bürkert
FLUID CONTROL SYSTEMS

Control Mode
Communication settings

Control Word
Executing cyclic commands

Object Route Function
Enables access to further büS objects

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EtherCAT

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PROFINET

Operating Instructions

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Operating Instructions 2411/07_ENen_00810415 / Original DE

Fieldbus devices – description of the büS objects

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1 GENERAL NOTES

1.1 Contact addresses

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2 CONTROL MODE

Control Mode controls the behaviour of the fieldbus device when connection is established with the controller and also controls the behaviour of the Namur LED. *Control Mode* can be described and is transferred acyclically.

Byte	Description		Bit	Action when bit is set
Byte 0	Condition to start communication	Byte 0 has the possible values 0–2	Bit 0 = 0 Bit 1 = 0	Auto start, operating state also without controller
			Bit 0 = 1 Bit 1 = 0	Start only when connection to the controller is correct
			Bit 0 = 0 Bit 1 = 1	Start must be set manually by the controller via *Control Word*
Byte 1	reserved			
Byte 2	Behaviour of the LED when there is a disconnection from the controller		Bit 0	Switch LED (only for Type ME23) A loss of connection to the controller does not affect the colour of the Switch LED.
			Bit 1	Namur LED A loss of connection to the controller does not affect the colour of the Namur LED.
Byte 3	reserved			

Table 1: 0x3C32 Sub 1

Example of the composition of a value in the *Control Mode* object:

	Byte 3	Byte 2	Byte 1	Byte 0	Description
				01	Start only when connection to the controller is correct
			00		reserved
		02			A loss of connection to the controller does not affect the colour of the Namur LED.
	00				reserved
0x	**00**	**02**	**00**	**01**	**Write value to the *Control Mode* object.**

Table 2: Example of a value in Control Mode

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3 CONTROL WORD

Control Word is used to write a CANopen standard command to the büS network during operation. Therefore individual devices or the entire network can be activated. *Control Word* is transferred cyclically.

Byte	Description	Value	Action when bit is set
Byte 0	Definition of the target device for CANopen commands	0x00	Fieldbus device
		0x01-0x7F	Address of the büS device in the network (Node ID)[1]
		0xFF	All devices
Byte 1	Commands to CANopen standard for büS network	0x01	operational
		0x02	stop
		0x80	pre operational
		0x81	node reset
		0x82	communication reset
Byte 2	reserved		
Byte 3	Communication status	0x01	RUN, no connection to controller required
		0x02-0xFF	STOP, connection to controller required

Table 3: 0x3C32 Sub 2

Control Word can be used e.g. to start or stop individual devices or the entire system as well as to simulate connection to the controller.

Example of the composition of a value in the *Control Word* object:

	Byte 3	Byte 2	Byte 1	Byte 0	Description
				00	Fieldbus device
			01		operational
		00			reserved
	01				RUN, no connection to controller required
0x	**01**	**00**	**01**	**00**	**Write value to the Control Word object**

Table 4: Example of a value in Control Word

1) Node ID see device description in the Bürkert Communicator

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4 OBJECT ROUTE FUNCTION (ORF)

The *Object Route Function (ORF)* allows access to individual objects in the büS network. The (fieldbus) object addresses required for access are described in chapters “5 Object addresses fieldbuses” on page 10. Reading or writing to an object can take up to 150 milliseconds.

Index	Subindex	Object	Data type	Description
0x3C31	0x01	Index/Subindex/ NodeID	UINT32	Target object: Writing Index and Subindex of the object. The NodeID[2] of the device is also specified. Index and Subindex are stored in the device description/EDS. Index: 2 bytes (MSB), Subindex: 1 byte, Node ID: 1 byte. For write access + 0x00000080.
	0x02	Data length for write access	UINT32	Data length of the write command in bytes, number of valid bytes is not specified for reading.
	0x03	Value UINT32	UINT32	Here the value to be written is specified or the readout value is displayed. Data ≤ 4 bytes.
	0x04	Value string	STRING	Is used to read and write texts. Data > 4 bytes.
	0x05	result	UINT32	Process result: 0 = Command successfully executed > 0 = Error occurred during execution (see “Table 6”) 0xFFFFFFFF: Read and write process not yet concluded
	0x06	call/cancel	UINT8	Execute command: 1 = execute 0 = finish

Table 5: Object Route Function

Read access

→ *Write Index/Subindex/NodeID*.

→ Execute *call/cancel*.

✔ The result is output in *Value UINT32* or *Value string*.

