PROFILE

Draft 22 September 1994

Drive Engineering / Servo 22

Profile:	Drive Engineering
Profile No.:	22
Date:	15 May 1995
Author:	DRIVECOM Nutzergruppe e.V. Postfach 1102, D-32817 Blomberg Telephone: +49 52 35 / 3-4 18 64 Telefax: +49 52 35 / 3-4 18 62
Order No.:	22

Contents

1. Preface

Within the framework of factory automation, increasingly powerful and more flexible systems are needed in industrial drive engineering. Digitised drive controllers are capable of fulfilling these requirements. However, open and standardised communication capabilities are needed to enable their complete integration into complex production sequences.

The DRIVECOM User Group has taken on the task of standardising the most important drive hardware functions and of summarising them in this profile for drive engineering.

- To be able to define the drive drive controller functions regardless of the communication medium, an internationally recognised and standardised user interface (DIN 19245, Part 2) was used for communications. This created a continuous link to MMS.

- The InterBus-S system, which fulfils the demands of drive engineering in terms of real-time response and a standardised user interface, was chosen as the transfer medium.

The profile for drive controllers is oriented to their users and manufacturers. For the user, this profile definition is a meaningful addition for standardised communications and represents a generally valid convention concerning the contents of data and the response of hardware. These function definitions standardise a few essential drive parameters. Consequently, hardware from different manufacturers exhibits the same response in the communication medium when using these standard parameters.

The DRIVECOM User Group was founded by 14 companies in September 1990 and has been a registered association since June 1991. It is the proprietor of the association's mark "DRIVECOM-Nutzergruppe e.V.", and has taken on the task of communicating the results of its work to all interested parties and of introducing DRIVECOM products to the market on an international scale. After a review of the requirements defined in the profile, the DRIVECOM User Group grants the right to identify products with the DRIVECOM mark. An independent board of experts has been established to review conformance and certify products having a DRIVECOM profile.

The existing profile, Version 2.0, February 1993, has been submitted in draft by the DRIVECOM-Nutzergruppe e. V. Working Group 2. Amendments and additions are to be expected until it is adopted.

1.1 Definitions

Drive controllers

Drive controllers are actuators that operate without feedback and automatic control equipment having a speed, current or position feedback. Two types of units are mainly used in electrical drive engineering, namely the classical variable-speed DC drive and the three-phase or AC drive using motors that have slip (asynchronous) or using non-slip (synchronous) motors.

- Stepper motor drive;
- Direct current drive;
  - DC-Servo drive;
- Three-phase-synchronous drive;
  - AC-Servo drive (sin-commutated);
  - brushless direct-current drive (trapezoidal commutation);
- Three-phase-asynchronous drive;
  - Standard drive with frequency inverter;
  - Servo drive with vector controller:
- Positioning controls.

Device profile

The device profile defines the application functions that are visible through communication. The application functions are mapped to the communication by the following definitions:

- by the communication profile,
- by interaction between the application functions, insofar as they are executed through the communication system, and
- by the communication services (utilities) used and the communication objects that can be manipulated with them.

The result of mapping is the application’s visible response. The definitions contained in an application profile enable interoperability in a field of application if permitted by the device characteristics used.

Characteristics of devices significant to the user are also defined.

A distinction is made between mandatory functions, optional and manufacturer-specific device functions, and parameters.

If the user limits himself to the mandatory functions or parameters, interchangeability of drive controllers is possible if this is permitted by the device characteristics and adjustments used. In relation to communication, and regardless of the function, devices are always interchangeable if use is made of the same parameters.

One example of this is activation of a device using the "Control Word" parameter. A guarantee is provided that a drive controller is put into operation with the same sequence of commands in the control word.

Communication profile

In relation to the specific application or hardware group, the communication profile limits or classifies the degrees of freedom contained in the specification of the data transfer medium. The communication profile defines communication services and parameters that are defined in the specification as being optional.

All optional functions and parameters that are not stated in the communication profile remain optional. Mandatory services and parameters are binding, even if not stated in the profile.

The profile also limits or defines value ranges of attributes and parameters.

InterBus-S serves as the communication medium.

Communication interface

The communication interface is composed of a channel for services compatible with DIN 19 245, Part 2 (Peripherals Communication Protocol channel, PCP channel) and a channel for process data.

All communication objects can be accessed through the PCP channel. The process data channel serves the purpose of swift transfer of specific communication objects. The PCP services allow acknowledged access to communication objects, i.e. access to a communication object is confirmed by the drive.

Below, the data transferred to the process data channel is referred to as process data.

Process data

Through the process data channel, data is transferred in unacknowledged and equidistant form. The channel has a width of up to 16 bytes. Each byte can be read and written.

The direction specified for the process data is viewed from the bus, i.e.

- process output data consists of data read out of the process data channel by the drive controller,
- process input data consists of data written into the process data channel by the drive controller.

State machine

This profile describes some functions with the aid of a state machine. A state represents a specific internal and external behaviour. It can only be terminated by means of defined events. Corresponding state transitions are assigned to events. Actions can be executed at a transition. The state's response is altered at the transition. When the transition is ended, the current state is changed to the follow-up state.

Index, subindex

The index serves to address a parameter (communication object). Within a parameter created as a structure, the subindex addresses a subparameter (element of a communication object).

Substitute values

The parameter is defined with the substitute value when the optional communication objects are not implemented.

Mandatory range

The mandatory range is the value range within which a parameter, if it is implemented, can be defined in all cases.

Functions

Function is understood to be a self-contained unit with input parameters, control signals and output variables or actions.

Function Groups

Because drive engineering may have so many different applications, the separate device features are gathered together into function groups.

1.2 References

The application protocol and the data structures conform to DIN 19 245,Part 2 .

The application interface for communication through the PCP channel also conforms to DIN 19 245, Part 2).

The definitions for data transfer through the process data channel are based on the Interbus-S specification.

1.2.1 Authors

Mr Fitz	ASB GmbH, D-Bad Schönborn
Mr Fischer	Control Techniques, D-Hennef
Mr Pollmeier	ESR Pollmeier, D-Ober-Ramstadt
Mr Boltz	Elpro AG, D-Berlin
Mr Rathert	HANNING Elektro-Werke, D-Oerlinghausen
Mr Rauber	Hauser, D-Offenburg
Mr Schnurbusch	Lenze, D-Aerzen
Mr Volmer	Mannesmann Demag, D-Hamburg
Mr Kuner	PAPST-MOTOREN, D-St.Georgen
Mr Krumsiek	Phoenix Contact, D-Blomberg
Mr Fleischmann	Refu-Elektronik, D-Metzingen
Mr Ribback	Reliance Electric AG, CH-Dierikon/Luzern
Mr Östringer	SEW EURODRIVE, D-Bruchsal
Mr Petersen	SIEB & MEYER, D-Lüneburg
Mr Dilger	Stöber Antriebstechnik, D-Pforzheim

1.2.2 Bibliography

/1/ DRIVECOM-Profile Drive Engineering 21

/2/ Interbus-S-Profile Sensor/Actuator 12

/3/ Application document InterBus-S Management Version 0.9

/4/ Application document Application Layer Interface Version 2.0

/5/ DIN 19245 Part 2 (PROFIBUS Layer 7)

/6/ InterBus-S CLUB e.V. Guideline

/7/ Controller profile

/8/ DRIVECOM Implementation guideline

1.3 Abbreviations

M	Mandatory
MAP	Manufacturing Automation Protocol
MMS	Manufacturing Messages Services
O	Optional
OV	Object Dictionary
RFG	Ramp Function Generator
PCP	Peripherals Communication Protocol
PMS	Peripherals Message Specification
VFD	Virtual Field Device
.con	Confirmation-Primitive
.ind	Indication-Primitive
.req	Request-Primitive
.res	Response-Primitive

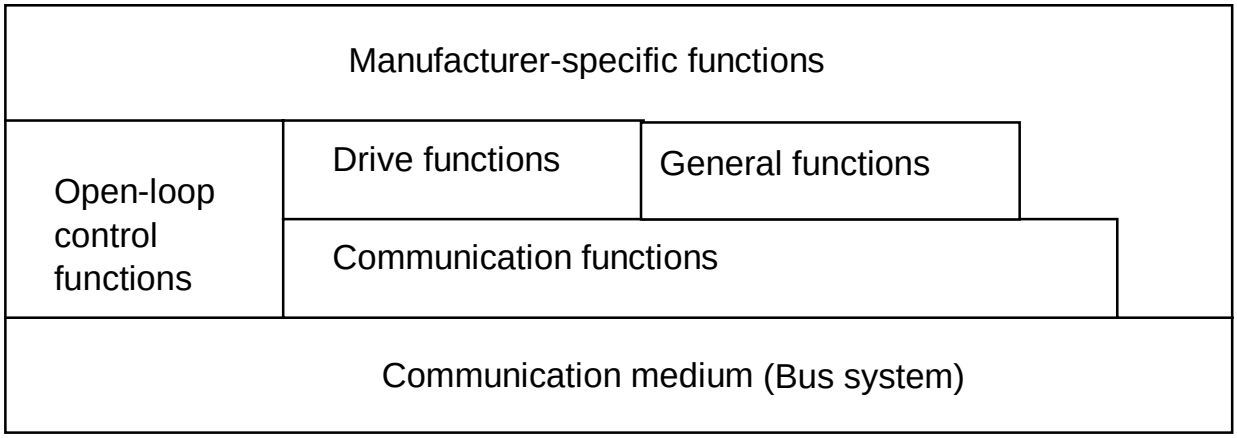
2. Summary

2.1 DRIVECOM Function Structure

This profile defines application functions of variable-speed drive controllers. The application functions are subdivided into

- open-loop control functions (e.g. device control, modes of operation)
- profile drive functions (e.g. speed-, position functions)
- general functions (e.g. device information, block parameterization, malfunction functions).
- communication functions (e.g. Read, Write)

Free areas are also defined for manufacturer-specific functions.



Each application function is described with the aid of a function block. The hardware response is described by a state machine in the open-loop control functions. This profile takes into account the fact that there may be separate hardware for communication and for tasks related to communication.

The drive functions contain the standardised drive functions that communicate with the communication medium through the defined communication functions.

Mechanisms by which information is transmitted via the bus system, are laid down in the communications functions.

The control functions describe the behaviour of the device and coordinate the various device functions, e.g. device control.

In addition to those functions established in the profile, the manufacturer can define additional, manufacturer-specific functions.

2.1.1 Function Groups

Device function which, form a content point of view, belong together are grouped into function groups. All function groups which are implemented in a device are listed in a function group list:

- speed function group 1;
- position function group;
- speed function group 2;
- torque function group;
- set-point generator function group;
- factor function group.

2.1.2 Modes of Operation

Various modes of operation are supported, depending on the function groups implemented:

- end position setting;
- speed setting 1 (DRIVECOM Profile 21);
- speed setting 2;
- torque setting;
- manual operation;
- reference operation;
- manufacturer-specific modes op operation.

2.2 Overview of Chapters

The profile is aimed at the user and device manufacturer of drive controllers and positioning controls.

Chapter 1: Explanation and history of the profile's creation

Chapter 2: Summary, breakdown, definitions

Chapter 3: Characterisation of hardware

Chapter 4: Description of the complete application from the point of view of communication

Chapter 5: Definition of data structures defined in the Profile (e.g. Records)

Chapter 6: Definition of device relationship

Chapter 7: Description of possible modes of operation of a device

3. Characterisation of Hardware

Electrical drive engineering is of extreme importance to automation technology because electromotive drives can be found in almost all branches of industry. Open or closed-loop control of the corresponding process variables such as the speed, torque or position is needed to ensure that the drive can fulfil its task optimally. These tasks are essentially performed by electronic drive controllers.

To perform drive tasks, additional mechanical components such as a clutch, gearbox or brake are used besides the drive controller and motor.

Depending on the field of application, present-day automation technology places high demands on the operating range, accuracy, dynamics and closed-loop control response. Owing to the very large bandwidth of possible applications, the market demands a wide range of diverse hardware in relation to functions and price.

At the same time, integration of drive controllers into superior control systems is an increasingly important function. Serial links are increasingly taking the place of the previous conventional coupling to control systems through analog interfaces (0 - 10 V or 0 - 20 mA). This was made possible by the use of microprocessor technology, by means of which drive controllers have become capable of communicating.

Communication is the "nervous system" of automation. Open and powerful interfaces are crucial to further growth of the drive market.

The open structure of the DRIVECOM profile ensures coverage of the diverse functions.

Corresponding to the PROFIBUS standard, drive controllers in a communication network can be active or passive nodes.

3.1 Device Data

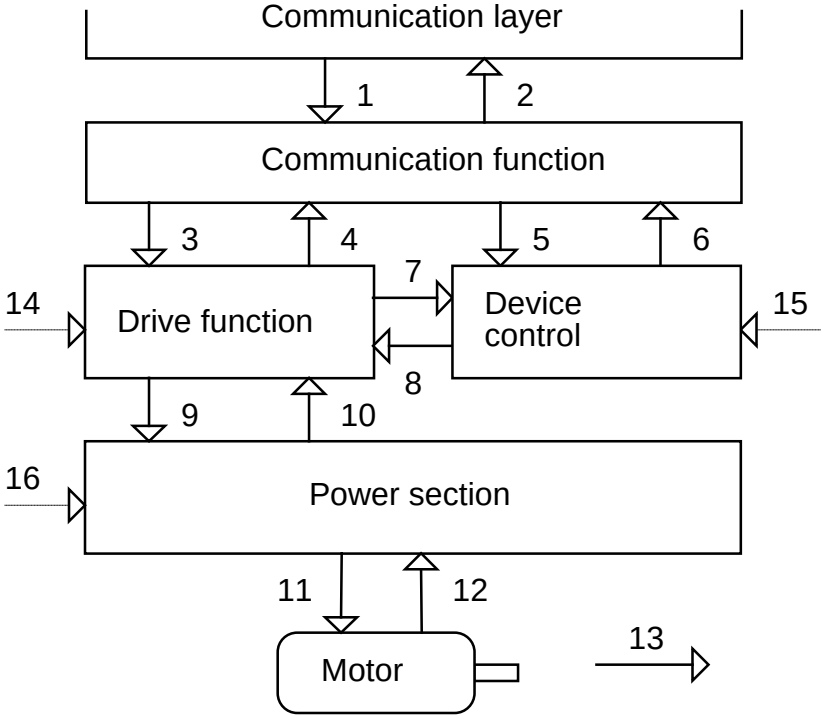
Electrical drive controllers are distinguished by virtue of the fact that changes in a process variable (e.g. the speed) are caused by analog or digital signals. Additional parameters are needed to optimally adapt drive controllers and motors to the process. This is described in further detail with reference to the example of the static frequency inverter used to adjust three phase asynchronous machines. Besides needing the actual setpoint information, this device also needs information about the motor’s type point, the system’s minimum and maximum permissible speeds, the maximum speed change during acceleration and deceleration and information about commissioning and shutdown of the machine.

An analysis of the above-mentioned parameters leads to the creation of two data classes, namely: the group of data to be transmitted cyclically (e.g. speed, position and torque) and the acyclic data transfer group (e.g. the minimum and maximum speed limits). This data classification is encountered not only in drive engineering, but also in the entire field of sensors/actuators.

If we take a look at the two data classes from the point of view of quality, there are significant differences in relation to the time requirements and data width involved. The cyclic data generally involves low quantities of data ranging from 16 - 32 bits and has to be transferred with a cycle time of a few milliseconds. In contrast, the group of acyclic data involves clearly higher quantities of data, e.g. 50 * 16 bits of information units. Contrary to the cyclic data, such data changes seldomly. The time requirement, the cycle time, is therefore oriented to the cyclic data.

4. Application and Device Characteristics

This chapter describes the complete application from the point of view of communication. The application is broken down into the following function blocks:



Communication function

The communication function executes all functions specific to communication. These include execution of the services, control of communication, mapping of the process data to the communication objects and monitoring both communication and the process data.

Device control

The device control block controls the entire functions of the device (state machine).

Drive function

The drive function executes all functions specific to the drive. It generates the control information and the setpoints for the power section. With the aid of the speed function, these setpoints are derived from the control information of the device control and setpoints from the communication function.

Power section

The power section is controlled by the drive functions and forwards the corresponding physical variables to the motor.

Communication layer

The communication layer contains a layer 7, corresponding to DIN 19 245, Part 2, and a layer 2 conforming to the InterBus-S specification (see Chapters 5.2 - 5.7).

Interactions between the function blocks

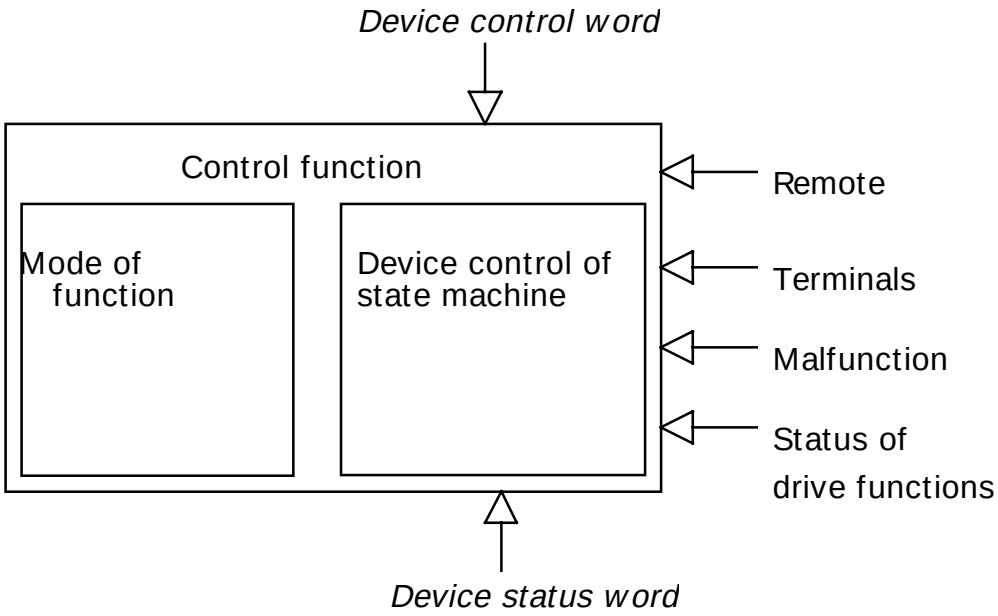
1 Data from the bus system
2 Data to the bus system
3 Specification of drive parameters
4 Readout of drive parameters
5 Commands to the device control (control word)
6 Status of the device control
7 Status of the drive function, malfunction
8 Control of the drive function
9 Control information and manipulated variable to the power section
10 Actual values and status of the power section
11 Interface between the power section and motor
12 Actual value of the motor
13 Mechanical output variable of the motor
14 Information from control terminals
15 Information from control terminals
16 Information from control terminals

4.1 Device Control

The device control function block controls all functions of the device (drive function and power section). It is divided into:

- device control of state machine
- modes of operation control.

The control sequence is described by a state machine. Device control is influenced by the control word, the mode of operation, the internal signals (e.g. remote), the power section status, the drive function status and malfunctions. The device control influences the drive functions. The status word is derived from the device status and internal signals and can be read out through the bus.



The function groups are subsequently described in different chapters. The chapters end with a mapping of the device objects to communication.

Control word

The drive controller can be controlled via the bits in the ”control word”.

Description, see Chapter Device Control State Machine.

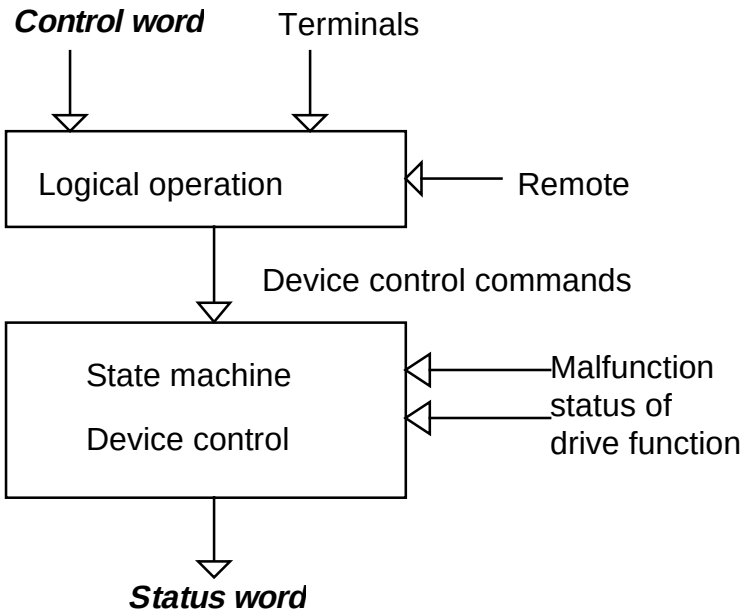
Status word

The parameter 'status word' displays information about the status and signals of the drive controller. Description, see Chapter Device Control State Machine.

Remote

This internal signal displays, whether the drive controller is being parametrised via the bus.

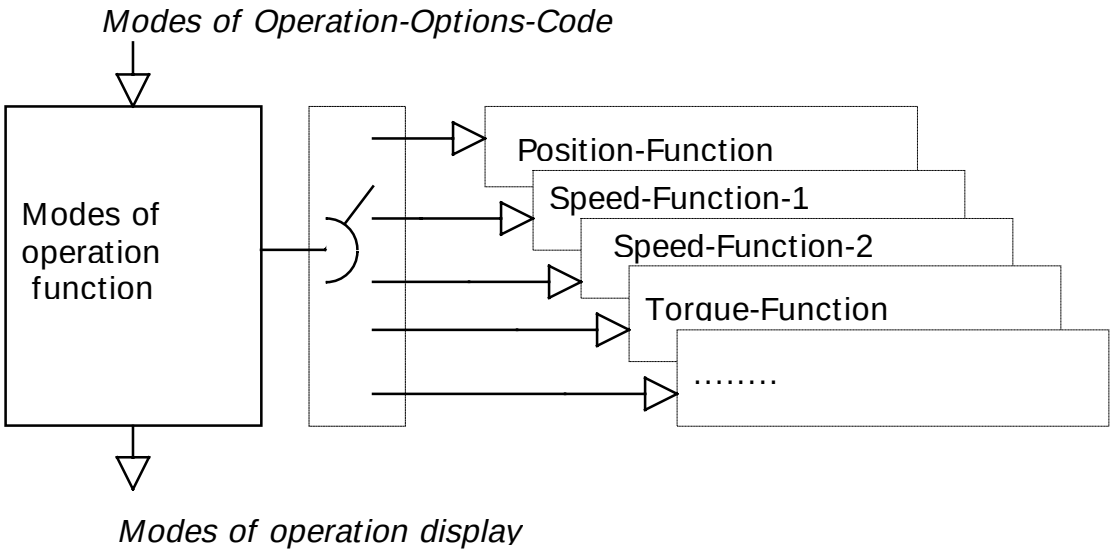
The external interaction of the state machine is essentially done via device control commands (see chapter Control Word). Interaction by internal signals from the drive functions and malfunctions is also possible. The device control commands are made up of a logical interconnection of control word and external signals (terminals). In this way, write access to the control word can be suppressed by means of the remote signal (optional).



Modes of operation

The behaviour of the device is dependent on the active mode of operation. For example, the quick stop function in torque operation mode behaves differently from that in position mode. The meaning of some bits in the control word and status word are also dependent on the mode of operation.

For a description see Chapter Modes of Operation and Chapter Drive Functions.



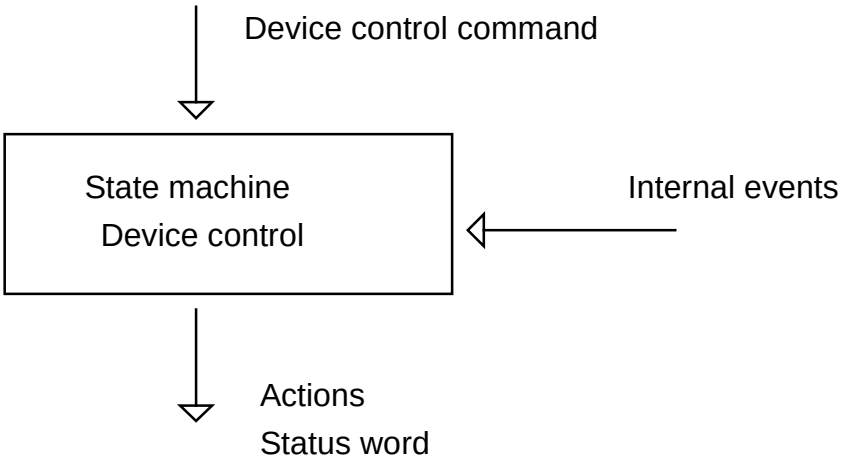
4.1.1 Device Control State Machine

Profile number : 22

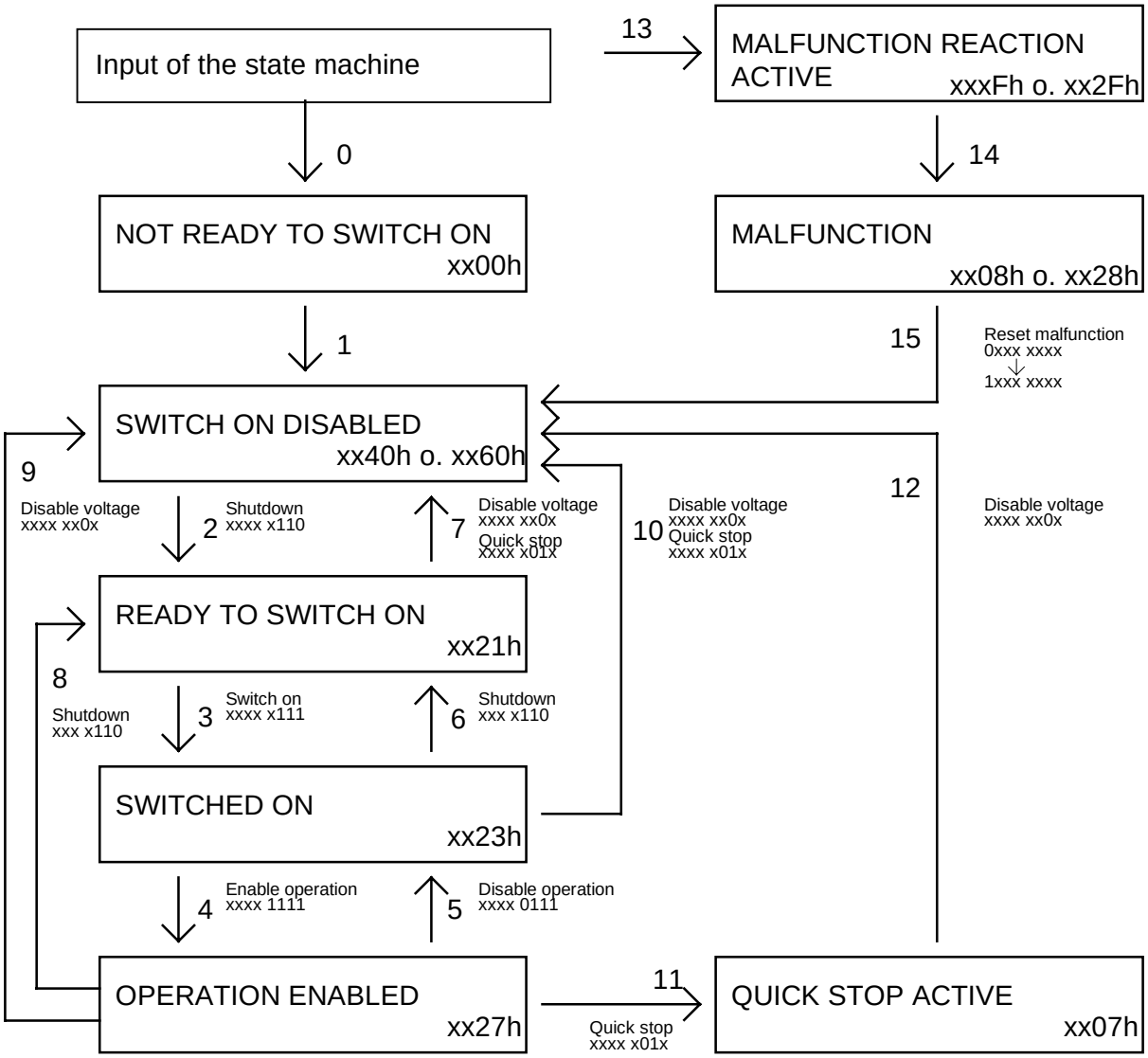
Function group : 01

Function version : 00

The state machine describes the device statuses and the possible control sequence of the drive. A status represents a specific internal and external response. By means of device control commands and/or internal events, the status can be changed and a control sequence thus executed. The current status can be read out by way of the status word.



State diagram



In the states, the status word index 6041 is given; at the state transitions the ”control word” index 6040 is given. The form xxxx xxxx shows only bits 7...0 in binary form; xxxxh shows the hexadecimal expression.

In a state machine, the device control commands lead to the following transitions:

Device control command	Triggered state transitions	Control word bit7 ... bit0
Shutdown	2,6,8	xxxx x110
Switch on	3	xxxx x111
Disable voltage	7,9,10,12	xxxx xx0x
Quick stop	7,10,11	xxxx x01x
Disable operation	5	xxxx 0111
Enable operation	4	xxxx 1111
Reset malfunction	15	0xxx xxxx > 1xxx xxxx

States of the device control

NOT READY TO SWITCH ON:
- The electronic circuitry is receiving its supply voltage
- Self test running
- Initialisation running
- The drive function is disabled

SWITCH ON DISABLED:
- Software/hardware initialisation completed
- Parameter definition of the application with the stored values completed
- The application's parameters can be redefined
- The drive function is disabled
- Switching on is disabled

READY TO SWITCH ON:
- The application's parameters can be redefined
- The drive function is disabled
- Switching on is enabled

SWITCHED ON:
- The application's parameters can be redefined
- The drive function is disabled
- The power section is operable

OPERATION ENABLED:
- The application's parameters can be redefined
- The drive function is enabled

QUICK STOP ACTIVE:
- The application's parameters can be redefined
- Quick stop function is executed
- The drive function is enabled

MALFUNCTION:
- The application's parameters can be redefined
- The drive function is disabled

MALFUNCTION REACTION ACTIVE:
- The application's parameters can be redefined
- An action is executed depending on the fault
- The drive function can be enabled

Data transitions of the device control

0 Input of the state machine -> NOT READY TO SWITCH ON

Event: - Reset
Action: - Start self test
- Start initialisation

1 NOT READY TO SWITCH ON --> SWITCH ON DISABLED

Event: - Error-free self test
- Initialisation completed without errors occurring
Action: - Activate communication and process data monitoring

2 SWITCH ON DISABLED --> READY TO SWITCH ON

Event: - "Shutdown" command
Condition: - Depending on the manufacturer-specific requirements (e.g. power section ready)
Action: - None

3 READY TO SWITCH ON --> SWITCHED ON

Event: - "Switch-on" command
Action: - The power section is switched on if it is not already switched on.

