and **S-0-0122, Output revolutions of load gear** must be less than 2^63.

Processing command values in modulo format; shortest path, direction pre-selection

With active module function, the interpretation of position command values such as **S-0-0047, Position Command Value**, or **S-0-0258 Target Position** depends on the selected mode:

The following options exist:

- Shortest path
- Positive direction
- Negative direction

The parameter **S-0-0393, Command value mode for modulo format** is available for selecting the mode. This parameter only becomes active if the modulo format has been activated in **S-0-0076, Position Data Scaling Type.**

The following selections are possible:

S-0-0393:	Meaning:
0	shortest path
1	positive direction
2	negative direction

Fig. 7-12: Selecting the modulo mode

Modulo mode "shortest path"

The shortest way is taken to reach the next command value. The drive approaches the command value in negative direction if the difference of two consecutive command values is greater than half the modulo value.

Modulo mode "positive direction"

Irrespective of whether or not the difference of two consecutive command values is greater than half the modulo value, the drive always approaches the command value in positive direction.

Modulo mode "negative direction"

Irrespective of whether or not the difference of two consecutive command values is greater than half the modulo value, the drive always approaches the command value in negative direction.

7.2 Setting the Measuring Systems

DKC02.1 permits the following optional measuring systems to be evaluated:

- Incremental encoder with sinusoidal signals (1Vpp)

This check is also performed in the command **S-0-0128, C2 Communication phase 4 transition check**. The command error **C203 Parameter Calculation Error (->S-0-0022)** will be generated there.

The following parameters are used for displaying the actual feedback values of the individual measuring systems:

- **S-0-0051, Position Feedback Value 1 (Motor Feedback)**
- **S-0-0053, Position Feedback Value 2 (Ext. Feedback)**

The following commands are used for setting the absolute reference of the actual feedback values 1/2 with respect to machine zero:

- **S-0-0148, C6, Drive controlled homing procedure,** and
- **P-0-0012, Command 'Set Absolute Measurement'**

Maximum representable travel ranges

The resulting maximum representable actual value range depends on the motor measuring system. The position values of the motor encoder may be represented in absolute or in modulo format (see also "Position data display format" on page 7-3). If absolute format is selected, the maximum representable actual value range is identical to the maximum possible travel range of the drive.

Motor measuring system	max. travel range rotary motor	max. travel range linear motor
Resolver	+/- (2^16 encoder cycles / S-0-0116 Resolution of rotational feedback 1) motor revolutions	--

Fig. 7-13: Max. representable travel ranges

Motor encoder

Only resolvers (single-turn and absolute) with data storage are evaluated. Additional parameterization is not required.

External encoders

The following parameters are available for setting the parameter values of the external encoder:

- **S-0-0117, Resolution of external feedback 1**
- **S-0-0115, Position feedback 2 type parameter**
- **P-0-0075, Interface Feedback 2**

The number of the interface to which the measuring system is connected, the resolution of the external encoder, the sense of the motion, etc. are specified in these parameters. Parameter **S-0-0053, Position Feedback Value 2 (Ext. Feedback)** shows the position of the external encoder.

The parameter values of the external encoder should always be selected such that **S-0-0053, Position Feedback Value 2 (Ext. Feedback)** and **S-0-0051, Position Feedback Value 1 (Motor Feedback)** run in parallel when the measuring systems, that are interconnected via the mechanical system of the machine, are moved.

Resolution of the external encoder

The parameter **S-0-0117, Resolution of rotational feedback 1** is used for setting the resolution of the external encoder. The line division of the external encoder must be defined in this parameter.

Activating the external encoder via P-0-0075 = 2

De-activating the external encoder via P-0-0075 = 0

Only single-turn incremental encoders with 1-Vpp sinusoidal signals can be evaluated.

Actual feedback value monitoring

In applications that contain an external measuring system, actual feedback value monitoring can provide additional safety. Actual feedback value monitoring is able to diagnose the following axis errors:

- Slip in the mechanical drive system
- Measuring system errors (that have not been detected by the additional measuring system monitoring functions).

The following parameter is used for setting the monitoring function:

- **S-0-0391, Monitoring Window ext. feedback**

If an error is detected, **F236, Excessive Position Feedback Difference** is generated.

Operation principle of actual feedback value monitoring

Actual feedback value monitoring compares the actual feedback values from the motor encoder and from the external encoder with each other. An error **F236, Excessive Position Feedback Difference** is generated if the difference between the two actual values is greater than **S-0-0391, Monitoring Window ext. feedback**. The position states of motor encoder and external encoder will be cleared in this case.

Actual feedback value monitoring is only active if an external encoder exists and is evaluated and if the value of the parameter **S-0-0391, Monitoring Window ext. feedback** is different from '0'.

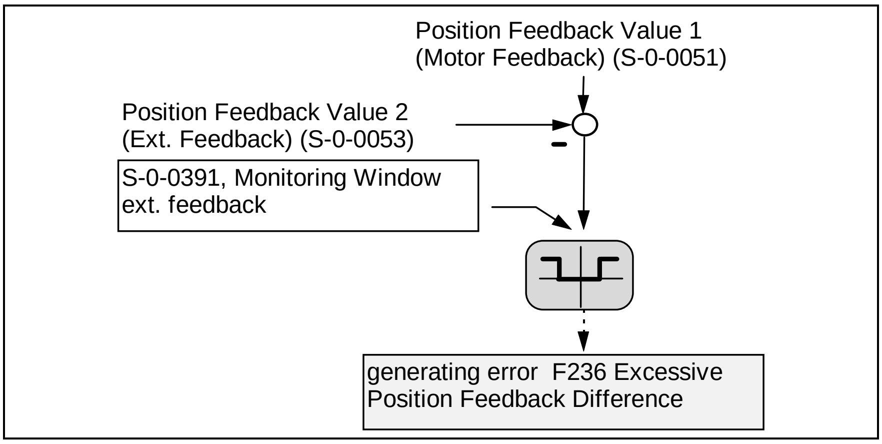

Fig. 7-14: Actual position monitoring principle

Setting the actual feedback value monitoring window

Setting actual feedback value monitoring requires

- all control loops of the drive to be set correctly,
- the mechanical axis system to be in its final state,
- the axis to be homed.

The monitoring window must be defined under user-related aspects. The following basic procedure is recommended:

- Perform a typical machining cycle. Select the intended acceleration and velocity data of the axes.
- Gradually set the parameter **S-0-0391, Monitoring Window ext. feedback** to smaller values until the drive issues the error message **F236 Excessive Position Feedback Difference**. Depending on the existing mechanical system, start with 1...2 mm and decrease the window in steps of 0.3...0.5 mm.
- The value at which the monitoring function starts to be activated must be multiplied with a tolerance factor of 2 ... 3, and be entered in the parameter **S-0-0391, Monitoring Window ext. feedback**.

When you determine the monitoring window value, you must remember that the current position value monitoring function works dynamically. This means that dynamic deviations of the two actual feedback values during acceleration and deceleration phases will also be registered. Using static axis errors as basis of the setting therefore proves insufficient.

De-activating current position value monitoring

Current position value monitoring can be de-activated if the externally connected measuring system is employed for other measuring purposes, not for axis position control. In this case, set the parameter **S-0-0391, Monitoring Window ext. feedback** to 0.

Other features of the external encoder

S-0-0115, Position feedback 2 type parameter is used for setting major features of the external encoder, such as

- non-inverted/inverted sense of motion
- distance-encoded reference markers yes/no
- rotary / linear measuring system
- absolute / not absolute

This parameter is of the following structure:

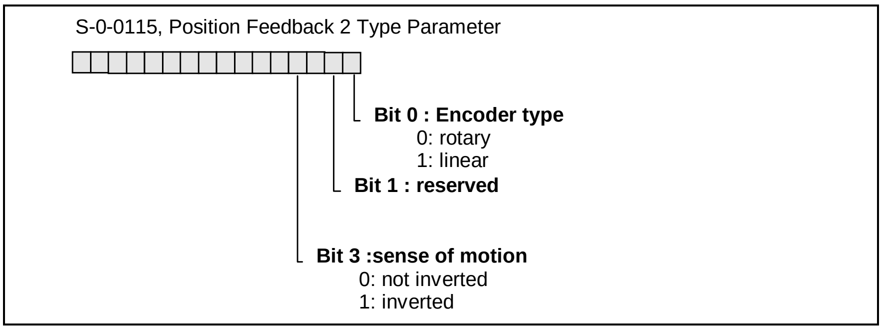

Fig. 7-15: Parameter S-0-0115

Actual feedback values of non-absolute measuring systems after initialization

If an absolute measuring system does not exist, the following procedure is employed for initializing the actual feedback values in the command **S-0-0128, C2 Communication phase 4 transition check** according to whether or not the parameter **P-0-0019, Position Start Value** has been written to in the preceding communication phase 2 or 3.

P-0-0019 has been written to:	Actual feedback value 1:	Actual feedback value 2:
no	init. raw value from motor encoder	init. raw value from motor encoder
yes	initial position value	initial position value

Fig. 7-16: Actual feedback values of non-absolute measuring systems after initialization

WARNING

There are no valid actual feedback values prior to measuring system initialization.
Initialization is performed in the transition command from phase 3 to 4.

7.3 Further Settings for Absolute Measuring Systems

Setting absolute dimension

When an absolute measuring system is commissioned, its actual feedback value first shows an arbitrary value that is not related to machine zero. The value of the parameter **S-0-0403, Position feedback value status** is "0".

The command "Set absolute dimension" permits the actual feedback value of that measuring system to be set to the required value. After "Set absolute dimension", the actual feedback value of the encoder concerned has a defined reference to machine zero.

Since all required data items of the absolute measuring system are buffered in the feedback data storage and/or parameter data storage, the complete information is available after the unit is switched back on. The actual feedback value retains its reference to machine zero.

The following parameter exists for executing the function:

- **P-0-0012, Command 'Set Absolute Measurement'**

The function additionally needs or influences the following parameters:

- **S-0-0147, Homing Parameter**
- **S-0-0052, Reference distance 1**
- **S-0-0054, Reference distance 2**
- **S-0-0403, Position feedback value status**

Operation principle "Set absolute dimension"

The encoder, that is connected to the mechanical system, is brought to a precisely measured position. The required value of the measuring system's actual feedback value at that point is entered in the parameter **S-0-0052, Reference distance 1** (for motor encoders) or **S-0-0054, Reference distance 2** (for external encoders). Next, the command **P-0-0012, Command 'Set absolute measurement'** is started. This sets the actual feedback value to the value that has been entered in the individual reference dimension, and the position status becomes "1".

Three different cases are distinguished when the command is executed:

1.) Setting absolute dimension without enabling the controller

2.) Setting absolute dimension and enabling the controller; executing the function by subsequently starting the command "Drive-controlled homing".

3.) Setting absolute dimension and enabling the controller; executing the function by subsequently removing the controller enable signal.

Setting absolute dimension without enabling the controller

When the absolute dimension is set without enabling the controller, the axis is first moved to the precisely measured position, and the command **P-0-0012, Command 'Set absolute measurement'** is started with de-activated controller enabling signal after the required actual feedback value at this point has been written to the reference dimension.

The command immediately sets the actual feedback value of the measuring system to the reference dimension and the position status to "1". The command is terminated at the drive side and may be cleared.

This simple method of command execution usually proves sufficient. However, if the application is a "suspended axis" or if there is a different reason for the approached position not to be held without the controller being enabled, the command may, under certain conditions, also be executed with the controller being enabled.

(See 2. or 3. of "Basic Drive Functions" on page 7-1)

Setting absolute dimension and enabling the controller, with subsequent "drive-controlled homing"

Setting absolute dimension and enabling the controller, with a subsequent start of the "drive-controlled homing" command permits the actual feedback value of a controlled axis to be switched over. This may be required for a "suspended axis".

The procedure is as follows:

- Move the axis to the measured position.
- Enter the required actual feedback value in the corresponding reference dimension actual feedback value parameter.
- Start the command **P-0-0012, Command 'Set Absolute Measurement'**. The position data is not yet switched over.
- Start the command **S-0-0148, C6 Drive controlled homing procedure**. The function recognizes that this is an absolute measuring system, and performs "Set absolute dimension". This means that the actual feedback value is set to the reference dimension. At the same time, the actual feedback value (**S-0-0047, Position Command Value)** is set to the same value. As in each execution of "drive-controlled homing", the position command value is read via the service channel, and the position command value at the drive side is set to this value before the homing command is cleared.

- **Caution:**
  It must be ensured that the encoder that is to be set has been selected in bit 3 of **S-0-0147, Homing Parameter**.
- Clear the command **P-0-0012, Command 'Set Absolute Measurement'**.

Setting absolute dimension and enabling the controller, with subsequently removing the controller enabling signal

Setting absolute dimension and enabling the controller, and subsequently de-activating the controller enabling signal with enabled controller and subsequent de-activation of the controller enabling signal enables the actual feedback value of a controlled axis to be switched over. The actual feedback value is only switched over when the controller enabling signal is switched off.

The procedure is as follows:

- Move the axis to the measured position.
- Enter the required actual feedback value in the corresponding reference dimension actual feedback value parameter.
- Start the command **P-0-0012, Command 'Set Absolute Measurement'**. The position data is not yet switched over.
- Switch off the controller enabling signal. The actual feedback value is set to the reference dimension, and the command is terminated at the drive side.
- Clear the command **P-0-0012, Command 'Set Absolute Measurement'**.

Setting actual feedback values to absolute dimension

The states of the actual feedback values from the motor encoder and, if it exists, from the external encoder after the "Set absolute dimension" command has been executed depend on bit 3 of **S-0-0147, Homing Parameter** and on the existence of an absolute encoder that is used as motor encoder or external encoder.

Motor encoder:	External encoder:	S-0-0147 bit 3:	Actual feedback value 1:	Actual feedback value 2:
absolute	non-absolute or non-existent	any value	reference dimension 1	reference dimension 1

Fig. 7-17: Setting actual feedback values to absolute dimension

Actual feedback values from absolute encoders after power-on

(See also "Actual feedback values from absolute measuring systems after initialization" on page 7-18)

Possible error messages upon setting absolute measurement

The following error messages may occur during the execution of the command:

- **C302 Absolute Measuring System Not Installed**
  The command **P-0-0012, Command 'Set Absolute Measurement'** was started without an absolute measuring system being available.

Absolute encoder monitoring

If a measuring system with absolute position feedback is employed, activating the absolute encoder monitoring function provides additional safety. The basis operation principle of the monitoring function is:

When the drive's power supply is switched off, the current actual position of the axis is loaded in a resident memory. When the axis is switched back on, the system computes the difference between the stored position and the newly read position from the measuring system. The error message **F276 Absolute encoder error** is output if the difference is greater than the position window that is specified in parameter **P-0-0097, Monitoring Window abs. Encoder**.

Expedient utilization of the absolute encoder monitoring function is possible in the following applications:

- The motor is equipped with a blocking brake.
- The mechanical drive system is self-locking and cannot manually be moved.

Setting the absolute encoder monitoring function

The absolute encoder monitoring window must be set by the user. The window setting depends on the amount by which the axis concerned may move when it is switched off. Assuming, that the axis is equipped with a blocking brake or is self-locking, a value of 0.1 motor revolutions (36° with reference to the motor shaft) can be entered as a standard value for the parameter **P-0-0097, Monitoring Window abs. Encoder.**

De-activating the absolute encoder monitoring function

Using the absolute encoder monitoring function for axes that can or must easily be moved when they are switched off is not expedient. The absolute encoder monitoring function should be switched off in these cases in order to avoid meaningless error states.

Writing 0 to P-0-0097 switches the absolute encoder monitoring function off.

Actual feedback values from absolute measuring systems after initialization

The states of the actual feedback values from the motor encoder and, if it exists, from the external encoder after initialization of the actual feedback values in the command **S-0-0128, C2 Communication phase 4 transition check** depend on

- bit 3 in **S-0-0147, Homing Parameter**
- the existence of an absolute encoder as motor encoder.

Motor encoder:	**External encoder:**	**Bit 3 , S-0-0147:**	**S-0-0051, actual feedback value 1:**	**S-0-0053, actual feedback value 2:**	**S-0-0403, Position feedback value status:**
absolute	not absolute	0	absolute value from motor encoder	absolute value from motor encoder	1
absolute	not absolute	1	absolute value from motor encoder	absolute value from motor encoder	0

Fig. 7-18: Actual feedback values from absolute measuring systems after initialization

7.4 Drive Limitations

Current limitation

Current limitation delimits the command current to the parameters

- **P-0-4046, Active peak current, and**
- **P-0-4045, Active permanent current**

The active permanent current is the current that can continuously be drained from the drive. The active peak current is available for short periods only.

If the drive must supply peak current for an extended period of time, the drive-internal thermal monitoring function reduces the permissible output current from the active peak current to the active permanent current.

The two parameters result from the individual drive specifications, such as the amplifier peak current (**S-0-0110, Amplifier Peak Current)** etc., and the contents of the following parameters:

- **P-0-0109, Torque/force peak limitation**
- **S-0-0109, Motor Peak Current**
- **S-0-0111, Motor Current at Standstill**
- **S-0-0092, Bipolar Torque/Force Limit Value**
- **P-0-4011, Switching Frequency**

Selecting the active peak current

The parameter **P-0-4046, Active peak current** cannot be selected separately. Its value results from the following parameters:

- **S-0-0110, Amplifier Peak Current**
- **S-0-0109, Motor Peak Current**
- **P-0-0109, Torque/force peak limitation**
- **S-0-0092, Bipolar Torque/Force Limit Value**

The following activities are required for this purpose:

- The permissible amplifier peak current is limited to **S-0-0109, Motor Peak Current** (if that value is smaller).
- Dynamic reduction during operation by monitoring the thermal load of the drive (see also "Monitoring the thermal load" on page 7-20).
- Limitation to **P-0-0109, Torque/force peak limitation** and **S-0-0092, Bipolar Torque/Force Limit Value**
  (see also "Torque/force limitation" on page 7-21)

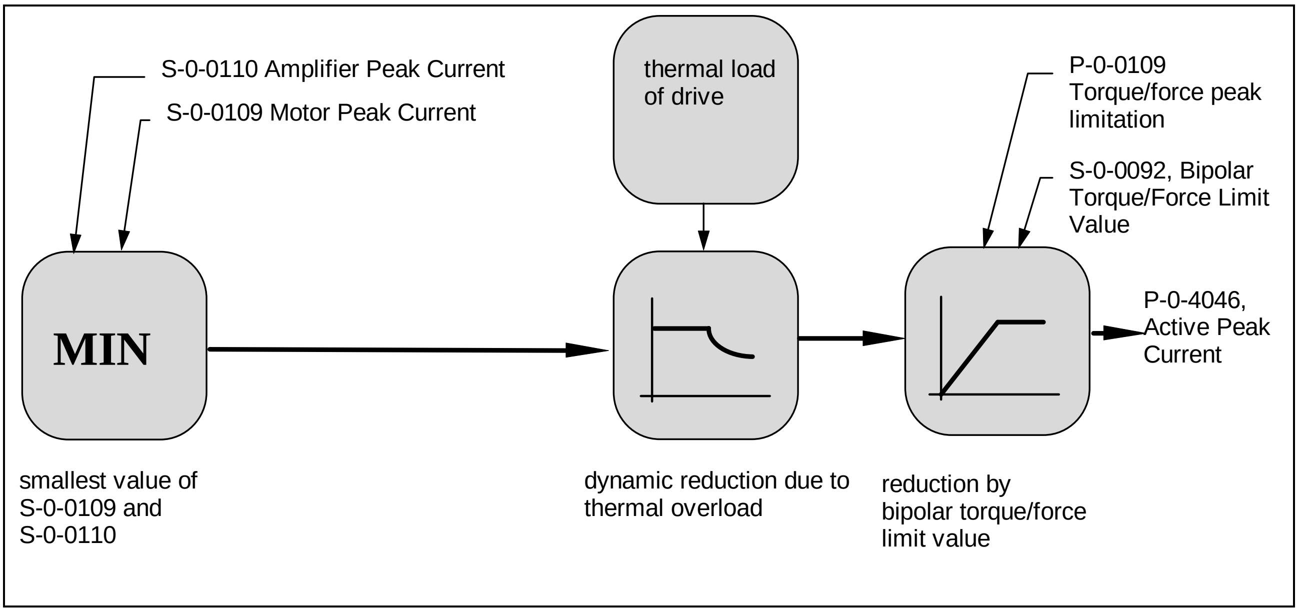

Fig. 7-19: Determining the torque-producing peak current

Selecting the active permanent current

The content of the parameter **P-0-4045, Active permanent current** results from

- **P-0-4011, Switching Frequency**
- **P-0-4046, Active peak current**

For this purpose,

- the corresponding permanent current is determined from the selected switching frequency and the related unit specifications;
- the current is limited to the determined value of **P-0-4046, Active peak current**.

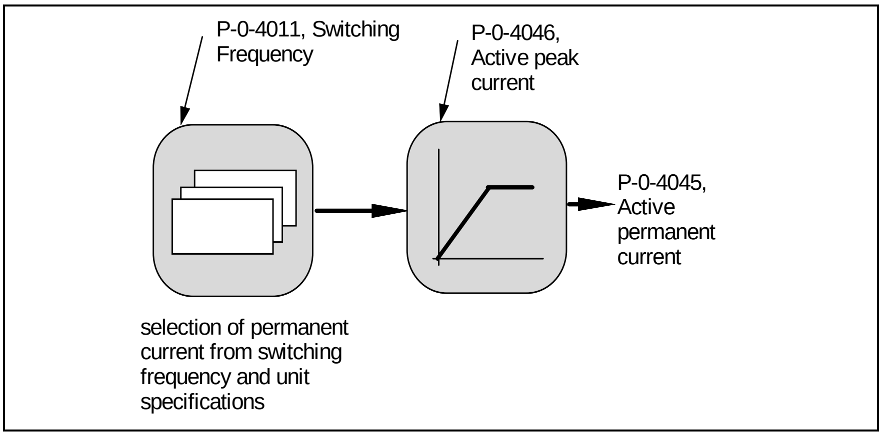

Fig. 7-20: Setting the active permanent current

Monitoring the thermal load

The thermal load of the drive specifies how much the drive's output stage is loaded by the supplied command current. For this purpose, the chip overtemperature of the power transistors is continually computed from

- the drive-related data,
- the command current profile, and
- the selected switching frequency

This value must not exceed the permissible chip temperature. When this state is reached, the drive responds by dynamically reducing the command current.

(See also "Selecting the active peak current" on page 7-19)

In this case, the drive generates the warning **E257 Continuous current limiting active**.

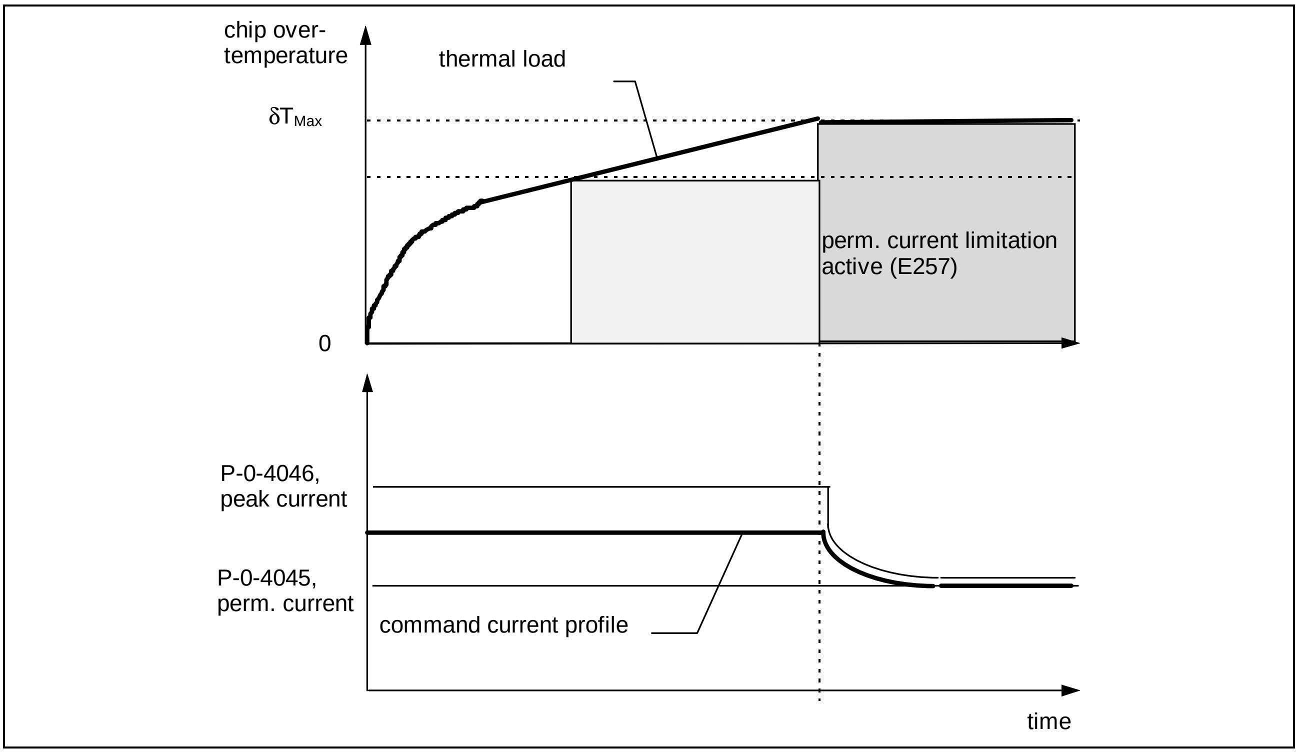

Fig. 7-21: Monitoring the thermal load, and continuous current limitation

Torque/force limitation

The following two parameters are used for limiting the maximum permissible torque at the user side:

- **S-0-0092, Bipolar Torque/Force Limit Value**
- **P-0-0109, Torque/force peak limitation**

These parameters define the maximum percentage of **S-0-0111, Motor Current at Standstill** that is provided at the user side.

The parameter **S-0-0092, Bipolar Torque/Force Limit Value** is provided for being able to limit the maximum driving torque during operation to values that are smaller than the maximum possible value. This is helpful, for example, for temporarily driving to a limit stop.

Due to the maximum permissible current of the individual motor/drive combination, each drive has a specific peak torque that is required in many applications for acceleration processes. There are cases, however, in which application-related reasons require the maximum peak torque to be limited to a smaller value. The parameter **P-0-0109, Torque/force peak limitation** permits the maximum peak torque of a drive to be limited such that it suits the application. The parameter ensures at a higher level that the maximum peak torque that is permissible for the specific application will not be exceeded, even if **S-0-0092, Bipolar Torque/Force Limit Value** has been set to a much higher value.

In conjunction with current limiting, this limits the maximum output current that is shown in **P-0-4046, Active peak current**.

(See also "Current limitation" on page 7-19).

The following figure shows the interaction between current limitation and torque/force limitation that determines the maximum output current.

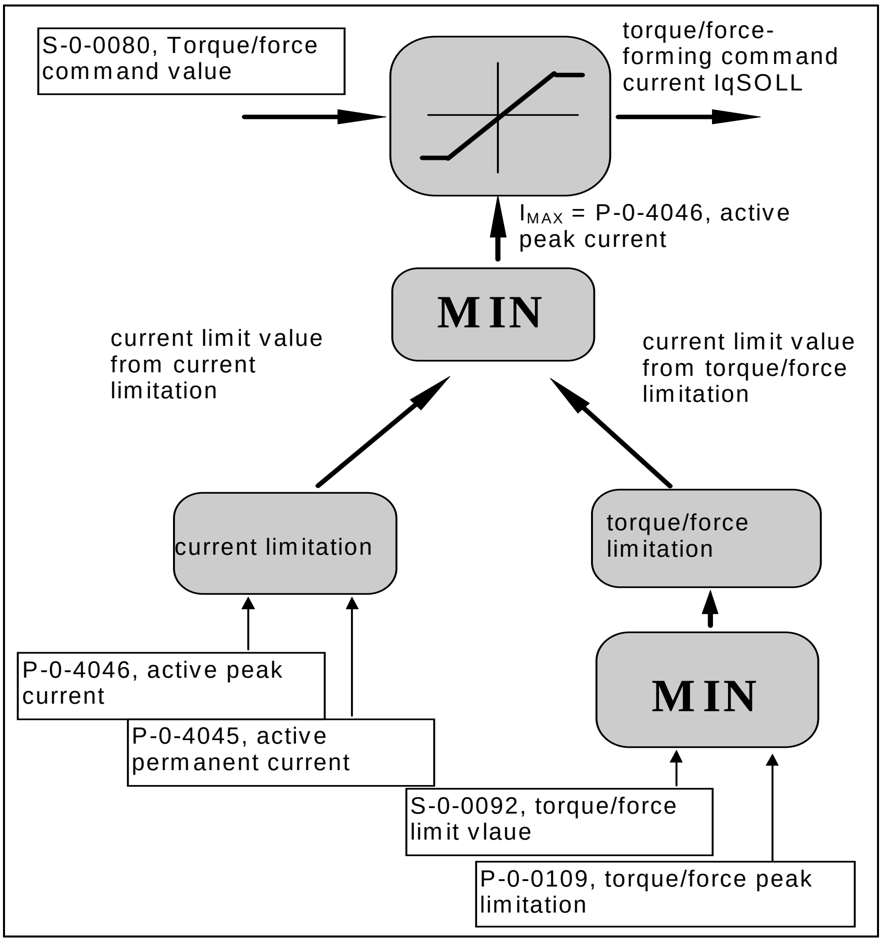

Fig. 7-22: Current limitation and torque/force limitation

Current limitation and torque/force limitation both have an effect on limiting the torque-forming command current.

Effective is always the smaller value of

- current limit value from current limitation
- current limit value from torque/force limitation

This is shown in the parameter **P-0-4046, Active peak current**.

Velocity Limitation

The following two parameters are used for limiting the velocity of the controlled drive:

- **S-0-0113, Maximum Motor Speed (nmax)**
- **S-0-0091, Bipolar Velocity Limit Value**

The parameter **S-0-0091, Bipolar Velocity Limit Value** is provided for being able to variably limit the maximum velocity to values that are smaller than the maximum possible velocity.

The parameter **S-0-0113, Maximum Motor Speed (nmax)** characterizes the motor’s maximum possible speed. With MDD and MKD motors, it exists in the motor feedback data storage and need not be entered separately.

Limitation to maximum motor velocity

The maximum motor velocity defines the maximum velocity of the drive at the drive side. It becomes effective as

- maximum input value of the parameter **S-0-0091, Bipolar Velocity Limit Value**

Limitation to bipolar velocity limit value

The bipolar velocity limit value defines the maximum drive velocity at the user side. It becomes effective for

- actual velocity monitoring in **torque control** mode;
- limitation of the resulting command value in the velocity controller;
- monitoring the position command value differences in **position control** mode (see also position command value monitoring)
- limitation of **S-0-0036, Velocity Command Value** in **velocity control** mode.

Monitoring the actual velocity in torque control mode

In torque control mode, the velocity is monitored for not exceeding the 1.125-fold value of **S-0-0091, Bipolar Velocity Limit Value**. If that value is exceeded, the fatal error

- **F879 Crossing velocity limit (S-0-0091) Value**

is generated, and the drive transitions to no torque.

Limiting the resulting command value in the velocity controller

In all modes in which the velocity controller is active (all modes except **torque control**), the specified velocity command value is limited to the value of **S-0-0091, Bipolar Velocity Limit Value**. When this state is reached, the warning

- **E259 Command velocity limitation active**

is generated.

Limitation of S-0-0036, Velocity Command Value, in velocity control mode

In velocity control mode, the input of **S-0-0036, Velocity Command Value** is limited to **S-0-0091, Bipolar Velocity Limit Value**. The following warning is issued if the entered value of S-0-0036 exceeds that limit:

- **E259 Command velocity limitation active**

Travel range limitations

There are two different procedures of monitoring the permissible travel range of an axis.

These are monitoring for

- axis travel limit switches, and
- axis limit values

Thus, overtraveling either means actuating a travel limit switch or is equivalent to one of the two axis limit values exceeding the homed (i.e. referring to machine zero) actual feedback value

The drive’s response to overtraveling can be selected. The following options exist:

- Error with the reaction "Setting speed command value to zero" and automatic de-activation of the drive enable signal.
- Warning with the reaction "Setting speed command value to zero" that is automatically cleared when the error condition disappears.

This is selected in bit 2 of **P-0-0090, Travel limit parameter**

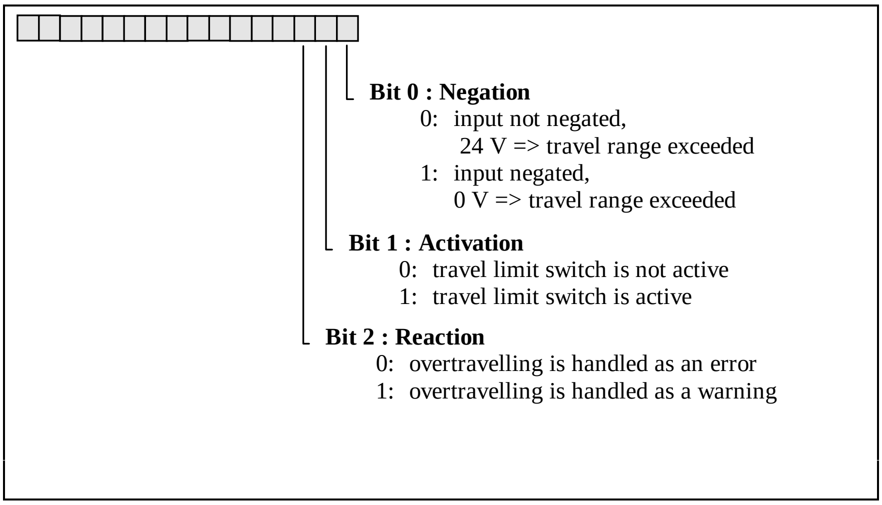

Fig. 7-23: Selecting the drive response to overtraveling (bit 2)

Overtraveling as an error

If "0" is entered in bit 2 of **P-0-0090, Travel limit parameter**, overtraveling is handled as an error with the response of setting the speed command value to zero (see also Setting velocity command value to zero).

The drive is switched off after the speed command value has been set to zero, and is consequently free from torque. The ready contact opens.

Thus, putting the unit back into operation requires

- the error to be cleared either via the command **S-0-0099, Reset class 1 diagnostic** or by pressing the S1 button;
- the drive to be re-activated by a 0-1 edge of the drive enable signal.

If the error condition still exists (i.e. the limit switch is still pressed or the axis limit values are still exceeded), only command values will be accepted that lead back to the valid range. The verification of the command values depends on the selected mode:

Mode:	Command value verification:
Torque control	Polarity of S-0-0080, torque/force command value
all modes with drive-internal velocity control	Polarity of the internal velocity command value
all modes with drive-internal position control	Polarity of the velocity that results from the specified position command value

Fig. 7-24: Command value verification in the event of an error

The travel range error re-appears if a command value is specified that leads further away from the valid range.

Overtraveling as a warning

If "1" is entered in bit 2 of **P-0-0090, Travel limit parameter,** overtraveling is handled as a warning with the response of setting the velocity command value to zero.

The drive does not switch off the internal drive enabling signal. If the error condition still exists (i.e. the limit switch is still pressed or the axis limit values are still exceeded), only command values will be accepted that lead back to the valid range. The verification of the command values depends on the selected mode (see also previous chapter).

Axis travel limit switch - monitoring

Monitoring for overtraveling the axis travel limit switches is only performed if

- the monitoring function is activated in bit 1 of **P-0-0090, Travel limit parameter**

Overtraveling is detected when an axis travel limit switch is actuated. The diagnosis depends on the way of handling the situation:

Handled:	7-seg. display:	Diagnosis:
as an error	F643	F643 Positive Travel Limit Switch Detected
	F644	F644 Negative Travel Limit Switch Detected
as a warning	E843	E843 Positive Limit Switch activated
	E844	E844 Negative Limit Switch activated

Fig. 7-25: Diagnosis upon activation of a travel limit switch

Axis travel limit switch - connections

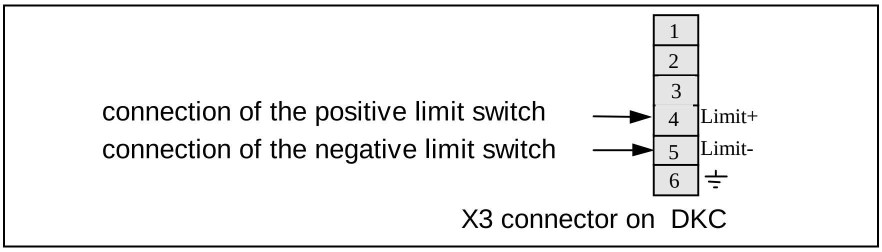

Fig. 7-26: Connecting the travel limit switch to X3

Axis travel limit switch - activation and polarity

The parameter **P-0-0090, Travel limit parameter** is used for activating the axis travel limit switches. It also permits the inputs to be negated (0 V at input -> traverse range exceeded).

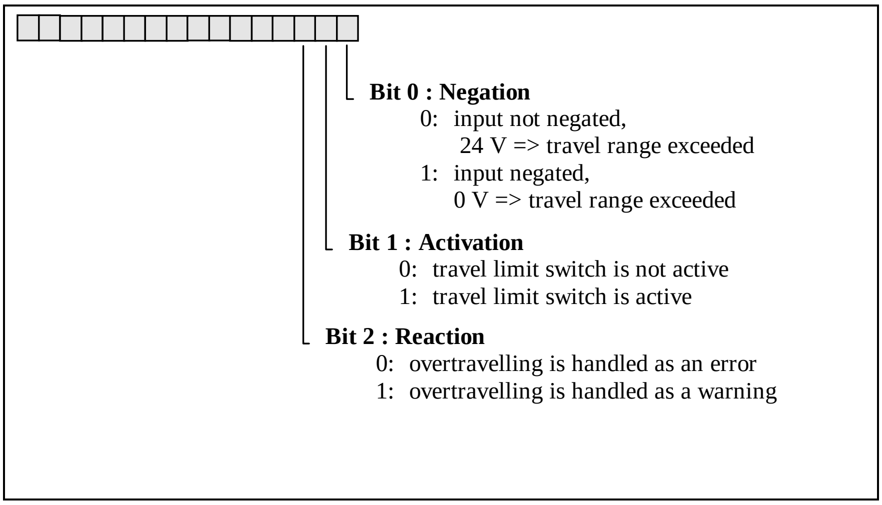

Fig. 7-27: Activation and negation of the axis travel limit switches (bit 0 or 1)

Axis limit values

The system only monitors the axis limit values parameters

- **S-0-0049, Positive position limit value**
- **S-0-0050, Negative position limit value**

if

- the encoder system of the active mode has been homed (i.e. the actual feedback values refer to machine zero). Here, **S-0-0403, Position feedback value status** is "1".

  AND

- the axis limit value monitoring function has been activated in bit 4 of **S-0-0055, Position Polarity Parameter**.

The system detects when the axis limit values are overtraveled if the actual feedback value of the active mode exceeds the travel range between the axis limit values.

Bit 3 of the parameter **S-0-0147, Homing Parameter** defines whether the actual feedback value of the motor encoder or of the external encoder will be employed for monitoring.

If the active mode is drive-internal interpolation, the drive checks whether the target position is outside the range of the axis limit values. If this is the case, the drive will not move, generates the warning **E253, Target position out of travel zone**, and sets bit 13 in the parameter **S-0-0128, C2 Communication phase 4 transition check**.

In the event of the axis limit values being exceeded, the diagnosis depends on the method of handling the situation:

Handling:	7-seg. display:	Diagnosis:
as an error	F629	F629 Positive Travel Limit Value is exceeded
	F630	F630 Negative Travel Limit Value is exceeded
as a warning	E829	E829 Positive Position Limit Value exceeded
	E830	E830 Negative Position Limit Value exceeded

Fig. 7-28: Diagnosis upon exceeding an axis limit value

Axis limit values - activation

Axis limit value monitoring is activated in bit 4 of **S-0-0055, Position Polarity Parameter**

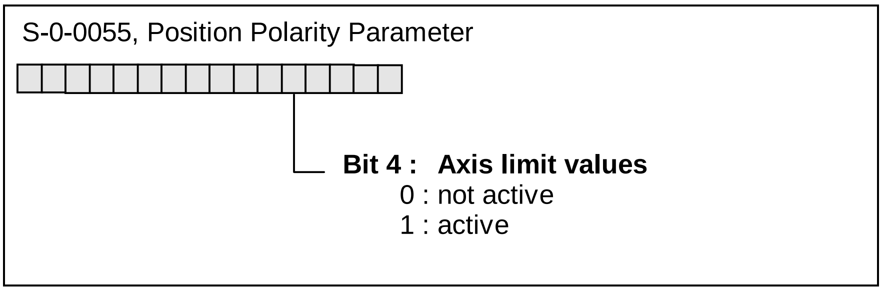

Fig. 7-29: Activating axis limit value monitoring

7.5 Drive-Related Error Reaction

The error reaction chiefly depends on the class of the error

When the drive detects an error, it responds in a way that can be preselected.

The response depends on

- the error class of the error that has occurred,

  and the settings of the parameters
- P-0-0117, NC Reaction in Error Situation
- P-0-0119, Deceleration as best as possible

Note: The error class determines whether or not the reaction that has been selected via the above-mentioned parameters can be performed in the event of an error.

There are four error classes of different priority.

(see also "error classes")

Error class	Diagnosis	Reaction of the drive
Fatal	F8xx	The selection of the error reaction via the parameters **P-0-0117, NC Reaction in Error Situation** and **P-0-0119, Deceleration as best as possible** is ignored since no more reactions are possible at the drive end. Torque/force is released immediately.
Traverse range	F6xx	Irrespective of the settings of the parameters **P-0-0117, NC Reaction in Error Situation** and **P-0-0119, Deceleration as best as possible**, the velocity command value is immediately set to zero. The reaction corresponds to the selection: P-0-0117 = 0 (no NC reaction) P-0-0119 = 0 (set velocity command value to zero). This ensures that the axis is stopped as quickly as possible when the travel range is exceeded.
Interface	F4xx	An NC reaction is not possible since communication to the NC is no longer functioning. The drive immediately performs the shutdown procedure that has been selected via **P-0-0119, Deceleration as best as possible**.
Non-fatal	F2xx	The drive performs the shutdown procedure that has been selected via **P-0-0117, NC Reaction in Error Situation** and **P-0-0119, Deceleration as best as possible**. If 'NC Reaction in Error Situation' has been activated, the drive continues working for 30 seconds after the error has been recognized, as if an error had not been detected. This time is available to the NC for stopping the axis in an NC-controlled fashion. Subsequently, the drive performs the reaction that has been selected via P-0-0119.

Fig. 7-14: Error reaction of the drive

Best shutdown possible

The parameter **P-0-0119, Deceleration as best as possible** permits the reaction of the drive to an interface or non-fatal error to be selected.

At the end of each error reaction, the drive switches off the torque.

The following options can be selected:

Value of P-0-0119:	Reaction:
0	Setting velocity command value to zero
1	Setting torque command value to zero

Fig. 7-15: Possible selections of best shutdown possible

The drive reaction that is defined by "best shutdown possible" also determines the response of the drive to

- a transition of the drive enable signal from 1 to 0 (de-activating the drive enable signal)
- a transition from operation mode to parameterization mode with active drive enable signal (returning from communication phase)

Setting velocity command value to zero

If "best shutdown possible"" has been set to "0", the drive will be stopped in velocity control at a command value = 0 when an error is detected. The drive decelerates at its maximum permissible torque/force.

(See also "Current limitation" on page 7-19.)

The following figure shows the time diagram of triggering the motor brake (if there is one) and the output stage enabling signal when the velocity command value is set to zero.

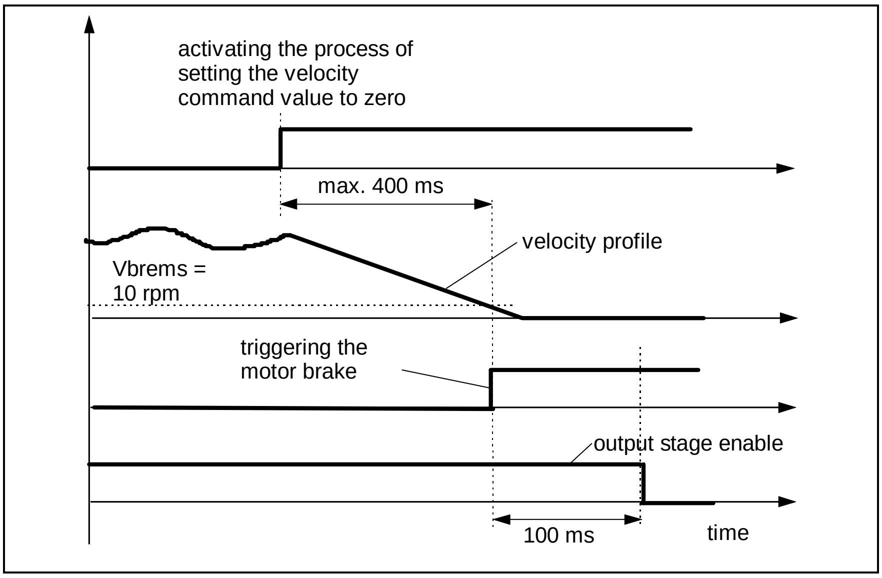

Fig. 7-16: Time diagram of setting the velocity command value to zero

Note: The brake will be applied if the deceleration ramp is longer than 400 ms. After another 100 ms, the drive will be without torque.

Torque release

With existing motor brake, torque release is not expedient

If "best shutdown possible" is set to "1", the torque of the drive will be switched off in the event of an error. The brake is activated immediately.

CAUTION

Torque release as error reaction in conjunction with motor brake

Risk of damaging the motor brake

⇒ Avoid selecting this error reaction

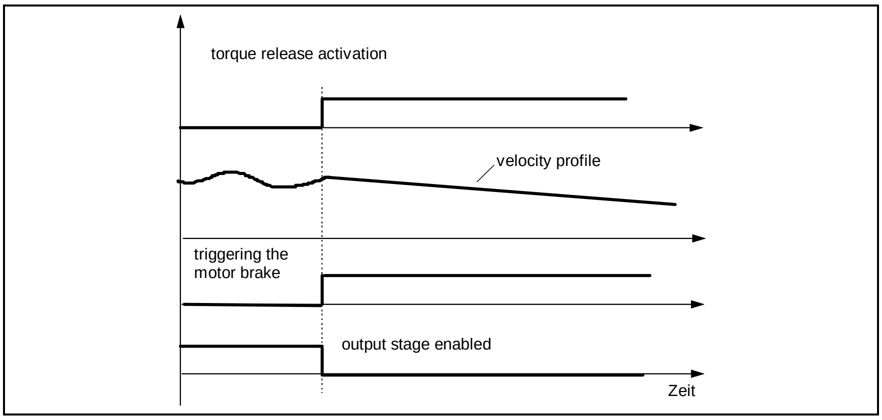

Fig. 7-17: Torque release timing diagram

NC reaction to an error

NC reaction to an error is restricted to non-fatal errors. To all other errors, the drive always responds with an immediate error reaction

The controller is notified if an error is detected in the drive. The controller can consequently use a "travel procedure for an error situation" to shut down the machine's servo axes in a co-ordinated way, thus avoiding damage to the equipment.

