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Fieldbus Manual for PROFIBUS, PROFINET and DeviceNet

BK Mikro9

Tool and Object Monitoring System
Protection against Follow-up Problems
in the Process of Production

Version 1.02

Jul. 31, 2018

General Notice

Safety guidelines

This document contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger.



DANGER

Symbol with signal word: **Danger**

Immediate danger to life and limb of personnel and others.

Non-compliance will cause death or serious (crippling) injury.



WARNING

Symbol with signal word: **Warning**

Hazardous situation to life and limb of personnel and others.

Non-compliance may cause death or serious injury.



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Symbol with signal word: **Caution**

Potentially hazardous situation

Non-compliance may cause slight injury;
possible damage to property.

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Important information about the product, the handling of the product, or the part of the documentation onto which is supposed to be made especially attentive.



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Qualified persons in accordance with the safety guidelines are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

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We have checked the contents of this document for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Discharge your body electrostatically before touching the device (e.g. by contacting a grounded metallic object).

EU Declaration of Conformity



The product of Schubert System Elektronik GmbH complies with the directives listed in chapter "Technical Data" of BK Mikro9 basic manual.

The assessment of the requirements is based on the standards listed therein.

The EU declaration of conformity and the related documentation will be maintained in accordance with the directives at:

Schubert System Elektronik GmbH
take-off Gewerbepark 36
78579 Neuhausen ob Eck
Germany

Restriction of Hazardous Substances (RoHS) Compliance

RoHS-compliant

All products of the BK Mikro9 series are Pb-free / RoHS compliant referred to EU directive 2011/65/EU.

Standard(s) for Safety



The BK Mikro9 series is UL listed.

UL 508 - Standard for Industrial Control Equipment C22.2. No. 142-M1987
- Standard for Process Control

Note

This BK Mikro9 Fieldbus Manual describes the PROFIBUS/PROFINET/DeviceNet handling of the following system:

- BK Mikro9

Please read the Fieldbus Manual before the first use, and keep it carefully for the later use.

It is written for customers with prior knowledge in PC technology and automation.

Purpose



This Fieldbus Manual is part of the Technical Documentation of the Tool and Object Monitoring System BK Mikro9. It provides service personnel and system advisors with the information required to install, commission, operate and maintain the system.

BK Mikro9

Fieldbus Manual

Material no. 68 36 323

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1 Characteristics

This manual describes the PROFIBUS/PROFINET/DeviceNet handling of the BK Mikro9 system. The PROFIBUS/PROFINET and the DeviceNet functions and parameters are similar but there are specific characteristics.

BK Mikro9 controls units



Fig. 1-1: BK Mikro9 control units

For further information like wiring, model types and accessories see BK Mikro9 basic manual.

The basic manual describes the functions of the BKM91PB, BKM91PN, BKM91D control units, and similar versions with firmware revision 1.21 or higher. The firmware could be updated with the "System Setup BK Mikro9" PC program.

1.1 General function

Commands and parameter data to the BK Mikro9 control unit are sent and received by the PLC via fieldbus. Most settings can be done via fieldbus, some like the PROFIBUS address you have to do with the "**System Setup BK Mikro9**" configuration software.

The "**System Setup BK Mikro9**" software can be downloaded at:

<http://www.bkmikro.com>

Typical scanning sequence:

1. PLC sends Check command with tool size or tool number to BK Mikro9.
2. BK Mikro9 scan cycle begins.
3. Scanner detects tool – OK/KO message is sent to PLC.
4. Wand moves back in HomePos.
5. Next scan cycle can begin.

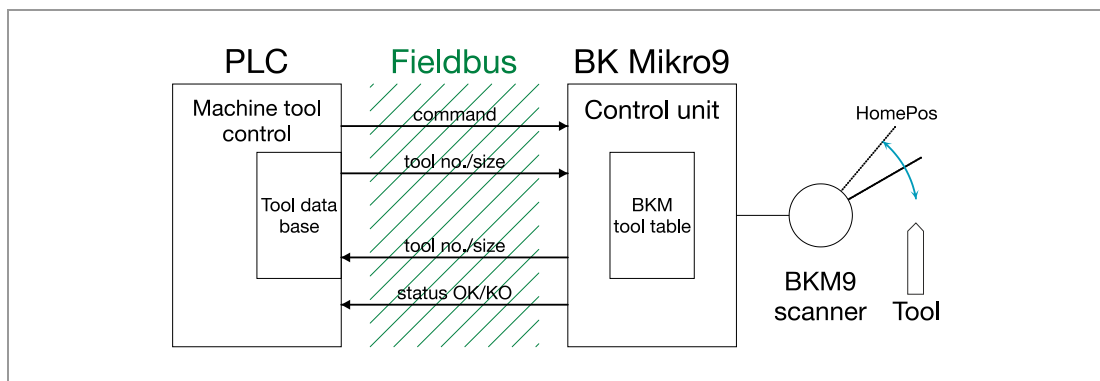


Fig. 1-2: Function sequence

There are two modes possible:

- Controlling of tools with table in memory of the BK Mikro9
- Controlling of tools with set values from PLC

1.2 Checking with tool table

The simplest way to run the BK Mikro9 is to use the tool table. All tool data and parameters are stored in the BKM tool table. The data can be modified with the fieldbus or with the "System Setup BK Mikro9" PC program and the USB interface.

The PLC sends via fieldbus only a command and the tool number, and the BK Mikro9 responds with the status and OK/KO message.

In this mode the tools must be taught in first. The PLC sends the tool number (AW3) and the Teach command in AW2. The wand of the scanner moves to the tool, measures the angle, and stores it in the BKM tool table.

For checking a tool the PLC sends the Check command in AW2 and the relevant tool number (AW3). The wand moves to the tool and compares the measured angle with the stored one and if it is within the tolerance area, the OK bit is set, if not the KO bit is set.

1.2.1 Activation of the tool table ("System Setup BK Mikro9" PC configuration software)

With the "System Setup BK Mikro9" configuration program different attributes and functions can be programmed. Each tool can get a different tolerance for example. Every tool has a number and is stored in the table.

The PC program is not necessary but it helps to modify each tool and global parameters.

To run the table function with PROFIBUS/PROFINET the Table bit must be set in the AW2 control word. The AW3 word defines the tool number (appropriately listed table position).

The Check bit in the AW2 control word will execute this function.

With DeviceNet the protocol 2/1 and the protocol 3/2 are used with the tool table.

The Teach bit is used to teach a tool and to store the tool in the table for all fieldbuses. If a new tool is taught the tolerance or intensity is taken from the parameter list for this tool. The parameters can be changed via PROFIBUS/PROFINET/DeviceNet or with the "System Setup BK Mikro9".

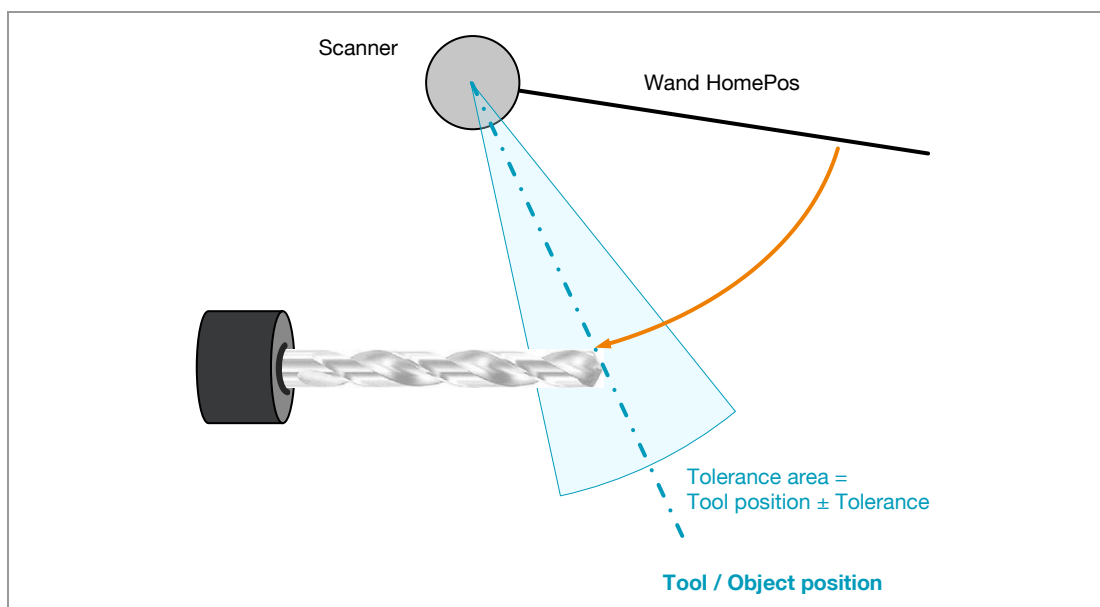


Fig. 1-3: Scanning cycle

1.3 Set value via tool data base

The second way to check the tools is the tool data base in the PLC. The PLC sends the tool position in degrees [°] or in millimeters [mm] to the BK Mikro9. The scanner wand moves to the target position and checks the existence of a tool.

In PROFIBUS/PROFINET the PLC sends the tool length in AW3 word and the command in the AW2 word to the control unit. The tolerance is also sent with AW2 word. The tolerance can also be set to 0, then the internal parameter for the tolerance will be used.

For DeviceNet the protocol 19/19 is used.

1.3.1 Object set value via Teach

If a tool needs to be checked that doesn't have a value in the tool data base, then it is necessary to perform a Teach procedure. The object set value (AW3) has to be larger than the object position being taught. In Teach, object set value serves only as an end limit for the movement of the wand range during this cycle. The object set value can also be set to 0, then the internal parameter "Teach Limit" will be the end limit for this cycle.