4 SWITCHED ON --> OPERATION ENABLED

Event: - "Enable-Operation" command
Action: - Enable drive function

5 OPERATION ENABLED --> SWITCHED ON

Event: - "Disable-Operation" command
Action: - Execute the parameter-definable "Drive-Disable-Function"

6 SWITCHED ON --> READY TO SWITCH ON

Event: - "Shutdown" command
Action: - The power section can be switched off

7 READY TO SWITCH ON --> SWITCH ON DISABLED

Event: - "Quick-Stop" or "Disable-Voltage" command
Action: - None

8 OPERATION ENABLED --> READY TO SWITCH ON

Event: - "Shutdown" command
Action: - Execute the parameter definable "Drive-Disable-Function"
- The power section can be switched off

9 OPERATION ENABLED --> SWITCH ON DISABLED

Event: - "Disable-Voltage" command
Action: - Disable drive function
- The power section can be switched off

10 SWITCHED ON --> SWITCH ON DISABLED

Event: - "Disable-Voltage" command
or
- "Quick-Stop" command
Action: - The power section can be switched off

11 OPERATION ENABLED --> QUICK STOP ACTIVE

Event: - "Quick-Stop" command
Action: - Trigger the parameter-definable "Quick-Stop-Function"

12 QUICK STOP ACTIVE --> SWITCH ON DISABLED

Event: - Quick stop has been completed
or
- "Disable-Voltage" command
Action: - Disable drive function
- The power section can be switched off

13 All states --> MALFUNCTION REACTION ACTIVE

Event: - Drive malfunction detected
Action: - Trigger malfunction reaction depending on the fault

14 MALFUNCTION REACTION ACTIVE --> MALFUNCTION

Event: - Malfunction reaction concluded
Action: - Disable drive function
- The power section can be switched off

15 MALFUNCTION --> SWITCH ON DISABLED

Event: - "Malfunction-Reset" command
Condition: - Malfunction is no longer present
Action: - Malfunction reset is executed

The status change takes place only if the actions have been executed completely. The sequence of actions corresponds to the sequence in which they are processed when the status is changed. Once the actions have been processed completely, the next status has been attained and new commands are accepted.

Explanation of actions:

"Disable-Drive-Function" and "Drive-Function-Disabled"

The drive shows the following response:

No power to the drive. This can be achieved in different ways, depending on the manufacturer. For example:

- switch power switch to high impedance,

- switch power outputs to a potential,

- output of 0 V.

Setpoints are not processed.

Explanation of actions:

"Enable-Drive-Function" and "Drive-Function-Enabled"

The drive shows the following response:

- The power section is enabled.

- Setpoints can be processed.

Explanation of the event ”drive malfunctions”

Drive malfunctions may occur in all states of the device control. They always cause a changeover to the MALFUNCTION REACTION ACTIVE state. In this state, a reaction is executed depending on the fault. The malfunction state is assumed after execution of the reaction. The state can only be terminated by means of the "Malfunction-Reset" command, and only if the malfunction is no longer present.

4.1.1.1 Control Word

As the result of logical combination, the "Control-Word" and the external signals (terminals) produce the device control commands that act on the state machine of the device control. In this way, functions are executed and operating states of the device are defined. The control word is composed of 16 bits that have the following meanings:

Bit	Name	mandatory
0	Switch-on	X
1	Disable voltage	X
2	Quick stop	X
3	Enable operation	X
4	Dependent on mode of operation	
5	Dependent on mode of operation	
6	Dependent on mode of operation	
7	Reset-malfunction	X
8	Reserved	
9	Reserved	
10	Reserved	
11	Manufacturer-specific	
12	Manufacturer-specific	
13	Manufacturer-specific	
14	Manufacturer-specific	
15	Manufacturer-specific	

Device control commands

The device control commands are triggered by the following bit combinations in the control word:

Command	Bit 7 Reset-malfunction	Bit 3 Enable-operation	Bit 2 Quick-stop	Bit 1 Disable-voltage	Bit 0 Switch-on	Transitions
Shutdown	X	X	1	1	0	2,6,8
Switch-on	X	X	1	1	1	3
Disable-voltage	X	X	X	0	X	7,9,10,12
Quick-stop	X	X	0	1	X	7,10,11
Disable operation	X	0	1	1	1	5
Enable-operation	X	1	1	1	1	4
Reset-malfunction	0>1	X	X	X	X	15

0>1: Change from bit=0 to bit=1

The bits marked X are irrelevant here.

Description of the remaining bits in the control word

- Bit 4, 5, 6 dependent on mode of operation:

These control bits are explained in the individual modes of operation.

- Bits 8, 9, 10 reserved:

These control bits are reserved for profile additions. The functions do not become active if these bits are set to "0". They must be set to "0" whenever they are not assigned to any defined function.

- Bits 11, 12, 13, 14, 15 Manufacturer-specific:

These control bits switch manufacturer-specific functions. The functions are not active when these bits are set to "0". They must be set to "0" unless they are assigned a manufacturer-specific function.

Attribute	**Value**
Index, Name	6040, control word
Object class	mandatory
Access	Read-all, Write-all
Process data mapping	PO-data
Unit	-
Value range	xxxxx000 xxxxxxxx
Mandatory range	-
Default value	0
Substitute value	-

4.1.1.2 Status Word

Information about the status of the device and messages is indicated in the status word.

Bit	Name	mandatory
0	Ready-to-switch-on	X
1	Switched-on	X
2	Operation-enabled	X
3	Malfunction	X
4	Voltage-disabled	X
5	Quick-stop	X
6	SWITCH-ON-DISABLED	X
7	Warning	
8	Message	
9	Remote	X
10	Face-value-reached	X
11	Limit-value	X
12	Dependent on mode of operation	
13	Dependent on mode of operation	
14	Manufacturer-specific	
15	Manufacturer-specific	

Device statuses

The device statuses are indicated by the following bit combinations in the status word:

Status	Bit 6 Switch-on-disabled	Bit 5 Quick-stop	Bit 3 Malfunction	Bit 2 Operation-enabled	Bit 1 Switched-on	Bit 0 Ready-to-switch-on
NOT-READY-TO-SWITCH-ON	0	X	0	0	0	0
SWITCH-ON-DISABLED	1	X	0	0	0	0
READY-TO-SWITCH-ON	0	1	0	0	0	1
SWITCHED-ON	0	1	0	0	1	1
OPERATION-ENABLED	0	1	0	1	1	1
MALFUNCTION	0	X	1	0	0	0
MALFUNCTION-REACTION-ACTIVE	0	X	1	1	1	1
QUICK-STOP-ACTIVE	0	0	0	1	1	1

The bits marked X are irrelevant here. Other bit combinations are not allowed.

Description of the remaining bits in the control word

Bit 4 Voltage-disabled:

The disabled voltage request is active when bit 4 = 0.

Bit 5 Quick-stop:

The quick stop request is indicated if bit 5 = 0. Alternatively, the status of the device control is indicated depending on other bits.

Bit 7 Warning:

This is a group indication that indicates manufacturers' specific or standardised warnings. A warning is present if bit 7 = 1.

Bit 8 Message:

This is a collective indication indicating the presence of manufacturers' specific or standardised messages. A message is present is bit 8 = 1.

Bit 9 Remote:

Remote indicates that parameters can be modified through the bus if bit 9 = 1.

Bit 10 Setpoint-reached:

Setpoint reached indicates that a defined setpoint has been reached when bit 10 = 1.

Bit 11 Limit-value:

This bit indicates that a limit is active when bit 11 = 1. (In this version, this is triggered only by the speed limits and the motor speed limit.)

- Bit 12, 13 Dependent on mode of operation:

These status bits are explained in the individual modes of operation.

- Bit 14, 15 Manufacturer-specific

Indicates manufacturer-specific information. The bits must be set to 0, as long as they are not assigned to any manufacturer-specific information.

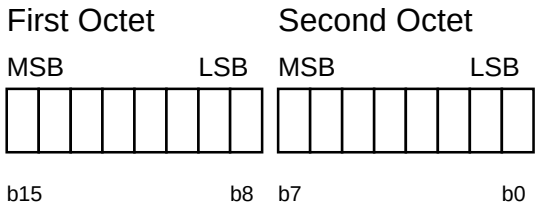
Attribute	**Value**
Index, Name	6041, status word
Object class	mandatory
Access	read only
Process data mapping	PI-data
Unit	-
Value range	-
Mandatory range	-
Default value	0
Substitute value	-

Mapping of device function to communication

Object description: 'Control word'

Object Attribute	**Value**	**Meaning**
Index	6040	Control word
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	A	Octet-String
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

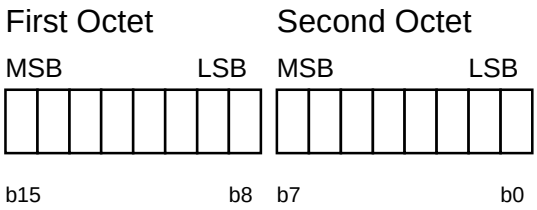
Mapping of control word to octet string:



Object description: 'Status word'

Object Attribute	**Value**	**Meaning**
Index	6041	Status word
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	A	Octet-String
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

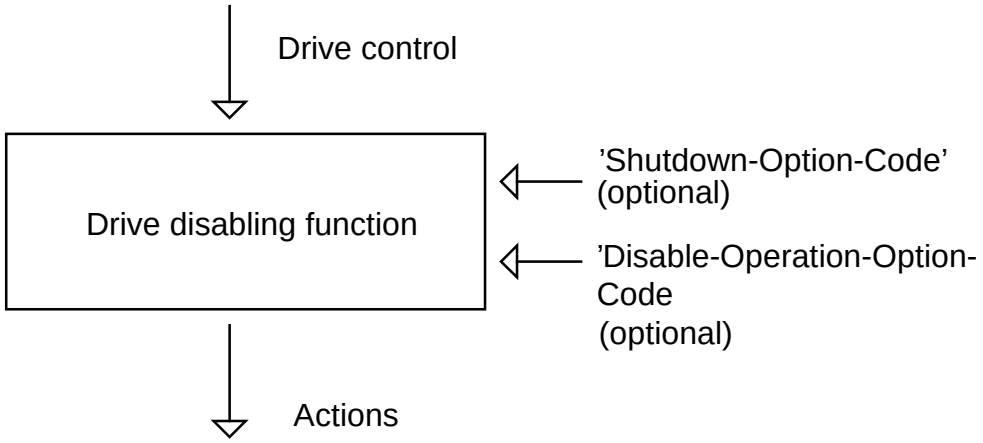
Mapping of status word to octet string:



4.1.1.3 Drive Disabling Function

The drive disabling function defines the response of the device to the transition from the OPERATION ENABLED state to the SWITCHED ON or READY FOR SWITCH ON STATE.

.



"Shutdown-Option-Code"

The "Shutdown-Option-Code" parameter specifies the action that is triggered when the device control executes a transition from the OPERATION ENABLED to READY FOR SWITCH ON state.

Option Code	Meaning of Option Code
-32768 ... -1	Manufacturer-specific
0	Disable drive function
1	Slow down with slow down ramp and then Disabling of the drive function
2 ... 32767	Reserved for DRIVECOM profiles

Attribute	Value
Index, Name	605B, Shutdown-Option-Code
Object class	Optional
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	Profile specific Code
Default value	-
Substitute value	0

"Disable-Operation-Option-Code"

The "Disable-Operation-Option-Code" specifies the action that is triggered when the device control executes the transition from the OPERATION ENABLED to the SWITCHED ON state.

Option Code	Meaning of Option Code
-32768 ... -1	Manufacturer-specific
0	Disable drive function
1	Slow down with slow down ramp and then Disabling of the drive function
2 ... 32767	Reserved for DRIVECOM profiles

Attribute	Value
Index, Name	605C, Disable-Operation-Option-Code
Object class	Optional
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	Profile specific Code
Default value	-
Substitute value	1

Action

The function defined in the corresponding "Option-Code" is triggered.

Mapping of the device function to communication

Object description: 'Shutdown-Option-Code"

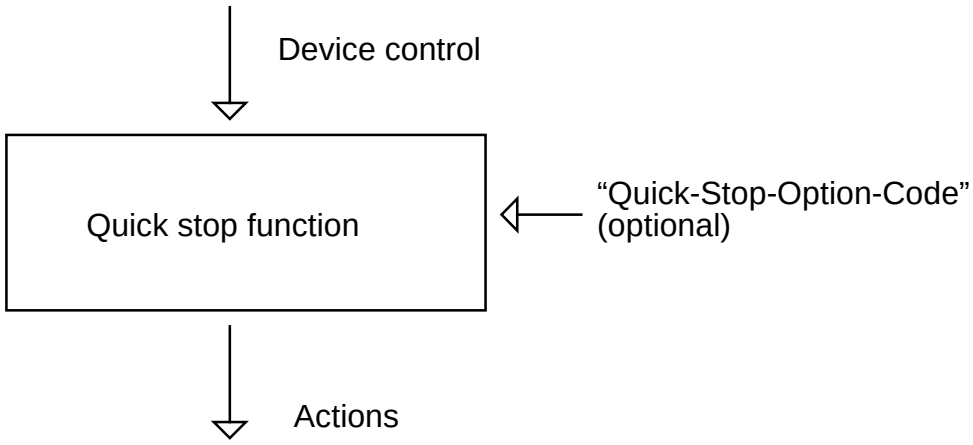
Object Attribute	Value	Meaning
Index	605B	'Shutdown-Option-Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Disable-Operation-Option-Code”

Object Attribute	Value	Meaning
Index	605C	Disable-Operation-Option-Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.1.1.4 Quick Stop Function

The "Quick-Stop-Function" defines the response of the device in the QUICK STOP ACTIVE state.



"Quick-Stop-Option-Code"

The "Quick-Stop-Option-Code" parameter specifies the action that is triggered when the "Quick-Stop-Function" signal is sent by the device control.
.

Option Code	Meaning of Option Code
-32768 ... -1	Manufacturer-specific
0	Disable drive function
1	Slow down on slow down ramp
2	Slow down on quick stop ramp
3	Slow down at the current limit
4	Slow down at the voltage limit
5 ... 32767	Reserved for DRIVECOM profiles

Attribute	**Value**
Index, Name	605A, Quick-Stop-Option-Code
Object class	Optional
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	Profile specific code
Default value	-
Substitute value	1

Action

The function defined in the "Quick-Stop-Option-Code" is triggered.
.

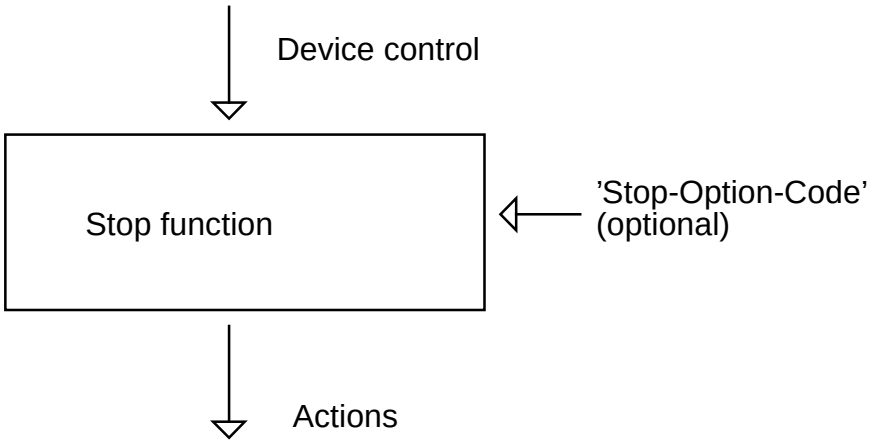
Mapping of device function to communication

Object- Description: "Quick-Stop-Option-Code"

Object Attribute	**Value**	**Meaning**
Index	605A	Quick-Stop-Option-Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.1.1.5 Stop Function

The stop function is executed if the "Disable-RFG" control bit in the "Control-Word" parameter is set to 0.



"Stop-Option-Code"

The "Stop-Option-Code" parameter specifies the action that is triggered when the stop function is activated.

Option Code	Meaning of Option Code	Substitute value
-32768 ... -1	Manufacturer-specific	
1	Slow down on slow down ramp	*
2	Slow down on quick stop ramp	
3	Slow down at the current limit	
4	Slow down at the voltage limit	
2 ... 32767	Reserved for DRIVECOM profiles	
0	Disable drive function	

Attribute	**Value**
Index, Name	605D, Stop-Option-Code
Object class	Dependent on mode of operation
Access	Read-All, Write-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	Profile specific code
Default value	-
Substitute value	1

Mapping of device function on communication

Object description: ”Stop-Option-Code”

Object Attribute	**Value**	**Meaning**
Index	605D	Stop-Option-Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.1.2 Modes of Operation

Profile number : 22

Function group : 03

Function version : 00

In Profile 2.2 it is possible to implement different device functions. Since it is not possible to operate these functions in parallel, the user is able to activate the required function by selecting a mode of operation. An example of exclusive functions are those for position and torque control, which can only control one variable at any one time. Other variables can perform at most a limited function. Such hybrids are regarded as the particular characteristics of a mode of operation. Position control operation and encoder profile support can be active at the same time, for example. Consequently encoder profile support is not regarded as a mode of operation.

It is possible for the user to switch between the various modes of operation as long as this is supported by the device. It is possible for the manufacturer to allow dynamic mode of operation switching at any time or to limit switching for example to the state ”switch down disabled”. Switching can also be limited to the state ”local control”; i.e. not possible via the bus. A device characteristic listed in the device function list can possibly have several modes of operation.

The following modes of operation are listed:

- end position setting;
- speed setting 1 (DRIVECOM Profile 21);
- speed setting 2;
- torque setting;
- manual operation;
- reference operation.

With the exception of the ”reference operation”, these listed modes of operation can all be put under the heading of ”setpoint setting”.

In parallel to this, manufacturer-specific modes of operation may also be available. These must not be limited to setpoint settings.

The reference operation is regarded as a special form of a program function. The program function allows the user to run complex or time-critical sequences, e.g. tool change or special reference operations, directly in the device.

The switching between the modes of operation listed above should not incur any automatic reconfiguration of the process data channel. Problems which occur through switching of setpoint values during change of mode of operation must be monitored by the user. If necessary they can be rectified by prior reconfiguration of the process data channel.

Two objects are defined for management of modes of operation.

- modes of operation-option code
- modes of operation-display

The device control and status words contain bits, whose meaning is dependent on the mode of operation. When switching mode of operation, the ”bits” changed meaning needs to be monitored.

4.1.2.1 Description of Parameters

”Modes of Operation - Option-Code”

The parameter ”Modes of Operation-Option-Code” defines the mode of operation.

Option Code	Meaning of the Option Function
0	reserved
1	End position setting
2	Speed setting 1 (DRIVECOM Profile 21)
3	Speed setting 2
4	Torque setting
5	manual operation
6	reference operation
-1 ... -128	Manufacturer-specific modes of operation

Attribute	**Value**
Index, Name	6060, Modes of Operation - Option Code
Object class	mandatory
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
value range	i8
Mandatory range	-
Default value	-
Substitute value	-

Modes of operation display

The parameter 'modes of operation-display' returns the current mode of operation. The meaning of the returned value corresponds to that of the modes of operation option code (see modes of operation option code).

Attribute	**Value**
Index, Name	6061, Modes of operation display
Object class	mandatory
Access	Read only
Process data mapping	Manufacturer-specific
Unit	-
Value range	i8
Mandatory range	-
Default value	-
Substitute value	-

4.1.2.2 Mapping the Device Functions to Communication

Object description: ”Modes of Operation - Option Code”

Object Attribute	Value	Meaning
Index	6060	Modes of Operation - Option Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description ”Modes of Operation Display”

Object Attribute	Value	Meaning
Index	6061	Modes of Operation Display
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2 Drive Functions

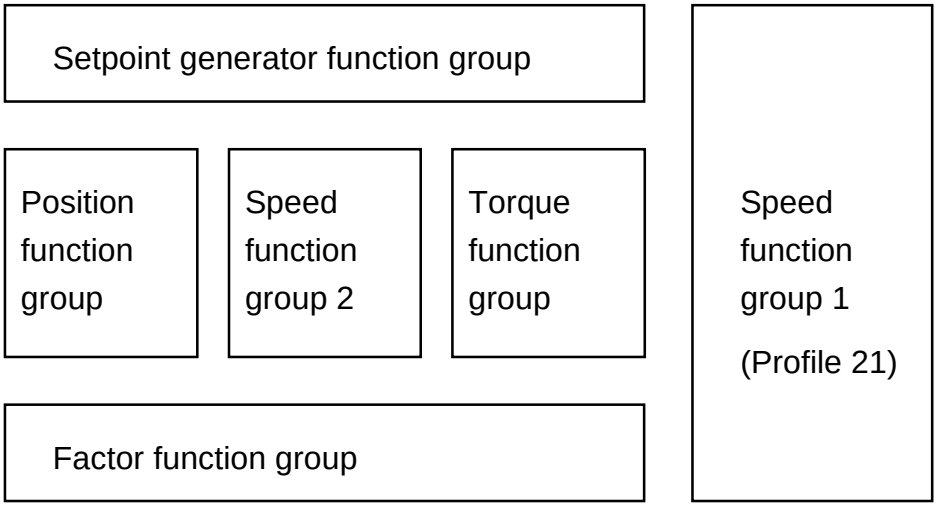
Overall structure and arrangement of the function groups

The drive function in Profile 22 distinguishes between the following modes of operation, which can be further divided into modes of operation:

- speed operation 1 (Profile 21)
- position operation reference operation
  end position setting
- speed operation 2
- torque operation

The methods of operation use the following function groups, whereby different functions from the function groups are used, depending on the mode of operation:

- speed function group 1;
- setpoint generator function group;
- position function group;
- speed function group 2;
- torque function group;
- factor function group.



These function groups can be grouped as follows:

Method of operation	related function groups
position operation	setpoint generator f.g. + position f.g.
speed operation 2	setpoint generator f.g. + speed f.g. 2
torque operation	setpoint generator f.g. + torque f.g.
speed operation 1	speed function group 1

Speed function group 1 is compatible with Profile 21 and corresponds to the drive functions given there.

The individual function groups are described in the various subsequent chapters. The block diagrams only indicate the relationship between the effects of the parameters. They do not describe the actual structure of the manufacturer-specific control loops or implementations.

The individual parameters are described for graphic illustrations. Multiple description of parameters in various function groups is not carried out. Cross-references are made at the relevant points.

The symbols introduced for physical and standardised signals in () are necessary to clarify the description and occur at the relevant interfaces in the various function groups.

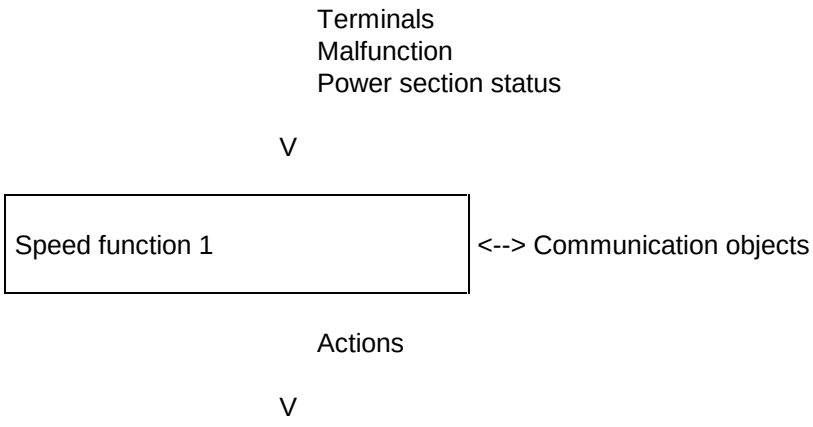
The chapter ends with a mapping of the objects to communication.

The factor function group describe the relationships and calculation of the standardisation factors and must not be implemented. The related factors are optional.

4.2.1 Speed Function Group 1

Profile number	:	22
Function group	:	04
Function version	:	00

The speed function group 1 comprises the speed function 1, in which the speed actions of the drive are defined. This speed function corresponds to the speed function of the DRIVECOM Profile 21.



4.2.1.1 Speed Function 1

The speed function is composed of the following subfunctions:

- Factor function
- 1/factor function
- Percentage function
- Pole number function
- Speed limit
- Motor speed limit
- Ramp function
- Ramp-min function
- Closed-loop/open-loop control function

The speed function 1 can be influenced by the following parameters:

- "Nominal-Speed-Value" (mandatory)
- "Nominal-Percentage" (optional)
- "Pole-Number" (optional)
- "Nominal-Value-Factor" (optional)
- "Dimension-Factor" (optional)
- "Speed-Min-Max-Amount" (mandatory)
- "Speed-Min-Max" (optional)
- "Speed-Motor-Min-Max-Amount" (optional)
- "Speed-Motor-Min-Max" (optional)
- "Frequency-Motor-Min-Max-Amount" (optional)
- "Frequency-Motor-Min-Max " (optional)
- "Speed-Acceleration" (mandatory)
- "Speed-Deceleration" (mandatory)
- "Speed-Quick-Stop" (optional)
- "Ramp-Function-Time" (optional)
- "Slow-Down-Time" (optional)
- "Quick-Stop-Time" (optional)
- "Speed-Reference-Value" (optional)

The speed function 1 returns the following output parameters:

- "Speed-Reference-Variable" (mandatory)
- "Actual-Speed" (mandatory)
- "Manipulated-Speed-Variable" (optional)
- "Percentage-Reference-Variable" (optional)
- "Actual-Percentage" (optional)
- "Manipulated-Percentage-Variable" (optional)

General definitions concerning speed functions

For all signed speed objects, the positive value denotes rotation to the right and the negative value denotes rotation to the left (when viewing the drive shaft).

The minimum or maximum values (e.g. -32768 and +32767 for integer 16) are output if the value of an object exceeds the value range that can be represented.

Figures 1 and 2 show the minimum and maximum structures of the speed function. It is not intended for them to specify implementations, but to describe the scope of functions. In these structures, the unit in which the speed values in the speed functions are calculated is "rpm". The descriptions of the drive functions refer to the structure.

Key to symbols

Functions

Internal variables

Text Object

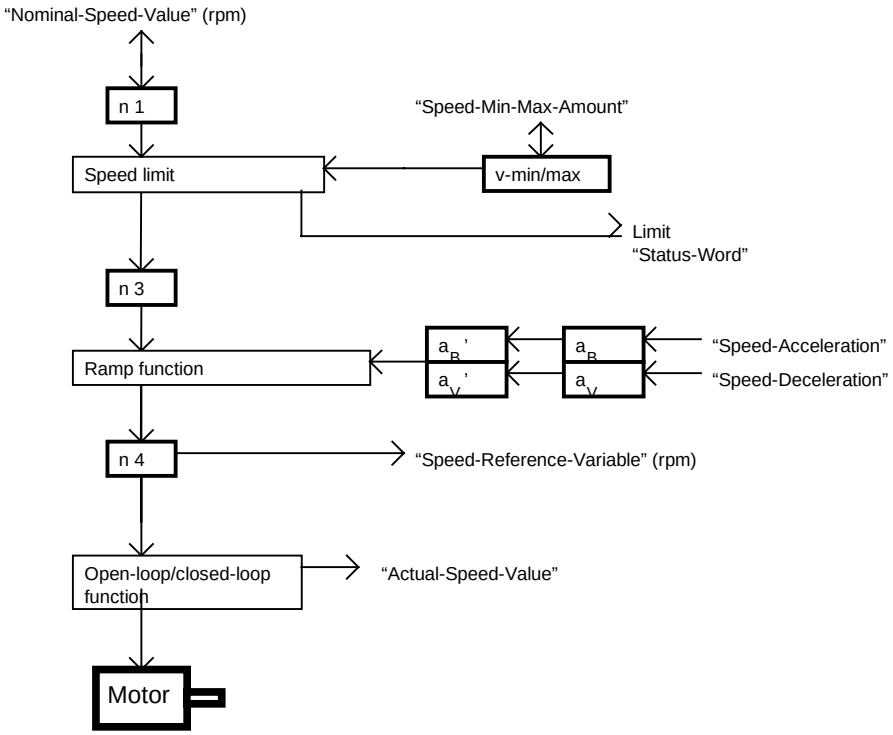


Figure 1: Structure of the speed function 1 when using the mandatory objects exclusively

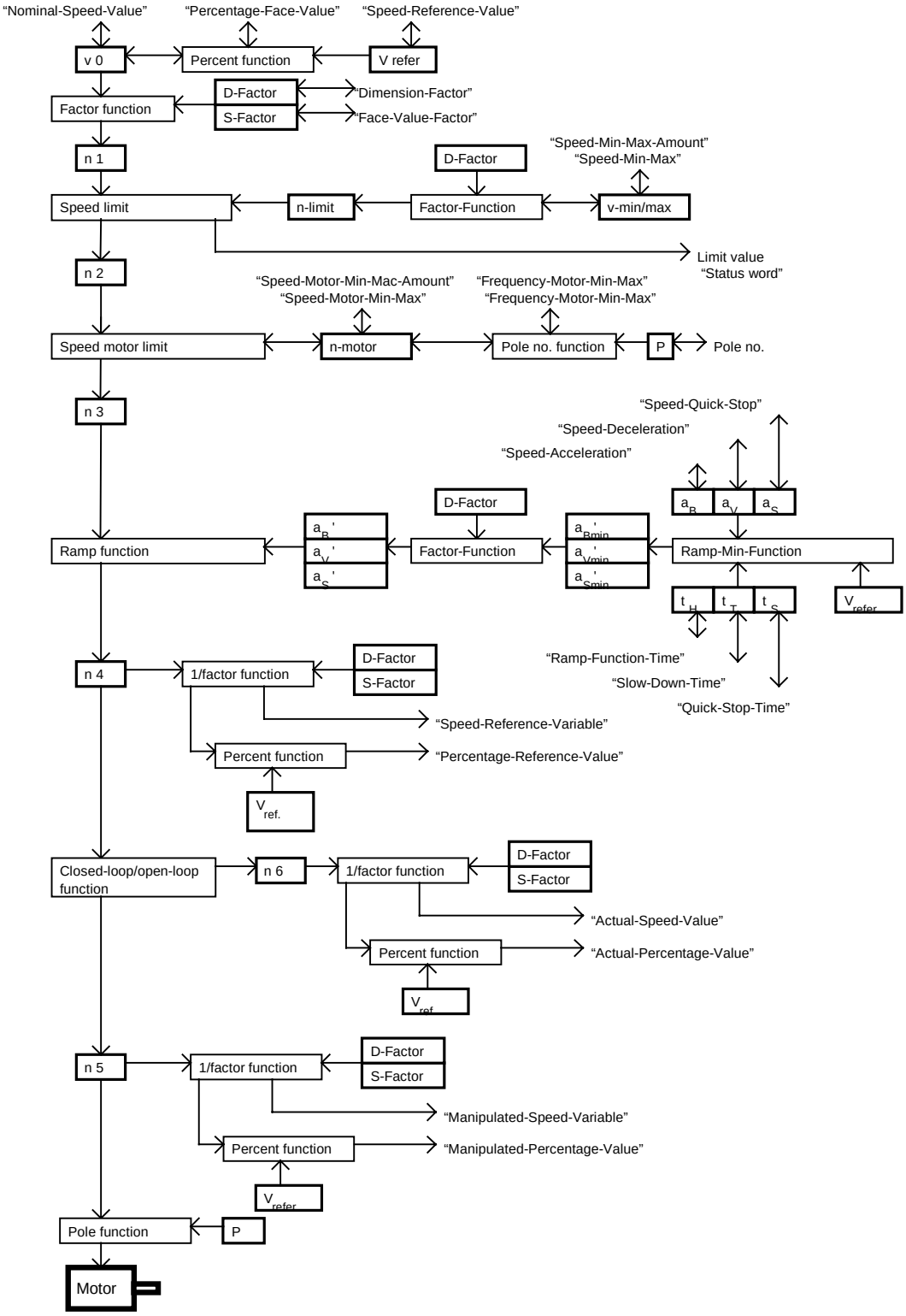


Figure 2: Structure of the speed function 1 when using all mandatory and optional objects

Nominal-Speed-Value

The "Nominal-Speed-Value" is the specified speed of the system. It is multiplied by the "Dimension-Factor" and the "Setpoint-Factor", if these are implemented. The "Nominal-Speed-Value" is converted to the unit [rpm] by multiplying the "Nominal-Speed-Value" by the "Dimension-Factor". The unit of the "Nominal-Speed-Value" is interpreted as [rpm] if the "Dimension-Factor" is not implemented or has the value 1. The value ranges from -32768 to 32767 (integer 16). The parameter can be read and written.

