SCHUBERT
SYSTEM ELEKTRONIK

It simply works!

Tool and Process Monitoring

BK Mikro®

Edition 2014

SCHUBERT
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Content

About us.

As a member of the Schubert Group of companies, Schubert System Electronik GmbH belongs to a globally active, family-owned company that stands for innovation and sustainable growth – and with approximately 1,000 employees. Over 40 years of experience in the development, manufacturing and application of innovative electronics and technological know-how in all key areas of microcomputer engineering form the basis of our expertise.

We deliver highly advanced automation solutions for the technical user. All of our products are the result of ever-increasing strength of innovation and our high standards of quality and reliability.

For this, we are grateful for the personal efforts and commitment of each and every one of our employees who plan, develop, design, build and produce for us – every day.

We have long recognized that you can only enjoy long-term success if you offer measurable customer benefits. Our references include customers with the highest standards in all areas of production: companies from the mechanical engineering and plant engineering sectors, from the food and beverage industry, textile and wood processing, plastics, chemicals, medical and measurement technologies. You too can capitalize on the synergies that result from our extensive, cross-sector expertise.

BK Mikro

Risk and reliability.

Modern production facilities are only profitable if they work perfectly and produce to capacity. Without the right tool and process monitoring, however, this can no longer be achieved. And for this very reason, fully automated production processes require the automated monitoring of machining processes.

The risks

Today, production facilities are increasingly operated to their full performance potential. In machining centers, rotary transfer machines, transfer lines, machine tools and special machines (or other automated production systems) rejection rates and production downtimes can lead to high losses and damages. The reason can be something as straightforward as tool breakage, or an incorrectly fed or missing tool. Clamping and ejection errors are a problem as well.

The reliability solution

Reliable process monitoring systems guarantee secure control of the production process. They detect the slightest deviations from the should-be status and generate an instantaneous machine stop in order to avoid further damage or production losses. The quick and precise fault indication significantly reduces the time needed to remedy problems. The benefits users capitalize on with BK Mikro lie in a higher degree of automation and lower operating costs.

Reliable fault detection
The permanent automated monitoring of machining processes detects such faults and prevents costly damages.

Quick reaction required
To enable a quick reaction, the faulty production needs to be stopped immediately. And this is exactly what BK Mikro achieves – quickly and reliably.

Specific benefits in production

- Increased productivity
- Improved production quality
- Minimized rejection rate
- Reduced idle times
- Unmanned operation during breaks and at night
- Extended operating time
- Maximum tool availability
- Protection of spindle and feeder
- Easing the task of the machine operator
- Multiple machining

BK Mikro – A synonym for reliability.

The BK Mikro brand brings together the highest key values. BK Mikro not only stands for innovation, products and services, but also for a complete philosophy reflected in its brand identity.

Reliable

Precision and quality are the cornerstones for the highest possible level of constant reliability. BK Mikro meets this high requirement, excels through long-term reliability and significantly increases production quality.

Universal

Easy to handle, adaptable to any challenge, and efficient in use – with the customer benefit always in the foreground. This applies to both the modular hardware and the intelligent software.

Innovative

At first view, with its electro-mechanic sensor principle, BK Mikro may not appear to be high-tech. But its particular innovation lies in its exceptional functionality which is permanently process-optimized.

Made in Germany

Far more than a simple designation of origin – this stands for excellent engineering and has an excellent reputation on the international market.

It simply works – with absolute reliability

BK Mikro stands for the absolutely secure and reliable monitoring of work processes in industrial production. This monitoring is achieved via intelligent sensor system solutions based on sound technological knowledge and industry-specific application experience.

“It simply works” says it all. It communicates the simple and reliable functioning of BK Mikro – even under the most adverse conditions. In this way, the user is ideally equipped to maximize production quality and efficiency.

Everything reliably under control: A system for every application.

In automated production, BK Mikro systems can take on an enormous range of possible applications.

Widespread use

Our tool monitoring systems deliver enhanced security and reliability in automated production processes in over 90,000 installations worldwide.

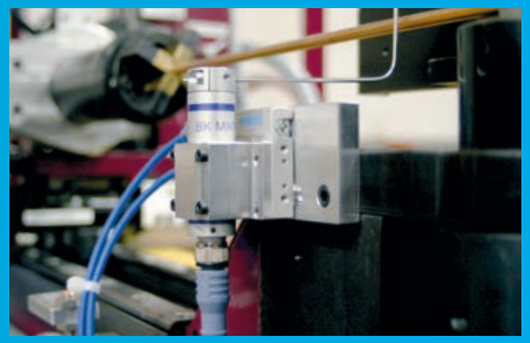
Functional safety

The system has stood the test of time in the most demanding fields of application and the most adverse environmental conditions. Wherever the highest level of precision is required, BK Mikro fulfills its task with robust accuracy.