If the wand contacts an object within the Teach range an OK message will be triggered and the measured object position will be transmitted via fieldbus to the PLC. This position can be filled in the tool data base to the corresponding tool.

1.3.2 Check the tool

To check the tool, the stored object position with tolerance is transmitted to the control unit. The measurement sequence begins by setting the Check bit.

The wand moves to the object position and compares the measured object position with the transmitted one and if it is within the tolerance area, the OK bit is set, if not the KO bit is set.

1.4 Rescan

The Rescan option helps to improve the repeat accuracy of the scanner. With small tolerances and long wands, it could happen that the BK Mikro9 detects a KO although the tool is OK. This wrong measurement could happen through different influences for example dirt or chips on the wand or at the tool.

If Rescan is active and a KO is detected, the Rescan initiates automatically a second scan to the object. If the second check is good an OK message is generated. Otherwise a KO is finally set. The second scan is done with a slower speed to get a higher accuracy. The Rescan helps to avoid a machine stop that happens through a wrong KO message.

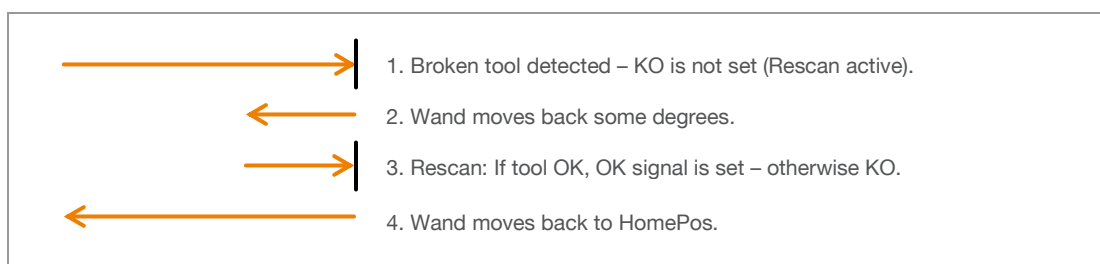


Fig. 1-4: Rescan function

1.5 Monitoring unit Degree/Millimeter

1.5.1 Degree mode

In this mode all values are measured and all settings are in degrees [°]. This is the factory default setting of the BK Mikro9.

For this mode no setup of the BK Mikro9 is necessary.

1.5.2 Millimeter mode

In this mode all values are measured and most parameters are set in millimeters [mm], not in degrees [°].

To use this function it is necessary to run a setup. This setup can be started with the PC program or with fieldbus. In this setup the position of the scanner compared to the tools is calculated.

The setup has to run only one time when the BK Mikro9 is installed.

There are different kinds of setup for different requirements.

■ 1-Tool-Setup-Mode-1

is used when the position of the scanner to the tool magazine is known.

Only one reference tool is needed to run this setup.

■ 3-Tool-Setup-Mode

is used when the position of the scanner in the magazine is unknown.

Three tools (short, middle and long) as reference tools are needed.

The parameter 21 has to be set for millimeter mode. When the PC program is used to setup the tools in millimeter mode the parameter 21 is set automatically.



The HomePos offset and the LimitPos are always set in degrees [°].

1-Tool-Setup-Mode-1

In this setup the distance between scanner and tool axis [VertDistance] as well as RefToolLength and ToolLength are required (blue-colored in the following figure).

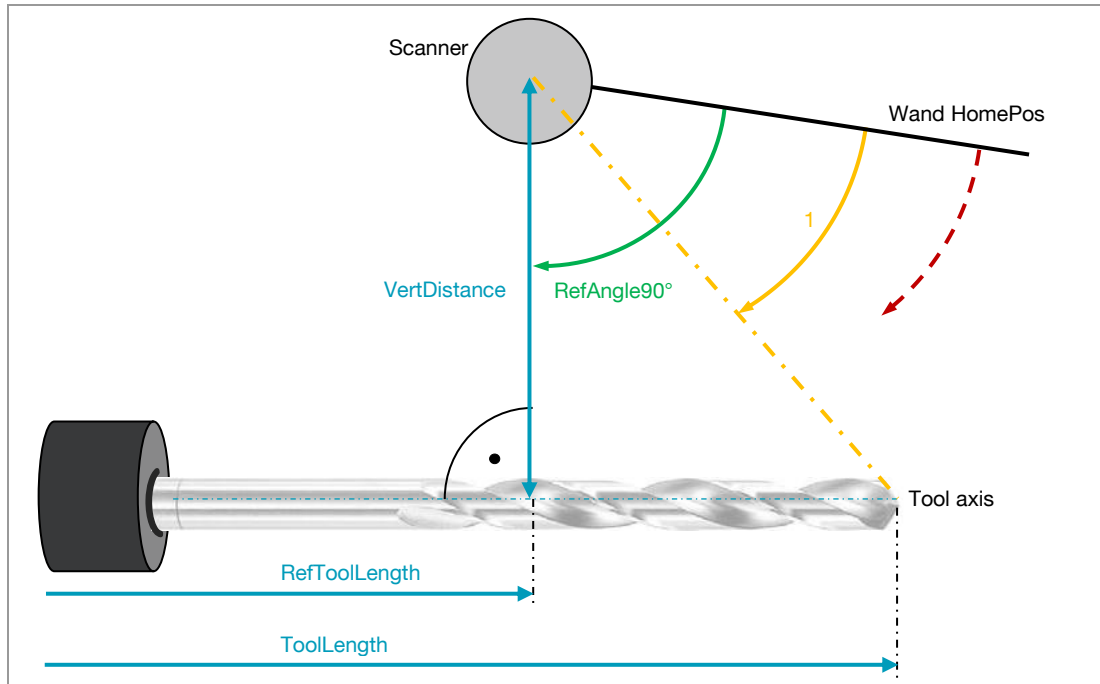


Fig. 1-5: 1-Tool-Setup-Mode-1

VertDistance can be set in parameters 22 and 23, RefToolLength is set in parameters 26 and 27. The parameter numbers are similar for PROFIBUS/PROFINET and DeviceNet.

Any tool can be placed to run the setup. The ToolLength is set in the AW3 word and with the Teach command the setup cycle begins.

Sequence for setup:

1. Set parameter 21 to 1 (millimeter mode).
2. Set VertDistance (parameters 22 and 23).
3. Set RefToolLength (parameters 26 and 27).
4. Set parameter 17 Bit 2 (1-Tool-Setup-Mode-1).
5. Put any known tool in position for scanning.
6. Set Teach command with ToolLength for setup cycle.
7. Clear parameter 17 Bit 2 (RefAngle90° is calculated).

BK Mikro9 is now ready for measurements in millimeter mode.

3-Tool-Setup-Mode

In this setup three different tools are needed (blue-colored in the following figure).

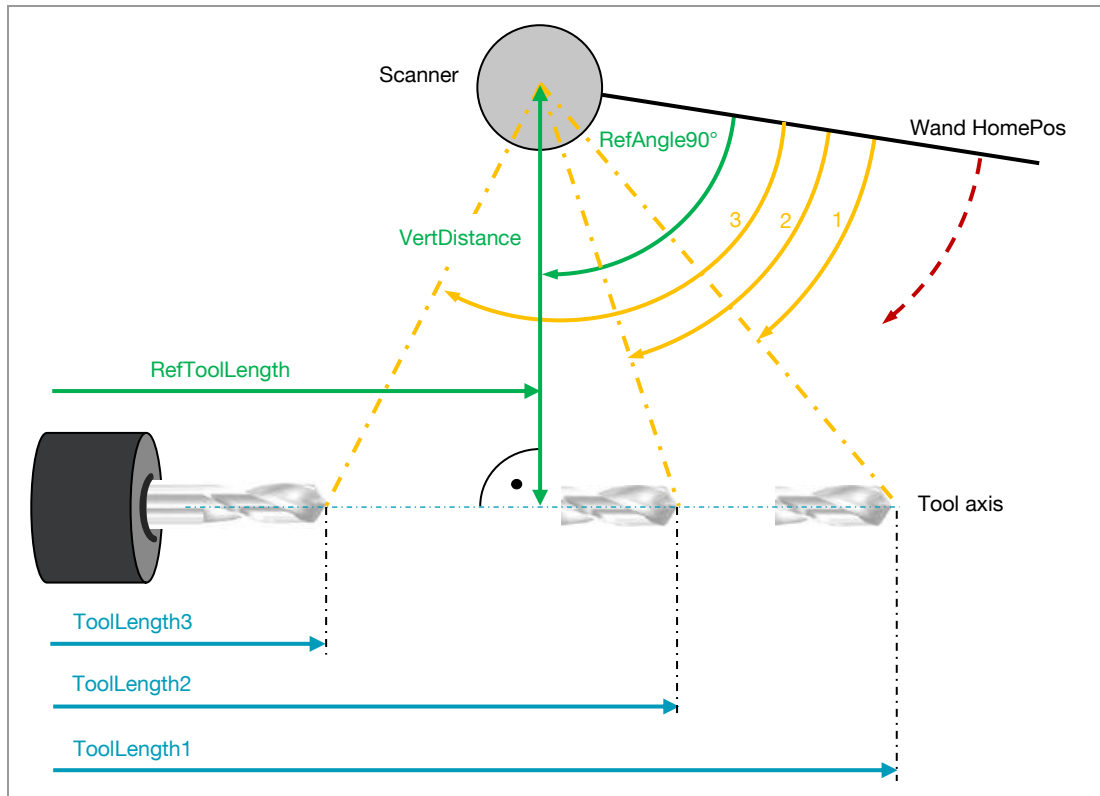


Fig. 1-6: 3-Tool-Setup-Mode

Sequence for setup:

1. Set parameter 21 to 1 (millimeter mode).
2. Set parameter 17 Bit 2 and Bit 3 (3-Tool-Setup-Mode).
3. Put reference tool 1 in position for scanning.
4. Set tolerance byte to 1 (for tool 1).
5. Set Teach command with ToolLength1 for setup cycle (tolerance: 1).
6. Put reference tool 2 in position for scanning.
7. Set Tolerance byte to 2 (for tool 2).
8. Set Teach command with ToolLength2 for setup cycle (tolerance: 2).
9. Put reference tool 3 in position for scanning.
10. Set Tolerance byte to 3 (for tool 3).
11. Set Teach command with ToolLength3 for setup cycle (tolerance: 3).
12. Clear parameter 17 Bit 2 and Bit 3 (VertDistance, RefAngle90° and RefToolLength are calculated).