This can only be done if the drive-related error reaction is delayed, so that the axis that reports the error is able to follow the command values from the controller. To do this, a time delay between the recognition of the error and the drive-related response can be selected in the drive (in **P-0-0117, NC Reaction in Error Situation).**

Emergency stop function

The emergency stop function is used for shutting down the drive via a hardware input at the drive unit.

Activating the emergency stop input triggers the drive to perform the error reaction that has been selected for stopping the drive. The error diagnosis **F234, Emergency-Stop** appears and bit 15 of the parameter **S-0-0011, Class 1 Diagnostics** is set. Provided that the emergency stop input is inactive, the activation can be cleared with the command **S-0-0099, Reset class 1 diagnostic**.

The function works as if an error had occurred in the drive. Bit 1 of **P-0-0008, Activation E-Stop-Function** permits the error reaction to be defined.

If bit 1 = 0, the drive is shut down according to the error reaction that has been selected via **P-0-0119, Deceleration as best as possible**. This corresponds to detecting a non-fatal error.

If bit 1 = 1, triggering the emergency stop decelerates the drive at maximum torque down to speed = 0, irrespective of the error reaction that has been specified in the P-0-0119 parameter. For drive behavior and error reaction parameterization, this corresponds to the best shutdown possible "set velocity command value to zero".

Activation and polarity of the emergency stop input

The parameter **P-0-0008, Activation E-Stop-Function** is used for activating the emergency stop input and selecting the reaction to shutting down the drive.

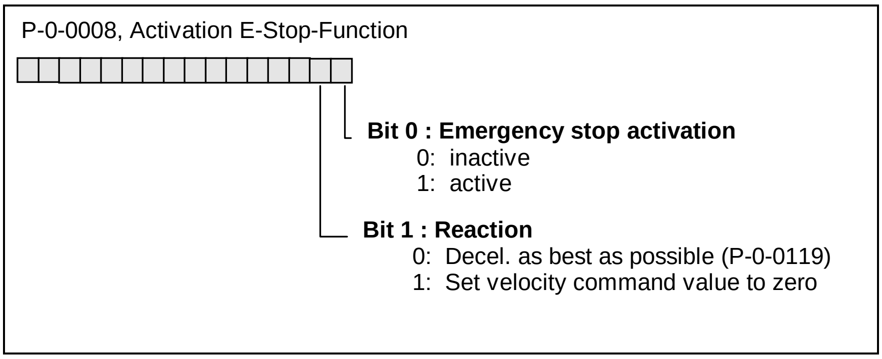

Fig. 7-18: Structure of **P-0-0008, Activation E-Stop-Function**

The input polarity cannot be selected. It is always 0-active (0 V at the connector input means that emergency stop is active).

Connection of the emergency stop input

Each drive possesses a binary input to connect an emergency stop signal.

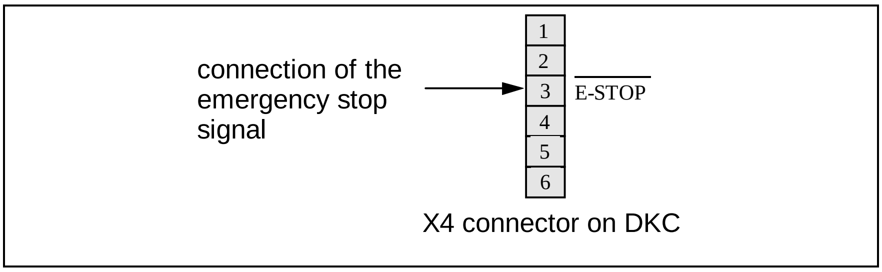

Fig. 7-19: Connecting the emergency stop signal to X4

7.6 Control Loop Selections

General information on control loop selections

The control loop selections made in a digital drive controller have a major significance to the properties of the servo axis. Defining the control loop selections requires much expertise.

The controller settings usually need not be "optimized"

This is why application-related controller parameters are available for all digital INDRAMAT drives. These parameters can be found in the DRIVEDAT drive data base or are available within the scope of the commissioning programs SERCTOP and/or DRIVETOP (see also "Initial program loading" on page 7-32).

In some cases, application-related adjustment of the control loop settings may be required. The following essential basic rules for setting control loop parameters must be observed in these cases.

The specified methods must be seen as a rough guideline that will lead to a robust controller setting. Application-related aspects may require different selections to be made.

Initial program loading

The initial program loading function permits default controller parameters to be activated in motor types that possess a motor feedback data storage unit. Such motor types include

- MDD
- MKD

Those parameters are used for selecting controller parameters that are compatible with the employed motor type. The parameters have been determined in the laboratory and are valid for relationships of the moments of inertia of $J_{internal} = J_{external}$.

A large number of applications are able to work with these values. Default values exist for the following parameters:

- **S-0-0106, Proportional Gain 1 Current Regulator**
- **S-0-0107, Current Regulator 1 Integral Action Time**
- **S-0-0100, Velocity Loop Proportional Gain**
- **S-0-0101, Velocity Loop Integral Action Time**
- **P-0-0004, Smoothing Time Constant**
- **S-0-0104, Position Loop prop. Gain KV**
- **S-0-0392, Velocity Feedback Filter time constant**

The **initial program loading** function can be activated in two different ways:

- Automatic activation during the execution of the command **S-0-0128, C2 Communication phase 4 transition check** when a motor type is used with this drive controller for the first time.
- Executing the command **S-0-0262, Command Basic Load**

Automatic execution of the initial program loading function

The drive controller is able to realize the first time a connected motor type is used together with the drive. While the command **S-0-0128, C2 Communication phase 4 transition check** is executed, it compares the parameter **S-0-0141, Motor Type,** that is read from the motor feedback data storage, with the value of the parameter **P-0-4036, Contacted Motor Type** that is buffered in the drive controller's parameter storage. If the two parameters are different, the error **F208 Motortype has changed** is generated, and the 7-segment display shows the message "UL".

Prior to clearing the fault and, consequently, starting the initial program loading function, the user may now save the application-related controller parameters.

The error **UL**, **Motor type has changed** can be cleared in two different ways:

1.) Executing the command **S-0-0099, Reset class 1 diagnostic**

2.) Pressing the S1 button

The initial program loading function is activated in either case.

Executing the initial program loading function as a command

The **S-0-0262, Command Basic Load** parameter permits the function to be performed as a command. This may be expedient if manually modified controller parameters are to be reset to their default values.

Setting the current controller

The parameter values of the current control loop has been specified by INDRAMAT and cannot be changed by the user. The factory-defined parameter values are stored in the feedback and are loaded into the amplifier during initial program loading.

WARNING

Modifying the values that have been defined by INDRAMAT

may damage the motor and the drive controller

⇒ Changing the current controller parameters is not permitted

Setting the velocity controller

The following parameters are used for setting the velocity controller:

- **S-0-0100, Velocity Loop Proportional Gain**
- **S-0-0101, Velocity Loop Integral Action Time**
- **P-0-0004, Smoothing Time Constant**

These parameters must either be set by executing the initial program loading function once, or must be determined by the following procedure:

Preparation of velocity controller adjustment

Various preparations are necessary before the velocity controller can be adjusted:

- The mechanical system of the machine must be set up in its final version in order to have the original conditions available for determining the parameters.
- The drive controller must properly be connected.
- The function of the safety limit switch must have been checked (if such a switch exists).
- Velocity control mode must have been selected in the drive.

To start with determining the parameter values, the controller parameters must be set to the following values:

S-0-0100, Velocity Loop Proportional Gain = standard value of the connected motor

S-0-0101, Velocity Loop Integral Action Time = 6,500 ms

P-0-0004, Smoothing Time Constant = minimum value (500 µs)

S-0-0392, Velocity Feedback Filter time constant = 500 µs

A compensation function must not be active when the velocity controller parameters are determined.

Determining the critical proportional gain and P-0-0004, Smoothing Time Constant

- Activate the controller enabling signal and move the drive at low velocity (rotary motors: 10...20 rpm, linear motors: 1... 2 m/min)
- Increase **S-0-0100, Velocity Loop Proportional Gain** until the system becomes unstable (continuous oscillation).
- Display the actual velocity on an oscilloscope and determine the oscillation frequency(see also "Analog output "). If the oscillation frequency is significantly higher than 500 Hz, increase **P-0-0004, Smoothing Time Constant** until the oscillation decays. Next, **S-0-0100, Velocity Loop Proportional Gain** must be increased until the system becomes unstable again.
- Reduce **S-0-0100, Velocity Loop Proportional Gain** until the oscillation dies down on its own.

The resulting value is the "**critical velocity controller proportional gain**".

Determining the critical integral-action time

- Set **S-0-0100, Velocity Loop Proportional Gain** to 0.5 x critical proportional gain
- Decrease **S-0-0101, Velocity Loop Integral Action Time** until the system becomes unstable
- Increase **S-0-0101, Velocity Loop Integral Action Time** until the continuous oscillation decays.

The resulting value is the "**critical integral-action time**".

Determining the speed controller setting

The determined critical values permit a controller setting to be derived that possesses the following features:

- Independent of variations at the axis as there is sufficient distance to the stability limits.
- The properties can safely be reproduced in series machines.

The table below lists some of the most common applications and the corresponding control loop settings.

Application:	Speed controller proportional gain:	Speed controller integral-action time:	Comment:
Feed axis of standard machine tool	Kp = 0.5 x Kpkrit	Tn = 2 x Tnkrit	Good load rigidity and good control response
Feed axis of perforating machine or nibble machine	Kp = 0.8 x Kpkrit	Tn = 0	High proportional gain; no integral-action component in order to achieve short settling times
Feed drive of trailing severing devices	Kp = 0.5 x Kpkrit	Tn = 0	Relatively undynamic controller setting without integral-action component in order to avoid distortion between the severing device and the severed material.

Fig. 7-20: Speed controller adjustment characteristics

See also Supplement B Diagnosis Description: **F878 Velocity Loop Error**.

Setting the position controller

The following parameter is used for setting the position controller:

- **S-0-0104, Position Loop prop. Gain KV**

This parameter must either be set by executing the initial program loading function once, or must be determined by the following procedure:

Preparation of position controller adjustment

Various preparations are necessary before the position controller can be adjusted:

- The mechanical system of the machine must be set up in its final version in order to have the original conditions available for determining the parameters.
- The drive controller must properly be connected.
- The function of the safety limit switch must have been checked (if such a switch exists).
- Velocity control mode must have been selected in the drive.
- The subordinate speed controller must properly be adjusted. A relatively small value should be selected as the starting value of the K_v factor ($K_v = 1$).
- A compensation function must not be active when the position controller parameters are determined.

Determining the critical position controller gain

- Use the drive in a mode in which the position control loop in the drive is closed.
- Move (e.g. via the jog function of the connected NC controller) the axis at low velocity (rotary motors: 10...20 rpm, linear motors: 1... 2 m/min).
- Increase the K_v factor until the system becomes unstable.
- Reduce the K_v factor until the continuous oscillation dies down on its own.

The resulting K_v factor is the "**critical position control loop gain**".

Determining the position controller setting

In most applications, a position controller setting in the range between 50 and 80% of the critical position control loop gain proves expedient.

This means:

S-0-0104, Position Loop prop. Gain KV = 0.5 ... 0.8 x K_{vcrit}

Position control loop monitoring

Position control loop monitoring exists to enable malfunctions within the position control loop to be diagnosed.

Possible causes of triggering position control loop monitoring include:

- Exceeding the drive's torque and/or acceleration capability
- Mechanical blocking of the axes
- Malfunction in the encoder

Position control loop monitoring is only active if a mode has been activated in which the position control loop in the drive is closed. The following two parameters are used for setting and diagnosing the monitoring function:

- **S-0-0159, Monitoring Window**
- **P-0-0098, Max. Model Deviation**

The following error is generated if position control loop monitoring detects an error in the position control loop:

- **F228 Excessive Deviation**

Basic method of operation of position control loop monitoring

To monitor the position control loop, an actual feedback model value is maintained in the drive as long as the position control loop is closed. This model value only depends on the specified position command value profile and on the selected control loop parameters. The actual feedback model value is continually compared with the real actual feedback value that enters control as the actual value. If the difference exceeds the value of **S-0-0159, Monitoring Window** for more than 50 ms, an error **F228 Excessive Deviation** will be generated.

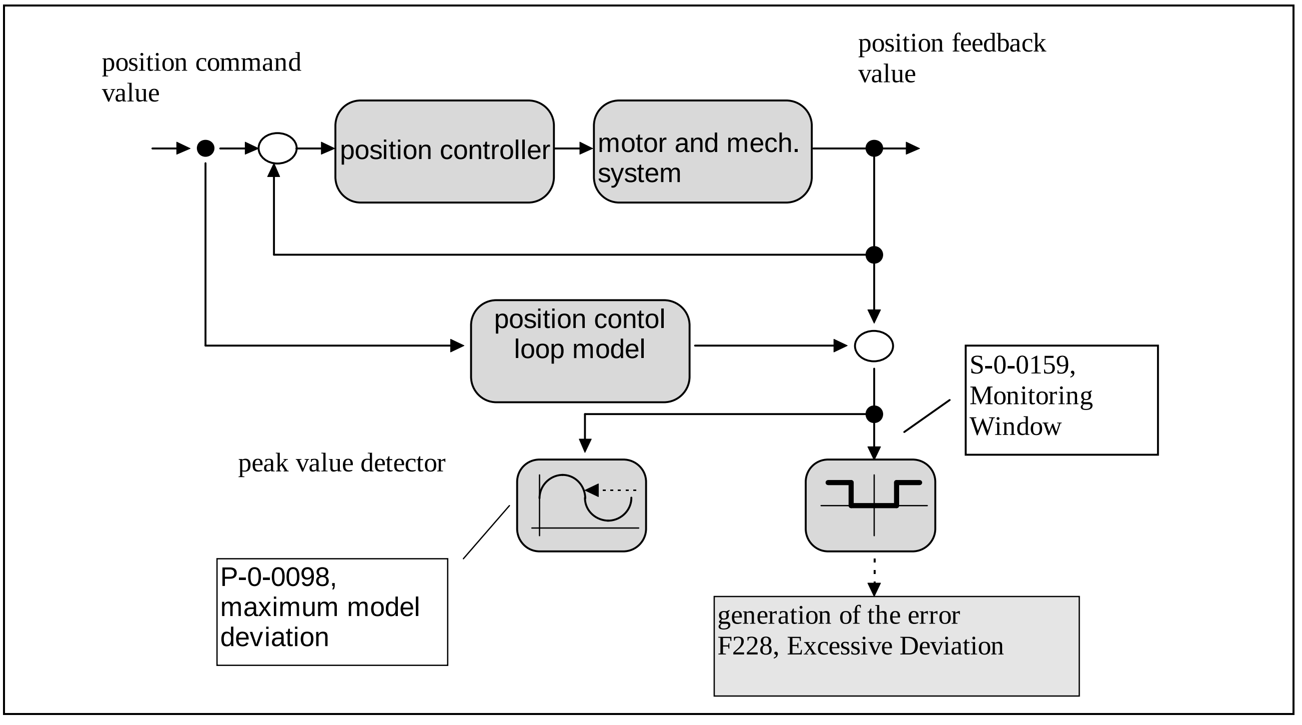

Fig. 7-21: Position control loop monitoring principle

The monitoring function always interprets the actual feedback value that is used in position control. This means that actual feedback value 1 is used for position control with motor encoder, and actual feedback value 2 is used for position control with external encoder.

Setting position control loop monitoring

The following requirements must be satisfied prior to setting position control loop monitoring:

- Ensure that velocity and position control loop are properly set before position control loop monitoring is set.
- The axis concerned should be checked and in its final state, also with respect to the mechanical components.

Position control loop monitoring should be set as follows:

- Perform a typical machining cycle via the connected controller. The maximum scheduled velocity must be used for the movement.
- The parameter **P-0-0098, Max. Model Deviation** always shows the highest occurred value of the deviation between actual feedback value and the estimated actual feedback value. (Note: The content of this parameter is not permanently stored. This means that it is zero when the drive is switched on.)
- This value is used as an auxiliary quantity for setting the monitoring window. The parameter **S-0-0159, Monitoring Window** must be set to the value that results from the content of the parameter **P-0-0098, Max. Model Deviation,** multiplied with a safety factor (recommended safety factor value between 1.5 and 2).

Example:

Content of **P-0-0098**, **Max. Model Deviation**:

0.1 mm

-> Definition for the parameter **S-0-159, Monitoring Window**:

0.2 mm (= 2 x 0.1 mm)

De-activating position control loop monitoring

Position control loop monitoring should always be activated. There are exceptions, however, in which position control loop monitoring must be de-activated. This can be done by setting the parameter **S-0-0159, Monitoring Window** to a very large value.

Setting acceleration precontrol

In servo applications that require highest precision at high velocities, the accuracy of an axis during the acceleration and deceleration phases can significantly be increased by activating the acceleration precontrol function.

Acceleration precontrol may expediently be used in the following typical applications:

- Free form surface machining
- Grinding

The following parameter is used for setting the acceleration precontrol function:

- **S-0-0348, Acceleration Feedforward prop. Gain**

Use the following procedure to properly determine the parameter value.

Requirements for correctly setting acceleration precontrol

- Velocity and position control loop must properly be set.
- Lag-free operation must be selected for the position controller.

Setting acceleration precontrol

Acceleration precontrol depends on the moment of inertia and can therefore only be set at the user’s site.

Setting is performed in two steps:

- Computing a guide value for acceleration precontrol. This requires the amount of the total moments of inertia ($J_{Motor}+J_{Load}$), reduced to the motor shaft, to be available. The rough amount of that value is known from axis dimensioning. In addition, the torque constant of the employed motor is required and can be obtained from the motor data sheet or the parameter **P-0-0051, Torque/Force Constant**. The guide value is computed as

$$acceleration\ precontrol = \frac{J_{\mathrm{Motor}} + J_{Load}}{Kt} * 1000$$

acceleration precontrol [mA\rad\s²]
J*Motor*: moment of inertia of the motor [kgm²]
J*Load*: moment of inertia of the load [kgm²]
Kt: torque constant of the motor [NM/A]

Fig.7-22: Guide value of acceleration precontrol

The computed guide value must be entered in the parameter **S-0-0348, Acceleration Feedforward prop. Gain**.

- Verification of the efficacy of acceleration precontrol and, if required, fine adjustment of the parameter **S-0-0348, Acceleration Feedforward prop. Gain**.

  The deviation of the actual feedback value from the position command value can be output via the analoguos digital outputs of the drive controller. To check the efficacy of acceleration precontrol, the signal must be displayed on an oscilloscope while the axis is traveling through the relevant machining cycle. During the acceleration and deceleration phases, acceleration precontrol must considerably reduce the dynamic deviation.

Setting the velocity mix factor

The velocity mix factor can be used for making up the actual velocity value, that is employed for velocity control, of values from the motor and the external measuring system. This can be advantageous when there is a play- or torsion-affected coupling between load and motor. The following parameter is used for setting the mixing ratio

- **P-0-0121, Velocity Mixfactor Feedback1&Feedback2**

Obviously, this function can only be used if an external measuring system exists. If this is not the case, **P-0-0121** is automatically set to 0%.

The mix of the actual velocity value can continuously be selected between

- 100% actual velocity value from the motor encoder
  /
  0% actual value from the external encoder (P-0-0121 = 0)
  and
- 0% actual velocity value from the motor encoder
  /
  100% actual value from the external encoder (P-0-0121 = 100)

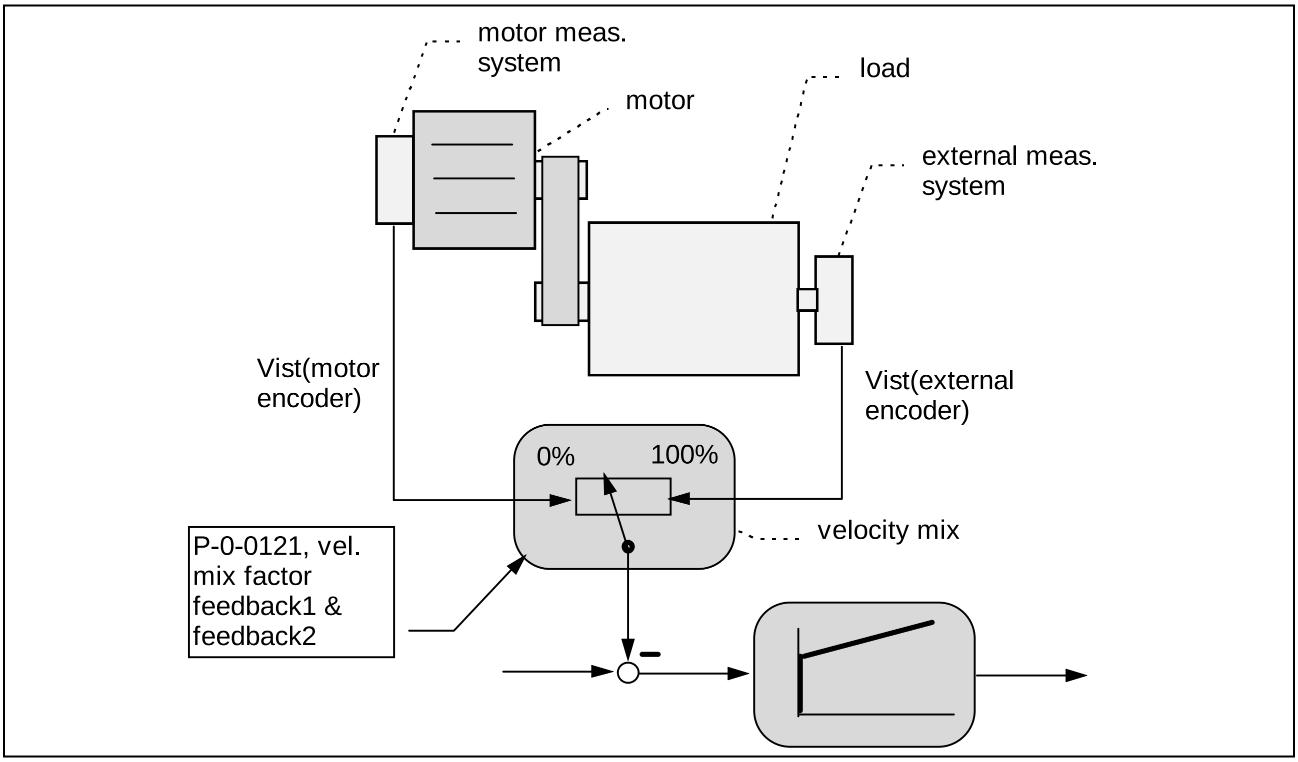

Fig. 7-23: Operation principle of the velocity mix

7.7 Drive Stop

The drive stop function is used for stopping an axis at a defined acceleration and a defined jerk.

The function is activated either by clearing the drive stop bit (bit 13) in the master control word or by interrupting a drive control command (e.g. drive-controlled homing).

The following parameters are used for this purpose:

- **S-0-0138, Bipolar acceleration limit value**
- **S-0-0193, Positioning jerk**

The following parameters are additionally used for diagnosis purposes:

- **S-0-0124, Standstill window**
- **S-0-0182, Manufacturer Class 3 Diagnostics**

Operation principle of drive stop

The function is activated when bit 13 of the master control word is set from "1" to "0". The drive no longer follows the command values of active mode. It transitions to position control and employs the limit parameters **S-0-0138, Bipolar acceleration limit value** and **S-0-0193, Positioning jerk** to generate command values for stopping the axis. The 7-segment display shows **AH**, the diagnosis in S-0-095 is **A010 Drive Stop**.

If the actual velocity falls below the value of parameter **S-0-0124, Standstill window**, bit "drive stop acknowledgment" in **S-0-0182, Manufacturer Class 3 Diagnostics** is set.

Setting bit 13 of the master control word back to "1" re-activates the selected mode.

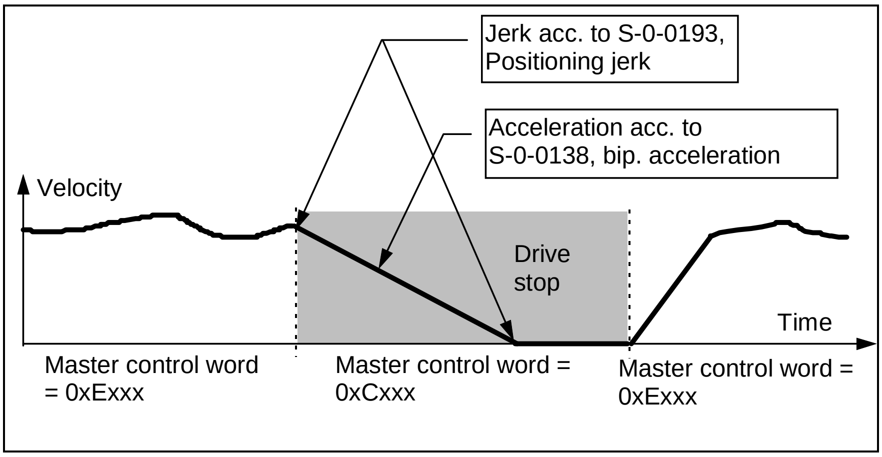

Fig. 7-24: Drive stop principle

Position-controlled stopping is performed with lag-affected position control if a mode was active before that also contained lag-affected position control. Otherwise, the function will be executed with lag-free position control.

7.8 Drive-Controlled Homing

Homing a servo axis establishes the reference between the actual feedback value and the machine zero point.

Drive-controlled homing means that, keeping the selected homing velocity and homing acceleration at their levels, the drive automatically produces position command values to perform the drive movements that are required for homing.

The function may be used for a motor encoder or for an external encoder.

The following parameters exist for executing the function:

- **S-0-0148, C6 Drive controlled homing procedure**
- **S-0-0147, Homing Parameter**
- **S-0-0298, Reference Cam shift by...**
- **S-0-0299, Home switch offset**
- **S-0-0052, Reference distance 1**
- **S-0-0054, Reference distance 2**
- **S-0-0150, Reference offset 1**
- **S-0-0151, Reference offset 2**
- **S-0-0041, Homing velocity**
- **S-0-0042, Homing acceleration**

In addition, the following parameters are used:

- **S-0-0108, Feedrate override**
- **S-0-0057, Position window**
- **S-0-0193, Positioning jerk**
- **S-0-0403, Position feedback value status**

Type and arrangement of the measuring system's reference markers

For a better understanding, measuring systems can be subdivided into three different groups that are distinguished by type and arrangement of their reference markers.

- **Type 1**: Measuring systems with absolute single-turn range (such as resolvers). Such a measuring system has an absolute range in fractions of an encoder rotation. Typical applications are the motor encoders of MDD or MKD motors.
- **Type 2**: Incremental rotary measuring systems with one reference marker per encoder revolution (such as the ROD or RON types from Messrs Heidenhain).
- **Type 3**: Incremental translatory measuring systems with one or more reference markers (such as LS digirulers from Messrs Heidenhain).

The drive-internal recognition of the reference marker arrangement follows the settings in the corresponding position encoder type parameter **S-0-0277, Position feedback 1 type parameter** (for motor encoders) or **S-0-0115, Position feedback 2 type parameter** (for external encoders).

The setting of bit 0 shows whether it is a rotary or a linear measuring system.

This setting is performed automatically in a measuring system with data storage.

See also setting the measuring systems.

Setting the homing parameter

The basic sequence of actions depends on the setting of the parameter **S-0-0147, Homing Parameter**.

The following selections are made in that parameter:

- Homing approach direction positive/negative
- Homing using motor encoder / external encoder
- Evaluation of reference switch yes/no
- Evaluation of reference marker yes/no

The parameter is of the following structure:

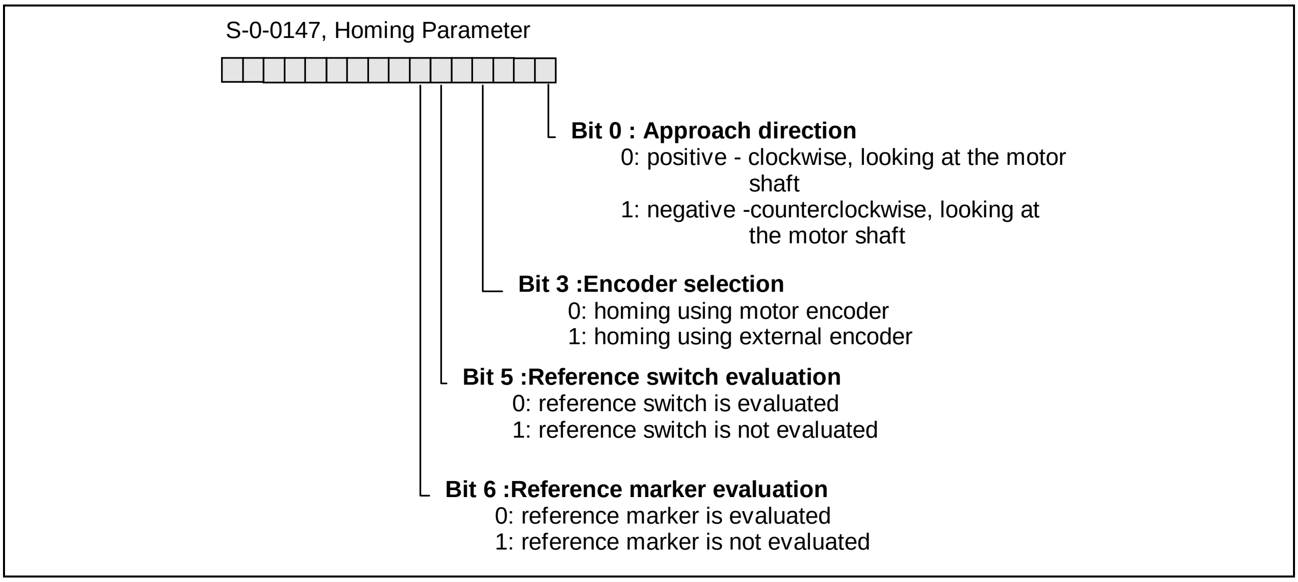

Fig. 7-25: Structure of the parameter **S-0-0147, Homing Parameter**

In addition, the sequence depends on type and arrangement of the reference markers of the encoder that is to be homed.

Functional sequence "drive-controlled homing"

The command value profile depends on the parameters **S-0-0041, Homing velocity**, **S-0-0108, Feedrate override**, and **S-0-0042, Homing acceleration**.

In addition, a jerk limitation can be activated that delimits incremental acceleration changes. This is done by specifying the parameter **S-0-0193, Positioning jerk**.

The following figure illustrates this process:

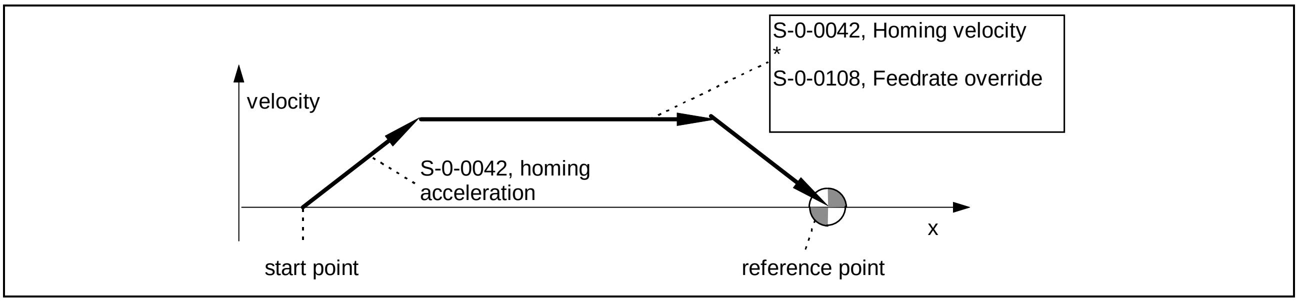

Fig. 7-26: Command value profile from homing velocity and homing acceleration

Like in all drive-controlled functions, the maximum velocity can be influenced by a feed rate. The active maximum velocity results from the product of **S-0-0041, Homing velocity** and **S-0-0108, Feedrate override**.

WARNING

With some measuring system, there are restrictions with respect to the maximum velocity that may be used for homing.

Measuring system	Max. homing velocity
Single-turn resolver	300 rpm

Fig. 7-27: Permissible velocity during homing

The warning **E255 Feedrate-Override(S0-0108) = 0** is issued if the parameter **S-0-0108, Feedrate override** has zero assigned.

The co-ordinate system is shifted to machine zero when the positioning window around the homing point is entered

In drive-controlled homing, the drive always positions on the homing point. With types 1...3, that point is defined by the position of the selected reference marker and an additionally set offset.

When the drive enters the positioning window around the homing point, position command value and actual feedback value are switched over. In this process, the position command value (**S-0-0047, Position Command Value**) is set to

- **S-0-0052, Reference distance 1** (for motor encoders), or
- **S-0-0054, Reference distance 2** (for external encoders)

New actual feedback values are computed from the information of the internally measured position of the reference marker and the required actual feedback value on that marker. Thus, the drive-internal co-ordinate system is shifted and the command is reported as being terminated.

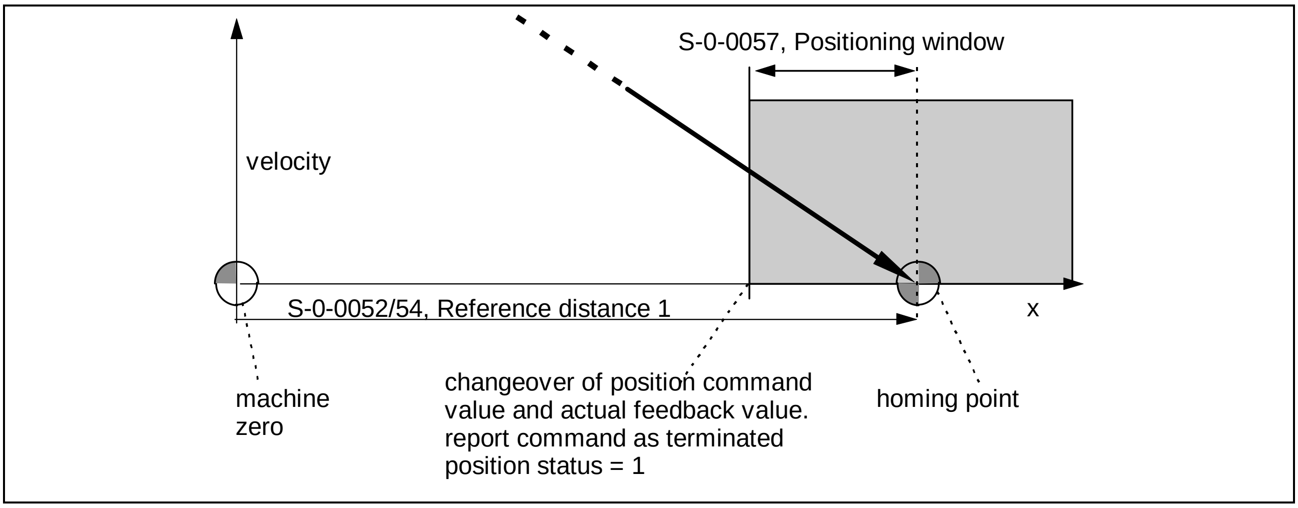

Fig. 7-28: Changeover of position command value and actual feedback value

Upon the changeover of position command value and actual feedback value, **S-0-0403, Position feedback value status** is set to "1". This means that the actual feedback value now refers to the machine zero point. The parameter **S-0-0403, Position feedback value status** shows the position status of the measuring system that has been selected in bit 3 of **S-0-0147, Homing Parameter**.

Note: If the drive is switched back to phase 2 after the homing command has been performed, the parameter **S-0-0403, Position feedback value status** will be set to "0" because the actual values are newly initialized in the changeover command 3 to 4.

Actual feedback values after the command "drive-controlled homing"

After the command drive-controlled homing has been executed, the states of the actual feedback values from motor encoder and, if installed, external encoder depend on bit 3 in **S-0-0147, Homing Parameter** and the existence of an absolute encoder as motor encoder or external encoder.

Motor encoder:	external encoder:	S-0-0147 Bit 3:	Actual feedback value 1:	Actual feedback value 2:
absolute	not absolute or non-existent	1	unchanged	position feed-back value 2
not absolute	not absolute	0	position feed-back value 1	position feed-back value 1
not absolute	not absolute	1	position feed-back value 2	position feed-back value 2

Fig. 7-29: Actual feedback values after the drive-controlled homing command

Including reference offset

If the evaluation of the reference marker has been activated in the homing parameter, the position of the selected reference marker is always assumed as homing point. If a measuring system of the type 1...3 exists (no distance code), the position of the homing point can be shifted with respect to the reference marker position. Thus, the position after homing can be selected as required.

The following parameters are used for selecting the shift:

- **S-0-0150, Reference offset 1** (for motor encoder)
- **S-0-0151, Reference offset 2** (for external encoder)

If the selected reference offset is positive, it is interpreted such that, with respect to the homing point, the reference marker is closer to the start point. In homing, the drive will always cross the reference marker before it stops on the homing point. The drive does not reverse the direction of travel after it has crossed the reference marker.

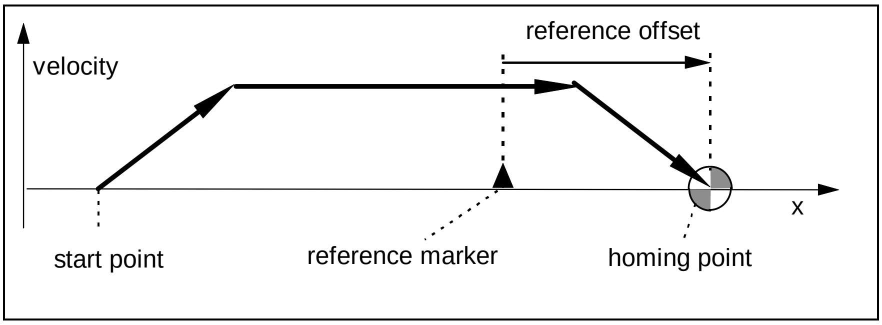

Fig. 7-30: Command value profile with positive reference offset

With negative reference offset, the direction of travel can be reversed during homing

If the selected reference offset is negative, it is interpreted such that, with respect to the homing point, the reference marker is further away from the start point. If a measuring system of type 1 is employed, the drive immediately travels to the homing point after the command has been started, and does not approach the reference marker. The reference marker is approached if a measuring system of type 2 or type 3 is used. The drive then reverses the direction of travel and goes to the homing point.

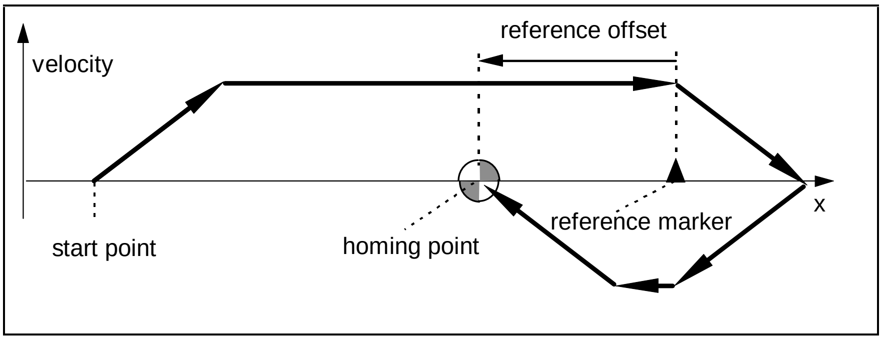

Fig. 7-31: Command value profile with negative reference offset and type 2 or 3

Selecting a negative reference offset permits the homing position to be placed between start point and reference marker. When the command is started again, the drive will again locate the reference marker that is to be interpreted.

Evaluating the zero switch

If the arrangement of the reference markers is not unambiguous, a zero switch can be used for identifying a specific marker. If evaluation of the zero switch is selected (bit 5 in S-0-0147 = 0), the reference marker that follows the positive edge of the zero switch will be evaluated when the drive moves in the direction towards the homing point.

Using the parameter **S-0-0403, Position feedback value status**, the switch may have an IDN assigned.

Example: Homing a motor encoder with one reference marker per revolution.

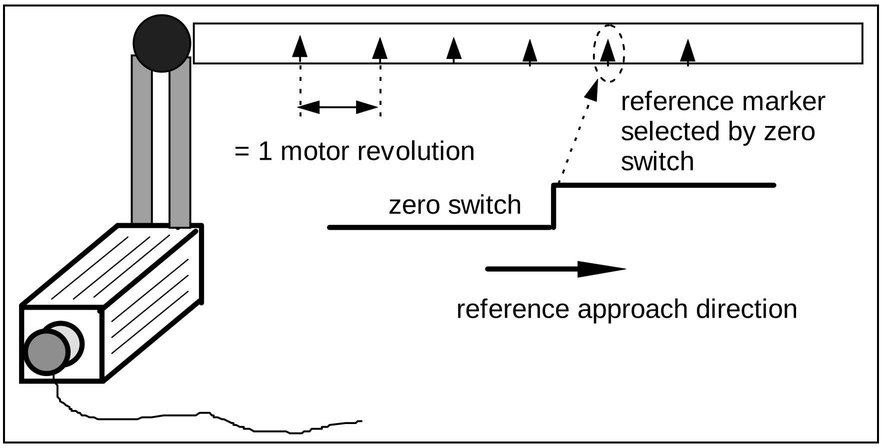

Fig. 7-32: Selecting the reference marker according to the direction of approach

When zero switch evaluation is active, the drive first looks for the positive edge of the zero switch. The drive moves in the selected homing direction if the zero switch is not actuated when the command is started.

The homing direction must be selected such that the positive edge can be found.

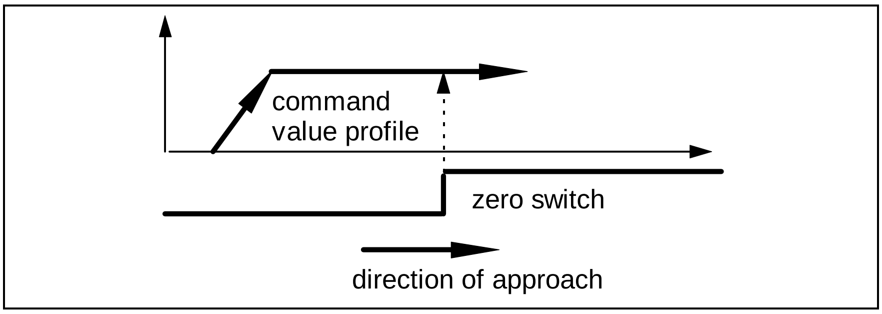

Fig. 7-33: Correctly selected direction of approach

The units can be damaged if the direction of approach is incorrect

If the wrong reference approach direction has been selected, the drive generates command values that go away from the positive zero switch edge, risking that the drive reaches its travel range limits and damages the machine.

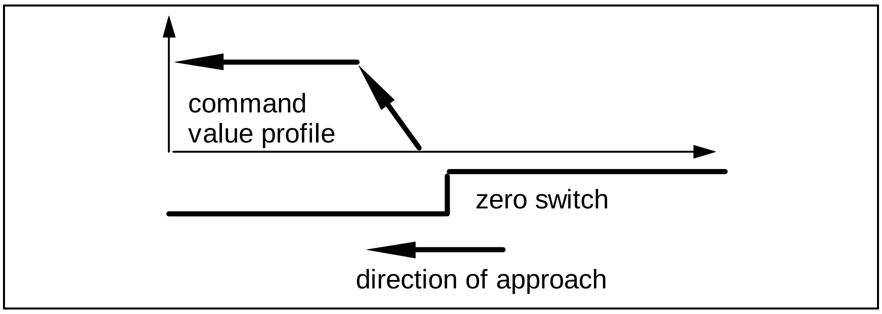

Fig. 7-34: Incorrectly set direction of approach

Command value profile with zero switch being pressed at the start of the command

If the zero switch has been actuated when the command is started, the drive generates command values in the opposite direction of approach in order to move away from the zero switch. If a 1-0 edge of the zero switch is detected, the drive reverses its direction of movement and continues as if the start point were in the inactive zero switch range.

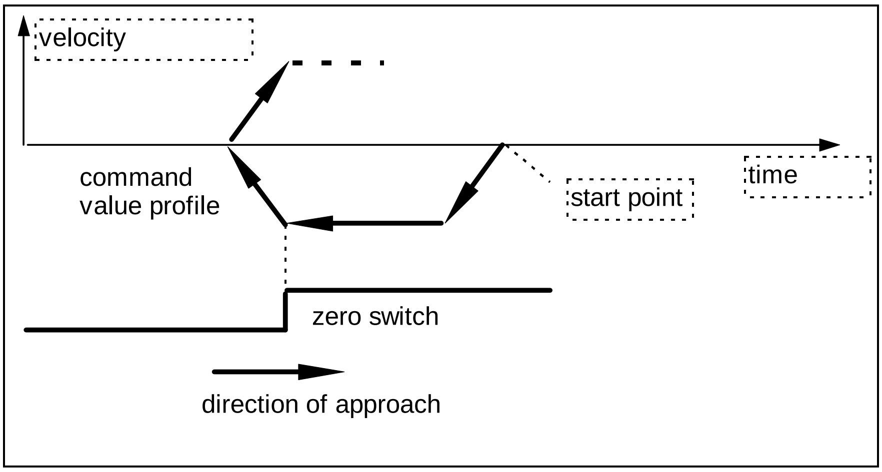

Fig. 7-35: Command value profile with the start position on the zero switch

Monitoring the distance between zero switch and reference marker

If the distance between the zero switch edge and the reference marker that is to be interpreted is too small, there is a risk that the zero switch edge is only recognized after the reference marker has occurred. Thus, only the subsequent reference marker will be evaluated, and the reference marker selection is no longer unambiguous.