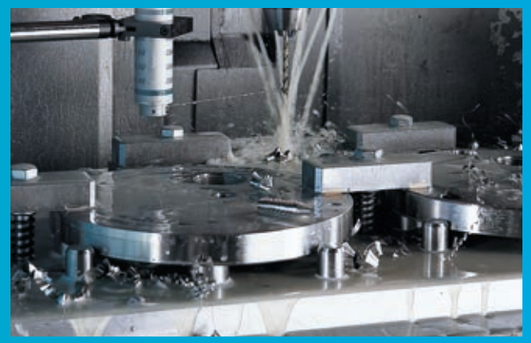
The universal multi-talent

BK Mikro excels with its versatility, making it applicable for a wide range of uses. BK Mikro offers the perfect solution for all production processes.

Workpiece inspection: Checking drill depths



Workpiece inspection: Checking contours



Tool breakage inspection: Unilateral scanning

Tool breakage inspection: Bidirectional scanning

Tool monitoring

- Stationary and rotating tools
- Single spindle/double spindles
- Breakage detection
- Radial scanning on spiral coil/cutting edge

Measuring hidden geometries

- Borings/cavities
- Testing functions in narrow process areas
- Application-specific wand variants
- Linear scanning

Object inspection

- Feeding, ejection and free-space inspection
- Correct tool storage in magazine
- Measuring of length or diameter
- Radial or linear scanning

Testing contours/profiles

- Checking contours for defects
- Registering irregularities
- Monitoring material feeding
- Radial or linear scanning

Position recognition

- Detection of deviations
- Monitoring of tolerances
- Inspection of material thickness
- Radial or linear scanning

Clever, robust and tactile: Component interaction.

The system’s components are behind its high degree of flexibility and adaptability: the scanner, the control unit, and the online and offline programmable configuration software. And finally, the various connectivity options – including fieldbus interfaces – as well as the space-saving installation make the BK Mikro system a real talent for integration.

The system

A system based on mechanical contact, such as BK Mikro, excels with its easy installation, and it is maintenance-free and comparatively economical. The tactile sensor is potential-free and, thanks to its sturdy scanner, it is absolutely non-susceptible to disturbances. The monitoring takes place inside the process area – and time is not wasted moving the tool towards the testing device.

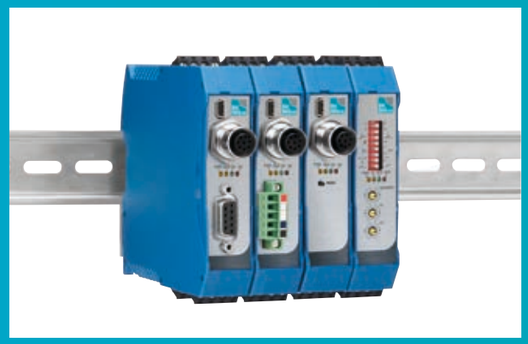
The principle

The wand, which is moved by the scanner, scans object positions or areas in the machine cycle. A control unit with a micro-computer triggers the wand movement by a signal (or a command from the fieldbus-master). The result provided by the wand is compared to the parameters and nominal values defined in the control unit, resulting in an “OK” or “KO” signal, which is transmitted to the machine control..

The scanner

BK Mikro offers scanner versions adapted to different performance classes. Rotary scanners fulfill orthogonal moving functions or the axial scanning of a tool tip, while linear scanners are used for stroke movements.

Scanners: see page 20



The control unit

In order to perfectly comply with many different applications, several models are available. They differ in terms of functional range and interface characteristics, e.g. for monitoring a multitude of objects or for individual monitoring functions, as well as for application-specific configuration options.

Control units: see page 28

System advantages

- Independence from the power of the spindle motor and the machine control
- Can be used in the working space as well as in the magazine
- Tool monitoring also possible in non-productive times
- Bilateral scanning possible (e.g. double or multiple spindles)
- Scanning of rotating tools with diameters ≥ 0.1 mm
- Easy mounting (no adjustment) and maintenance-free
- Individual retrofitting at any time
- Absolutely resistant to external influences (cooling media, chips, vibration, temperature, etc.)

Manifold functions, consistently developed for practice.

Just a few examples are provided here to illustrate BK Mikro's extensive functionality. Technological developments and customer requirements and wishes ensure BK Mikro's ongoing finetuning.

Unidirectional scanning
Depending on the preset parameters in the control unit or the test instructions transmitted by the machine control, the wand rotates to the left or the right until it reaches the test object. Upon reaching the object or transgressing the monitoring range, it changes its rotational direction and returns to the home position.

Bidirectional scanning
By means of a preset angle, the wand can be assigned a freely definable home position between two objects to be monitored. Once the wand has reached this position, both objects can be charged and scanned. The order of the scanning direction can be selected freely.