Write access

❗ For write access the value 0x80 must be added to the Node ID.

→ *Write Index/Subindex/NodeID* (+0x80).

→ In *Data length for write access* specify the number of bytes to be written.

→ Enter the value to be written in *Value UINT32* or *Value string*.

→ Output command with *call/cancel*.

2) Node ID see device description in the Bürkert Communicator

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4.1 Definition of the errors in the “result” object

Process result	Definition of error
0x00	No error
0x01	Init Block Transfer
0x02	General error
0x04	No Subindex specified
0x05	Access not supported
0x06	Range Overflow
0x07	Range Underflow
0x08	Unknown Data Type
0x09	Data length too great
0x0A	Data length too small
0x0B	No Mapping
0x0C	PDO Too Long
0x0D	Invalid Value
0x0E	Wrong Togglebit
0x0F	No object
0x10	Local Error
0x11	Service could not be implemented
0x12	Load Error
0x13	Save Error
0x14	Generic Internal Error
0x15	Resource Not Available
0x16	Service Not Executed
0x17	Internal Sw Error
0x18	Present Device State
0x19	Range Exceeded
0x1A	Invalid Seq Number
0x1B	Invalid Block Size
0x1C	CRC Error
0x1D	Unknown Specifier
0x1E	Write Only
0x1F	Read access only
0x20	Out Of Memory
0x21	No data
0x22	Time Out SDO Protocol
0x32	SDO Reset
0x33	Parameter Error
0x34	Internal Error
0x35	SDO Send Error
0x36	SDO State Error
0x37	Length Error

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Process result	Definition of error
0x38	SDO Block User Error
0x39	SDO Block Size Error
0x3A	SDO Sequenze Error
0x3B	SDO CRC Error
0x3C	Message Lost
0x3D	SDO No Token
0x3E	SDO Not Supported
0x3F	SDO Route Function Active
0xFE	Node Not Active
0xFF	No device with this Node ID available
0xFFFFFFFF	Process is running

Table 6: Errors when executing the “result” object

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5 OBJECT ADDRESSES FIELDBUSES

5.1 Object addresses EtherCAT

Object	Index	Subindex
Index/Subindex/NodeID	0x3C31	0x01
Data length for write access	0x3C31	0x02
Value UINT32	0x3C31	0x03
Value string	0x3C31	0x04
result	0x3C31	0x05
call/cancel	0x3C31	0x06

5.1.1 Example of read access EtherCAT

Target: Display the serial number of the EDIP participant with Node ID 9.

Object	Subindex	EDIP participant (Node ID 9)
0x2000 (device description)	0x07 (serial number)	0x09

Procedure:

1. Write *Index/Subindex/NodeID* of the target object

→ Select Index 0x3C31, Subindex 0x01.

→ Write Index (0x2000) and Subindex (0x07) of the object to be read and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20000709

2. Execute *call/cancel*

→ Select Index 0x3C31, Subindex 0x06.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

3. Read out result in *Value UINT32* or *Value string*

At a value ≤ 4 bytes the serial number is read from *Value UINT32*.
At a value > 4 bytes the serial number is read from *Value string*.

→ Read out value on Index 0x3C31, Subindex 0x03 (UINT32).

✓ The serial number of the EDIP participant with Node ID 9 is displayed.

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5.1.2 Example of write access EtherCAT

Target: Device reset for an EDIP participant with Node ID 9.

For write access to the Node ID, add the value 0x80!

Object	Subindex	EDIP participant (Node ID 9)
0x2001 (communication device)	0x04 (Reset)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select Index 0x3C31, Subindex 0x01.

→ Write index (0x2001) and Subindex (0x04) of the object to be written and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20010409 (+0x80) = **0x20010489**

2. **In *Data length for write access* specify the number of bytes to be written.**

→ Select Index 0x3C31, Subindex 0x02.

→ Write length of the object to be written to this object.

Object	Value to be written
Data length for write access	0x01

3. **Write *Value UINT32* or *Value string***

At a value ≤ 4 bytes *Value UINT32* is written.
At a value > 4 bytes *Value string* is written.

→ Select Index 0x3C31, Subindex 0x03 (UINT32).

→ Write value 2 (= device reset)

Object	Value to be written
Value UINT32	0x02

4. **Execute *call/cancel***

→ Select Index 0x3C31, Subindex 0x06.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

✓ In the case of the EDIP participant with Node ID 9 a device reset is executed.