Attribute	**Value**
Index, Name	6042, Nominal-Speed-Value
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	PO data
Unit	Speed Units G1a
Value range	i16
Mandatory range	i16
Default value	0
Substitute value	-

"Reference-Speed-Variable"

The "Reference-Speed-Variable" is the speed provided by the ramp function, scaled to the unit of the "Nominal-Speed-Value". The value ranges from -32768 to 32767 (integer 16). The parameter can only be read.

Attribute	**Value**
Index, Name	6043, Reference-Speed-Variable
Object class	Dependent on mode of operation
Access	Read only
Process data mapping	Manufacturer-specific
Unit	Speed Units G1a
Value range	i16
Mandatory range	i16
Default value	-
Substitute value	-

"Actual-Speed-Value"

The "Actual-Speed-Value" is the speed on the motor spindle or load, scaled to the unit of the "Nominal-Speed-Value". Depending on the system, speed deviations may occur between the "Actual-Speed-Value" and the physical speed. The value ranges from -32768 to 32767 (integer 16). The parameter is read-only.

Attribute	**Value**
Index, Name	6044, Actual-Speed-Value
Object class	Dependent on mode of operation
Access	Read only
Process data mapping	PI-Data
Unit	Speed Units G1a
Value range	i16
Mandatory range	i16
Default value	-
Substitute value	-

"Manipulated-Speed-Variable"

The "Manipulated-Speed-Variable" is the speed on the motor's spindle or load with a compensation value, scaled to the unit of the "Nominal-Speed-Value". The compensation value is generated by the controller/ control function. The value ranges from -32768 to 332767 (integer 16). The parameter is read-only.

Attribute	**Value**
Index, Name	6045, Manipulated-Speed-Variable
Object class	Dependent on mode of operation
Access	Read-Only
Process data mapping	Manufacturer-specific
Unit	Speed Units G1a
Value range	i16
Mandatory range	i16
Default value	-
Substitute value	-

"Nominal-Percentage"

The "Nominal-Percentage" is converted by the percent function to a speed value and is mapped to the "Nominal-Speed-Value" object. The "Nominal-Percentage" has no unit. Its value ranges from -32768 to 32767 (integer 16). The value 16383 corresponds to 100 % of the "Speed-Reference-Value". Accordingly, a total range of the manipulated variable amounting to +/- 200 % is possible. The parameter can be written and read.

Attribute	**Value**
Index, Name	6052, Nominal-Percentage
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	% from Speed Reference Value
Value range	i16
Mandatory range	i16
Default value	0
Substitute value	-

"Percentage-Reference-Variable"

The "Percentage-Reference-Variable" is calculated on the basis of the "Reference-Speed-Variable" by means of the percentage function. Accordingly, the "Percentage-Reference-Variable" is within the same value range as the "Nominal-Percentage". The value ranges from -32768 to 32767 (integer 16). The value 16383 corresponds to 100 % of the "Speed-Reference-Value". Accordingly, an indication range of +/-200 % is possible. The parameter is read-only.

Attribute	**Value**
Index, Name	6053, Percentage-Reference-Variable
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	% from Speed Reference Value
Value range	i16
Mandatory range	i16
Default value	-
Substitute value	-

"Actual-Percentage"

The "Actual-Percentage" is calculated on the basis of the "Actual-Speed-Value" by means of the percentage function. In this way, the "Actual-Percentage" is shown in the same value range as the "Nominal-Percentage". The value ranges from -32768 to 32767 (integer 16). The value 16383 corresponds to 100 % of the "Speed-Reference-Value". Therefore, an indication range of +/-200 % is possible. The parameter is read-only.

Attribute	**Value**
Index, Name	6054, Actual-Percentage
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	% from Speed Reference Value
Value range	i16
Mandatory range	i16
Default value	-
Substitute value	-

"Percentage-Manipulated-Variable"

The "Percentage-Manipulated-Variable" is calculated on the basis of the "Manipulated-Speed-Variable". In this way, the "Percentage-Manipulated-Variable" is shown in the same value range as the "Nominal-Percentage". The value ranges from -32768 to 32767 (integer 16). The value 16383 corresponds to 100 % of the "Speed-Reference-Value". Therefore, an indication range of +/-200 % is possible. The parameter is read-only.

Attribute	**Value**
Index, Name	6055, Percentage-Manipulated-Variable
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	% from Speed Reference Value
Value range	i16
Mandatory range	i16
Default value	-
Substitute value	-

Mapping of the device function to communication

Object description: "Nominal-Speed-Value"

Object attribute	Value	Meaning
Index	6042	Nominal-Speed-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Reference-Speed-Variable"

Object attribute	Value	Meaning
Index	6043	Reference-Speed-Variable
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Actual-Speed-Value"

Object attribute	Value	Meaning
Index	6044	Actual-Speed-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Manipulated-Speed-Variable"

Object attribute	Value	Meaning
Index	6045	Manipulated-Speed-Variable
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Nominal-Percentage"

Object attribute	Value	Meaning
Index	6052	Nominal-Percentage
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Percentage-Reference-Variable"

Object attribute	Value	Meaning
Index	6053	Percentage-Reference-Variable
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Actual-Percentage"

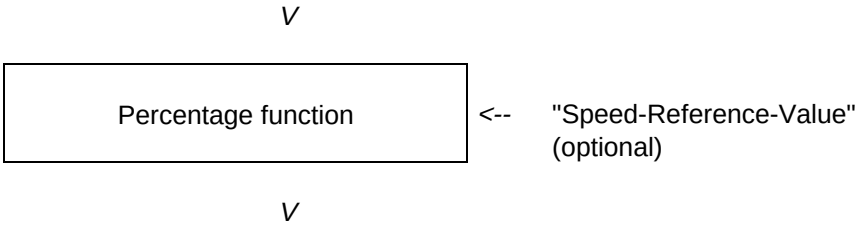
Object attribute	Value	Meaning
Index	6054	Actual-Percentage
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Percentage-Manipulated-Variable"

Object attribute	Value	Meaning
Index	6055	Percentage-Manipulated-Variable
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.1.2 Percentage Function

The percentage function serves to convert percentages to speed values and vice versa.



"Speed-Reference-Value" ($v_{Reference}$)

This parameter serves to represent "Speed-Values" (setpoints, actual values and ramps) as relative values. If the "Speed-Reference-Value" is modified, the ramps' slopes are changed relative to the change in the "Speed-Reference-Value".

This parameter has the same unit as the "Nominal-Speed-Value" and the following value range: 0 .... 4 294 967 295 (unsigned 32).

Attribute	Value
Index, Name	604E, Speed-Reference-Value
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G1b
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

Mapping of the device function to communication

Object description: "Speed-Reference-Value"

Object attribute	Value	Meaning
Index	604E	Speed-Reference-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Converting percentages to speed values

$$\text{Speed value} = \frac{\text{Percentage} * \text{"Speed-Reference-Value"}}{100\ \%}$$

Converting speed values to percentages

$$\text{Percentage} = \frac{\text{Speed value} * 100\ \%}{\text{"Speed-Reference-Value"}}$$

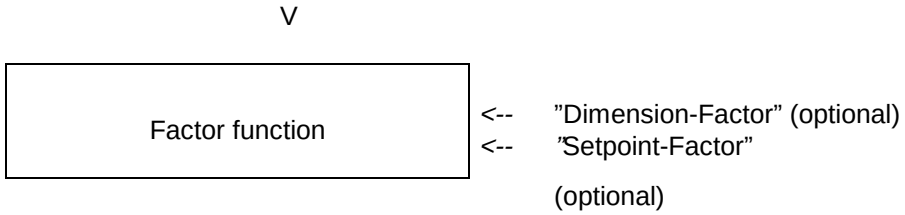
4.2.1.3 Factor Function and 1/Factor Function

The factor function multiplies the input variables by the assigned factors.

- The "Nominal-Speed-Value" is multiplied by the "Dimension-Factor" and the "Setpoint-Factor".

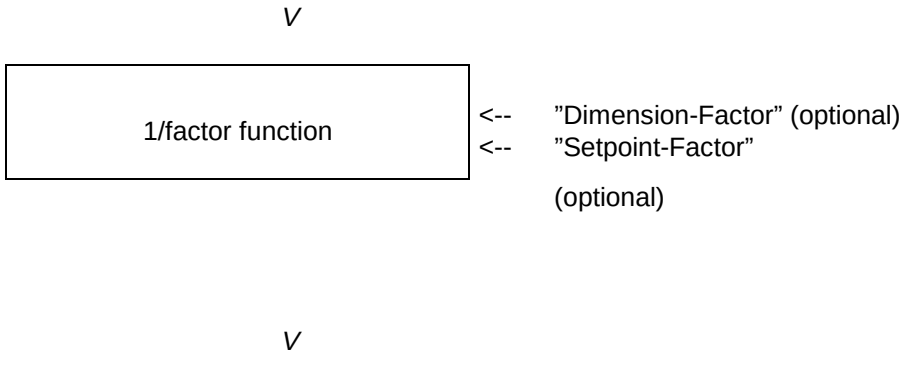
- The values of the speed limit and the values for the ramp function are multiplied by the "Dimension-Factor".

A factor has a value of 1 if it is not implemented.



The 1/factor function divides the input variables by the assigned factors.

- The output variables of the "Speed-Function" are calculated by division with the "Dimension-Factor" and the "Setpoint-Factor" and therefore returned to the scaling of the specified setpoint.



"Dimension-Factor"

The "Dimension-Factor" is generated by division using a "Numerator" parameter and a "Denominator" subparameter. These parameters have a value ranging from -2 147 483 648 to 2 147 483 647 (integer 32), but except the value 0!

The "Dimension-Factor" serves to include gearing in calculation or serves to scale to frequencies or specific units of the user. It influences the specified setpoint, the speed limit and the ramp function as well as the output variables of the speed function.

Attribute	Value
Index, Name	604C, Dimension-Factor
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Setpoint-Factor"

The "Setpoint-Factor" is generated by division, using a "Numerator" parameter and a "Denominator" parameter. These parameters have no unit and have values within a range from -32768 to 32767 (integer 16), but excluding the value 0!

The "Setpoint-Factor" serves to modify the resolution or directing range of the specified setpoint. It is included in calculation of the specified setpoint and the output variables of the speed function only.

Attribute	Value
Index, Name	604B, Setpoint-Factor
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

Calculating the "Dimension-Factor"

Every user's specific speed consists of a specific unit referred to a specific unit of time (e.g. 1/sec, bottles/min, m/sec, ...).

The purpose of the dimension factor is to convert this specific unit to the "revolutions/minute" unit.

Specific unit * DF = 1 revolution (motor shaft)

$$I * DF = O$$

I = "Nominal-Speed-Value" expressed as the user's specific speed = Input value of the factor function

Unit of I: [I] = Specific unit

O = Speed value in [rpm] = Output value of the factor function

$$\text{Unit of O: } [O] = \frac{1}{\text{min}} = \frac{\text{Revolution}}{\text{min}}$$

DF = Dimension factor

$$\text{Unit of DF: } [DF] = \frac{1}{\text{Specific unit}} * \frac{1}{\text{min}}$$

Refer to the appendix for examples.

Mapping of the device function to communication

Object description: 'Dimension-Factor'

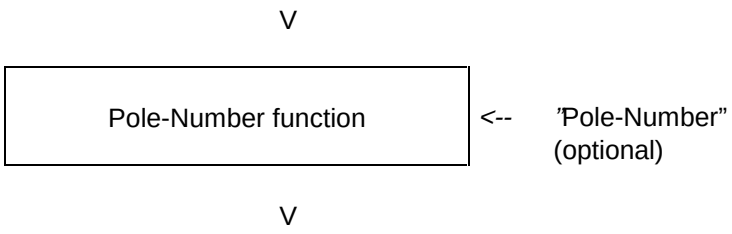
Object attribute	**Value**	**Meaning**
Index	604C	Dimension-Factor
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Setpoint-Factor”

Object attribute	Value	Meaning
Index	604B	Setpoint-Factor
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.1.4 Pole Number Function

The pole number function serves to convert frequency values to speed values and vice versa.



"Pole-Number"

The user must describe the "Pole-Number" parameter with a value corresponding to the number of poles belonging to the connector motor. This parameter has no unit. The value range depends on the manufacturer-specific need and is represented as unsigned 8.

Attribute	Value
Index, Name	604D, Pole-Number
Object class	dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	u8
Mandatory range	-
Default value	-
Substitute value	-

Converting speed values to frequency values

$$\text{Frequency} = \frac{\text{Speed} * \text{Pole number}}{60 * 2}$$

Converting frequency values to speed values

$$\text{Speed} = \frac{\text{Frequency} * 60 * 2}{\text{Pole number}}$$

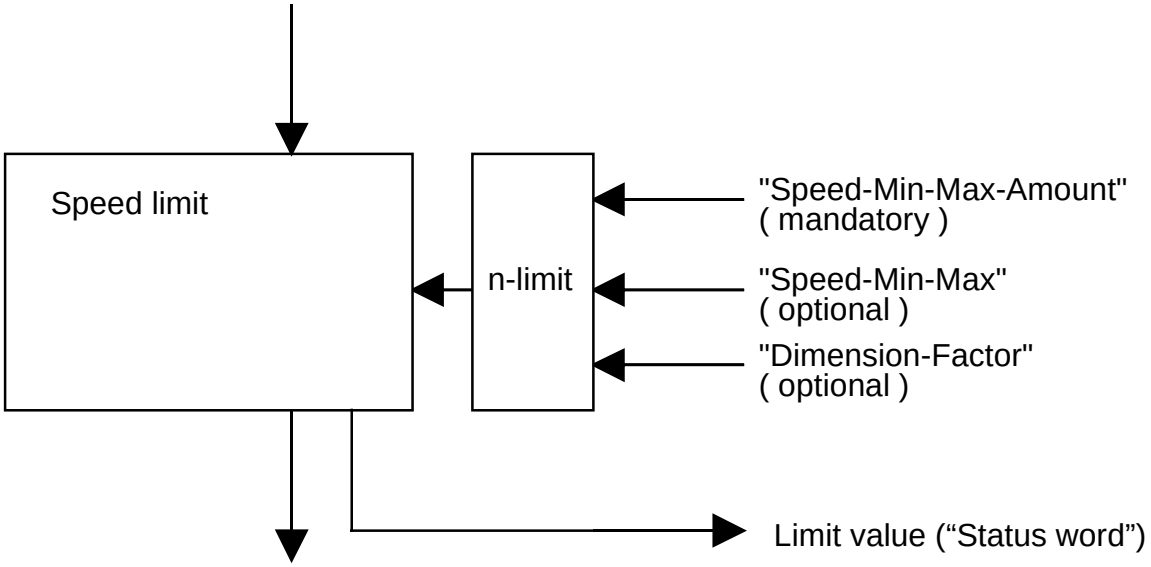
Mapping of the device function to communication

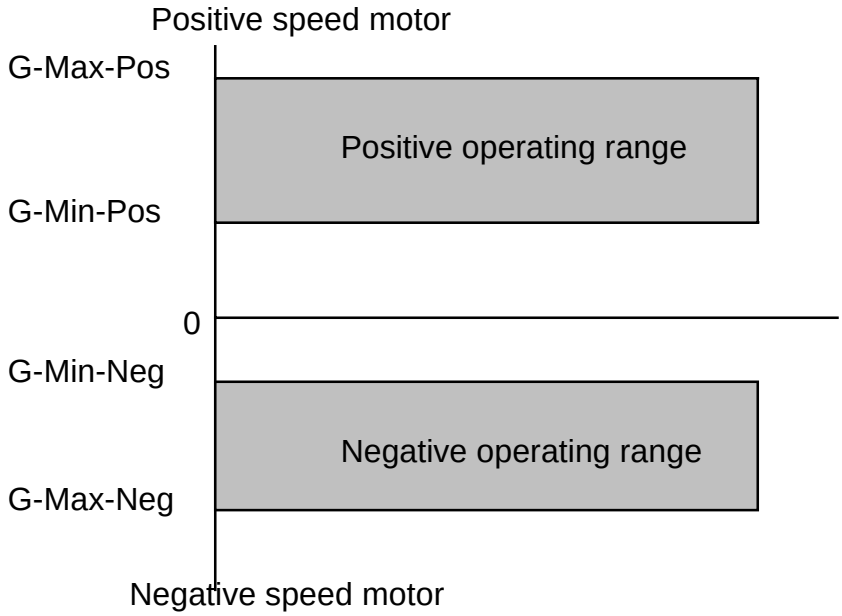
Object description: ”Pole-Number”

Object attribute	**Value**	**Meaning**
Index	604D	Pole-Number
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	5	Unsigned8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.1.5 Speed Limit

The speed limit limits the drive's speed range. Limits can be specified in the user's specific scale by including the "Dimension-Factor" in the speed limit.





"Speed-Min-Max-Amount"

The "Speed-Min-Max-Amount" parameter is composed of the "Speed-Min-Amount" and "Speed-Max-Amount" subparameters. These subparameters have no unit and have values within a range from 0 to 4 294 967 295 (unsigned 32):

The "Speed-Max-Amount" subparameter is mapped internally to the "Speed-Max-Pos" and "Speed-Max-Neg" values. The "Speed-Min-Amount" subparameter is mapped internally to the "Speed-Min-Pos" and "Speed-Min-Neg" values.

Only the "Pos-values" are returned if the "Speed-Min-Max-Amount" parameter is read out.

Attribute	**Value**
Index, Name	6046, Speed-Min-Max-Amount
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Speed-Min-Max"

The "Speed-Min-Max" parameter is composed of the "Speed-Min-Pos", "Speed-Max-Pos", "Speed-Min-Neg" and "Speed-Max-Neg" subparameters. These subparameters have no unit and have values within a range from 0 to 4 294 967 295 (unsigned 32).

The subparameters are mapped internally to the corresponding values.

Attribute	**Value**
Index, Name	6047, Speed-Min-Max
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Limit-Value"

The "Limit-Value" message is generated if the input value of the speed limit results in a value outside the speed limit's operating range. The "Limit-Value" message is mapped in the status word.

Mapping of the device function to communication

Object description: "Speed-Min-Max-Amount"

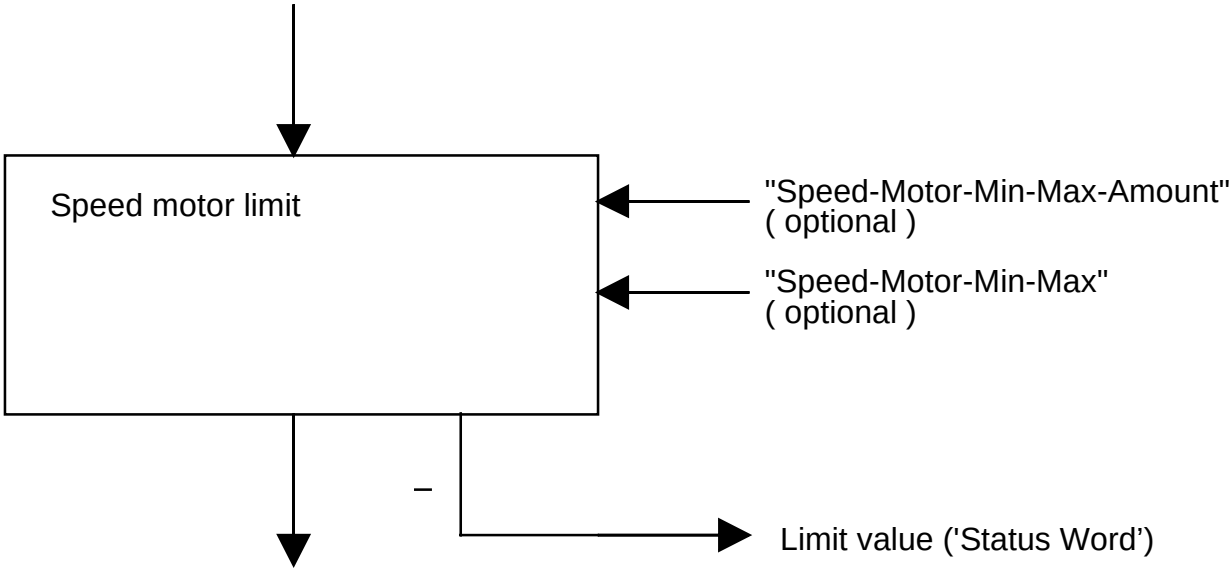
Object attribute	**Value**	**Meaning**
Index	6046	Speed-Min-Max-Amount
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Speed-Min-Max”

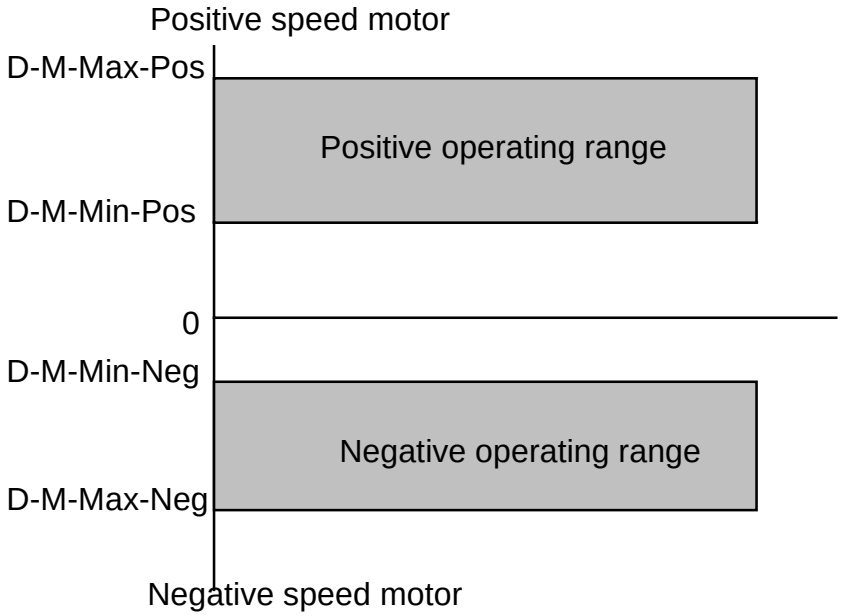
Object attribute	Value	Meaning
Index	6047	Speed-Min-Max
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	4	4 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.1.6 Speed Motor Limit

The frequency parameters of the "Frequency-Motor-Min-Max-Amount" and "Frequency-Motor-Min-Max" objects are mapped internally to the parameters of the corresponding speed objects.



The "Speed-Motor-Limit" limits the motor's speed range. This parameter has a safety function that ensures that the set motor speed range cannot be exceeded inadvertently by a factor modification.


Positive speed motor
D-M-Max-Pos
Positive operating range
D-M-Min-Pos
0
D-M-Min-Neg
Negative operating range
D-M-Max-Neg
Negative speed motor

"Speed-Motor-Min-Max-Amount"

The "Speed-Motor-Min-Max-Amount" parameter is composed of the "Speed-Motor-Min-Amount" and "Speed-Motor-Max-Amount" parameters. These subparameters have the unit [1/(1000 min)] and values within a range from 0 to 4 294 967 295 [1/(1000 min)] (unsigned 32). This results in a limiting range from 0 ... 4 294 967 [rpm].

The "Speed-Motor-Max-Amount" subparameter is mapped internally to the "Speed-Motor-Max-Pos" and "Speed-Motor-Max-Neg" values. The "Speed-Motor-Min-Amount" subparameter is mapped internally to the "Speed-Motor-Min-Pos" and "Speed-Motor-Min-Neg" values.

Only the "Pos-Values" are returned if the "Speed-Motor-Min-Max-Amount" parameter is read out.
.

Attribute	**Value**
Index, Name	6056, Speed-Motor-Min-Max-Amount
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

Mapping of the device function to communication

Object description: ”Speed-Motor-Min-Max-Amount”

Object attribute	**Value**	**Meaning**
Index	6056	Speed-Motor-Min-Max-Amount
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

"Speed-Motor-Min-Max"

The "Speed-Motor-Min-Max" parameter is composed of the "Speed-Motor-Min-Pos", "Speed-Motor-Max-Pos", "Speed-Motor-Min-Neg" and "Speed-Motor-Max-Neg" subparameters. These subparameters have the unit [1/1000 min)] and values within a range from 0 ... 4 294 967 295 [1/(1000 min)] (unsigned 32). This results in a limiting range from 0 .. 4 294 967 [rpm].

The subparameters are mapped internally to the corresponding values.

Attribute	Value
Index, Name	6057, Speed-Motor-Min-Max
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Limit-Value"

The "Limit-Value" message is generated if the input value of the "Speed-Motor-Limit" results in a value outside of the operating range of the "Speed-Motor-Limit". The "Limit-Value" message is mapped in the status word.

Mapping of the device function to communication

Object description: ”Speed-Motor-Min-Max”

Object attribute	Value	Meaning
Index	6057	Speed-Motor-Min-Max
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	4	4 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Frequency-Motor-Min-Max-Amount”

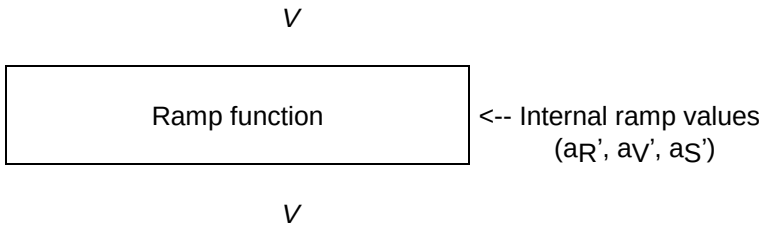
Object attribute	Value	Meaning
Index	6058	Frequency-Motor-Min-Max-Amount
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Mapping of the device function to communication

Object description: ”Frequency-Motor-Min-Max”’

Object attribute	Value	Meaning
Index	6059	Frequency-Motor-Min-Max
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	4	4 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.1.7 Ramp Function



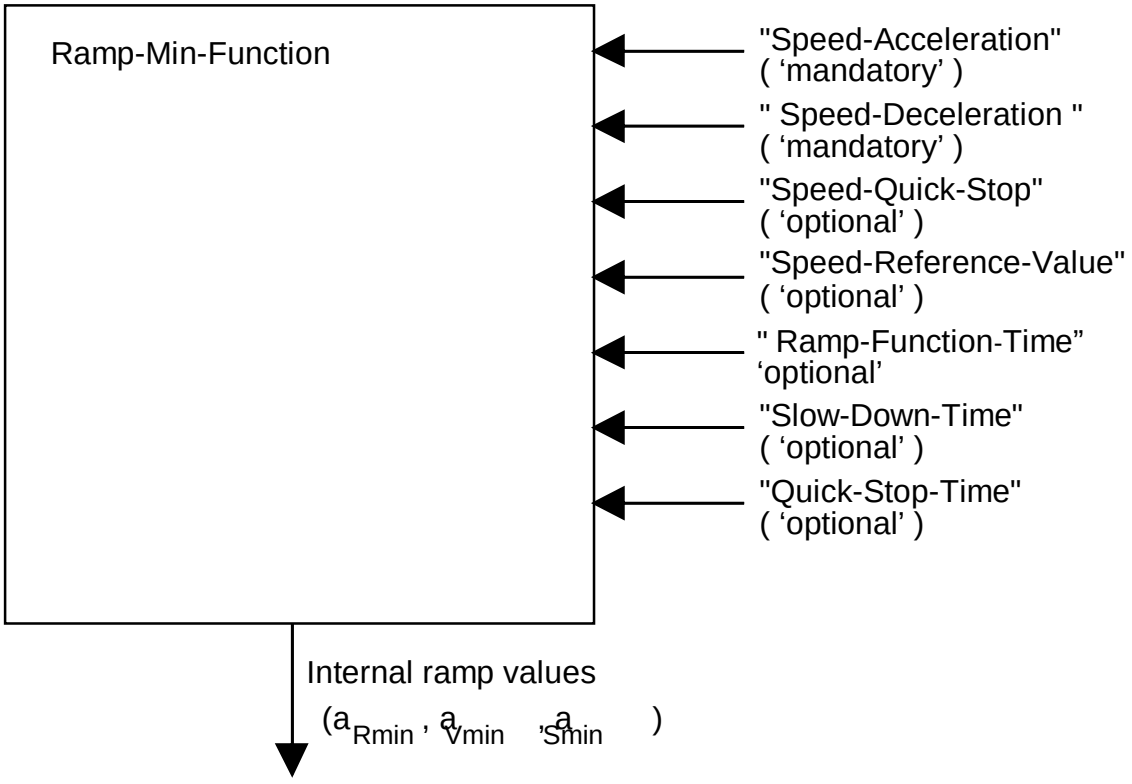
Implementation of the speed function as shown in Figure 1 (Chapter 4.2.1.4.1)

The internal ramp values a_B' and a_V' directly consist of the "Speed-Acceleration" and "Speed-Deceleration" parameters.

Implementation of the speed function as shown in Figure 2 (Chapter 4.2.1.4.1)

The internal ramp values a_B', a_V'and a_S' are the output values of the ramp-min-function, weighted with the dimension factor.

Ramp-Min-Function



The internal ramp values (a_{Bmin}, a_{Vmin}, a_{Smin}) are recalculated as follows if one of the input parameters for the ramp function is modified.

$$a_R min = MIN = a_R, \frac{\text{'Speed-Reference-Value'}}{\text{'Ramp function time'}}$$

$$a_V min = MIN\ a_V, \frac{\text{'Speed-Reference-Value'}}{\text{'Slow-Down-Time'}}$$

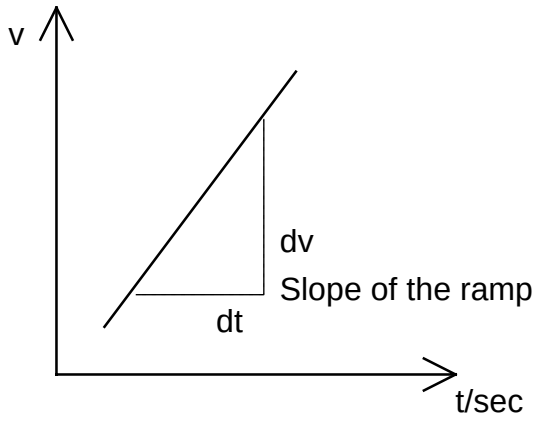
$$a_S min = MIN\ a_S, \frac{\text{'Speed -Reference-Value'}}{\text{'Quick-Stop-Time'}}$$

The ramp-min-function selects the lower respective value of the slopes.

"Speed-Acceleration" (a_B)

The "Speed-Acceleration" parameter specifies the slope of the acceleration ramp. It is generated as the quotient of the "Delta-Speed" and "Delta-time" subparameters.

"Speed Acceleration" $(a_B) = \frac{\text{Delta speed}}{\text{Delta time}}$



Delta speed

The speed has the same unit as the "Nominal-Speed-Value". This subparameter has the following value range: 0 ... 4 294 967 295 (unsigned 32).

Delta time

This subparameter is specified in sec and has the following value range: 0 ... 65 535 [sec] (unsigned 16).

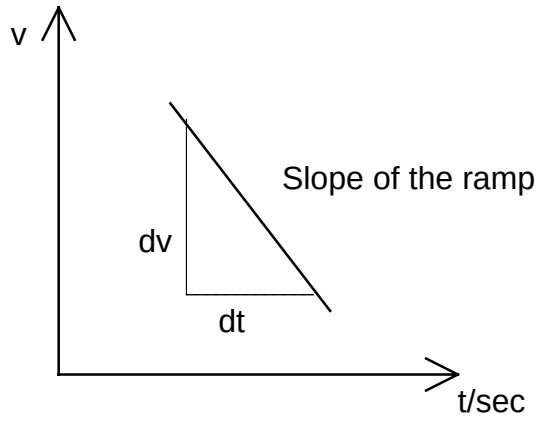
This function directly follows the setpoint if the parameter 0 is defined for the "Delta-Time" value.