BK Mikro9 is now ready for measurements in millimeter mode.

Notes to the setup

Please notice following references if you choose the length measuring system:

- The setting of the point shifting parameter applies for the tool length too!
- The conversion parameters have to be determined exactly, because small faults can effect highly the measured value.



- Use the same intensity for a regular check.
- Always hit the centerline! If not possible, add a correction length.
- Bended tools result in incorrect measuring!

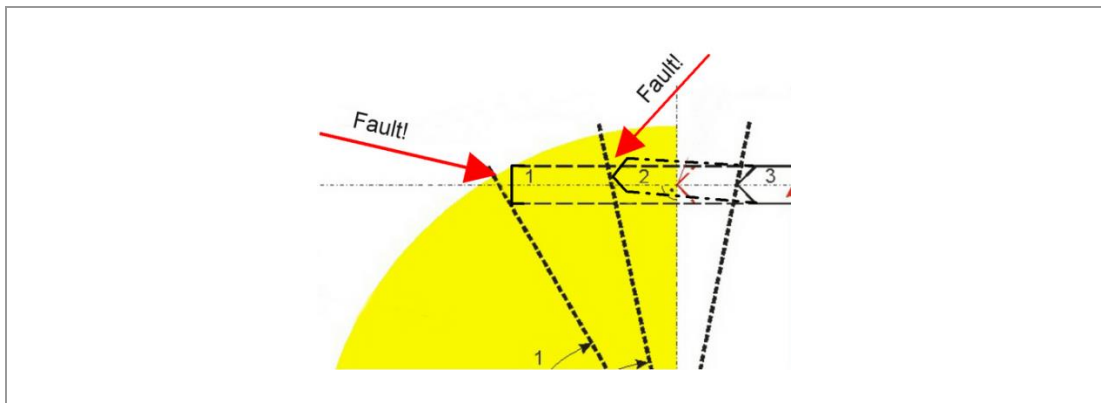


Fig. 1-7: Cause of problems with not correct values

- The tool length could be specified in different ways depending on the PLC.
- BK Mikro9 needs the real tool length to the tip of the tool for correct measurements.

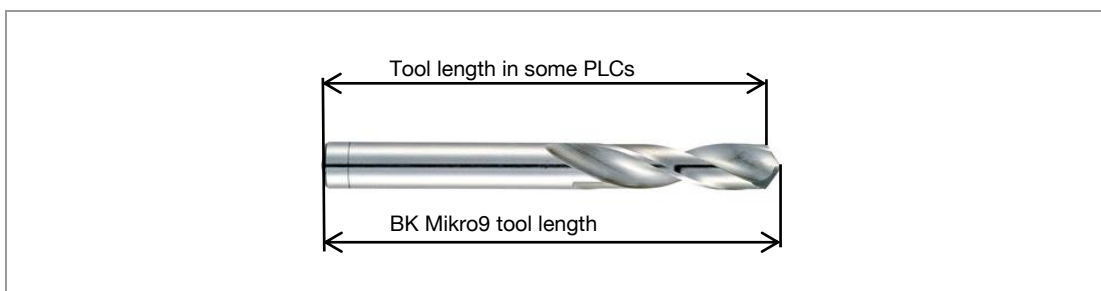


Fig. 1-8: Different tool length specification

1.6 Fieldbus timing

After sending a command (for example Check), the command must be cleared before the next command is accepted.

Fieldbus timing

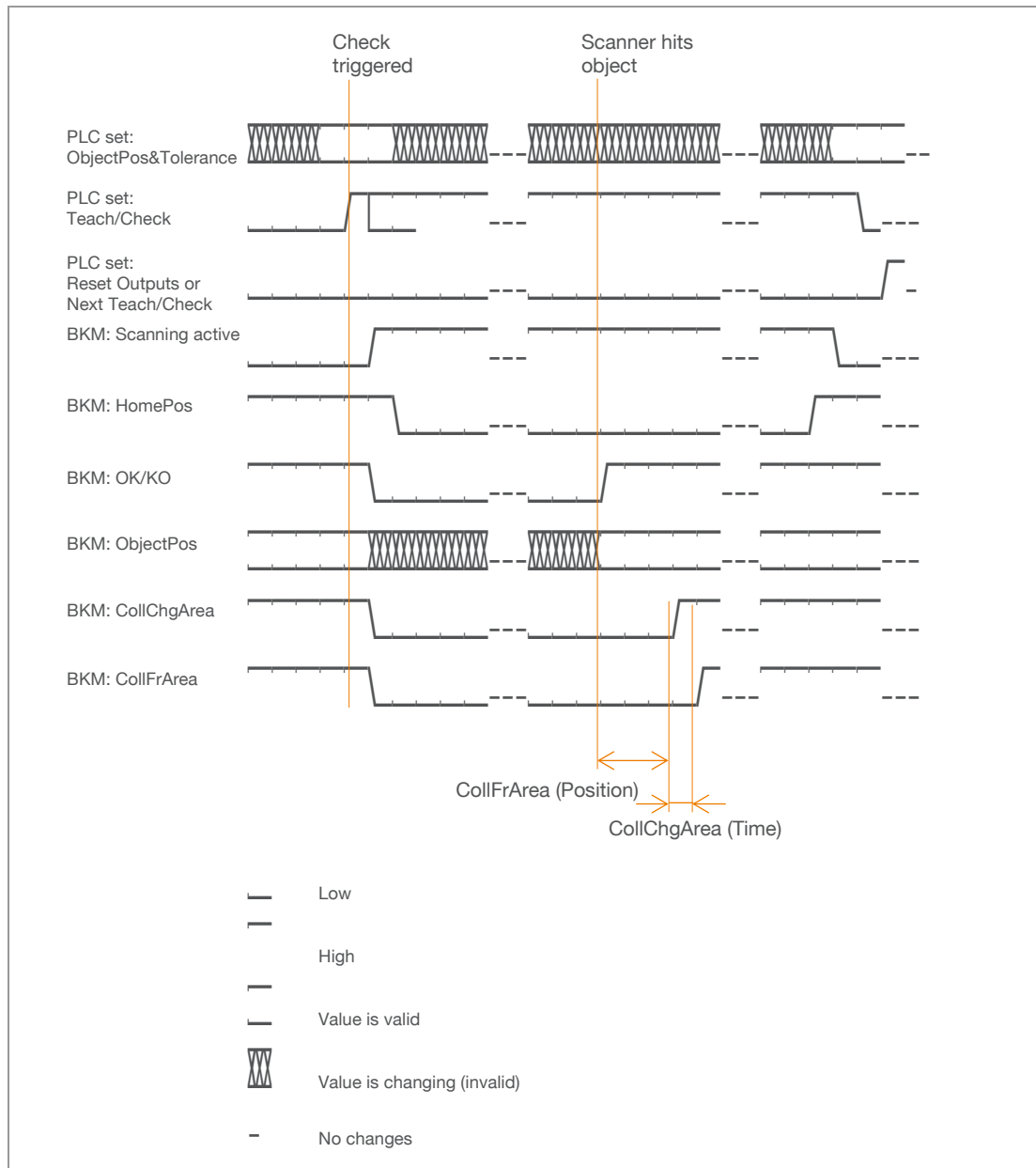


Fig. 1-9: Timing of the fieldbus

2 PROFIBUS-DP

2.1 PROFIBUS interface

The PROFIBUS interface is a floating RS-485 interface (electrically insulated).
A standard 9 pin Sub-D socket is used for the plug in the front of the control unit.
The pin assignment of the 9 pin Sub-D socket corresponds to PROFIBUS standard.

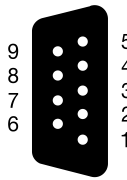
 Sub-D socket, 9 pin	Pin	Signal	Function
	1	N.C.	not connected
	2	N.C.	not connected
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	GND	Data reference potential
	6	5V	5 VDC
	7	N.C.	not connected
	8	RxD/TxD-N	Data line A
	9	N.C.	not connected

Fig. 2-1: PROFIBUS-DP interface

2.2 Principle PROFIBUS properties

2.2.1 Address setting

The PROFIBUS can be set via PC with the "System Setup BK Mikro9" configuration program or with the BKM9IO extension module in connection with the control unit.

The BKM91PB control unit is delivered with an address of 50 dec.

2.2.2 PROFIBUS baud rates

Supported baud rates
9.6 kBaud
19.2 kBaud
45.45 kBaud
93.75 kBaud
187.5 kBaud
500 kBaud
1.5 MBaud
3 MBaud
6 MBaud
12 MBaud

The baud rate is identified automatically.