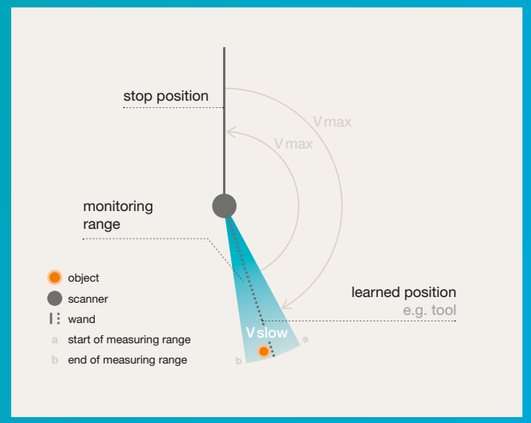
Teach-in
In the learning mode, the wand rotates until it reaches an object. The angle measured is then stored in the tool data base under the selected tool number. The exact preset angle for the actual scanning is then defined by the stored position plus the preset tolerance value.

Start
A measuring process is triggered by the "start" function. If the wand reaches the object inside the angle position learned by "Teach" or preset by parameters, the "OK" signal is sent. If the wand stops before the monitoring range or goes beyond it, a "KO" signal occurs.

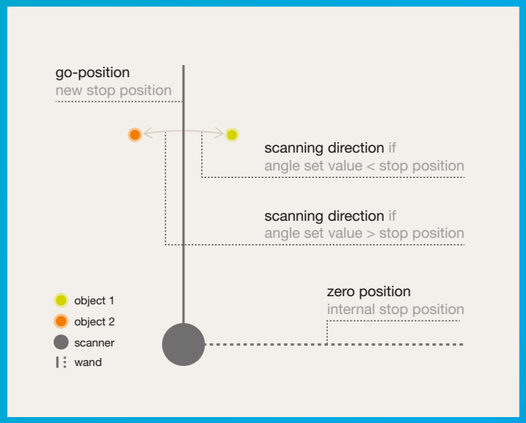
Reference run
This function is required every time the parameters of a measuring system have changed, e.g. after replacement of a scanner. By means of the reference run, the wand can be assigned a new home-position.

Optimized scanning time
The scanning process can be optimized to 150 ms, in order to shorten the time during which the tool has to remain in its position.

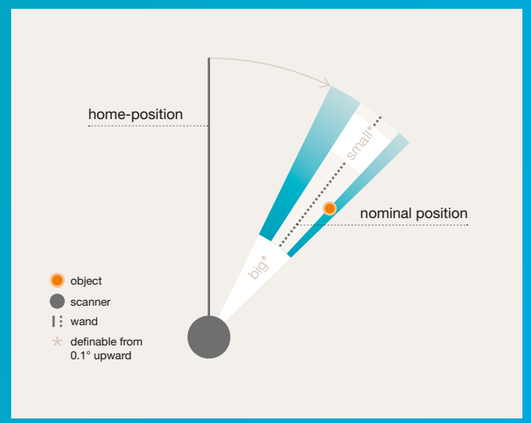
- During forward travel and before the actual scanning, the wand is moved by command towards the object to be monitored up to 10° (pre-position), while the tool can still be positioned.
- During backward travel, the tool can be moved again before the wand has reached its home-position.



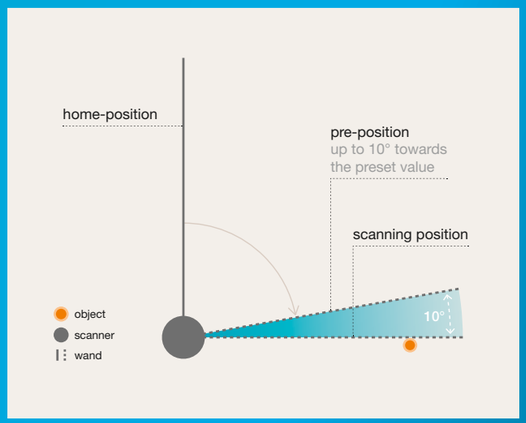
Position / range monitoring



Bidirectional monitoring



Tolerance area



Pre-position principle

Flexible and open in the connection.

BK Mikro offers three types of operation for a system network, depending on machine coupling and programming technique.

Operation via fieldbus

The monitoring is performed according to the parameters (angle/tolerance, etc.) from PROFIBUS or DeviceNetmaster (PLC). An unlimited number of tools can be scanned. With this model, the full functional range is availableg.