Attribute	**Value**
Index, Name	6048, Speed-Acceleration
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Speed-Deceleration" (a_V)

The "Speed-Deceleration" parameter specifies the slope of the deceleration ramp. It is generated as the quotient of the "Delta-Speed" and "Delta-Time" subparameters.

$$\text{"Speed Deceleration"}\ (A_V) = \frac{\text{Delta speed}}{\text{Delta time}}$$



Delta speed

The speed has the same unit as the "Nominal-Speed-Value". This subparameter has the following value range: 0 ... 4 294 967 295 (unsigned 32).

Delta time

This subparameter is specified in sec and has the following value range: 0 ... 65 535 [sec] (unsigned 16).

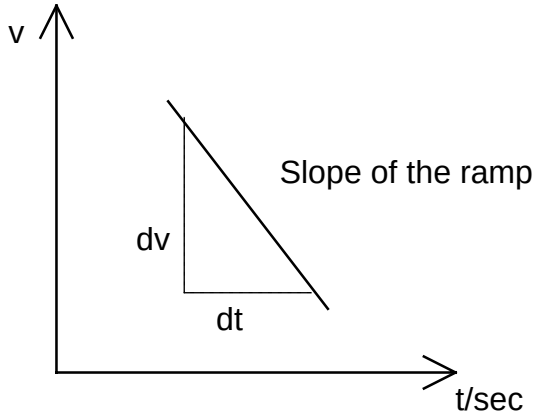
This function directly follows the setpoint if the parameter 0 is defined for the "Delta-Time" value.
.

Attribute	**Value**
Index, Name	6049, Speed Deceleration
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Speed-Quick-Stop" (a_S)

The "Speed-Quick-Stop" parameter specifies the slope of the quick stop ramp. It is generated as the quotient of the "Delta-Speed" and "Delta-Time" subparameters.

$$\text{"Speed-Quick-Stop"}\ (A_S) = \frac{\text{Delta speed}}{\text{Delta time}}$$



Delta speed

The speed has the same unit as the "Nominal-Speed-Value". This subparameter has the following value range: 0 ... 4 294 967 295 (unsigned 32).

Delta time

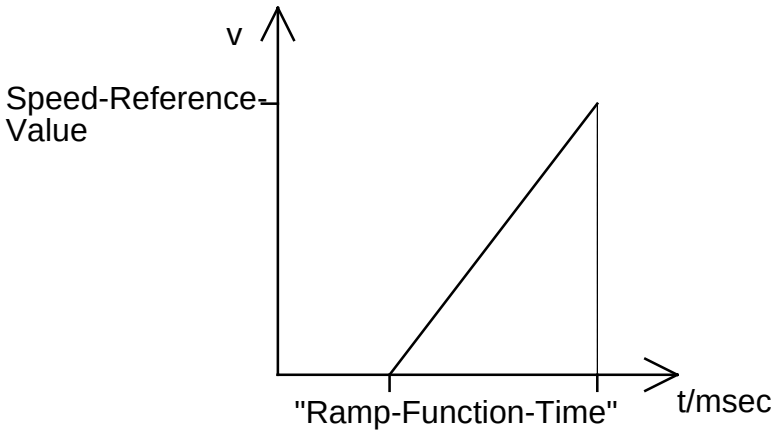
This subparameter is specified in sec and has the following value range: 0 ... 65 535 [sec] (unsigned 16).

This function directly follows the setpoint if the parameter 0 is defined for the "Delta-Time" value.

Attribute	**Value**
Index, Name	604A, Speed-Quick-Stop
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

"Ramp-Function-Time" (t_H)

The "Ramp-Function-Time" specifies the time during which the drive starts up from zero to the "Speed-Reference-Value".
.



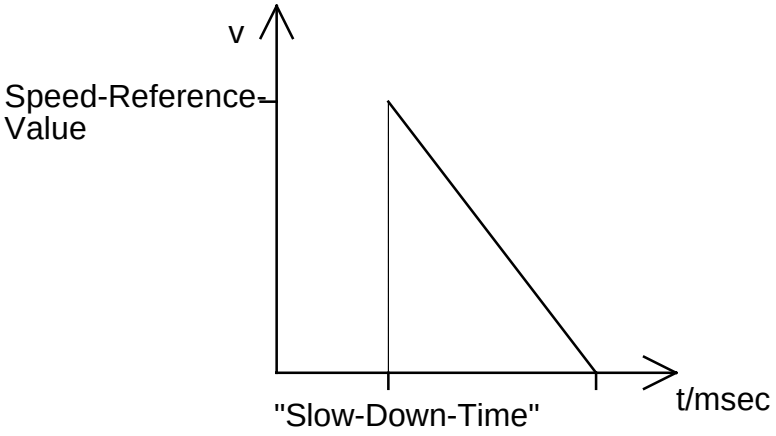
This parameter is specified in ms and has the following value range: 0 ... 4 294 967 295 [msec] (unsigned 32).

By setting the parameter 0 for the "Ramp-Function-Time", the ramp becomes infinite and the reference variable directly follows the setpoint.

Attribute	**Value**
Index, Name	604F, Ramp-Function-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

"Slow-Down-Time" (t_T)

The "Slow-Down-Time" specifies the time during which the drive slows down from the "Speed-Reference-Value" to zero.
.



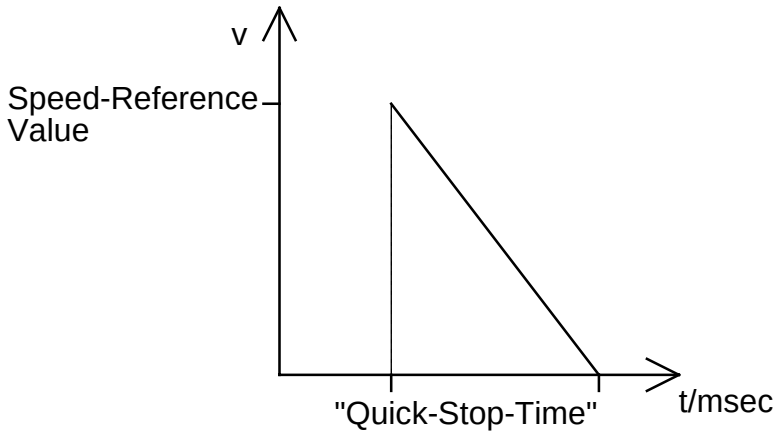
This parameter is specified in ms and has the following value range: 0 ... 4 294 967 295 [msec] (unsigned 32).

By defining the parameter 0 for the "Slow-Down-Time", the ramp becomes infinite and the reference variable directly follows the setpoint.

Attribute	**Value**
Index, Name	6050, Slow-Down-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

"Quick-Stop-Time" (t_S)

The "Quick-Stop-Time" specifies the time during which the drive slows down from the "Speed-Reference-Value" to zero in the QUICK STOP ACTIVE state.



This parameter is specified in ms and has the following value range: 0 ... 4 294 967 295 [msec] (unsigned 32).

By defining the parameter 0 for the "Quick-Stop-Time", the ramp becomes infinite and the reference variable directly follows the setpoint.

Attribute	**Value**
Index, Name	6051, Quick-Stop-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

Mapping of the device function to communication

Object description: ”Speed-Acceleration”

Object attribute	**Value**	**Meaning**
Index	6048	Speed-Acceleration
Variable-Name	-	Not available
Object-Code	09	Record
Number of Elements	2	2 Elements
Data-Type-Index	21	Ramp
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Speed-Deceleration”

Object attribute	Value	Meaning
Index	6049	Speed-Deceleration
Variable-Name	-	Not available
Object-Code	09	Record
Number of Elements	2	2 Elements
Data-Type-Index	21	Ramp
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Speed-Quick-Stop”

Object attribute	Value	Meaning
Index	604A	Speed-Quick-Stop
Variable-Name	-	Not available
Object-Code	09	Record
Number of Elements	2	2 Elements
Data-Type-Index	21	Ramp
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Ramp-Function-Time”

Object attribute	Value	Meaning
Index	604F	Ramp-Function-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Slow-Down-Time”

Object attribute	Value	Meaning
Index	6050	Slow-Down-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: ”Quick-Stop-Time”

Object attribute	Value	Meaning
Index	6051	Quick-Stop-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.1.8 Closed-Loop/Open-Loop Control Function

On the basis of the "Speed-Reference-Variable", the controller/ control function returns the "Actual-Speed-Value" and the "Manipulated-Speed-Variable".

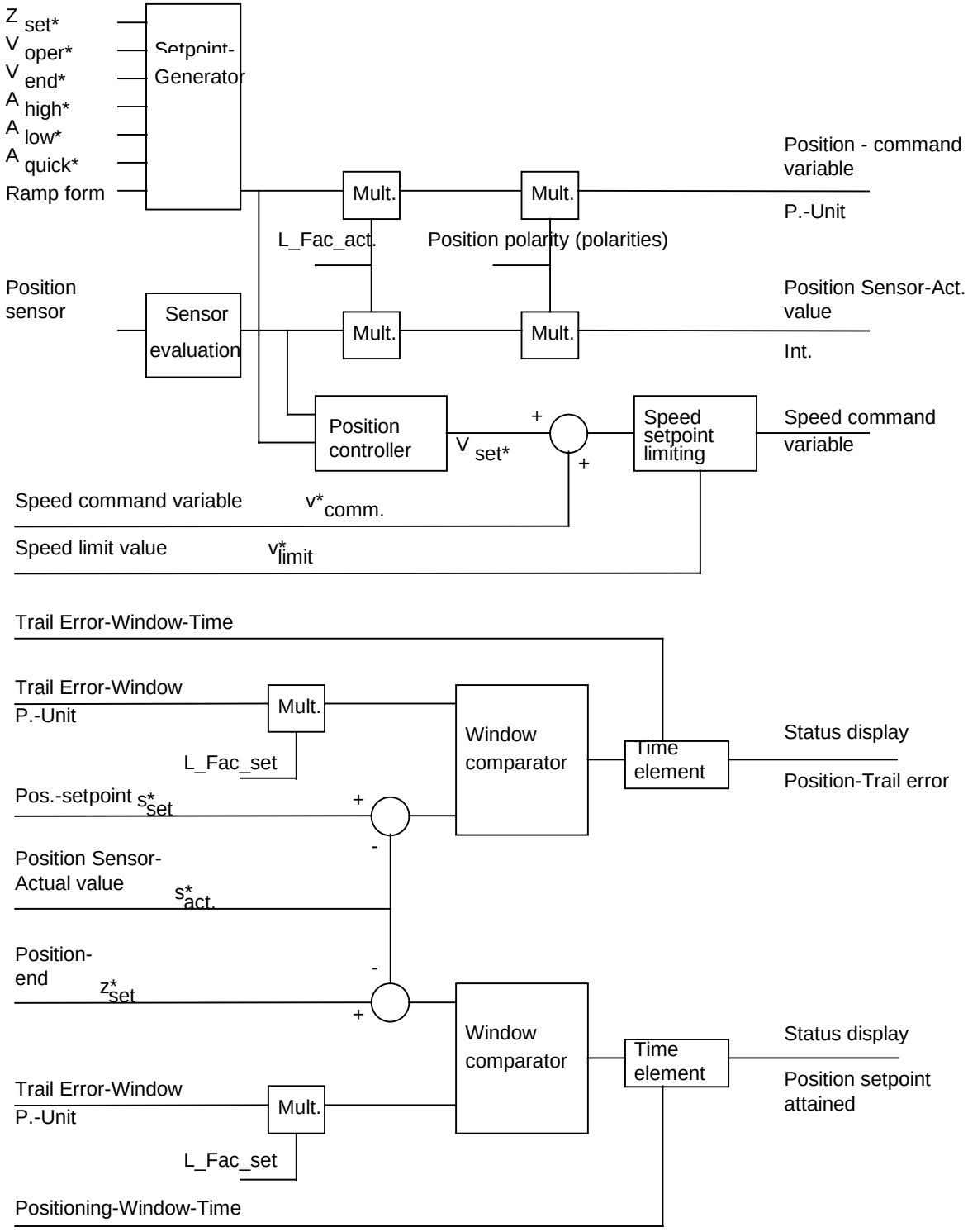
Depending on realisation of the function, the "Actual-Speed-Value" is the "Speed-Reference-Variable" or a calculated or measured "Actual-Speed-Value":

Depending on realisation of the function, the "Manipulated-Speed-Variable" is the "Speed-Reference-Variable" or a calculated "Speed-Output".

4.2.2 Position-Function Group

Profile number : 22
Function group : 06
Function version : 00

4.2.2.1 Structure of the Function Group



This function group contains descriptions of the parameters required for position control.

Several subfunctions are contained in the function group:

- position setpoint value from the setpoint generator;
- calculation of actual value for position;
- position control;
- monitoring (trail error, positioning window).

The end position is set by the user either in sensor increments or user units.

These values are then checked against the limit values (see parameters - ”Position-Min-Max-Limit-Values in the setpoint generator function group) and limited if necessary.

If the ”end position” is given in user units, this is converted into sensor increments by means of a factor (position factor-setpoint: L_fac_set; see factor function group).

The setpoint generator calculates, using the ”end position” ”speed” ”acceleration” and ”deceleration” parameters, a new position setpoint (S_{set}^*) at each scan point.

The actual value for position is given to the user in both sensor increments (”position sensor-actual value”) and in user units (”position actual value”).

The position controller calculates a speed correction variable (V_{corr}^*) as the command variable for the speed controller.

The monitoring functions act directly on the ”status word” parameter, so that the user can tell immediately when the end position has been reached or when a trail error has occurred.

4.2.2.2 Description of Parameters

The following parameters are not described here but in the setpoint generator function group section:

- 'end position';
- 'speed';
- 'end speed';
- 'acceleration';
- 'deceleration';
- 'quick stop';
- 'ramp form speed'.

The following parameters are described in the factor function group section:

- 'L_Fac_set';
- 'L_Fac_act.'.

'Position-Command-Variable'

This parameter describes the output variable of the setpoint generator and thereby the input variable of the position controller in user units.

Attribute	**Value**
Index, Name	6062, Position-Command-Variable
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Postion sensor units
Value range	i32
Mandatory range	-
Default value	-
Substitute value	-

”Position-Sensor-Actual-Value”

The ”Position-Sensor-Actual-Value” is an input variable of the position controller. The unit is increments.

Attribute	**Value**
Index, Name	6063, Position-Sensor-Actual-Value
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Position sensor increments
Value range	i32
Mandatory range	-
Default value	-
Substitute value	-

’Position-Actual-Value’

The 'Position-Actual-Value' is the current position of the drive and is returned in the same unit as that in which the end position was prescribed.

Attribute	**Value**
Index, Name	6064, Position-Actual-Value
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Position sensor units
Value range	i32
Mandatory range	-
Default value	-
Substitute value	-

’Trail-Error-Window’

The 'Trail-Error-Window' is located on the currently specified position setpoint (S_{set}^*). If the current position sensor-actual value (S_{actual}^*) lies outside this window, a trail error occurs. This trail error can occur, amongst other things, when:

- the motor is blocked;
- the setpoint cannot be attained;
- the controller coefficients have been set wrongly.

When 'Trail-Error-Window' = 2^{32}-1 the trail error monitoring function is switched off.

Attribute	**Value**
Index, Name	6065, Trail-Error-Window
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Position sensor units
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

'Trail-Error-Window-Time'

If a trail error occurs, the corresponding bit is input in the status word if the trail error is pending for a longer time than that set in the 'Trail-Error-Window-Time' parameter. The reaction of the drive controller to a trail error is manufacturer-specific.

Attribute	**Value**
Index, Name	6066, Trail-Error-Window-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u16
Mandatory range	-
Default value	-
Substitute value	0

'Positioning-Window'

The 'Positioning-Window' is located on the end position. In the 'Position-actual value' is within this window, then the bit "position attained" is input in the status word.

When 'Positioning-Window' = 2^{32}-1 the positioning window monitoring function is switched off.

Attribute	**Value**
Index, Name	6067, Positioning Window
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Position sensor units
Value range	u32
Mandatory range	-
Default value	-
Substitute value	0

'Positioning-Window-Time'

The 'Positioning-Window-Time' parameter prevents the "position attained" bit from being input when the positioning window is briefly covered. The drive must dwell in the window for a certain time before the bit is input.

Attribute	**Value**
Index, Name	6068, Positioning-Window-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u16
Mandatory range	-
Default value	-
Substitute value	0

4.2.2.3 Mapping of the Device Function to Communication

Object description: 'Position-Command-Variable'

Object attribute	Value	Meaning
Index	6062	Position-Command-Variable
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Position-Sensor-Actual-Value'

Object attribute	Value	Meaning
Index	6063	Position-Sensor-Actual-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Position-Actual-Value'

Object attribute	Value	Meaning
Index	6064	Position-actual-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Trail-Error-Window'

Object attribute	Value	Meaning
Index	6065	Trail-Error-Window
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Trail-Error-Window-Time'

Object attribute	Value	Meaning
Index	6066	Trail-Error-Window-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Positioning-Window'

Object attribute	Value	Meaning
Index	6067	Positioning-Window
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Positioning-Window-Time'

Object attribute	Value	Meaning
Index	6068	Positioning-Window-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.2.4 Setpoint Setting for "End Position Setting" Mode of Operation

In Profile 21 the setpoints (e.g. speed setpoint) are active immediately after transmission via the bus.

For the transmission of end positions for Profile 22, the following possibilities are supported as options:

a) Block setting:

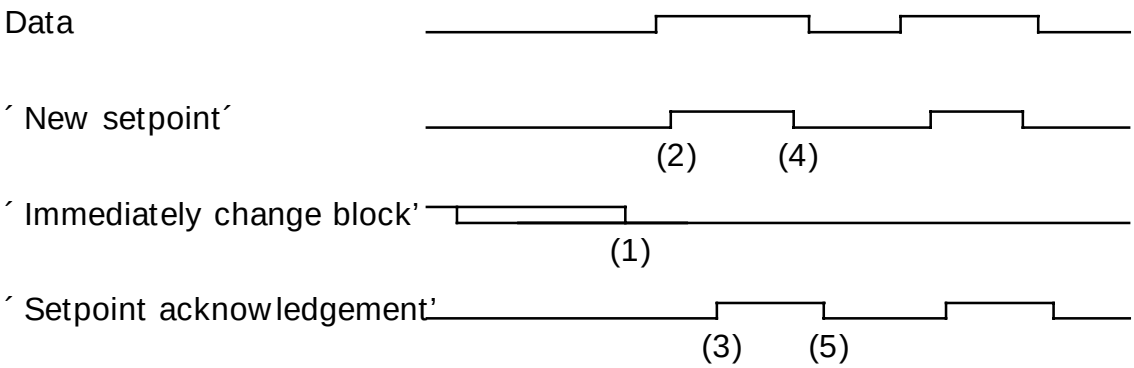
The end position is approached via a speed profile.

b) Setpoint setting:

The new end position is received immediately into the setpoint generator.

Both possibilities are controlled via the "new setpoint" and "immediately change block" bits in the "control word" parameter, and by "setpoint acknowledgement" in the "status word" parameter. These bits generate an acknowledgement operation which allows block preparation via PCP, whilst another is being processed. The response times in the sequential program are thereby reduced considerably. In addition, several setpoints can be transmitted in sequence and then set as simultaneously valid.

a) Block setting



Description of transitions

Transition	Meaning		Condition(s)
1	'Immediately-change-block'	H->L	'Setpoint acknowledgement'= L 'New setpoint'= L
2	'New setpoint'	L->H	'Setpoint acknowledegment'= L transmit (D1) data
3	'Setpoint acknowledgement'	L->H	'New setpoint'= H
4	'New setpoint'	H->L	'Setpoint acknowledgement' = H
5	'Setpoint acknowledgement'	H->L	'New setpoint'=L transmit data (D1) to setpoint generator

Description of actions

(1): Block setting is selected when "immediately change block" = 0. This condition must be attained by (2) at the latest.

The drive controller (server) signals its readiness to receive new setpoints with "setpoint acknowledgement = 0".

(2): After the data has been transmitted, the master signals, to the drive controller, the validity of the data with "new setpoint = 1".

(3): On the basis of "new setpoint = 1" the drive controller takes the data and then sets the "setpoint acknowledgement = 1".

(4): To end the transmission the master inputs the bit 2 "new setpoint" = 0.

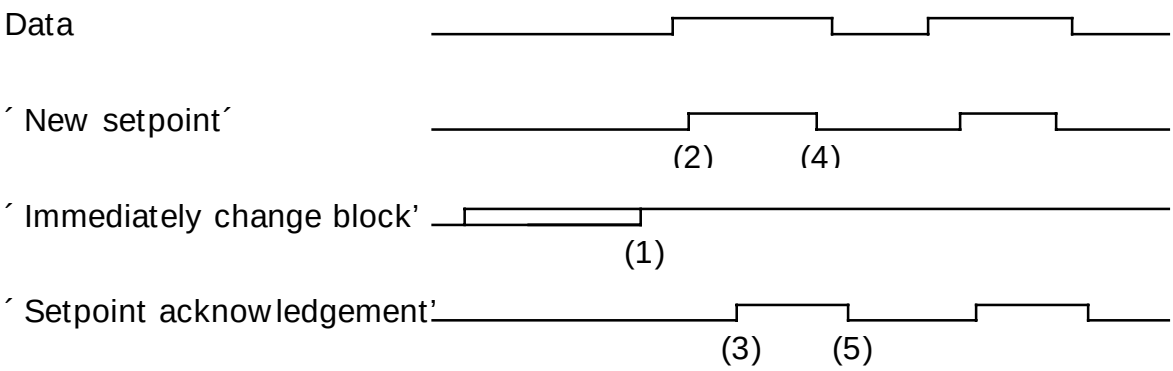
(5): By returning the bit "setpoint acknowledgement" to 0, the drive controller indicates it is ready to receive once again. This returning action is carried out in manufacturer-specific conditions; the earliest it can occur however is during transmission (4).

The control bit "immediately change block" is used in particular for rapid response to exceptional situation, e. g. reaching limit switch or emergency stop.

EXAMPLE 1: Example of implementation for manufacturer specific conditions:

The drive controller transmits the new setpoints to the setpoint generator only when the last block has been fully executed, (see also "setpoint attained" bit in "status word" parameter). Only after this may its input buffer be written to with another block, otherwise data is lost.

b) Setpoint setting



Description of transition

Transition	Meaning		Condition(s)
1	'Immediately-change-block'	H->L	'Setpoint acknowledgement'= L 'New setpoint'= L
2	'New setpoint'	L->H	'Setpoint acknowledegment'= L transmit (D1) data
3	'Setpoint acknowledgement'	L->H	'New setpoint'= H
4	'New setpoint'	H->L	'Setpoint acknowledgement' = H
5	'Setpoint acknowledgement'	H->L	'New setpoint'=L transmit data (D1) to setpoint generator

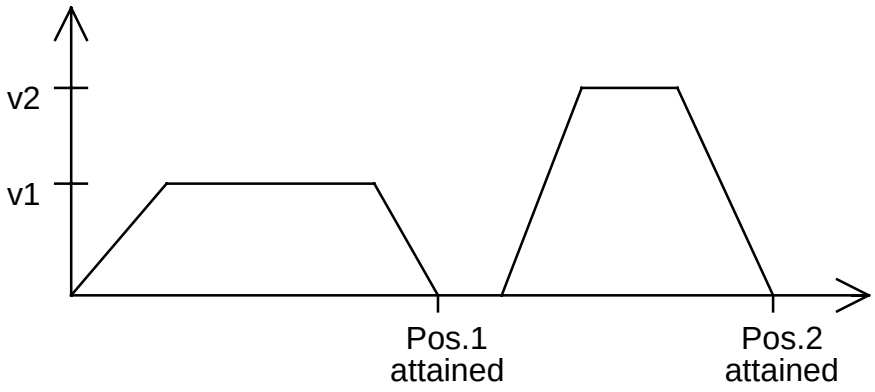
(1): Setpoint setting is selected when "immediately change block" = 1. This condition must be attained by (2) at the latest.

In particular, the condition "new setpoint" = 1 and "immediately change block" = 1 can be pre-set when changing mode of operation. Through this, it is possible to set the setpoints asynchronous to the "control word".

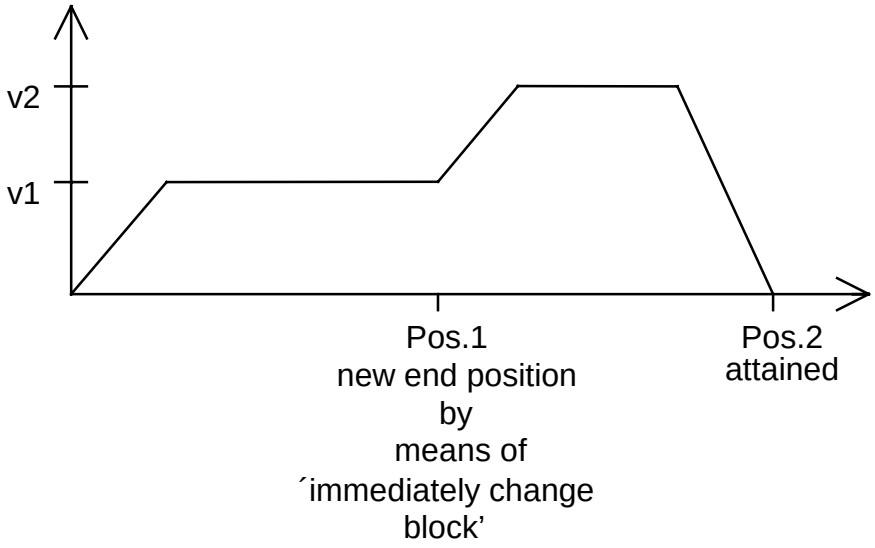
The sequence of actions with the transitions (2), (3), (4) and (5) remains unchanged.

EXAMPLE 2: Two diagrams can clarify the differing effect of the two setpoint settings:

a) Traverse path profile with block operation



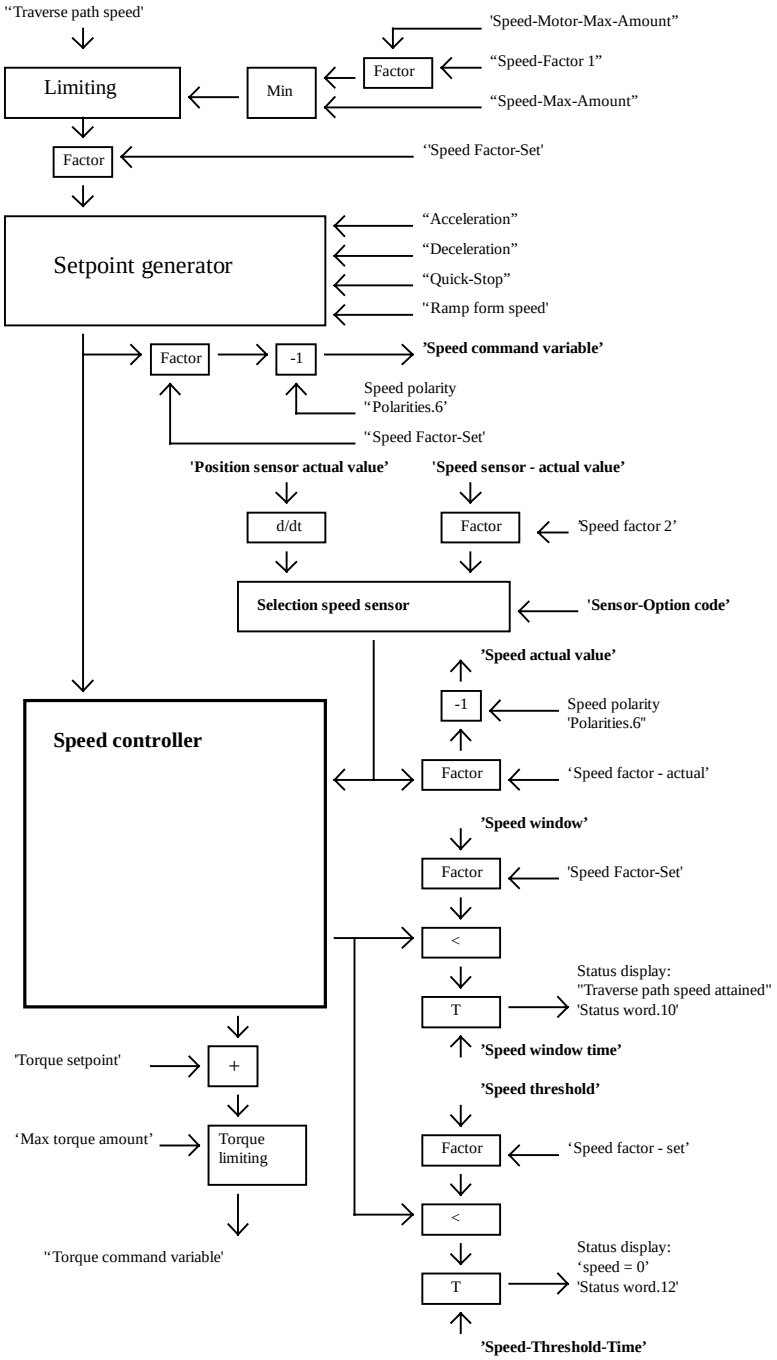
b) Traverse path profile with setpoint operation



4.2.3 Speed Function Group 2

Profile number : 22
Function group : 05
Function version : 00

4.2.3.1 Structure of the Function Group



The speed function group comprises the following sub-functions:

- setpoint setting via setpoint generator;
- speed calculation using position sensor or speed sensor;
- speed control with associated in- and output signals;
- limiting of the torque setpoint;
- monitoring of traverse path speed using window;
- monitoring of speed actual value using threshold.

The method of operation of the setpoint generator and its input parameters

- traverse path speed $V_{traverse}^{*}$;
- acceleration A_{high}^{*};
- deceleration A_{low}^{*};
- quick-stop A_{quick}^{*} and
- ramp form speed

are described in the setpoint generator function group.

For speed calculation, several sensors can be used. In particular it is intended that the same sensor is used for position and speed, as is possible with a resolver or encoder for example. This keeps cost to a minimum and simplifies the system.

Speed control is not dealt with in any detail here; only the format and maximum number of controller coefficients are established.

The speed controller calculates a torque manipulated variable. This is added to a torque pre-control which has been calculated from the setpoint generator. The limited sum is made available to the torque controller as the torque command variable.

Monitoring functions for the current actual speed value make available status information for the higher-level systems.

4.2.3.2 Description of Parameters

The factors required for normalisation

- 'G_Fac_2'
- 'G_Fac_set'
- 'G_Fac_actual'

are all linearly dependent and are therefore described in the Factor-Function group.

Polarities

See Setpoint generator.

'Position-Sensor-Actual-Value'

The position sensor-actual value can if requested, be used (using differentiation) to calculate the rotational speed. It is expressed in position sensor increments, and is described in greater detail in the Position Function section.

'Rotational-Speed-Sensor-Actual-Value'

The rotational speed sensor actual value describes the value input from a rotational speed sensor if available. It is expressed in increments (with encoder) or in increments/s (with tacho and A/D converter). This value is re-normalised to the format of the position sensor, using the normalisation factor G_Fac_2.

Attribute	**Value**
Index, Name	6069, Rotational-Speed-Sensor-Actual-Value
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Position sensor increments/sec
Value range	i32
Mandatory range	-
Default value	-
Substitute value	-

'Sensor-Option-Code'

The sensor option code establishes a source for the rotational speed actual value. Here a distinction is made between the evaluation of a differentiated position signal or the evaluation of a signal from a separate speed sensor.

Option code	Meaning of the option function	Substitute value
-32768 ... -1	Manufacturer-specific	
0	Speed-actual value from position sensor	
1	Speed-actual value from speed sensor	
2 ... 32767	reserved for other profiles	

Attribute	**Value**
Index, Name	606A, Sensor-Option Code
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Command-Variable'

The output variable of the setpoint generator (V_{set}^*) is, if necessary, corrected further by a manipulated variable from the position function (V_{corr}^*), and is limited by V_{limit}^*. It is then loaded into the speed controller as a command variable.