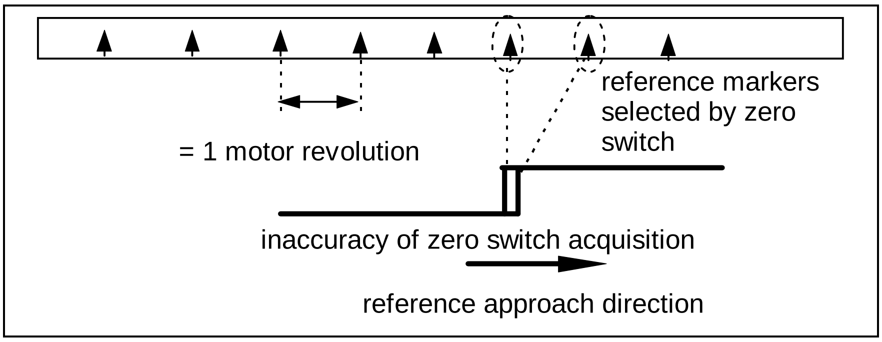

Fig. 7-36: Incorrect selection of the reference markers with too small a distance between zero switch edge and reference marker

The distance between zero switch edge and reference marker is therefore monitored.

The command error **C602 Distance homing switch-reference mark erroneous** is generated if the distance between zero switch edge and reference marker falls below a specific value.

The critical range of the distance is:

0.25 * distance between the reference markers

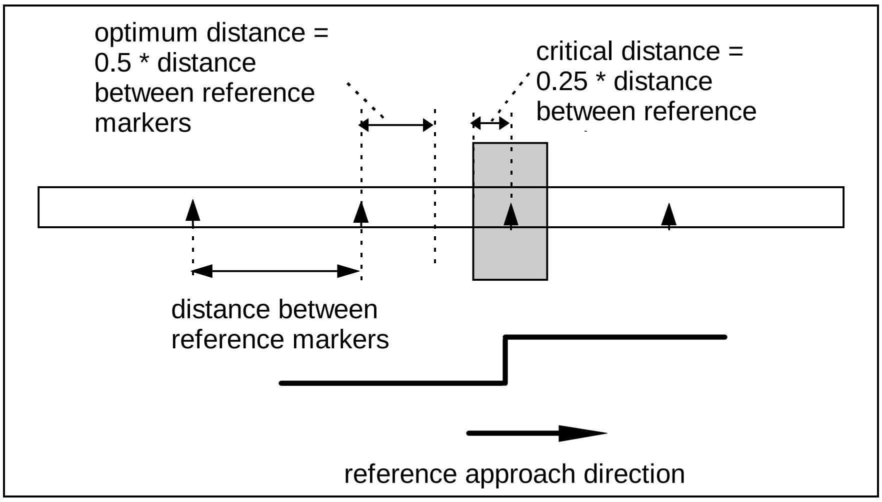

Fig. 7-37: Critical and optimum distance between zero switch and reference marker

The optimum distance between zero switch and reference marker is:

0.5 * distance between the reference markers

Upon each homing with zero switch evaluation, the difference between the actual distance and the optimum distance is monitored. That difference is saved in the parameter **S-0-0298, Reference Cam shift by...**. Subsequently, the zero switch edge can mechanically be shifted by that value.

To avoid a mechanical shift of the zero switch edge, this can be done by the software in the parameter **S-0-0299, Home switch offset**. The value in the parameter **S-0-0298, Reference Cam shift by...** must then be entered in the parameter **S-0-0299, Home switch offset**.

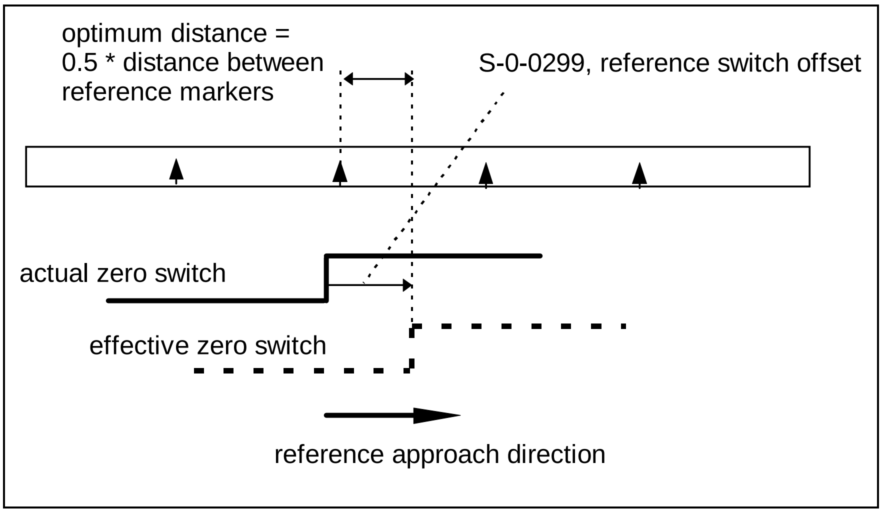

Fig. 7-38: Effect of the parameter **S-0-0299, Home switch offset**

Use the following procedure to set the value of the parameter **S-0-0299, Home switch offset**:

- Execute the homing command with **S-0-0299, Home switch offset** = 0.
- If the distance is outside the range 0.25...0.75 * distance between reference markers, the error message **C602 Distance homing switch-reference mark erroneous** will be generated, and the value from **S-0-0298, Reference Cam shift by...** must be entered in **S-0-0299, Home switch offset**.
- Verification: Upon the next homing, **S-0-0298, Reference Cam shift by...** should be almost 0.

Connection and location of the zero switch

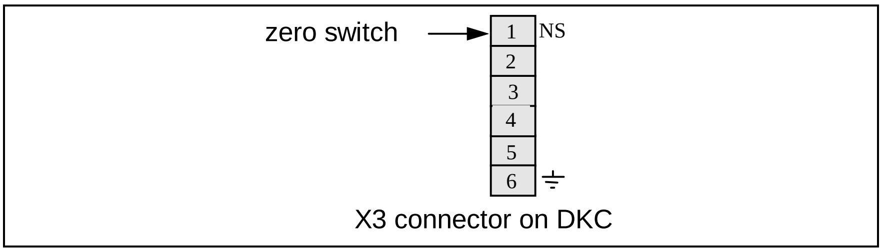

Fig. 7-39: Connecting the zero switch to X3

The zero switch should be installed such that its "actuated" range is greater than the valid travel range. Otherwise, an adverse start position at the start of the command may lead to overtraveling the valid range, and damage the machinery.

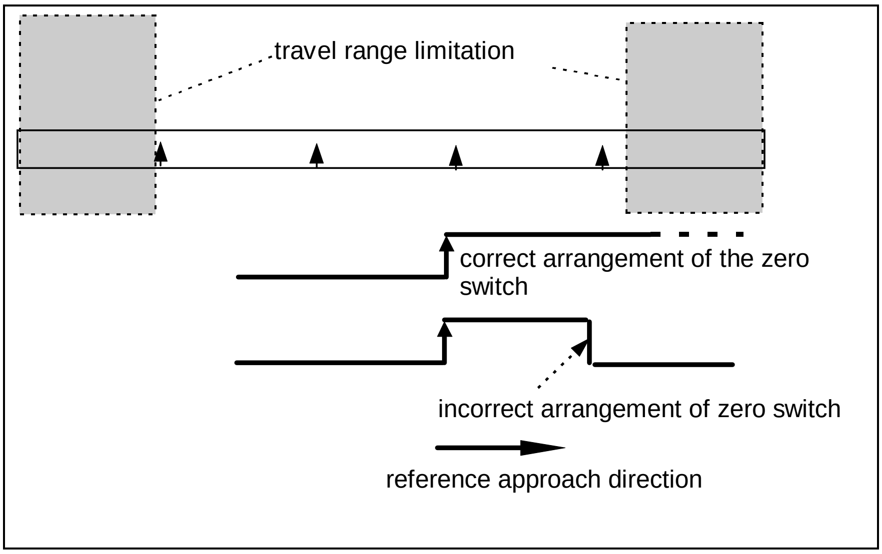

Fig. 7-40: Location of the zero switch with respect to the travel range

Actions of the controller in "drive-controlled homing"

The interpolator at the controller side must be set to the position command value that is read from the drive

During "drive-controlled homing", the drive generates is own position command values. Command values from the controller are ignored. When the drive reports the command as being terminated, the position command value, that is now related to the machine zero point, is provided in the parameter **S-0-0047, Position Command Value**. The controller must read that parameter via the service channel before the command is terminated, and the interpolator at the controller side must be set to its value. When the controller terminates the command, and the command values from the controller become again effective in the drive, they should resume from the value that was read from the drive.

Starting, interrupting and terminating the command "drive-controlled homing"

The function is interpreted as a command.

To start the function, the command must be set and enabled by writing to the parameter **S-0-0148, C6 Drive controlled homing procedure** (default = 3). The drive acknowledgment must be taken from the data status of the same parameter. The command is terminated when the command change bit in the drive status word is set and the acknowledgment transitions from *in progress* (7) to *command executed* (3) or *command error* (0xF).

If the command is interrupted during execution (acknowledgment = 7) (default = 1), the drive reacts by activating the drive stop function. Command execution is continued when the interruption is suspended.

(See also "Drive Stop" on page 7-39)

Possible error messages in "drive-controlled homing"

The following command errors may occur during the execution of the command:

- **C601 Homing Not Possible If Drive Is Not Enabled**
  The controller enable signal was not set when the command was started.
- **C602 Distance homing switch-reference mark erroneous**
  The distance between zero switch and reference marker is too small. See also "Monitoring the distance between zero switch and reference marker" on page 7-47
- **C604 Homing of absolute encoder not possible**
  The encoder that is to be homed is an absolute encoder. The command "drive-controlled homing" was started without having started the "set absolute dimension" command beforehand.

(See also "Setting absolute dimension" on page 7-15)

7.9 Language Selection

The parameter **S-0-0265, Language Selection**permits the language of

- names and units of parameters
- diagnosis text

to be selected.

The following languages have currently been implemented:

Value of S-0-0265:	Language:
0	German
1	English

Fig. 7-41: Language selection

Notes

8 Optional Drive Functions

8.1 Analog Output

The "Analog output" function permits drive-internal signals and state variables to be output as analog voltage signals. These signals may then be viewed on an oscilloscope that is connected to the analog outputs.

Two 8-bit digital-to-analog converters are used for converting the digital signals from the drive. The maximum output voltage is ±10 V; the output cycle time is 500 µs.

The following parameters exist for the function:

- **P-0-0038, Signal Select Analog Output Channel 1**
- **P-0-0039, Signal Select Analog Output Channel 2**
- **P-0-0040, Scaling Factor for Velocity Data Channel 1**
- **P-0-0041, Scaling Factor for Velocity Data Channel 2**
- **P-0-0042, Scaling Factor for Position Data Channel 1**
- **P-0-0043, Scaling Factor for Position Data Channel 2**
- **P-0-0136, Scaling Torque/Force Channel 1**
- **P-0-0137, Scaling Torque/Force Channel 1**
- **P-0-0139, Analog Output 1**
- **P-0-0140, Analog Output 2**

Analog output of preset signals

Preset channel selection numbers permit certain signals to be selected. Selection is made by entering the channel selection number (hexadecimal format) in the parameters P-0-0038 and P-0-0039.

The following pre-defined signals exist:

Number:	Signal selection:	Scaling:
0x0	Zero point	0V
0x1	Torque-producing command current	variable
0x2	Actual velocity value after mix and filter	variable
0x3	S-0-0036, Velocity Command Value	variable
0x4	Position command value difference	variable
0x5	S-0-0051, Position Feedback Value 1	variable
0x6	S-0-0053, Position Feedback Value 2	variable
0x7	S-0-0189, Following Error	variable
0x8	Motor encoder sine signal	1 : 1
0x9	Motor encoder cosine signal	1 : 1
0xa	P-0-0139	1 : 1
0xb	P-0-0140	1 : 1
0x10	External encoder sine signal	1 : 1
0x11	External encoder cosine signal	1 : 1
0x12	Torque-forming actual current	variable
0x13	Magnetizing actual current	variable

0x14	Actual velocity value of motor encoder	variable
0X16	Bleeder utilization factor	10V = 100%

Tab. 8-1: Signal selection of analog output

variable scaling of position and velocity data

If signal selection is used for selecting position or velocity data, the following parameters can be used for scaling:

- **P-0-0040, Scaling Factor for Velocity Data Channel 1**
- **P-0-0041, Scaling Factor for Velocity Data Channel 2**
- **P-0-0042, Scaling Factor for Position Data Channel 1**
- **P-0-0043, Scaling Factor for Position Data Channel 2**

The unit rpm/10 V always refers to motor revolutions. Any gear transmission is not taken into account. The same applies to the unit degree/10 V.

Bit and byte output from the data storage

The function can only be used with information about the structure of the drive processor’s data storage. However, that structure changes as the version changes. The function can consequently only be used be the developing engineers.

Selection is also made via the signal selection parameters. Address and bit number and/or shift number of the bit/byte that is to be output is entered here, not a preset number.

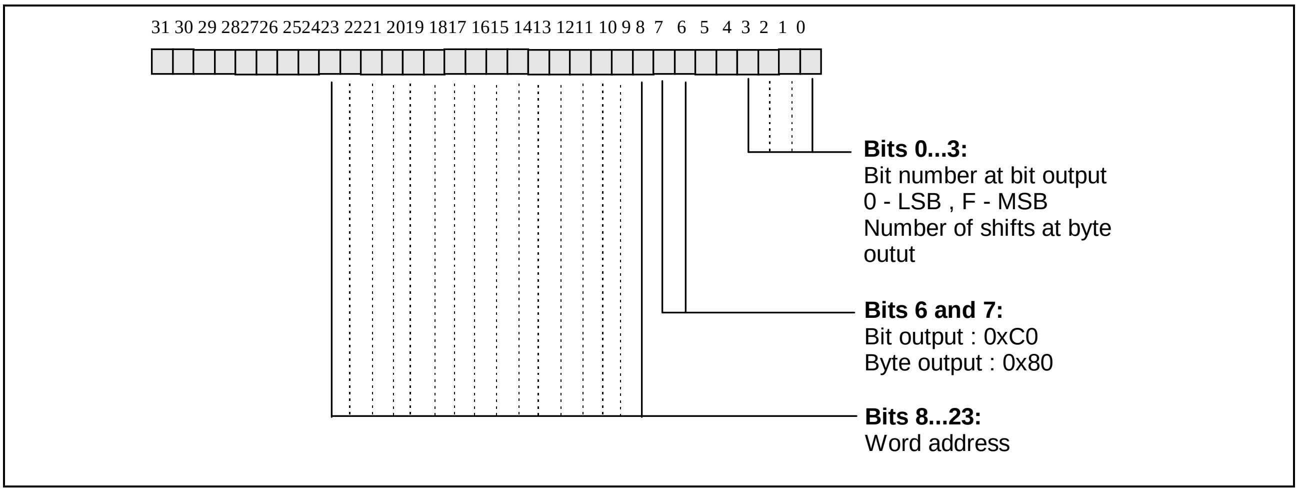

Fig. 8-1: Bit and byte output parameter values

Analog output connections

The analog signals are output at the X3 connector of the base unit.

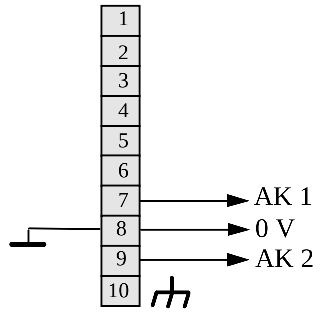

Fig. 8-2: Analog output connections

8.2 Probe Input Function

Two probe inputs are provided for measuring position and time values via two binary input signals. These inputs permit

- position feedback value 1/2 and/or
- a relative internal time [in µs)

to be measured at a moment that is defined by the edges of the input signals.

Note: **The probe inputs are scanned every 51** µs. The measured position feedback value 1/2 signal is produced every 500 µs. Linear interpolation is performed between these two vertices at an accuracy of **51** µs.

Parameters permit the absolute values of these signals at the moment of the occurrence of the positive or negative edge or their difference to be read.

The following parameters are available for the function:

- **S-0-0170, Probing cycle procedure command**
- **S-0-0401, Probe 1**
- **S-0-0402, Probe 2**
- **S-0-0169, Probe control parameter**
- **P-0-0200, Signal select probe 1**
- **P-0-0201, Signal select probe 2**
- **S-0-0405, Probe 1 enable**
- **S-0-0406, Probe 2 enable**
- **S-0-0130, Probe value 1 positive edge**
- **S-0-0131, Probe value 1 negative edge**
- **P-0-0202, Difference probe values 1**
- **S-0-0132, Probe value 2 positive edge**
- **S-0-0133, Probe value 2 negative edge**

- **P-0-0203, Difference probe values 2**
- **S-0-0409, Probe 1 positive latched**
- **S-0-0410, Probe 1 negative latched**
- **S-0-0411, Probe 2 positive latched**
- **S-0-0412, Probe 2 negative latched**

Operational principle of probe input evaluation

S-0-0170, Probing cycle procedure command provides for a general activation of the function. Albeit the function has been activated as a command, it does not supply a command acknowledgment, and the KÄ bit is not serviced.

Thus, "3" must be entered in S-0-0170 to activate the function.

From that moment on, the states of the probe signals are shown in the parameters **S-0-0401, Probe 1** and **S-0-0402, Probe 2**.

The parameters **S-0-0405, Probe 1 enable** and/or **S-0-0406, Probe 2 enable** are used for enabling a probe input. The trigger mechanism for the evaluation of the positive and/or negative edge of the probe input signal is activated upon a 0-1 transition of that signal.

If, from this time on, an edge of the related probe is sensed, the selected signal is stored in the positive and/or negative measured value parameter. At the same time, the amount of the difference between the positive and the negative measured value is determined and stored in measured value difference. The respective status messages **S-0-0409, Probe 1 positive latched, S-0-0410, Probe 1 negative latched, S-0-0411, Probe 2 positive latched,** and/or **S-0-0412, Probe 2 negative latched** are set to "1".

Clearing the probe input enable signal clears the status messages **S-0-0409, Probe 1 positive latched**, **S-0-0410, Probe 1 negative latched**, **S-0-0411, Probe 2 positive latched**, and/or **S-0-0412, Probe 2 negative latched**.

Note: Following the 0-1 edge of the probe input enable signal, only the first positive and the first negative edge of the corresponding input are evaluated. Each new measurement requires the probe input enable signal to be set to 0 and back to 1. Clearing the probe input enable signal also clears the corresponding parameters of the latched measured values.

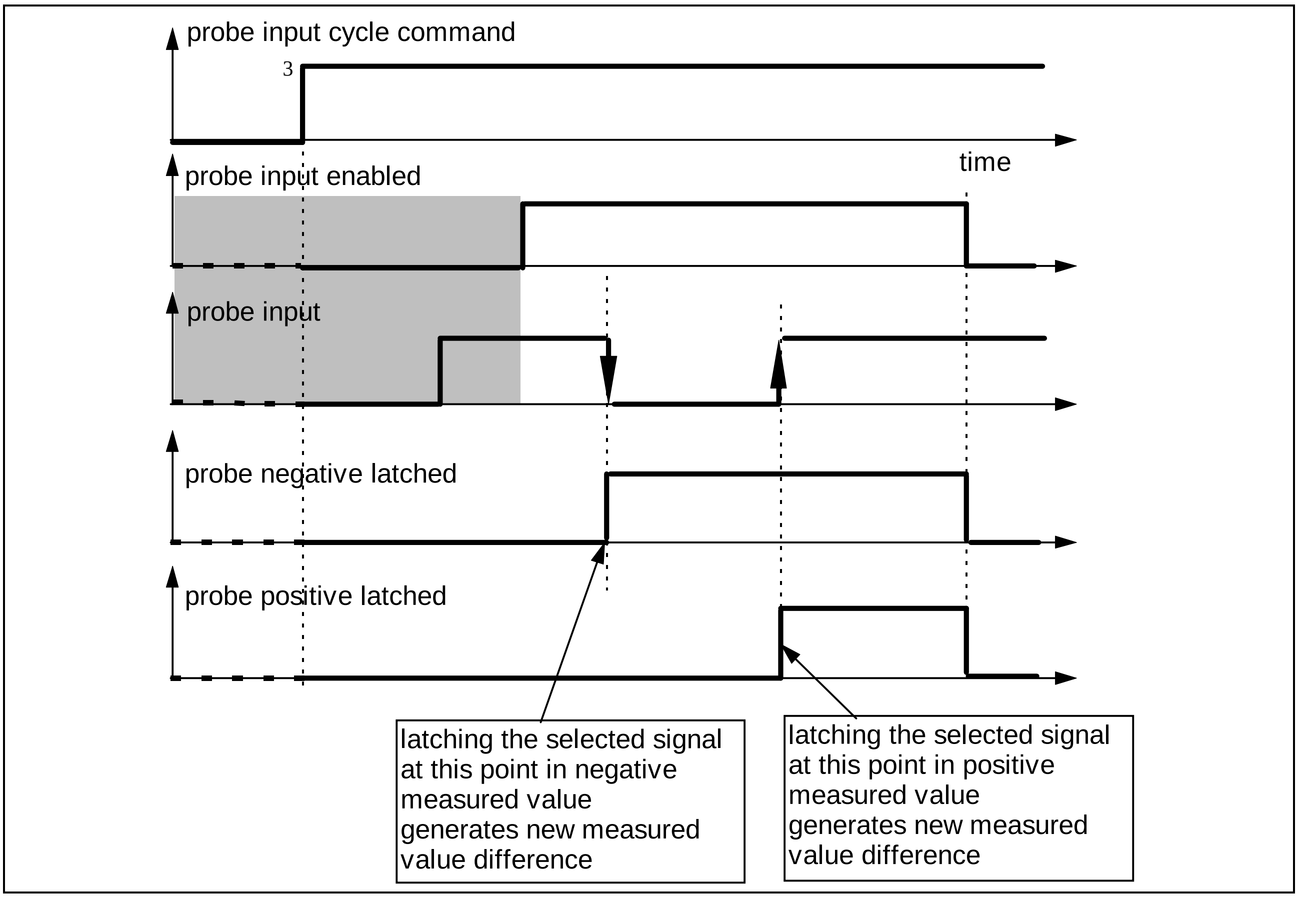

Fig. 8-3: Evaluating the probe signal edges; evaluation of positive and negative edge activated in probe input parameter

Actions in writing to S-0-0170, Probing cycle procedure command

The probe input function is started when "3" is written to the parameter **S-0-0170, Probing cycle procedure command.** In addition,

- the data status of **S-0-0170, Probing cycle procedure command** is set to "7";
- all measured values and measured value differences are set to "0";
- all "latched measured value" parameters are cleared.

Edge selection of the probe inputs

For a probe input, there are the parameters positive measured value and negative measured value. While the positive measured value is assigned to the 0-1 edge of the probe signal, the negative measured value is assigned to the 1-0 edge. Whether or not the two edges will actually be evaluated and lead to storing the measured value in positive/negative measured value must be specified in the parameter **S-0-0169, Probe control parameter**.

The parameter should be set before the function is activated. It is of the following structure:

S-0-0169, Probe Control Parameter

Bit 0 : Activation pos. edge probe 1
0: pos edge is not evaluated
1: pos. edge is evaluated

Bit 1 : Activation neg. edge probe 1
0: neg. edge is not evaluated
1: neg. edge is evaluated

Bit 2 : Activation pos. edge probe 2
0: pos. edge is not evaluated
1: pos. edge is evaluated

Bit 3 : Activation neg. edge probe 2
0: neg. edge is not evaluated
1: neg. edge is evaluated

Bit 4 : Position feedback value selection
0 : S-0-0053 is always used as measured value if external encoder exists and position feedback values are selected in signal selection
1 : S-0-0051 is always used as measured value if position feedback values are selected in signal selection

Fig. 8-4: Structure of the parameter **S-0-0169, Probe control parameter**

Signal selection of the probe signal inputs

The following signals are available and can be measured:

- Position feedback value 1 (motor encoder)
- Position feedback value 2 (external encoder; only if installed)
- Internal time

Selection is made via the parameters **P-0-0200, Signal select probe 1** and **P-0-0201, Signal Select Probe 2**, and via bit 4 of **S-0-0169, Probe control parameter**.

P-0-0200 and P-0-0201 can be used to specify, separately for the two probe inputs, whether a position feedback value or an internal time is measured.

Value of P-0-0200/201:	Signal:
0	position feedback value 1/2
1	time

Fig. 8-5: Signal definition of probe function

Depending on that selection, units and fractional part digits of the parameters positive measured value, negative measured value, and difference between measured values of the respective probe are changed over.

If a position feedback value has been selected in the signal selection parameters, bit 4 of **S-0-0169, Probe control parameter** determines whether **S-0-0051, Position Feedback Value 1 (Motor Feedback)** or **S-0-0053, Position Feedback Value 2 (Ext. Feedback)** is used as a signal.

Connection of the probe inputs

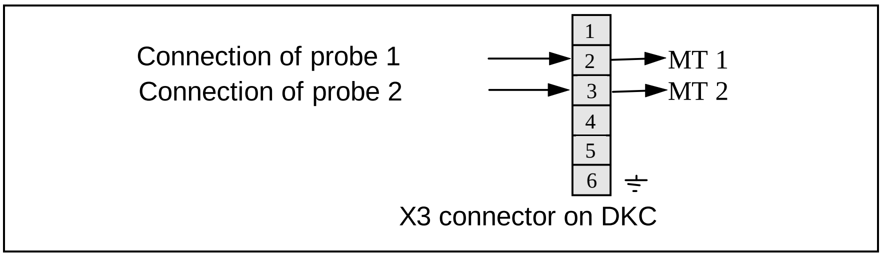

Fig. 8-6: Connection of the probe inputs

The following levels are used for the probe inputs:

Low : 0..+2,5V

High: +16V..U_{ext}(max)

8.3 Traveling to Dead Stop

The command **S-0-0149, D400 Positive stop drive procedure command** causes all controller monitoring functions to be switched off that would lead to an error message in class 1 diagnostic if the drive were blocked by a dead stop.

When the command is started, the drive generates the diagnosis **D400 Positive stop drive procedure command**

The controller monitoring functions are de-activated in any drive mode.

The error **D401, ZKL1-Error at Command Start** is generated if an error message of class 1 diagnostic is pending when the command is started.

The drive reports the command as properly terminated if

- the controller monitoring functions are switched off,
- $|Md|$ (S-0-0084) >= $|Md_{Grenz}|$ (S-0-0092), and
- $n_{ist} = 0$.

Note: **The message** $n_{ist} = 0$ is influenced by the parameter **S-0-0124, Standstill window**.

All original controller monitoring functions become active again when the controller clears the command after it has been executed.

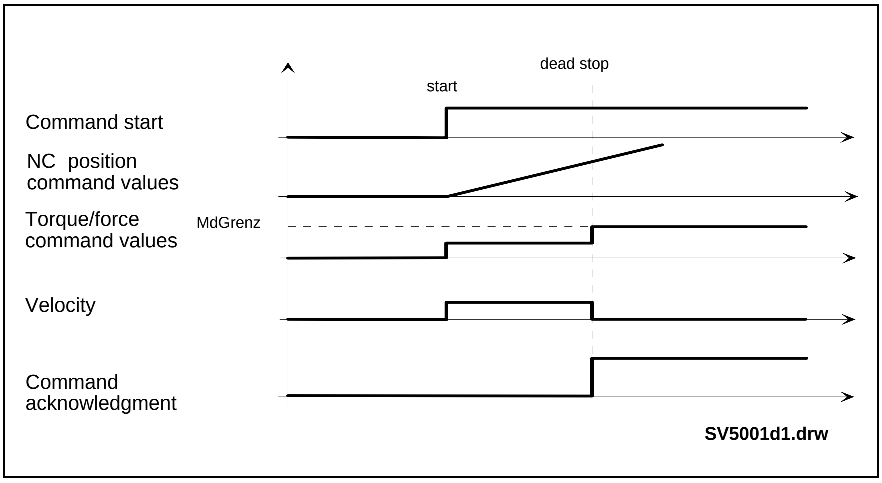

Fig. 8-7: Time diagram of activating the "driving to dead stop" command

9 Serial Communication

9.1 General Information About Serial Communication

The DKC02.1 unit possesses a serial interface that can be used for exchanging data and diagnosis information. The interface can be used in **RS232 mode** or in **RS485** mode.

9.2 Communication via RS232 Interface

The RS232 interface is provided particularly for connecting a PC that contains the DRIVETOP commissioning program. A maximum communication distance of 15 m is possible.

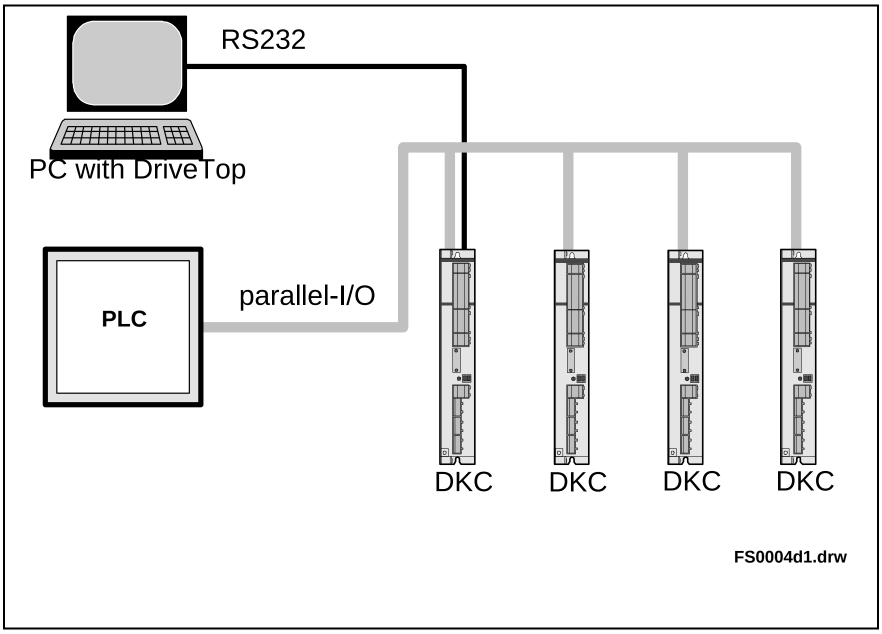

Fig. 9-1: : Communication via RS 232 interface

9.3 Communication via RS485 Interface

Communication via RS485 interface permits a serial bus with the following specifications to be implemented:

- Up to 32 drives can be connected with a bus master.
- Baud rates: 9,600 and 19,200 bits/s
- Max. communication distance: 1,000 m
- Half-duplex operation via 2 wires

Data exchange via RS485:

- Parameters
- Commands
- Diagnoses

Using several drives with DRIVETOP

Benefits:

- Commissioning several DKC units without reconnecting the interface cables (central connection for setting parameter values and diagnosis).
- Implementation of a central PC-based visualization unit.

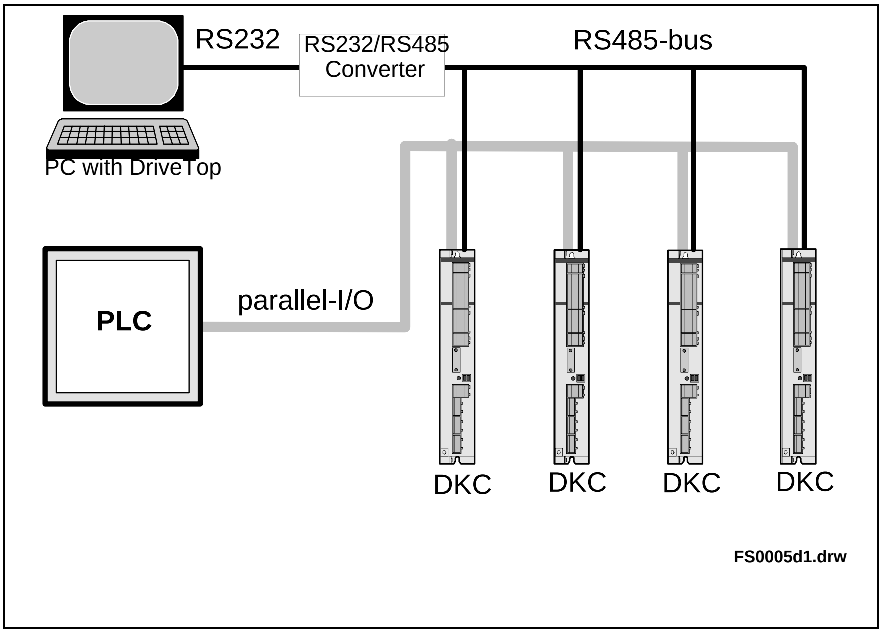

Fig. 9-2: Using several drives with DRIVETOP

Setting parameter values and diagnosis via a PLC

Benefits:

- Parameters can be modified via the PLC (e.g. adjusting positioning blocks)
- Reading the error code provides enhanced diagnostics for PLC.

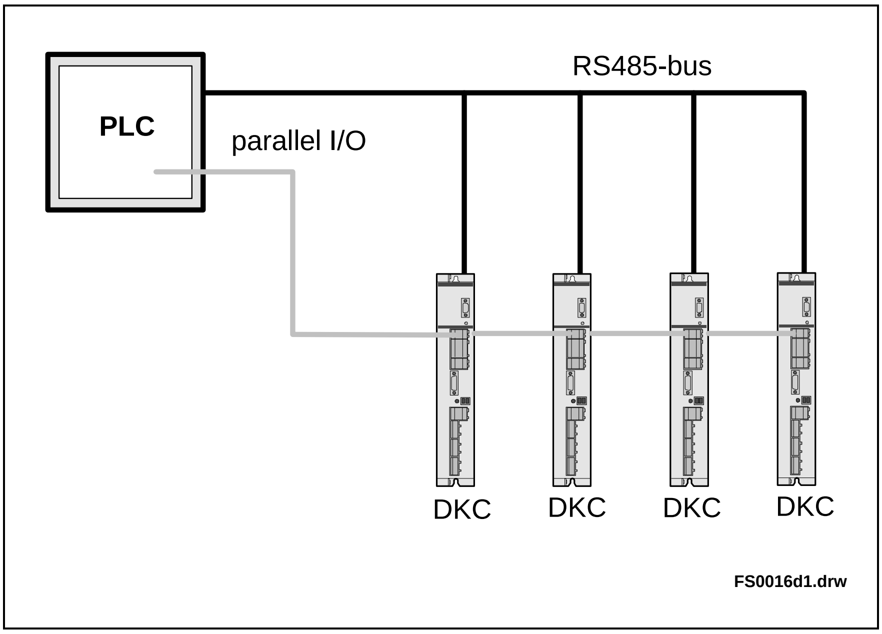

Fig. 9-3: Setting parameter values and diagnosis via a PLC

Setting parameter values and diagnosis of drive groups via an operator station

Benefits:

- Implementation of a central visualization unit.

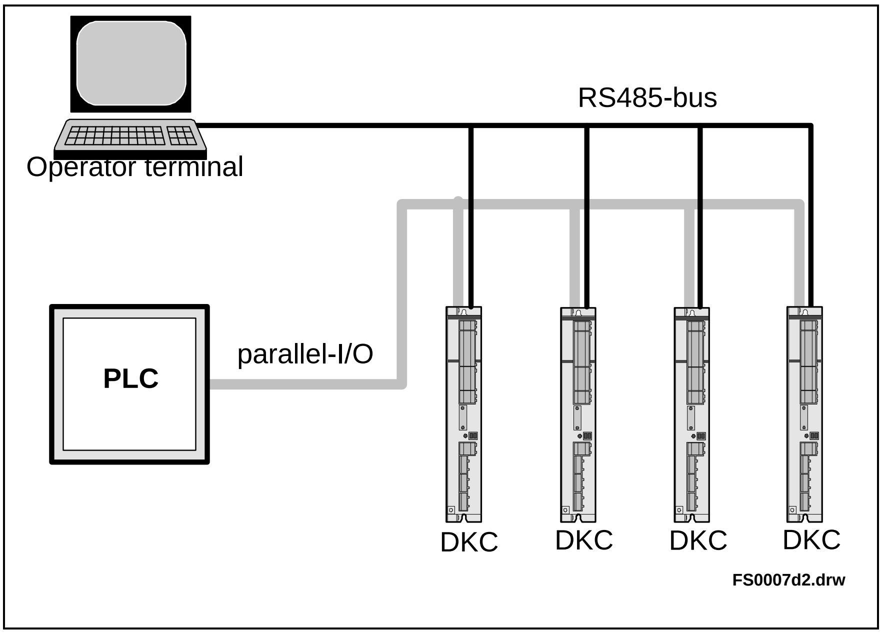

Fig. 9-4: Setting parameter values and diagnosis of drive groups via an operator station

9.4 Communication Procedures

Communication parameters

Three parameters control the data exchange via the serial interface:

- Baud rate (**P-0-4021**)
- Turnaround delay (**P-0-4050**)

If several drives are interconnected via the RS485 interface, data exchange must be organized by allocating drive addresses to the individual bus devices.

The drive address is selected on the rotary encoding switches on the front panel (S2 - units / S3 - tens). Valid addresses range between 1 and 99.

Example: Drive address 13

Set S2 to 3 and

S3 to 1

With the RS232 interface, the drive address need not necessarily be specified since only one drive can be connected here at any one time.

WARNING

If several drives are to be interconnected via RS485,

⇒ it must be ensured that only one drive per assigned address works on the serial bus.

P-0-4021
Baud rate

The baud rate of the serial interface can be selected. The following selections are possible:

0 : 9,600 bits/s

1 : 19,200 bits/s

WARNING

⇒ The same baud rate must be selected for all bus devices.

P-0-4050
Turnaround delay

The RS484 interface works in half-duplex mode. The data direction must be changed during data exchange. The DKC units need less than one millisecond for this process. The turnaround delay can be selected via a parameter in order to give the connected devices (PS or PLC) sufficient time for changing direction at their end.

The value is entered in ms. The maximum value possible is 200 ms.

Upon delivery, the turnaround delay is set to 1 ms. This selection is suitable for most PCs.

If you encounter communication problems (such as TIMEOUT message in DriveTop), increase the selected turnaround delay until the problem disappears. For safety reasons, the determined limit value should be multiplied by a safety factor of 1.5 before it is entered as turnaround delay value.

Selecting the drive address

Communication via the RS485 bus requires each bus device to have a specific bus address assigned. To avoid addressing conflicts, each address may only be assigned once.

Note: **In the DKC1.1 unit, the drive address is assigned via the RS232 interface using** DRIVETOP. The communication parameter **P-0-4022 Drive address** defines the active address of a bus device. With DKC2.1 and DKC3.1, the RS485 address of the drive is always the same as the SERCOS and/or PROFIBUS address. The address of those devices is selected via address selector switches on the unit.

Basic state after the control voltage is applied

All drives that are connected to the RS485 bus are in passive mode after the control voltage has been switched on.

Communication is not possible in passive mode. To change to active mode, the drive must specifically be addressed by a "change drive" command.

Addressing a specific bus device

To establish communication with a bus device, that bus device must specifically be addressed by a CHANGE DRIVE command, specifying the drive address. Each CD command activates the drive at the specified address, and puts all other drives in passive mode. The addressed drive responds with its prompt. From now on, communication is performed with the activated drive until another CHANGE DRIVE command changes over to a different drive.

Example:

BCD:04 (CR)	Command for selecting drive 4
S04:>	Echo from the connected drive. All other drives are passive.

Parameter structure

All parameters of the drive controller are stored in a uniform parameter structure. Each parameter consists of seven elements. The table below describes the individual elements and the access possibilities. The parameter structure shown here will be discussed in the following sections.

Element no.	Data block element	Access possibility
1	Ident number	Read
2	Name	Read
3	Attribute	Read
4	Unit	Read
5	Min. input value	Read
6	Max. input value	Read
7	Operating data	Read / write

Tab. 9-1: Parameter structure

Note: The Supplement contains a parameter description with detailed specifications of all available parameters.

Write access to a parameter

Write access to a parameter is usually performed in the following way:

S01:> ***Ident no. of the parameter, data block element number, w, operating data (carriage return)***

Once the write operation has been completed, the drive re-displays its prompt.

The following input is required to access the parameter value of the parameter P-0-0004, for example:

S01:>***P-0-0004,7,w,500 (carriage return)***

S01:>The drive writes 500 as operating data item (data block element 7)

Read access to a parameter

Read access to a parameter is usually performed in the following way:

S01:> ***Ident number of the parameter, data block element number, r (carriage return)***

The drive returns the contents of the addressed data block element.

The following input is required to access the operating data item of the parameter P-0-0004, for example:

S01:>***P-0-0004,7,r (carriage return)***

1000

The drive returns the operating data item 1000 (data block element 7).

Write access to list parameters

There are various lists in the drive. In the writing process, those lists must be addressed in a slightly modified way.

S01:> ***Ident number of the parameter, data block element number, w, > (carriage return)***

?List element 1 (carriage return)

?List element 2 (carriage return)

...

?List element x (carriage return)

?< (carriage return

The input must be terminated by the character "<". Only then, the data will be accepted in the drive.

Read access to list parameters

Read access to list parameters is performed in the same way as with normal parameters. In the reply, the drive returns all list elements.

Triggering a command

Various commands can be executed in the DKC. Within the drive controller, the commands are executed automatically. There are commands for:

- **Transition between operation and parameterization mode**
  S-0-0127 C1 Communication phase 3 transition check
  S-0-0128 C2 Communication phase 4 transition check
  P-0-4023 C4 Communication phase 2 transition check
- **Initial program loading** (S-0-0262)
- **Clear error** (S-0-0099)
- **Homing** (S-0-0148)
- **Setting absolute dimension** (P-0-0012)

A command can be started, interrupted, and terminated via the serial interface. The status of the command execution can be read.

A command is activated in the following way:

S01:> ***Ident number of the command,7,w,11 (carriage return)***

Inquiring the command status

The current status of a command can be inquired. This feature can specifically be used to ensure that the command execution at the drive end is completed before the connected controller (or PC) has terminated the command.

The command status is inquired in the following way:

S01:> ***Ident number of the command,1,w,0 (carriage return)***

After the ident number of the command parameter has been written, the drive reports the current command status.

11 (means that command is set in the drive)

Possible status messages:

- Command in the drive set
- Command execution in the drive enabled
- Command not yet executed
- Command execution not possible (error)
- Command properly executed
- Command execution in the drive interrupted
- Command in the drive not set

The command status is transmitted in the form of a bit list. The following figure shows the meanings of the individual bits.

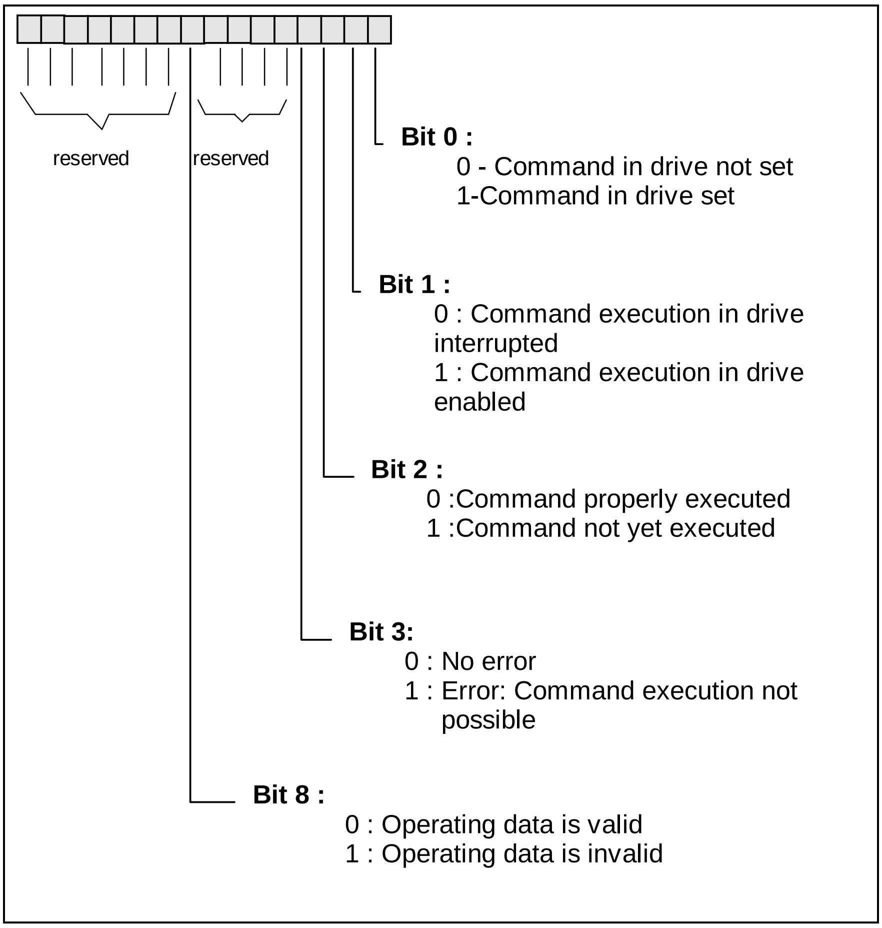

Fig. 9-5: Command acknowledgment (data status)

Terminating a command

A command is terminated in the following way:

S01:> ***Ident number of the command,7,w,0 (carriage return)***

Error messages

An error message is output if illegal parameter access is attempted or if, for example, an attempt is made to perform a write access to a data block element that cannot be written to:

List of the possible error codes

Error code:	Error description:
#1001	Ident number cannot be found
#1009	Incorrect access to element 1
#2001	Name cannot be found
#2002	Name transfer too short
#2003	Name transfer to long
#2004	Name cannot be written to
#2005	Name can currently not be written to
#3002	Attribute transfer too short
#3003	Attribute transfer too long
#3004	Attribute cannot be modified
#3005	Attribute currently write-protected
#4001	Unit cannot be found
#4002	Unit transfer too short
#4003	Unit transfer too long
#4004	Unit cannot be modified
#4005	Unit can currently not be modified
#5001	Min value cannot be found
#5002	Min value transfer too short
#5003	Min value transfer too long
#5004	Min value cannot be modified
#5005	Min value can currently not be modified
#6001	Max value cannot be found
#6002	Max value transfer too short
#6003	Max value transfer too long
#6004	Max value cannot be modified
#6005	Max value currently write-protected
#7002	Data transfer too short
#7003	Data transfer too long
#7004	Data cannot be written to
#7005	Data can currently not be written to
#7006	Data item < Min value
#7007	Data item > Max value
#7008	Data incorrect
#9001	Input cannot be identified
#9002	Parameter type error
#9003	Invalid data record number
#9004	Invalid data block number
#9005	Data element number not defined
#9006	Error in write/read code (r/w)
#9007	Invalid character in data

9.5 Typical Applications

Modifying positioning block data

Assumption:

- Several drives are connected to a PLC via RS485. The discussed drive has address 1.
- Drive works in positioning mode. Four positioning blocks are employed.
- The target positions of the positioning blocks shall be modified via the RS485 interface.