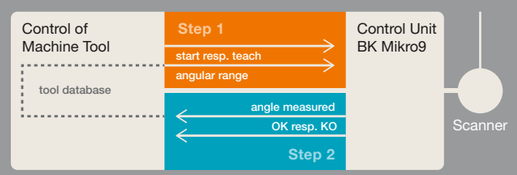
Parameterization via PC

Parameterization of the tool and object data is performed at the PC, transmitted to the control unit via USB, and digitally controlled via I/O channels by the PLC during operation. In connection with an extension module, up to 512 objects/tools can be programmed and monitored via the selection inputs.

Parameterization without a PC

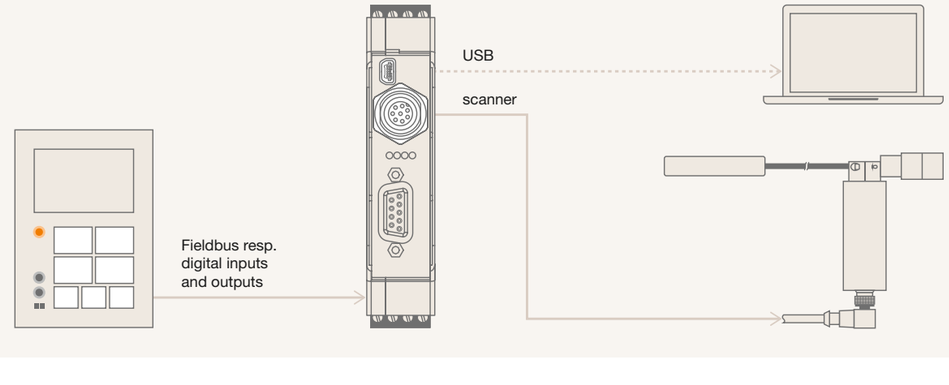
For simple handling without a PC, the major functions (right/left rotation of the wand, object or free space monitoring, definition of scanning intensity) can be set via toggle switch at the I/O extension module. During operation, programming by the PLC is also performed via digital I/Os.

Instructions and parameterization data are transmitted from the PLC to the control unit. Reversely, the control unit sends its status reports to the machine control.

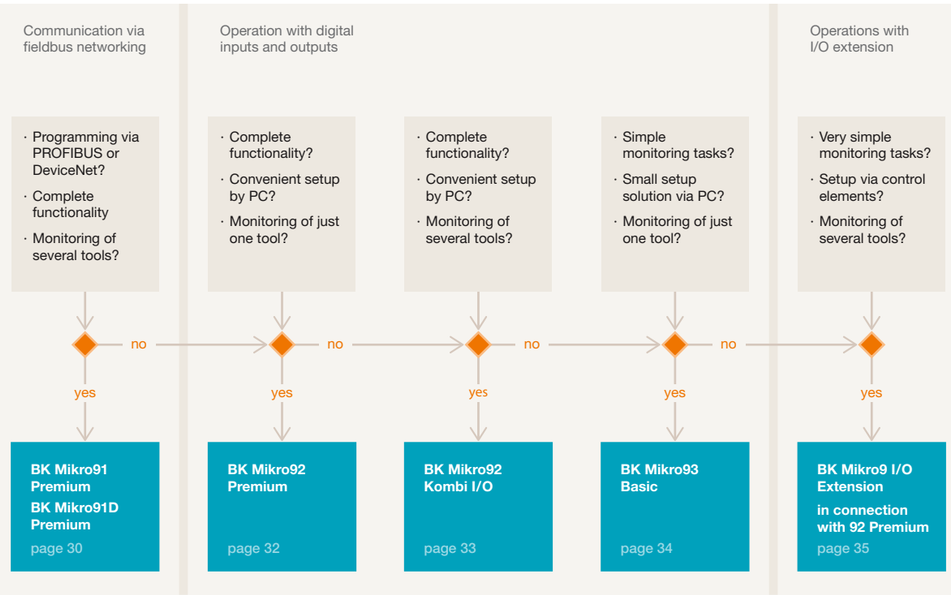


Instructions and parameterization data are transmitted from the PLC to the control unit. Reversely, the control unit sends its status reports to the machine control.

Components in the system network



Determine your system requirements



Intelligent software for configuration.

The desktop software specifically designed for BK Mikro serves to create and administer tool or workpiece monitoring cycles in CNC machining programs. Programming is achieved by interactive input.

Program structure
The premium mode allows for the full functional range, while the basic mode allows for reduced options only. Both programs offer a system set-up which can be programmed online and offline.