This is then made available as the 'speed command variable' in units of speed. Account is taken of the speed polarity

Attribute	**Value**
Index, Name	606B, Speed-Command-Variable
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	i32
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Actual-Value'

The 'Speed-actual value' is also given in sensor units and follows the speed setpoint.

Attribute	**Value**
Index, Name	606C, Speed-Actual-Value
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	i32
Mandatory range	-
Default value	-
Substitute value	-

'Torque-Max-Amount'

see torque and current functions

'Torque-Command-Variable'

see torque and current functions.

'Speed-Window'

The speed window monitors whether the required traverse path speed has actually been attained after completion of the acceleration and braking phase.

Attribute	**Value**
Index, Name	606D, Speed-Window
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Window-Time'

The relevant bit 'Traverse path speed attained' in the status word is input if the difference between traverse path speed and traverse path speed - actual speed is greater than the 'speed-window time' in the speed window.

Attribute	**Value**
Index, Name	606E, Speed-Window-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u16
Mandatory range	-
Default value	0
Substitute value	0

'Speed-Threshold'

If the 'Speed actual value' exceeds the 'speed-threshold' by a greater amount than the 'speed-threshold-time' the "speed = 0" bit is retained in the 'status word'. If it is below this value the bit is input and a signal is given to halt the axle.

Attribute	**Value**
Index, Name	606F, Speed-Threshold
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	u16
Mandatory range	-
Default value	0
Substitute value	0

'Speed-Threshold-Time'

Attribute	Value
Index, Name	6070, Speed-Threshold-Time
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Milliseconds
Value range	u16
Mandatory range	-
Default value	0
Substitute value	0

4.2.3.3 Mapping of the Device Function to Communication

Object description: 'Rotational-Speed-Sensor-Actual-Value'

Object attribute	Value	Meaning
Index	6069	Rotational-Speed-Sensor-Actual-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Sensor-Option-Code'

Object attribute	Value	Meaning
Index	606A	Sensor-Option-Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Command-Variable'

Object attribute	Value	Meaning
Index	606B	Speed-Command-Variable
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Actual-Value'

Object attribute	Value	Meaning
Index	606C	Speed-Actual-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Window'

Object attribute	Value	Meaning
Index	606D	Speed-Window
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Window-Time'

Object attribute	Value	Meaning
Index	606E	Speed-Window-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Threshold'

Object attribute	Value	Meaning
Index	606F	Speed-Threshold
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Threshold-Time'

Object attribute	Value	Meaning
Index	6070	Speed-Threshold-Time
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

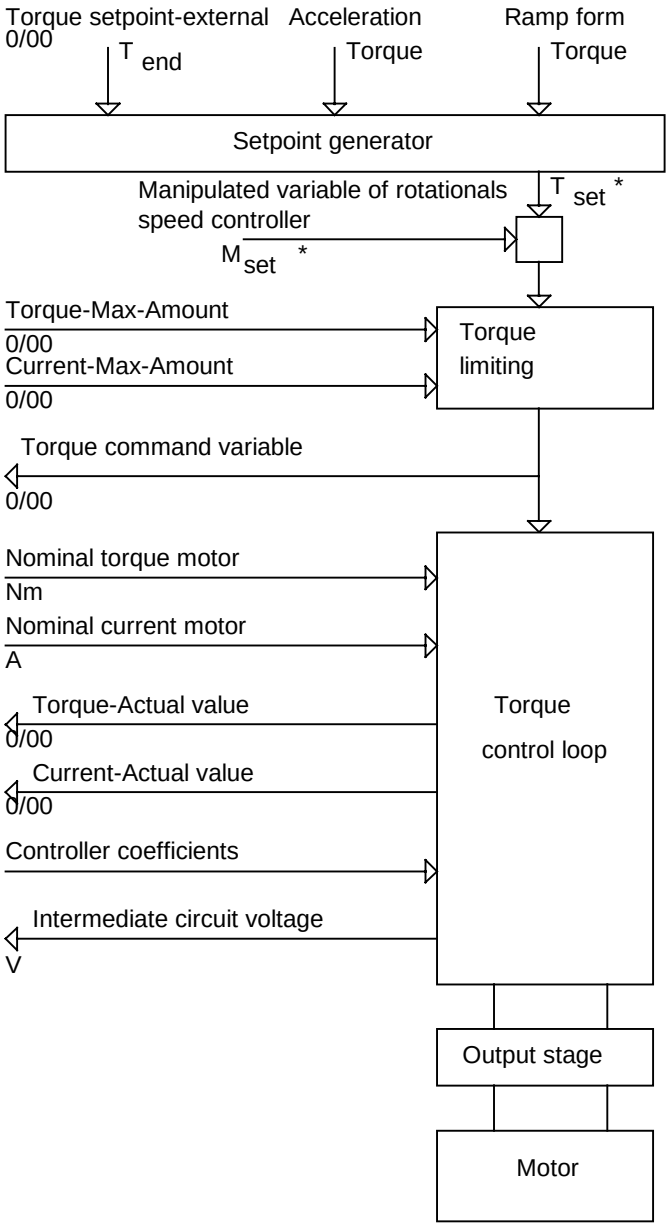
4.2.4 Torque-Function Group

Profile number : 22

Function group : 07

Function version : 00

4.2.4.1 Structure of the Function Group



In this function group the parameters required for torque control are described.

The block diagram gives only an indication of the parameters' range of effect; it does not describe at all the actual structure of the manufacturer-specific control loops.

The input variables are input either from a superimposed control loop (rotational speed controller) or directly as torque-setpoint. If this input variable has been processed by the setpoint generator, then the 'Acceleration-Torque' parameter is required.

The setpoint generator is only indicated in this function group, since it is described as a function group in its own right.

The limited setpoint (torque command variable) and the corresponding actual value (current or torque) are both available to the user as parameters. Both these parameters are relative variables, which refer to the nominal data of the relevant motor.

The required controller coefficients are defined and described by the manufacturer.

Another parameter which this function can return is the intermediate circuit voltage; it is calculated in the range of this function.

4.2.4.2 Description of Parameters

'Torque-Setpoint-External'

In the torque control mode of operation this parameter can be selected as the input variable of the torque controller.

Attribute	**Value**
Index, Name	6071, Torque-Setpoint-External
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Thousandths of nominal torque
Value range	i16
Mandatory range	-
Default value	0
Substitute value	0

'Torque-Max-Amount'

This value is the maximum permissible torque in the motor.

Attribute	**Value**
Index, Name	6072, Torque-Max-Amount
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Thousandths of nominal torque
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Current-Max-Amount'

This value is the maximum permissible torque-forming current in the motor.

Attribute	**Value**
Index, Name	6073, Current-Max-Amount
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Thousandths of nominal current
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Torque Command-Variable'

This parameter is the output value of the limiting function for motor torque. The input variable of the limiting function is made up of the setpoint (T_{set}*) and a correction value (T_{manip}*) for the rotational speed controller.

Attribute	**Value**
Index, Name	6074, Torque-Command-Variable
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Thousandths of nominal torque
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Nominal Current-Motor'

This value is obtained from the motor's identification plate and is given in 0.1 ampere units. The relative current data refer to this value.

Attribute	**Value**
Index, Name	6075, Nominal-Current-Motor
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	0.1 Ampere
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Nominal Torque-Motor'

This value is taken from the identification plate of the motor and is given in units of 0.1 Nm. The relative torque data refer to this value.

Attribute	Value
Index, Name	6076, Nominal-Torque-Motor
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	0.1 Newtonmeter
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Torque-Actual-Value'

The 'Torque-actual value' corresponds to the current torque in the drive motor.

Attribute	Value
Index, Name	6077, Torque-Actual-Value
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Thousandths of nominal torque
Value range	i16
Mandatory range	-
Default value	-
Substitute value	-

'Current-Actual-Value'

The 'current-actual value' corresponds to the prevailing effective current in the drive motor.

Attribute	Value
Index, Name	6078, Current-Actual-Value
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Thousandths of nominal current
Value range	i16
Mandatory range	-
Default value	-
Substitute value	-

'Intermediate-Circuit-Voltage'

This parameter describes the current intermediate circuit voltage at the drive controller.

Attribute	Value
Index, Name	6079, Intermediate-Circuit-Voltage
Object class	Dependent on mode of operation
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	Volts
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Ramp-Form-Torque'

NOTE 1: This parameter is not described here, but in the setpoint generator function group:

'Acceleration-Torque'

NOTE 2: This parameter is not described here, but in the setpoint generator function group:

4.2.4.3 Mapping of the Device Function to Communication

Object description: 'Torque-Setpoint-External'

Object attribute	Value	Meaning
Index	6071	Torque-Setpoint-External
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Torque-Max-Amount'

Object attribute	Value	Meaning
Index	6072	Torque-Max-Amount
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Current-Max-Amount'

Object attribute	Value	Meaning
Index	6073	Current-Max-Amount
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Torque-Setpoint-Internal'

Object attribute	Value	Meaning
Index	6074	Torque-Setpoint-Internal
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Nominal-Current-Motor'

Object attribute	Value	Meaning
Index	6075	Nominal-Current-Motor
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Nominal-Torque-Motor'

Object attribute	Value	Meaning
Index	6076	Nominal-Torque-Motor
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Torque-Actual-Value'

Object attribute	Value	Meaning
Index	6077	Torque-Actual-Value
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Current-Actual-Value'

Object attribute	**Value**	**Meaning**
Index	6078	Current-Actual-alue
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Intermediate-Circuit-Voltage'

Object attribute	**Value**	**Meaning**
Index	6079	Intermediate-Circuit-Voltage
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	6	Unsigned16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.5 Setpoint Generator-Function Group

Profile number : 22

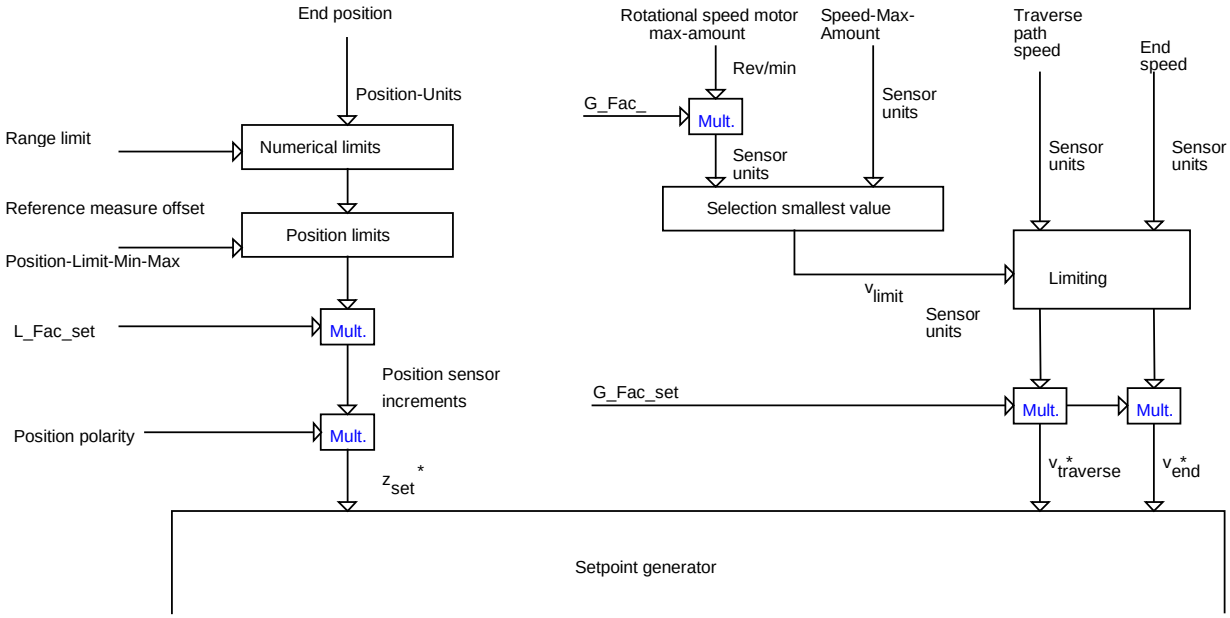
Function group : 08

Function version : 00

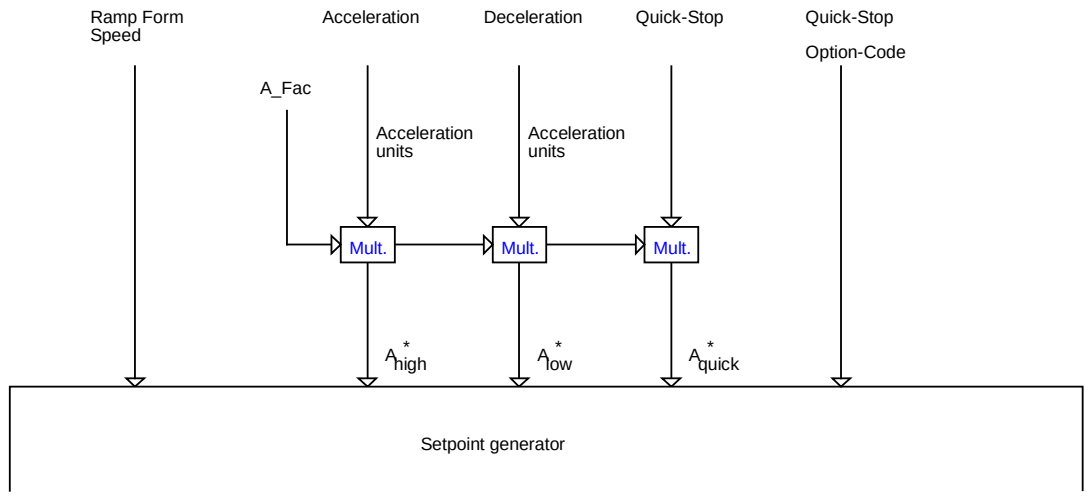
4.2.5.1 Structure of the Function Group

Input data of the setpoint generator:

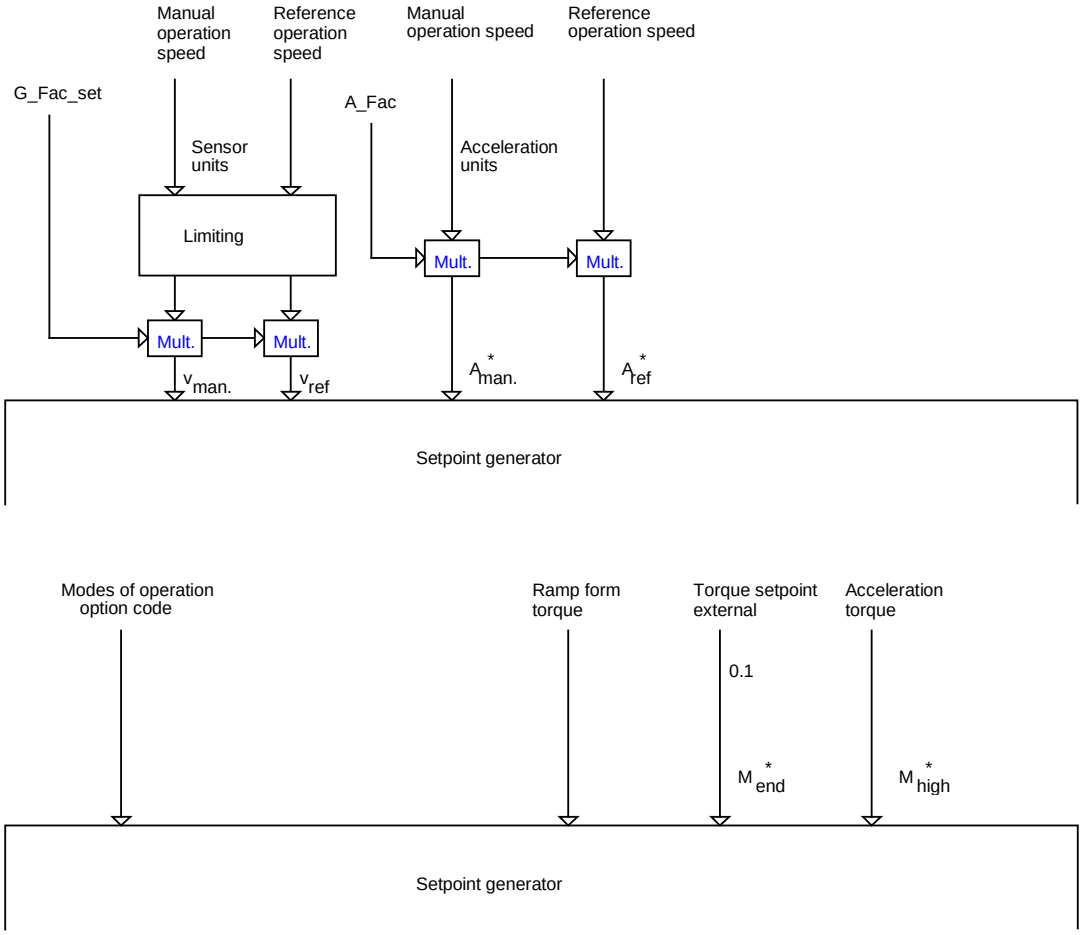
- Position and speed



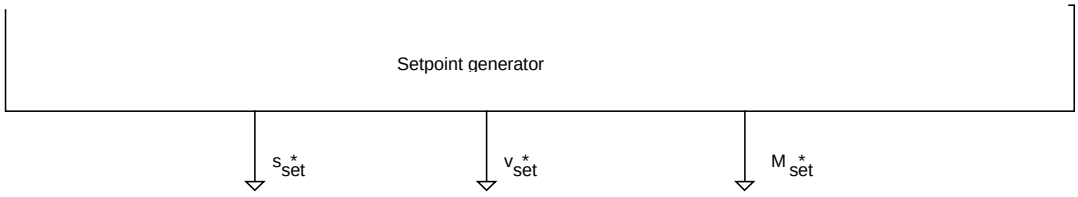
- Acceleration



- Special modes of operation, manual and reference operation and torque setting



Output data of the setpoint generator



The setpoint generator has precedence over the position, speed and torque function since it calculates the relevant input parameters for the mode of operation selected and prepares setpoints for the controller function in each scanning cycle. Which setpoints are prepared depends on the type and number of the controller functions supported by the manufacturer. Not all setpoints therefore have to be supported.

Mode of operation:	Parameter used:
Position:	Z_{set}^*, $V_{traverse}^*$, V_{end}^*, A_{high}^*, A_{low}^*, A_{quick}^*, Ramp form speed
Speed:	$V_{traverse}^*$, A_{high}^*, A_{low}^*, A_{quick}^*, Ramp form speed
Torque:	T_{end}^*, T_{high}^*, Ramp form torque
Programme:	
manual +/-:	$V_{man.}$, $A_{man.}^*$
Reference operation	V_{ref}^*, A_{ref}^*

The output variables of the setpoint generator are made up of the following, depending on the selected mode of operation:

- position command variable S_{set}^* in position sensor increments;
- speed command variable V_{set}^* in position sensor increments/s;
- torque command variable T_{set}^* in thousandths of motor-nominal torque.

Before the data is processed in the setpoint generator, the physical input parameters are limited according to requirements, and re-normalised into internal variables. The normalisation factors required for this are, on account of their interdependency, described in the Factor Function.

4.2.5.2 Description of Parameters

End-Position

The end position is the position which the drive is to attain in the position control mode of operation, whilst taking into consideration the set parameters for movement control, e.g. speed, acceleration and deceleration.

The end position can also be expressed in both sensor increments and user units. For the latter case, the various parameters which affect position normalisation need to be observed.

Attribute	**Value**
Index, Name	607A, End-Position
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Position sensor units
Value range	i32
Mandatory range	-
Default value	0
Substitute value	-

'Range-Limit'

The range limit is formed from the sub parameters 'range limit min' and 'range limit max' and it restricts the numerical limit of the position. When these limits are reached or exceeded, it is automatically continued at the other end of the numerical loop.

The following positioning modes are therefore produced:

Range-Limit-Min	Range-Limit-Max	Application example
-2^{31}	$2^{31}-1$	linear axis (no limiting)
-360000	360000	rotary table (0 ... 360 degrees)
0	1000000	continuous assembly line (length 1000mm)

In all modes the set goals are relatively or absolutely possible (set by the control word). A change in the numerical loop can be prevented by suitable selection of software end limits.

Attribute	Value
Index, Name	607B, Range-Limit
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Reference-Measurement-Offset'

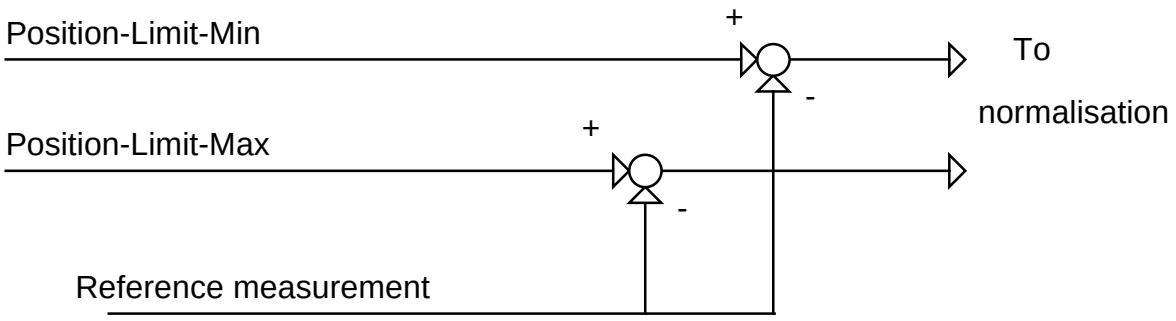
The reference measurement offset is the difference between the real zero point and the machine zero point. On completion of the reference operation, the reference measurement offset is recopied to the position set point and the position actual value. With a final positioning to 0, the axis moves about this offset to the real zero point. All further positioning is carried out with reference to this real zero point. For further details, see Reference Operation.

Attribute	Value
Index, Name	607C, Reference-Measurement-Offset
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Position sensor units
Value range	i32
Mandatory range	-
Default value	-
Substitute value	0

'Position-Limit-Value-Min-Max'

The object 'position-limit-value-min-max' is made up of the 'position-limit-value-min' and 'position-limit-value-min-max' sub parameters.

The position limit values are software end limits and correspond to the absolute position limits within which the setpoints and actual values (in absolute form) must move. Each new end position is checked against these limits. They must always make reference to the machine zero-point (same unit as end position). Therefore they must be corrected to the reference measurement offset, as in the following diagram:



This calculation only has to be carried out once when the limits are changed.

Attribute	**Value**
Index, Name	607D, Position-Limit-Value-Min-Max
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Polarities'

The setpoints and actual values are multiplied by 1 or -1 depending on polarity. This allows the user to reverse the orientation.

Bit-No.	Bit-class	Meaning
7	optional	Position polarity Bit 7 = 1 means reversal of direction Default value: Bit 7 = 0
6	optional	Speed polarity Bit 6 = 1 means reversal of direction Default value: Bit 6 = 0

The speed polarity depends directly on position polarity and is thus fixed by this. If they have to be reversed separately therefore, this can be done with bit 6.

Attribute	**Value**
Index, Name	607E, Polarities
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	0
Substitute value	0

”Speed-Max-Amount'

The maximum speed is set commonly for both directions of rotation with a resolution of 0.001. The unit is the same as that for traverse path speed.

Attribute	**Value**
Index, Name	607F, Speed-Max-Amount
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

”Speed-Motor-Max-Amount”

The maximum rotational speed is set commonly for both directions of rotation with a resolution of 1 rev/min. This serves as protection for the motor and can be taken from the motor’s technical data sheet.

Attribute	**Value**
Index, Name	6080, Speed-Motor-Max-Amount
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	0.001 1/min
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

’Traverse-Path-Speed’

The traverse path speed can be set either in sensor increments per ms or in user units. If necessary, the speed normalisation parameter is to be observed.

Attribute	**Value**
Index, Name	6081, Traverse-Path-Speed
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	i32
Mandatory range	-
Default value	0
Substitute value	-

'End-Speed'

'End-Speed' describes the speed which the drive must have attained upon reaching its end position. Normally the drive is standing when it reaches its end position, i.e., in this case the 'end speed' = 0.

Attribute	**Value**
Index, Name	6082, End-Speed
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	i32
Mandatory range	-
Default value	0
Substitute value	0

'Acceleration', 'Deceleration', 'Quick Stop'

The parameters acceleration, deceleration, and quick-stop are set in user units or in (inc/s^2). These parameters indicate either the rise of the traverse path ramp (with linear ramps) or the maximum rise (with other functions).

Quick Stop is the deceleration with which the drive is braked, if the command quick stop (bit 2 in the control word) is input. The user can set the required Quick Stop ramp via an option code.

Attribute	**Value**
Index, Name	6083, Acceleration
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed units
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

Attribute	**Value**
Index, Name	6084, Deceleration
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed units
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

Attribute	**Value**
Index, Name	6085, Quick Stop
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed units
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

'Ramp-Form-Speed'

The ramp form speed is a selection function, with which the acceleration curve is described. A distinction is made here for example, between linear, sinusoidal, sine quadratic, etc. acceleration.

Option Code	Meaning of the Option Function
-32768 ... -1	Manufacturer-specific
0	Ramp form linear
1	Ramp form sin^2
2	Ramp form jerk-free
3	Ramp form jerk-limited
4 ... 32767	reserved for further profiles

Attribute	**Value**
Index, Name	6086, Ramp-Form-Speed
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	-
Default value	-
Substitute value	-

'Acceleration-Torque'

In the torque control mode of operation, the relevant set points are diverted through the setpoint generator to facilitate a defined adjustment behaviour.

The change in torque is interpreted by the 'Acceleration-Torque' parameter, in thousandths of nominal torque per s^2 . How the change is carried out depends on the 'Ramp-Form-Torque'.

Attribute	Value
Index, Name	6087, Acceleration-Torque
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	1/sec2
Value range	u16
Mandatory range	-
Default value	-
Substitute value	-

'Ramp-Form-Torque'

The option code 'Ramp-Form-Torque' is used to establish, to which function a new torque setpoint is to be adjusted.

Option Code	Meaning of the Option Function
-32768 ... -1	Manufacturer-specific
0	Ramp form linear
1	Ramp form sin^2
2	Ramp form jerk-free
3	Ramp form jerk limited
3 ... 32767	reserved for further profiles

Attribute	Value
Index, Name	6088, Ramp-Form-Torque
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i16
Mandatory range	-
Default value	-
Substitute value	-

'Torque-Setpoint-External'

see torque function

4.2.5.3 Mapping of the Device Function to Communication

Object description: 'End-Position'

Object attribute	**Value**	**Meaning**
Index	607A	End-Position
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Range-Limit'

Object attribute	Value	Meaning
Index	607B	Range-Limit
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Reference-Measurement-Offset'

Object attribute	Value	Meaning
Index	607C	Reference-Measurement-Offset
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Position-Limit-Value-Min-Max'

Object attribute	Value	Meaning
Index	607D	Position-Limit-Value-Min-Max
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Polarities'

Object attribute	Value	Meaning
Index	607E	Polarities
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	A	Octet-String
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Speed-Max-Amount"

Object attribute	Value	Meaning
Index	607F	Speed-Max-Amount
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Speed-Motor-Max-Amount'

Object attribute	Value	Meaning
Index	6080	Speed-Motor-Max-Amount
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Traverse-Path-Speed'

Object attribute	Value	Meaning
Index	6081	Traverse-Path-Speed
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'End-Speed'

Object attribute	Value	Meaning
Index	6082	End-Speed
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	4	Integer32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Acceleration'

Object attribute	Value	Meaning
Index	6083	Acceleration
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Deceleration'

Object attribute	Value	Meaning
Index	6084	Deceleration
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Quick Stop'

Object attribute	Value	Meaning
Index	6085	Quick Stop
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Ramp-Form-Speed'

Object attribute	Value	Meaning
Index	6086	Ramp form-speed
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Acceleration-Torque'

Object attribute	Value	Meaning
Index	6087	Acceleration-Torque
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Ramp form-Torque'

Object attribute	Value	Meaning
Index	6088	Ramp-Form-Torque
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.2.6 Factor-Function Group

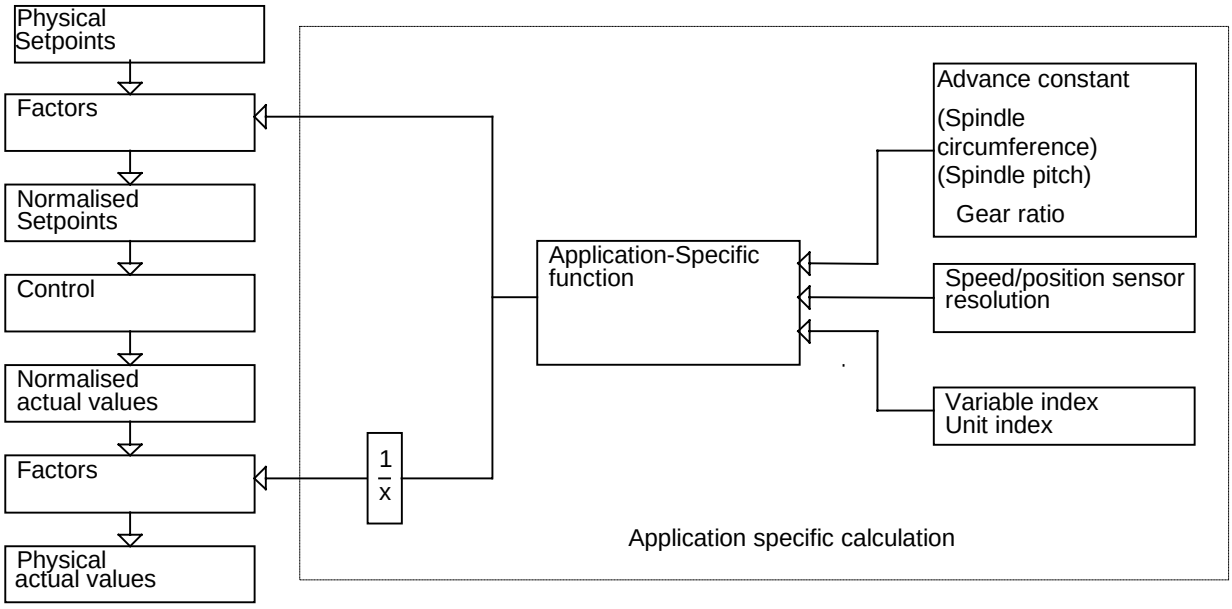
Profile number : 22

Function group : 09

Function version : 00

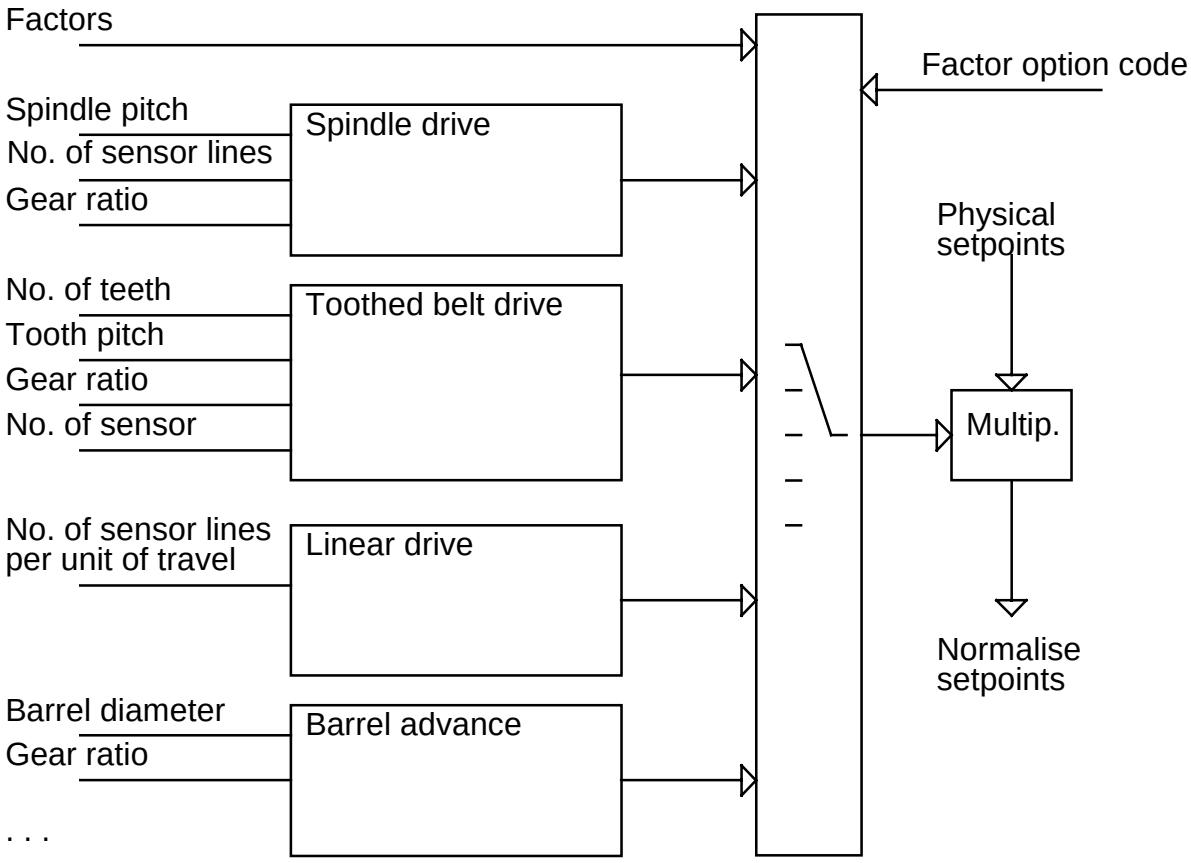
The change form a physical, unit based system to a computer-based numerical system requires normalisation of the physical variables by multiplication by various factors. The mode of effect and the calculation of these normalisation factors is described on the following pages.