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5.2 Object addresses EtherNet/IP

Object	Class	Instance	Attribute
Index/Subindex/NodeID	C7	1	3
Data length for write access	C7	2	3
Value UINT32	C7	3	3
Value string	C7	4	3
result	C7	5	3
call/cancel	C7	6	3

5.2.1 Example of read access EtherNet/IP

Target: Display the serial number of the EDIP participant with Node ID 9.

Object	Subindex	EDIP participant (Node ID 9)
0x2000 (device description)	0x07 (serial number)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select Class C7, Instance 1, Attribute 3.

→ Write Index (0x2000) and Subindex (0x07) of the object to be read and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20000709

2. **Execute *call/cancel***

→ Select Class C7, Instance 6, Attribute 3.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

3. **Read out result in *Value UINT32* or *Value string***

> At a value ≤ 4 bytes the serial number is read from *Value UINT32*.
> At a value > 4 bytes the serial number is read from *Value string*.

→ Read out value on Class C7, Instance 3, Attribute 3.

✓ The serial number of the EDIP participant with Node ID 9 is displayed.

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5.2.2 Example of write access EtherNet/IP

Target: Device reset for an EDIP participant with Node ID 9.

For write access to the Node ID, add the value 0x80!

Object	Subindex	EDIP participant (Node ID 9)
0x2001 (communication device)	0x04 (Reset)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select Class C7, Instance 1, Attribute 3.

→ Write index (0x2001) and Subindex (0x04) of the object to be written and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20010409 (+0x80) = **0x20010489**

2. **In *Data length for write access* specify the number of bytes to be written.**

→ Select Class C7, Instance 2, Attribute 3.

→ Write length of the object to be written to this object.

Object	Value to be written
Data length for write access	0x01

3. **Write *Value UINT32* or *Value string***

At a value ≤ 4 bytes *Value UINT32* is written.
At a value > 4 bytes *Value string* is written.

→ Select Class C7, Instance 3, Attribute 3.

→ Write value 2 (= device reset)

Object	Value to be written
Value UINT32	0x02

4. **Execute *call/cancel***

→ Select Class C7, Instance 6, Attribute 3.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

✓ In the case of the EDIP participant with Node ID 9 a device reset is executed.

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5.3 Object addresses Modbus TCP

Object	Function code	Address
Index/Subindex/NodeID	FC16	800
Data length for write access	FC16	802
Value UINT32	FC16	804
Value string	FC16	806
result	FC03	816
call/cancel	FC16	818[3]

5.3.1 Example of read access Modbus TCP

Target: Display the serial number of the EDIP participant with Node ID 9.

Object	Subindex	EDIP participant (Node ID 9)
0x2000 (device description)	0x07 (serial number)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select function code FC16, address 1000.

→ Write Index (0x2000) and Subindex (0x07) of the object to be read and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20000709

2. **Execute *call/cancel***

→ Select function code FC16, address 1018.

→ Write value 0x0100 (= execute).

Object	Value to be written
call/cancel	0x0100

3. **Read out result in *Value UINT32* or *Value string***

> At a value ≤ 4 bytes the serial number is read from *Value UINT32*.
> At a value > 4 bytes the serial number is read from *Value string*.

→ Read out value on function code FC16, address 1004 (UINT32).

✓ The serial number of the EDIP participant with Node ID 9 is displayed.

3) To execute, write 0x0100

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5.3.2 Example of write access Modbus TCP

Target: Device reset for an EDIP participant with Node ID 9.

For write access to the Node ID, add the value 0x80!

Object	Subindex	EDIP participant (Node ID 9)
0x2001 (communication device)	0x04 (Reset)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select function code FC16, address 1000.

→ Write index (0x2001) and Subindex (0x04) of the object to be written and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20010409 (+0x80) = **0x20010489**

2. **In *Data length for write access* specify the number of bytes to be written.**

→ Select function code FC16, address 1002.

→ Write length of the object to be written to this object.

Object	Value to be written
Data length for write access	0x01

3. **Write *Value UINT32* or *Value string***

At a value ≤ 4 bytes *Value UINT32* is written.
At a value > 4 bytes *Value string* is written.

→ Select function code FC16, address 1004.

→ Write value 2 (= device reset)

Object	Value to be written
Value UINT32	0x02

4. **Execute *call/cancel***

→ Select function code FC16, address 1018.

→ Write value 0x0100 (= execute).

Object	Value to be written
call/cancel	0x0100

✓ In the case of the EDIP participant with Node ID 9 a device reset is executed.