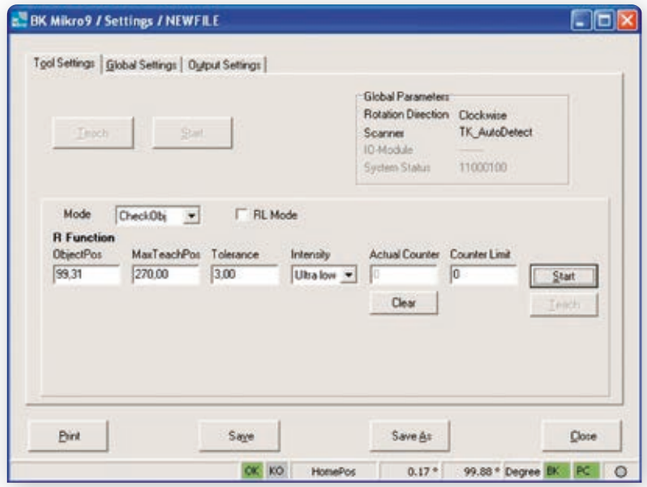
Programming mode
In this mode, attributes of up to 512 tools can be defined (e.g. angle set value or tool length, tolerance and scanning intensity). If there is a USB-connection to the control unit, the current status is already displayed during the projecting. It is also possible to test individual orders or initiate a teach-in process.

Manual mode
This mode serves to check and monitor programmed functions and processes. Here, the status of BK Mikro is displayed extensively as well. Furthermore, manual traverse movements of the wand can be triggered. All results can be recorded as long-term monitoring (“trace”).

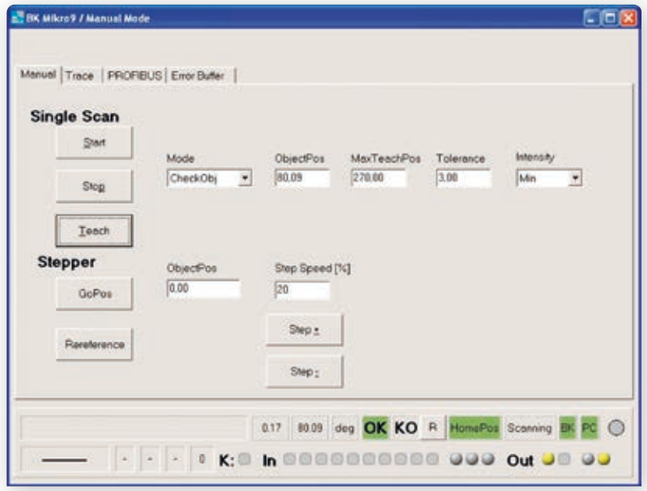
Help-File
This file provides an up-to-date help platform, which supports the user by a simple training of the programming and application functions.

The “System Setup BK Mikro9” configuration software can be downloaded free of charge at **www.bkmikro.com**.

Basic mode – easy programming, instant production.

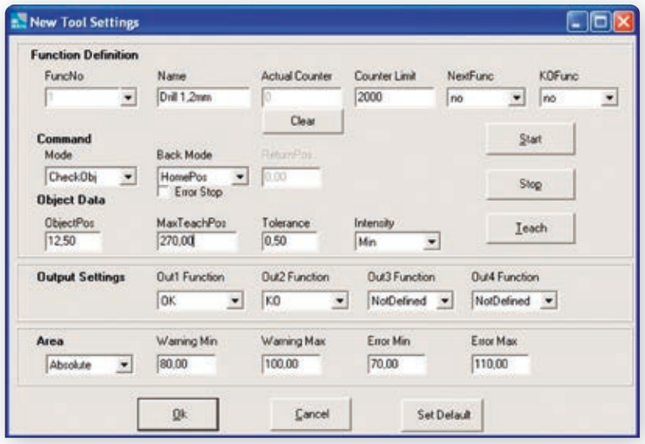


“Tool settings” programming mode attribute:
For monitoring instructions such as position check (“Check Object”) or free-space check (“FreeSpace”).

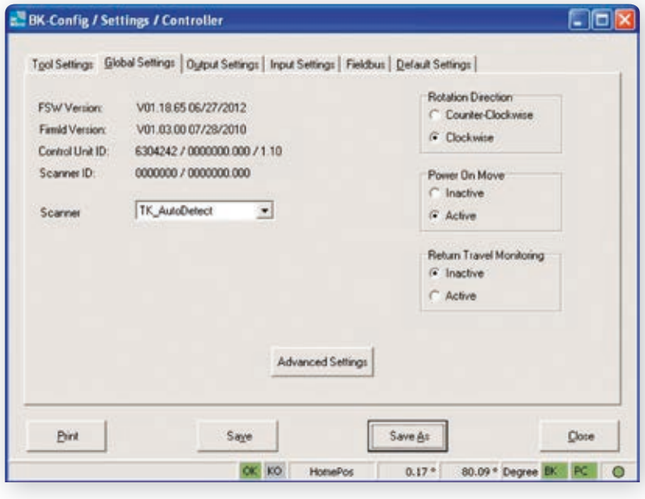


“Scan” manual mode attribute:
For quick monitoring and displaying of angles, tolerances and intensities.