4.2.6.1 Mode of Effect of the Factor



Because there are numerous positioning applications, the application-specific calculations must be carried out by the manufacturer. The results of these calculations are the normalisation factors for the conversion of physical setpoints and actual values into normalised ones.

This may be illustrated as follows:



The factors defined in the profile are directly suitable for normalising physical setpoints and actual values**.**

The application-specific input parameters are converted in the relevant function blocks, (e.g. spindle drive) to the described factors.

Often occurring input parameters are incorporated into the object dictionary without their associations. This ensures a standard number of parameters for future implementation.

4.2.6.2 Description of Parameters

The following deals with the calculation of the factors from the different physical input parameters. The formulae show the relationship between the individual parameters and are shown here by way of example. They can be used in several different ways, as specified by the manufacturer and depending on the internal numerical normalisation.

The calculation example shown here is based on the following units:

Physical input variable	Unit of physical input variable	Unit of internally normalised variable
Position	Position-Unit	Position sensor increments
Speed	Speed-Unit	Position sensor increments/s
Acceleration	Acceleration-Unit	Position sensor increments/s^2

The physical input parameters result from the mechanical properties of the drive unit and the required mode of expression for the variables.

Parameter	typical value ranges
Advance constant	0.1 ... 1000 position units
Position sensor-Resolution	50 ... 10^6 inc
Speed sensor-resolution	0 ... 10^6 inc/s
Gear ratio	0.1 ... 1000
Position units index	mm, inch, degree (values, see Sensor/Actuator Profile)
Position variables index	-3
Speed units index	m/s, min^{-1} (values, see Sensor/Actuator Profile)
Speed variables index	-3
Acceleration units index	$1/s^2$ (values, see Sensor/Actuator Profile)
Acceleration variables index	0

Constants	fixed defined values
Torque-Resolution	0.001

Position-Unit

The position unit is made up of the physical variable (variable index) and unit (unit index)

Position-Unit = $10^{\text{unit index}} \bullet$ variable index (for unit index < 64)

EXAMPLE 1:

Unit index = -6 (mm)

Variable index = 1 (length)

Position-Unit = $10^{\text{unit index}} \bullet$variable index 10^{-3} mm = 10^{-6} m

Speed-Unit

The Speed-Unit is made up of the physical variable (variable index) and unit (unit index).

Speed-Unit = $10^{\text{unit index}} \bullet$variable index (for unit index < 64)

EXAMPLE 2

Unit index = -3 (m/sec)

Variable index = 13 (speed)

Speed-Unit = $10^{\text{unit index}} \bullet$variable index = 10^{-3} m/sec

Acceleration-Unit

The acceleration unit is made up of the physical variable (variable index) and unit (unit index).

Acceleration unit = $10^{\text{unit index}} \bullet$variable index (for unit index < 64)

EXAMPLE 3:

Unit index = 0

Variable index = 35 (acceleration in $1/sec^2$)

Acceleration unit = $10^{\text{unit index}} \bullet$variable index = $1/sec^{-1}$

'Position-Unit-Index'

The position unit index fixes the unit for the following parameters:

- 'Position-Actual-Value',
- 'Position-Setpoint',
- 'Position-End'
- 'Positioning-Window',
- 'Trail-Error-Window',
- 'Reference-Measurement-Offset',
- 'Position-Limit-Value-Min-Max',
- 'Range-Limit'

Attribute	**Value**
Index, Name	6089, Position-Unit-Index
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i8
Mandatory range	0
Default value	-
Substitute value	-

'Position-Variable-Index'

The position variable index refers to the same parameters as for 'position unit index' and fixes their physical variables. (Code, see Sensor/Actuator Profile /2/)

Attribute	**Value**
Index, Name	608A, Position-Variable-Index
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	u8
Mandatory range	32
Default value	-
Substitute value	-

'Speed-Unit-Index'

The 'Speed unit index' fixes the unit of the following parameters:

- 'Speed-Actual-Value',
- 'Speed-Setpoint',
- 'End-Speed',
- ''Traverse-Path-Speed'
- 'Speed-Window',
- 'Speed-Max-Amount',
- 'Speed-Threshold',
- 'Manual-Operation-Speed'
- 'Reference-Operation-Speed'

Attribute	**Value**
Index, Name	608B, Speed-Unit-Index
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i8
Mandatory range	73
Default value	-
Substitute value	-

'Speed-Variable-Index'

The 'speed variable index' refers to the same parameters as 'speed unit index' and establishes their physical variables. (Code, see Sensor/Actuator Profile /2/)

Attribute	**Value**
Index, Name	608C, Speed-Variable-Index
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer -specific
Unit	-
Value range	u8
Mandatory range	11
Default value	-
Substitute value	-

'Acceleration-Unit-Index'

The 'Acceleration-Unit-Index' fixes the following parameters:

- 'Acceleration',
- 'Deceleration',
- Quick-Stop,
- 'Reference-Operation-Acceleration'
- 'Manual-Operation-Acceleration'

.

Attribute	**Value**
Index, Name	608D, Acceleration-Unit-Index
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer -specific
Unit	-
Value range	i8
Mandatory range	-
Default value	-
Substitute value	-

'Acceleration-Variable-Index'

The 'Acceleration-Variable-Index' refers to the same parameters as 'Acceleration-Unit-Index' and establishes their physical variables. (Code, see Sensor/ Actuator Profile /2/)

Attribute	**Value**
Index, Name	608E, Acceleration-Variable-Index
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	u8
Mandatory range	-
Default value	-
Substitute value	-

'Position-Sensor-Resolution' (N_L)

The 'Position-Sensor-Resolution' indicates the number of increments per revolution of the motor. The resolution refers to the sensor which is set for Position Control and corresponds to the 'Encoder-Resolution' (see Encoder Profile).

$$\text{'Position-Sensor-Resolution'} = \frac{\text{Position sensor increments}}{\text{Revolutions of motor}}$$

Subparameter 1	Increments
Subparameter 2	Revolutions of motor

Attribute	**Value**
Index, Name	608F, Position-Sensor-Resolution
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Sensor-Resolution'

The 'Speed-Sensor-Resolution' indicates the number of increments per second for a motor revolution/ sec. The resolution refers to the sensor which is set for speed control.

$$\text{'Speed sensor-Resolution'} = \frac{\text{increment/sec}}{\text{motor revolution / sec}}$$

Subparameter 1	Increment/sec
Subparameter 2	Motor revolution/sec

Attribute	**Value**
Index, Name	6090, Speed-Sensor-Resolution
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Gear-Ratio'

The gear ratio is the ratio of the revolutions of the motor shaft to the output shaft of the gears.

$$\text{'Gear-Ratio'} = \frac{\text{Revolutions of the motor shaft}}{\text{Revolutions of the output shaft}}$$

Subparameter 1	Revolutions of the motor shaft
Subparameter 2	Revolutions of the output shaft

EXAMPLE 1: 50:1

50 revolutions of motor shaft correspond to 1 revolution of the output shaft.

EXAMPLE 2: 105:10

10,5 revolutions of the motor shaft corresponds to 1 revolution of the output shaft.

Attribute	**Value**
Index, Name	6091, Gear-Ratio
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Advance-Constant'

The 'Advance-Constant' indicates the travel per revolution of the output shaft of the motor or, if available, the gear.

$$\text{'Advance constant'} = \frac{\text{Advance in position units}}{\text{Revolutions of the output shaft}}$$

Subparameter 1	Advance in position units
Subparameter 2	Revolutions of the output shaft

Attribute	**Value**
Index, Name	6092, Advance-Constant 0
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

These physical input parameters enable the normalisation factors to be calculated. When using the formula, note needs to be taken and, if necessary a unit check made, that the unit of the factors multiplied with the unit of the input variable is the same as that of the unit of the internally normalised variable.

'Position-Factor-Set'

The end position, expressed in position units is multiplied by this factor, to normalise it to the internal format in position sensor increments.

$$\text{'Position-Factor-Set'} = \frac{\text{Position sensor-Resolution} * \text{Gear ratio} * 10^{\text{position unit index}}}{\text{Advance constant}}$$

Subparameter 1	counter
Subparameter 2	denominator

Attribute	**Value**
Index, Name	6093, Position-Factor-Set
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Factor-Set'

Speed normalisation enables the setpoints which were given in speed units to be converted to position sensor units/s.

The speeds given in speed units are multiplied by this factor to normalise them to position sensor increments/sec..

$$\text{'Speed -factor-Set'} = \frac{\text{'Speed sensor-Resolution} * \text{Gear ratio} * 10^{\text{speed unit index}} * \text{Position-Unit}}{\text{Advance constant} * \text{sec} * \text{Speed-Unit}}$$

Subparameter 1	Counter
Subparameter 2	Denominator

Attribute	**Value**
Index, Name	6094, Speed-Factor-Set
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Factor-1'

Because the limit values are set in different units (rotational speed- motor-max_amount and Speed-Max-Amount) it is necessary to renormalise:

$$\text{'Speed factor-1} = \frac{\text{Advance constant} * \text{speed unit \& sec}}{60\ \text{sec / min} * \text{Gear-Ratio} * \text{Position-Unit}}$$

Subparameter 1	Counter
Subparameter 2	Denominator

Attribute	**Value**
Index, Name	6095, Speed-Factor-1
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Speed-Factor-2'

Because there are different sensor systems for calculating position and speed, the number of increments needs to be transferred into each one. The speed sensor system is thus mapped onto the position sensor:

$$\text{'Speed-Factor-2'} = \frac{\text{Position sensor-Resolution}}{\text{Speed sensor-Resolution}}$$

Subparameter 1	Counter
Subparameter 2	Denominator

Attribute	**Value**
Index, Name	6096, Speed-Factor-2
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

'Acceleration-Factor'

This factor converts acceleration in acceleration units into units of position sensor increments/$s^{2.}$

$$\text{'Acceleration factor'} = \frac{\text{Speed-Unit} * 10^{\text{acceleration unit index}}}{\text{Acceleration unit} * 10^{\text{speed unit index}} * \text{sec}} * \text{speed - factor set}$$

Subparameter 1	Counter
Subparameter 2	Denominator

Attribute	**Value**
Index, Name	6097, Acceleration-Factor
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

4.2.6.3 Mapping of the Device Function to Communication

Object description: 'Position-Unit-Index'

Object attribute	Value	Meaning
Index	6089	Position-Unit-Index
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	2	Integer8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Position-Variable-Index'

Object attribute	Value	Meaning
Index	608A	Position-Variable-Index
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	5	Unsigned8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Unit Index'

Object attribute	Value	Meaning
Index	608B	Speed-Unit-Index
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	2	Integer8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Variable-Index'

Object attribute	Value	Meaning
Index	608C	Speed-Variable-Index
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	5	Unsigned8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Acceleration-Unit-Index'

Object attribute	Value	Meaning
Index	608D	Acceleration-Unit-Index
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	2	Integer8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Acceleration-Variable-Index'

Object attribute	Value	Meaning
Index	608E	Acceleration-Variable-Index
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	5	Unsigned8
Length	1	1 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Position-Sensor-Resolution'

Object attribute	Value	Meaning
Index	608F	Position-Sensor-Resolution
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Sensor-Resolution'

Object attribute	Value	Meaning
Index	6090	Speed-Sensor-Resolution
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Transmission-Ratio'

Object attribute	Value	Meaning
Index	6091	Transmission-Ratio
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Advance-Constant'

Object attribute	Value	Meaning
Index	6092	Advance-Constant
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Position-Factor-Set'

Object attribute	Value	Meaning
Index	6093	Position-Factor-Set
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Factor-Set'

Object attribute	Value	Meaning
Index	6094	Speed-Factor-Set
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Factor-1'

Object attribute	Value	Meaning
Index	6095	Speed-Factor-1
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: 'Speed-Factor-2'

Object attribute	Value	Meaning
Index	6096	Speed-Factor-2
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object description: "Acceleration-Factor'

Object attribute	Value	Meaning
Index	6097	Acceleration-Factor
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	2	2 Elements
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

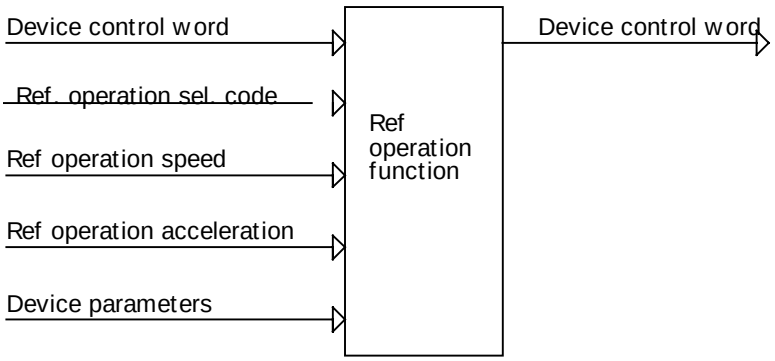
4.2.7 Reference Operation Function Group

Profile number : 22

Function group :

Function version:

4.2.7.1 Structure of the Function Group



For the operation of positioning drives, an exact knowledge of the absolute position is normally required. Since for cost reasons, drives often do not have an absolute sensor, a reference operation is necessary. There are several, application-specific methods. The 'Reference Operation Option Code' is used for selection.

The exact sequence of the reference operation is clearly described with a method. In some circumstances, a device has several methods to choose from, using the 'Reference Option Code'.

4.2.7.2 Description of Individual Parameters

The reference method clearly establishes

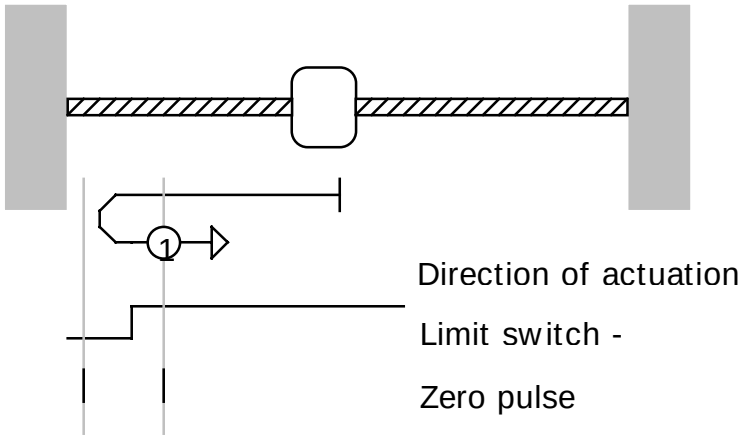
- the reference signal (limit switch+, Limit switch-, machine zero point switch),
- the direction of actuation
- and the position of the zero pulse.

The real zero point is calculated by adding the machine zero point (calculated in the reference operation) and the 'Reference Measurement Offset'.

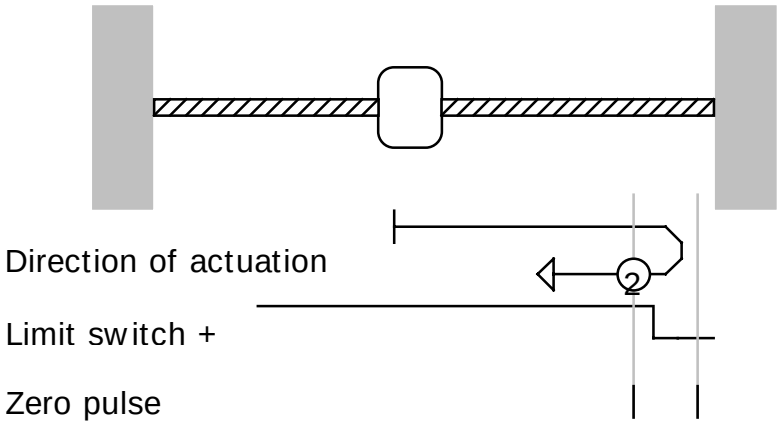
The device manufacturer allocates the reference signals to the physical inputs and their polarities.

Various reference positions are illustrated in the following diagrams. A circled number indicates the code for selection of this reference position. The direction of actuation is also described here.

Method-1. Negative limit switch actuation.

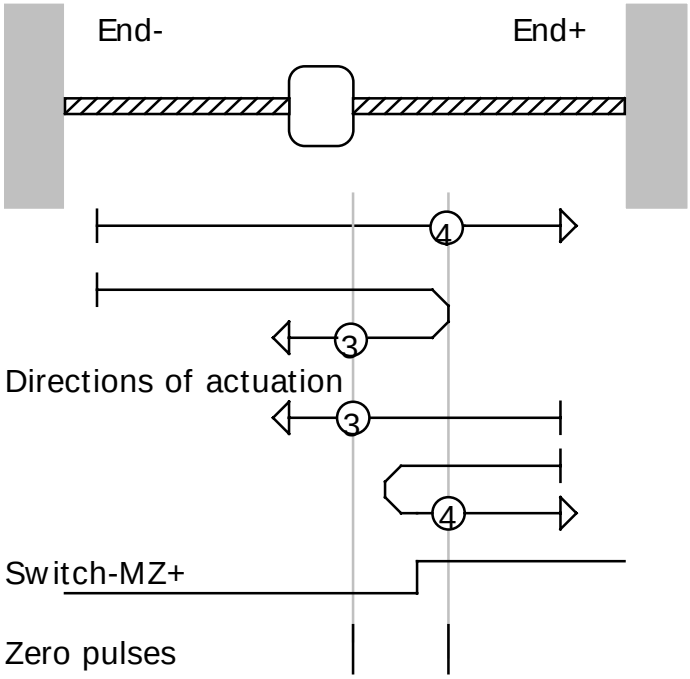


Method-2. Positive limit switch actuation.



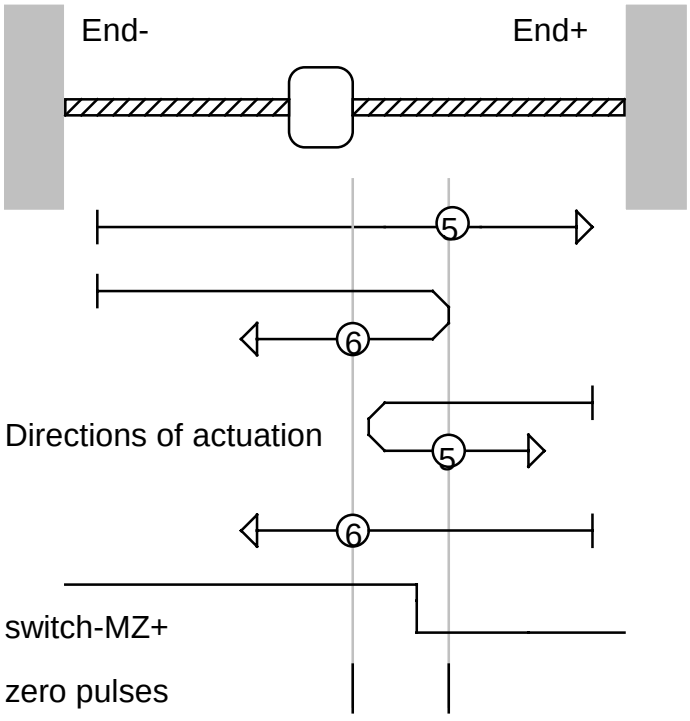
Methods 3 and 4. Positive zero point transfer switch actuation

For methods 3 and 4 the direction of actuation is produced from the state of the machine zero point switch. The option code decides on the valid zero pulse.



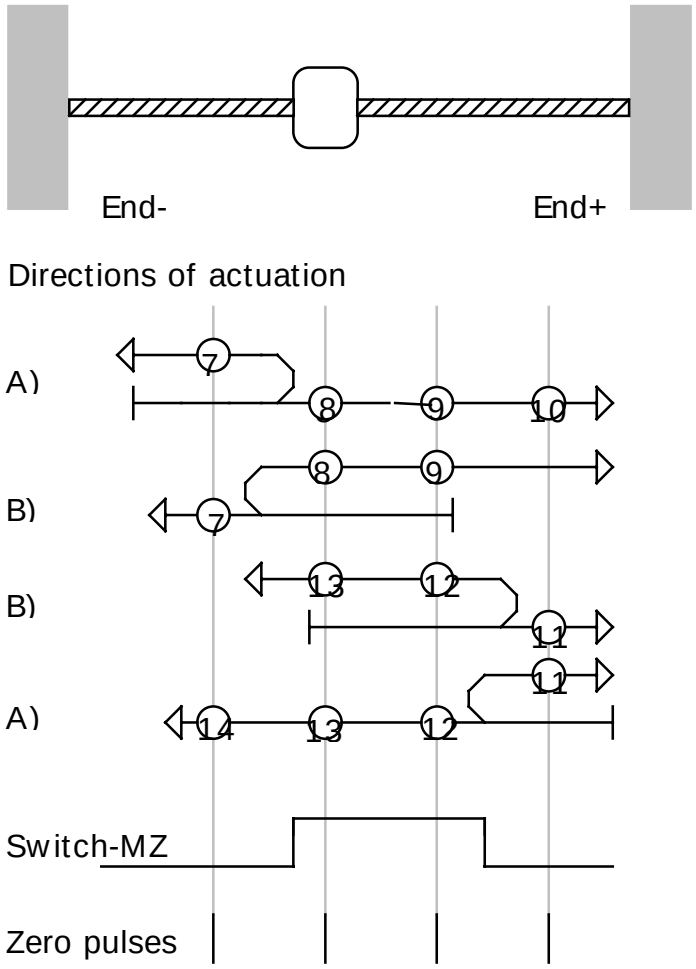
Methods 5 and 6. Negative zero point transfer switch actuation

For methods 5 and 6 the direction of actuation is produced from the state of the machine zero point switch. The option code decides on the valid zero pulse.



Methods 7 to 14. Zero point switch actuation

For methods 7 to 14, the pulse edge of the machine zero point switch is evaluated. The direction of actuation and the valid zero pulse are selected using the option code. If the zero point switch is active at the start of the function, then the diagrams marked B) apply; in the other case, diagrams marked A) apply. If the zero point switch is not in the direction of actuation, the device manufacturer can opt to use the relevant limit switch as a reversing switch.



4.2.7.3 Reference Operation Function Sequence

The reference operation is commenced by the positive edge of the BIT-4 in the device control word. The successful completion is indicated by a ‘ONE’ in the device status word. A ‘ONE’ in BIT-13 of the status word indicates a malfunctioning reference operation. The cause is found by reading the error codes.

Description of the bits in the device control word which are dependent on mode of operation

Bit-4	Meaning
0	Reference operation inactive
0->1	Start reference operation
1	Reference operation active
1->0	Interrupt reference operation

Description of the bits in the device control word which are dependent on mode of operation

Bit-13	Bit-12	Meaning
0	0	Reference operation not yet completed
0	1	Reference operation carried out successfully
1	0	Reference operation not successfully carried out
1	1	prohibited state

4.2.7.4 Description of Parameters

'Reference Operation-Option Code'

Option Code	Meaning of the option function
-128..-1	Manufacturer-specific
0	No reference operation required
1..14	Methods 1 to 14. (see text)
15..127	reserved

Attribute	**Value**
Index, Name	6098, Reference Operation-Option Code
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	-
Value range	i8
Mandatory range	0
Default value	0
Substitute value	0

´Reference Operation-Speed´

The ´Reference Operation-Speed´ establishes the speed setpoints for the reference operation.

Attribute	**Value**
Index, Name	6099, Reference Operation-Speed
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed Units G2
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

´Reference Operation-Acceleration´

The ´Reference Operation-Acceleration´ establishes the acceleration setpoints for reference operation.

Attribute	**Value**
Index, Name	609A, Reference Operation-Acceleration
Object class	Dependent on mode of operation
Access	Write-All, Read-All
Process data mapping	Manufacturer-specific
Unit	Speed units
Value range	u32
Mandatory range	-
Default value	-
Substitute value	-

4.2.7.5 Mapping of the Device Function to Communication

Object Description: ´Reference Operation-Option-Code´

Object attribute	**Value**	**Meaning**
Index	6098	Reference Operation-Option-Code
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	3	Integer16
Length	2	2 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object Description: ´Reference Operation-Speed´

Object attribute	**Value**	**Meaning**
Index	6099	Reference-Operation-Speed
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

Object Description: ´Reference-Operation-Acceleration´

Object attribute	**Value**	**Meaning**
Index	609A	Reference-Operation-Acceleration
Variable-Name	-	Not available
Object-Code	07	Simple-Variable
Data-Type-Index	7	Unsigned32
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0300	Read-All, Write-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.3 General Functions

Profile number : 22

Function group : 02

Function version : 00

Functions from other profiles can be integrated into a drive device. The function groups description parameter indicates the function groups from which functions can be integrated into the device. The communication functions from the Sensor/Actuator Profile have to be integrated into a device drive.

The following sections describe only the additions and modifications to definitions from other profiles.

4.3.1 Function Group Dictionary

'Function-Group-Description'

This parameter contains information on the device's function groups. The parameter is a field with 4 * n entries. Value range of n (max. PDU length).

Attribute	**Value**
Index, Name	600F, Function-Group-Description
Object class	mandatory
Access	Read-only
Process data mapping	Manufacturer-specific
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	-

	Profile Number		Function Group Number	
	Profile Group	Version	Function group designation	Version
00120100	Sensor/Actuator	2	Communication function	0
00220100	DRIVECOM	1	Device Control State Machine	x
00220x00	DRIVECOM	x	One application function	x

Profile group:

This parameter indicated the profile group in which this function is described. For a DRIVECOM device a minimum of one function from Profile groups 2 and 1 must be available.

Value range: 0-FF hex

Profile-Group	Meaning
0	No Profile (Manufacturer-specific)
1	Sensor/Actuator
2	DRIVECOM

NOTE: The subparameter of the profile group normally contains the value 2 for DRIVECOM functions. If a function from another profile is implemented, the respective Profile Group is given.

Profile version:

This parameter contains the profile version designation of the respective profile group.

Value range: 0-F hex

Function group designation:

This parameter indicates a function group within a profile group. For a DRIVECOM device a minimum of one drive function from Profile Group 2 must be available.

Value range: 0-6 hex

Function Group Designation	Meaning
0	reserved
1	Device Control State Machine
2	General Functions
3	Mode of Operation Functions
4	Speed Functions 1(old)
5	Speed Functions 2(new)
6	Position Functions
7	Torque Functions
8	Setpoint Generator
9	Factor Functions
10	Program Functions

Function version:

This parameter indicates the version of a device function group.

Value range: 0-FF hex

EXAMPLE 1:

	Profile Number		Function Group Number	
	Profile group	Version	Function Group Designation	Version
00 12 01 00	Sensor/actuator	2	Communication Function	0
00 12 01 00	Sensor/actuator	2	Communication Function	0
00 12 02 00	Sensor/actuator	2	Sensor/actuator-Functions	0
00 21 00 00	DRIVECOM 21	1	-	-
00 22 01 00	DRIVECOM	2	Device control	0
00 22 02 00	DRIVECOM	2	Speed Function old	0
00 22 03 00	DRIVECOM	2	Speed Function new	0
00 22 04 00	DRIVECOM	2	Position Functions	0
00 22 05 00	DRIVECOM	2	Torque Functions	0

Error message: yes, see read or write function.

Mapping of the device function to communication

Object description: Function Groups-Description

Object attribute	Value	Meaning
Index	600F	Function Groups-Description
Variable-Name	-	Not available
Object-Code	08	Array
Number of Elements	n	n Elements
Data-Type-Index	A	Octet-String
Length	4	4 Byte
Password	00	No Password
Access-Groups	00	No Access Groups
Access-Rights	0001	Read-All
Local-Address	xxxx	Manufacturer-specific
Extension	-	Not available

4.3.2 Malfunction Function

See Sensor/Actuator Profile Chapter 6.2.3 Malfunction Function.

The ‘malfunction code’ parameter is mandatory and read-only.