Establish communication with the axis concerned

BCD:01 (CR)	Command to change to the drive.
S01:>	Echo from the connected drive. All other drive are passive.

Note: The drive returns the complete input sequence after CR has been received. Individual characters are not echoed.

De-activate resident storage

During writing, the parameters are usually stored in an EEPROM. Thus the data will be retained when the power supply is switched off.

If you want to modify parameters frequently during operation (such as modifying the target positions of positioning blocks), there is a risk of exceeding the EEPROM's maximum permissible number of write cycles. To avoid that, resident storage must be switched off.

Every time the power supply is switched on, resident storage must be switched off from the connected controller. It remains in that state until the power supply is switched off.

Switch off resident storage: **S01:>** S-0-0269,7,w,1 (CR)

Write list of target positions to drive

The target positions of all axes are stored in the form of a list in the parameter P-0-4006. To modify one or more values of that list requires all relevant values to be written. If four target positions are used, all four positions must be written, even if only one position shall be modified.

S01:> P-0-4006, 7,w,> (CR)

?*100.0 (CR)*	target position	block0
?*200.0 (CR)*	target position	block1
?*300.0 (CR)*	target position	block2
?*400.0 (CR)*	target position	block3
?*<(CR)* (CR)		

The target positions are effective in the drive immediately after writing has been completed.

9.6 Connections

RS 485 connection

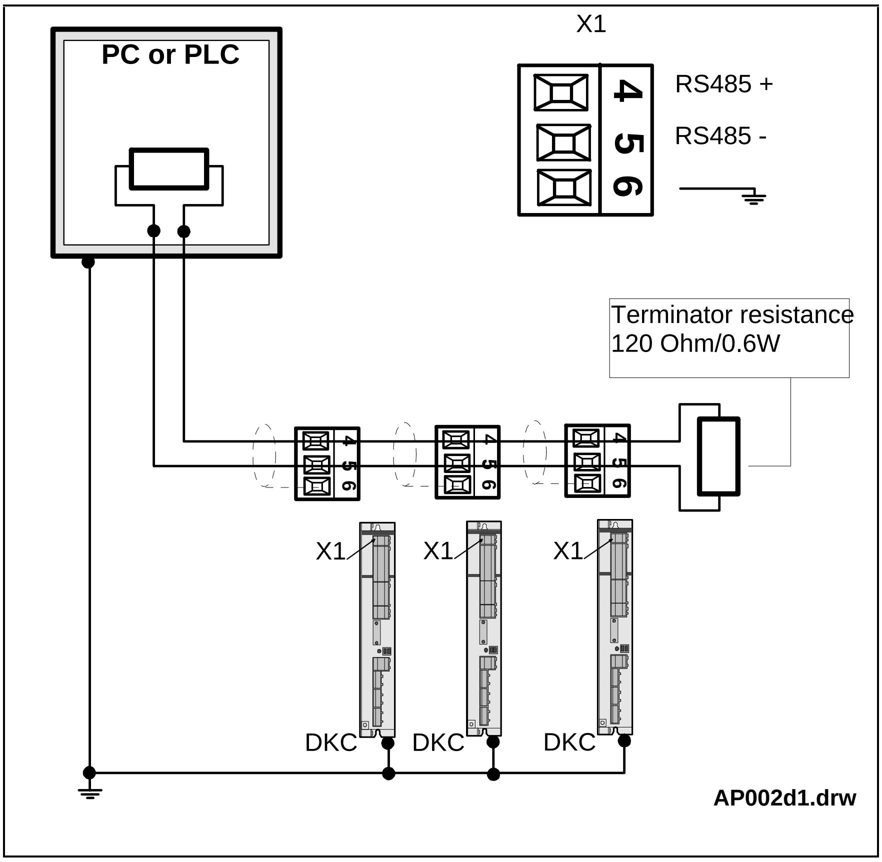

Fig. 9-6: RS 485 connection

Note: A maximum of 32 drives can be interconnected. The total cable length must not exceed 1000 m. The user must provide a terminating resistance at either end of the communication line, using double ferrules.

RS 232 connection

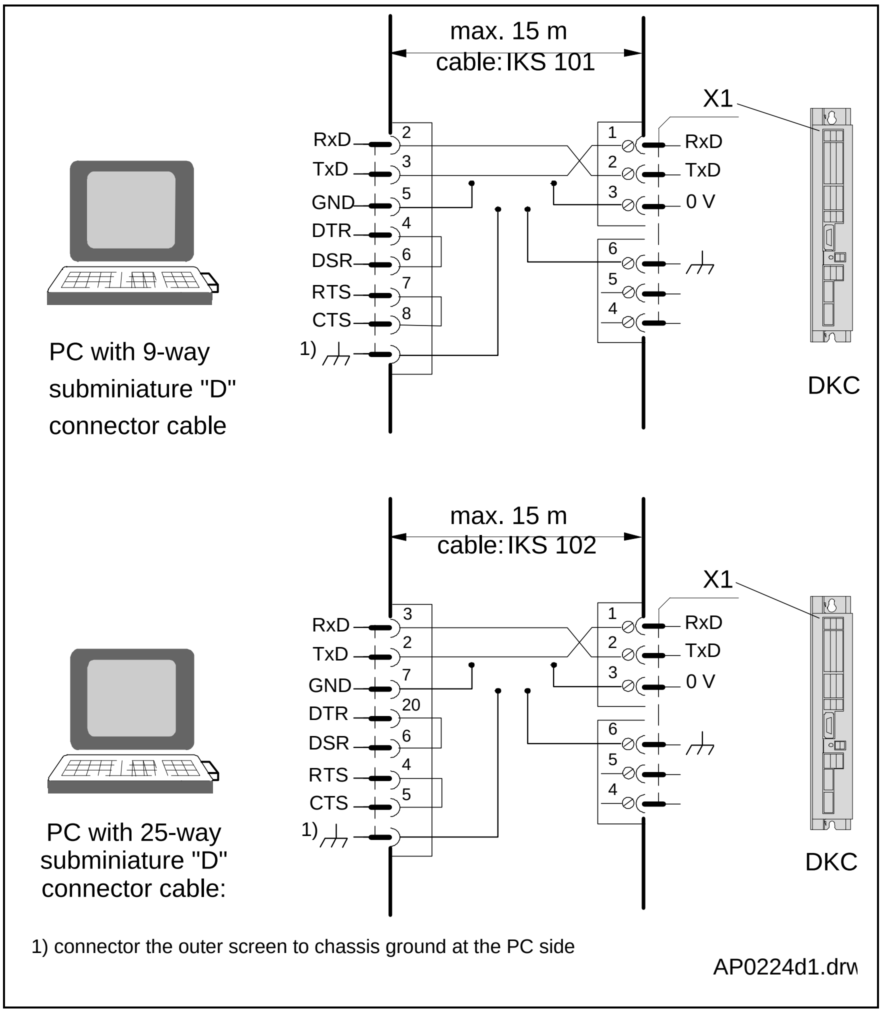

Fig. 9-7: RS 232 connection

Note: Only point-to-point connections are possible. The maximum cable length is 15 m. PC and drive controller must have a common central grounding point.

10 Glossar

Error reaction

If an error is detected in the drive, the drive responds automatically and performs an error reaction. Each error reaction shuts down the drive finally. The type of the error reaction depends on the error class and the setting of the parameters P-0-0117..119.

External encoder

The external measuring system is optional. In most cases it is directly connected to the load. The position feedback value from the encoder is stored in **S-0-0053, Position Feedback Value 2 (Ext. Feedback)**. Activating position control modes that employ encoder 2 closes the position control loop using the position feedback value from the external encoder.

Motor encoder

The motor encoder is a mandatory component. It is the measuring system that is used for commutation. The position feedback value from the encoder is stored in **S-0-0051, Position Feedback Value 1 (Motor Feedback)**. Activating position control modes that employ encoder 1 closes the position control loop using the position feedback value from the motor encoder.

Modulo format

Position feedback value and position command values can be processed in absolute format or in modulo format. If modulo processing has been selected, the position data lies inside the range 0 ... **S-0-013, Modulo Value**. The function permits endlessly rotating axes to be implemented.

Initial program loading

With MDD and MKD motors, the motor feedback data storage contains control parameters that enable smooth co-operation of the drive with the motor to be performed. The control parameters have not been optimized with respect to the application.

SERCOS INTERFACE

A digital interface that is used for communication between controllers and drives in numerically controlled machines. One or more loop structures are used. Usually, fiber optics cables are employed for establishing the physical connection between the devices.

Parameter setting mode

The drive is in parameter setting mode when communication phases 1...3 have been specified. The drive cannot be activated (i.e. activating the controller enable signal) in that mode. This requires operating mode to be selected first. Some parameters can only be set in parameter setting mode.

Operating mode

All drive-internal initialization procedures have been completed in operating mode. The communication transition checks for the communication phases 3 and 4 have been performed. The interface is in communication phase 4. Some parameters cannot be written to now. The drive may be activated by activating power and the controller enable signal.

Diagnosis

Drive diagnosis informs about the current drive state. It consists of a diagnosis number and a diagnosis text. Drive diagnosis is available on the seven-segment display (H1 display) and in the parameters **S-0-0390, Diagnostic Message Number** and **S-0-0095, Diagnostic Message**.

Command

Commands are used for controlling complex functions in the drive. Each command has a parameter assigned. The drive employs the command acknowledgment, that is a part of the data status, to report the current execution degree of the command.

Warning

A warning is used for diagnosing states that have not or not yet caused the drive to shut down. The cause of the warning should be eliminated. Failure to do so may cause an error to be generated and thus lead to an automatic shutdown of the drive.

Error

During operation, a variety of monitoring functions are performed in the drive. The drive generates an error if a state is detected that no longer ensures proper operation. Executing the error reaction automatically shuts down the drive.

Mode

The mode is selected in the parameters S-0-0032..35. It defines how a command value is processed in the drive and how it eventually leads to moving the axes. The mode does not specify how the command value gets into the drive.

Parameter

Communication with the drive controller is performed by reading and writing data block elements of the drive parameters. A parameter is addressed by its ident number (data block element 1).

Operating data item

Data block element 7 of a parameter is the operating data item. It contains the value of the parameter.

Data status

Each parameter has a data status that can be read from the controller via the required data channel. It contains information about the validity of the parameter, and the command’s command acknowledgment.

Scaling

Scaling stands for the combination of unit and number of fractional part digits of a parameter. It can be selected for position, velocity and acceleration data.

11 Index

ECODRIVE
Drive Controller DKC02.1

Supplement A
Parameter description
SSE 03VRS

DOK-ECODRV-SSE-03VRS**-FKB1-EN-P • 12.96

Contents

1 General

Document structure

This chapter lists all standard and product-related parameters in numerically ascending order.

In addition to the specifications in the Description of Functions, it gives a comprehensive description of all parameters that are used in the ECODRIVE Software.

The description of each individual parameter is subdivided into two sections:

1) General description
This section specifies function and meaning of the parameter, and provides help to setting its parameters.

2) Attribute description
The characteristics and features listed here are used for classifying the parameter. Albeit they are required for a complete description of the parameter, they are not relevant in a swift overview of the parameter's meaning.

Definitions

The following abbreviations are used in this document:

Data length :

2 bytes - the operating data item is 2 bytes long.

4 bytes - the operating data item is 4 bytes long.

1 byte variable - this is an operating data item of variable length (list). One data element is 1 byte long.

2 bytes variable - this is an operating data item of variable length (list). One data element is 2 bytes long.

4 bytes variable - this is an operating data item of variable length (list). One data element is 4 bytes long.

Format :

BIN - the operating data item shall be displayed in a binary format

HEX - the operating data item shall be displayed in a hexadecimal format

DEC_OV - the operating data item shall be displayed in a decimal format without a sign.

DEC_MV - the operating data item shall be displayed in a decimal format with a sign.

ASCII - the operating data item is a character string

IDN - the operating data item is an ident number

Modification :

no - the operating data item cannot be modified

P2 - the operating data item can only be modified in communication phase 2

P23 - the operating data item can only be modified in communication phases 2 and 3

P234 - the operating data item can be modified in any communication phase

P3 - the operating data item can only be modified in communication phase 3

P4 - the operating data item can only be modified in communication phase 4

Storage :

fixed - the operating data item has invariably been programmed in the drive

no - the operating data item is not buffered in the drive.

Param/EEPROM - the operating data item is buffered in the EEPROM of the programming module (DSM).

Drive/EEPROM - the operating data item is buffered in the EEPROM of the drive controller.

Feedb/EEPROM - the operating data item is buffered in the EEPROM of the motor feedback data storage (only with MDD and MKD motors)

Validity check:

no - the validity of the operating data item is not checked.

Phase 2 - the operating data item it checked in the command "**S-0-0127 Communication phase 3 transition check**"

Phase 3 - the operating data item it checked in the command "**S-0-0128 Communication phase 4 transition check**"

Limit check :

no - the limit values of the operating data item are not checked in the write operation.

yes - the limit values of the operating data item are checked in the write operation.

Combination check:

no - in the write operation, the operating data item is not checked for a valid combination (bit strings).

yes - in the write operation, the operating data item is checked for a valid combination (bit strings).

cyclic transfer:

no - the operating data item can neither in the master data message frame not in the drive message frame be configured as a cyclic data item

AT - the operating data item can be configured as a cyclic data item in the drive message frame.

MDT - the operating data item can be configured as a cyclic data item in the master data message frame.

2 Standard Parameters

S-0-0001, NC Cycle Time (TNcyc)

Description:

The NC cycle time specifies the time intervals at which the NC provides new command values. The NC cycle time must be transferred from the master to the slave during communication phase 2. From communication phase 3 onwards, it must be taken into account in the slave. The NC cycle time must be an integer multiple of **S-0-0002, SERCOS Cycle Time T_{Scyc}.**

$$T_{Ncyc} = T_{Scyc} * j, \quad \text{with } j = 1,2,3......$$

See also functional description of "Position command monitoring function.

S-0-0001 - attributes

Ident number:	S-0-0001	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	2000 / 65000	**Default value:**	4000

S-0-0002, SERCOS Cycle Time (Tscyc)

Description:

The interface cycle time specifies the time intervals at which the cyclic data is transferred. The interface cycle time values have been defined as 500 µs, 1 ms, and, in 1-ms increments, 2 ms ... 65 ms. The SERCOS cycle time must be transferred from the master to the slave during communication phase 2, and be activated in master and slave from communication phase 3 onwards.

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0002 - attributes

Ident number:	S-0-0002	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	2000 / 65000	**Default value:**	4000

S-0-0003, Minimum AT Transmit Starting Time (T1min)

Description:

In the value of this parameter, the slave specifies the minimum time required between the end of the received master synchronization message frame and the transmission of its drive message frame.

The master reads the time $T1_{min}$ in communication phase 2 in order to compute the value of **S-0-0006, AT Transmission Starting Time (T1)**.

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0003 - attributes

Ident number:	S-0-0003	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0004, Transmit/Receive Transition Time (TATMT)

Description:

The value of this parameter specifies the time required by the slave for changing over to receiving the master data message frame after its drive message frame has been transmitted.

The master reads the transmit - receive changeover time in order to compute the moment when the master message frame is transmitted (**S-0-0089, MDT Transmit Starting Time (T2)).**

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0004 - attributes

Ident number:	S-0-0004	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0005, Minimum Feedback Acquisition Time (T4min)

Description:

Minimum time required by the slave between actual value acquisition and the end of the master synchronization message frame. The drive specifies the value such that the current actual values can be transferred to the NC in the next drive message frame.

During communication phase 2, the master reads this value in order to select for all drives the moment in which the actual values are measured (**S-0-0007, Feedback Acquisition Starting Time (T4)**).

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0005 - attributes

Ident number:	S-0-0005	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0006, AT Transmission Starting Time (T1)

Description:

This transmission starting time parameter defines the moment after the end of the master synchronization message frame at which the slave must transmit its drive message frame during communication phases 3 and 4.

The parameter is transferred from the master to the slave during communication phase 2, and is active from communication phase 3 onwards.

The value of the transmission starting time parameter must be equal to or greater than the value of the **S-0-0003, Minimum AT Transmit Starting Time (T1min)** parameter.

Requirement: T1min ≤ T1

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0006 - attributes

Ident number:	S-0-0006	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	12 / 65535	**Default value:**	80

S-0-0007, Feedback Acquisition Starting Time (T4)

Description:

The time specified by the master at which the actual values are measured after the end of the master synchronization message frame. Thus, the master can specify the same measuring moment for all drives that are mutually co-ordinated. This ensures the actual value acquisition of the drives concerned to be synchronized. The cyclically transmitted command values are also processed at the time T4. The master must set the value of the feedback acquisition starting time parameter to a value that is smaller than or equal to the difference between **S-0-0002, SERCOS Cycle Time T_{Scyc}** and the inquired **S-0-0005, Minimum Feedback Acquisition Time (T4min)**.

Requirement: $T4 \leq T_{Scyc} - T4min$

See also functional description of "Configuration of message frame transmit and receive times"

S-0-0007 - attributes

Ident number:	S-0-0007	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	0 / 65535	**Default value:**	3500

S-0-0008, Command Valid Time (T3)

Description:

The "command valid time" parameter specifies the time from which onwards the drive may access the new command values.

Thus, the master may specify the same "command valid time" for all drives with co-ordinated operation. The drive activates the "command valid time" from communication phase 3 onwards.

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0008 - attributes

Ident number:	S-0-0008	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	0 / 65535	**Default value:**	420

S-0-0009, Beginning Address in Master Data Telegram

Description:

The parameter represents the start address of the data record of a drive in the MDT as a byte position that begins with 1 for the first data byte which follows the address field in the MDT.

The master notifies each drive of the start address of the drive data record in communication phase 2. The start address is activated from communication phase 3 onwards.

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0009 - attributes

Ident number:	S-0-0009	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	1 / 65531	**Default value:**	1

S-0-0010, Length of Master Data Telegram

Description:

The length of the master data message frame (MDT) in bytes includes the data records from all drives. The master transfers the MDT length to all drives during communication phase 2. Master and slave activate it from communication phase 3 onwards.

See also functional description of "Configuration of message frame transmit and receive times" function.

S-0-0010 - attributes

Ident number:	S-0-0010	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	4 / 65534	**Default value:**	4

S-0-0011, Class 1 Diagnostics

Description:

Function: Drive interlocking

When the drive detects a class 1 diagnostics error situation, the following activities are initiated in the drive:

1. Error reaction of the drive as described under "Error" in the Description of Functions.
2. Setting the static error bit for class 1 diagnostics in the drive status to "1". The drive resets the error bit to "0" if there is no class 1 diagnostics error pending when the command **S-0-0099, Reset class 1 diagnostic** is received from the drive via the service channel.

Parameter structure:

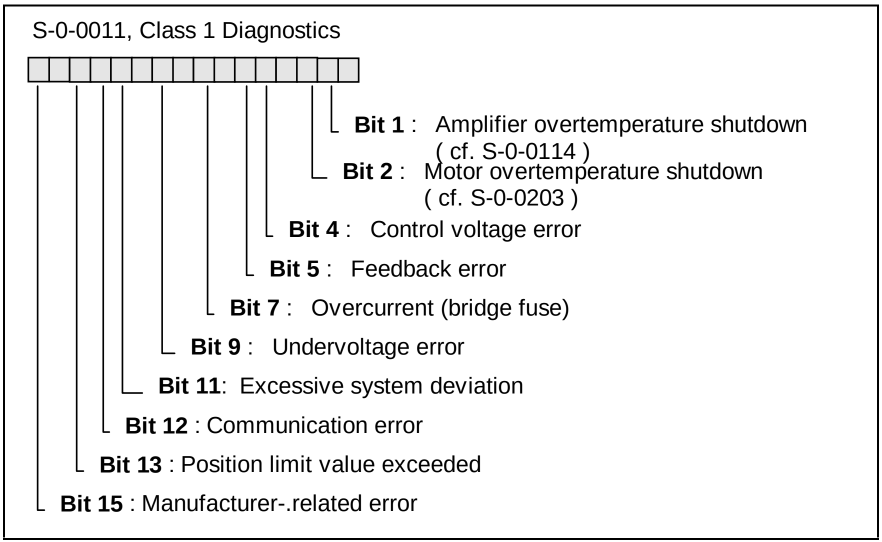

Fig. 2-1: S-0-0011, Diagnostics class

Note: The software only supports the bits that are listed here.

See also functional description of "S-0-0011, Class 1 Diagnostics" function.

S-0-0011 - attributes

Ident number:	S-0-0011	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0012, Class 2 Diagnostics

Description:

Function: Shutdown warning

The change bit of class 2 diagnostics in the drive status is set to "1" when a warning becomes active or disappears in class 2 diagnostics. Reading class 2 diagnostics via the service channel resets the change bit for class 2 diagnostics in the drive status to "0".

Parameter structure:

Bit 0 : Overload warning
Bit 1 : Amplifier overtemperature warning
Bit 2 : Motor overtemperature warning
Bit 3 : Reserved
Bit 4 : Reserved
Bit 5 : Positioning velocity > n_{limit}
Bit 6: Reserved
Bit 7: Reserved
Bit 8: Reserved
Bit 9 : Reserved
Bit 10: Reserved
Bit 11: Reserved
Bit 12 : Reserved
Bit 13 : Target position outside position limit values
Bit 14 : Reserved
Bit 15 : Manufacturer-related warning

Fig. 2-2: S-0-0012, Class 2 diagnostics

Note: The software only supports the bits that are listed here.

See also functional description of "S-0-0012, Class 2 Diagnostics" function.

S-0-0012 - attributes

Ident number:	S-0-0012	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0013, Class 3 Diagnostics

Description:

Function: Reporting the operating states

The change bit of class 3 diagnostics in the drive status is set to "1" when a message becomes active or disappears in class 3 diagnostics. Reading class 3 diagnostics via the service channel resets the change bit for class 3 diagnostics in the drive status to "0".

Parameter structure:

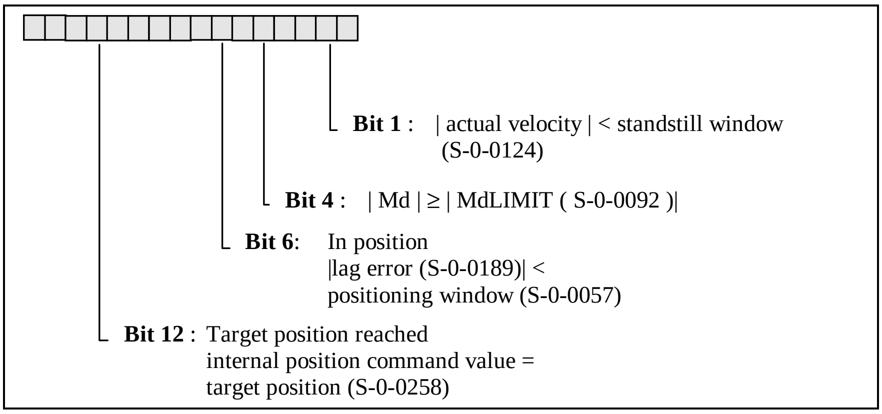

Fig. 2-3: S-0-0013, Class 3 diagnostics

Note: The software only supports the bits that are listed here.

See also functional description of "S-0-0013, Class 3 Diagnostics" function.

S-0-0013 - attributes

Ident number:	S-0-0013	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0014, Interface Status

Description:

Bits 3-15 of this parameter show whether or not a communication error has occurred:

all bits 3 .. 15 = 0 => no error

one bit of 3 .. 15 = 1 => error is pending

Bit 12 in parameter **S-0-0011, Class 1 Diagnostics** is set if a communication error is detected. The drive only resets the communication error to "0" if there is no error pending at the interface and the command **S-0-0099, Reset class 1 diagnostic** has been received via the service channel.

The first three bits (0, 1, 2) can be used for inquiring the current communication phase.

Parameter structure:

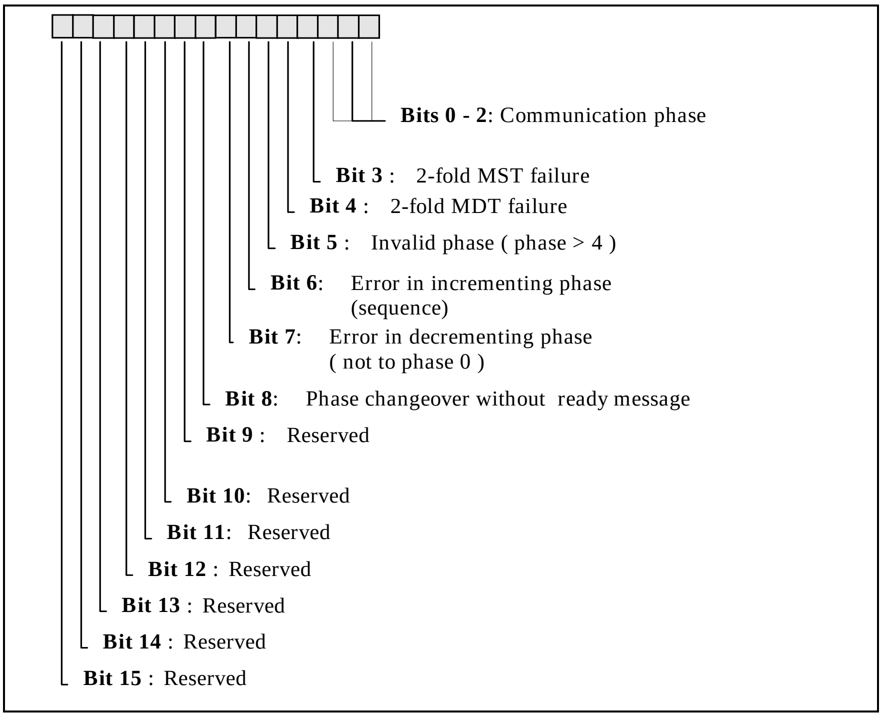

Fig. 2-4: S-0-0013, Interface Status

See also functional description of "Diagnosis of the interface status" function.

S-0-0014 - attributes

Ident number:	S-0-0014	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0015, Telegram Type Parameter

Description:

This parameter permits a selection to be made between preferred message frames and configured message frame.

The defined message frame type is only activated in master and slave from communication phase 3 onwards.

Parameter structure:

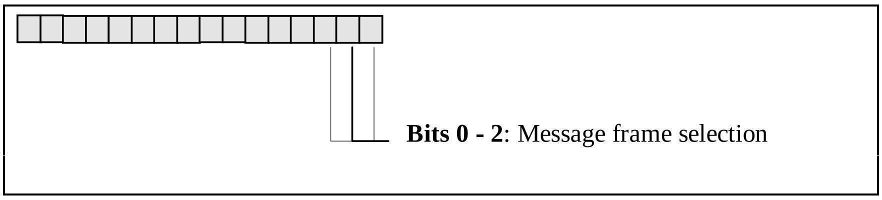

Fig. 2-5: S-0-0015, Message frame parameter

Note: The software only supports the bits that are listed here.

Message frames:

Bits 0-2:		**MDT:**	**AT:**
0	VZ 0	no cyclic data	no cyclic data
1	VZ 1	**DF1**: S-0-0080 torque command value	no cyclic data
2	VZ 2	**DF1**: S-0-0036 velocity command value	**DF1**: S-0-0040 actual velocity value
3	VZ 3	**DF1**: S-0-0036 velocity command value	**DF1**: S-0-0051/S-0-0053 pos. feedb. Val. 1
4	VZ 4	**DF1**: S-0-0047 position command value	**DF1**: S-0-0051/S-0-0053 pos. feedb. Val. 1
5	VZ 5	**DF1**: S-0-0047 position command value **DF2**: S-0-0036 velocity command value	**DF1**: S-0-0051/S-0-0053 pos. feedb. Val. 1 **DF2**: S-0-0040 actual velocity value
6	VZ 6	**DF1**: S-0-0036 velocity command value	no cyclic data
7		configurable message frame	

Fig. 2-6: Supported bits

with VZ : preferred message frame

DF1/2 : Data field 1 / 2

See also functional description of "Configuration of the message frame contents" function.

S-0-0015 - attributes

Ident number:	S-0-0015	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	0 / 7	**Default value:**	0

S-0-0016, Custom Amplifier Telegram Configuration List

Description:

If the configurable message frame has been defined in **S-0-0015, Telegram Type Parameter**, this list is used for application-related configuration of the configurable data block in the AT. The list may only contain operating data items that are listed in the parameter **S-0-0187, List of Configurable Data in the AT**.

See also functional description of "Configuration of the message frame contents" function.

S-0-0016 - attributes

Ident number:	S-0-0016	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes variable	**Validity check:**	Phase 2
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	" "

S-0-0017, IDN List of all Operation Data

Description:

This ID no. list contains the ident numbers of all other operating data items that exist in the drive.

See also functional description of "Parameter" function.

S-0-0017 - attributes

Ident number:	S-0-0017	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes variable	**Validity check:**	No
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0021, IDN List of Invalid Op. Data for Comm. Ph. 2

Description:

Prior to performing a phase transition from 2 to 3 that has been initiated by the controller using the transition check command to **S-0-0127 C1 Communication phase 3 transition check**, the drive checks whether all communication parameters are complete and correct. The drive enters the required or invalid operating data items in this ID no. list if it recognizes that one or more ident numbers are invalid. The error diagnosis message **C101, Invalid Communication Parameter** is used for notifying the drive of that situation.

See also functional description of "**S-0-0127 C1 Communication phase 3 transition check**" function.

S-0-0021 - attributes

Ident number:	S-0-0021	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes variable	**Validity check:**	No
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3

Description:

Prior to performing a phase transition from 3 to 4 that has been initiated by the controller using the transition check command to **S-0-0128 C1 Communication phase 4 transition check**, the drive checks the parameters for the following points:

- validity of the parameter
- parameter is inside the valid input range
- compatibility with other parameters

If a parameter does not comply with these requirements, the drive enters the operating data item in the ID no. list.

The drive employs the following messages for acknowledging the transition command:

- **C201 Invalid Parameter, or**
- **C202 Limit Error Parameter, or**
- **C203 Parameter Calculation Error**

See also functional description of "**S-0-0128, C2 Communication phase 4 transition check**" function.

S-0-0022 - attributes

Ident number:	S-0-0022	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes variable	**Validity check:**	No
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0024, Config. List of the Master Data Telegram

Description:

Provided that the configured message frame has been defined in **S-0-0015, Telegram Type Parameter**, the configurable data record in the MDT is configured via this list to meet the application.

The list may only contain operating data items that are contained in the parameter **S-0-0188, List of configurable data in the MDT**.

See also functional description of "Configuration of the message frame contents" function.

S-0-0024 - attributes

Ident number:	S-0-0024	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes variable	**Validity check:**	Phase 2
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	"."

S-0-0028, MST Error Count

Description:

The "MST error count" parameter counts all invalid MSTs in the communication phases 3 and 4.

If two MSTs fail in immediate succession, the unit generates the error message **F401, Double MST Error Shutdown** and returns to phase 0.

The "MST error count" parameter stops at (2^16) - 1. This means that the value of an error counter in a heavily disturbed environment will be 65,535 after a long time.

See also functional description of "Error counter for message frame failures" function.

S-0-0028 - attributes

Ident number:	S-0-0028	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0029, MDT Error Counter

Description:

The "MDT error count" parameter counts all invalid master data message frames in the communication phases 3 and 4.

If two MDTs fail in immediate succession, the unit generates the error message **F402, Double MDT Error Shutdown** and returns to phase 0.

The "MDT error count" parameter stops at (2^16) - 1. This means that the value of an error counter in a heavily disturbed environment will be 65,535 after a long time.

See also functional description of "Error counter for message frame failures" function.

S-0-0029 - attributes

Ident number:	S-0-0029	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0030, Manufacturer Version

Description:

This parameter permits the drive software version to be read.

Example: DKC02.1-SSE-03V01

S-0-0030 - attributes

Ident number:	S-0-0030	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	1 byte variable	**Validity check:**	No
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0032, Primary Mode of Operation

Description:

The mode defined in this parameter is activated in the drive if

- the primary mode of operation has been selected in the master control word (bits 8 and 9 = "00").
- control and power section are operational
- the controller enabling signal RF has been set

The mode is selected by entering a bit list. Certain positions have invariably been defined in that bit list.

Bit 3, for example, selects whether position control with or without lag error is to be employed:

Bit 3 = 0 position control with lag error
Bit 3 = 1 position control without lag error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2

Fig. 2-7: Bit list S-0-0032

See also functional description of "Setting the operating parameters" function.

S-0-0032 - attributes

Ident number:	S-0-0032	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	10b

S-0-0033, Secondary Operation Mode 1

Description:

The mode defined in this parameter is activated in the drive if

- the primary mode of operation has been selected in the master control word (bits 8 and 9 = "01").
- control and power section are operational
- the controller enabling signal RF has been set

The mode is selected by entering a bit list. Certain positions have invariably been defined in that bit list. Bit 3, for example, selects whether position control with or without lag error is to be employed:

Bit 3 = 0 position control with lag error
Bit 3 = 1 position control without lag error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2

Fig. 2-8: Bit list S-0-0033

See also functional description of "Setting the operating parameters" function.

S-0-0033 - attributes

Ident number:	S-0-0033	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	10b

S-0-0034, Secondary Operation Mode 2

Description:

The mode defined in this parameter is activated in the drive if

- the primary mode of operation has been selected in the master control word (bits 8 and 9 = "10").
- control and power section are operational
- the controller enabling signal RF has been set

The mode is selected by entering a bit list. Certain positions have invariably been defined in that bit list.

Bit 3, for example, selects whether position control with or without lag error is to be employed:

Bit 3 = 0	position control with lag error
Bit 3 = 1	position control without lag error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2

Fig. 2-9: Bit list S-0-0034

See also functional description of "Setting the operating parameters" function.

S-0-0034 - attributes

Ident number:	S-0-0034	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	10b

S-0-0035, Secondary Operation Mode 3

Description:

The mode defined in this parameter is activated in the drive if

- the primary mode of operation has been selected in the master control word (bits 8 and 9 = "11").
- control and power section are operational
- the controller enabling signal RF has been set

The mode is selected by entering a bit list. Certain positions have invariably been defined in that bit list.

Bit 3, for example, selects whether position control with or without lag error is to be employed:

Bit 3 = 0	position control with lag error
Bit 3 = 1	position control without lag error

Bit list:	Meaning:
0000,0000,0000,0001	Torque control
0000,0000,0000,0010	Velocity control
0000,0000,0000,x011	Position control with encoder 1
0000,0000,0000,x100	Position control with encoder 2
0000,0000,0001,x011	Drive-internal interpolation, encoder 1
0000,0000,0001,x100	Drive-internal interpolation, encoder 2

Fig. 2-10: Bit list S-0-0035

See also functional description of "Setting the operating parameters" function.

S-0-0035 - attributes

Ident number:	S-0-0035	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	10b

S-0-0036, Velocity Command Value

Description:

The velocity command value is specified in this parameter. Together with **S-0-0037, Additive velocity command value**, it produces the drive's effective velocity command value.

In position control modes, this parameter shows the position controller's output quantities.

See also functional description of "Velocity control" function.

S-0-0036 - attributes

Ident number:	S-0-0036	**Modification:**	P234
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	MDT
Input min./ max.:	S-0-0044	**Default value:**	--

S-0-0037, Additive velocity command value

Description:

In the drive, the additive velocity command value is added to **S-0-0036, Velocity Command Value**.

See also functional description of "Velocity control" function.

S-0-0037 - attributes

Ident number:	S-0-0037	**Modification:**	P234
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	MDT
Input min./ max.:	S-0-0044	**Default value:**	--

S-0-0040, Velocity Feedback Value

Description:

The drive transmits the velocity feedback value cyclically or via the service channel to the controller.

See also: functional description of "Preparing the velocity controller settings".

S-0-0040 - attributes

Ident number:	S-0-0040	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	AT
Input min./ max.:	S-0-0044	**Default value:**	--

S-0-0041, Homing Velocity

Description:

The product of **S-0-0041, Homing velocity** and **S-0-0108, Feedrate override** provides the velocity that is used by the drive for executing the command **S-0-0148, C6 Drive controlled homing procedure**.

See also: functional description of "Drive-controlled homing"

S-0-0041 - attributes

Ident number:	S-0-0041	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	No
Input min./ max.:	>0 / S-0-0044	**Default value:**	1000000

S-0-0042, Homing acceleration

Description:

This parameter specifies the acceleration value the drive employs for executing the command **S-0-0148, C6 Drive controlled homing procedure**.

See also: functional description of "Drive-controlled homing"

S-0-0042 - attributes

Ident number:	S-0-0042	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0160	**Combination check:**	No
Fractional part digits:	S-0-0160	**Cyclic transfer:**	No
Input min./ max.:	>0 / S-0-0160	**Default value:**	1000000

S-0-0043, Velocity polarity parameter

Description:

This parameter permits the polarity of the velocity data items to be selected according to the needs of the application.

The polarities are changed outside (at input and output) of a controlled system, not inside such a system.

The following applies to rotary motors:
Looking onto the motor shaft, positive velocity command value and positive polarity provide clockwise rotation.

The following applies to linear motors:
Positive direction is assumed when the primary part of the linear motor travels in the direction of the power supply connections at its end face.

Parameter structure:

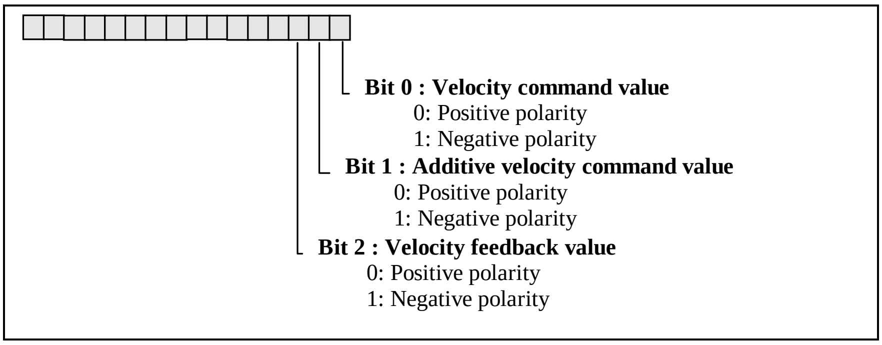

Fig. 2-11: S-0-0043, Velocity polarity parameter

See also: functional description of "Polarities of command and feedback values".

S-0-0043 - attributes

Ident number:	S-0-0043	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	0

S-0-0044, Velocity data scaling type

Description:

Various scaling types can be defined for the velocity data in the drive.

Parameter structure:

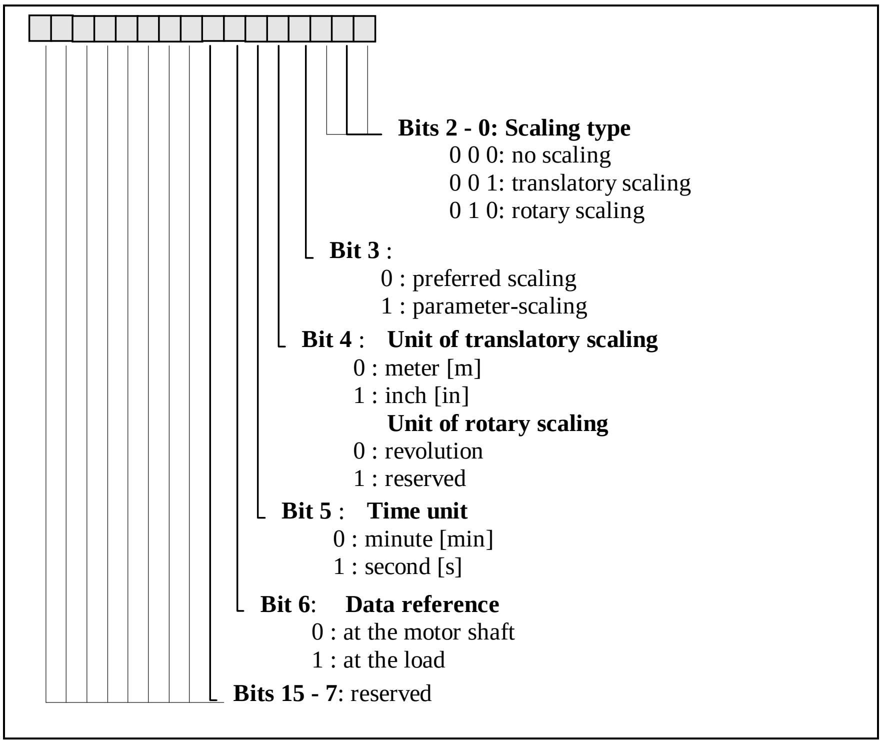

Fig. 2-12: S-0-0044, Velocity data scaling type

See also: functional description of "Velocity data display format"

S-0-0044 - attributes

Ident number:	S-0-0044	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Check_P3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	0xA

S-0-0045, Velocity data scaling factor

Description:

This parameter defines the scaling factor of all velocity data items in the drive.

It is set to "1" if preferred scaling is selected via **S-0-0044, Velocity data scaling type**.

See also: functional description of "Velocity data display format"

S-0-0045 - attributes

Ident number:	S-0-0045	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	1 / 65535	**Default value:**	1

S-0-0046, Velocity data scaling exponent

Description:

This parameter defines the scaling exponent of all velocity data items in the drive.

See also: functional description of "Velocity data display format"

S-0-0046 - attributes

Ident number:	S-0-0046	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-32 / 32	**Default value:**	-4

S-0-0047, Position Command Value

Description:

In position control mode, this parameter is transferred from the controller to the drive at the NC cycle time frequency.

See also: functional description of "Position control".

S-0-0047 - attributes

Ident number:	S-0-0047	**Modification:**	P234
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	MDT
Input min./ max.:	S-0-0076	**Default value:**	--

S-0-0049, Positive position limit value

Description:

The "positive position limit value" parameter describes the maximum travel distance in positive direction.

The position limit value is only active if all position data items are related to the reference point (bit 0 of the parameter **S-0-0403, Position feedback value status** is "1"). Bit 5 in **S-0-0055, Position Polarity Parameter** enables the position limit values to be de-activated.

If the drive receives an **S-0-0258, Target Position** that lies beyond the positive position limit value, it sets the warning bit 13 in **S-0-0012, Class 2 Diagnostics** and generates the warning **E253, Target position out of travel zone**.

If the positive position limit value is exceeded, the drive sets error bit 13 in **S-0-0011, Class 1 Diagnostics**.

See also: functional description of "Position limit values"

S-0-0049 - attributes

Ident number:	S-0-0049	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./ max.:	S-0-0076	**Default value:**	1000000

S-0-0050, Negative position limit value

Description:

The "negative position limit value" parameter describes the maximum travel distance in negative direction.

The position limit value is only active if all position data items are related to the reference point (bit 0 of the parameter **S-0-0403, Position feedback value status** is "1"). Bit 5 in **S-0-0055, Position Polarity Parameter** enables the position limit values to be de-activated.

If the drive receives a target position that lies beyond the negative position limit value, it sets the warning bit 13 in **S-0-0012, Class 2 Diagnostics** and generates the warning **E253, Target position out of travel zone**.

If the negative position limit value is exceeded, the drive sets error bit 13 in **S-0-0011, Class 1 Diagnostics**.

See also: functional description of "Position limit values"

S-0-0050 - attributes

Ident number:	S-0-0050	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./ max.:	S-0-0076	**Default value:**	-1000000

S-0-0051, Position Feedback Value 1 (Motor Feedback)

Description:

"Position Feedback Value 1 (Motor Feedback)" represents the current position of the motor encoder. The value can be transferred from the drive to the controller.

See also: functional description of "Setting the measuring systems"

S-0-0051 - attributes

Ident number:	S-0-0051	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./ max.:	-- / --	**Default value:**	--

S-0-0052, Reference distance 1

Description:

The parameter represents the distance between machine zero and the reference point of the motor measuring system (reference distance 1).

After the command **S-0-0148, C6 Drive controlled homing procedure** has been executed, the drive sets **S-0-0047, Position Command Value** to that value if the motor encoder has been homed.

See also: functional description of "Drive-controlled homing"

S-0-0052 - attributes

Ident number:	S-0-0052	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./ max.:	S-0-0076	**Default value:**	0

S-0-0053, Position Feedback Value 2

Description:

Position Feedback Value 2 always refers to an external encoder.

See also: functional description of "Setting the measuring systems"

S-0-0053 - attributes

Ident number:	S-0-0053	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./ max.:	-- / --	**Default value:**	--

S-0-0054, Reference distance 2

Description:

The parameter represents the distance between machine zero and the reference point of the external measuring system (reference distance 2).

After the command **S-0-0148, C6 Drive controlled homing procedure** has been executed, the drive sets **S-0-0047, Position Command Value** to that value if the motor encoder has been homed.

See also: functional description of "Drive-controlled homing"

S-0-0054 - attributes

Ident number:	S-0-0054	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./ max.:	S-0-0076	**Default value:**	0

S-0-0055, Position Polarity Parameter

Description:

This parameter permits the polarity of the specified position data items to be inverted. The polarities are changed outside (at input and output) of a controlled system, not inside such a system.

The following applies to rotary motors:
Looking onto the motor shaft, positive position command value difference and positive polarity provide clockwise rotation of the shaft.

The following applies to linear motors:
Positive direction is assumed when the primary part of the linear motor travels in the direction of the power supply connections at its end face.

Bit 4 is used for activating and de-activating software position limits.

Parameter structure:

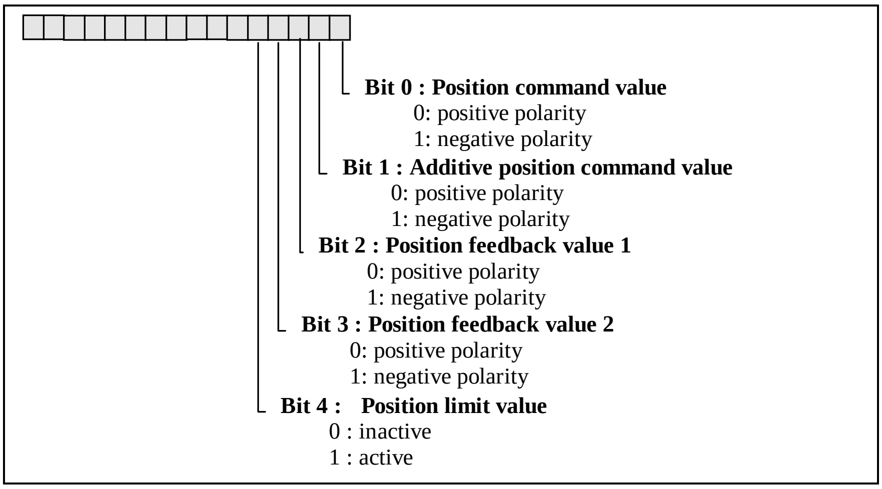

Fig. 2-13: S-0-0055, Position polarity parameter

Note: The software only supports the bits that are listed here. If the controller modifies bit 0, the drive sets bits 1...3 to the value of bit 0.