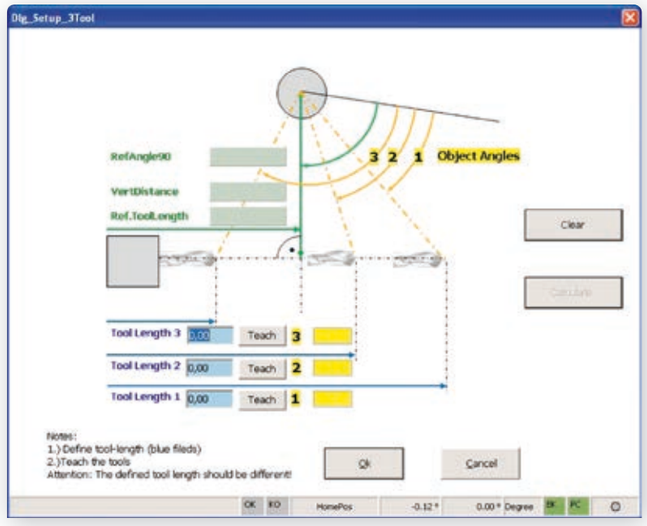
Premium mode – innovative and convenient projecting.



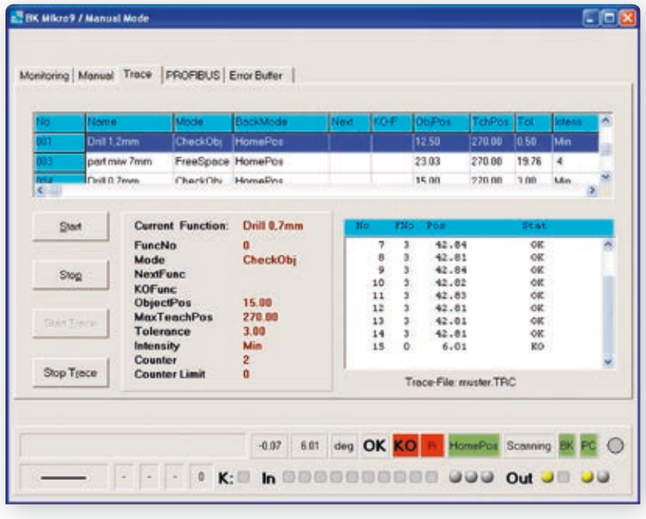
“Tool settings” programming mode attribute:
To edit a new tool and to change the data of an existing tool; supports the programming of data for up to 512 functions.



“Global settings” programming mode attribute:
For individual base settings of the control unit with application-relevant values.



“Setup” programming mode attribute:
To determine the parameters for conversion from an angular measuring system to a linear measuring system (via three learned scanning angles in a tool axis).



“Trace” manual mode attribute:
To execute, monitor and record scanning processes.

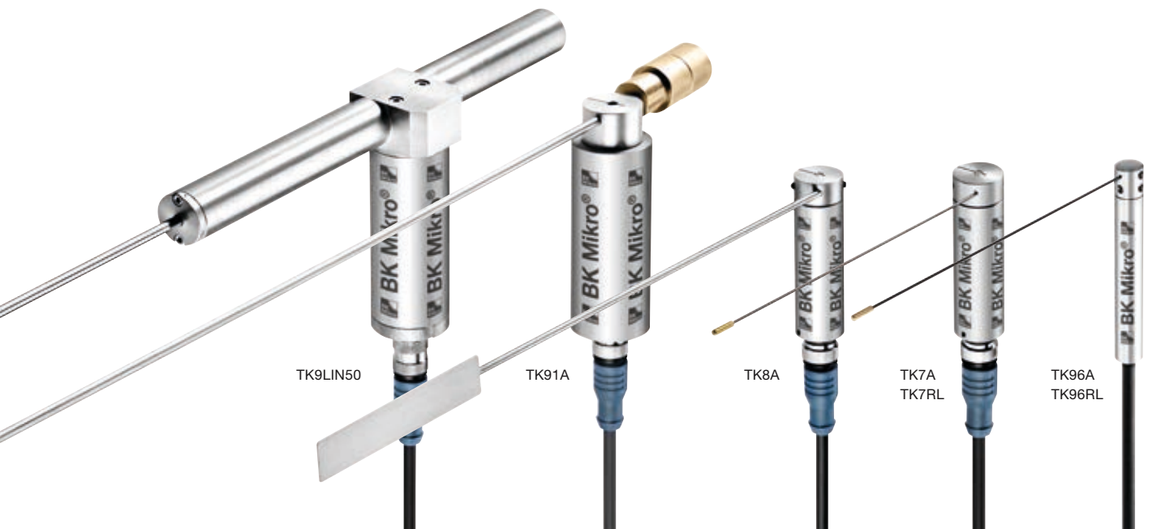
The scanners: Proven under extreme conditions.