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5.4 Object addresses PROFIBUS DPV1

Object	Slot	Index
Index/Subindex/NodeID	0	1
Data length for write access	0	2
Value UINT32	0	3
Value string	0	4
result	0	5
call/cancel	0	6

5.4.1 Example of read access PROFIBUS DPV1

Target: Display the serial number of the EDIP participant with Node ID 9.

Object	Subindex	EDIP participant (Node ID 9)
0x2000 (device description)	0x07 (serial number)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select Slot 0, Index 1.

→ Write Index (0x2000) and Subindex (0x07) of the object to be read and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20000709

2. **Execute *call/cancel***

→ Select Slot 0, Index 6.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

3. **Read out result in *Value UINT32* or *Value string***

At a value ≤ 4 bytes the serial number is read from *Value UINT32*.
At a value > 4 bytes the serial number is read from *Value string*.

→ Read out value on Slot 0, Index 3 (UINT32).

✓ The serial number of the EDIP participant with Node ID 9 is displayed.

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5.4.2 Example of write access PROFIBUS DPV1

Target: Device reset for an EDIP participant with Node ID 9.

For write access to the Node ID, add the value 0x80!

Object	Subindex	EDIP participant (Node ID 9)
0x2001 (communication device)	0x04 (Reset)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select Slot 0, Index 1.

→ Write index (0x2001) and Subindex (0x04) of the object to be written and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20010409 (+0x80) = **0x20010489**

2. **In *Data length for write access* specify the number of bytes to be written.**

→ Select Slot 0, Index 2.

→ Write length of the object to be written to this object.

Object	Value to be written
Data length for write access	0x01

3. **Write *Value UINT32* or *Value string***

At a value ≤ 4 bytes *Value UINT32* is written.
At a value > 4 bytes *Value string* is written.

→ Select Slot 0, Index 3.

→ Write value 2 (= device reset)

Object	Value to be written
Value UINT32	0x02

4. **Execute *call/cancel***

→ Select Slot 0, Index 6.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

✓ In the case of the EDIP participant with Node ID 9 a device reset is executed.

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5.5 Object addresses PROFINET

Object	Slot	Subslot	Index
Index/Subindex/NodeID	0	1	1
Data length for write access	0	1	2
Value UINT32	0	1	3
Value string	0	1	4
result	0	1	5
call/cancel	0	1	6

5.5.1 Example of read access PROFINET

Target: Display the serial number of the EDIP participant with Node ID 9.

Object	Subindex	EDIP participant (Node ID 9)
0x2000 (device description)	0x07 (serial number)	0x09

Procedure:

1. **Write *Index/Subindex/NodeID* of the target object**

→ Select Slot 0, Subslot 1, Index 1.

→ Write Index (0x2000) and Subindex (0x07) of the object to be read and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20000709

2. **Execute *call/cancel***

→ Select Slot 0, Subslot 1, Index 6.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

3. **Read out result in *Value UINT32* or *Value string***

> At a value ≤ 4 bytes the serial number is read from *Value UINT32*.
> At a value > 4 bytes the serial number is read from *Value string*.

→ Read out value on Slot 0, Subslot 1, Index 3 (UINT32) or 4 (string).

✓ The serial number of the EDIP participant with Node ID 9 is displayed.

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5.5.2 Example of write access PROFINET

Target: Device reset for an EDIP participant with Node ID 9.

For write access to the Node ID, add the value 0x80!

Object	Subindex	EDIP participant (Node ID 9)
0x2001 (communication device)	0x04 (Reset)	0x09

Procedure:

1. Write *Index/Subindex/NodeID* of the target object

→ Select Slot 0, Subslot 1, Index 1.

→ Write index (0x2001) and Subindex (0x04) of the object to be written and the Node ID of the device (0x09) to this object.

Object	Value to be written
Index/Subindex/NodeID	0x20010409 (+0x80) = **0x20010489**

2 In *Data length for write access* specify the number of bytes to be written.

→ Select Slot 0, Subslot 1, Index 2.

→ Write length of the object to be written to this object.

Object	Value to be written
Data length for write access	0x01

3. Write *Value UINT32* or *Value string*

At a value ≤ 4 bytes *Value UINT32* is written.
At a value > 4 bytes *Value string* is written.

→ Select Slot 0, Subslot 1, Index 3.

→ Write value 2 (= device reset)

Object	Value to be written
Value UINT32	0x02

4. Execute *call/cancel*

→ Select Slot 0, Subslot 1, Index 6.

→ Write value 1 (= execute).

Object	Value to be written
call/cancel	0x01

In the case of the EDIP participant with Node ID 9 a device reset is executed.

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