2.2.3 GSD File

The appropriate GSD file for BK Mikro9 is named "MSCT05CF.gsd" and can be downloaded at:
<http://www.bkmikro.com>

3 PROFINET IO

3.1 General features

- PROFINET specification 2.3
- Conformance Class A
- 2 Ethernet ports (RJ-45), 100 Mbit/s, full duplex
- Auto negotiation, auto crossover
- Supports MRP

3.2 PROFINET interface

The PROFINET IO interface is designed as a RJ-45 connection and complies with 100BaseTX standards.

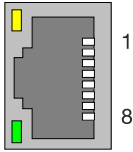
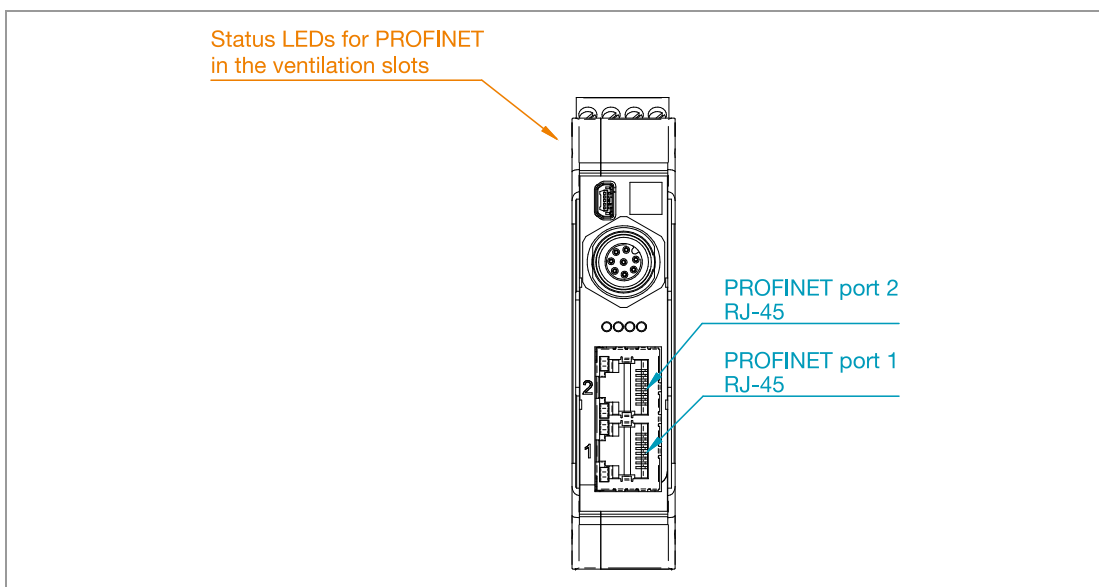
RJ-45 socket 8 pin, 2 LEDs	Pin	Signal	Function
	1	TD +	Transmit Data +
	2	TD -	Transmit Data -
	3	RD +	Receive Data +
	4	-	not connected
	5	-	not connected
	6	RD -	Receive Data -
	7	-	not connected
	8	-	not connected

Fig. 3-1: PROFINET interface



3.2.1 Status LEDs on RJ-45 sockets

LED	Function
Green	ROFINET link
Yellow	PROFINET activity

3.2.2 Status LEDs on the side of the housing

LED	Color	Status	Description
MT	Yellow	On	Maintenance required
SF	Yellow	On	System fail
RY	Green	Off	BK Mikro9 has not started correctly
		Flashing	BK Mikro9 is booting
		On	BK Mikro9 PROFINET has started correctly
BF	Red	Off	The PROFINET controller has an active communication link to the BK Mikro9
		Flashing	Link status ok; no communication link to a PROFINET controller
		On	No link status available

3.2.3 GSDML File

The appropriate GSDML file for BK Mikro9 is named "GSDML-V2.31-SSE-BKM9xPN-20150618.xml" and the symbol file is "GSDML-031F-0001-BKM9xPN-ICO.ico" and can be downloaded at:
<http://www.bkmikro.com>

3.2.4 Module properties

The **Vendor ID** of Schubert System Elektronik GmbH is **0x031F**.

The **Device ID** is 0x0001.

The **product family** is BK Mikro9.

The product name is **BKM91PN** or **BKM94PN**.

4 General Protocol for PROFIBUS or PROFINET

4.1 Protocol size (Standard 6/6)

Configuration with "System Setup BK Mikro9" PC software

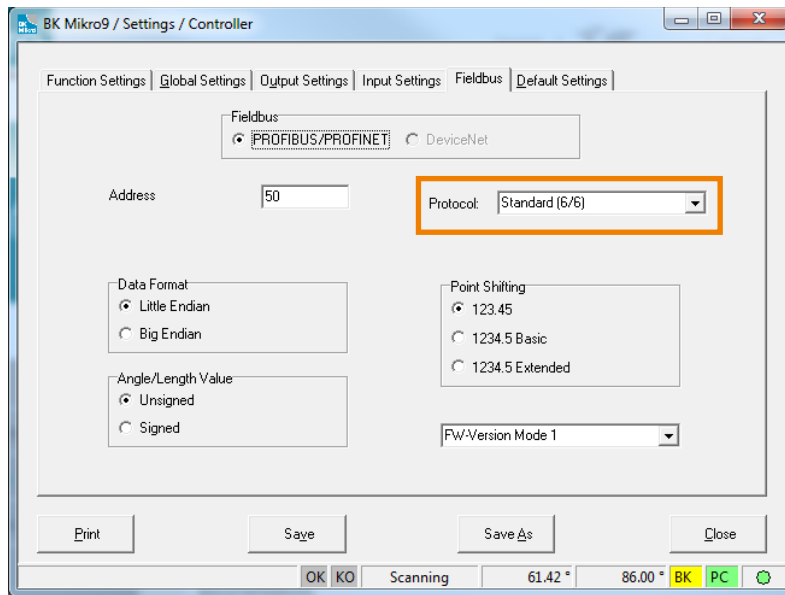


Fig. 4-1: Data format setting in "System Setup BK Mikro9" PC program

PLC → BK Mikro9:

3 data words output (2 bytes each)

Output words		Function
AW1	Bit 0...15	Parameter identification
AW2	Bit 0...15	Control word
AW3	Bit 0...15	Object set value

BK Mikro9 → PLC:

3 data words input (2 bytes each)

Input words		Function
EW1	Bit 0...15	Parameter identification
EW2	Bit 0...15	Status word
EW3	Bit 0...15	Object position

Data from PLC to BK Mikro9 control unit will be transmitted via control words of the PROFIBUS/PROFINET (process channel).

Data from BK Mikro9 control unit to PLC will be transmitted via status words.

Data transmission runs cyclically.

The protocol 64/64 is reserved for future use.

4.2 PROFIBUS/PROFINET data format

Various PLCs interpret the byte sequence of the output and input words differently. Because of this the Bits 7-0 and 15-8 may get mixed up.

Like in the example below, the data is preset and transferred in the "Little Endian" format.

Little Endian

AW2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Tolerance								Table	-	Stop	PrePos	GoPos	Rereference	Teach	Check

Big Endian

AW 2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Table	-	Stop	PrePos	GoPos	Rereference	Teach	Check	Tolerance							

The particular byte sequence can be changed with help of the "System Setup BK Mikro9" PC program. Using this program messages can be sent and received in either the Little Endian or the Big Endian format.

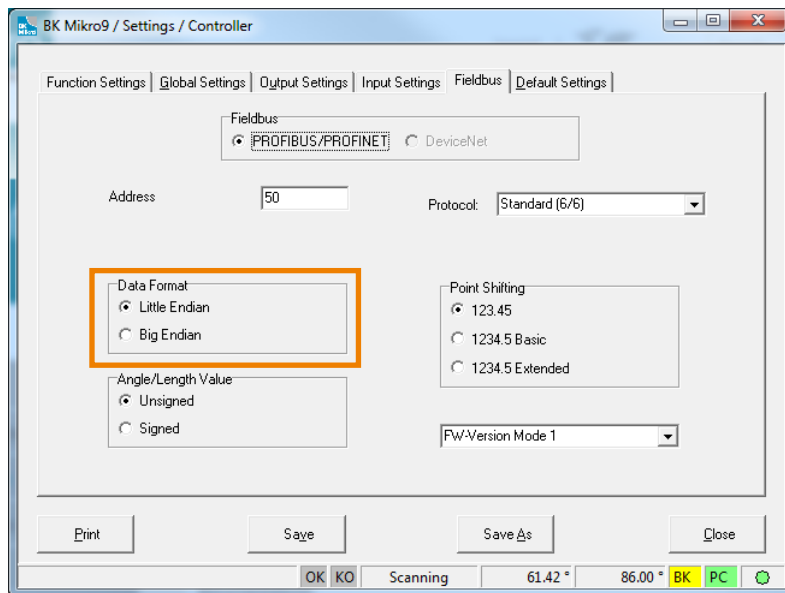


Fig. 4-2: PROFIBUS/PROFINET data format setting in "System Setup BK Mikro9" PC program

4.3 Process data: Output words AW1 / AW2 / AW3

From PLC to BK Mikro9 control unit

4.3.1 Parameter identification AW1

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Parameter data (0...255)								Parameter number (0...31)					Reset OK/KO	Write Parameter byte	Read Parameter byte

4.3.2 Control word AW2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Tolerance								Table active	R*	Stop	PrePos	GoPos	Re-reference	Teach	Check

* reserved: future use possible

Tolerance byte		
Value	Degree [°]/mm Point shifting inactive	Degree [°]/mm Point shifting active
0	Param.	Param.
1	0.1	1
2	0.2	2
3	0.3	3
...
255	25.5	255