The scanners are designed for the toughest applications, equipped with strong scanner shafts, and due to double-lipped special seals (as in pumps), they are impervious to aggressive cooling agents, dust and chips.

Universal
BK Mikro is the ideal solution for original equipment manufacturers (machine builders) and for retrofitting (users). The compact scanner dimensions and the wide scanning range, as well as the smooth, cylindrical wall, allow for easy assembly without additional adjustment aids.

Adaptive
Primarily, a suitable scanner is selected according to the machining process and the geometry of spindle and magazine. In this way, unilateral or bilateral scanning (with double spindles), the axially rotating or linear scanning movement and different measuring lengths are ideally achieved.

Application-specific
Since the drive is controlled by position, rotational speed and torque, the object is gently touched by a carefully “dosed” probing force. This allows for the scanning of smallest rotating drills (axially as small as 0.1 mm!) and the detection of the slightest damages.



Scanner and cycle data in comparison

Scanner (Type)*	TK9LIN50	TK91A	TK94A/RL	TK8A	TK7A/RL	TK96A/RL
Shaft (Ø)	–	4 mm	4 mm	3 mm	3 mm	4 mm
Body (Ø)	–	32 mm	32 mm	20 mm	20 mm	12 mm
Wand length** (max.)	–	610 mm	250 mm	380 mm	250 mm	100 mm
Plate	–	yes	no	yes	no	no
Time of 180° rotation (ca.)	–	1.80 s	0.25 s	1.30 s	0.40 s	0.85 s
Repeat accurancy (+ / - [°] max.)	–	0.05	1.20	0.15	1.20	1.20
Stroke length (max.)	50 mm	–	–	–	–	–
Time of one stroke (ca. sec)	1.40 s	–	–	–	–	–
Repeat accuracy (mm)	0.05	–	–	–	–	–

* Protection class IP67, > 5 million scanning cycles | ** Depending on application other lengths can be requested

TK96A / TK96RL: small and dynamic

TK96 is the ideal solution for applications in the smallest process zones with the highest system availability and a sturdy environment.
Both variants have identical system features, but differ with respect to the internal stop (in model “A”) and the possibility of bilateral scanning (with the “RL” designation). The TK96 series stands out with its especially small dimensions and excellent scanning data.

Scanning

· TK96A in one direction: right or left
· TK96RL bidirectional: right-left or left-right
· Lateral (orthogonal)

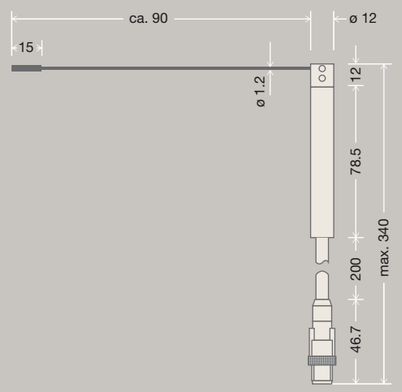
Application

Tool/object monitoring and free-space monitoring

Technical Data

Housing	Stainless steel
Protection class	IP67
Wand length	100 mm (can be shortened), Ø 1.2 mm Wand exchangeable
Scanning angle	TK96A: max. 270° TK96RL: max. 360°
Control unit connection	Fixed cable (200 mm) Small circular connector M12 × 1, 8 pin
Ambient temperature	0 °C to +65 °C
Storage temperature	-25 °C to +85 °C
Scanning cycles	> 5 million at minimum scanning intensity

Mechanical Dimensions (mm)



TK7A / TK7RL: compact and fast

TK7 is established in the price-sensitive segment and is especially suitable for fast and simple monitoring tasks.
Both scanner variants of this type have identical features. The only difference is that in type “A”, the rotational movement is limited by a mechanical stop, whereas type “RL” (without the mechanical stop) can rotate in both directions. Due to the highly dynamic features of the drive, the advantage of TK7 lies in the very fast scanning speed, rather than in scanning precision.

Scanning

· TK7A in one direction: right or left
· TK7RL bidirectional: right-left or left-right
· Lateral (orthogonal)