[hex]	Meaning
0000	no malfunction
1000	general malfunction
2000	current
2100	current on device input side
2110	short circuit/earth leakage
2120	earth leakage
2121	earth leakage phase L1
2122	earth leakage phase L2
2123	earth leakage phase L3
2130	short circuit
2131	short circuit phases L1-L2
2132	short circuit phases L2-L3
2133	short circuit phases L3-L1
2200	internal current
2211	internal current No. 1
2212	internal current No. 2
2213	over-current in ramp function
2214	over-current in the sequence
2220	continuous over-current
2221	continuous over-current No. 1
2222	continuous over-current No. 2
2230	short circuit/earth leakage
2240	earth leakage
2250	short circuit
2300	current on device output side
2310	continuous over-current
2311	continuous over-current No. 1
2312	continuous over-current No. 2
2320	short circuit/earth leakage
2330	earth leakage
2331	earth leakage phase U
2332	earth leakage phase V
2333	earth leakage phase W
2340	short circuit
2341	short circuit phases U-V
2342	short circuit phases V-W
2343	short circuit phases W-U

[hex]	Meaning
3000	Voltage
3100	Mains voltage
3110	Mains over-voltage
3111	Mains over-voltage phase L1
3112	Mains over-voltage phase L2
3113	Mains over-voltage phase L3
3120	Mains under-voltage
3121	Mains under-voltage phase L1
3122	Mains under-voltage phase L2
3123	Mains under-voltage phase L3
3130	phase failure
3131	phase failure L1
3132	phase failure L2
3133	phase failure L3
3134	phase sequence
3140	mains frequency
3141	mains frequency too great
3142	mains frequency too small
3200	internal voltage
3210	internal over-voltage
3211	over-voltage No. 1
3212	over-voltage No. 2
3220	Internal under-voltage
3221	under-voltage No. 1
3222	under-voltage No. 2
3230	load error
3300	output voltage
3310	output over-voltage
3311	output over-voltage phase U
3312	output over-voltage phase V
3313	output over-voltage phase W
3320	armature circuit
3321	armature circuit interrupted
3330	field circuit
3331	field circuit interrupted

[hex]	Meaning
4000	temperature
4100	ambient temperature
4110	excess ambient temperature
4120	too low ambient temperature
4130	temperature supply air
4140	temperature air outlet
4200	temperature device
4210	excess temperature device
4220	too low temperature device
4300	temperature drive
4310	excess temperature drive
4320	too low temperature drive
4400	temperature supply
4410	excess temperature supply
4420	too low temperature supply
5000	device hardware
5100	supply
5110	supply low voltage
5111	U1 = supply +/- 15 V
5112	U2 = supply + 24 V
5113	U3 = supply + 5 V
5114	U4 = manufacturer-specific
....	..... for U5, U6, U7
5118	U8 = manufacturer-specific
5119	U9 = manufacturer-specific
5120	supply intermediate circuit
5200	control
5210	measurement circuit
5220	computing circuit
5300	operating unit
5400	power section
5410	output stages
5420	chopper
5430	input stages
5440	contactors
5441	contactor 1 = manufacturer-specific
5442	contactor 2 = manufacturer-specific
5443	contactor 3 = manufacturer-specific
5444	contactor 4 = manufacturer-specific
5445	contactor 5 = manufacturer-specific
5450	fuses
5451	S1 = L1
5452	S2 = L2
5453	S3 = L3
5454	S4 = manufacturer-specific
....	.... for S5, S6, S7, S8
5459	S9 = manufacturer-specific

[hex]	Meaning
5500	data storage
5510	RAM
5520	EPROM
5520	EEPROM
6000	device software
6010	Software-Reset (Watchdog)
6100	internal software
6200	user software
6300	data record
6301	data record No. 1
..	from 2 to 14 corresponding
630F	data record No. 15
6310	loss of parameter
6320	parameter error
7000	supplementary modules
7100	power
7110	brake chopper
7111	failure brake chopper
7112	over-current brake chopper
7113	protective circuit brake chopper
7120	motor
7121	motor blocked
7122	motor error or commutation malfunction
7123	motor tilted
7200	measurement circuit
7300	sensor
7301	tacho fault
7302	tacho wrong polarity
7303	resolver 1 fault
7304	resolver 2 fault
7305	incremental sensor 1 fault
7306	incremental sensor 2 fault
7307	incremental sensor 3 fault
7310	speed
7320	position
7400	computation circuit
7500	communication
7510	serial interface No. 1
7520	serial interface No. 2
7600	data storage
8000	monitoring
8100	communication
8110	process data monitoring
8120	host monitoring

[hex]	Meaning
8200	control
8300	torque control
8311	excess torque
8312	difficult start-up
8313	standstill torque
8321	insufficient torque
8331	torque fault
8400	rotational speed controller
8500	position controller
8600	positioning controller
8611	trail error
8612	reference limit
8700	synchro controller
8800	winding controller
9000	external malfunction
F000	additional functions
F001	deceleration
F002	sub-synchronous run
F003	stroke operation
F004	control

Codes not listed are reserved.

4.4 Communication Function

Profile number : 12

Function group :

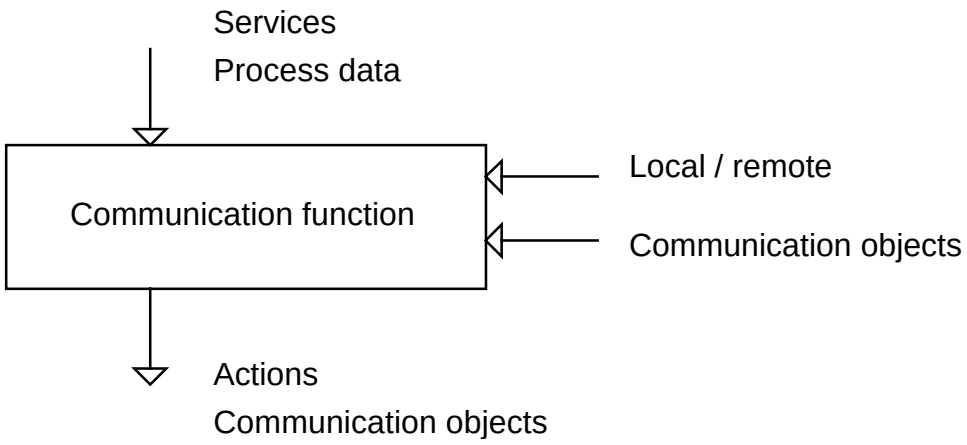
Function version :

The services and functions required for communication are described in Sensor/Actuator Profile 12 (Chapter. 6.3); only the additions and modifications for the DRIVECOM profile are described here.

In addition the following signal is introduced:

Local/Remote

The internal local/remote signal controls execution of the write service.



4.4.1 Connection Establishment

See Sensor-Actuator Profile 6.4.1.1

Profile number

The value of the service parameter profile number for this profile is 0022 hex.

4.4.2 Connection Abort

See Sensor-Actuator Profile 6.4.1.2

Connection-Abort-Option-Code

The Connection-Abort-Option-Code is expanded with the device control commands ”Disable-Voltage” and ”Quick-Stop”.

Option code	Meaning of the option function	Substitute value
-32768 ... -1	Manufacturer-specific	
0	No action	
1	Malfunction	
2	Device control command ”Disable voltage”	
3	Device control command ”Quick-Stop”'	
4 ... 32767	reserved for DRIVECOM-profiles	

4.4.3 Status Function

See Sensor-Actuator Profile 6.4.1.6

Physical-Status

This parameter provides a rough overview of the device's operating state.

	Physical Status	Status of the device control
0	Ready	OPERATION ENABLED
1	Partly ready	All other states
2	Not ready	CANNOT BE ACTIVATED
3	Maintenance required	Not used

Local-Detail

Bits 0 to 15 of the status word are mapped in bits 0 to 15 of this parameter. The remaining bits 16 to 23 are reserved.

4.4.4 Write Function

4.4.4.1 Block Parametrisation

The parameter ‘control word’ is defined as anon-dependent parameter and is therefore not included in block parametrisation.

> NOTE: The block parametrisation is to be implemented in such a way that access to the ‘control word’ is always effective.

4.4.5 Process Data Monitoring

See Sensor-Actuator Profile 6.4.1.10

The Process-Data-Monitoring-Option-Code is expanded with the device control commands 'Disable voltage' and 'Quick Stop'.

Option code	Meaning of the option function	Substitute value
-32768 ... -1	Manufacturer-specific	
0	No action	
1	Malfunction	
2	Device control command "Disable-Voltage"	
3	Device control command "Quick-Stop"	
4 ... 32767	reserved for DRIVECOM profiles	

4.4.6 Communication Monitoring

See Sensor-Actuator Profile 6. 4.1.11

The communication-monitoring-option-code is expanded with the device control commands '"Disable voltage" and "Quick Stop".

Option code	Meaning of the option function	Substitute value
-32768 ... -1	Manufacturer-specific	
0	No action	
1	Malfunction	
2	Device control command "Disable voltage"	
3	Device control command "Quick-Stop"	
4 ... 32767	reserved for DRIVECOM profiles	

4.4.7 Process Data Control

Process-Input-Data-Description

This parameter contains the data defining which process input data is mapped to which communication objects. Communication objects that can be mapped to process input data are identified in the object function (Chapter 5). If the entered indices do not conform to the subindices, description of this parameter is discontinued and an error message is issued.

.

Attribute	**Value**
Index, Name	6000, PI-data description
Object class	mandatory
Access	Write-All, Read-All
Process data mapping	Not possible
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	Status, Speed-Actual

"Process-Output-Data-Description"

This parameter contains the data defining the communication objects to which the process output data is mapped. Mapping of the process output data to the communication object is interrupted by writing this parameter. Communication objects that can be mapped to process output data are identified in the object function (Chapter 5). If the entered indices do not conform to the subindices, description of this parameter is discontinued and an error message is issued.

Attribute	**Value**
Index, Name	6001, PO-Data-Description
Object class	mandatory
Access	Write-All, Read-All
Process data mapping	Not possible
Unit	-
Value range	-
Mandatory range	-
Default value	-
Substitute value	Control, Speed-Set

"Process-Output-Data-Enable"

The drive controller is informed with this parameter that the process output data is enabled. The "Process-Output-Data-Enable" parameter may assume the value TRUE to enable the process data channel and the value FALSE to disable it. This parameter must be implemented if the "Process-Output-Data-Description" parameter has been implemented.

Attribute	**Value**
Index, Name	6002, PO-Data-Enable
Object class	mandatory
Access	Write-All, Read-All
Process data mapping	Not possible
Unit	-
Value range	Bool
Mandatory range	Bool
Default value	True
Substitute value	-

5 Data Structures

This chapter brings together the data structures of all user data.

The parameters of a drive device are stored in an object dictionary. This object dictionary serves as a description of the parameters. It contains data on the index, data type, object type, access rights, etc. The index serves as parameter addressing when writing or reading. This object dictionary can be read with the ‘communication object-list-read’ function.

For the structure of the object dictionary see Sensor/Actuator Profile.

For a list of the parameters addressable via the communication, see Appendix A.

6 Device Relationships

7 Operating Phases of the Application

7.1 Initialisation/Abort

Initialisation

When the voltage is switched on or the device has returned to position, the sequence begins.

The following actions are carried out:

- initialisation of the communication interface;
- initialisation of the process data;
- initialisation of the parameters.

Initialisation of the communication interface

The communication relation is parametrised with the following values:

PMS-CRL-Parameter	Value
PMS-Service-Supported	Read.ind/res,Write.ind/res, (all other services optional)
Max-Outstanding-Services	1
Max-PDU-Sending-High-Prio	0
Max-PDU-Sending-Low-Prio	Manufacturer-specific
Max-PDU-Receiving-High-Prio	0
Max-PDU-Receiving-Low-Prio	Manufacturer-specific

Initialisation of the process data

The process in- and output data registers are pre-set with zero.

Initialisation of the parameters

The following communication objects must be parametrised in the sequence with the respective stored values, or, if not available, with Substitute values.

Communication-Object	Value	Substitute value
Process Data-Monitoring-Time	FFFF	off
Process Data-Monitoring-Option Code	0	no response
Communication-Monitoring Time	FFFF	off
Communication-Monitoring-Option Code	0	no response
Clear-Connection-Option Code	0	no response
Process-Input Data Description	4	Length = 4 bytes
	6041,00	'Status word'
	6044,00	'Speed-Actual value'
	0000,00	0000,00
Process-Output Data Description	4	Length = 4 bytes
	6040,00	'Control word'
	6042,00	'Speed-Setpoint'
	0000,00	
	0000,00	

Abort

The following actions are carried out:

- reset of the process data

If the communication and application become disconnected, the process input data are set to zero if the application unit fails.

7.2 Operating Phase

The functions indicated in the ‘Function Group Dictionary’ may be active in the ‘operation’ operation phase, depending on the mode of operation.

The following functions are always active:

- Device Control State Machine;
- Communication Functions;
- General Functions.

7.3 Commissioning and Planning Phase

8 Communication Profile

8.1 Layer 1

All definitions concerning layer 1 are described in this chapter.

InterBus-S coupling

InterBus-S can be coupled through the following interfaces:

- Remote bus interface
- Local bus interface

Remote bus interface

- D-SUB 9-pole (male) to the controller
- D-SUB 9-pole (female) to the bus end
- IN interface, electrically isolated, 500 V AC
- OUT interface, electrically isolated, 500 V AC (OPTIONAL)
- 2-wire ring
- Diagnostic LEDs
    - Remote bus control (RC), green
    - Remote bus disable (Rbd), red
    - Bus active (BA), green
    - Transmit (TR), yellow (OPTIONAL)

Local bus interface

- D-SUB, 15-pole
- Interface electrically isolated, 500 V AC
- Diagnostic LED operating voltage (5 V) green

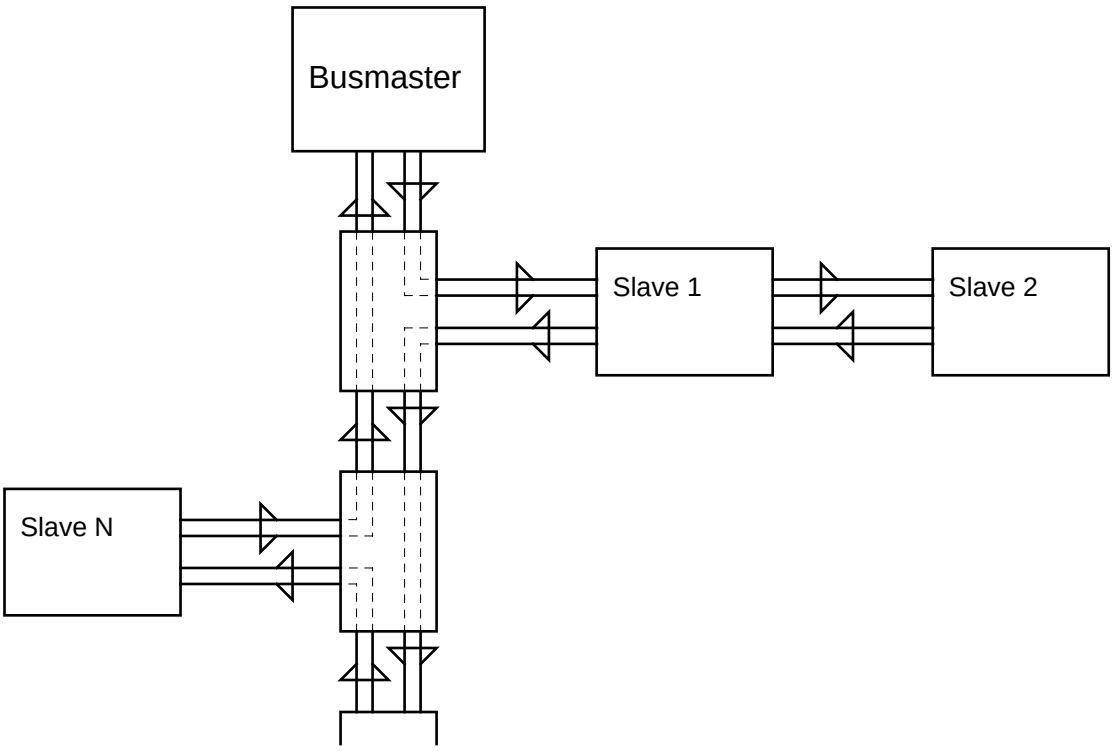
.

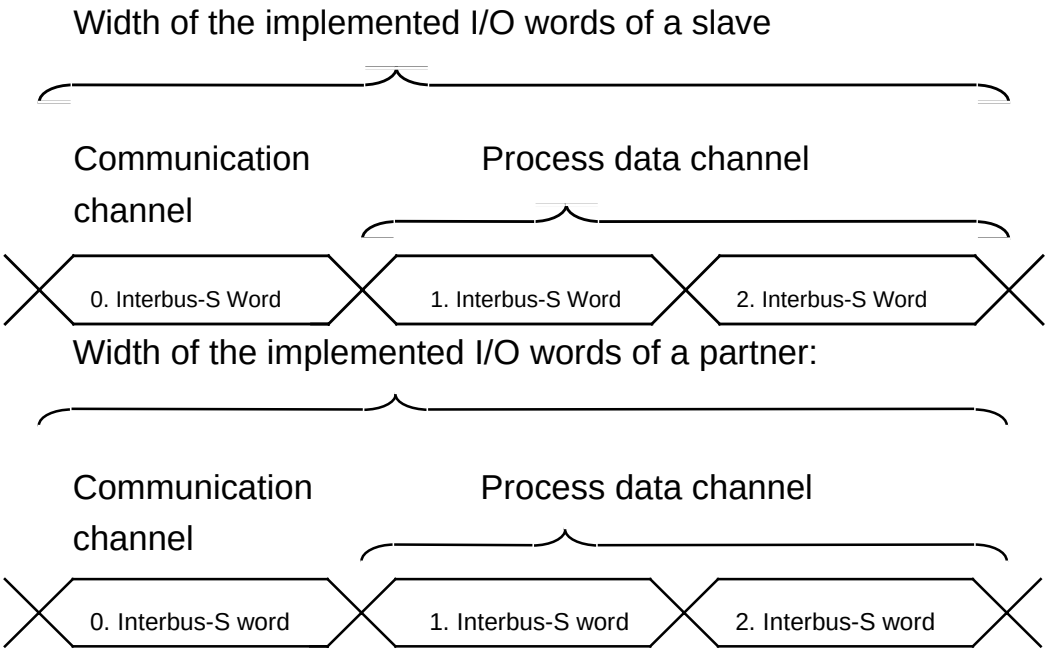
8.2 Layer 2

All definitions concerning layer 2 are described in this chapter.

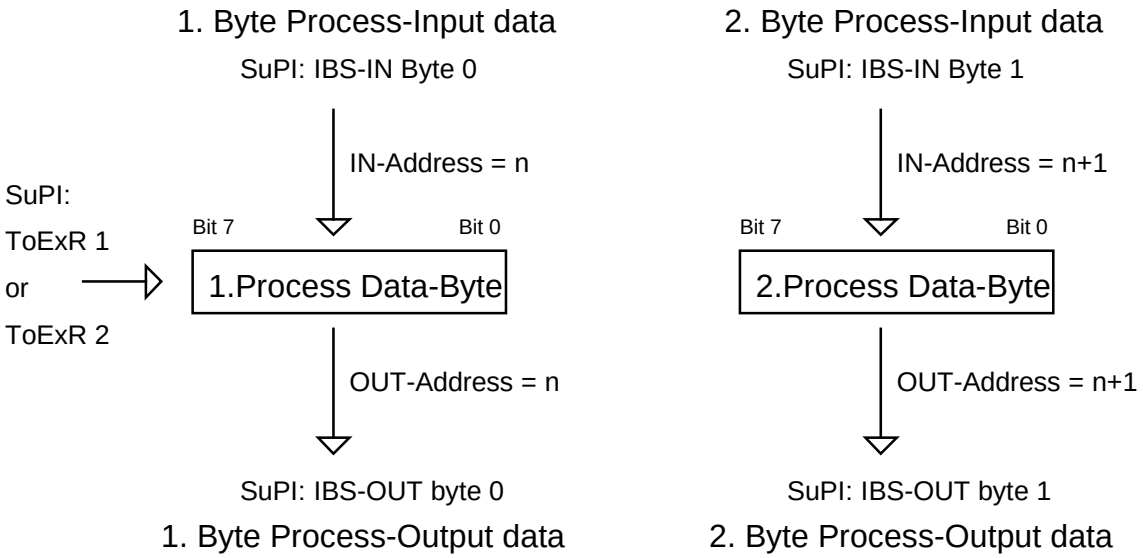
InterBus-S registers

The configuration of the data registers belonging to an InterBus-S node, and thus addressing at the I/O level, is defined below.





Addressing process data:



Process data direction:

- Process input data is transferred from the drive to the bus system.
- Process output data is transferred from the bus system to the drive.

Identification of InterBus-S communication partners

The ID-Code of a DRIVECOM device is structured in the following way:

			Data width	ID number

IBS-Coupling	ID number
Remotebus	1110 0011
Localbus	1100 0011

Data width InterBus-S register

The following values are permissible for the numbering of the InterBus-S register.

InterBus-S register (Words)	Data width	Process data-channel-length (for parameter-channel-length of 1 word) (Words)	
3	---0 0011	2	mandatory
4	---0 0100	3	
5	---0 0101	4	
6	---0 1110	5	
7	---0 1111	6	
8	---0 0110	7	
9	---0 0111	8	
10	---1 0101	9	
12	---1 0110	11	
14	---1 0111	13	
16	---1 0010	14	
24	---1 0011	23	
26	---1 0001	25	
32	---1 0100	31	

The InterBus register number 3 must be adjustable.

8.3 Layer 7

Appendix A

Object dictionary

This appendix lists the descriptions of all the objects of DRIVECOM-Profile 22 in table format. The object dictionary is sorted according to various criteria; thus access to the objects according to different criteria is possible.

This appendix contains tables, sorted according to the following criteria:

- Name of the object;
- Index of the object;
- Function group, to which the object belongs
    - all objects;
    - only those objects, that are mandatory in at least one mode of operation.

Column headings

The column headings in the tables have the following meaning (listed alphabetically):

from Profile Version

Indicates from which profile the parameter is defined:

21	from DRIVECOM-Profile 21 (rotational speed varying drives);
22	from DRIVECOM-Profile 22 (positioning drives);
21 12	from DRIVECOM-Profile 21 (rotational speed varying drives), then taken into the Sensor/Actuator-Profile 12 since it is a parameter which is generally important for devices with Sensor/Actuator operation. Also available in DRIVECOM-Profile 22 which makes reference to Sensor/Actuator Profile 12;
22 12	from Sensor/Actuator-Profile 12, also available in DRIVECOM-Profile 22, which makes reference to the Sensor/Actuator-Profile 12.

Access-Rights

Access rights

Abbreviations used:

Ra	Read all
Wa	Write all

Data-Type

Data type, which is stored in the objects as data type index code.

Abbreviations used:

Bool	Boolean
Date	Date
i8	Integer 8
i16	Integer 16
i32	Integer 32
OctStr	Octet-String
PDB	Process data description
Ramp	Ramp
u8	Unsigned 8
u16	Unsigned 16
u32	Unsigned 32
VisStr	Visible String

PDB and Ramp are data types defined specifically for the profile.

Default value

The value which the parameter has when the drive controller is switched on.

Unit

Unit of measurement of the object

Abbreviations used (in alphabetical order):

A	Ampere
B	Acceleration units
G1a	Speed units of speed function 1 (including the setpoint-factor)
G1b	Speed units of speed function 1 (not including the setpoint-factor)
G1ref	Speed-reference value
G2	Speed units of speed function 2
Hz	Hertz
In	Nominal current
incr	Position sensor increments
L	Position sensor units
min	minutes
Mn	Nominal torque
msec	Milliseconds
Nm	Newtonmeter
Quotient	Quotient from several units; too complex for entry in the table
sec	Seconds

Unit	Unit index according to Sensor/Actuator-Profile 12
V	Volt
Value	Value index according to Sensor/Actuator-Profile 12
%	Percent
o/oo	Thousandths
-	Entry of unit not possible

If necessary the resolution is given with the unit as power of ten.

Elemen.

Abbreviation for "Elements"

Number of elements in an object, with structural objects (Array or Record)

"n" means the number of elements is not fixed, but is to be set by the manufacturer of the drive controller.

Substitute value

If the parameter is not implemented, the drive controller must behave as though the parameter with this fixed value (the Substitute value) has been implemented.

Index

Index of the object.

Chapter Profile

Number of chapters in this text in which the object is defined.

Len.

Abbreviation for "Length"

Length of the object in Bytes (given only if the length is not implied by the type (data type) of the object).

"n" means, that the number of elements is not fixed, but is to be set by the manufacturer of the drive controller.

m/o

Abbreviation for "Object class"

Possible values:

m = mandatory;

o = optional;

b = dependent on mode of operation.

Indicates whether the object has to be implemented (mandatory) or whether it can be left to the drive manufacturer to implement the object (optional). The value "Dependent on mode of operation" means that the object is mandatory or optional depending on the mode of operation which the drive controller is supporting (see also columns "m/o depending on mode of operation").

m/o for
Mode of operation

Object class with respect to the mode of operation supported by the drive controller.

Possible values:

m = mandatory for the current mode of operation;

o = optional for the current mode of operation;

- = not required for current mode of operation.

Indicates for each mode of operation whether the object is mandatory, optional or not required for the drive controllers which are supporting this mode of operation.

The modes of operation are abbreviated as follows:

Ge_1	Speed setting 1;
Position	End position setting;
Ge_2	Speed setting 2;
Torque	Torque setting;
Refe	Reference operation.

Name

Name of the object

Obj.-Code

Abbreviation for "Object-Code"

Possible values:

Array	Array;
Record	Record;
Var	Simple Variable.

PD-map.

Abbreviation for "Process data mapping"

Possible values:

E	It has to be possible to map object to process input data;
A	It has to be possible to map object to process output data;
-	Must not be possible to map object to process data;
empty	Mapping to process data optional (to be fixed by the manufacturer of the drive controller).

Mandatory range

The minimum value range which a drive controller has to support. The mandatory range is a (possibly improper) subset of the value range.

Value range

The maximum value range of the parameter. It can be restricted by the manufacturer.

Fields of the object description not listed in the tables

The following fields of the object description are not listed in the tables:

Access-Groups

This field is not listed in the tables, as it has the value 0 for all objects (no access-groups).

Extension

This field is not listed in the tables, as it is not available for all objects (no extension).

Local-Address

This field is not listed in the tables, as it has a manufacturer-specific value for all objects.

Password

This field is not listed in the tables, as it has the value 0 for all objects (no Password).

Variable-Name

This field is not listed in the tables, as it is not available for all objects (no Variable name).

Appendix B

Table B1: Status word
Meaning of the Bits in the different modes of operation

Bit	mandatory	Modes of operation					
		Speed setting 1	End position setting	Speed setting 2	Torque setting	Reference operation	Manual operation (planned)
0	x	Ready to switch on (Device Control State Machine)					
1	x	Ready (Device Control State Machine)					
2	x	Operation-enabled (Device Control State Machine)					
3	x	Malfunction (Device Control State Machine)					
4	x	Voltage-disabled					
5	x	Quick Stop (Device Control State Machine)					
6	x	Switch-on-disabled (Device Control State Machine)					
7		Warning					
8		Message					
9	x	Remote					
10	x	Setpoint-attained					
		Speed	Position	Speed	Torque	Speed	reserved
11	x	Limit value					
12		reserved	Setpoint-Acknowledgement	Speed=0	reserved	Reference-attained	reserved
13		reserved	Trail error Position	reserved	reserved	Reference-error	reserved
14		Manufacturer-specific					
15		Manufacturer-specific					

Table B2: Control word
Meaning of the Bits in the different Modes of operation

Bit	mandatory	Modes of operation					
		Speed setting 1	End position setting	Speed setting 2	Torque setting	Reference operation	Manual operation (planned)
0	x	Switch on (Device Control State Machine)					
1	x	Disable voltage (Device Control State Machine)					
2	x	Quick Stop (Device Control State Machine)					
3	x	Enable operation (Device Control State Machine)					
4		RFG-Disable	New-Setpoint	reserved	reserved	Reference operation-Start	reserved
5		RFG-Stop	Immediately change block	reserved	reserved	reserved	reserved
6		RFG-Zero	Absolute/Relative	reserved	reserved	reserved	reserved
7	x	Reset-malfunction (Device Control State Machine)					
8		reserved					
9		reserved					
10		reserved					
11		Manufacturer-specific					
12		Manufacturer-specific					
13		Manufacturer-specific					
14		Manufacturer-specific					
15		Manufacturer-specific					

Appendix C

Table C1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by name (continued)

Chapter Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of operation					PD-abb.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.2.5	607B	Range-Limit	Array	2	i32		Ra Wa	b	-	o	o	o	o							22
4.2.5	6083	Acceleration	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
4.2.5	6087	Acceleration-Torque	Var		u32		Ra Wa	b	-	-	-	o	-		1/sec^2	u16	-	-	-	22
4.2.6	608D	Acceleration-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8		-	-	22
4.2.6	6097	Acceleration-Factor	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	608E	Acceleration-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8		-	-	22
4.1.1	605C	Disable-Operation-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	1	21
4.1.2	6061	Modes of Operation-Display	Var		i16		Ra	m	m	m	m	m	m		-	i8	-	-	-	22
4.1.2	6060	Modes of Operation-Option-Code	Var		i16		Ra Wa	m	m	m	m	m	m		Option Code	i8	-	-	-	22
4.2.1	604C	Dimension-Factor	Array	2	i32		Ra Wa	b	o	-	-	-	-							21
4.2.5	6080	Speed-Motor-Max-Amount	Var		u32		Ra Wa	b	-	o	o	o	-		10^{-3} 1/min	u16	-	-	-	22
4.2.1	6057	Speed-Motor-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6056	Speed-Motor-Min-Max-Amount	Array	2	u32		Ra Wa	b	o	-	-	-	-							21
4.2.3	6069	Rotational-Speed-Sensor-Actual Value	Var		i32		Ra	b	-	o	o	o	-		Incr/sec	i32	-	-	-	22
4.2.5	6082	End-Speed	Var		i32		Ra Wa	b	-	o	-	-	-		G2	i32	-	0	0	22
4.2.1	6059	Frecuency-Motor-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6058	Frecuency-Motor-Min-Max-Amount	Array	2	u32		Ra Wa	b	o	-	-	-	-							21
4.3	600F	Function-Groups-Description	Array	n	OctStr	4	Ra	m	m	m	m	m	m		-					22
4.2.3	606A	Sensor-Option-Code	Var		i16		Ra Wa	b	-	o	o	o	-		Option Code	i16	-	-	-	22
4.3	600C	Device-Description	Var		VisStr	64	Ra Wa	o	o	o	o	o	o		-		-	-	-	22 12
4.2.1	6048	Speed-Acceleration	Record		Ramp		Ra Wa	b	m	-	-	-	-							21
4.2.1	604E	Speed-Reference-Value	Var		u32		Ra Wa	b	o	-	-	-	-		G1b	u32	-	-	-	21
4.2.6	608B	Speed-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8	73	-	-	22
4.2.6	6095	Speed-Factor-1	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6096	Speed-Factor-2	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6094	Speed-Factor-Set	Array	2	u32		Ra Wa	b	-	-	o	-	-							22

Table C1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by name (continued)

Chapter Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.2.3	606D	Speed-Window	Var		u32		Ra Wa	b	-	o	o	-	-		G2	u16	-	-	-	22
4.2.3	606E	Speed-Window-Time	Var		u16		Ra Wa	b	-	o	o	-	-		msec	u16	-	0	0	22
4.2.3	606B	Speed-Command-Variable	Var		i32		Ra	b	-	o	o	o	-		G2	i32	-	-	-	22
4.2.1	6043	Speed-Command-Variable	Var		i16		Ra	b	m	-	-	-	-		G1a	i16	i16	-	-	21
4.2.6	608C	Speed-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8	11	-	-	22
4.2.3	606C	Speed-Actual-Value	Var		i32		Ra	b	-	o	m	o	-		G2	i32		-	-	22
4.2.1	6044	Speed-Actual-Value	Var		i16		Ra	b	m	-	-	-	-	E	Gla	i16	i16	-	-	21
4.2.5	607F	Speed-Max-Amount	Var		u32		Ra Wa	b	-	o	o	o	-		G2	u32	-	-	-	22
4.2.1	6047	Speed-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6046	Speed-Min-Max-Amount	Array	2	u32		Ra Wa	b	m	-	-	-	-							21
4.2.1	604A	Speed-Quick-Stop	Record		Ramp		Ra Wa	b	o	-	-	-	-							21
4.2.3	606F	Speed-Threshold	Var		u32		Ra Wa	b	-	o	o	o	-		G2	u16	-	0	0	22
4.2.3	6070	Speed-Threshold-Time	Var		u16		Ra Wa	b	-	o	o	o	-		msec	u16	-	0	0	22
4.2.1	6042	Speed-Setpoint	Var		i16		Ra Wa	b	m	-	-	-	-	A	G1a	i16	i16	0	-	21
4.2.1	6045	Speed-Manipulated-Variable	Var		i16		Ra	b	o	-	-	-	-		G1a	i16	i16	-	-	21
4.2.1	6049	Speed-Deceleration	Record		Ramp		Ra Wa	b	m	-	-	-	-							21
4.2.6	6090	Speed-Sensor-Resolution	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6091	Transmission	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.1.1	605D	Stop-Option-Code	Var		i16		Ra Wa	b	o	-	-	-	-		Option Code	i16	a profile-spec. Code	-	1	21
4.2.1	604F	Ramp-Function-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
4.4	6006	C-Monitoring-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
4.4	6005	C-Monitoring-Time	Var		u16		Ra Wa	o	o	o	o	o	o		msec	u16	65535	-	65535	21 12
4.3	600B	Calibrating-Date	Var		Date		Ra	o	o	o	o	o	o		Date	Date	-	-	-	22 12
4.3	6008	Identification-Number	Var		u16		Ra Wa	o	o	o	o	o	o		-	u16	u16	-	-	21 12
4.2.6	6089	Position-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8	0	-	-	22
4.2.6	6093	Position-Factor-Set	Array	2	u32		Ra Wa	b	-	o	-	-	-							22
4.2.2	6062	Position-Command-Variable	Var		i32		Ra	b	-	o	-	-	-		L	i32	-	-	-	22
4.2.5	607D	Position-Limit-Value-Min-Max	Array	2	i32		Ra Wa	b	-	o	o	o	-							22