See also: functional description of "Polarity of command and feedback values"

S-0-0055 - attributes

Ident number:	S-0-0055	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	0 / 31	**Default value:**	0

S-0-0057, Positioning window

Description:

The drive sets the "im-position" bit in **S-0-0013, Class 3 Diagnostics** if the amount of the difference between position feedback value and target position is smaller than the value of the positioning window.

During the execution of the command **S-0-0148, C6 Drive controlled homing procedure**, this parameter is used for reporting the completion of the command if the position feedback value enters the range of reference point ± **S-0-0057 Positioning window**.

See also: functional description of "S-0-0182, Manufacturer Class 3 Diagnostics"

S-0-0057 - attributes

Ident number:	S-0-0057	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./ max.:	0 / S-0-0076	**Default value:**	1000

S-0-0059, Position switch flag parameter

Description:

The flag of the position switching point depends on the position feedback value.

The associated flag is set to "0" if the position feedback value is smaller than the position switching point. The associated flag is set to "1" if the position feedback value is greater than or equal to the position switching point. The state of the "waypoint" output corresponds to that flag.

S-0-0059 - attributes

Ident number:	S-0-0059	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	binary	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0060, Position Switch point 1

A position switch consists of a position switching point and a position switching point flag. The associated flag is set to "0" if the position feedback value is smaller than the position switching point. The associated flag is set to "1" if the position feedback value is greater than or equal to the position switching point.

S-0-0060 - attributes

Ident number:	S-0-0060	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Yes
Format:		**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./ max.:	S-0-0076	**Default value:**	0

S-0-0076, Position Data Scaling Type

Description:

Various scaling types can be selected for the position data in the drive.

Parameter structure:

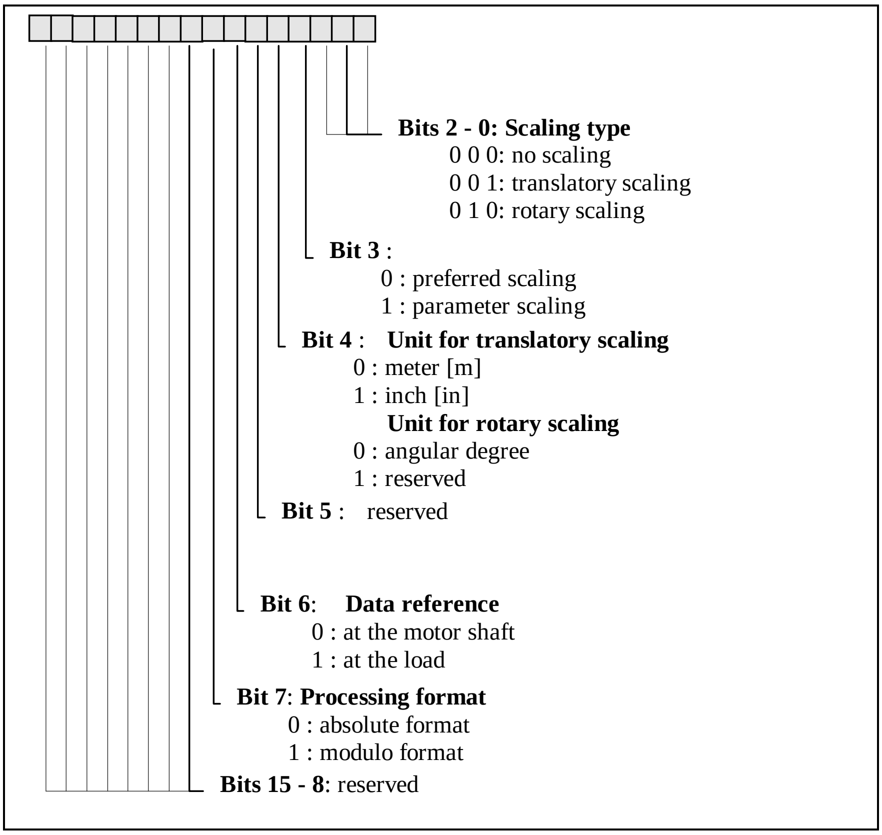

Fig. 2-14: S-0-0076, Scaling type for position data

Note: The software only supports the bits that are listed here.

See also: functional description of "Position data display format"

S-0-0076 - attributes

Ident number:	S-0-0076	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	1010b

S-0-0077, Linear Position Data Scaling Factor

Description:

This ID number contains the scaling factor that is employed for scaling all position data items in the drive.

The parameter is set to "1" if translatory scaling has been selected in **S-0-0076, Position Data Scaling Type**.

See also: functional description of "Position data display format"

S-0-0077 - attributes

Ident number:	S-0-0077	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	1

S-0-0078, Linear Position Data Scaling Exponent

Description:

This ID number contains the scaling exponent that is employed for scaling all position data items in the drive if translatory scaling has been selected.

The drive sets this parameter if translatory scaling is selected.

See also: functional description of "Position data display format"

S-0-0078 - attributes

Ident number:	S-0-0078	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-32 / 32	**Default value:**	-7

S-0-0079, Rotatational position resolution

Description:

If rotary position scaling is selected, this parameter is used for selecting the LSB scaling of all position data items.

The LSB can be determined as follows:

Example:

A value of 36000 must be selected to obtain an LSB resolution of 0.01 degrees.

If preferred scaling has been selected in **S-0-0076, Position Data Scaling Type**, rotary position solution is set to 3,600,000. For the LSB, this means a resolution of 0.0001 degrees.

See also: functional description of "Position data display format"

S-0-0079 - attributes

Ident number:	S-0-0079	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	1 / 0xFFFFFFFF	**Default value:**	36000

S-0-0080, Torque/Force Command

Description:

In "torque control" mode, the torque command values are transferred from the controller to the drive. The torque required for the individual velocities can be retrieved from this parameter if the velocity controller is active. Currently, only percent scaling is supported.

The data item corresponds to the current command value, referring to the motor standstill current (S-0-0111).

Conversion into a torque or force value is possible by multiplying the command current with the torque/force constant (P-0-0051).

See also: functional description of "Torque/force controller"

S-0-0080 - attributes

Ident number:	S-0-0080	**Modification:**	P234
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0086	**Combination check:**	No
Fractional part digits:	S-0-0086	**Cyclic transfer:**	MDT/AT
Input min./ max.:	P-0-4046	**Default value:**	--

S-0-0084, Torque/Force Feedback Value

Description:

Currently, only percent scaling is supported.

The data item corresponds to the measured actual current value, referring to the motor standstill current (S-0-0111).

Conversion into a torque or force value is possible by multiplying the actual current with the torque/force constant (P-0-0051).

S-0-0084 - attributes

Ident number:	S-0-0084	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0086	**Combination check:**	No
Fractional part digits:	S-0-0086	**Cyclic transfer:**	AT
Input min./ max.:	-- / --	**Default value:**	--

S-0-0085 Torque polarity parameter

Description:

This parameter permits the polarities of the specified torque data to be reversed according to the application requirements.

The polarities are changed outside (at input and output) of a controlled system, not inside such a system.

The following applies to rotary motors:
Looking onto the motor shaft, a positive position torque command value and positive polarity provide clockwise rotation of the shaft.

Parameter structure:

Bit 0 : Torque command value
0: positive polarity
1: negative polarity

Bit 1 : Additive torque command value
0: positive polarity
1: negative polarity

Bit 2 : Actual torque value
0: positive polarity
1: negative polarity

Fig. 2-15: S-0-0085, Torque/force polarity parameter

Note: If the controller modifies bit 0, the drive sets bits 1...2 to the value of bit 0.

S-0-0085 - attributes

Ident number:	S-0-0085	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./ max.:	0 / --	**Default value:**	0

S-0-0086, Torque/Force data scaling type

Description:

Currently, only percent scaling of the torque/force data is supported.

100 % = S-0-0111, motor standstill current

See also: functional description of "Selectable scaling of position, velocity, and acceleration data"

S-0-0086 - attributes

Ident number:	S-0-0086	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	0

S-0-0088, Receive to Receive Recovery Time (TMTSY)

Description:

This parameter defines the time that is required by a slave for becoming ready for receiving the next master synchronization message frame after it has received a master data message frame.

The controller reads the parameter in phase 2 in order to compute the time slot parameter.

See also: functional description of "Configuration of message frame transmit and receive times"

S-0-0088 - attributes

Ident number:	S-0-0088	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0089, Transmit Starting Time (T2)

Description:

This parameter defines the beginning of the transmission of the master data message frame after the end of the master synchronization message frame. The master transfers the value to the slave during communication phase 2. The value is activated in phase 3.

See also: functional description of "Configuration of message frame transmit and receive times"

S-0-0089 - attributes

Ident number:	S-0-0089	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 2
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	0 / 65535	**Default value:**	363

S-0-0090, Command Value Transmit Time (TMTSG)

Description:

Time required in the slave for providing the command values for the drive after the master data message frame has been received.

See also: functional description of "Configuration of message frame transmit and receive times"

S-0-0090 - attributes

Ident number:	S-0-0090	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0091, Bipolar Velocity Limit Value

Description:

The bipolar velocity limit value parameter describes the maximum velocity that is permitted symmetrically in either direction. **S-0-0113, Maximum Motor Speed (nmax)** defines the maximum value that may be entered.

See also: functional description of "Velocity limitation"

S-0-0091 - attributes

Ident number:	S-0-0091	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	MDT
Input min./ max.:	>0 / S-0-0113	**Default value:**	10000000

S-0-0092, Bipolar Torque/Force Limit Value

Description:

This parameter describes the maximum torque that is permitted symmetrically in either direction (accelerating, decelerating).

See also: functional description of "Torque/force limitation"

S-0-0092 - attributes

Ident number:	S-0-0092	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0086	**Combination check:**	No
Fractional part digits:	S-0-0086	**Cyclic transfer:**	MDT
Input min./ max.:	0 / P-0-4046	**Default value:**	5000

S-0-0093, Torque/Force data scaling factor

Description:

This parameter is used for specifying the scaling factor for all torque/force data items in the drive.

See also: functional description of "Selectable scaling of position, velocity and acceleration data"

S-0-0093 - attributes

Ident number:	S-0-0093	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	1 / 65535	**Default value:**	1

S-0-0094, Torque/Force data scaling exponent

Description:

This parameter is used for defining the scaling exponent for all torque/force data items in the drive.

See also: functional description of "Selectable scaling of position, velocity and acceleration data"

S-0-0094 - attributes

Ident number:	S-0-0094	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-32 / 32	**Default value:**	-1

S-0-0095, Diagnostic Message

Description:

This parameter contains the currently relevant operating state of the drive.

It is preceded by the diagnosis number from **S-0-0390, Diagnostic Message Number**.

Example:

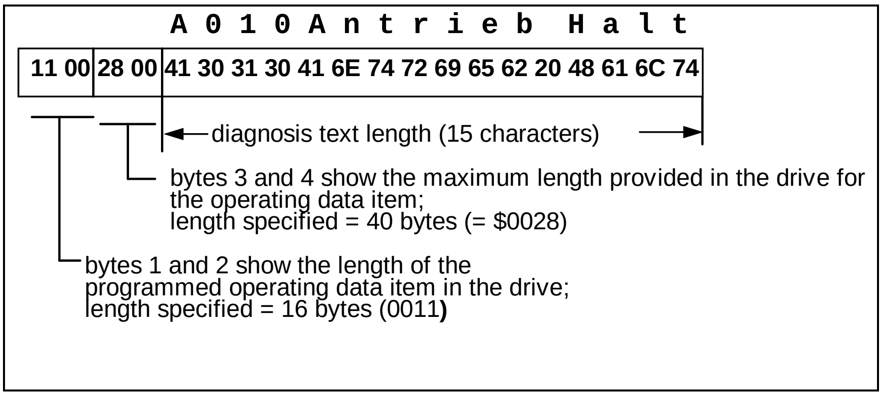

Fig. 2-16: S-0-0095, Diagnostic message

See also: functional description of "Plaintext diagnosis"

S-0-0095 - attributes

Ident number:	S-0-0095	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	1 byte variable	**Validity check:**	No
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0096, Slave arrangement (SLKN)

Description:

During initialization, the master must know the existing drives and the related slave numbers in order to be able to perform optimized automatic time slot computation.

The master receives this information from the drives during communication phase 2.

Valid address range: 01 .. 99

Typical address	03	03

See also: functional description of "Setting the drive address of the SERCOS interface"

S-0-0096 - attributes

Ident number:	S-0-0096	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	--

S-0-0097, Mask class 2 diagnostic

Description:

In **S-0-0012, Class 2 Diagnostics**, the mask permits the effect of warnings on the change bit in the drive status to be masked. The class 2 diagnostic change bit is set when a masked warning changes.

The mask has no effect on the class 2 diagnostic operating data item.

See also: functional description of "Change bits in class 2 and 3 diagnostic in the drive status word"

S-0-0097 - attributes

Ident number:	S-0-0097	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --		
Default value:	1111 1111 1111 1111 b		

S-0-0098, Mask class 3 diagnostic

Description:

In **S-0-0013, Class 3 Diagnostics**, the mask permits the effect of warnings on the change bit in the drive status to be masked. The class 3 diagnostic change bit is set when a masked warning changes. The mask has no effect on the class 3 diagnostic operating data item.

See also: functional description of "Change bits in class 2 and 3 diagnostic in the drive status word"

S-0-0098 - attributes

Ident number:	S-0-0098	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	-- / --	**Default value:**	0xFFFF

S-0-0099, C5 Reset class 1 diagnostic

Description:

When the drive receives this command via the service channel, class 1 diagnostics, interface status and drive interlocking in the drive status are cleared if no more errors are pending.

See also: functional description of "Clearing errors"

S-0-0099 - attributes

Ident number:	S-0-0099	**Modification:**	P234
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./ max.:	0 / 11b	**Default value:**	--

S-0-0100, Velocity Loop Proportional Gain

Description:

When the drive is started, the command "Initial program loading" can be used for loading a default value for this parameter (provided there is a motor with feedback storage; **P-0-4014, Motor Type:** 1 or 5). This is the case with MKD motors.

See also: functional description of "Setting the velocity controller"

S-0-0100 - attributes

Ident number:	S-0-0100	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	As/rad	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./ max.:	0,1 / 312,9	**Default value:**	0,7

S-0-0101, Velocity Loop Integral Action Time

Description:

The speed controller generates a current command value from the difference between the command speed value and the speed feedback value (= speed deviation).

That current command value consists of a proportional component and an integral-action component. The speed controller's integral-action time is the time constant at which the integral component of the current command value increases at a constant speed deviation.

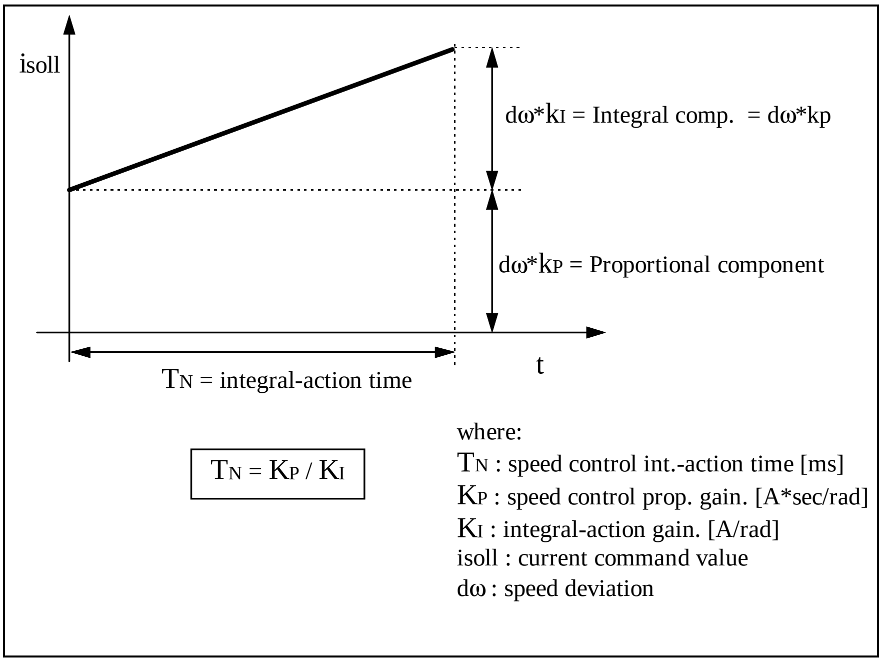

Fig. 2-17: Definition of the integral-action time

Integral-action time:

The integral-action time is the time a pure integral-action controller would take until the controller output variable (y) is equal to the output variable of a proportional-action controller at the time t = 0.

Integral-action time stands for the value of the time axis at which the integral-action component is equal to the proportional-action component.

Entering 0 de-activates the integral-action component.

See also: functional description of "Setting the speed controller"

S-0-0101 - attributes

Ident number:	S-0-0101	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	ms / ms	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./ max.:	0 / 3276,7	**Default value:**	15,0

S-0-0103, Modulo Value

Description:

When modulo format is selected (parameter **S-0-0076, Position Data Scaling Type**), the modulo value parameter defines the position value from which position counting starts again from 0.

See also parameter **S-0-0393, Command value mode for modulo format**.

See also functional description of "Modulo function"

S-0-0103 - attributes

Ident number:	S-0-0103	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	>0 / S-0-0076	**Default value:**	100

S-0-0104, Position Loop KV-Factor (closed-loop control)

Description:

The parameter contains the value of the proportional-action gain of the position controller.

When the drive is started, the command "Initial program loading" can be used for loading a default value for this parameter (provided there is a motor with feedback storage; **P-0-4014, Motor Type:** 1 or 5). This is the case with MKD motors.

See also functional description of "Setting the position controller"

S-0-0104 - attributes

Ident number:	S-0-0104	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	1000/min	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	>0 / 239.99	**Default value:**	1.00

S-0-0106, Proportional Gain 1 Current Regulator

Description:

This parameter represents the proportional gain of the current controller.

The current controller's proportional gain has been defined for the specific motor-drive combination used in the system. It depends on the motor type and should not be modified. It can be determined using the "Initial program loading" function or from the motor data sheets.

See also functional description of "Setting the current controller"

S-0-0106 - attributes

Ident number:	S-0-0106	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	V/A	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	0 / 500.00	**Default value:**	30.66

S-0-0107, Current Regulator 1 Integral Action Time

Description:

The parameter value depends on the motor and can be found in the motor data sheet.

See also functional description of "Setting the current controller"

S-0-0107 - attributes

Ident number:	S-0-0107	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	ms	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0.1 / 6553.5	**Default value:**	2.0

S-0-0108, Feedrate override

Description:

The feedrate override parameter only has an effect in "drive-controlled motion commands", such as

- "drive-controlled homing" command "
- "drive-internal interpolation" mode"

In such a case, the drive computes the velocity command values.

The feedrate override value acts as a multiplier on these velocity command values.

S-0-0108 - attributes

Ident number:	S-0-0108	**Modification:**	P4
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	%	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	0 / 655.35	**Default value:**	10000=100%

S-0-0109, Motor Peak Current

Description:

If the value of the motor peak current is smaller than the value of the amplifier’s peak current, the latter is automatically limited to the former.

With MDD and MKD motors, this value is stored in the motor feedback and is loaded from there when the drive is started for the first time.

See also functional description of "Selecting the active peak current"

S-0-0109 - attributes

Ident number:	S-0-0109	**Modification:**	No
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0 / 500.000	**Default value:**	--

S-0-0110, Amplifier Peak Current

Description:

Amplifier-related peak current from the drive controller.

See also functional description of "Current limitation"

S-0-0110 - attributes

Ident number:	S-0-0110	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0.001 / 500.000	**Default value:**	--

S-0-0111, Motor Current at Standstill

Description:

"Motor current at standstill" defines the current at which the motor continuously supplies the standstill torque that is specified in the data sheet.

With MDD and MKD motors, this value is stored in the motor feedback and is loaded from there when the drive is started for the first time.

S-0-0111 - attributes

Ident number:	S-0-0111	**Modification:**	No
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0 / 500.000	**Default value:**	--

S-0-0112, Amplifier Nominal Current

Description:

Permissible continuous current for the drive controller. This amplifier-related value depends on the switching frequency.

S-0-0112 - attributes

Ident number:	S-0-0112	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0.001 / 500.000	**Default value:**	--

S-0-0113, Maximum Motor Speed (nmax)

Description:

The maximum motor speed must not be exceeded. It has a limiting effect on the parameter **S-0-0091, Bipolar Velocity Limit Value**.

With MDD and MKD motors, this value is stored in the motor feedback and is loaded from there when the drive is started for the first time. For other motor types, the value can be found in the data sheet.

See also functional description of "Velocity limitation"

S-0-0113 - attributes

Ident number:	S-0-0113	**Modification:**	No
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	4	**Cyclic transfer:**	No
Input min./max.:	>0 / S-0-0044	**Default value:**	--

S-0-0115, Position feedback 2 type parameter

Description:

This parameter defines major features of the external encoder (encoder 2).

Parameter structure:

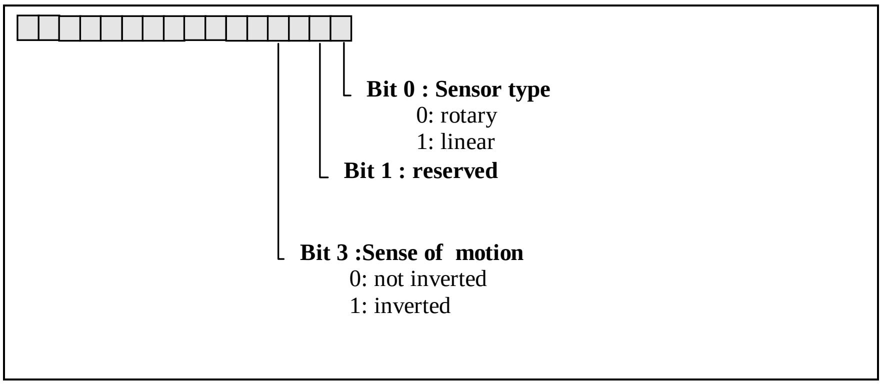

Fig. 2-18: S-0-0115, Position feedback 2 type parameter

Note:

Only measuring systems with the following features are supported:

- no data storage
- 1 V_{pp} amplitude
- no absolute measuring systems

Note: The software only supports the bits that are listed here.

See also functional description of "Other features of the external encoder"

S-0-0115 - attributes

Ident number:	S-0-0115	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0116, Resolution of rotational feedback 1

Description:

With rotary motors, this value specifies the number of resolver cycles per motor revolution.

S-0-0116 - attributes

Ident number:	S-0-0116	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Fractional part digits:	--	**Combination check:**	No
Input min./max.:	1 / 4	**Cyclic transfer:**	No
Default value:	--	**Unit:**	Increments

S-0-0117, Resolution of rotational feedback 2

Description:

With rotary encoders, the resolution of the external encoder contains the number of cycles per external encoder revolution.

See also functional description of "Resolution of the external encoder"

S-0-0117 - attributes

Ident number:	S-0-0117	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Fractional part digits:	--	**Combination check:**	No
Input min./max.:	--	**Cyclic transfer:**	No
Default value:	0	**Unit:**	Increments

S-0-0118, Resolution of linear feedback

Description:

The input of the linear encoder resolution is computed from

- the grid constant of the digiruler
- the external multiplier of the digitizing unit.

If there is no external multiplier (i.e. multiplication is performed in the drive amplifier), the external multiplier must be set to 1 and only the grid constant is to be specified.

S-0-0118 - attributes

Ident number:	S-0-0118	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	mm	**Combination check:**	No
Fractional part digits:	5	**Cyclic transfer:**	No
Input min./max.:	0 / 0 x FFFFFFFF	**Default value:**	0

S-0-0121, Input revolutions of load gear

Description:

A mechanical gearbox is frequently used between motor and load. Its transmission ratio results as:

$$\frac{\textbf{load gear output (S-0-0122)}}{\textbf{load gear input (S-0-0121)}}$$

Fig. 2-19: Transmission ratio

Example: 5 motor revolutions yield 2 gearbox output revolutions

=> S-0-0121 : 5
S-0-0122 : 2

See also functional description of "Reduction ratio"

S-0-0121 - attributes

Ident number:	S-0-0121	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 0xFFFFFFFF	**Default value:**	1

S-0-0122, Output revolutions of load gear

Description:

A mechanical gearbox is frequently used between motor and load.

Its transmission ratio results as:

$$\frac{\textbf{load gear output (S-0-0122)}}{\textbf{load gear input (S-0-0121))}}$$

Fig. 2-20: Transmission ratio

Example: 5 motor revolutions yield 2 gearbox output revolutions

=> S-0-0121 : 5
S-0-0122 : 2

See also functional description of "Reduction ratio"

S-0-0122 - attributes

Ident number:	S-0-0122	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 0xFFFFFFFF	**Default value:**	1

S-0-0123, Feed constant

Description:

This parameter describes the conversion of rotary into translatory motion. It is defined as the translatory distance that is traveled when the gearbox shaft rotates once.

Characteristics:

Recirculating ball screw:	Rack and pinion:
Feed constant = lead screw (typical value 10.00 mm)	Feed constant = effective pinion diameter * Pi

Fig. 2-21: Feed constant characteristics

Note: The unit depends on bit 4 in S-0-0076, Position Data Scaling Type:

Bit 4, S-0-0076 = 0 -> mm/rev

Bit 4, S-0-0076 = 1 -> Inch/rev

See also functional description of "Feed constant"

S-0-0123 - attributes

Ident number:	S-0-0123	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	5	**Cyclic transfer:**	No
Input min./max.:	>0 / S-0-0076	**Default value:**	1000000

S-0-0124, Standstill window

Description:

Motor standstill is defined as the situation in which **S-0-0040, Velocity Feedback Value** lies below a selectable threshold (the "standstill window"). Bit 1 of **S-0-0013, Class 3 Diagnostics** is set in standstill.

See also functional description of "S-0-0182, Manufacturer Class 3 Diagnostics"

S-0-0124 - attributes

Ident number:	S-0-0124	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	No
Input min./max.:	**>**0 / S-0-0044	**Default value:**	100000

S-0-0127, C1 Communication phase 3 transition check

Description:

The master (controller) employs this command for notifying the slave (drive) that it has transferred all communication parameters that are required for communication phase 3. After it has received this command, the slave checks whether faultless operation in communication phase 3 is possible from its own perspective.

The command is faultlessly completed when the slave is ready to follow the specification of communication phase 3 in the MST and to comply with the message frame structure. Otherwise the command will be terminated with an error.

The controller clears the command after a positive command acknowledgment. Subsequently, the controller enters communication phase 3 in the MST.

See also functional description of "S-0-0127, C1 Communication phase 3 transition check"

S-0-0127 - attributes

Ident number:	S-0-0127	**Modification:**	P2
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3 = 11bin	**Default value:**	--

S-0-0128, C2 Communication phase 4 transition check

Description:

The master (controller) employs this command for notifying the slave (drive) that it has transferred all communication parameters that are required for communication phase 4. The slave employs the command to check whether faultless operation in communication phase 4 is possible from its own perspective.

The command is faultlessly completed when the slave is ready for cyclic operation in communication phase 4.

The controller clears the command after a positive command acknowledgment. Subsequently, the controller enters communication phase 4 in the MST.

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

S-0-0128 - attributes

Ident number:	S-0-0128	**Modification:**	P3
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3 = 11bin	**Default value:**	--

S-0-0130, Probe value 1 positive edge

Description:

Upon the positive edge of the input signal from **S-0-0401, Probe 1**, the drive stores the current value of the selected signal in this parameter.

The signal that is to be measured is defined by the parameters **P-0-0200, Signal select probe 1** and **S-0-0169, Probe control parameter**.

See also functional description of "Probe Input Function"

S-0-0130 - attributes

Ident number:	S-0-0130	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

S-0-0131, Probe value 1 negative edge

Description:

Upon the negative edge of the input signal from **S-0-0401, Probe 1**, the drive stores the current value of the selected signal in this parameter.

The signal that is to be measured is defined by the parameters **P-0-0200, Signal select probe 1** and **S-0-0169, Probe control parameter**.

See also functional description of "Probe Input Function"

S-0-0131 - attributes

Ident number:	S-0-0131	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

S-0-0132, Probe value 2 positive edge

Description:

Upon the positive edge of the input signal from **S-0-0402, Probe 2**, the drive stores the current value of the selected signal in this parameter.

The signal that is to be measured is defined by the parameters **P-0-0201, Signal select probe 2** and **S-0-0169, Probe control parameter**.

See also functional description of "Probe Input Function"

S-0-0132 - attributes

Ident number:	S-0-0132	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

S-0-0133, Probe value 2 negative edge

Description:

Upon the negative edge of the input signal from **S-0-0402, Probe 2**, the drive stores the current value of the selected signal in this parameter.

The signal that is to be measured is defined by the parameters **P-0-0201, Signal select probe 2** and **S-0-0169, Probe control parameter**.

See also functional description of "Probe Input Function"

S-0-0133 - attributes

Ident number:	S-0-0133	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

S-0-0134, Master control word

Description::

This enables the master control word to be displayed on the NC screen via the service channel.

In addition, the master control word provides help in commissioning and troubleshooting.

See also functional description of "Master control word"

S-0-0134 - attributes

Ident number:	S-0-0134	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	Bin	**Limit check:**	No
Unit:	---	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0135, Drive status word

Description:

This enables the master control word to be displayed on the NC screen via the service channel. In addition, it provides help in commissioning and troubleshooting.

See also functional description of "Drive status word"

S-0-0135 - attributes

Ident number:	S-0-0135	**Modification:**	No
Function:	Parameter	**Storage:**	Prog. Module
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0138, Bipolar acceleration limit value

Description:

This parameter describes the maximum acceleration that is permitted symmetrically in either direction (accelerating, decelerating).

When the "Drive stop" function is executed, the drive employs this acceleration value to decelerate to the velocity v = 0.

S-0-0138 - attributes

Ident number:	S-0-0138	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes

Unit:	S-0-0160	**Combination check:**	No
Fractional part digits:	S-0-0160	**Cyclic transfer:**	MDT
Input min./max.:	>0 / S-0-0160	**Default value:**	2000000

S-0-0140, Controller Type

Description:

The operating data item of the controller type contains the manufacturer's type specification.

Example: DKC02.1-040-7

S-0-0140 - attributes

Ident number:	S-0-0140	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	1 byte variable	**Validity check:**	Phase 3
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	--	**Default value:**	--

S-0-0141, Motor Type

Description:

The operating data item of the motor type contains the manufacturer's type specification.

With MDD and MKD motors, this value is stored in the motor feedback. Upon the first start of the drive it is loaded from there.

Example: MDD 065A-N040-N2L-095GB0

S-0-0141 - attributes

Ident number:	S-0-0141	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	1 byte variable	**Validity check:**	Phase 3
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0142, Application type

Description:

A descriptive name of the drive can be stored in this parameter (e.g. primary spindle, swivel axis, ...). It does not have a functional significance.

S-0-0142 - attributes

Ident number:	S-0-0142	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	1 byte variable	**Validity check:**	Phase 3
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	"Default"

S-0-0143, SERCOS interface version

Description:

The operating data item contains the version of the SERCOS interface specification.

The following definitions are currently valid:

V	**V 01.01:**	**V 01.02:**
SERCOS specification German 01.00:	SERCOS specification English	SERCOS update German/English
version 5/90	version 4/91	version 9/91

Fig. 2-22: S-0-0143, Version of the SERCOS interface specification

See also functional description of "Overview of SERCOS communication"

S-0-0143 - attributes

Ident number:	S-0-0143	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	1 byte variable	**Validity check:**	No
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0147, Homing Parameter

Description:

This parameter is used for selecting the sequences for **S-0-0148, C6 Drive controlled homing procedure** with respect to plant, NC and drive installation.

Parameter structure:

Bit 0 : Approach direction
0: positive - clockwise rotation looking on the motor shaft
1: negative - counter-clockwise rotation looking on the motor shaft

Bit 3 : Sensor selection
0: homing with motor encoder
1: homing with external encoder

Bit 5 : Homing switch evaluation
0: homing switch is evaluated
1: homing switch is not evaluated

Bit 6 : Reference marker evaluation
0: reference marker is evaluated
1: reference marker is not evaluated

Fig. 2-23: S-0-0147, Homing parameter

Note: The software only supports the bits that are listed here. Bit 5 additionally activates the monitoring function for the external 24-V supply.

See also functional description of "Drive-controlled homing"

S-0-0147 - attributes

Ident number:	S-0-0147	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0x4 = 100bin

S-0-0148, C6 Drive controlled homing procedure command

Description:

When this command is set and enabled, the drive (provided it is in "AF" operating status) automatically transitions to drive-internal position control and accelerates at **S-0-0042, Homing acceleration** to **S-0-0041, Homing velocity**. Bit 0 in the parameter **S-0-0403, Position feedback value status** is cleared. Changes of the cyclic command values are ignored as long as the command is active.

The homing sequence is defined by **S-0-0147, Homing Parameter**. After the command has properly been executed (drive in standstill and position feedback value is related to the reference point), the drive sets bit 0 in the parameter **S-0-0403, Position feedback value status**.

End of command: The controller reads **S-0-0047, Position Command Value** via the service channel and sets its position command value to the value of that parameter. Next, the controller clears the command and the drive follows the cyclic command values.

See also functional description of "Drive-controlled homing"

S-0-0148 - attributes

Ident number:	S-0-0148	**Modification:**	P4
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3 = 11 bin	**Default value:**	--

S-0-0149, d400 Positive stop drive procedure command

Description:

Setting and enabling this command de-activates all controller monitoring functions that would lead to a class 1 diagnostics error message when the drive is blocked by a hard stop.

Parameter structure:

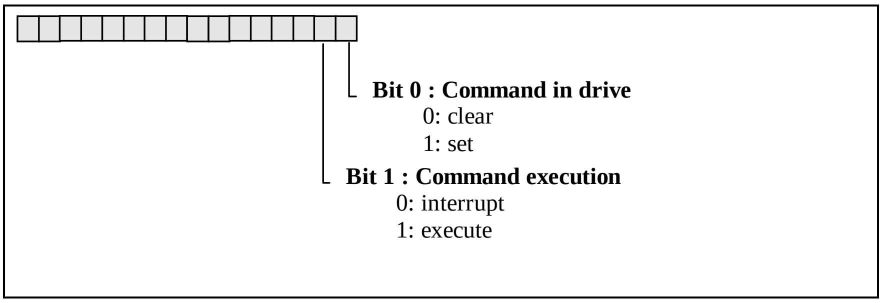

Fig. 2-24: S-0-0149, Positive stop drive procedure command

See also functional description of "Positive stop drive procedure command"

S-0-0149 - attributes

Ident number:	S-0-0149	**Modification:**	P4
Function:	Command	**Storage:**	No
Data length:	2 Byte	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--/--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0/3		

S-0-0150, Reference offset 1

Description:

This parameter describes the distance between the position encoder reference marker 1 and **S-0-0052, Reference distance 1**.

See also functional description of "Drive-controlled homing"

S-0-0150 - attributes

Ident number:	S-0-0150	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	S-0-0076	**Default value:**	0

S-0-0151, Reference offset 2

Description:

This parameter describes the distance between the position encoder reference marker 2 and **S-0-0054, Reference distance 2**.

See also functional description of "Drive-controlled homing"

S-0-0151 - attributes

Ident number:	S-0-0151	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	S-0-0076	**Default value:**	0

S-0-0159, Monitoring Window

Description:

The monitoring window is used for selecting the maximum deviation between measured and computed position feedback value that can be tolerated. The drive sets an error **F228 Excessive Deviation** in class 1 diagnostics if the position deviation exceeds the monitoring window.

The maximum deviation that occurs is always stored in the parameter **P-0-0098, Max. Model Deviation**.

Procedure of setting the parameter:

See also functional description of "Position loop monitoring"

S-0-0159 - attributes

Ident number:	S-0-0159	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	0 / S-0-0076	**Default value:**	10000

S-0-0160, Acceleration data scaling type

Description:

Various scaling types can be selected for the acceleration data items in the drive.

Parameter structure:

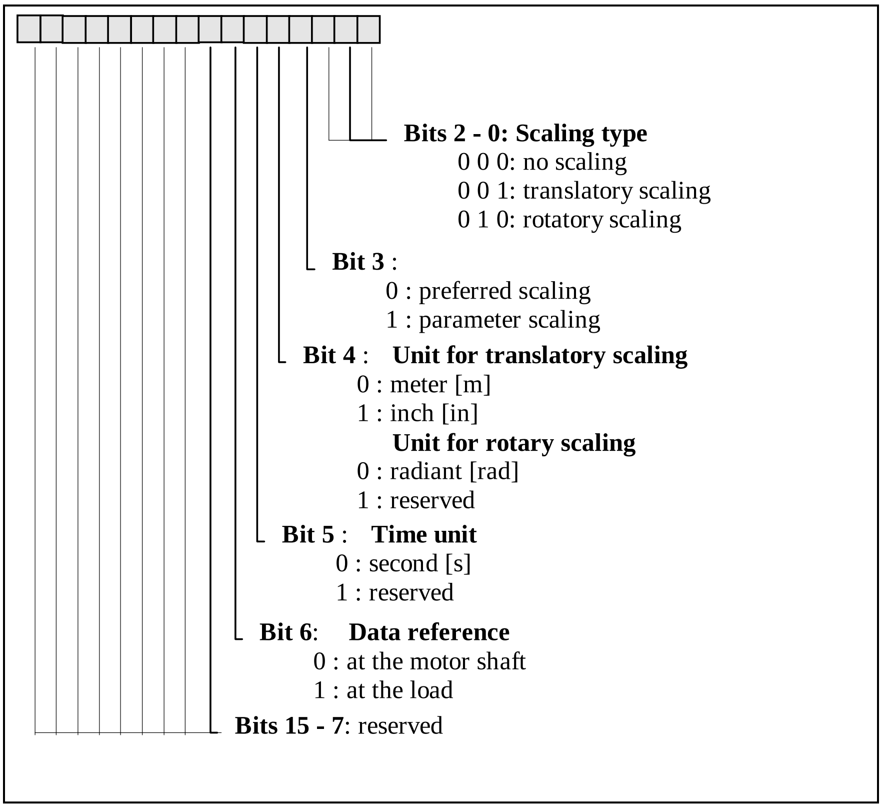

Fig. 2-25: S-0-0160, Scaling type for acceleration data

Note: The software only supports the bits that are listed here.

See also functional description of "Acceleration data display format"

S-0-0160 - attributes

Ident number:	S-0-0160	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0xA = 1010bin

S-0-0161, Acceleration data scaling factor

Description:

When parameter scaling has been selected in **S-0-0160, Acceleration data scaling type**, the scaling factor for all acceleration data items in the drive is selected in this parameter.

Parameter structure:

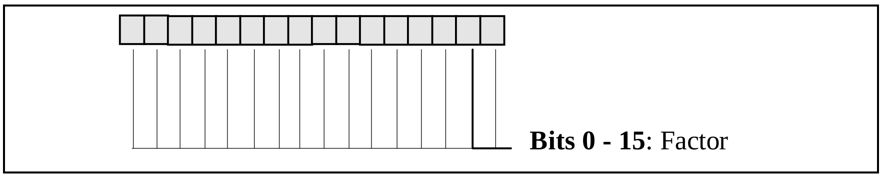

Fig. 2-26: S-0-0161, Acceleration data scaling factor

See also functional description of "Acceleration data display format"

S-0-0161 - attributes

Ident number:	S-0-0161	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 65535	**Default value:**	1

S-0-0162, Acceleration data scaling exponent

Description:

When parameter scaling has been selected in **S-0-0160, Acceleration data scaling type**, the scaling exponent for all acceleration data items in the drive is selected in this parameter.

Parameter structure:

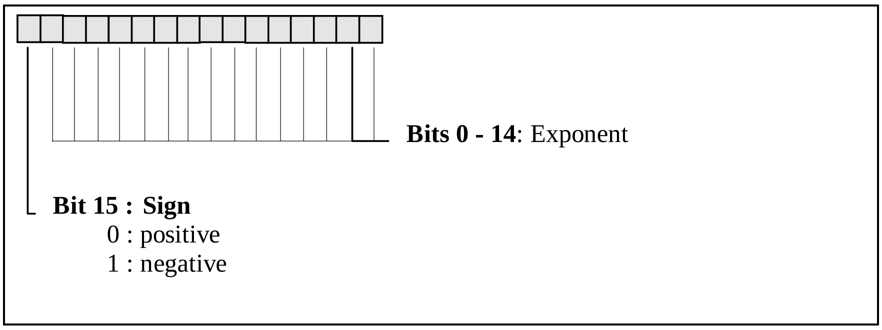

Fig. 2-27: S-0-0162, Acceleration data scaling exponent

See also functional description of "Acceleration data display format"

S-0-0162 - attributes

Ident number:	S-0-0162	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-32 / 32	**Default value:**	-3

S-0-0169, Probe control parameter

Description:

This parameter defines whether one or both probe inputs ("Probe 1" and "Probe 2") is (are) active, and the edge (positive/negative) that triggers the storage of the measured data.

Parameter structure:

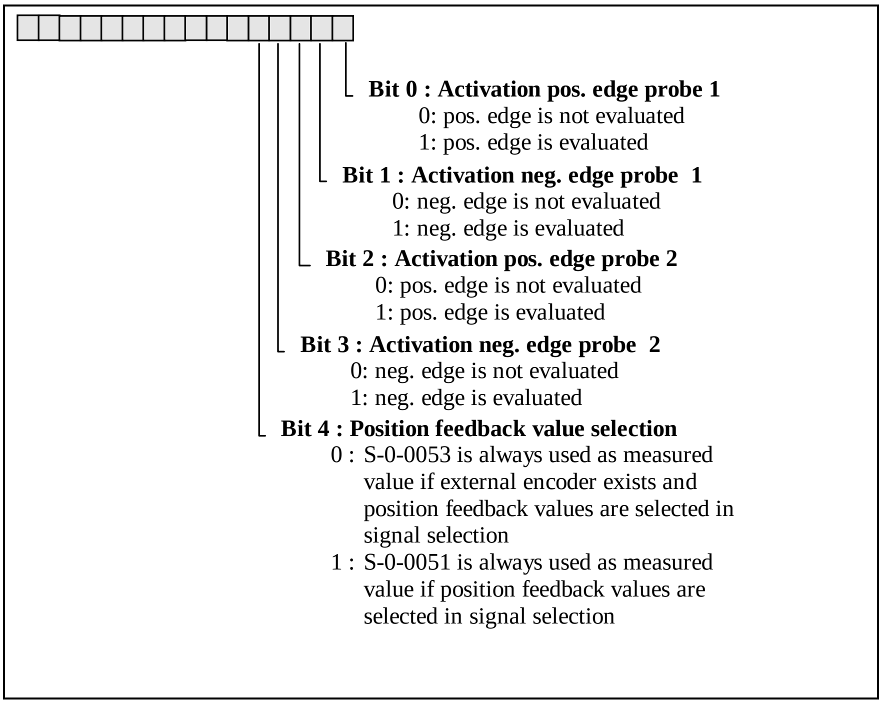

Fig. 2-28: S-0-0169, Probe control parameter

Note: The software only supports the bits that are listed here.

See also functional description of "Probe Input Function"

S-0-0169 - attributes

Ident number:	S-0-0169	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0170, Probing cycle procedure command

Description:

When this command is set and enabled, the drive reacts to

- **S-0-0405, Probe 1 enable / S-0-0406, Probe 2 enable** and
- **S-0-0401, Probe 1 / S-0-0402, Probe 2**

according to the programming in **S-0-0169, Probe control parameter**.

Several measurements can be made from the NC while the command is active.

The NC clears the command specification when it does not want any more new measurements.

Parameter structure:

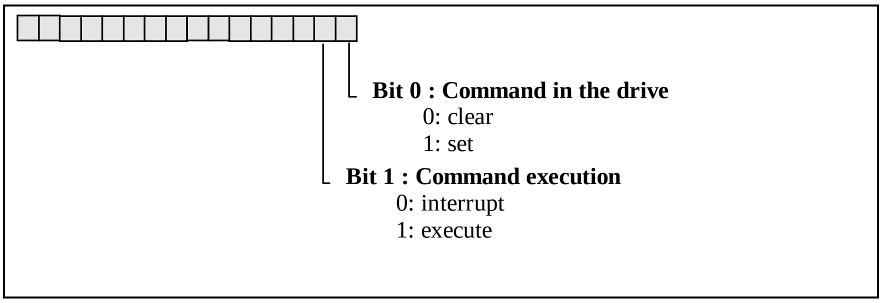

Fig. 2-29: S-0-0170, Probing cycle procedure command

Note: The software only supports the bits that are listed here. Bit 0 additionally activates the monitoring function of the external 24-V supply.

See also functional description of "Probe Input Function"

S-0-0170 - attributes

Ident number:	S-0-0170	**Modification:**	P4
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3 = 11bin	**Default value:**	--

S-0-0182, Manufacturer Class 3 Diagnostics

Description:

Various operating state messages are stored here every 8 ms. A change in a message state is not indicated by a change bit.

Parameter structure:

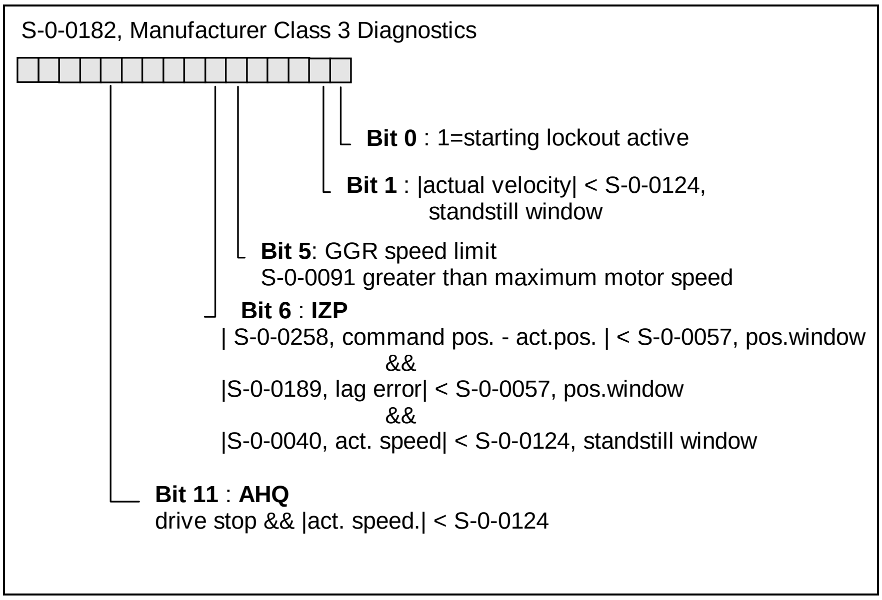

Fig. 2-30: S-0-0182, Manufacturer Class 3 Diagnostics

Note: The software only supports the bits that are listed here.