Specification of the tolerance in multiples of 0.1 or 1 in degree [°] or mm

Point shifting (sub parameter PROFIBUS/PROFINET options Bit 10)

Value of parameter no. 5 (Tolerance range) is active

4.3.3 Object set value AW3

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Object set value															

Object set value		
Value	Degree [°]/mm Point shifting inactive	Degree [°]/mm Point shifting active
0	P1/P2	P1/P2
1	0.01	0.1
2	0.02	0.2
3	0.03	0.3
...
65535	655.35	6553.5

Specification of the object set value in multiples of 0.01 or 0.1 in degree [°] or mm

Point shifting (sub parameter PROFIBUS/PROFINET options Bit 10)

Check position between P1 (Param. 7&8) and P2 (Param. 9&10)

4.4 Process data: Input words EW1 / EW2 / EW3

From BK Mikro9 control unit to PLC

4.4.1 Parameter identification EW1

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Parameter data (0...255)								Parameter number (0...31)					Error during reading		Error during writing	Parameter updated

4.4.2 Status word EW2

15	14	13	12	11	10	9	8
R*	Parameter error	Control word error	Set value error	Wand error	Control unit error	Scanner error	Cable error

7	6	5	4	3	2	1	0
Collision-free area (CollFrArea)	Time frame (CollChgArea)	Scanning area not reached	KO	OK	R*	Scanning active	Wand in HomePos

* reserved: future use possible

4.4.3 Object position EW3

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Object position															

Object position		
Value	Degree [°]/mm Point shifting inactive	Degree [°]/mm Point shifting active
0	0	0
1	0.01	0.1
2	0.02	0.2
3	0.03	0.3
...
65535	655.35	6553.5

Specification of the object position in multiples of 0.01 or 0.1 in degree [°] or mm

Point shifting (sub parameter PROFIBUS/PROFINET options Bit 10)

4.5 Parameter list

The transmission of the parameters also runs cyclically via the process channel of the PROFIBUS/PROFINET.

No.	Name	Default	Min.	Max.	Format	Description
0	Scanning intensity	0	0	7	Dec	0 = Low 1 = High 2 = Intermediate level 1 3 = Intermediate level 2 4 = Intermediate level 3 5 = Intermediate level 4 6 = Intermediate level 5 7 = Intermediate level 6
1	Sub parameter / Out1 (relay output)	0000 0001	0	255		see "Declarations concerning parameters" below this table
2	Out2 (relay output)	1	0	1	Boolean	0 = InActive normally closed 1 = Active normally open
3	Monitoring	1	0	7	Dec	0 = Free space 1 = Check object
4	Rotation direction	1	0	1	Boolean	0 = Left 1 = Right
5	Tolerance range	300	2	255	0.1°/mm unit	3.00°/mm (Default)
6	Scanner	0	1	129	Dec	0 = TK_AutoDetect 1 = TK8A 2 = TK7A/RL 3 = TK8A Short Wand 4 = TK91A610 5 = TK91A510 6 = TK94A/RL 7 = TK9LIN50/100 8 = TK96A/RL 9 = TK91A732 10 = TK91A270 11 = Reserved 12 = Reserved 13 = TK91A910 14 = Reserved 15 = TK91A328 16 = TK94A/RL250S 17 = TK8A380Q 128 = User Scanner 1 129 = User Scanner 2
7	P1 Low byte	160	0	255	0.01°/mm unit	Position 1
8	P1 High byte	15	0	255	2.56°/mm unit	40.00°/mm (Default)
9	P2 Low byte	200	0	255	0.01°/mm unit	Position 2
10	P2 High byte	50	0	255	2.56°/mm unit	130.00°/mm (Default)
11	Return travel monitoring	0	0	1	Boolean	0 = Outputs do not change. 1 = If wand does not come back during return travel, KO output will be active.
12	Power On	1	0	1	Boolean	0 = Wand will not travel after Power On. 1 = Wand will travel to HomePos after Power On.

No.	Name	Default	Min.	Max.	Format	Description
13	Output setting	0	0	1	Boolean	0 = Outputs will be set at object position. 1 = Outputs will be set at HomePos.
14	Output state	0	0	1	Boolean	0 = Outputs will be reset with the next scan. 1 = Outputs will be reset with decreasing Teach/Check signal. 2 = The outputs are set for a time, (see Output State for OK/KO Time)
15	Limit Position	0	1	255	only ° unit	0 = Inactive 1..255
16	Reserved	-	-	-	-	-
17	Common options	0	0	255	Boolean	see "Description of the parameters"
18	HomePos Offset	0	0	255	only 0.1° unit	0.0° (Default) adopt scanner parameter
19	Time frame value	0	0	255	1ms unit	0ms (Default) tool replacement area = tool free space
20	Collision-free area	0	0	255		0.00°/mm (Default) adopt scanner parameter
21	Monitoring unit *	0	0	1	Boolean	0 = Degree 1 = Millimeter
22	VertDistance Low byte *	0	0	255	0.01mm unit	0.00mm (Default)
23	VertDistance High byte *	0	0	255	2.56mm unit	
24	RefAngle90° Low byte *	0	0	255	0.01° unit	0.00° (Default)
25	RefAngle90° High byte *	0	0	255	2.56° unit	
26	RefToolLength Low byte *	0	0	255	0.01mm unit	0.00mm (Default)
27	RefToolLength High byte *	0	0	255	2.56mm unit	
28	BKM variant *	read_only			Hex	20h = BKM91PB 22h = BKM91I 23h = BKM91D 24h = BKM91PN
29	Date month *	read_only			Dec	Date month (01-12)
30	Date year *	read_only			Dec	Date year (07-xx for 2007-20xx)
31	FW version *	read_only			Dec	Software version for example 11 is version 1.1

Default settings are bold.

* Parameters 21-31 show Bank0 setting (Default)

Declarations concerning parameters:

- The table shows the allocation of parameters 0 ... 31. More parameters can be addressed with the sub parameter in parameter no. 1.
- There are parameters that can be read as well as written. Other parameters are "read_only".
- An attempt to write a "read_only" parameter causes an error message.

4.5.1 Description of the parameters

No. Description

0 Scanning intensity

Scanning intensity determines the size of strength and rate during the Teach cycle and/or within the tolerance range of Check cycle. There are 8 steps of setting.

1 Sub parameter

The 8 bit data word of this parameter is partitioned in a 4 bit sub address and a 4 bit data word. When data is written to the BK Mikro9 the sub address must be set. If it is 0000 the Out1 parameter will be written. When data is read from the BK Mikro9 the sub address must be set too.

Parameter data AW1/EW1

15	14	13	12	11	10	9	8
Sub address				Data			

Sub address	Data
0000	<p>Out1 (Bit coded)</p> <p>This parameter defines the active status of the relay output 1.</p> <p>Bit 8: Out1 inactive: Out1 normally closed active: Out1 normally open</p> <p>Bit 9-11: reserved</p>
0001	<p>Scanning mode (Value coded)</p> <p>Normal Normal check (default), the wand has to stop completely at the object to finish measurement.</p> <p>Vibration tolerant If there are vibrations in the machine, it is possible that the BK Mikro9 needs more time to finish measurement. In the "Vibration tolerant" mode, small movements are accepted. The measuring result is effected insignificant.</p> <p>Fast In this mode, measuring will be stopped shortly after touching the tip of the object. Fast mode is designed to verify that an object is within the tolerance area and only needs to see the wand stop once within the tolerance. Since the object is only contacted once the measurement results are not as precise.</p> <p>Note: All tolerances are limited to 0.5° by the controller. The programmed values are not effected.</p> <p>0: Normal 1: Vibration tolerant 2: Fast 3: Reserved</p>

Sub address	Data
0010	<p>PrePosition speed (Value coded)</p> <p>The speed of the PrePosition can be changed. This has an influence how fast the position of the PrePosition will be achieved and how strong the wand swings.</p> <p>Standard High speed during "PrePosition", large overshoot</p> <p>Very slow Slowest speed during "PrePosition", smallest overshoot</p> <p>Slow Slow speed during "PrePosition", compromise between speed and overshoot</p> <p>Long Wand Optimal setting for wands from 610 mm</p> <p>0: Standard 1: Very slow 2: Slow 3: Long Wand</p>
0011	<p>PROFIBUS/PROFINET options (Bit coded / Value coded)</p> <p>Bit 8: PROFIBUS/PROFINET Data format (inactive: LSB, active: MSB)</p> <p>Bit 9: PROFIBUS/PROFINET Value (inactive: unsigned, active: signed)</p> <p>Bit 11&10: 00 no point shifting active 01 Basic point shifting: Point shifting for angle/length set value (AW3, EW3), tolerance (AW2) and for parameters 5 and 18 10 reserved – do not use 11 Extended point shifting: for parameters 07-10, 15, 20 and 22-27 and basic point shifting active</p>
0100	<p>Bank shifting (Value coded – PROFIBUS only)</p> <p>With this setting the meaning of parameters 21-31 can be changed:</p> <p>0000 Bank 0 - Firmware version display Mode 1 (default setting) Parameter 29 shows the month Parameter 30 shows the year Parameter 31 shows the FW version</p> <p>0001 Bank 1 - Firmware version display Mode 2 Parameter 29 shows the FW major index Parameter 30 shows the FW minor index Parameter 31 shows the FW subversion index</p> <p>0010 Bank 2 - Extended error information Parameter 21-31 shows extended error information see table "Extended error messages" below</p> <p>0011 Bank 3 - Material number and serial number of scanner and control unit will be displayed, if existing Parameter 21 shows material number of the control unit (value + 6304234) Parameter 22 shows part 1 (LSB) of serial number of the control unit Parameter 23 shows part 2 of serial number of the control unit Parameter 24 shows part 3 of serial number of the control unit Parameter 25 shows part 4 (MSB) of serial number of the control unit Parameter 26 shows material number of the scanner (value + 6304234) Parameter 27 shows part 1 (LSB) of serial number of the scanner Parameter 28 shows part 2 of serial number of the scanner Parameter 29 shows part 3 of serial number of the scanner Parameter 30 shows part 4 (MSB) of serial number of the scanner Parameter 31 reserved</p> <p>0100-1111 reserved</p>