Table C1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by name (continued)

Chapter Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.2.6	608A	Position-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8	32	-	-	22
4.2.2	6064	Position-Actual-Value	Var		i32		Ra	b	-	m	o	o	-		L	i32	-	-	-	22
4.2.6	608F	Position Sensor-Resolution	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.2	6063	Position Sensor-Actual-Value	Var		i32		Ra	b	-	o	o	o	-		Incr	i32	-	-	-	22
4.2.5	607A	End-Position	Var		i32		Ra Wa	b	-	m	-	-	-		L	i32	-	0	-	22
4.3	600D	Model-Description	Var		VisStr	64	Ra	o	o	o	o	o	o		-		-	-	-	22 12
4.2.4	6077	Torque-Actual-Value	Var		i16		Ra	b	-	o	o	o	-		o/oo Mn	i16	-	-	-	22
4.2.4	6072	Torque-Max-Amount	Var		u16		Ra Wa	b	-	o	o	o	-		o/oo Mn	u16	-	-	-	22
4.2.4	6074	Torque-Command-Variable	Var		i16		Ra	b	-	o	o	o	-		o/oo Mn	u16	-	-	-	22
4.2.4	6071	Torque-Setpoint-External	Var		i16		Ra Wa	b	-	-	-	m	-		o/oo Mn	i16	-	0	0	22
4.2.4	6076	Nominal-Torque-Motor	Var		u16		Ra Wa	b	-	o	o	o	-		10^{-1} Nm	u16	-	-	-	22
4.2.4	6075	Nominal-Current-Motor	Var		u16		Ra Wa	b	-	o	o	o	-		10^{-1} A	u16	-	-	-	22
4.4	6001	PO-Data-Description	Record		PDB		Ra Wa	m	m	m	m	m	m	-	-				Control,Speed-Set	21 12
4.4	6002	PO-Data-Enable	Var		Bool		Ra Wa	m	m	m	m	m	m	-	-	Bool	Bool	True	-	21 12
4.3	6009	Block-Parameter-Identification	Var		u8		Ra Wa	o	o	o	o	o	o		-	u8	u8	-	-	21 12
4.3	600E	Parameterisation-Date	Var		Date		Ra	o	o	o	o	o	o		Date	Date	-	-	-	22 12
4.4	6004	PD-Monitoring-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
4.4	6003	PD-Monitoring-Time	Var		u16		Ra Wa	o	o	o	o	o	o		msec	u16	65535	-	65535	21 12
4.4	6000	PI-Data-Description	Record		PDB		Ra Wa	m	m	m	m	m	m	-	-				Status,Speed-Act.	21 12
4.2.5	607E	Polarities	Var		OctStr	1	Ra Wa	b	-	o	o	o		o	-		-	0	0	22
4.2.1	604D	Pole-Number	Var		u8		Ra Wa	b	o	-	-	-	-		Pole	u8	-	-	-	21
4.2.2	6067	Positioning-Window	Var		u32		Ra Wa	b	-	o	-	-	-		L	u32	-	-	0	22
4.2.2	6068	Positioning Window-Time	Var		u16		Ra Wa	b	-	o	-	-	-		msec	u16	-	-	0	22
4.2.1	6053	Percentage-Command-Variable	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
4.2.1	6054	Percentage-Actual-Value	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
4.2.1	6052	Percentage-Setpoint	Var		i16		Ra Wa	b	o	-	-	-	-		% G1refer.	i16	i16	0	-	21
4.2.1	6055	Percentage-Manipulated-Variable	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
4.4	6011	Process-Output-Data	Var		OctStr	n	Ra	o	o	o	o	o	o		-	-	-	-	-	22 12

Table C1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by name (completed)

Chapter Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.4	6010	Process-Input-Data	Var		OctStr	n	Ra Wa	o	o	o	o	o	o		-	-	-	-	-	22 12
4.2.5	6086	Ramp-Form-Speed	Var		i16		Ra Wa	b	-	o	o	o	-		Option Code	i16	-	-	-	22
4.2.5	6088	Ramp-Form-Torque	Var		i16		Ra Wa	b	-	-	-	o	-		Option Code	i16	-	-	-	22
4.2.7	609A	Reference-Operation-Acceleration	Var		u32		Ra Wa	b	-	-	-	-	o		B	u32	-	-	-	22
4.2.7	6099	Reference-Operation-Speed	Var		u32		Ra Wa	b	-	-	-	-	m		G2	u32	-	-	-	22
4.2.7	6098	Reference-Operation-Option-Code	Var		i16		Ra Wa	b	-	-	-	-	m		Option Code	i8	0	0	0	22
4.2.5	607C	Reference-Measurement-Offset	Var		i32		Ra Wa	b	-	o	-	-	m		L	i32	-	-	0	22
4.2.2	6065	Trail-Error-Window	Var		u32		Ra Wa	b	-	o	o	-	-		L	u32	-	-	-	22
4.2.2	6066	Trail-Error-Window-Time	Var		u16		Ra Wa	b	-	o	o	-	-		msec	u16	-	-	0	22
4.2.5	6085	Quick-Stop	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
4.1.1	605A	Quick-Stop-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	1	21
4.2.1	6051	Quick-Stop-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
4.3	600A	Serial-Number	Var		u32		Ra	o	o	o	o	o	o		-	u32	-	-	-	22 12
4.2.1	604B	Setpoint-Factor	Array	2	i16		Ra Wa	b	o	-	-	-	-			21				
4.1.1	6041	Status-Word	Var		OctStr	2	Ra	m	m	m	m	m	m	E	-	-	-	0	-	21
4.1.1	6040	Control-Word	Var		OctStr	2	Ra Wa	m	m	m	m	m	m	A	-	-	-	0	-	21
4.1.1	605B	Shutdown-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	0	21
4.2.4	6078	Current-Actual-Value	Var		i16		Ra	b	-	o	o	o	-		o/oo In	i16	-	-	-	22
4.2.4	6073	Current-Max-Amount	Var		u16		Ra Wa	b	-	o	o	o	-		o/oo In	u16	-	-	-	22
4.3	603F	Malfunction-Code	Var		OctStr	2	Ra	m	m	m	m	m	m		-			-	-	21 12
4.2.1	6050	Ramp-Down-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
4.4	6007	Abort-Connection-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
4.2.5	6081	Traverse-Path-Speed	Var		i32		Ra Wa	b	-	o	m	-	-		G2	i32	-	0	-	22
4.2.5	6084	Deceleration	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
4.2.6	6092	Advance-Constant	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.4	6079	Intermediate-Circuit-Voltage	Var		u16		Ra	b	-	o	o	o	-		V	u16	-	-	-	22

Appendix D

Table D1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by index (continued)

Chapter Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.4	6000	PI-Data-Description	Record		PDB		Ra Wa	m	m	m	m	m	m	-	-				Status,Speed-Act.	21 12
4.4	6001	PO-Data-Description	Record		PDB		Ra Wa	m	m	m	m	m	m	-	-				Control,Speed-Set	21 12
4.4	6002	PO-Data-Enable	Var		Bool		Ra Wa	m	m	m	m	m	m	-	-	Bool	Bool	True	-	21 12
4.4	6003	PD-Monitoring-Time	Var		u16		Ra Wa	o	o	o	o	o	o		msec	u16	65535	-	65535	21 12
4.4	6004	PD-Monitoring -Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
4.4	6005	C-Monitoring-Time	Var		u16		Ra Wa	o	o	o	o	o	o		msec	u16	65535	-	65535	21 12
4.4	6006	C-Monitoring -Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
4.4	6007	Abort-Connection-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
4.3	6008	Identification-Number	Var		u16		Ra Wa	o	o	o	o	o	o		-	u16	u16	-	-	21 12
4.3	6009	Block-Parameter-Identification	Var		u8		Ra Wa	o	o	o	o	o	o		-	u8	u8	-	-	21 12
4.3	600A	Serial-Number	Var		u32		Ra	o	o	o	o	o	o		-	u32	-	-	-	22 12
4.3	600B	Calibrating-Date	Var		Date		Ra	o	o	o	o	o	o		Date	Date	-	-	-	22 12
4.3	600C	Device-Description	Var		VisStr	64	Ra Wa	o	o	o	o	o	o		-		-	-	-	22 12
4.3	600D	Model-Description	Var		VisStr	64	Ra	o	o	o	o	o	o		-		-	-	-	22 12
4.3	600E	Parameterisation-Date	Var		Date		Ra	o	o	o	o	o	o		Date	Date	-	-	-	22 12
4.3	600F	Function-Group-Description	Array	n	OctStr	4	Ra	m	m	m	m	m	m		-					22
4.4	6010	Process-Input data	Var		OctStr	n	Ra Wa	o	o	o	o	o	o		-	-	-	-	-	22 12
4.4	6011	Process-Output data	Var		OctStr	n	Ra	o	o	o	o	o	o		-	-	-	-	-	22 12
4.3	603F	Malfunction-Code	Var		OctStr	2	Ra	m	m	m	m	m	m		-			-	-	21 12
4.1.1	6040	Control Word	Var		OctStr	2	Ra Wa	m	m	m	m	m	m	A	-	-	-	0	-	21
4.1.1	6041	Status Sord	Var		OctStr	2	Ra	m	m	m	m	m	m	E	-	-	-	0	-	21
4.2.1	6042	Speed-Setpoint	Var		i16		Ra Wa	b	m	-	-	-	-	A	G1a	i16	i16	0	-	21
4.2.1	6043	Speed-Command-Variable	Var		i16		Ra	b	m	-	-	-	-		G1a	i16	i16	-	-	21
4.2.1	6044	Speed-Actual-Value	Var		i16		Ra	b	m	-	-	-	-	E	Gla	i16	i16	-	-	21
4.2.1	6045	Speed-Manipulated-Variable	Var		i16		Ra	b	o	-	-	-	-		G1a	i16	i16	-	-	21
4.2.1	6046	Speed-Min-Max-Amount	Array	2	u32		Ra Wa	b	m	-	-	-	-							21

Table D1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by index (continued)

Chap. Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.2.1	6047	Speed-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6048	Speed-Acceleration	Record		Ramp		Ra Wa	b	m	-	-	-	-							21
4.2.1	6049	Speed-Deceleration	Record		Ramp		Ra Wa	b	m	-	-	-	-							21
4.2.1	604A	Speed-Quick-Stop	Record		Ramp		Ra Wa	b	o	-	-	-	-							21
4.2.1	604B	Setpoint-Factor	Array	2	i16		Ra Wa	b	o	-	-	-	-			21				
4.2.1	604C	Dimension-Factor	Array	2	i32		Ra Wa	b	o	-	-	-	-							21
4.2.1	604D	Pole-Number	Var		u8		Ra Wa	b	o	-	-	-	-		Pole	u8	-	-	-	21
4.2.1	604E	Speed-Reference-Value	Var		u32		Ra Wa	b	o	-	-	-	-		G1b	u32	-	-	-	21
4.2.1	604F	Ramp-Function-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
4.2.1	6050	Ramp-Down-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
4.2.1	6051	Quick-Stop-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
4.2.1	6052	Percentage-Setpoint	Var		i16		Ra Wa	b	o	-	-	-	-		% G1refer.	i16	i16	0	-	21
4.2.1	6053	Percentage-Command-Variable	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
4.2.1	6054	Percentage-Actual-Value	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
4.2.1	6055	Percentage-Manipulated-Variable	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
4.2.1	6056	Speed-Motor-Min-Max-Amount	Array	2	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6057	Speed-Motor-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6058	Frequency-Motor-Min-Max-Amount	Array	2	u32		Ra Wa	b	o	-	-	-	-							21
4.2.1	6059	Frequency-Motor-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.1.1	605A	Quick Stop-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	1	21
4.1.1	605B	Shut down-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	0	21
4.1.1	605C	Disable-Operation-Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	1	21
4.1.1	605D	Stop-Option-Code	Var		i16		Ra Wa	b	o	-	-	-	-		Option Code	i16	a profile-spec. Code	-	1	21
4.1.2	6060	Modes of Operation-Option Code	Var		i16		Ra Wa	m	m	m	m	m	m		Option Code	i8	-	-	-	22
4.1.2	6061	Modes of Operation-Display	Var		i16		Ra	m	m	m	m	m	m		-	i8	-	-	-	22
4.2.2	6062	Position-Command-Variable	Var		i32		Ra	b	-	o	-	-	-		L	i32	-	-	-	22
4.2.2	6063	Position-Sensor-Actual-Value	Var		i32		Ra	b	-	o	o	o	-		Incr	i32	-	-	-	22
4.2.2	6064	Position-Actual-Value	Var		i32		Ra	b	-	m	o	o	-		L	i32	-	-	-	22

Table D1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by index (continued)

Chap. Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.2.2	6065	Trail-Error-Window	Var		u32		Ra Wa	b	-	o	o	-	-		L	u32	-	-	-	22
4.2.2	6066	Trail-Error-Window-Time	Var		u16		Ra Wa	b	-	o	o	-	-		msec	u16	-	-	0	22
4.2.2	6067	Positioning-Window	Var		u32		Ra Wa	b	-	o	-	-	-		L	u32	-	-	0	22
4.2.2	6068	Positioning-Window-Time	Var		u16		Ra Wa	b	-	o	-	-	-		msec	u16	-	-	0	22
4.2.3	6069	Rotational-Speed-Sensor-Actual Value	Var		i32		Ra	b	-	o	o	o	-		Incr/sec	i32	-	-	-	22
4.2.3	606A	Sensor-Option-Code	Var		i16		Ra Wa	b	-	o	o	o	-		Option Code	i16	-	-	-	22
4.2.3	606B	Speed-Command-Variable	Var		i32		Ra	b	-	o	o	o	-		G2	i32	-	-	-	22
4.2.3	606C	Speed-Actual-Value	Var		i32		Ra	b	-	o	m	o	-		G2	i32		-	-	22
4.2.3	606D	Speed-Window	Var		u32		Ra Wa	b	-	o	o	-	-		G2	u16	-	-	-	22
4.2.3	606E	Speed-Window-Time	Var		u16		Ra Wa	b	-	o	o	-	-		msec	u16	-	0	0	22
4.2.3	606F	Speed-Threshold	Var		u32		Ra Wa	b	-	o	o	o	-		G2	u16	-	0	0	22
4.2.3	6070	Speed-Threshold-Time	Var		u16		Ra Wa	b	-	o	o	o	-		msec	u16	-	0	0	22
4.2.4	6071	Torque-Setpoint-External	Var		i16		Ra Wa	b	-	-	-	m	-		o/oo Mn	i16	-	0	0	22
4.2.4	6072	Torque-Max-Amount	Var		u16		Ra Wa	b	-	o	o	o	-		o/oo Mn	u16	-	-	-	22
4.2.4	6073	Current-Max-Amount	Var		u16		Ra Wa	b	-	o	o	o	-		o/oo In	u16	-	-	-	22
4.2.4	6074	Torque-Command-Variable	Var		i16		Ra	b	-	o	o	o	-		o/oo Mn	u16	-	-	-	22
4.2.4	6075	Nominal-Current-Motor	Var		u16		Ra Wa	b	-	o	o	o	-		10^{-1} A	u16	-	-	-	22
4.2.4	6076	Nominal-Torque-Motor	Var		u16		Ra Wa	b	-	o	o	o	-		10^{-1} Nm	u16	-	-	-	22
4.2.4	6077	Torque-Actual-Value	Var		i16		Ra	b	-	o	o	o	-		o/oo Mn	i16	-	-	-	22
4.2.4	6078	Current-Actual-Value	Var		i16		Ra	b	-	o	o	o	-		o/oo In	i16	-	-	-	22
4.2.4	6079	Intermediate-Circuit-Voltage	Var		u16		Ra	b	-	o	o	o	-		V	u16	-	-	-	22
4.2.5	607A	End-Position	Var		i32		Ra Wa	b	-	m	-	-	-		L	i32	-	0	-	22
4.2.5	607B	Range-Limit	Array	2	i32		Ra Wa	b	-	o	o	o	o							22
4.2.5	607C	Reference-Measurement-Offset	Var		i32		Ra Wa	b	-	o	-	-	m		L	i32	-	-	0	22
4.2.5	607D	Position-Limit-Value-Min-Max	Array	2	i32		Ra Wa	b	-	o	o	o	-							22
4.2.5	607E	Polarities	Var		OctStr	1	Ra Wa	b	-	o	o	o		o	-		-	0	0	22
4.2.5	607F	Speed-Max-Amount	Var		u32		Ra Wa	b	-	o	o	o	-		G2	u32	-	-	-	22
4.2.5	6080	Speed-Motor-Max-Amount	Var		u32		Ra Wa	b	-	o	o	o	-		10^{-3} 1/min	u16	-	-	-	22

Table D1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by index (completed)

Chap. Profile	Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
									Ge_1	Position	Ge_2	Torque	Refe							
4.2.5	6081	Traverse-Path-Speed	Var		i32		Ra Wa	b	-	o	m	-	-		G2	i32	-	0	-	22
4.2.5	6082	End-Speed	Var		i32		Ra Wa	b	-	o	-	-	-		G2	i32	-	0	0	22
4.2.5	6083	Acceleration	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
4.2.5	6084	Deceleration	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
4.2.5	6085	Quick Stop	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
4.2.5	6086	Ramp-Form-Speed	Var		i16		Ra Wa	b	-	o	o	o	-		Option Code	i16	-	-	-	22
4.2.5	6087	Acceleration-Torque	Var		u32		Ra Wa	b	-	-	-	o	-		$1/sec^2$	u16	-	-	-	22
4.2.5	6088	Ramp-Form-Torque	Var		i16		Ra Wa	b	-	-	-	o	-		Option Code	i16	-	-	-	22
4.2.6	6089	Position-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8	0	-	-	22
4.2.6	608A	Position-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8	32	-	-	22
4.2.6	608B	Speed-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8	73	-	-	22
4.2.6	608C	Speed-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8	11	-	-	22
4.2.6	608D	Acceleration-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8		-	-	22
4.2.6	608E	Acceleration-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8		-	-	22
4.2.6	608F	Position Sensor-Resolution	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6090	Speed-Sensor-Resolution	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6091	Transmission	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6092	Advance-Constant	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6093	Position-Factor-Set	Array	2	u32		Ra Wa	b	-	o	-	-	-							22
4.2.6	6094	Speed-Factor-Set	Array	2	u32		Ra Wa	b	-	-	o	-	-							22
4.2.6	6095	Speed-Factor-1	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6096	Speed-Factor-2	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.6	6097	Acceleration-Factor	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.7	6098	Reference Operation-Option Code	Var		i16		Ra Wa	b	-	-	-	-	m		Option Code	i8	0	0	0	22
4.2.7	6099	Reference Operation-Speed	Var		u32		Ra Wa	b	-	-	-	-	m		G2	u32	-	-	-	22
4.2.7	609A	Reference Operation-Acceleration	Var		u32		Ra Wa	b	-	-	-	-	o		B	u32	-	-	-	22

Appendix E

Table E1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by function groups (continued)

Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
								Ge_1	Position	Ge_2	Torque	Refe							
4.1.1 Device control-State Machine																			
6040	Control Word	Var		OctStr	2	Ra Wa	m	m	m	m	m	m	A	-	-	-	0	-	21
6041	Status Word	Var		OctStr	2	Ra	m	m	m	m	m	m	E	-	-	-	0	-	21
605A	Quick Stop-Option Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	1	21
605B	Shut down-Option Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	0	21
605C	Disable-Operation-Option Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	a profile-spec. Code	-	1	21
605D	Stop-Option Code	Var		i16		Ra Wa	b	o	-	-	-	-		Option Code	i16	a profile-spec. Code	-	1	21
4.1.2 Modes of Operation																			
6060	Modes of Operation-Option Code	Var		i16		Ra Wa	m	m	m	m	m	m		Option Code	i8	-	-	-	22
6061	Modes of Operation-Display	Var		i16		Ra	m	m	m	m	m	m		-	i8	-	-	-	22
4.2.1 Speed-Function Group 1																			
6042	Speed-Setpoint	Var		i16		Ra Wa	b	m	-	-	-	-	A	G1a	i16	i16	0	-	21
6043	Speed-Command Variable	Var		i16		Ra	b	m	-	-	-	-		G1a	i16	i16	-	-	21
6044	Speed-Actual Value	Var		i16		Ra	b	m	-	-	-	-	E	Gla	i16	i16	-	-	21
6045	Speed-Manipulated Variable	Var		i16		Ra	b	o	-	-	-	-		G1a	i16	i16	-	-	21
6046	Speed-Min-Max-Amount	Array	2	u32		Ra Wa	b	m	-	-	-	-							21
6047	Speed-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
6048	Speed-Acceleration	Record		Ramp		Ra Wa	b	m	-	-	-	-							21
6049	Speed-Deceleration	Record		Ramp		Ra Wa	b	m	-	-	-	-							21
604A	Speed-Quick Stop	Record		Ramp		Ra Wa	b	o	-	-	-	-							21
604B	Setpoint-Factor	Array	2	i16		Ra Wa	b	o	-	-	-	-			21				
604C	Dimension-Factor	Array	2	i32		Ra Wa	b	o	-	-	-	-							21
604D	Pole Number	Var		u8		Ra Wa	b	o	-	-	-	-		Pole	u8	-	-	-	21
604E	Speed-Reference Value	Var		u32		Ra Wa	b	o	-	-	-	-		G1b	u32	-	-	-	21

Table E1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by function groups (continued)

Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
								Ge_1	Position	Ge_2	Torque	Refe							
604F	Ramp-Function-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
6050	Ramp-Down-Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
6051	Quick Stop Time	Var		u32		Ra Wa	b	o	-	-	-	-		msec	u32	-	-	-	21
6052	Percentage-Setpoint	Var		i16		Ra Wa	b	o	-	-	-	-		% G1refer.	i16	i16	0	-	21
6053	Percentage-Command-Variable	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
6054	Percentage-Actual-Value	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
6055	Percentage-Manipulated-Variable	Var		i16		Ra	b	o	-	-	-	-		% G1refer.	i16	i16	-	-	21
6056	Speed-Motor-Min-Max-Amount	Array	2	u32		Ra Wa	b	o	-	-	-	-							21
6057	Speed-Motor-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
6058	Frequency-Motor-Min-Max-Amount	Array	2	u32		Ra Wa	b	o	-	-	-	-							21
6059	Frequency-Motor-Min-Max	Array	4	u32		Ra Wa	b	o	-	-	-	-							21
4.2.2 Position-Function Group																			
6062	Position-Command-Variable	Var		i32		Ra	b	-	o	-	-	-		L	i32	-	-	-	22
6063	Position-Sensor-Actual Value	Var		i32		Ra	b	-	o	o	o	-		Incr	i32	-	-	-	22
6064	Position-Actual Value	Var		i32		Ra	b	-	m	o	o	-		L	i32	-	-	-	22
6065	Trail-Error-Window	Var		u32		Ra Wa	b	-	o	o	-	-		L	u32	-	-	-	22
6066	Trail-Error-Window-Time	Var		u16		Ra Wa	b	-	o	o	-	-		msec	u16	-	-	0	22
6067	Positioning-Window	Var		u32		Ra Wa	b	-	o	-	-	-		L	u32	-	-	0	22
6068	Positioning-Window-Time	Var		u16		Ra Wa	b	-	o	-	-	-		msec	u16	-	-	0	22
4.2.3 Speed-Function Group 2																			
6069	Rotational-Speed-Sensor-Actual Value	Var		i32		Ra	b	-	o	o	o	-		Incr/sec	i32	-	-	-	22
606A	Sensor-Option-Code	Var		i16		Ra Wa	b	-	o	o	o	-		Option Code	i16	-	-	-	22
606B	Speed-Command-Variable	Var		i32		Ra	b	-	o	o	o	-		G2	i32	-	-	-	22
606C	Speed-Actual-Value	Var		i32		Ra	b	-	o	m	o	-		G2	i32		-	-	22
606D	Speed-Window	Var		u32		Ra Wa	b	-	o	o	-	-		G2	u16	-	-	-	22
606E	Speed-Window-Time	Var		u16		Ra Wa	b	-	o	o	-	-		msec	u16	-	0	0	22

Table E1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by function groups (continued)

Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
								Ge_1	Position	Ge_2	Torque	Refe							
606F	Speed-Threshold	Var		u32		Ra Wa	b	-	o	o	o	-		G2	u16	-	0	0	22
6070	Speed-Threshold-Time	Var		u16		Ra Wa	b	-	o	o	o	-		msec	u16	-	0	0	22
4.2.4	Torque-Function Group																		
6071	Torque Setpoint-External	Var		i16		Ra Wa	b	-	-	-	m	-		o/oo Mn	i16	-	0	0	22
6072	Torque-Max-Amount	Var		u16		Ra Wa	b	-	o	o	o	-		o/oo Mn	u16	-	-	-	22
6073	Current-Max-Amount	Var		u16		Ra Wa	b	-	o	o	o	-		o/oo In	u16	-	-	-	22
6074	Torque-Command Variable	Var		i16		Ra	b	-	o	o	o	-		o/oo Mn	u16	-	-	-	22
6075	Nominal Current-Motor	Var		u16		Ra Wa	b	-	o	o	o	-		10^{-1} A	u16	-	-	-	22
6076	Nominal Torque-Motor	Var		u16		Ra Wa	b	-	o	o	o	-		10^{-1} Nm	u16	-	-	-	22
6077	Torque-Actual Value	Var		i16		Ra	b	-	o	o	o	-		o/oo Mn	i16	-	-	-	22
6078	Current-Actual Value	Var		i16		Ra	b	-	o	o	o	-		o/oo In	i16	-	-	-	22
6079	Intermediate Circuit Voltage	Var		u16		Ra	b	-	o	o	o	-		V	u16	-	-	-	22
4.2.5	Setpoint Generator-Function Group																		
607A	End-Position	Var		i32		Ra Wa	b	-	m	-	-	-		L	i32	-	0	-	22
607B	Range-Limit	Array	2	i32		Ra Wa	b	-	o	o	o	o							22
607C	Reference-Measurement-Offset	Var		i32		Ra Wa	b	-	o	-	-	m		L	i32	-	-	0	22
607D	Position-Limit-Value-Min-Max	Array	2	i32		Ra Wa	b	-	o	o	o	-							22
607E	Polarities	Var		OctStr	1	Ra Wa	b	-	o	o	o		o	-		-	0	0	22
607F	Speed-Max-Amount	Var		u32		Ra Wa	b	-	o	o	o	-		G2	u32	-	-	-	22
6080	Speed-Motor-Max-Amount	Var		u32		Ra Wa	b	-	o	o	o	-		10^{-3} 1/min	u16	-	-	-	22
6081	Traverse-Path-Speed	Var		i32		Ra Wa	b	-	o	m	-	-		G2	i32	-	0	-	22
6082	End-Speed	Var		i32		Ra Wa	b	-	o	-	-	-		G2	i32	-	0	0	22
6083	Acceleration	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
6084	Deceleration	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
6085	Quick-Stop	Var		u32		Ra Wa	b	-	o	o	o	-		B	u32	-	-	-	22
6086	Ramp-Form-Speed	Var		i16		Ra Wa	b	-	o	o	o	-		Option Code	i16	-	-	-	22

Table E1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by function groups (continued)

Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
								Ge_1	Position	Ge_2	Torque	Refe							
6087	Acceleration-Torque	Var		u32		Ra Wa	b	-	-	-	o	-		1/sec^2	u16	-	-	-	22
6088	Ramp-Form-Torque	Var		i16		Ra Wa	b	-	-	-	o	-		Option Code	i16	-	-	-	22
4.2.6 Factor-Function Group																			
6089	Position-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8	0	-	-	22
608A	Position-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8	32	-	-	22
608B	Speed-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8	73	-	-	22
608C	Speed-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8	11	-	-	22
608D	Acceleration-Unit-Index	Var		i8		Ra Wa	b	-	o	o	o	o		Unit	i8		-	-	22
608E	Acceleration-Value-Index	Var		u8		Ra Wa	b	-	o	o	o	o		Value	u8		-	-	22
608F	Position-Sensor-Resolution	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
6090	Speed-Sensor-Resolution	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
6091	Transmission	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
6092	Advance-Constant	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
6093	Position-Factor-Set	Array	2	u32		Ra Wa	b	-	o	-	-	-							22
6094	Speed-Factor-Set	Array	2	u32		Ra Wa	b	-	-	o	-	-							22
6095	Speed-Factor-1	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
6096	Speed-Factor-2	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
6097	Acceleration-Factor	Array	2	u32		Ra Wa	b	-	o	o	o	-							22
4.2.7 Reference Operation-Function Group																			
6098	Reference Operation-Option Code	Var		i16		Ra Wa	b	-	-	-	-	m		Option Code	i8	0	0	0	22
6099	Reference Operation-Speed	Var		u32		Ra Wa	b	-	-	-	-	m		G2	u32	-	-	-	22
609A	Reference Operation-Acceleration	Var		u32		Ra Wa	b	-	-	-	-	o		B	u32	-	-	-	22
4.3 General Functions																			
6008	Identification Number	Var		u16		Ra Wa	o	o	o	o	o	o		-	u16	u16	-	-	21 12
6009	Block-Parameter-Identification	Var		u8		Ra Wa	o	o	o	o	o	o		-	u8	u8	-	-	21 12
600A	Serial Number	Var		u32		Ra	o	o	o	o	o	o		-	u32	-	-	-	22 12

Table E1 : Object dictionary for Profile Drive Engineering 22 DRIVECOM Nutzergruppe e. V. sorted by function groups (completed)

Index	Name	Object-Code	Ele-men.	Data-Type	Len.	Access Rights	m/o	m/o for Mode of Operation					PD-map.	Unit	Value range	Mandatory range	Default-Value	Substitute value	from Profile Version
								Ge_1	Position	Ge_2	Torque	Refe							
600B	Calibrating-Date	Var		Date		Ra	o	o	o	o	o	o		Date	Date	-	-	-	22 12
600C	Device-Description	Var		VisStr	64	Ra Wa	o	o	o	o	o	o		-		-	-	-	22 12
600D	Model-Description	Var		VisStr	64	Ra	o	o	o	o	o	o		-		-	-	-	22 12
600E	Parameterisation Date	Var		Date		Ra	o	o	o	o	o	o		Date	Date	-	-	-	22 12
600F	Function-Group-Description	Array	n	OctStr	4	Ra	m	m	m	m	m	m		-					22
603F	Malfunction-Code	Var		OctStr	2	Ra	m	m	m	m	m	m		-			-	-	21 12
4.4 Communication Functions																			
6000	PI-Data-Description	Record		PDB		Ra Wa	m	m	m	m	m	m	-	-				Status,Speed.-Act.	21 12
6001	PO-Data-Description	Record		PDB		Ra Wa	m	m	m	m	m	m	-	-				Control, Speed-Set	21 12
6002	PO-Data-Enable	Var		Bool		Ra Wa	m	m	m	m	m	m	-	-	Bool	Bool	True	-	21 12
6003	PD-Monitoring-Time	Var		u16		Ra Wa	o	o	o	o	o	o		msec	u16	65535	-	65535	21 12
6004	PD-Monitoring -Option-Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
6005	C-Monitoring-Time	Var		u16		Ra Wa	o	o	o	o	o	o		msec	u16	65535	-	65535	21 12
6006	C-Monitoring -Option Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
6007	Abort connection-Option Code	Var		i16		Ra Wa	o	o	o	o	o	o		Option Code	i16	0	-	0	21 12
6010	Process-Input-Data	Var		OctStr	n	Ra Wa	o	o	o	o	o	o		-	-	-	-	-	22 12
6011	Process-Output-Data	Var		OctStr	n	Ra	o	o	o	o	o	o		-	-	-	-	-	22 12