See also functional description of "S-0-0182, Manufacturer class 3 diagnostics"

S-0-0182 - attributes

Ident number:	S-0-0182	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

S-0-0185, Length of the config. data record in the AT

Description:

In the operating data item of this ident number, the drive specifies the maximum length (in bytes) it is able to process in the configurable data record of the AT.

See also functional description of "Configuration of message frame contents"

S-0-0185 - attributes

Ident number:	S-0-0185	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No

Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0186, Length of the config. data record in the MDT

Description:

In the operating data item of this ident number, the drive specifies the maximum length (in bytes) it is able to process in the configurable data record of the MDT.

See also functional description of "Configuration of message frame contents"

S-0-0186 - attributes

Ident number:	S-0-0186	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0187, List of Configurable Data in the AT

Description:

This list contains the ident numbers of the operating data items that may be configured in the drive message frame.

See also functional description of "Configuration of message frame contents"

S-0-0187 - attributes

Ident number:	S-0-0187	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes variable	**Validity check:**	Phase 2
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0188, List of Configurable Data in the MDT

Description:

This list contains the ident numbers of the operating data items that may be configured in the master data message frame.

See also functional description of "Configuration of message frame contents"

S-0-0188 - attributes

Ident number:	S-0-0188	**Modification:**	P2
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes variable	**Validity check:**	Phase 2
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:		**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0189, Following Error

Description:

In this operating data item, the drive stores the current difference between position command value and associated control-relevant position feedback value (**S-0-0051, Position Feedback Value 1 (Motor Feedback)** or **S-0-0053, Position Feedback Value 2 (Ext. Feedback)**).

See also functional description of "Definition of the position controller setting"

S-0-0189 - attributes

Ident number:	S-0-0189	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

S-0-0192, IDN-List of backup operation data

Description:

The data item of the IDN list contains the ident numbers of all operating data items that must be loaded in the drive to ensure proper operation. These are usually the parameters that are buffered in the programming module. The controller employs this IDN list for creating a backup copy of the drive parameters.

See also functional description of "Application parameter storage"

S-0-0192 - attributes

Ident number:	S-0-0192	**Modification:**	No
Function:	Parameter	**Storage:**	Fixed
Data length:	2 bytes variable	**Validity check:**	No
Format:	IDN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:		**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0193, Positioning jerk

Description:

The positioning jerk parameter limits the changes in the acceleration in "drive-internal interpolation". Entering 0 de-activates jerk limitation.

See also functional description of "Generator function: Drive-internal interpolation"

S-0-0193 - attributes

Ident number:	S-0-0193	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0160	**Combination check:**	No
Fractional part digits:	S-0-0160	**Cyclic transfer:**	MDT
Input min./max.:	0 / S-0-0160	**Default value:**	0

S-0-0258, Target Position

Description:

In "Drive-internal interpolation" mode, the controller transfers the target position as a command value to the drive. The drive moves to the target position, taking the values of the parameters **S-0-0259, Positioning velocity**, **S-0-0260**, **Positioning acceleration**, and **S-0-0193, Positioning jerk** into account.

S-0-0258 - attributes

Ident number:	S-0-0258	**Modification:**	P234
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	MDT
Input min./max.:	S-0-0076	**Default value:**	--

S-0-0259, Positioning velocity

Description:

The value of the positioning velocity parameter determines the velocity that is used for approaching the **S-0-0258, Target Position** in "Drive-internal interpolation" mode.

See also functional description of "Generator function: Drive-internal interpolation"

S-0-0259 - attributes

Ident number:	S-0-0259	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	MDT
Input min./max.:	S-0-0044	**Default value:**	5 000 000

S-0-0260, Positioning acceleration

Description:

The value of the positioning acceleration parameter is used for accelerating to **S-0-0259, Positioning velocity** in "Drive-internal interpolation" mode.

See also functional description of "Generator function: Drive-internal interpolation"

S-0-0260 - attributes

***Ident number:**	S-0-0260	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0160	**Combination check:**	No
Fractional part digits:	S-0-0160	**Cyclic transfer:**	MDT
Input min./max.:	>0 / S-0-0160	**Default value:**	5 000 000

S-0-0262, Command Basic Load

Description:

Setting and enabling this command loads and activates the basic setting parameters for current, velocity and position controller that have been stored in the motor. The basic setting parameters have **not** been optimized for the application. They merely provide for smooth interaction between motor and amplifier.

Caution:

⇒ Executing this command may overwrite previously optimized parameters.

See also functional description of "Initial program loading"

S-0-0262 - attributes

Ident number:	S-0-0262	**Modification:**	P234
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3 = 11bin	**Default value:**	--

S-0-0265, Language Selection

Description:

All parameter names, units and diagnosis/error messages are stored in several languages in the drive controller. This parameter determines the language in which the texts are to be output.

- 0 : German
- 1 : English

Further languages are in preparation.

S-0-0265 - attributes

Ident number:	S-0-0265	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	-- / --	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 1	**Default value:**	0

S-0-0269, Parameter buffer mode

Description:

The "parameter buffer mode" defines whether the data that comes via the serial interface will be stored temporarily (in the RAM) or permanently (in the EEPROM).

1: Data is stored temporarily.

0: Data is stored permanently.

The drive sets bit 0 to "0" when the power supply is switched on.

S-0-0269 - attributes

Ident number:	S-0-0269	**Modification:**	P234
Function:	Parameter	**Storage:**	de
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	Yes
Unit:	--/--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0/1	**Default value:**	0

S-0-0277, Position feedback 1 type parameter

Description:

This parameter defines the major features of the motor encoder (position encoder 1).

Parameter structure:

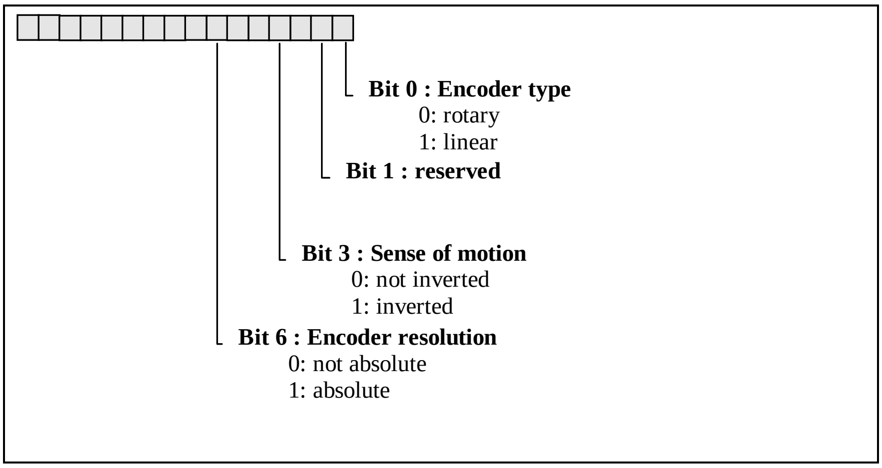

Fig. 2-31: S-0-0277, Position feedback 1 type parameter

Note: Bit 6 is automatically set in an absolute measuring system with data storage.
When an MDD or MKD motor is used, the drive sets and write-protects bits 0, 1, and 3.

Note: The software only supports the bits that are listed here.

S-0-0277 - attributes

Ident number:	S-0-0277	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0298, Reference Cam Shifting

Description:

In drive-controlled homing, the drive is able to evaluate a reference switch. There is an optimum value of the relative position between the reference switch signal and the motor encoder's zero marker. To make adjustment easier during commissioning, this parameter shows the distance between the reference cam and the ideal point.

The indication (in mm, degrees, or inches) depends on the selected scaling type for position data (**S-0-0076, Position Data Scaling Type**).

S-0-0298 - attributes

Ident number:	S-0-0298	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	S-0-0076	**Default value:**	--

S-0-0299, Home switch offset

Description:

If several reference markers of the measuring system that is to be homed can be detected in the travel range of the axis, a zero switch must be employed for selecting one of these markers as the relevant marker.

The distance between zero switch edge and reference marker must be large enough to ensure that the edge is detected. Otherwise, only the subsequent marker would be selected.

In measuring systems that contain several reference markers of known and equal distance from each other, the distance between edge and marker is therefore monitored.

The minimum distance is ¼ * d (d = distance between the reference markers). The optimum distance is ½ * d.

If the distance is smaller than ¼ * d, **S-0-0148, C6 Drive controlled homing procedure** is aborted and the negative acknowledgment **C602 Distance homing switch-reference mark erroneous** is issued. The distance may then be modified mechanically or using this parameter.

See also functional description of "Drive-controlled homing"

S-0-0299 - attributes

Ident number:	S-0-0299	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	S-0-0076	**Default value:**	0

S-0-0301, Allocation of Real-Time Control Bit 1

Description:

To allocate a signal to the real-time control bit - 1, the ident number of the signal is written to the operating data item of the allocation of the real-time control bit - 1.

Such an allocation causes the allocated signal (bit 0) to be influenced by the real-time control bit - 1 (= part of the master control word).

If the programmed IDN does not exist, the drive issues the service channel error message "IDN cannot be found" in response.

If the programmed IDN exists but cannot be written to in phase 4, the drive responds with issuing the error message "Incorrect data".

See also functional description of "Real-time control and status bits"

S-0-0301 - attributes

Ident number:	S-0-0301	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0303, Allocation of Real-Time Control Bit 2

Description:

To allocate a signal to the real-time control bit - 2, the ident number of the signal is written to the operating data item of the allocation of the real-time control bit - 2.

Such an allocation causes the allocated signal (bit 0) to be influenced by the real-time control bit - 2 (= part of the master control word).

See also functional description of "Real-time control and status bits"

S-0-0303 - attributes

Ident number:	S-0-0303	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0305, Allocation of Real-Time Status Bit 1

Description:

To allocate a signal to the real-time status bit - 1, the ident number of the signal is written to the operating data item of the allocation of the real-time status bit - 1.

Such an allocation causes the allocated signal (bit 0) to be shown in the real-time status bit - 1 (= part of the drive status word).

If the programmed IDN does not exist, the drive issues the service channel error message "IDN cannot be found" in response.

See also functional description of "Real-time control and status bits"

S-0-0305 - attributes

Ident number:	S-0-0305	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0307, Allocation of Real-Time Status Bit 2

Description:

To allocate a signal to the real-time status bit - 2, the ident number of the signal is written to the operating data item of the allocation of the real-time status bit - 2.

Such an allocation causes the allocated signal (bit 0) to be shown in the real-time status bit - 2 (= part of the drive status word).

See also functional description of "Real-time control and status bits"

S-0-0307 - attributes

Ident number:	S-0-0307	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0

S-0-0331, Status "feedback = 0"

Description:

This parameter is used for defining an IDN for "Feedback = 0 status", and can therefore be allocated to a real-time status bit (IDN 0-0305). "Feedback = 0 status" is defined as a bit in class 3 diagnostics (IDN 0-0013). It is set if the actual velocity value is inside the standstill window (IDN 00124).

Only bit 0 is defined in the operating data item.

The "in motion" output corresponds to the inverted value of this bit.

S-0-0331 - attributes

Ident number:	S-0-0331	**Modification:**	No
Function:	Parameter	**Storage:**	--
Data length:	2 bytes	**Validity check:**	--
Format:	binary	**Limit check:**	--
Unit:	--	**Combination check:**	--
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0348, Prop. Gain Acceleration Feedforward

Description:

Acceleration precontrol reduces the lag error that occurs during acceleration in lagless operation. For this purpose, the current acceleration command value is multiplied with the value of the parameter **S-0-0348, Acceleration Feedforward prop. Gain** (→ Asoll), and added to the current command value from the speed controller.

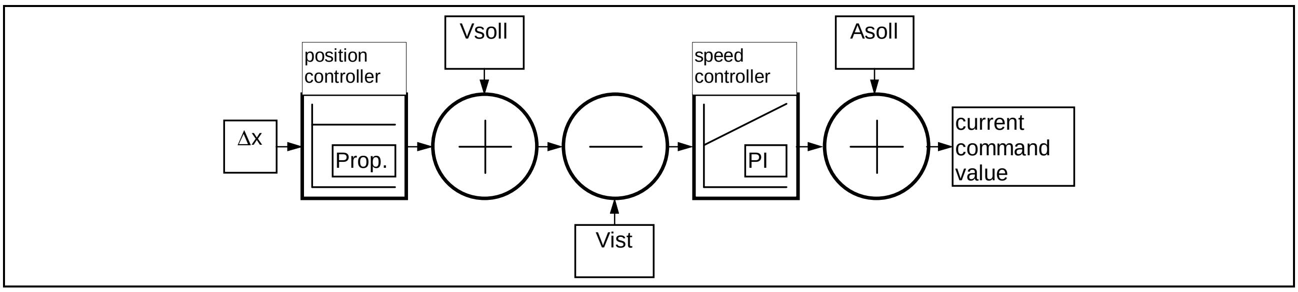

Fig. 2-32: Velocity and acceleration precontrol

Activation

Writing a value >0 to the parameter activates acceleration precontrol

Note: The controller is able to work without precontrol (default value = 0). Acceleration precontrol is only possible in lagless operation.

Comparison of the precontrol functions (feedforward)

Velocity precontrol is activated by selecting a mode without **lag**. From the position controller's perspective, it produces a **1st order feedforward** (velocity) and, at constant velocity, a position deviation of 0. Acceleration (and deceleration) still produce a lag.

Acceleration precontrol is activated by setting this parameter to a value >0. From the position controller's perspective, it produces a **2nd order feedforward** (proportional to the acceleration) and, provided that the correct value has been selected and acceleration is constant, a position deviation of 0.

S-0-0348 - attributes

Ident number:	S-0-0348	**Modification:**	P234
Function:	Parameter	**Storage:**	EEPROM
Data length:	2 Byte	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	mA/(rad/s²)	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0 / 5006,5	**Default value:**	0

S-0-0349, Jerk Limit bipolar

Description:

The bipolar jerk limit limits the acceleration changes in "drive stop".

See also functional description of "Drive stop functional principle"

S-0-0349 - attributes

Ident number:	S-0-0349	**Modification:**	No
Function:	Parameter	**Storage:**	Prog.
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	--/--	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0/0		

S-0-0390, Diagnostic Message Number

Description:

The number that is shown in the 7-segment display is stored in the "diagnostic message number" parameter. This enables the controller to generate its own diagnoses on the basis of the diagnosis number (for example in a language that is not stored as a diagnosis message in the drive).

Example:

Diagnosis:	„F822 Motor encoder error: Signals too small“ in parameter S-0-0095
7-segment display:	alternately „F8“ <=> „22“
Diagnosis number:	„F822(hex)“ in parameter S-0-0390

See also **S-0-0095, Diagnostic Message**

S-0-0390 - attributes

Ident number:	S-0-0390	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0391, External encoder monitoring window

Description:

This parameter is used for defining the maximum deviation permitted of **S-0-0051, Position Feedback Value 1 (Motor Feedback)** and **S-0-0052, Reference distance 1**.

An error **F236, Excessive Position Feedback Difference** is generated if this value is exceeded for more than 20 ms.

Writing 0 to this parameter de-activates the monitoring function.

See also functional description of "Position feedback value monitoring"

S-0-0391 - attributes

Ident number:	S-0-0391	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	0 **/** S-0-0076	**Default value:**	1000

S-0-0392, Velocity Feedback Filter time constant

Description:

A VZ1 low-pass filter is employed as velocity feedback filter. This parameter selects the time constant of that filter.

Entering 500 µs renders the filter inactive.

S-0-0392 - attributes

Ident number:	S-0-0392	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs / µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	500 / 65535	**Default value:**	500

S-0-0393, Command value mode for modulo format

Description:

With active module function, the interpretation of position command values (such as **S-0-0047, Position Command Value**) depends on the selected mode. The parameter **P-0-0013, Command value mode for modulo format** is used for selecting the mode.

The parameter only has an effect if modulo format has been selected in **S-0-0076, Position Data Scaling Type**.

The following values can be selected.

S-0-0393:	Meaning:
0	shortest path
1	positive direction
2	negative direction

Fig. 2-33: Parameter S-0-0393

S-0-0393 - attributes

Ident number:	S-0-0393	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	DEC_O	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	MDT
Input min./max.:	0 / 2	**Default value:**	0

S-0-0400, Home switch

Description:

This parameter is used for allocating an IDN to the reference switch (external signal).

Possible application:

The IDN (and, consequently, the actual state of the reference switch) can be allocated to a real-time status bit.

Parameter structure:

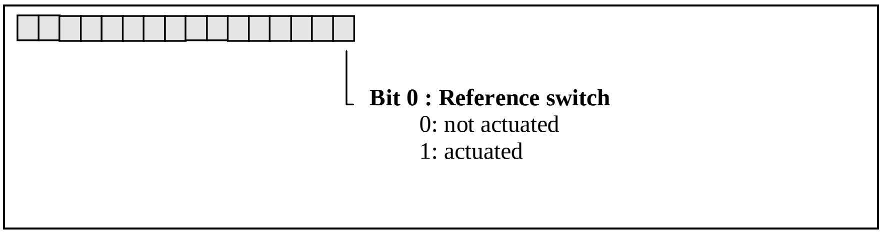

Fig. 2-34: S-0-0400, Reference switch

See also functional description of "Evaluating the zero switch"

S-0-0400 - attributes

Ident number:	S-0-0400	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0401, Probe 1

Description:

This parameter is used for allocating an ident number to the probe - 1 (external signal). This enabled probe 1 to be allocated to a real-time status bit, for example.

The drive only interrogates the probe - 1 signal and maintains it at a valid state if the command **S-0-0170, Probing cycle procedure command** is active and **S-0-0405, Probe 1 enable** exists.

Parameter structure:

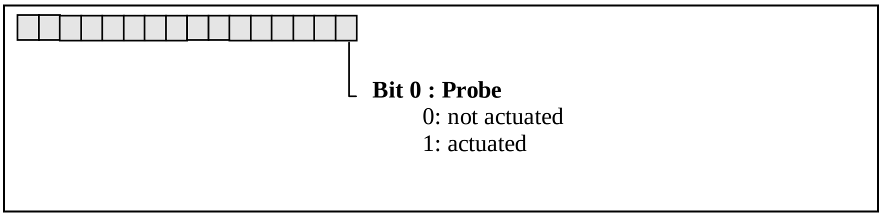

Fig. 2-35: S-0-0401, Probe

See also functional description of "Probe Input Function".

S-0-0401 - attributes

Ident number:	S-0-0401	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0402, Probe 2

Description:

This parameter is used for allocating an ident number to the probe - 2 (external signal). This enabled probe 2 to be allocated to a real-time status bit, for example.

The drive only interrogates the probe - 2 signal and maintains it at a valid state if the command **S-0-0170, Probing cycle procedure command** is active and **S-0-0406, Probe 2 enable** exists.

Parameter structure:

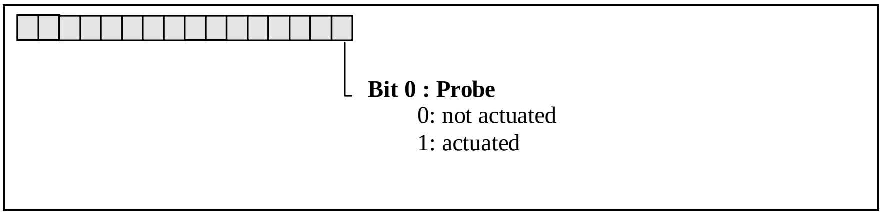

Fig. 2-36: S-0-0402, Probe

See also functional description of "Probe Input Function".

S-0-0402 - attributes

Ident number:	S-0-0402	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0403, Position feedback value status

Description:

The drive sets bit 0 of this parameter if the position feedback value that is selected by bit 3 of **S-0-0147, Homing Parameter** invariably refers to machine zero.

When the commands **S-0-0148, C6 Drive controlled homing procedure** or **P-0-0012, Command 'Set Absolute Measurement'** are executed in the drive, the bit is reset upon the start of the command. Once the command has successfully be completed, the bit will again be set.

The position feedback value status can be allocated to a real-time status bit and thus continually be reported to the NC in the drive status (see **S-0-0305, Allocation of Real-Time Status Bit 1**).

Parameter structure:

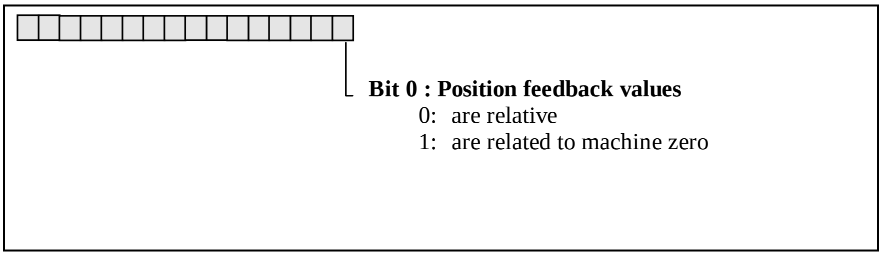

Fig. 2-37: S-0-0403, Position feedback value status

See also functional description of "Drive-controlled homing"

S-0-0403 - attributes

Ident number:	S-0-0403	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0405, Probe 1 enable

Description:

This parameter is used for enabling a probe input.

Upon the 0 → 1 transition of this signal, the trigger mechanism for evaluating the positive and/or negative edge of the probe signal is activated.

Probe 1 enable can be allocated to a real-time control bit and thus be transferred to the drive in the master control word.

Parameter structure:

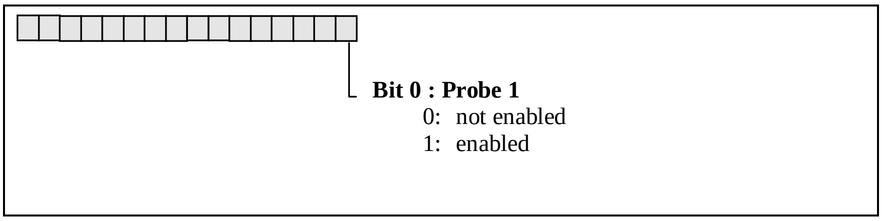

Fig. 2-38: S-0-0405, Probe 1 enable

See also functional description of "Probe Input Function".

S-0-0405 - attributes

Ident number:	S-0-0405	**Modification:**	P4
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0406, Probe 2 enable

Description:

This parameter is used for enabling a probe input.

Upon the 0 → 1 transition of this signal, the trigger mechanism for evaluating the positive and/or negative edge of the probe signal is activated.

Probe 2 enable can be allocated to a real-time control bit and thus be transferred to the drive in the master control word.

Parameter structure:

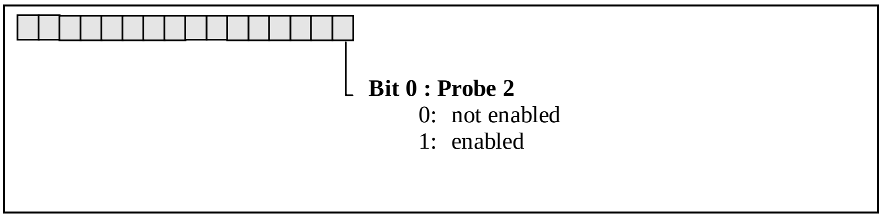

Fig. 2-39: S-0-0406, Probe 2 enable

See also functional description of "Probe Input Function".

S-0-0406 - attributes

Ident number:	S-0-0406	**Modification:**	P4
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0409, Probe 1 positive latched

Description:

The drive sets bit 0 in this parameter if

- the command **S-0-0170, Probing cycle procedure command** is active;
- bit 0 has been set in **S-0-0169, Probe control parameter**;
- **S-0-0405, Probe 1 enable** exists;
- and the positive edge of **S-0-0401, Probe 1** is detected.

At the same time, the drive saves the value of the selected signal in **S-0-0130, Probe value 1 positive edge**.

The drive clears the bit if the NC clears the command **S-0-0170, Probing cycle procedure command** or if **S-0-0405, Probe 1 enable** transitions from "1" to "0".

The parameter **S-0-0409, Probe 1 positive latched** can be allocated to a real-time status bit and thus continually be transferred to the NC in the drive status (see **S-0-0305, Allocation of Real-Time Status Bit 1**).

Parameter structure:

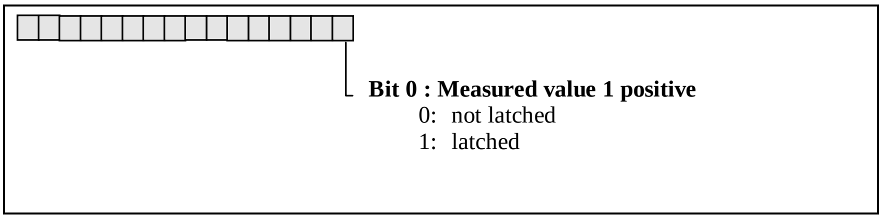

Fig. 2-40: S-0-0409, Probe 1 positive latched

See also functional description of "Probe Input Function".

S-0-0409 - attributes

Ident number:	S-0-0409	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0410, Probe 1 negative latched

Description:

The drive sets bit 0 in this parameter if

- the command **S-0-0170, Probing cycle procedure command** is active;
- bit 1 has been set in **S-0-0169, Probe control parameter**;
- **S-0-0405, Probe 1 enable** exists;
- and the negative edge of **S-0-0401, Probe 1** is detected.

At the same time, the drive saves the value of the selected signal in **S-0-0131, Probe value 1 negative edge**.

The drive clears the bit if the NC clears the command **S-0-0170, Probing cycle procedure command** or if **S-0-0405, Probe 1 enable** transitions from "1" to "0".

The parameter **S-0-0410, Probe 1 negative latched** can be allocated to a real-time status bit and thus continually be transferred to the NC in the drive status (see **S-0-0305, Allocation of Real-Time Status Bit 1**).

Parameter structure:

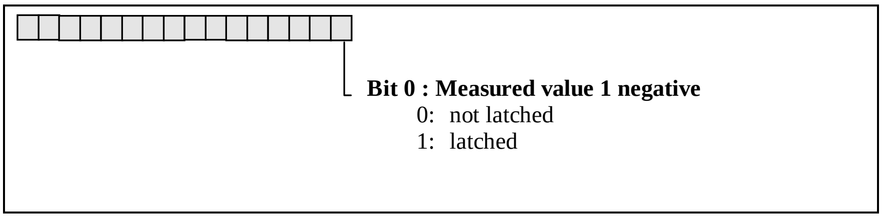

Fig. 2-41: S-0-0410, Probe 1 negative latched

See also functional description of "Probe Input Function".

S-0-0410 - attributes

Ident number:	S-0-0410	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0411, Probe 2 positive latched

Description:

The drive sets bit 0 in this parameter if

- the command **S-0-0170, Probing cycle procedure command** is active;
- bit 3 has been set in **S-0-0169, Probe control parameter**;
- **S-0-0406, Probe 2 enable** exists;
- and the positive edge of **S-0-0402, Probe 2** is detected.

At the same time, the drive saves the value of the selected signal in **S-0-0132, Probe value 2 positive edge**.

The drive clears the bit if the NC clears the command **S-0-0170, Probing cycle procedure command** or if **S-0-0406, Probe 2 enable** transitions from "1" to "0".

The parameter **S-0-0411, Probe 2 positive latched** can be allocated to a real-time status bit and thus continually be transferred to the NC in the drive status (see **S-0-0305, Allocation of Real-Time Status Bit 1**).

Parameter structure:

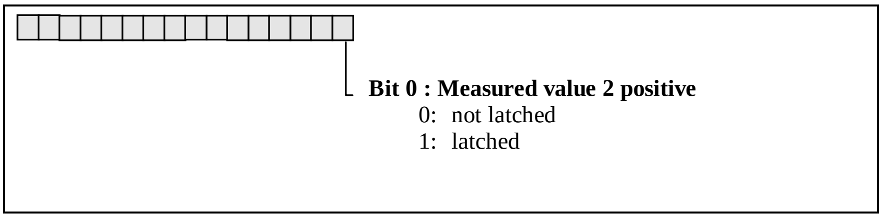

Fig. 2-42: S-0-0411, Probe 2 positive latched

See also functional description of "Probe Input Function".

S-0-0411 - attributes

Ident number:	S-0-0411	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

S-0-0412, Probe 2 negative latched

Description:

The drive sets bit 0 in this parameter if

- the command **S-0-0170, Probing cycle procedure command** is active;
- bit 3 has been set in **S-0-0169, Probe control parameter**;
- **S-0-0406, Probe 2 enable** exists;
- and the negative edge of **S-0-0402, Probe 2** is detected.

At the same time, the drive saves the value of the selected signal in **S-0-0133, Probe value 2 negative edge**.

The drive clears the bit if the NC clears the command **S-0-0170, Probing cycle procedure command** or if **S-0-0406, Probe 2 enable** transitions from "1" to "0".

The parameter **S-0-0412, Probe 2 negative latched** can be allocated to a real-time status bit and thus continually be transferred to the NC in the drive status (see **S-0-0305, Allocation of Real-Time Status Bit 1**).

Parameter structure:

Bit 0 : Measured value 2 negative
0: not latched
1: latched

Fig. 2-43: S-0-0412, Probe 2 negative latched

See also functional description of "Probe Input Function".

S-0-0412 - attributes

Ident number:	S-0-0412	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

3 Product Specific Parameters

P-0-0004, Smoothing Time Constant

Description:

The time constant that can be activated in this parameter is effective at the output of the speed controller and is suitable for suppressing quantization effects and for limiting the speed controller's bandwidth.

See also functional description of "Setting the velocity controller"

P-0-0004 - attributes

Ident number:	P-0-0004	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	500 / 65500	**Default value:**	500

P-0-0006, Overload Factor

Description:

The "overload factor" parameter influences the torque values M_{max} and M_{KB} and the running time value ED that have been specified in the selection data.

When the parameter is set to a value that is higher than the value in the selection data, the following values are reduced:

- running time value ED, and
- in some cases the maximum torque M_{max}

$$\ddot{U}F \approx \frac{M_{KB}}{M_{dN}} \cdot 100\%$$

ÜF = P-0-0006
MKB = short-term operation torque in Nm
MdN = standstill duration torque in Nm

Fig. 3-1: Overload factor

P-0-0006 - attributes

Ident number:	P-0-0006	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_0V	**Limit check:**	Yes
Unit:	%	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	1 / 500	**Default value:**	100

P-0-0008, Activation E-Stop-Function

Description:

The parameter P-0-0008 is used for activating the emergency stop input and for selecting a reaction to shut down the drive.

Parameter structure:

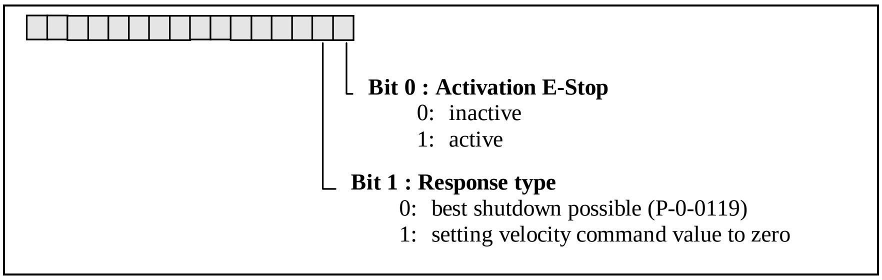

Fig. 3-2: P-0-008, Activation E Stop Function

The input polarity cannot be selected. It is always 0-active (i.e. the emergency stop is active if 0 V are applied to the input).

See also functional description of "Activation and polarity of the emergency stop input"

P-0-0008 - attributes

Ident number:	P-0-0008	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	-- / --	**Default value:**	0

P-0-0009, Error Message Number

Description:

An error that occurs during cyclic operation is diagnosed by the drive and shown on the 7-segment display.

At the same time, a bit in **S-0-0011, Class 1 Diagnostics** and the change bit for that diagnostic class in the drive status word are set. The controller can now read the error code shown on the display as a decimal number (201..899) via the parameter **P-0-0009, Error Message Number,** and perform a specific error reaction.

The value of this parameter is "0" if there is no error pending.

Example:

pending error:	**F822, Motor Encoder Failure: Signals too small**
P-0-0009:	822

See also functional description of "Error message number"

P-0-0009 - attributes

Ident number:	P-0-0009	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_0V	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	-- / --	**Default value:**	--

P-0-0010, Excessive Position Command

Description:

The position command value monitoring function has triggered the error **F237, Excessive Position Command Difference** and has shut down the drive according to the error reaction that was defined in the parameter **P-0-0119, Deceleration as best as possible** .

While the excessive position command value that has triggered the error is saved in parameter P-0-0010, the last valid position command value is saved in parameter **P-0-0011, Last valid Position Command Value**.

Only command values that are specified by the NC are monitored.

See also functional description of "Position command value monitoring"

P-0-0010 - attributes

Ident number:	P-0-0010	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer::**	No
Input min./max.	S-0-0076	**Default value:**	--

P-0-0011, Last Valid Position Command Value

Description:

The last valid position command value is stored in this parameter when the error **F237, Excessive Position Command Difference** occurs.

See also functional description of "Position command value monitoring"

P-0-0011 - attributes

Ident number:	P-0-0011	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer::**	No
Input min./max.	S-0-0076	**Default value:**	--

P-0-0012, Command "Set Absolute Measurement"

Description:

When an absolute measuring system is put into operation, its position feedback value first shows a random value that is not related to machine zero.

The value of the parameter **S-0-0403, Position feedback value status** is 0 in this case.

The command **P-0-0012, Command 'Set Absolute Measurement'** permits the position feedback value of that measuring system to be set to the required value. Once the command has been completed, the position feedback value of the encoder concerned has a defined reference to machine zero.

All necessary data items of the absolute measuring system are buffered in the feedback data storage and/or parameter data storage and are thus available after the system is switched back on. The position feedback value retains its reference to machine zero.

The parameter P-0-0012 is available for the execution of the function.

See also functional description of "Setting absolute dimension".

P-0-0012 - attributes

Ident number:	P-0-0012	**Modification:**	P4
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	0 / 3 = 11bin	**Default value:**	--

P-0-0018, Number of Pole Pairs/Pole Pair Distance

Description:

With rotary motors, the number of pole pairs per motor revolution is specified here. If the motor features a motor feedback data storage, the value is stored there and need not be specified. With linear motors, the length of one pole pair must be specified here.

P-0-0018 - attributes

Ident number:	P-0-0018	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC-OV	**Limit check:**	Yes
Fractional part digits:	0	**Combination check:**	No
Input min./max.	1/4	**Cyclic transfer::**	No
Default value:	--	**Unit in English:**	--

P-0-0019, Position Start Value

Description:

With non-absolute measuring systems, the position start value parameter is used for programming a defined initialization value for the position start values 1 and 2.

During initialization of the position feedback values, the drive checks in the command **S-0-0128, C2 Communication phase 4 transition check** whether the position start value has been written in communication phase 2 or 3. The position start values 1 and 2 are only set to that value if this has been done. The position start value only has an effect with non-absolute encoders.

See also functional description of "Position feedback values of non-absolute measuring systems after initialization"

P-0-0019 - attributes

Ident number:	P-0-0019	**Modification:**	P23
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer::**	No
Input min./max.	S-0-0076	**Default value:**	0

P-0-0038, Signal Select Analog Output Channel 1

Description:

DKC02.1 provides the "analog output" function. There are two outputs that permit drive-internal signals and status variables to be output as analog voltage signals.

The signals can be viewed on an oscilloscope connected to the analog outputs. The maximum output voltage is ±10 V at a resolution of 8 bits.

There are predefined channel numbers that permit specific signals to be selected.

For analog channel 1, selection is made by entering the channel selection number (hexadecimal format) in parameter P-0-038.

The following predefined signals exist:

Number:	Signal selection:	Scaling:
0x0	Zero point	0V
0x1	Torque-forming command current	P-0-0136
0x2	Velocity feedback value after mixing and filtering	P-0-0040
0x3	S-0-0036, velocity command value	P-0-0040
0x4	Position command value difference	P-0-0040
0x5	S-0-0051, position feedback value 1	P-0-0042
0x6	S-0-0053, position feedback value 2	P-0-0042
0x7	S-0-0189, lag	P-0-0042
0x8	Sine signal motor encoder	1 : 1
0x9	Cosine signal motor encoder	1 : 1
0xa	P-0-0139	1:1
0xb	P-0-0140	1:1
0xd	Speed command value	P-0-0040
0x10	Sine signal external encoder	1 : 1
0x11	Cosine signal external encoder	1 : 1
0x12	Torque-forming actual current	P-0-0136
0x13	Magnetizing actual current	P-0-0136
0x14	Velocity feedback value of motor encoder	P-0-0040
0X16	Bleeder utilization	10V = 100%

Fig. 3-3: Analog output signal selection

The following parameters must be considered for scaling:

- **P-0-0040, Scaling Factor for Velocity Data Channel 1**
- **P-0-0042, Scaling Factor for Position Data Channel 1**
- **P-0-0044, Scaling Factor for Power Analog Outputs**

See also functional description of "Analog output"

P-0-0038 - attributes

Ident number:	P-0-0038	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	-- / --	**Default value:**	0

P-0-0039, Signal Select Analog Output Channel 2

Description:

DKC02.1 provides the "analog output" function. There are two outputs that permit drive-internal signals and status variables to be output as analog voltage signals. These signals can be viewed on an oscilloscope that connects to the analog outputs. The maximum output voltage is ±10 V at a resolution of 8 bits. There are predefined channel numbers that permit specific signals to be selected.

For analog channel 2, selection is made by entering the channel selection number (hexadecimal format) in parameter P-0-039.

The following predefined signals exist:

Number	Signal selection:	Scaling:
0x0	Zero point	0V
0x1	Torque-forming command current	P-0-0137
0x2	Velocity feedback value after mixing and filtering	P-0-0041
0x3	S-0-0036, velocity command value	P-0-0041
0x4	Position command value difference	P-0-0041
0x5	S-0-0051, position feedback value 1	P-0-0043
0x6	S-0-0053, position feedback value 2	P-0-0043
0x7	S-0-0189, lag	P-0-0043
0x8	Sine signal motor encoder	1 : 1
0x9	Cosine signal motor encoder	1 : 1
0xa	P-0-0139	1 : 1
0xb	P-0-0140	1 : 1
0x10	Sine signal external encoder	1 : 1
0x11	Cosine signal external encoder	1 : 1
0x12	Torque-forming actual current	P-0-0137
0x13	Magnetizing actual current	P-0-0137
0x14	Velocity feedback value of motor encoder	P-0-0041
0x16	Bleeder utilization	10V = 100%

Fig. 3-4: Analog output signal selection

The following parameters must be considered for scaling:

- **P-0-0041, Scaling Factor for Velocity Data Channel 2**
- **P-0-0043, Scaling Factor for Position Data Channel 2**
- ***P-0-0044, Scaling Factor for Power Analog Outputs**

See also functional description of "Analog output"

P-0-0039 - attributes

Ident number:	P-0-0039	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	No
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	-- / --	**Default value:**	0

P-0-0040, Scaling Factor for Velocity Data Channel 1

Description:

If velocity data has been selected via the parameter **P-0-0038, Signal Select Analog Output Channel 1**, this parameter defines **P-0-0040, Scaling Factor for Velocity Data Channel 1**.

The unit rpm/10 V always refers to the motor. Any reduction ratio is not taken into account.

See also functional description of "Analog output"

P-0-0040 - attributes

Ident number:	P-0-0040	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC-OV	**Limit check:**	Yes
Fractional part digits:	0	**Combination check:**	No
Input min./max.	1 / 65535	**Cyclic transfer::**	No
Default value:	2000	**Unit in English:**	rpm/10V

P-0-0041, Scaling Factor for Velocity Data Channel 2

Description:

If velocity data has been selected via the parameter **P-0-0039, Signal Select Analog Output Channel 2**, this parameter defines **P-0-0041, Scaling Factor for Velocity Data Channel 2**.

The unit rpm/10 V always refers to the motor. Any reduction ratio is not taken into account.

See also functional description of "Analog output"

P-0-0041 - attributes

Ident number:	P-0-0041	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Fractional part digits:	1	**Combination check:**	No
Input min./max.	1 / 65535	**Cyclic transfer::**	No
Default value:	2000	**Unit in English:**	rpm/10V

P-0-0042, Scaling Factor for Position Data Channel 1

Description:

If position data has been selected via the parameter **P-0-0038, Signal Select Analog Output Channel 1**, this parameter defines **P-0-0042, Scaling Factor for Position Data Channel 1**.

The unit "degrees" refers to the motor.

See also functional description of "Analog output"

P-0-0042 - attributes

Ident number:	P-0-0042	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Fractional part digits:	1	**Combination check:**	No
Input min./max.	0,1 / 6553,5	**Cyclic transfer::**	No
Default value:	360,0	**Unit in English:**	Deg/10V

P-0-0043, Scaling Factor for Position Data Channel 2

Description:

If position data has been selected via the parameter **P-0-0039, Signal Select Analog Output Channel 2**, this parameter defines **P-0-0043, Scaling Factor for Position Data Channel 2**.

The unit "degrees" refers to the motor.

See also functional description of "Analog output"

P-0-0043 - attributes

Ident number:	P-0-0043	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Fractional part digits:	1	**Combination check:**	No
Input min./max.	0,1 / 6553,5	**Cyclic transfer::**	No
Default value:	3600	**Unit in English:**	Deg/10V

P-0-0051, Torque/Force Constant

Description:

The torque/force constant specifies the driving torque/force of the motor at a specific effective current.

With synchronous motors, the value exclusively depends on the motor design.

With asynchronous motors, this value is only valid if the motor is not used in the field shunting range.

With MKD and MDD motors, the parameter is stored in the feedback data storage.

$$M_A[Nm, N] = P\text{-}0\text{-}0051 * S\text{-}0\text{-}0080$$

with:	M_A	driving torque
	P-0-0051	torque/force constant [N/A]
	S-0-0080	torque/force command value [A]

P-0-0051 - attributes

Ident number:	P-0-0051	**Modification:**	P3
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	Nm/A	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer::**	No
Input min./max.	0 / 1000.00	**Default value:**	--

P-0-0075, Interface Feedback 2

Description:

This parameter is used for defining the encoder interface to which the external encoder is connected.

P-0-0075:	Measuring system:
0	no external encoder interface
2	Incremental encoder with sinusoidal signals, from Messrs Heidenhain, with signals $1V_{pp}$

Fig. 3-5: P-0-0075, interface module

P-0-0075 - attributes

Ident number:	P-0-0075	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	0 / 2	**Default value:**	0

P-0-0090, Travel limit parameter

Description:

The parameter P-0-0090 is used for activating the axis travel limit switches. It also permits the inputs to be inverted.

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1: The drive stops and the velocity command value is set to zero. It only starts moving when command values are specified that move the drive into the valid range.

Parameter structure:

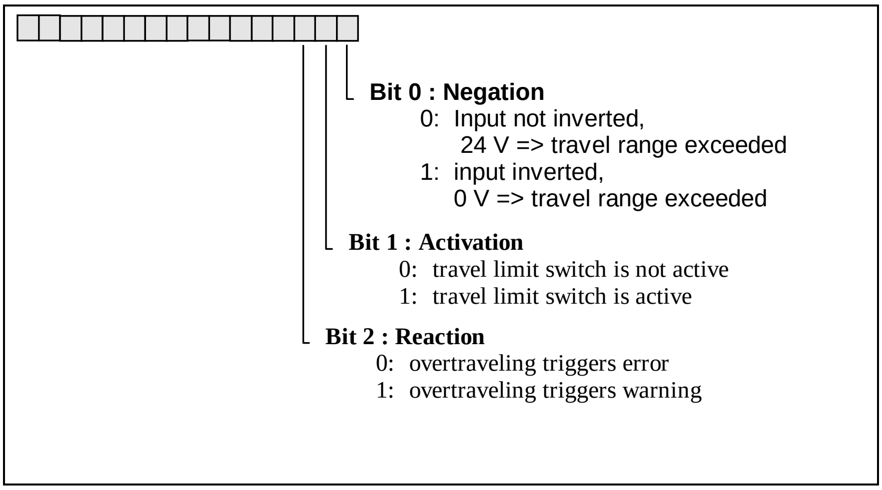

Fig. 3-6: P-0-0090, Travel limit parameter

See also functional description of "Travel range limits"

P-0-0090 - attributes

Ident number:	P-0-0090	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	BIN	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer::**	No
Input min./max.	0 / 111 bin	**Default value:**	0

P-0-0097, Monitoring Window abs. Encoder

Description:

When the absolute encoder monitoring function is used, the stored and the current actual position of the axis are compared in the transition command 3 → 4.

The error message **F276 Absolute encoder error** is issued if the difference is greater than the value in parameter P-0-0097.

0.1 motor revolutions (= 36 degrees with reference to the motor shaft) can be assumed as a standard value is the axis is equipped with a blocking brake or is self-locking.

See also functional description of "Absolute encoder monitoring"

P-0-0097 - attributes

Ident number:	P-0-0097	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer::**	No
Input min./max.	0 / S-0-0076	**Default value:**	25000

P-0-0098, Max. Model Deviation

Description:

"Max. Model Deviation" describes the maximum deviation between the real position feedback value and a model position feedback value that is computed by the drive.

The user may read the parameter and employ it for setting the values of the parameter **S-0-0159, Monitoring Window**.

Two cases must be distinguished when the model position feedback value is determined:

1) Position control with lag

In this mode, a model is employed for simulating the controlled system.

The maximum deviation between the resulting mode position feedback value and the real position feedback value is stored in the parameter P-0-0098.

The model of the controlled system represents a first-order time-delay element that only depends on the Kv factor of the position controller.

2) Position control without lag

In this mode, the position command value is compared with the position feedback value. The maximum deviation that has occurred is stored in P-0-0098.

A model of the controlled system is not required.

See also functional description of "Position control loop monitoring"

P-0-0098 - attributes

Ident number:	P-0-0098	**Modification:**	P234
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer::**	No
Input min./max.	0 / S-0-0076	**Default value:**	--

P-0-0099, Position Command Smoothing Time Constant

Description:

The parameter **P-0-0099, Position Command Smoothing Time Constant** defines the maximum jerk that is possible with cyclic position command value specification.