Sub address	Data				
	General view of the Banks				
	Parameter	Bank 0 *	Bank 1	Bank 2 **	Bank 3
	21	Monitoring unit	Monitoring unit	Cable error	Material no. of the control unit
	22	Vert. Distance Low byte	Vert. Distance Low byte	Scanner error	Serial number control unit part 1
	23	Vert. Distance High byte	Vert. Distance High byte	Control unit error	Serial number control unit part 2
	24	Reference angle Low byte	Reference angle Low byte	Wand error	Serial number control unit part 3
	25	Reference angle High byte	Reference angle High byte	Set value error	Serial number control unit part 4
	26	RefToolLength Low byte	RefToolLength Low byte	Future use	Material no. of the scanner
	27	RefToolLength High byte	RefToolLength High byte	Parameter error	Serial number scanner part 1
	28	BKM variant	BKM variant	Future use	Serial number scanner part 2
	29	Date month	FW major index	Future use	Serial number scanner part 3
	30	Date year	FW minor index	Future use	Serial number scanner part 4
	31	FW version	FW subversion index	Future use	Future use
	* Bank 0 is default setting				
	** Bank 2: see following table "Extended error messages"				

Sub address	Data																																																																										
	<p>Extended error messages</p> <p>If parameters switched to Bank 2 the extended error messages can be shown. Not described values are reserved for future error messages. 0x00 is no error detect.</p> <table border="1"> <thead> <tr> <th data-bbox="635 589 916 613">Parameter 21 – Cable error</th> <th data-bbox="1249 589 1310 613">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 629 951 654">Motor current too low at start up</td> <td data-bbox="1249 629 1305 654">0x01</td> </tr> <tr> <td data-bbox="635 669 847 694">Cable break detected</td> <td data-bbox="1249 669 1305 694">0x02</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="635 710 943 734">Parameter 22 – Scanner error</th> <th data-bbox="1249 710 1310 734">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 750 807 775">Not valid position</td> <td data-bbox="1249 750 1305 775">0x01</td> </tr> <tr> <td data-bbox="635 790 959 815">Scanner blocked – no movement</td> <td data-bbox="1249 790 1305 815">0x02</td> </tr> <tr> <td data-bbox="635 831 935 855">No reference (HomePos) found</td> <td data-bbox="1249 831 1305 855">0x03</td> </tr> <tr> <td data-bbox="635 871 1007 896">Critical error – position change to high</td> <td data-bbox="1249 871 1305 896">0x04</td> </tr> <tr> <td data-bbox="635 911 788 936">Wrong scanner</td> <td data-bbox="1201 911 1310 936">0x05-0x06</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="635 952 975 976">Parameter 23 – Control unit error</th> <th data-bbox="1249 952 1310 976">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 992 916 1016">Internal power supply error 1</td> <td data-bbox="1201 992 1310 1016">0x01-0x08</td> </tr> <tr> <td data-bbox="635 1032 743 1057">Logic error</td> <td data-bbox="1249 1032 1305 1057">0x09</td> </tr> <tr> <td data-bbox="635 1072 916 1097">No tool in table programmed</td> <td data-bbox="1249 1072 1305 1097">0x0A</td> </tr> <tr> <td data-bbox="635 1113 916 1137">Control box hardware error 1</td> <td data-bbox="1201 1113 1310 1137">0x0B-0x12</td> </tr> <tr> <td data-bbox="635 1153 892 1178">PROFINET hardware error</td> <td data-bbox="1201 1153 1310 1178">0x13-0x17</td> </tr> <tr> <td data-bbox="635 1193 916 1218">Internal power supply error 2</td> <td data-bbox="1201 1193 1310 1218">0x18-0x25</td> </tr> <tr> <td data-bbox="635 1234 815 1258">Temperature error</td> <td data-bbox="1201 1234 1310 1258">0x26-0x27</td> </tr> <tr> <td data-bbox="635 1274 831 1299">Micro SD card error</td> <td data-bbox="1249 1274 1305 1299">0x28</td> </tr> <tr> <td data-bbox="635 1314 916 1339">Control box hardware error 2</td> <td data-bbox="1249 1314 1305 1339">0x29</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="635 1355 916 1379">Parameter 24 – Wand error</th> <th data-bbox="1249 1355 1310 1379">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 1395 935 1420">Wand blocked – no movement</td> <td data-bbox="1249 1395 1305 1420">0x01</td> </tr> <tr> <td data-bbox="635 1435 916 1460">Wand return movement error</td> <td data-bbox="1249 1435 1305 1460">0x02</td> </tr> <tr> <td data-bbox="635 1476 1118 1500">GoPos movement error – set position not reached</td> <td data-bbox="1249 1476 1305 1500">0x03</td> </tr> <tr> <td data-bbox="635 1516 1094 1541">Wand stepping failed – set position not reached</td> <td data-bbox="1249 1516 1305 1541">0x04</td> </tr> <tr> <td data-bbox="635 1556 995 1581">Wand speed test failed – internal test</td> <td data-bbox="1249 1556 1305 1581">0x05</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="635 1597 951 1621">Parameter 25 – Set value error</th> <th data-bbox="1249 1597 1310 1621">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 1637 1035 1662">No object found – move over set position</td> <td data-bbox="1249 1637 1305 1662">0x01</td> </tr> <tr> <td data-bbox="635 1677 1067 1702">GoPos set position larger than Limit Position</td> <td data-bbox="1249 1677 1305 1702">0x02</td> </tr> <tr> <td data-bbox="635 1718 1070 1742">PrePos set position larger than Limit Position</td> <td data-bbox="1249 1718 1305 1742">0x03</td> </tr> <tr> <td data-bbox="635 1758 730 1783">Reserved</td> <td data-bbox="1201 1758 1310 1783">0x04-0x05</td> </tr> <tr> <td data-bbox="635 1798 1129 1823">Teach/Check set position larger than Limit Position</td> <td data-bbox="1249 1798 1305 1823">0x06</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="635 1839 908 1863">Parameter 26 – Future use</th> <th data-bbox="1249 1839 1310 1863">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 1879 730 1904">Reserved</td> <td data-bbox="1249 1879 1310 1904"></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th data-bbox="635 1919 963 1944">Parameter 27 – Parameter error</th> <th data-bbox="1249 1919 1310 1944">Value</th> </tr> </thead> <tbody> <tr> <td data-bbox="635 1960 987 1984">Parameter Position P1 and P2 equal</td> <td data-bbox="1249 1960 1305 1984">0x01</td> </tr> <tr> <td data-bbox="635 2000 1142 2024">RL Mode: Parameter Position P1 and P2 are set to 0</td> <td data-bbox="1249 2000 1305 2024">0x02</td> </tr> <tr> <td data-bbox="635 2040 1015 2065">Parameter P1 larger than Limit Position</td> <td data-bbox="1249 2040 1305 2065">0x03</td> </tr> </tbody> </table>	Parameter 21 – Cable error	Value	Motor current too low at start up	0x01	Cable break detected	0x02	Parameter 22 – Scanner error	Value	Not valid position	0x01	Scanner blocked – no movement	0x02	No reference (HomePos) found	0x03	Critical error – position change to high	0x04	Wrong scanner	0x05-0x06	Parameter 23 – Control unit error	Value	Internal power supply error 1	0x01-0x08	Logic error	0x09	No tool in table programmed	0x0A	Control box hardware error 1	0x0B-0x12	PROFINET hardware error	0x13-0x17	Internal power supply error 2	0x18-0x25	Temperature error	0x26-0x27	Micro SD card error	0x28	Control box hardware error 2	0x29	Parameter 24 – Wand error	Value	Wand blocked – no movement	0x01	Wand return movement error	0x02	GoPos movement error – set position not reached	0x03	Wand stepping failed – set position not reached	0x04	Wand speed test failed – internal test	0x05	Parameter 25 – Set value error	Value	No object found – move over set position	0x01	GoPos set position larger than Limit Position	0x02	PrePos set position larger than Limit Position	0x03	Reserved	0x04-0x05	Teach/Check set position larger than Limit Position	0x06	Parameter 26 – Future use	Value	Reserved		Parameter 27 – Parameter error	Value	Parameter Position P1 and P2 equal	0x01	RL Mode: Parameter Position P1 and P2 are set to 0	0x02	Parameter P1 larger than Limit Position	0x03
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Parameter P1 larger than Limit Position	0x03																																																																										

	Parameter P2 larger than Limit Position	0x04
	Parameter 28-31 – Future use	Value
	Reserved	
Sub address	Data	
0101	HomePos characteristic (Bit coded) Bit 8 inactive: normal active: Push mode, the wand is pressed in HomePos against the mechanical stop Bit 9-11: reserved	
0110	KO characteristic (Bit coded) Bit 8 inactive: return immediately when KO is detected active: return at object, wand is moving until an object is hit Bit 9-11: reserved	
0111	Angle/length output characteristic (Bit coded) Bit 8 inactive: last measured angle/length (EW3) is shown active: actual position of the wand is shown in EW3 Bit 9-11: reserved	
1000	Rereference monitoring (Bit coded) Bit 8 inactive: normal inspection of the Rereference function active: precise inspection of the Rereference function Bit 9-11: reserved	
1001	Rescan (Bit coded / Value coded) Bit 9&8: 00 inactive 01 Rescan active 10-11 reserved Bit 11&10: reserved	
1010	Reserved	
1011	PrePos Offset (Value coded) 0: Default setting 1-15: PrePos offset in degree	
1100	Additional Teach Cycles (Value coded) 0: None 1-4: Added Teach cycles	
1101	Reserved	
1110	Reserved	
1111	Output State for OK/KO Time setting (Value coded) 0: not defined 3...9: 300-900ms 12: 2000ms 1: 100ms 10: 1000ms 13-14: 2500-3000ms 2: 200ms 11: 1500ms 15: 3500ms	

2 Out2

This parameter defines the active status of the relay output 2.

Out2 inactive: Out1 normally closed
active: Out2 normally open

3 Monitoring

Using this parameter, either object or free space monitoring can be specified.

Object monitoring

When an object is scanned the OK output is active if the presence of the object is detected in the specified range. The KO output is active if the object is not present.

Free space monitoring

checks, if the specified area can be exceeded without hit to a barrier.

The ranges are specified using either the object set value and tolerance definitions or using the P1 and P2 position parameters. If the object set position is defined as 0, then P1 and P2 are used as the tolerance range.

4 Rotation direction

This parameter changes the scanning direction of the wand.

As soon as the parameter is changed, the wand travels in the other direction to the internal stop.

5 Tolerance range

This parameter sets the tolerance range. With this information the tolerance range has not to be set in Check cycle.

Tolerance range = 0 in control word: +/- parameter value is used as tolerance range.

6 Scanner

For different wand settings a different scanner setting may be necessary.

Value	Type	Comment
0	TK_AutoDetect	Activate the automatic detection of the scanner. Only for scanner types of series TK9xxx.
1	TK8A	Scanner TK8: standard wand 380 mm
2	TK7A/RL	Scanner TK7: standard wand 165 mm
3	TK8A Short Wand	Scanner TK8: wand 165 mm
4	TK91A610	Scanner TK91: optimised for wands up to 610 mm
5	TK91A510	Scanner TK91: standard wand up to 610 mm, fast movement (optimised for 510 mm wand), autodetect setting
6	TK94A/RL	Scanner TK94: standard wand 165 mm
7	TK9LIN50/100	Scanner TK9LIN
8	TK96A/RL	Scanner TK96: standard wand 100 mm
9	TK91A732	Scanner TK91: optimised for wands up to 732 mm
10	TK91A270	Scanner TK91: optimised for wands up to 270 mm
11	TK91F510	Scanner TK91: special parameter setting
12	TK94A/RL250	Scanner TK94: optimised for wands up to 250 mm
13	TK91A910	Scanner TK91: optimised for wands up to 910 mm
14	TK91F662	Scanner TK91: special parameter setting
15	TK91A328	Scanner TK91: optimised for wands up to 328 mm
16	TK94A/RL250S	Scanner TK94: optimised for wands up to 250 mm (slow movement)
17	TK8A 380Q	Scanner TK8: square wand 380 mm
128	USER_0_NotDef	Parameter for one special scanner wand, loadable in the menu File/Scanner. If this is programmed, the assigned scanner wand name appears instead of "NotDef".
129	USER_1_NotDef	Parameter for one special scanner wand, loadable in the menu File/Scanner. If this is programmed, the assigned scanner wand name appears instead of "NotDef".



Note:

In case of a change of the scanner parameters the system must be restarted, the new wand parameters will be taken over!

- 7 Position 1: P1 Low byte
- 8 Position 1: P1 High byte
- 9 Position 2: P2 Low byte
- 10 Position 2: P2 High byte

Using these parameters the object set value can be preset by P1 and P2.

These values are used as range set value as soon as object set value = 0.

11 Return travel monitoring

Using this parameter the KO output can be activated in case of non-attaining HomePos. If return travel monitoring is not active, this information can also be interrogated in the "Wand in HomePos" bit via PROFIBUS/PROFINET.

12 Power On

Using this parameter it can be prevented that the wand starts moving immediately after switch-on of the power supply.

Usually set parameter to 1 (active): Default!

13 Output setting

The outputs switch either when the wand touches the object or only when the wand reaches HomePos.

14 Output state

The outputs can be reset either with the next scan or with decreasing Tech/Check signal.

15 Limit Position

limits the maximum range of the movement.

16 Reserved**17 Common options**

7	6	5	4	3	2	1	0
R*	R*	R*	Millimeter mode calculation			Scanner powerless	Scanning mode

* reserved: future use possible

Bit 0: Scanning mode

Inactive: The scanner scans only in one direction for an object.

Active: A function R/L is generated for the tool table.

In this mode the table bit (AW2 Bit 7) must be active at Teach or Check.

- At Teach both positions will be stored in a tool table.

- At Check both tools will be scanned.

Bit 1: Scanner powerless

Inactive: Scanner controls the position (normal operation).

Active: The scanner motor will be powerless.

The wand can be travelled freely.

At power on, this bit will be deleted and the scanner travels normally.

Bit 2-4: Millimeter mode calculation

000: when set from 0xx to 000 the millimeter mode parameters (22-27) are calculated.

001: recording for 1-Tool-Setup-Mode-1 is active

011: recording for 3-Tool-Setup-Mode is active

18 HomePos Offset

The HomePos of the wand before the mechanical backstop can be adjusted with this parameter. This parameter is always in degree.

The standard value of the particular scanner will be used if it is "0", e.g. 8°.

19 Time frame value

This value determines when the "Time frame (CollChgArea)" bit will be set (lies in status word EW2 before the "Collision-free area(CollFrArea)" bit).

20 Collision-free area

Here the "Collision-free area" of the wand is defined (e.g. outside a tool magazine).

21 Monitoring unit

All objects and free spaces can be monitored in two different ways:

- in degree units: all information is in degrees [°]
- in millimeter units: all information is in millimeters [mm]



Note:

In order to use the millimeter mode please note the information in chapter "Characteristics" under section "Millimeter mode".

22/23 VertDistance

This parameter corresponds to the distance between the scanner axis and the tool that the scanner wand would contact at 90°.

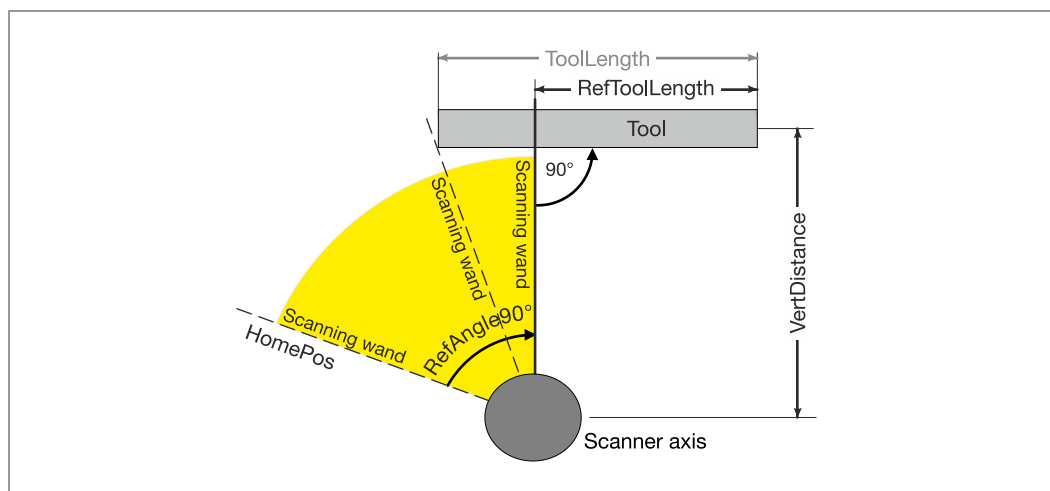


Fig. 4-3: VertDistance



Note:

This function is not possible with TK9LIN50/100 scanner!

24/25 RefAngle90°

This parameter corresponds to the angle between the tool and the home position (HomePos) at the 90° position of the tool to the wand (see Fig. 4-3).

26/27 RefToolLength

This parameter corresponds to the tool length at the 90° position of the tool to the wand (see Fig. 4-3).

28 BKM variant

This parameter is "read_only" and shows the variant of the control unit.

29 Date Month

This parameter is "read_only" and shows the date (month) of the firmware version of the control unit.

30 Date Year

This parameter is "read_only" and shows the date (year) of the firmware version of the control unit.

31 FW version

This parameter is "read only" and shows the firmware version of the control unit.

5 DeviceNet

5.1 DeviceNet interface

The DeviceNet interface is a removable 5 pin linear plug interface (electrically insulated).