The maximum jerk results as:

$$\text{max. jerk} = \frac{\text{2nd derivative of the pos. command}}{\text{P-0-0099 position command - smoothing time constant}}$$

Fig. 3-7: Max. jerk

P-0-0099 ≤ S-0-0001, NC Cycle Time (TNcyc) must be set if a filter shall not be activated.

P-0-0099 - attributes

Ident number:	P-0-0099	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	ms / ms	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer::**	No
Input min./max.	0 / 655,35	**Default value:**	0

P-0-0109 Torque/force peak limitation

See functional description of "Torque/force limitation"

P-0-0109 - attributes

Ident number:	P-0-0109	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	S-0-0086	**Combination check:**	No
Fractional part digits:	S-0-0086	**Cyclic transfer::**	No
Input min./max.	0 / S-0-0086	**Default value:**	5000

P-0-0117, NC Reaction in Error Situation

Description:

This parameter gives the NC for 30 seconds the possibility of performing a co-ordinated shutdown of the drive in the event of an error. The drive subsequently reacts with the selected **P-0-0119, Deceleration as best as possible**.

The function is possible with non-fatal errors and interface errors.

Parameter structure:

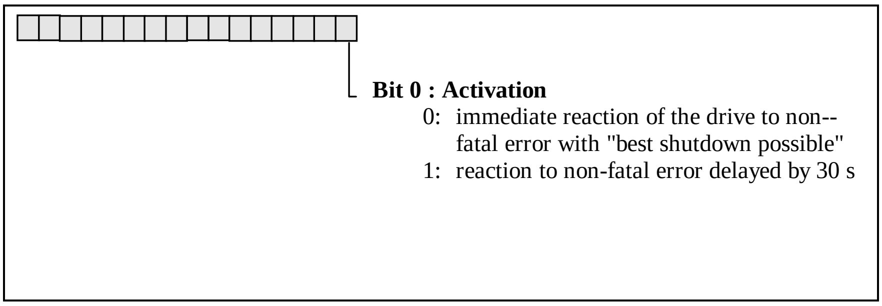

Fig. 3-8: P-0-0117, NC Reaction in Error Situation

See also functional description of "NC reaction in error situation"

P-0-0117 - attributes

Ident number:	P-0-0117	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 1	**Default value:**	0

P-0-0119, Deceleration as best as possible

Description:

This parameter defines the drive shutdown method in the event of

- non-fatal error
- interface error
- phase decrement
- removing controller enabling signal

P-0-0119:	Reaction:
0	Setting speed command value to zero; i.e. the motor is decelerated, taking the torque limit into account. The blocking brake is activated once the speed value is inside the standstill window (S-0-0124).
1	Torque release
2	Command value ramp and filter; currently not available.

Fig. 3-9: Drive shutdown methods

See also functional description of "Best shutdown possible"

P-0-0119 - attributes

Ident number:	P-0-0119	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 1	**Default value:**	0

P-0-0121, Velocity Mixfactor Feedback1&Feedback2

Description:

The parameter **P-0-0121, Velocity Mixfactor Feedback1&Feedback2** determines the ratio of the actual velocity values from motor encoder and external encoder.

Input is in percent values:

0.0 %: The speed controller only uses the speed from the motor encoder (= encoder 1)

100.0 %: The speed controller only uses the speed from the external encoder (= encoder 2)

The parameter is set to 0% if an external encoder does not exist.

See also functional description of "Setting the velocity mix factor"

P-0-0121 - attributes

Ident number:	P-0-0121	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	%	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0 / 100,0	**Default value:**	0

P-0-0123, Absolute encoder buffer

Description:

All data which the absolute encoder requires for position initialization is saved in this parameter when the amplifier is switched off.

P-0-0123 - attributes

Ident number:	P-0-0123	**Modification:**	No
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes variable	**Validity check:**	No
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- /--	**Default value:**	--

P-0-0136, Scaling Torque/Force Channel 1

Description:

If torque data has been selected via parameter **P-0-0038, Signal Select Analog Output Channel 1**, parameter **P-0-0136, Scaling Torque/Force Channel 1** defines the scaling of that data.

The unit of **P-0-0136** is A/10V = current/full scale reading.

If, for example, 40. A/10V is entered, the scaling of the analog signal results as 4 A/V.

P-0-0136 - attributes

Ident number:	P-0-0136	**Modification:**	P234
Function:	Parameter	**Storage:**	Prog.module
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_0V	**Limit check:**	Yes
Unit:	A/10V	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0.1 / 6553.5	**Default value:**	ITYP

P-0-0137, Scaling Torque/Force Channel 2

Description:

If torque data has been selected via parameter **P-0-0039, Signal Select Analog Output Channel 2**, parameter **P-0-0137, Scaling Torque/Force Channel 2** defines the scaling of that data.

The unit of **P-0-0137** is A/10V = current/full scale reading.

If, for example, 40. A/10V is entered, the scaling of the analog signal results as 4 A/V.

P-0-0137 - attributes

Ident number:	P-0-0137	**Modification:**	P234
Function:	Parameter	**Storage:**	Prog.module
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_0V	**Limit check:**	Yes
Unit:	A/10V	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0.1 /65535	**Default value:**	ITYP

P-0-0139, Analog Output 1

Description:

If **P-0-0139, Analog Output 1** has been selected via the parameter**s**

- **P-0-0038, Signal Select Analog Output Channel 1**
- **P-0-0039, Signal Select Analog Output Channel 2**

the contents of the parameter P-0-0139 will be output at the analog output channel 1 or channel 2, respectively.

Only values between -128 and +127 are possible. Those values are directly converted to ±10 V.

P-0-0139 - attributes

Ident number:	P-0-0139	**Modification:**	P234
Function:	Parameter	**Storage:**	
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_0V	**Limit check:**	Yes
Unit:	0.078V	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	Yes
Input min./max.:	-128 / 127	**Default value:**	--

P-0-0140, Analog Output 2

Description:

If **P-0-0140, Analog Output 2** has been selected via the parameter**s**

- **P-0-0038, Signal Select Analog Output Channel 1**
- **P-0-0039, Signal Select Analog Output Channel 2**

the contents of the parameter P-0-0140 will be output at the analog output channel 1 or channel 2, respectively.

Only values between -128 and +127 are possible. Those values are directly converted to ±10 V.

P-0-0140 - attributes

Ident number:	P-0-0140	**Modification:**	P234
Function:	Parameter	**Storage:**	
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_MV	**Limit check:**	Yes
Unit:	0.078V	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	Yes
Input min./max.:	-128 / 127	**Default value:**	--

P-0-0200, Signal select probe 1

Description:

This parameter selects the measured variable that is used for probe input 1.

The following signals can currently be selected:

P-0-0200:	Selected signal:
0	position feedback value 1 or 2, depends on bit 4 of **S-0-0169, Probe control parameter**
1	time measurement in µs

Fig. 3-10: P-0-0200, measured variable for probe input 1

See also functional description of "Probe function"

P-0-0200 - attributes

Ident number:	P-0-0200	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 1	**Default value:**	0

P-0-0201, Signal select probe Signal 2

Description:

This parameter selects the measured variable that is used for probe input 2.

The following signals can currently be selected:

P-0-0201:	Selected signal:
0	position feedback value 1 or 2, depends on bit 4 of **S-0-0169, Probe control parameter**
1	time measurement in µs

Fig. 3-11: P-0-0200, measured variable for probe input 1

See also functional description of "Probe function"

P-0-0201 - attributes

Ident number:	P-0-0201	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 1	**Default value:**	0

P-0-0202, Difference probe values 1

Description:

The amount of the difference between the positive and the negative measured value of probe 1 is stored here. The value is computed whenever a new positive or negative measured value is latched.

See also functional description of "Probe function"

P 0-0202 - attributes

Ident number:	P-0-0202	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	-- / --	**Default value:**	--

P-0-0203, Difference probe values 2

Description:

The amount of the difference between the positive and the negative measured value of probe 2 is stored here. The value is computed whenever a new positive or negative measured value is latched.

See also functional description of "Probe function"

P-0-0203 Attribute

Ident number:	P-0-0203	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	AT
Input min./max.:	S-0-0076	**Default value:**	--

P-0-0508, Commutator-Offset

Description:

With synchronous motors, this parameter specifies the offset between the raw value from the motor encoder and the resulting absolute electrical angle between stator current vector and rotor flux vector.

If a motor is equipped with a motor feedback data storage, the commutation offset is stored there and need not be specified.

P-0-0508 - attributes

Ident number:	P-0-0508	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 10000	**Default value:**	--

P-0-0509, Slot Angle

Description:

This parameter is not employed in the DKC02.1 unit.

P-0-0509 - attributes

Ident number:	P-0-0509	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3599	**Default value:**	--

P-0-0510, Moment of inertia of the rotor

Description:

This parameter specifies the rotor's moment of inertia. If a motor is equipped with a motor feedback data storage, the value is saved there.

P-0-0510 - attributes

Ident number:	P-0-0510	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	kgm^2	**Combination check:**	No
Fractional part digits:	5	**Cyclic transfer:**	No
Input min./max.:	0 / 1.00000	**Default value:**	--

P-0-0511, Brake current

Description:

This parameter is not employed in the DKC02.1 unit.

P-0-0511 - attributes

Ident number:	P-0-0511	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0 / 500.000	**Default value:**	--

P-0-0512, Default position loop Kv factor

Description:

This is the default value of the position loop gain. The parameter is entered at the factory and cannot be modified. Upon "load default parameters", the parameter value is copied to the parameter **S-0-0104, Position Loop prop. Gain KV**.

P-0-0512 - attributes

Ident number:	P-0-0512	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes

Unit:	1000/min	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	0.01 / 327.67	**Default value:**	--

P-0-0513, Feedbacktyp

Description:

This value exists in all measuring systems that are equipped with a feedback data storage. It characterizes encoder resolution and other important properties of the measuring system. The encoder or drive manufacturer defines the parameter code. The parameter cannot be written to and merely informs of the connected feedback. Measuring systems with feedback data storage are connected via the following encoder interfaces:

- 0 Standard resolver with MKD motors
- 1 Standard
- 4 DFF 1
- 8 DAG 2
- 16 Absolute encoder with MKD and MDD motors

P-0-0513 - attributes

Ident number:	P-0-0513	**Modification:**	No
Function:	Parameter	**Storage:**	Feedb/EEPROM
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 100	**Default value:**	--

P-0-0514, Absolute Encoder Offset

Description:

The parameter is used for position initialization of absolute encoders that possess feedback storage and have not been defined as modulo axes. **P-0-0514** cannot be written to.

P-0-0514 - attributes

Ident number:	P-0-0514	**Modification:**	No
Function:	Parameter	**Storage:**	Feedb/EEPROM
Data length:	4 bytes	**Validity check:**	No
Format:	HEX	**Limit check:**	No
Unit:	incr.	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- --	**Default value:**	--

P-0-0516, Feedback Interface

Description:

This parameter is not employed in the DKC02.1 unit.

P 0-0516 - attributes

Ident number:	P-0-0516	**Modification:**	--
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 byte	**Validity check:**	Yes
Format:	binary	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	0 / 100	**Default value:**	--

P-0-0518, Amplifier Nominal Current 2

Description:

The parameter defines the maximum nominal current of the amplifier at a reduced peak current. Together with the parameters **S-0-0110, Amplifier Peak Current**, **S-0-0112, Amplifier Nominal Current**, and **P-0-0519, Amplifier Peak Current 2**, it defines the continuous peak current characteristic curve used for the peak current limitation of the amplifier.

The value, that depends on the selected switching frequency, need not be entered as it has invariably been programmed in the amplifier.

P-0-0518 - attributes

Ident number:	P-0-0518	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0.001 / 500.000	**Default value:**	--

P-0-0519, Amplifier Peak Current 2

Description:

The drive permits a modified continuous peak current characteristic curve with reduced amplifier peak current and increased continuos amplifier current to be defined. The parameter P-0-0519 defines the amplifier peak current in this case. It is used for defining the operating point on the continuous peak current characteristic curve.

The value, that depends on the selected switching frequency, need not be entered as it has invariably been programmed in the amplifier.

P-0-0519 - attributes

Ident number:	P-0-0519	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0.001 / 500.000	**Default value:**	--

P-0-0520, Hardware Code

Description:

Parameter used for identifying the hardware revision level.

The parameter is written at the factory and cannot be modified.

P-0-0520 - attributes

Ident number:	P-0-0520	**Modification:**	not possible
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 Byte	**Validity check:**	No
Format:	decimal	**Limit check:**	No
Unit:	none	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	**-- --**	**Default value:**	--

P-0-0522, Absolute encoder count direction

This parameter is not employed in the DKC02.1 unit.

P-0-0522 - attributes

Ident number:	P-0-0522	**Modification:**	P2/P3
Function:	Parameter	**Storage:**	parallel EEPROM
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	0 / 1	**Default value:**	--

P-0-4000, Current-Zero-Trim Phase U

Description:

This parameter is used to show the determined result of the balance procedure of the actual current value sensor of phase U.

P-0-4000 - attributes

Ident number:	P-0-4000	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	%	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	-100.00 / 100.00	**Default value:**	--

P-0-4001, Current-Zero-Trim Phase V

Description:

This parameter is used to show the determined result of the balance procedure of the actual current value sensor of phase V.

P-0-4001 - attributes

Ident number:	P-0-4001	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_MV	**Limit check:**	Yes
Unit:	%	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	-100.00 / 100.00	**Default value:**	--

P-0-4002, Current-Zero-Trim Phase U

Description:

This parameter is determined in the test bay and is used for adjusting the current sensor with respect to its gain errors.

P-0-4002 - attributes

Ident number:	P-0-4002	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	4	**Cyclic transfer:**	No
Input min./max.:	0.0001/ 2.0000	**Default value:**	--

P-0-4003, Current-Zero-Trim Phase V

Description:

This parameter is determined in the test bay and is used for adjusting the current sensor with respect to its gain errors.

P-0-4003 - attributes

Ident number:	P-0-4003	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	4	**Cyclic transfer:**	No
Input min./max.:	0.0001 / 2.0000	**Default value:**	--

P-0-4004, Magnetizing current

This parameter is not employed in the DKC02.1 unit.

P-0-4004 - attributes

Ident number:	P-0-4004	**Modification:**	No
Function:	Parameter	**Storage:**	fixed
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0.001 / 500.000	**Default value:**	--

P-0-4005, Back EMF constant

Description:

This parameter is not employed in the DKC02.1 unit.

P-0-4005 - attributes

Ident number:	P-0-4005	**Modification:**	--
Function:	Parameter	**Storage:**	fixed
Data length:	4 byte	**Validity check:**	No
Format:	decimal	**Limit check:**	No
Unit:	Vs/rad	**Combination check:**	No
Fractional part digits:	4	**Cyclic transfer:**	No
		Default value:	--
Input min./max.:	0.0001 / 429496.7295		

P-0-4006, Process block target position

This parameter is not employed in the DKC02.1 unit.

P-0-4006 - attributes

Ident number:	P-0-4006	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	parallel EEPROM
		Validity check:	Yes
Format:	S-0-0076	**Limit check:**	Yes
Unit:	S-0-0076	**Combination check:**	No
Fractional part digits:	S-0-0076	**Cyclic transfer:**	No
Input min./max.:	S-0-0076	**Default value:**	0
Data length:	List with 32 elements of 4 bytes each, 128 bytes		

P-0 4007, Process block velocity

This parameter is not employed in the DKC02.1 unit.

P 0-4007 - attributes

Ident number:	P-0-4007	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	parallel EEPROM
		Validity check:	Yes
Format:	S-0-0044	**Limit check:**	Yes
Unit:	S-0-0044	**Combination check:**	No
Fractional part digits:	S-0-0044	**Cyclic transfer:**	No
Input min./max.:	S-0-0044	**Default value:**	100000
Data length:	List with 32 elements of 4 bytes each, 128 bytes		

P-0-4008, Process block acceleration

This parameter is not employed in the DKC02.1 unit.

P-0-4008 - attributes

Ident number:	P-0-4008	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	parallel EEPROM
		Validity check:	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	S-0-0160	**Combination check:**	No
Fractional part digits:	S-0-0160	**Cyclic transfer:**	No
Input min./max.:	S-0-0160	**Default value:**	100000
Data length:	List with 32 elements of 4 bytes each, 128 bytes		

P-0-4009, Process block jerk

This parameter is not employed in the DKC02.1 unit.

P-0-4009 - attributes

Ident number:	P-0-4009	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	Yes
		Validity check:	Yes
Format:	Parameter	**Limit check:**	No
Unit:	S-0-0160	**Combination check:**	No
Fractional part digits:	S-0-0160	**Cyclic transfer:**	No
Input min./max.:	0 / S-0-0160	**Default value:**	0
Data length:	List with 32 elements of 4 bytes each, 128 bytes		

P-0-4010 Load inertia

Description:

This parameter contains the determined load inertia without **P-0-0510, Moment of inertia of the rotor**. The load inertia value is required for optimizing the speed control loop, but it is not used in the present version. The inertia is rotary, and related to the motor.

P-0-4010 - attributes

Ident number:	P-0-4010	**Modification:**	P234 (always)
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	kg m²	**Combination check:**	No
Fractional part digits:	5	**Cyclic transfer:**	AT
Input min./max.:	0 / 21474.83647	**Default value:**	0

P-0-4011, Switching Frequency

Description:

This parameter permits the switching frequency of the pulse-controlled inverter to be set to 4 or 8 kHz.

See also functional description of "Setting the effective continuous current"

Attribute P 0-4011

Ident number:	P-0-4011	**Modification:**	P23
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	No
Unit:	kHz	**Combination check:**	Yes
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	4 / 8	**Default value:**	4

P-0-4012, Slip gain

Description:

This parameter does not have a meaning here.

P-0-4012 - attributes

Ident number:	P-0-4011	**Modification:**	No
Function:	Parameter	**Storage:**	fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	Hz/100A	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

P-0-4013 Maximum rotor frequency

Description:

This parameter does not have a meaning ere.

P-0-4013 - attributes

Ident number:	P-0-4013	**Modification:**	No
Function:	Parameter	**Storage:**	fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	Hz / 100A	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	**-- / --**	**Default value:**	--

P-0-4014, Motor Type

Description:

This parameter selects the motor type:

- 1: MDD
- 2: MKD

P-0-4014 - attributes

Ident number:	P-0-4014	**Modification:**	No
Function:	Parameter	**Storage:**	fixed
Data length:	2 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 255	**Default value:**	--

P-0-4015, DC bus voltage

Description:

The DC bus voltage is stored as a parameter in the amplifier.

The parameter cannot be written to; it is merely used for display and internal computations.

P-0-4015 - attributes

Ident number:	P-0-4015	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	V	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 1000	**Default value:**	--

P-0-4016 Dynamic compensation

Description:

This parameter is not employed in the DKC02.1 unit.

P-0-4016 - attributes

Ident number:	P-0-4016	**Modification:**	--
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Yes
Format:	DEC_OV	**Limit check:**	Yes
Unit:	degrees/1000rpm	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	0.00 / 3.80	**Default value:**	--

P-0-4019, Process block mode

This parameter is not employed in the DKC02.1 unit.

P-0-4019 - attributes

Ident number:	P-0-4019	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	parallel EEPROM
		Validity check:	Yes
Format:	hexadecimal	**Limit check:**	No
Unit:	--	**Combination check:**	Yes
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	--	**Default value:**	1
Data length:	List with 32 elements of 2 bytes each, 64 bytes		

P-0-4021, Baud Rate (RS232/485)

Description:

Various baud rates can be selected for communication via the serial interface.

Baud rate [bits/s]	Selection in parameter P-0-4021
9600	0
19200	1

Fig. 3-12: Selectable baud rates

Note: Do not alter the baud rate in the list of all parameters in DriveTop. If you do, you will be locked out of further communication.

P-0-4021 - attributes

Ident number:	P-0-4021	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	parallel EEPROM
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	0 / 3	**Default value:**	0

P-0-4023, C4 Communication phase 2 transition check

This parameter is not employed in the DKC02.1 unit.

P-0-4023 - attributes

Ident number:	P-0-4023	**Modification:**	P3 + P4
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	BIN	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 3 = 11bin	**Default value:**	--

P-0-4024, Test status

Description:

This parameter is used for information about the product progress in the factory.

P-0-4024 - attributes

Ident number:	P-0-4024	**Modification:**	--
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	2 bytes	**Validity check:**	Yes
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	--	**Default value:**	**--**

P-0-4025, Password

Description:

In version 03VRS there is only one supervisor password that is required for writing to the parameters that have invariably been set in the factory.

P-0-4025 - attributes

Ident number:	P-0-4025	**Modification:**	P2/P3/P4
Function:	Parameter	**Storage:**	parallel EEPROM
		Validity check:	Yes
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--
Data length:	0 byte - max. 10 characters		

P-0-4026, Process block selection

This parameter is not employed in the DKC02.1 unit.

P-0-4026 - attributes

Ident number:	P-0-4026	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	decimal	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	0 / 31	**Default value:**	-- / --

P-0-4027, Function parameter

This parameter is not employed in the DKC02.1 unit.

P-0-4027 - attributes

Ident number:	P-0-4027	**Modification:**	always
Function:	Parameter	**Storage:**	parallel EEPROM
Data length:	2 bytes	**Validity check:**	Yes
Format:	hexadecimal	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	0x8

P-0-4028, Impulse wire feedback -Offset

Description:

The offset of the impulse wires to the resolver encoder is stored in this parameter.

It is determined in the factory and stored in the feedback storage.

P-0-4028 - attributes

Ident number:	P-0-4028	**Modification:**	No
Function:	Parameter	**Storage:**	Feedb/EEPROM
Data length:	4 bytes	**Validity check:**	No
Format:	decimal.	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

P-0-4029, Impulse wire feedback -PIC counter value

Description:

This parameter contains the information about the absolute encoder position.

The value is updated upon each position initialization. The user cannot write to it.

P-0-4029 - attributes

Ident number:	P-0-4029	**Modification:**	No
Function:	Parameter	**Storage:**	Feedb/EEPROM
Data length:	4 bytes	**Validity check:**	No
Format:	HEX	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 0 x $FFFFFFFF_h$	**Default value:**	--

P-0-4035, Trim Current

Description:

The parameter is used for compensating the current measurement gain. It cannot be written to.

Attribute P 0-4035

Ident number:	P-0-4035	**Modification:**	No
Function:	Parameter	**Storage:**	Drive/EEPROM
Data length:	4 bytes	**Validity check:**	Phase 3
Format:	DEC_OV	**Limit check:**	Yes
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0.001 / 500.000	**Default value:**	--

P-0-4036, Contacted motor type

Description:

Whenever the "initial program loading" function is executed, the value of the parameter **S-0-0141, Motor Type** is stored in this parameter.

Whenever the controller is switched on, the value of the parameter **S-0-0141** from the motor feedback is compared with the value of P-0-4036. A different motor has been connected if the values are different, and the 7-segment display shows the message "UL". Pressing the "S1" button or starting the "Clear error" command (S-0-0099) activates the default control parameters of the new motor.

The function is only relevant in conjunction with motors that are equipped with motor feedback storage (such as MDD or MKD).

See also functional description of "Automatic execution of the initial program loading function"

P-0-4036 - attributes

Ident number:	P-0-4036	**Modification:**	P234
Function:	Parameter	**Storage:**	Param/EEPROM
Data length:	1 byte variable	**Validity check:**	Phase 3
Format:	ASCII	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	**-- / --**

P-0-4037, Default velocity loop proportional gain Kp

Description:

This is the default value of the velocity control proportional gain. The parameter is set at the factory and cannot be modified. Upon "loading default parameters", the parameter value is copied to the parameter **S-0-0100, Velocity Loop Proportional Gain**. Any differences in the units will be taken into account.

The default values permit the motor to be used. Optimum adaptation to the machine conditions requires the parameter S-0-0100 to be optimized.

P-0-4037 - attributes

Ident number:	P-0-4037	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Phase 3
Format:	decimal	**Limit check:**	No
Unit:	mAs/rad	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

P-0-4038, Default velocity loop integral action time

Description:

This is the default value of the velocity control integral-action time. The parameter is set at the factory and cannot be modified. Upon "loading default parameters", the parameter value is copied to the parameter **S-0-0101, Velocity Loop Integral Action Time**.

The default values permit the motor to be used. Optimum adaptation to the machine conditions requires the parameter S-0-0101 to be optimized.

P-0-4038 - attributes

Ident number:	P-0-4038	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	ms	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0.1 / 6553.5	**Default value:**	--

P-0-4039, Default current loop proportional gain

Description:

This is the default value of the current loop proportional gain. The parameter is set at the factory and cannot be modified. Upon "loading default parameters", the parameter value is copied to the parameter **S-0-0106, Proportional Gain 1 Current Regulator**

Current loop proportional gain has already been optimized and may not be modified.

P-0-4039 - attributes

Ident number:	P-0-4039	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	V/A	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	0 / 500.00	**Default value:**	--

P-0-4040, Digital Inputs

Description:

Bit string for reading the digital input signals from the DKCs.

1 means: A voltage of approximately 24 V is applied to the input.

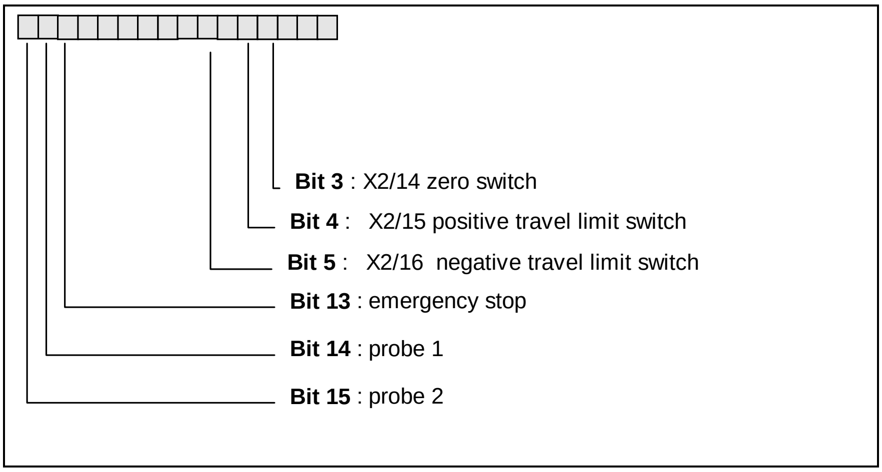

Fig. 3-13: P-0-4040 digital inputs

P-0-4040 - attributes

Ident number:	P-0-4040	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	Byte	**Validity check:**	No
Format:	Binary	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	-- /--	**Cyclic transfer:**	No
Input min./max.:	-- /--	**Default value:**	--

P-0-4041, Digital outputs

This parameter is not employed in the DKC02.1 unit.

P-0-4041 - attributes

Ident number:	P-0-4041	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	binary	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	-- / --	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

P-0-4042, Default velocity loop delay time

Description:

This is the default value of the speed controller filter time constant. The parameter is set at the factory and cannot be modified. Upon "loading default parameters", the parameter value is copied to the parameter **P-0-0004, Smoothing Time Constant**.

P-0-4042 - attributes

Ident number:	P-0-4042	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	µs	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	500 / 65535	**Default value:**	--

P-0-4043, Bleeder overload factor

Description:

This parameter describes the transient overload capacity of the integrated braking resistor. Bleeder overload factor = 60 means that the peak power of the brake resistor can be 60 times higher than the continuous power. The parameter is set at the factory and cannot be modified.

P-0-4043 - attributes

Ident number:	P-0-4043	**Modification:**	No
Function:	Parameter	**Storage:**	V.- EEPROM
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	--	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	1 / 100	**Default value:**	--

P-0-4044, Bleeder Load

Description:

This parameter can be used for reading the average power that is converted in the brake resistor. 100% means that the brake resistance has its continuous power applied. For safe operation, the load should be < 80%. The value is heavily smoothed. The "bleeder load" analog signal must be viewed in order to assess whether a machining cycles puts an excessive load on the brake resistor.

P-0-4044 - attributes

Ident number:	P-0-4044	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	decimal	**Limit check:**	No
Unit:	%	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	--

P-0-4045, Active continuous current

Description:

This value shows the currently permitted continuous current that does not overload the unit. At the same time, this is the current to which the current limitation function reduces.

See also functional description of "Determining the effective continuous current"

P-0-4045 - attributes

Ident number:	P-0-4045	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	**--**

P-0-4046, Active peak current

Description:

The parameter **P-0-4046, Active peak current** specifies the maximum active current the amplifier is currently able to supply. The current limitation function reduces that value. Further influencing factors are:

- **S-0-0092, Bipolar Torque/Force Limit Value**
- **S-0-0109, Motor Peak Current**

See also functional description of "Setting the effective peak current".

P-0-4046 - attributes

Ident number:	P-0-4046	**Modification:**	No
Function:	Parameter	**Storage:**	No
Data length:	4 bytes	**Validity check:**	No
Format:	DEC_OV	**Limit check:**	No
Unit:	A	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	-- / --	**Default value:**	**--**

P-0-4047, Motor inductance

Description:

The inductance of the motor, measured between two terminals.

The parameter is set at the factory and cannot be modified.

P-0-4047 - attributes

Ident number:	P-0-4047	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	No
Unit:	mH	**Combination check:**	No
Fractional part digits:	2	**Cyclic transfer:**	No
Input min./max.:	0 / 655.35	**Default value:**	**--**

P-0-4048, Stator resistance

Description:

Winding resistance of the motor, measured between two terminals.

The parameter is set at the factory and cannot be modified.

P-0-4048 - attributes

Ident number:	P-0-4048	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	No
Unit:	ohms	**Combination check:**	No
Fractional part digits:	3	**Cyclic transfer:**	No
Input min./max.:	0 / 65,535	**Default value:**	--

P-0-4049, Default current loop integral action time

Description:

This is the default value of the current controller filter integral-action time. The parameter is set at the factory and cannot be modified. Upon "loading default parameters", the parameter value is copied to the parameter **S-0-0107, Current Regulator 1 Integral Action Time.**

The current controller filter integral-action time has already been optimized and may not be modified.

P-0-4049 - attributes

Ident number:	P-0-4049	**Modification:**	No
Function:	Parameter	**Storage:**	Feedback
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	No
Unit:	ms	**Combination check:**	No
Fractional part digits:	1	**Cyclic transfer:**	No
Input min./max.:	0 / 6553.5	**Default value:**	--

P-0-4050, Delay answer RS232/485

Description:

This parameter defines the minimum time that must elapse between the reception of the last character of a message frame via the serial interface and the transmission of the first character of the response. RS485 need this time during operation for switching over from receive mode to transmit mode, and vice versa. Albeit this parameter is not required in RS232 operation, it should be set to 1 ms in that mode.

P-0-4050 - attributes

Ident number:	P-0-4050	**Modification:**	P2/P3/P4
Function: EEPROM	Parameter	**Storage:**	Parallel
Data length:	2 bytes	**Validity check:**	Yes
Format:	decimal	**Limit check:**	Yes
Unit:	ms	**Combination check:**	No
Fractional part digits:	0	**Cyclic transfer:**	No
Input min./max.:	0 / 200	**Default value:**	0

P-0-4094, Command Parameter Default Set

Description:

When this command is executed, all parameters in the parallel EEPROM are set to the default values that are stored in the EPROM. Invalid parameters are set to a valid state. After the software has been replaced, the system checks whether the number of buffered parameters has changed. The display shows "PL" if this is the case. Pressing the S1 button sets all buffered parameters to their default values.

To create a backup copy of the parameters, use the following procedure:

- Do not press the S1 button switch off the unit
- insert the old software save the parameters
- insert the new software press S1

P-0-4094 - attributes

Ident number:	P-0-4094	**Modification:**	P2
Function:	Command	**Storage:**	No
Data length:	2 bytes	**Validity check:**	No
Format:	binary	**Limit check:**	No
Unit:	--	**Combination check:**	No
Fractional part digits:	--	**Cyclic transfer:**	No
Input min./max.:	0 / 11 b	**Default value:**	**--**

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ECODRIVE
Drive Controller DKC02.1

Supplement B
Diagnostic message description
SSE 03VRS

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Contents

Notes

1 Diagnostic Message Description

1.1 Error Diagnoses

UL Motor Type not registered

Description:

The controller settings for current controller, speed controller and position controller are stored in the motor feedback. When the controller is connected to the motor for the first time, the controller indicates that the controller settings are not correct for that motor type. When the "initial program loading" command is started, the default settings from the feedback storage are loaded into the drive controller.

Pressing the S1 button on the drive controller starts the "initial program loading" command.

Cause:

The motor has been replaced.
A parameter file has been loaded in which the parameter **P-0-4036, Contacted Motor Type** and the motor type are different.

Remedial action:

Start command "C700 initial program loading" or press S1 button.

F208 attributes

7-segment display:	UL
Diagnosis number:	F208
Error class:	Not fatal
Error number:	208

PL Load parameter default values

Description:

After the firmware (EPROMs) has been replaced, the drive shows **"PL"** if parameters are different in the old and the new firmware. Pressing the S1 button on the drive controller or starting the command "load base parameters" clears all parameter values and sets the parameters to their default values.

Cause:

The firmware has been replaced; the number of parameter in the new firmware is different from the number of parameters in the old firmware.

Remedial action:

Press S1 on the drive controller. This clears all parameter values and sets the parameters to their factory-set default values.

CAUTION

⇒ This overwrites all parameters and motion blocks.

F209 Attribute:

7-segment display: PL

Diagnosis number: PL

Error class: Not fatal

F207 Switching to uninitialized operation mode

Cause:

"0" has been programmed in at least one of the four mode parameters **S-0-0032..35**. This mode has been selected by bits 8 and 9 in the master control word while the drive controller was activated.

Remedial action:

Enter the required mode in the activated mode parameter.

Valid modes are:

Meaning:	Bit list of mode parameters:
Torque control	0000 0000 0000 0001
Velocity control	0000 0000 0000 0010
Position control with position feedback value 1	0000 0000 0000 x011
Position control with position feedback value 2	0000 0000 0000 x100
Drive-internal interpolation with position feedback value 1	0000 0000 0001 x011
Drive-internal interpolation with position feedback value 2	0000 0000 0001 x100

Fig. 1-1: Modes

Parameter:	Primary mode	S-0-0032
	Secondary mode 1	S-0-0033
	Secondary mode 2	S-0-0034
	Secondary mode 3	S-0-0035

Verify that a valid interpolation type has been entered.

See also functional description of "Setting the mode parameters"

F207 attributes

7-segment display:	F2/07
Error number:	207
Diagnosis number:	F207
Error class:	Not fatal

F218 Heatsink Overtemperature Shutdown

Description:

The heat sink temperature of the DKCs is monitored. The unit is switched off to prevent damage if the heat sink temperature is too high.

Cause:

1. The ambient temperature is too high. The specified performance characteristics are valid up to an ambient temperature of 45°C.
2. The heat sink of the DKC is polluted.
3. Other modules or cabinet installation prevent convection.
4. Fan defective

Remedial action:

Ref. 1. Reduce ambient temperature (provide cooling for the switchgear cabinet, for example)

Ref. 2. Clean the heat sink

Ref. 3. Install the unit in a vertical position and provide sufficient clearance for the ventilation of the heat sink.

Ref. 4. Replace the unit

F218 attributes

7-segment display:	F2/18
Error number:	218
Diagnosis number:	F218
Error class:	Not fatal

F219 Motor Overtemperature Shutdown

The drive generates this error message when the motor temperature exceeds 150°C.

Cause:

1. Motor overload. The effective torque requested from the motor has exceeded the permissible continuous torque value for too long a time.
2. Broken wire or short-circuit in the cable to the motor temperature monitor.
3. Instability in the speed control loop.

Remedial action:

Ref. 1. Verify motor rating. Check whether the drive conditions of a system that has been used for a long time have changed in the meantime (pollution, friction, moved masses, etc.).

Ref. 2. Check the cable to the motor temperature monitor (X6/1 and X6/2) for broken wires or short-circuit.

Ref. 3. Check the parameter values of the speed control loop (see Functional Description).

See also functional description of "Temperature monitoring"

F219 attributes

7-segment display:	F2/19
Error number:	219
Diagnosis number:	F219
Error class:	Not fatal

F220 Bleeder Overtemperature Shutdown

Description:

Overload of the built-in brake resistance. The drive is shut down after braking if the maximum braking energy is exceeded. This protects the bleeder from thermal destruction.

Cause:

1. The energy returned from the mechanical system of the machine via the motor is too high.

Remedial action:

Ref. 1. Too much power ---> reduce acceleration values

Too much energy ---> reduce velocity values

Verify drive rating

Install additional bleeder module if necessary

F220 attributes

7-segment display:	F2/20
Diagnosis number:	F220
Error class:	Not fatal

F226 Undervoltage Error

The DC bus voltage is monitored. The drive is shut down after the selected error reaction when the voltage falls below the minimum threshold.

Cause:

1. Power shutdown without previous de-activation of the drive via the controller enable signal (RF)
2. Activating the drive via the controller enable signal (RF) without previous activation of the power section.
3. Malfunction of the power supply.

Remedial action:

1. Verification of the logic required for activating the drive in the connected controller.
2. Malfunctions in the power supply must be eliminated.

See also functional description of "Controller enable signal"

F226 attributes

7-segment display:	F2/26
Error number:	226
Diagnosis number:	F226
Error class:	Not fatal

F228 Excessive Deviation

When the position control loop in the drive is closed, it checks whether the specified command value can be followed. A model position feedback value is computed in the drive and compared with the actual position feedback value. This error is generated if the difference between theoretical and actual position feedback value exceeds the value of the parameter **S-0-0159, Monitoring Window** for more than 64 ms.

Cause:

1. The acceleration capacity of the drive has been exceeded.
2. The axis has been blocked.
3. Incorrect values in the drive parameters.
4. Incorrect value of **S-0-0159, Monitoring Window**
5. The power supply was switched off while the controller enable signal was applied.

Remedial action:

Ref. 1. Check the parameter **S-0-0092, Bipolar Torque/Force Limit Value** and set it to the maximum value that is permissible for the application.

Reduce the specified acceleration value of the controller (see Controller Manual).

Ref. 2. Check the mechanical system and eliminate axis jamming

Ref. 3. Check drive parameters

Ref. 4. Set **S-0-0159, Monitoring Window**

Ref. 5. Check if there are error messages different to "28" in the AC servo drive.

See also functional description of "Position control loop monitoring"

F228 attributes

7-segment display:	**F2/28**
Error number:	228
Diagnosis number:	F228
Error class:	Not fatal

F229 Motor Encoder Failure: Quadrant Error

A hardware error was detected in the employed motor encoder interface.

Cause:

1. Defective encoder cable
2. Interference on encoder cable
3. Defective motor encoder interface
4. Defective drive controller

Remedial action:

Ref. 1. Replace the encoder cable

Ref. 2. Lay the encoder cable separately from power cables

Ref. 3. Replace the motor encoder interface

Ref. 4. Replace the drive controller

F229 attributes

7-segment display:	F2/29
Error number:	229
Diagnosis number:	F229
Error class:	Not fatal

F234 Emergency Stop

Cause:

The emergency stop function has been triggered by switching off the +24 V signal art the emergency stop input. The drive was shut down with the selected error reaction.

Remedial action:

1. Eliminate the cause that has switched off the +24 V signal at the emergency stop input.
2. Activate the command "Reset class 1 diagnostics" via the controller (see Controller Manual).

See also functional description of "Emergency stop function"

F234 attributes

7-segment display:	F2/34
Error number:	234
Diagnosis number:	F234
Error class:	Not fatal

F236 Excessive Position Feedback Difference

Cause:

Position feedback value 1 and position feedback value 2 are set to the same value and the cyclic evaluation of both encoders is started in the communication phase 4 transition check command. In cyclic operation (phase 4), the position feedback value difference of both encoders is compared with **S-0-0391, Monitoring Window External Feedback**. The error **F236, Excessive Position Feedback Difference** is issued and the programmed error reaction performed if the value of the difference exceeds the monitoring window.

1. Incorrect parameter for external encoder
(**S-0-0115, Position feedback 2 type parameter
S-0-0117, Resolution of rotational feedback**

2. Incorrect parameter values for mechanical system between motor shaft and external encoder
(**S-0-0121, Input revolutions of load gear**
S-0-0122, Output revolutions of load gear
S-0-0123, Feed constant)
3. The mechanical system between motor shaft and external encoder is not rigid (e.g. gear play)
4. Defective encoder cable
5. Defect in signal conditioning of external measuring system
6. Maximum input frequency of encoder interface exceeded
7. External encoder not mounted on driven axis

Remedial action:

Ref. 1. Check **S-0-0115, Position feedback 2 type parameter** and **S-0-0117, Resolution of rotational feedback**

Ref. 2. Check **S-0-0121, Input revolutions of load gear,**
S-0-0122, Output revolutions of load gear, and
S-0-0123, Feed constant

Ref. 3. Increase **S-0-0391, Monitoring Window External Feedback**

Ref. 4. Replace encoder cable

Ref. 5. Replace axis controller

Ref. 6. Reduce velocity

Ref. 7. Set **S-0-0391, Monitoring Window External Feedback** to 0 (deactivate monitoring function)

See also functional description of "Position feedback monitoring"

F236 attributes

7-segment display:	F2/36
Error number:	236
Diagnosis number:	F236
Error class:	Not fatal

F237 Excessive Position Command Difference

Cause:

The position command values that arrive via the SERCOS interface are monitored when the drive works in position control mode. The position command value monitoring function responds if two consecutive position command values require the drive to provide a velocity that is equal to or greater than the value specified in **S-0-0091, Bipolar Velocity Limit Value**. While the **excessive position command value** is stored in parameter **P-0-0010**, the **last valid position command value** is stored in parameter **P-0-0011**.

Remedial action:

Compare **S-0-0091, Bipolar Velocity Limit Value** with the programmed velocity and adjust if necessary.

See also functional description of "Position command value monitoring"

F237 attributes

7-segment display:	F2/37
Error number:	237
Diagnosis number:	F237
Error class:	Not fatal

F242 External Encoder Failure: Signals too small

Cause:

In the high-resolution evaluation of an external measuring system, the analog signals of the measuring system are employed for monitoring the sine and cosine signal.

Remedial action:

- Check the cables to the measuring system
- Check the measuring system

F242 attributes

7-segment display:	F2/42
Error number:	242
Diagnosis number:	F242
Error class:	Not fatal

F245 External Encoder Failure: Quadrant Error

A hardware fault has been detected in the external measuring system's high-resolution position interface for sinusoidal signals.

Cause:

1. Defective encoder cable
2. Interference on encoder cable
3. Defective amplifier

Remedial action:

Ref. 1. Replace the encoder cable
Ref. 2. Lay the encoder cable separately from power cables
Ref. 3. Replace the amplifier

F245 attributes

7-segment display:	F2/45
Error number:	245
Diagnosis number:	F245
Error class:	Not fatal

F248 Low Battery Voltage

Cause:

In a motor of the MKD series, the absolute position information is stored in a battery-backed electronics system in the motor feedback. The battery has been designed for a utilization period of 10 years. This message is output if the battery voltage drops below 2.8 V. The function of the absolute encoder is ensured for another two weeks.

CAUTION	Hazard:	Faults in controlling motors and/or moved elements may lead to injuries.
	⇒ Action:	Replace battery as soon as possible

Preparation for changing batteries

The following parts are required:

- Size 10 TORX screwdriver
- Flat nose pliers; torque wrench
- New pre-assembled battery (order no.: 257101)

CAUTION	Hazard:	Faults in controlling motors and/or moved elements may lead to injuries.
	⇒	Switch off the power supply and secure it against being switched on again. Replace the battery while the control voltage is switched on.

If the control voltage were switched off while the battery is disconnected, the right reference point would be lost and must be re-established.

Removing the battery:

- Use a size 10 screwdriver to remove the TORX screws 1
- Pull out the cover of the RSF resolver feedback
- Remove connector 2 of the battery
- Loosen battery clamp 3 and remove battery

Inserting the battery

- Insert the pre-assembled battery (order no.: 257101) in the enclosure and tighten the clamping device.
- **Caution!** Do not squeeze the battery cable
- Reconnect battery connector 2

Close the cover of the resolver feedback, insert the 4 TORX screws and use the torque wrench to tighten them (1.8 Nm)

F248 attributes

7-segment display:	F2/48
Error number:	248
Diagnosis number:	F248
Error class:	Not fatal

F267 Erroneous Internal Hardware Synchronization

Cause:

A phase control loop synchronizes the drive control activities of all drives that are connected to a SERCOS loop. Proper synchronization is monitored. This error is generated if the average deviation exceeds 7 µs.

Remedial action:

Replace drive controller

F267 attributes

7-segment display:	F2/67
Error number:	267
Diagnosis number:	F267
Error class:	Not fatal

F276 Absolute encoder error > P-0-0097

The current actual position is saved when a drive controller with an absolute encoder motor (multi-turn) is switched off. When it is switched back on, the position that is determined by the absolute encoder evaluation is compared with the stored value. This error is generated if the deviation exceeds the programmed value of **P-0-0097, Monitoring Window abs. Encoder**.

Cause:

1. First-time activation after the motor has been replaced, for example (saved position is invalid).
2. The axis is moved in de-activated state by more than the distance that has been selected in **P-0-0097, Monitoring Window abs. Encoder**.
3. Incorrect position initialization.

Remedial action:

Ref. 1. Clear the error (establish the reference dimension)

Ref. 2. The axis is moved while it was switched off, and is outside its valid position.
Check whether a new motion command will lead to a damage.
Clear the error afterwards.

Ref. 3. **Hazard by unwanted axis movements.**
Check the reference dimension. There is a feedback defect if the reference dimension is incorrect. Replace the feedback (complete motor in the case of an absolute motor encoder with MDD or MKD motor).

See also functional description of "Monitoring absolute measuring systems"

F276 attributes

7-segment display:	F2/76
Diagnosis number:	F276
Error class:	Not fatal

F401 Double MST Error Shutdown

The drive has not received the master synchronization message frame in two consecutive SERCOS cycles.

Cause:

1. Malfunction in the fiber optics cable
2. Excessive damping of the light signals
3. (General) malfunction in the SERCOS interface
4. Master failed

Remedial action:

Ref. 1. Check all fiber optics connections in the SERCOS loop.

Ref. 2. Measure the damping in the fiber optics cables.
The maximum damping between TX and RX may not fall below 12,5 dB.

Ref. 3. Replace the SERCOS interface module in the drive.

Ref. 4. Check the master if all slaves have stopped.

See also functional description of "SERCOS interface error"

F401 attributes

7-segment display:	F4/01
Error number:	401
Diagnosis number:	F401
Error class:	Interface

F402 Double MDT Error Shutdown

The drive has not received the master data message frame (MDT) in two consecutive SERCOS cycles.

Cause:

1. Malfunction in the fiber optics cable
2. Excessive damping of the light signals
3. (General) malfunction in the SERCOS interface
4. Failure of the complete bus

Remedial action:

Ref. 1. Check all fiber optics connections in the SERCOS loop

Ref. 2. Measure the damping in the fiber optics cables.
The maximum damping between TX and RX may not fall below 12,5 dB.

Ref. 3. Replace the SERCOS interface module in the drive

Ref. 4. Check the master

See also functional description of "SERCOS interface error"

F402 attributes

7-segment display:	F4/02
Error number:	402
Diagnosis number:	F402
Error class:	Interface

F403 Invalid Communication Phase Shutdown

The SERCOS master module has specified an illegal communication phase (phase > 4).

Cause: Error in the controller's SERCOS master module.

Remedial action: Contact the controller manufacturer.

See also functional description of "SERCOS interface error"

F403 attributes

7-segment display:	F4/03
Error number:	403
Diagnosis number:	F403
Error class:	Interface

F404 Error during Phase Progression

Phase progression did not follow the required sequence.

Cause: Error in the controller's SERCOS master module

Remedial action: Contact the controller manufacturer

See also functional description of "SERCOS interface error"

F404 attributes

7-segment display:	F4/04
Error number:	404
Diagnosis number:	F404
Error class:	Interface

F405 Error during Phase Regression

Regression from a communication phase did not lead to phase 0.

Cause:

Error in the controller's SERCOS master module

Remedial action:

Contact the controller manufacturer

See also functional description of "SERCOS interface error"

F405 attributes

7-segment display:	F4/05
Error number:	405
Diagnosis number:	F405
Error class:	Interface

F406 Phase Switching Without Ready Signal

The SERCOS master has made an attempt to change phases without waiting for the ready message from the drive.

Cause:

Error in the controller's SERCOS master module

Remedial action:

Contact the controller manufacturer

See also functional description of "SERCOS interface error"

F406 attributes

7-segment display:	F4/06
Error number:	406
Diagnosis number:	F406
Error class:	Interface

F629 Positive Travel Limit Value is Exceeded

The drive has been provided with a command value that leads to an axis position outside the positive travel range. The axis has been stopped and the error reaction "set velocity command value to zero" issued. Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

S-0-0049, Positive position limit value is exceeded.

Remedial action:

1. Check **S-0-0049, Positive position limit value**
2. Check the controller software limits
3. Activate the axis after the error reaction

Procedure:

- Clear the error
- Activate power if it has been de-activated
- Move the axis to the permissible working range

Note: Only command values that lead back into the permissible working range will be accepted. Any other command value will stop the drive again.

See also functional description of "Axis limit values"

F629 attributes

7-segment display:	F6/29
Error number:	629
Diagnosis number:	F629
Error class:	Traverse range

F630 Negative Travel Limit Value is Exceeded

The drive has been provided with a command value that leads to an axis position outside the negative travel range. The axis has been stopped and the error reaction "set velocity command value to zero" issued. Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

S-0-0050, Negative position limit value is exceeded.

Remedial action:

1. Check **S-0-0050, Negative position limit value**
2. Check the controller software limits
3. Activate the axis after the error reaction

Procedure:

- Clear the error
- Activate power if it has been de-activated
- Move the axis to the permissible working range

Note: Only command values that lead back into the permissible working range will be accepted. Any other command value will stop the drive again.

See also functional description of "Axis limit values"

F630 attributes

7-segment display:	F6/30
Error number:	630
Diagnosis number:	F630
Error class:	Traverse range

F643 Positive Travel Limit Switch Detected

The positive travel limit switch has been actuated. The axis has been stopped with the error reaction "set velocity command value to zero". Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

The positive travel limit switch has been actuated.

Remedial action:

1. Reset the error
2. Activate the power supply
3. Move the axis into the permissible working range

Note: The drive will not accept any command values that lead further away from the permissible range. Specifying such a command will again result in this error.

See also functional description of "Travel limit switch"

F643 attributes

7-segment display:	F6/43
Error number:	643
Diagnosis number:	F643
Error class:	Traverse range

F644 Negative Travel Limit Switch Detected

The negative travel limit switch has been actuated. The axis has been stopped with the error reaction "set velocity command value to zero". Bit 2 of **P-0-0090, Travel limit parameter** has been set to "Exceeding the travel limit is considered as an error", or a drive control command has been started while the axis limit value is exceeded (e.g. drive-controlled homing).

Cause:

The negative travel limit switch has been actuated.

Remedial action:

1. Reset the error
2. Activate the power supply
3. Move the axis into the permissible working range

Note: The drive will not accept any command values that lead further away from the permissible range. Specifying such a command will again result in this error.

See also functional description of "Travel limit switch"

F644 attributes

7-segment display:	F6/44
Error number:	644
Diagnosis number:	F644
Error class:	Traverse range

F822 Motor Encoder Failure: Signals too Small

The amplitudes of the sine and cosine signals from the motor encoder are monitored.

Note: The error cannot be cleared in communication phase 4. Transition to communication phase 2 is necessary before the error can be cleared.

Remedial action:

- Check the cables .
- The signal cables must be laid separately from the motor power cables. The screen must be connected at the drive controller (see Configuration Instructions of the drive controller).
- Check the measuring system. Replace it if necessary.

F822 attributes

7-segment display:	F8/22
Error number:	822
Diagnosis number:	F822
Error class:	Fatal

F860 Overcurrent: Short in Power Stage

The current in the power transistor bridge has exceeded twice the value of the device peak current. The torque of the drive is released at once, and an optional blocking brake is applied immediately.

Cause:

1. Short-circuit in the motor cable
2. Defect in the drive controller’s power stage

Remedial action:

Ref. 1. Check the motor cable for a short-circuit.

Ref. 2. Replace the drive controller

F860 attributes

7-segment display:	F8/60
Error number:	860
Diagnosis number:	F860
Error class:	Fatal

F870 + 24 Volt Error

The drive controller has detected an error in the +24-V supply.

Note: The error cannot be cleared. The unit must be switched off.

Cause:

1. Short-circuit in the emergency stop circuit
2. 24-V supply is below the minimum value

Remedial action:

Ref. 1. Check the emergency stop circuit for short-circuit condition

Ref. 2. Check the power supply unit. Replace it if necessary.

F870 attributes

7-segment display:	F8/70
Error number:	870
Diagnosis number:	F870
Error class:	Fatal

F873 Power supply drive stage fault

Description:

The power supply of the drive stages is monitored. The drive is switched off if the voltage is too low.

Cause:

1. The power supply voltage of the driver stages is too low.

Remedial action:

Ref. 1. Replace the control unit.

F873 attributes

7-segment display:	F8/73
Error number:	873
Diagnosis number:	F873
Error class:	fatal

F878 Velocity Loop Error

If, with an active speed control loop, the difference between speed command value and feedback value is greater than 10% of the maximum motor speed, the speed feedback value must change in the direction of the command value. This error is generated if an approach to the command value cannot be detected for more than 20 ms and if the effective torque/force command value is within the limit (= **P-0-4046, Active peak current**).

Cause:

1. Wrong connection of motor cable
2. Power section of drive controller is defective
3. Feedback is defective
4. Incorrect setting of speed controller parameter value
5. Acceleration or deceleration ramp is too steep

Remedial action:

Ref. 1. Check the motor cable connection

Ref. 2. Replace the drive controller

Ref. 3. Replace the motor

Ref. 4. Check the speed controller according to the application description (see Chapter "Speed controller")

Ref. 5. Reduce the maximum acceleration in the controller

See also functional description of "Defining the speed controller setting"

F878 attributes

7-segment display:	F8/79
Error number:	878
Diagnosis number:	F878
Error class:	Fatal

F879, Crossing Velocity Limit (S-0-0091) Value

In torque control mode, the actual velocity is monitored. This error is generated if the velocity that has been programmed in the parameter **S-0-0091, Bipolar Velocity Limit Value** is exceeded (1.125-fold value, minimum 100 rpm).

Cause:

The command torque is higher than the load torque. This causes the actual velocity to be increased up to the maximum possible motor speed.

Remedial action:

Assign the correct torque command value for the required task. Reduce the parameter **S-0-0092, Bipolar Torque/Force Limit Value**.

See also functional description of "Limitation to bipolar velocity limit value"

F879 attributes

7-segment display:	F8/79
Error number:	879
Diagnosis number:	F879
Error class:	Fatal

F895 4 kHz Fault

Description:

The 4-kHz signal that is used for producing the resolver signals is synchronized with software processing. This error message is generated in the case of a synchronization error.

Cause:

1. Incorrect synchronization of resolver excitation voltage and software
2. The error could be caused by an electrostatic discharge.

Remedial action:

Ref. 1. Replace the drive controller and return it to the factory for inspection

Ref. 2 Cycle the power to all units off and back on. If this does not lead to a positive result: Replace the drive controller and return it to the factory for inspection

F895 attributes

7-segment display:	F8/95
Error number:	895
Diagnosis number:	F895
Error class:	fatal

1.2 Warning Diagnoses

E249 Positioning vel. (S-0-0259) greater S-0-0091

Cause:

For "drive-internal interpolation" mode, a velocity is specified in the parameter **S-0-0259, Positioning velocity** that is used for approaching the specified target position.

The message E249 is generated if that velocity is higher than the permissible maximum value **S-0-0091, Bipolar Velocity Limit Value**. The message bit 4 in **S-0-0013, Class 3 Diagnostics** is set at the same time.

Remedial action:

Reduce **S-0-0259, Positioning velocity**

See also functional description of "Drive-internal interpolation"

E249 attributes

7-segment display:	E2/49
Diagnosis number:	E249
Warning class:	Not fatal

E250 Drive Overtemperature Warning

The temperature of the heat sinks in the drive controller has reached the maximum permissible value. The drive follows the command value specification for a period of 30 seconds. Thus, the axis can be stopped via the controller in a process-related manner (e.g. terminating machining, exiting interference zone, etc.). After these 30 seconds, the drive performs the reaction that has been specified in the parameter **P-0-0119, Deceleration as best as possible.**

Cause:

1. Failure of the inbuilt fan
2. Failure of the cabinet air conditioning
3. Incorrect switchgear cabinet dimensioning with respect to heat dissipation

Remedial action:

Ref. 1. Replace the drive controller in the event of a fan failure.

Ref. 2 Establish the function of the cabinet air conditioning system.

Ref. 3 Check switchgear cabinet dimensioning.

E250 attributes

7-segment display:	E2/50 Kühlkörperübertemperaturvorwarnung
Diagnosis number:	E250
Warning class:	Not fatal

E251 Motor Overtemperature Warning

The motor temperature has risen beyond the maximum permissible value. The drive follows the command value specification for a period of 30 seconds. Thus, the axis can be stopped via the controller in a process-related manner (e.g. terminating machining, exiting interference zone, etc.). After these 30 seconds, the drive performs the reaction that has been specified in the parameter **P-0-0119, Deceleration as best as possible.**

Cause:

Motor overload.

The effective torque requested from the motor has exceeded the permissible standstill continuous torque value for too long a time.

Remedial action:

Verify motor rating. Check whether the drive conditions of a system that has been used for a long time have changed in the meantime (pollution, friction, moved masses, etc.).

See also functional description of "Temperature monitoring"

E251 attributes

7-segment display:	E2/51
Diagnosis number:	E251
Warning class:	Not fatal

E252 Bleeder Overtemperature Warning

Description: (see Cause:)

Cause:

The energy recovered from the motor loads the brake resistance in the DKC to approximately 90%. The bleeder overtemperature warning indicates that a bleeder overload must be expected if the recovered energy continues rising.

Remedial action:

Reduce the acceleration values and/or the velocity, and check drive rating.

E252 attributes

7-segment display:	E2/52
Diagnosis number:	E252
Warning class:	not fatal

E253 Target position out of travel zone

Cause:

For "drive-internal interpolation" mode, the system checks whether the specified **S-0-0258, Target Position** is inside the possible travel range of the drive. This is defined by the two parameters **S-0-0049, Positive position limit value** and **S-0-0050, Negative position limit value**.

The message E253 is generated and the warning bit 13 in **S-0-0012, Class 2 Diagnostics** set if the target position is outside the travel range.

Remedial action:

Check the specified **S-0-0258, Target Position,** and correct it if necessary.

See also functional description of "Drive-internal interpolation"

E253 attributes

7-segment display:	E2/53
Diagnosis number:	E253
Warning class:	Not fatal

E254 Not Homed

Description:

If "absolute position blocks" are selected in "block-controlled mode", the drive must be homed. An absolute position cannot be approached if this is not the case. The drive rejects the positioning block and stops. This warning is issued.

Cause:

An absolute positioning block has been selected without the drive being homed.

Remedial action:

1. Home the drive
2. Select a "relative positioning block"

E254 attributes

7-segment display:	E2/54
Diagnosis number:	E254
Warning class:	not fatal

E255 Feedrate Override(S-0-0108) = 0

The parameter **S-0-0108, Feedrate override** permits the travel velocity of drive-controlled motion commands to be modified.

This warning is output if the parameter is 0. The drive cannot follow pending command values in this case.

Cause:

1. The feedrate potentiometer of the connected controller is set to zero or is incorrectly be interpreted.
2. The parameter has been set to an incorrect value.

Remedial action:

Ref. 1. Check the feedrate potentiometer

Ref. 2 Set the parameter to the value that is correct for the application.

E255 attributes

7-segment display:	E2/55
Diagnosis number:	E255
Warning class:	Not fatal

E256 Torque Limit = 0

Cause:

1. Protection against mechanical overload can be provided by limiting the maximum torque through the parameter **S-0-0092, Bipolar Torque/Force Limit Value**. If the current value of that parameter is zero, the motor does not develop a torque and does not follow the specified command values.

Remedial action:

Ref. 1. Set the torque limit to a value that is greater than zero.

E256 attributes

7-segment display:	E2/56
Diagnosis number:	E256
Warning class:	Not fatal

E257 Continuous Current Limiting Active

The thermal load of the drive controller is monitored. If the drive is requested to provide a command current profile that represents too high a loading on the power transistors (excessive temperature of the power output stage), the drive responds with dynamically reducing the effective peak current, and outputs this warning. The parameter **P-0-4046, Active peak current** is reduced.

Cause: Overload of the drive controller.

Remedial action:

1. Check the amplifier rating.
2. Reduce the acceleration.
   Check whether the drive conditions of a system that has been used for a long time have changed in the meantime (pollution, friction, moved masses, etc.).

See also functional description of "Monitoring the thermal load"

E257 attributes

7-segment display:	E2/57
Diagnosis number:	E257
Warning class:	Not fatal

E259 Command velocity limitation active

In position control and velocity control mode, the effective velocity command value is limited to the value in parameter **S-0-0091, Bipolar Velocity Limit Value**. This warning is output if the resulting velocity command value reaches this limit.

Cause:

The value of parameter **S-0-0091, Bipolar Velocity Limit Value** is too low.

Remedial action:

In normal operation, the parameter **S-0-0091, Bipolar Velocity Limit Value** should be set to a value that is 10% higher than the NC working speed.

See also functional description of "Limitation to bipolar velocity limit"

E259 attributes

7-segment display:	E2/59
Diagnosis number:	E259
Warning class:	Not fatal

E410 Slave not scanned or address 0

Each slave that shall participate in the further phase startup process must be addressed by the SERCOS master during initialization of the SERCOS loop in communication phase 1. Each slave that has not been addressed or for which drive address "0" has been selected issues a warning E410. Communicating with these slaves at higher communication phases is not possible. They merely work in repeater mode.

Cause:

Slave has not been scanned in phase 1, or address "0" has been selected.

Remedial action:

- Select the correct slave address
- Check the SERCOS master configuration

See also functional description of "Commissioning the SERCOS interface"

E410 attributes

7-segment display:	E4/10
Diagnosis number:	E410
Warning class:	Not fatal

E825 Overvoltage in the Power Stage

Cause:

1. The energy recovered by the mechanical machine system via the motor has momentarily risen to a level that the bleeder could not completely convert into heat. Consequently, the DC bus voltage has exceeded the permissible maximum limit. This has de-activated the motor torque. The controller is re-activated when the DC bus voltage falls below the permissible maximum value.
2. DC bus voltage is too high.

Remedial action:

Ref. 1. Reduce the acceleration values and check the drive rating. If necessary, use an additional bleeder.

Ref. 2 Check the mains power supply.

E825 attributes

7-segment display:	E8/25
Error number:	825
Diagnosis number:	E825
Error class:	Not fatal

E829 Positive Position Limit Value Exceeded

The drive has received a command value that has led to an axis position outside the positive travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

S-0-0049, Positive position limit value exceeded.

Remedial action:

Specify command values that lead back to the valid range.

See also functional description of "Axis limit values"

E829 attributes

7-segment display:	E8/29
Diagnosis number:	E829
Warning class:	Fatal

E830 Negative Position Limit Value Exceeded

The drive has received a command value that has led to an axis position outside the negative travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

S-0-0050, Negative position limit value exceeded.

Remedial action:

Specify command values that lead back to the valid range.

See also functional description of "Axis limit values"

E830 attributes

7-segment display:	E8/30
Diagnosis number:	E830
Warning class:	Fatal

E843 Positive Travel Zone Limit Switch Activated

The drive has received a command value that has led to an axis position outside the positive travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

The positive travel zone limit switch has been actuated.

Remedial action:

Specify command values that lead back to the valid range.

See also functional description of "Travel limit switch - monitoring"

E843 attributes

7-segment display:	E8/43
Diagnosis number:	E843
Warning class:	Fatal

E844 Negative Travel Zone Limit Switch Activated

The drive has received a command value that has led to an axis position outside the negative travel range. The axis is stopped by setting the velocity command value to zero. A class 1 diagnostics error is not generated. The drive automatically follows command values that lead back to the valid range. Bit 2 of **S-0-0090, Command Value Transmit Time (TMTSG)** has been set to "Exceeding the travel limit is considered as a warning".

Cause:

The negative travel zone limit switch has been actuated.

Remedial action:

Specify command values that lead back to the valid range.

See also functional description of "Travel limit switch - monitoring "

E844 attributes

7-segment display:	E8/44
Diagnosis number:	E844
Warning class:	Fatal

Notes

1.3 Command Diagnoses

C100 Communication phase 3 transition check

The command **S-0-0127 C1 Communication phase 3 transition check** has been activated.

See also functional description of "S-0-0127, C1 Communication phase 3 transition check"

C100 attributes

7-segment display:	C1/00
Diagnosis number:	C100

C101 Invalid Communication Parameter (S-0-0021)

Cause:

Communication parameters that are required for drive operation in communication phase 3 are invalid.

Remedial action:

The invalid parameters are stored in the parameter **S-0-0021, IDN List of Invalid Op. Data for Comm. Ph. 2**. Write to the invalid parameters to make them valid.

See also functional description of "S-0-0127, C1 Communication phase 3 transition check"

C101 attributes

7-segment display:	C1/01
Diagnosis number:	C101

C102 Limit Error Communication Parameter (S-0-0021)

Cause:

The value of a parameter that is required for drive operation in communication phase 3 is outside its minimum/maximum input value limits.

Remedial action:

The invalid parameters are stored in the parameter **S-0-0021, IDN List of Invalid Op. Data for Comm. Ph. 2**.

Write values to those parameters that are inside the limits.

C102 attributes

7-segment display:	C1/02
Diagnosis number:	C102

C104 Config. IDN for MDT not configurable

Cause:

Message frame type 7 has been selected in parameter **S-0-0015, Telegram Type Parameter. S-0-0024, Config. List of the Master Data Telegram** contains parameters that are not contained in **S-0-0188, List of configurable data in the MDT**.

Remedial action:

Either select a preferred message frame (message frame type = 0...6), or enter parameters in **S-0-0024, Config. List of the Master Data Telegram** that are also contained in **S-0-0188, List of configurable data in the MDT**.

See also functional description of "Configuration of message frame contents"

C104 attributes

7-segment display:	C1/04
Diagnosis number:	C104

C105 Configured Length > Max. Length for MDT

Cause:

Message frame type 7 has been selected in the parameter **S-0-0015, Telegram Type Parameter**. The length of the configured data record in the MDT (that is defined through **S-0-0024, Config. List of the Master Data Telegram**) exceeds the maximum permissible value of **S-0-0186, Length of the config. data record in the MDT**.

Remedial action:

Either select a preferred message frame in **S-0-0015, Telegram Type Parameter** (message frame type = 0...6) or reduce the number of configured parameters in the MDT.

See also functional description of "Configuration of message frame contents"

C105 attributes

7-segment display:	C1/05
Diagnosis number:	C105

C106 N for AT not configurable

Cause:

Message frame type 7 has been selected in parameter **S-0-0015, Telegram Type Parameter**. Parameters have been entered in **S-0-0016, Custom Amplifier Telegram Configuration List** that are not entered in **S-0-0187, List of Configurable Data in the AT.**

Remedial action:

Either select preferred message frame in the parameter **S-0-0015, Telegram Type Parameter** (message frame type = 0...6), or enter parameters in **S-0-0016, Custom Amplifier Telegram Configuration List** that are contained in **S-0-0187, List of Configurable Data in the AT**.

See also functional description of "Configuration of message frame contents"

C106 attributes

7-segment display:	C1/06
Diagnosis number:	C106

C107 Configured Length > Max. Length for AT

Cause:

Message frame type 7 has been selected in the parameter **S-0-0015, Telegram Type Parameter**. The length of the configured data record in the AT (that is defined through **S-0-0016, Custom Amplifier Telegram Configuration List**) exceeds the maximum permissible value of **S-0-0187, Length of the config. data record in the AT**.

Remedial action:

Either select a preferred message frame in **S-0-0015, Telegram Type Parameter** (message frame type = 0...6) or reduce the number of configured parameters in the AT (**S-0-0016**).

See also functional description of "Configuration of message frame contents"

C107 attributes

7-segment display:	C1/07
Diagnosis number:	C107

C108 Time Slot Parameter > SERCOS Cycle Time

Cause:

One of the time slot parameters

- **S-0-0006, AT Transmission Starting Time (T1)**
- **S-0-0089, MDT Transmit Starting Time (T2)**
- **S-0-0007, Feedback Acquisition Starting Time (T4)**
- **S-0-0008, Command Valid Time (T3)**

exceeds **S-0-0002, SERCOS Cycle Time T_{Scyc}**

Remedial action:

Correct the corresponding parameter(s). The definition of these times is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuring the message frame transmit and receive times"

C108 attributes

7-segment display:	C1/08
Diagnosis number:	C108

C109 Position of Data Record in MDT (S-0-0009) even

Cause:

The parameter **S-0-0009, Beginning Address in Master Data Telegram** contains an even value. This is illegal.

Remedial action:

The parameter **S-0-0009, Beginning Address in Master Data Telegram** must be set to an odd number. The definition of this parameter is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C109 attributes

7-segment display:	C1/09
Diagnosis number:	C109

C110 Length of MDT (S-0-0010) odd

Cause:

The parameter **S-0-0010, Length of Master Data Telegram** contains an odd value. This is illegal.

Remedial action:

The parameter **S-0-0010, Length of Master Data Telegram** must be set to an even number. The definition of this parameter is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C110 attributes

7-segment display:	C1/10
Diagnosis number:	C110

C111 ID9 + Record Length - 1 > Length MDT (S-0-0010)

Cause:

The parameters **S-0-0009, Beginning Address in Master Data Telegram** and **S-0-0010, Length of Master Data Telegram** have been set to incorrect values. The length of the data record in the MDT for the drive plus the start address in the MDT exceed the total MDT length.

Remedial action:

Correct the parameter values of **S-0-0009, Beginning Address in Master Data Telegram** and **S-0-0010, Length of Master Data Telegram**. The definition of this parameter is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C111 attributes

7-segment display:	C1/11
Diagnosis number:	C111

C112 TNcyc (S-0-0001) or TScyc (S-0-0002) Error

Cause:

Only integer multiples of 1 ms are permitted for **S-0-0001, NC Cycle Time** and **S-0-0002, SERCOS Cycle Time**. A different value has been used here.

Remedial action:

Correct S-0-0001, NC Cycle Time and **S-0-0002, SERCOS Cycle Time**. The definition of these parameters is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C112 attributes

7-segment display:	C1/12
Diagnosis number:	C112

C113 Relation TNcyc (S-0-0001) to TScyc (S-0-0002) Error

Cause:

The value of **S-0-0001, NC Cycle Time** can only be equal to or a multiple of **S-0-0002, SERCOS Cycle Time** T_{Scyc}. A different value has been used here.

Remedial action:

Correct **S-0-0001, NC Cycle Time** and **S-0-0002, SERCOS Cycle Time**. The definition of these parameters is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C113 attributes

7-segment display:	C1/13
Diagnosis number:	C113

C114 T4 > TScyc (S-0-0002) - T4min (S-0-0005)

Cause:

The maximum value permitted for **S-0-0007, Feedback Acquisition Starting Time (T4)** is:

> **S-0-0002, SERCOS Cycle Time** - **S-0-0005, Minimum Feedback Acquisition Time (T4min)**

The value of **S-0-0007, Feedback Acquisition Starting Time (T4)** is incorrect.

Remedial action:

Correct **S-0-0007, Feedback Acquisition Starting Time (T4)**. The definition of this parameter is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C114 attributes

7-segment display:	C1/14
Diagnosis number:	C114

C115 T2 too small

Cause:

The selected value of **S-0-0089, MDT Transmit Starting Time (T2)** is incorrect. The drive cannot work with the value.

Remedial action:

Correct **S-0-0089, MDT Transmit Starting Time (T2)**.

The definition of this parameter is within the responsibility of the controller manufacturer and is specified by the SERCOS interface.

See also functional description of "Configuration of message frame transmit and receive times"

C115 attributes

7-segment display:	C1/15
Diagnosis number:	C115

C200 Communication phase 4 transition check

Meaning:

The command **S-0-0128, C2 Communication phase 4 transition check** has been activated.

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C200 attributes

7-segment display:	C2/00
Diagnosis number:	C200

C201 Invalid Parameter (-> S-0-0022)

Cause:

Communication parameters that are required for drive operation in communication phase 4 are invalid. The invalid parameters are stored in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedial action:

Write to the invalid parameters of **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3** to make them valid.

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C201 attributes

7-segment display:	C2/01
Diagnosis number:	C201

C202 Limit Error Parameter (->S-0-0022)

Cause:

The value of a parameter that is required for drive operation in communication phase 4 is outside its minimum/maximum input value limits, or the entered value cannot be processed (with bit strings). The incorrect parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedial action:

Write valid values to the parameters that are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3.**

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C202 attributes

7-segment display:	C2/02
Diagnosis number:	C202

C203 Parameter Calculation Error (->S-0-0022)

Cause:

Parameters that are required for phase 4 operation cannot be processed in their present form. The incorrect parameters are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

Remedial action:

Write correct values to the parameters that are listed in **S-0-0022, IDN List of Invalid Op. Data for Comm. Ph. 3**.

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C203 attributes

7-segment display:	C2/03
Diagnosis number:	C203

C207 Load Error LCA

Cause: Unit is defective.

Remedial action:

1. Switch the unit off and back on. If this proves unsuccessful:
2. Replace the unit.

C207 attributes

7-segment display:	C2/07
Diagnosis number:	C207

C210 External Feedback Required (-> S-0-0022)

Cause:

The values that have been entered in the parameters **S-0-0147, Homing Parameter** or in the **mode parameters S-0-0032..35** require an external encoder. The parameter **P-0-0075, Interface Feedback 2**, however, has been set to "0" (no external interface available).

Remedial action:

Change **S-0-0147, Homing Parameter** or **mode parameters S-0-0032..35** to using a motor encoder instead of an external encoder.

To activate the external measuring system, set **P-0-0075, Interface Feedback 2** to a value that is different from "0".

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C210 attributes

7-segment display: C2/10
Diagnosis number: C210

C211 Invalid Feedback Data (-> S-0-0022)

The motor feedback of an MDD or MKD motor contains a data storage unit. An attempt has been made of reading the parameters that are stored there. An error has occurred in this process.

Cause:

1. Defective motor feedback cable
2. Defective motor feedback
3. Defective drive controller

Remedial action:

Ref. 1. Check the motor feedback cable
Ref. 2. Replace the motor
Ref. 3. Replace the amplifier

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C211 attributes

7-segment display: C2/11
Diagnosis number: C211

C212 Invalid amplifier data (-> S-0-0022)

During drive initialization, the operating software fetches data from an EEPROM in the drive controller. The error message is generated if that access fails.

Cause:

Hardware defect in the drive controller.

Remedial action:

Replace the drive controller

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C212 attributes

7-segment display: C2/12
Diagnosis number: C212

C213 Position data scaling error

Cause:

The position data scaling parameters permit the position data display format to be selected. The drive-internal format of the position data depends on the employed motor encoder and the encoder resolution. The factor for converting the position data from drive-internal format to display format or vice versa is outside the range that can be processed, since either

- rotary motor and linear position scaling with motor reference, or
- the determined factor for the conversion of the position data from drive-internal format to display format or vice versa

cannot be represented.

Remedial action:

Check and correct the relevant parameters, such as:

- **S-0-0076, Position Data Scaling Type**
- **S-0-0077, Linear Position Data Scaling Factor**
- **S-0-0078, Linear Position Data Scaling Exponent**
- **S-0-0079, Rotational position resolution**
- **S-0-0116, Resolution of rotational feedback 1**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **S-0-0277, Position feedback 1 type parameter 1**

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C213 attributes

7-segment display:	C2/13
Diagnosis number:	C213

C214 Velocity data scaling error

Cause:

The velocity data scaling parameters permit the velocity data display format to be selected. The drive-internal format of the velocity data depends on the employed motor encoder and the encoder resolution. The factor for converting the velocity data from drive-internal format to display format or vice versa is outside the range that can be processed.

Remedial action:

Check and correct the relevant parameters, such as:

- **S-0-0044, Velocity data scaling type**
- **S-0-0045, Velocity data scaling factor**
- **S-0-0046, Velocity data scaling exponent**
- **S-0-0116, Resolution of rotational feedback 1**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **S-0-0277, Position feedback 1 type parameter 1**

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C214 attributes

7-segment display:	C2/14
Diagnosis number:	C214

C215 Acceleration data scaling error

Cause:

The acceleration data scaling parameters permit the acceleration data display format to be selected. The drive-internal format of the acceleration data depends on the employed motor encoder and the encoder resolution. The factor for converting the acceleration data from drive-internal format to display format or vice versa is outside the range that can be processed.

Remedial action:

Check and correct the relevant parameters, such as:

- **S-0-0160, Acceleration data scaling type**
- **S-0-0161, Acceleration data scaling factor**
- **S-0-0162, Acceleration data scaling exponent**
- **S-0-0116, Resolution of rotational feedback 1**
- **S-0-0121, Input revolutions of load gear**
- **S-0-0122, Output revolutions of load gear**
- **S-0-0123, Feed constant**
- **S-0-0277, Position feedback 1 type parameter 1**

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C215 attributes

7-segment display: C2/15

Diagnosis number: C215

C216 Torque/force data scaling error

Cause:

The torque/force data scaling parameters permit the torque/force data display format to be selected. The drive-internal format of the torque/force data depends on the employed motor encoder and the encoder resolution. The factor for converting the torque/force data from drive-internal format to display format or vice versa is outside the range that can be processed.

Remedial action:

Check and correct the relevant parameters, such as:

- **S-0-0086, Torque/Force data scaling type**
- **S-0-0093, Torque/force data scaling factor**
- **S-0-0094, Torque/Force data scaling exponent**
- **S-0-0110, Amplifier Peak Current**
- **S-0-0111, Motor Current at Standstill**

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C216 attributes

7-segment display: C2/16

Diagnosis number: C216

C217 Motor feedback data reading error

Encoder resolution and feedback type are read from the motor's feedback storage. An error has occurred during the read process.

Cause:

1. Defective motor feedback cable
2. Defective motor feedback

Remedial action:

Ref. 1. Check the motor feedback cable

Ref. 2. Replace the motor

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C217 attributes

7-segment display:	C2/17
Diagnosis number:	C217

C218 External feedback data reading error

An error has occurred during initialization with the external encoder.

Cause:

1. Defective motor feedback cable
2. Defective motor feedback

Remedial action:

Ref. 1. Check the motor feedback cable

Ref. 2. Replace the motor

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C218 attributes

7-segment display:	C2/18
Diagnosis number:	C218

C220 Mot. Feedback Initialization Error

Certain checks are performed during initialization with the motor encoder. A fault has been detected during these checks. Possible faults include:

- Error in reading the angle correction data
- Error in copying the angle correction data
- Fault in communicating with the encoder
- Fault in assembling the position of an initialization track
- Fault in reading the analog signals of an initialization track
- Incorrect pointer length of the analog signals of an initialization track
- Invalid offset between high- and low-resolution track
- Fault in the measuring system's microcontroller

Cause:

1. Defective motor feedback cable
2. Defective motor feedback
3. Defective measuring system interface

Remedial action:

Ref. 1. Check the motor feedback cable

Ref. 2. Replace the motor

Ref. 3. Replace the measuring system interface (module)

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C220 attributes

7-segment display:	C2/20
Diagnosis number:	C220

C221 Ext. Feedback Initializing Error

Certain checks are performed during initialization with the motor encoder. A fault has been detected during these checks. Possible faults include:

- Error in reading the angle correction data
- Error in copying the angle correction data
- Fault in communicating with the encoder
- Fault in assembling the position of an initialization track
- Fault in reading the analog signals of an initialization track
- Incorrect pointer length of the analog signals of an initialization track
- Invalid offset between high- and low-resolution track
- Fault in the measuring system's microcontroller

Cause:

1. Defective cable of external feedback
2. Defective feedback
3. Defective measuring system interface

Remedial action:

Ref. 1. Check the cable to external feedback

Ref. 2. Replace the feedback

Ref. 3. Replace the measuring system interface (module)

See also functional description of "S-0-0128, C2 Communication phase 4 transition check"

C221 attributes

7-segment display:	C2/21
Diagnosis number:	C221

C227 Modulo range error

See functional description of "Modulo processing boundary conditions"

C227 attributes

7-segment display:	C2/27
Diagnosis number:	C227

C300 Set absolute measuring

The command **P-0-0012, Command 'Set Absolute Measurement'** has been activated via the employed controller.

See also functional description of "Setting absolute dimension"

C300 attributes

7-segment display:	C3/00
Diagnosis number:	C300

C301 Setting Absolute Measuring Not Allowed, Drive Enable

Cause:

The command "C300 Set absolute measuring emulator" has been started while the controller enable signal was active.

Remedial action:

Terminate the command and de-activate the controller enable signal.

C301 attributes

7-segment display:	C3/01
Diagnosis number:	C301

C302 Absolute Measuring System Not Installed

The command **P-0-0012, Command 'Set Absolute Measurement'** has been started without an absolute measuring system being available.

The command can only be executed if an absolute measuring system exists.

Cause:

1. The command has incorrectly been activated.
2. The connected motor or the external measuring system are not designed as absolute encoders.

Remedial action:

Ref. 1. Prevent command execution.

Ref. 2. Equip motor or external measuring system with absolute encoder functions.

See also functional description of "Possible error messages in setting absolute dimension"

C302 attributes

7-segment display:	C3/02
Diagnosis number:	C302

C500 Reset class 1 diagnostic

S-0-0099, Reset class 1 diagnostic, the command for clearing errors, has been activated via the employed controller.

See also functional description of "Clearing errors"

C500 attributes

7-segment display:	C5/00
Diagnosis number:	C500

C600 Drive-controlled homing procedure command

The command **S-0-0148, C6 Drive controlled homing procedure** has been activated via the employed controller.

See also functional description of "Drive-controlled homing"

C600 attributes

7-segment display:	C6/00
Diagnosis number:	C600

C601 Homing Not Possible If Drive Is Not Enabled

Cause:

The command was started without the controller enabling signal being activated. This is not permitted.

Remedial action:

1. Switch on the power supply
2. Switch on the controller enabling signal
3. Start the command again

See also functional description of "Possible error messages in drive-controlled homing"

C601 attributes

7-segment display:	C6/01
Diagnosis number:	C601

C602 Distance homing switch - reference mark erroneous

Cause:

Evaluation of the zero switch has been activated. The distance between the positive zero switch edge and the reference marker that is to be evaluated is outside the permissible range.

Remedial action:

Enter the value from the parameter **S-0-0298, Reference Cam shift by...** in the parameter **S-0-0299, Home switch offset**.

See also functional description of "Connection and arrangement of the zero switch"

C602 attributes

7-segment display:	C6/02
Diagnosis number:	C602

C603 Homing Not Permitted In This Operating Mode

Cause:

The homing command cannot be executed if the drive is used in torque control or in speed control mode.

Remedial action:

Clear the homing command

Select a different mode

C603 attributes

7-segment display:	C6/03
Diagnosis number:	C603

C604 Homing of absolute encoder not possible

The command **S-0-0148, C6 Drive controlled homing procedure** has been started. The encoder selection in **S-0-0147, Homing Parameter** has selected an absolute measuring system. The command can only be executed if the command **P-0-0012, Command 'Set Absolute Measurement'** has been activated beforehand.

Remedial action:

Execute the command **P-0-0012, Command 'Set Absolute Measurement'** before you start the command **S-0-0148, C6 Drive controlled homing procedure**. This action establishes the absolute dimension reference.

See also functional description of "Possible error messages in drive-controlled homing"

C604 attributes

7-segment display:	C6/04
Diagnosis number:	C604

C605, Homing velocity too great

Cause:

Unequivocal allocation of a reference marker to a zero switch is not possible at a high velocity since the zero switch is only evaluated every 2 ms.

Remedial action:

Reduce the value of **S-0-0041, Homing velocity**.

C605 attributes

7-segment display:	C6/05
Diagnosis number:	C605

C700 Basic load

With motors of the MDD and MKD series, the mechanical system of the machine is adapted to the digital drive by activating the speed controller parameters that are stored in the motor feedback. The drive controller employs the C7 message to indicate that the command C700 initial program loading has been activated via the command **S-0-0262, Command Basic Load**.

Cause:

The command C700 initial program loading has been activated.

See also functional description of "Initial program loading"

C700 attributes

7-segment display:	C7/00
Diagnosis number:	C700

C800 Command Base-Parameter load

Description:

Pressing the S1 button on the drive controller when the display shows "PL" or starting **P-0-4094, Command Parameter Default Set** clears all parameters and sets them to a default value that is stored in the software.

The motion blocks will be lost, too.

C800 attributes

7-segment display:	C8/00
Diagnosis number:	C800

D400 Positive stop drive procedure command

When the command "travel to dead stop" is activated, all controller monitoring functions are de-activated that would cause a class 1 diagnostics message to be issued when the drive is blocked by a dead stop.

Cause:

The command **D400 Positive stop drive procedure command** has been activated.

See also functional description of "Travel to dead stop

D400 attributes

7-segment display:	D4/00
Diagnosis number:	D400

D401 ZKL1 Error at Command Start

Cause:

A class 1 diagnostics error has been detected when the command "travel to dead stop" was activated. The command could therefore not be executed.

Remedial action:

Eliminate the cause of the reported error. Clear the error and start the command again.

See also functional description of "Travel to dead stop

D401 attributes

7-segment display:	D4/01
Diagnosis number:	D401

1.4 Status Diagnoses

A000 Communication Phase 0

The communication structure is subdivided into four different communication phases: The phases 0 and 1 are used for identifying the devices.

Initialization is performed in ascending order. The controller specifies the communication phase.

An interruption in the phase progression is shown by the status display being stopped at the attained communication phase.

If diagnosis **A000 Communication Phase 0** is active, the drive is in phase 0 and waits for the controller to trigger the transition from phase 0 to phase 1.

See also functional description of "Parameter setting mode - operating mode"

A000 attributes

7-segment display:	P0
Diagnosis number:	A000

A001 Communication Phase 1

The communication structure is subdivided into four different communication phases: The phases 0 and 1 are used for identifying the devices.

Initialization is performed in ascending order. The controller specifies the communication phase.

An interruption in the phase progression is shown by the status display being stopped at the attained communication phase.

If diagnosis **A001 Communication Phase 1** is active, the drive is in phase 1 and the controller has not yet activated the transition from phase 1 to phase 2.

See also functional description of "Parameter setting mode - operating mode"

A001 attributes

7-segment display:	P1
Diagnosis number:	A001

A002 Communication Phase 2

The communication structure is subdivided into four different communication phases: Time and data structure of the protocols for communication phases 3 and 4 are prepared in phase 2.

Initialization is performed in ascending order. The controller specifies the communication phase.

An interruption in the phase progression is shown by the status display being stopped at the attained communication phase.

Before the controller transitions to communication phase 3, the command **S-0-0127 C1 Communication phase 3 transition check** must be started. Transition to communication phase 3 is not possible if the command is negatively acknowledged. The problems diagnosed by the drive must first be eliminated.

Note: The correctness of the parameters is not checked.

See also functional description of "Parameter setting mode - operating mode"

A002 attributes

7-segment display: P2

Diagnosis number: A002

A003 Communication Phase 3

The communication structure is subdivided into four different communication phases. Initialization is performed in ascending order. The controller specifies the communication phase. Transition to communication phase 4 completes initialization and permits power to be enabled.

An interruption in the phase progression is shown by the status display being stopped at the attained communication phase. The drive is in phase 3 if the diagnosis **A003 Communication phase 3** is active.

Before the controller transitions to communication phase 4 (operating mode), the command **S-0-0128, C2 Communication phase 4 transition check** must be started. Transition to communication phase 4 is not possible if the command is negatively acknowledged. The problems diagnosed by the drive must first be eliminated.

Note: The correctness of the parameters is not checked.

See also functional description of "Parameter setting mode - operating mode"

A003 attributes

7-segment display: P3

Diagnosis number: A003

A010 Halt Drive

The "Drive stop" function has been activated. That function is used for stopping an axis at a defined acceleration and a defined jerk. Subsequently, the drive is electrically held.

The function is activated either by clearing the drive stop bit (bit 13) in the master control word or by interrupting a drive control command (e.g. drive-controlled homing).

See also functional description of "Operation principle drive stop"

A010 attributes

7-segment display:	AH
Diagnosis number:	A010

A012 Control and Power Sections Ready for Operation

Control voltage is applied to the drive and the power supply has been switched on. The drive is ready for power output.

See also functional description of "Controller enabled"

A012 attributes

7-segment display:	Ab
Diagnosis number:	A012

A013 Ready for Power ON

Control voltage is applied to the drive; there is no fault in the drive. The drive is ready for the power to be switched on. It does not supply a torque. If it exists, the mechanical holding brake is applied.

See also functional description of "Parameter setting mode - operating mode"

A013 attributes

7-segment display:	bb
Diagnosis number:	A013

A100 Drive in Torque Mode

The drive is in torque mode. It follows the torque command value characteristic specified by the controller.

See also functional description of "Torque/force control"

A100 attributes

7-segment display: AF

Diagnosis number: A100

A101 Drive in Velocity Mode

The drive is in velocity control mode. It follows the velocity command value characteristic specified by the controller. The speed control loop is closed in the controller.

See also functional description of "Velocity control"

A101 attributes

7-segment display: AF

Diagnosis number: A101

A102 Position Mode Encoder 1

The drive is in **position control mode**. The position control loop is closed in the drive via a position encoder. The controller only specifies the position command value characteristic; the drive follows the command value with a lag.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also functional description of "Position control"

A102 attributes

7-segment display: AF

Diagnosis number: A102

A103 Position Mode Encoder 2

The drive is in **position control mode**. The position control loop is closed in the drive via a position encoder. The controller only specifies the position command value characteristic; the drive follows the command value with a lag.

Encoder 2 means that the position encoder is attached to the machine axis (direct measurement of the axis position).

See also functional description of "Position control"

A103 attributes

7-segment display: AF

Diagnosis number: A103

A104 Position Mode Encoder 1 / lagless positioning

The drive is in **position control mode**. The position control loop is closed in the drive via a position encoder. The controller only specifies the position command value characteristic; the drive follows the command value without a lag.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also functional description of "Position control"

Attribute

7-segment display: AF

Diagnosis number: A104

A105 Position Mode Encoder 2 / lagless positioning

The drive is in **position control mode**. The position control loop is closed in the drive via a position encoder. The controller only specifies the position command value characteristic; the drive follows the command value without a lag.

Encoder 2 means that the position encoder is attached to the machine axis (direct measurement of the axis position).

See also functional description of "Position control"

A105 attributes

7-segment display: AF

Diagnosis number: A105

A106 Drive-Controlled Interpolation/Encoder 1

The controller provides the drive with a position control value that is identical to the target position of the travel distance. The drive now generates (interpolates) an internal position command value characteristic that does not exceed the maximum values of jerk, acceleration and velocity that have been defined by the controller.

The drive approaches the target position of the travel distance with a lag.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also functional description of "Drive-internal interpolation"

A106 attributes

7-segment display:	AF
Diagnosis number:	A106

A107 Drive-Controlled Interpolation/Encoder 2

The controller provides the drive with a position control value that is identical to the target position of the travel distance. The drive now generates (interpolates) an internal position command value characteristic that does not exceed the maximum values of jerk, acceleration and velocity that have been defined by the controller.

The drive approaches the target position of the travel distance with a lag.

Encoder 2 means that the position encoder is attached to the machine axis (direct measurement of the axis position).

See also functional description of "Drive-internal interpolation"

A107 attributes

Diagnosis number:	A107

A108 Drive-Controlled Interpolation/Encoder 1/Lagless

The controller provides the drive with a position control value that is identical to the target position of the travel distance. The drive now generates (interpolates) an internal position command value characteristic that does not exceed the maximum values of jerk, acceleration and velocity that have been defined by the controller.

The drive approaches the target position of the travel distance without a lag.

Encoder 1 means that the position encoder is attached to the motor shaft (indirect measurement of the axis position).

See also functional description of "Drive-internal interpolation"

A108 attributes

7-segment display: AF

Diagnosis number: A108

A109 Drive-Controlled Interpolation/Encoder 2/Lagless

The controller provides the drive with a position control value that is identical to the target position of the travel distance. The drive now generates (interpolates) an internal position command value characteristic that does not exceed the maximum values of jerk, acceleration and velocity that have been defined by the controller.

The drive approaches the target position of the travel distance without a lag (activate step control).

Encoder 2 means that the position encoder is attached to the machine axis (direct measurement of the axis position).

See also functional description of "Drive-internal interpolation"

A109 attributes

7-segment display: AF

Diagnosis number A109

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