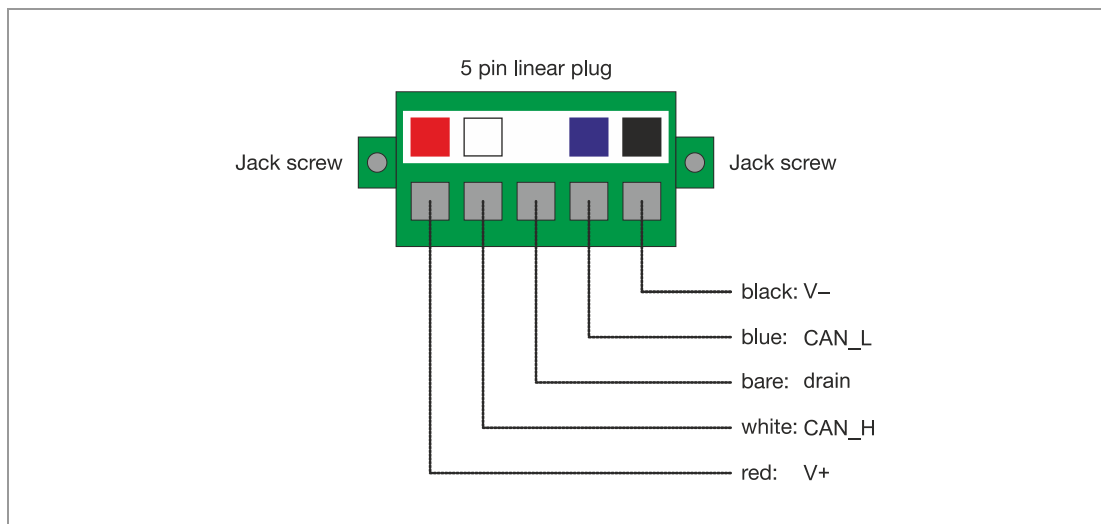


Fig. 5-1: DeviceNet interface

5.2 Configuration with "System Setup BK Mikro9" PC software

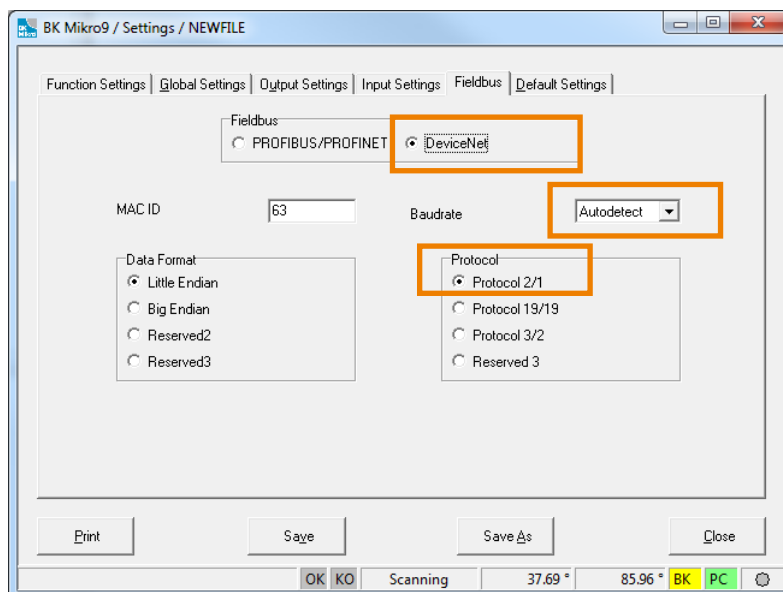


Fig. 5-2: DeviceNet setting in "System Setup BK Mikro9" PC program

5.3 Principle DeviceNet properties

5.3.1 Node Address

The DeviceNet MACID can be set via PC with the "System Setup BK Mikro9" configuration program or with the BKM9IO extension module in connection with the control unit.

The default setting of the address is 63 dec.

5.3.2 DeviceNet Baud rates

Supported baud rates
125 kBaud
250 kBaud
500 kBaud
Autodetect

The default setting is Autodetect.

The baud rate can be set directly to a definite rate with "System Setup BK Mikro9" configuration software or can be set to Autodetect which sets the baud rate automatically to the DeviceNet rate of the PLC.

5.3.3 EDS File

The EDS File "BKM91D.eds" is used for the DeviceNet management software.

The file can be downloaded at:

<http://www.bkmikro.com>

5.3.4 Module properties

The **Vendor ID** of Schubert System Elektronik GmbH is **1235 (04D4h)**.

The Device Type is a **Generic Device = 43 (2Bh)**.

The product code of the **BKM91D** is **1**.

The product name is **BKM91D**.

5.4 Protocol

There are three different DeviceNet protocols for communication with the PLC. They are different in size of data and complexity. The protocols can be changed with the "System Setup BK Mikro9" configuration software.

The parameter and command handling is similar to the PROFIBUS/PROFINET. For the description of the parameters see in chapter "General Protocol for PROFIBUS or PROFINET" the sections "Parameter list" and "Description of the parameters".

■ Protocol 2/1

Easiest and smallest protocol:
2 bytes transmit (from master) and 1 byte receive (from master)

■ Protocol 19/19

All functions and settings are available:
19 bytes in and 19 bytes out

■ Protocol 3/2

More tools can be checked and more status information than protocol 2/1:
3 bytes out and 2 bytes in

■ Default

The default setting is protocol 2/1.

5.4.1 Protocol 2/1

Two bytes (Command and Tool number) are sent from the PLC to the BKM91D and one byte (Device Status) is received.

Class 64h, Instance 01h:

PLC to BK Mikro9

Attribute ID	Data Type	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
01h	Byte	-	-	-	-	-	-	Teach	Check
03h	Byte	Tool number							

BK Mikro9 to PLC

Attribute ID	Data Type	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
02h	Byte	Collision-free area (CollFrArea)	Time frame (CollChgArea)	Scanning area not reached	KO	OK	-	Scanning active	Wand in HomePos

5.4.2 Protocol 19/19

19 bytes (Command/Tool number/Parameters/...) are sent from the PLC to the BKM91D and 19 bytes (Device status/Parameters/Tool position...) are received.

Class 65h, Instance 01h:

PLC to BK Mikro9

Attribute ID	Data Type	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
01h	Byte	-	-	-	-	-	Reset OK/KO	Write Parameter	Read Parameter
02h	UINT	Parameter number (2 bytes)							
03h	DINT	Parameter value (4 bytes)							
07h	DWORD	Table active	-	Stop	PrePos	GoPos	Re-reference	Teach	Check
0Ah	DINT	Tolerance (4 bytes)							
0Bh	DINT	Tool position / Tool number (4 bytes)							

BK Mikro9 to PLC

Attribute ID	Data Type	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
04h	Byte	-	-	-	-	-	Error during reading	Error during writing	Parameter updated
05h	UINT	Parameter number (2 bytes)							
06h	DINT	Parameter value (4 bytes)							
08h	DWORD	Collision-free area (CollFrArea)	Time frame (CollChgArea)	Scanning area not reached	KO	OK	-	Scanning active	Wand in HomePos
09h	DWORD	-	Parameter error	Control word error	Set value error	Wand error	Control unit error	Scanner error	Cable error
0Ch	DINT	Tool position / Tool number (4 bytes)							

5.4.3 Protocol 3/2

3 bytes (Command/Tool number) are sent from the PLC to the BKM91D and 2 bytes (Device status/Errors) are received.

Class 66h, Instance 01h:

PLC to BK Mikro9

Attribute ID	Data Type	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
01h	Byte	–	Reset OK/KO	Stop	PrePos	GoPos	Re-reference	Teach	Check
04h	UINT	Tool Number (2 bytes)							

Note:

Before a command Bit (Attribute 01h) is set the Byte must be reset to “0”.

BK Mikro9 to PLC

Attribute ID	Data Type	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
02h	Byte	Collision-free area (CollFrArea)	Time frame (CollChgArea)	Scanning area not reached	KO	OK	–	Scanning active	Wand in HomePos
03h	Byte	–	Parameter error	Control word error	Set value error	Wand error	Control unit error	Scanner error	Cable error

5.5 DeviceNet objects

Supported object classes

Class	Object	Description
0x01	Identity	Provides device type, serial number, vendor ID etc.
0x02	Message Router	Routes explicit messages to the proper destination.
0x03	DeviceNet	Maintains the physical connection to DeviceNet. This object also allocates/de-allocates the master/slave connection set.
0x04	Assembly	The Assembly object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection. Assembly objects can be used to bind input data or output data. The terms "input" and "output" are defined from the network's point of view. An input will produce data on the network and an output will consume data from the network.
0x05	Connection Class	The Connection object allocates and manages the internal resources associated with connections.
0x2B	Acknowledge Handler	The Acknowledge Handler object is used to manage the reception of message acknowledgments. This object communicates with a message producing Application Object within a device. The Acknowledge Handler object notifies the producing application of acknowledge reception, acknowledge timeouts, and production retry limit.
0x64	BKM9 Control Data 1	The vendor specific object provides the configuration, control and status of the device.
0x65	BKM9 Control Data 2	The vendor specific object provides the configuration, control and status of the device.
0x66	BKM9 Control Data 3	The vendor specific object provides the configuration, control and status of the device.

For a detailed DeviceNet protocol description see internet:

<http://www.bkmikro.com>

5.6 Data types

Data type	Description	Length / Bytes	Range
Byte	Bitfield – 8 Bits	1	
UINT	Unsigned Integer	2	0 to 65535
DINT	Double Integer	4	-2^{31} to $2^{31}-1$
DWORD	Bitfield - 32 Bits	4	

6 Configuration program for BK Mikro9

It is possible to set parameters of the BK Mikro9 control unit and to run functions manually with the "System Setup BK Mikro9" configuration program via USB interface of a PC.

After starting the configuration program, the start page will appear where various functions can be selected in the menu.

- Up to 512 functional attributes like specified object position, tolerance and backstop power can be defined in the programming operation.
- The present monitoring cycle status is displayed in detail when in manual mode.
- The wand can be operated or set manually (=>Manual Mode).
- A trace function for long-term monitoring is available (=>Trace).

A window in the manual mode shows the current PROFIBUS/PROFINET/DeviceNet message which is sent to the BK Mikro9 and the message which is sent to the PLC.

For further information please use the "Help" menu of the program.

The program is free to download at:

<http://www.bkmikro.com>

7 For direct contact

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It simply works!



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