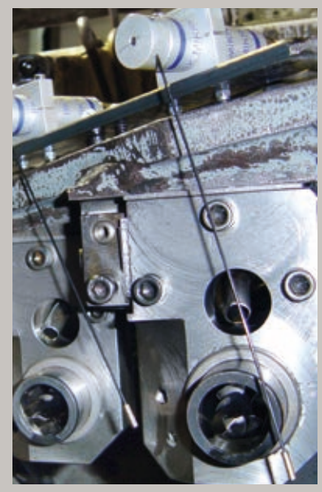
Application

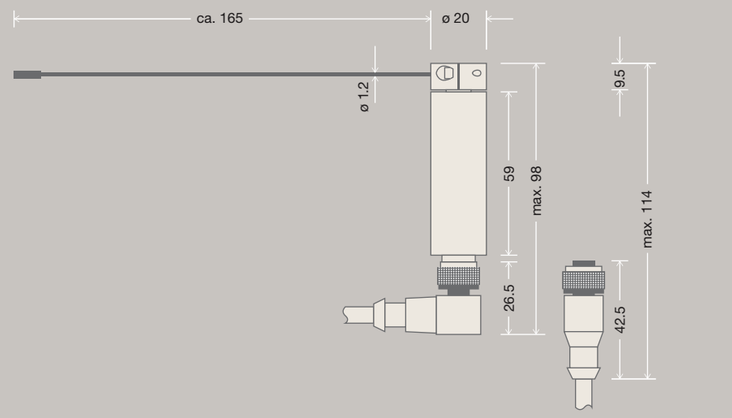
Tool/object monitoring and free-space monitoring

Technical Data

Housing	Anodized aluminium
Protection class	IP67
Wand length	175 mm (standard), Ø 1.2 mm Wand exchangeable
Scanning angle	TK7A: max. 270° TK7RL: max. 360°
Control unit connection	Small circular connector M12×1, 8 pin
Ambient temperature	0 °C to +80 °C
Storage temperature	-25 °C to +85 °C
Scanning cycles	> 5 million at minimum scanning intensity

Mechanical Dimensions (mm)





TK94A / TK94RL: robust and with high speed

TK94 components are ideal for monitoring applications which require particularly robust scanners for extremely short scanning cycles.
Both scanner variants of the TK94 series differ only with respect to the mechanical stop for type “A”. The “RL” model can rotate in both directions without this stop. The special feature of this series is the drive unit, which was designed for highly dynamic and extremely fast reactivity.

Scanning

· TK94A in one direction: right or left
· TK94RL bidirectional: right-left or left-right
· Lateral (orthogonal)

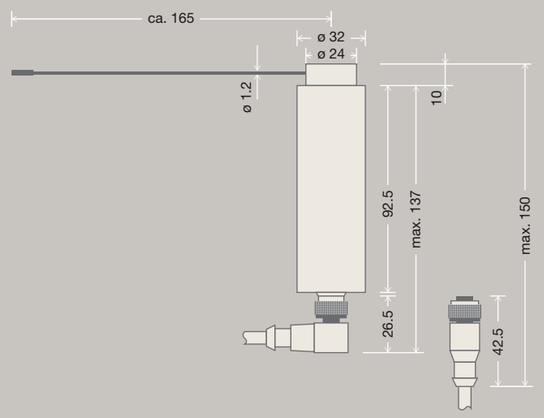
Application

Tool/object monitoring and free-space monitoring

Technical Data

Housing	Anodized aluminium
Protection class	IP67
Wand length	175 mm (standard), Ø 1.2 mm Wand exchangeable
Scanning angle	TK94A: max. 270° TK94RL: max. 360°
Control unit connection	Small circular connector M12×1, 8 pin
Ambient temperature	0 °C to +80 °C
Storage temperature	-25 °C to +85 °C
Scanning cycles	> 5 million at minimum scanning intensity

Mechanical Dimensions (mm)



TK8A: compact and precise

TK8 is especially suitable to achieve precise scanning results with relatively short scanning cycles and a larger distance to the object.
This rotary scanner offers two special features. On the one hand, the use of wands with a length of up to 380 mm allows for a larger distance to the object. And on the other, scanners with a plate can be used and allow to monitor the tool tips inside the tool magazine. The high positioning resolution of the drive ensures the highest monitoring precision.

Scanning

· In one direction: right or left
· Axial (rotational)

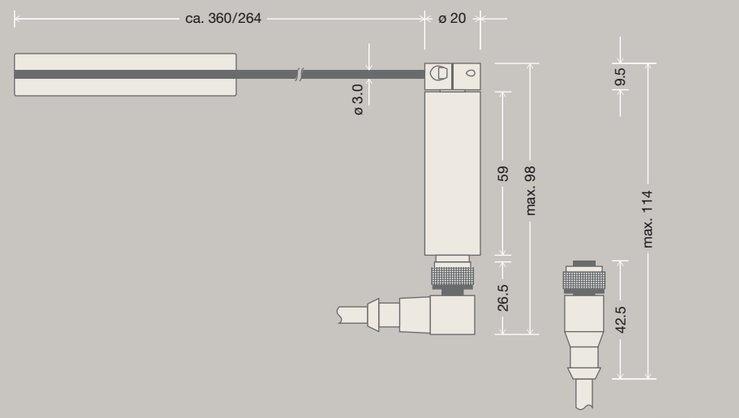
Application

Tool/object monitoring

Technical Data

Housing	Anodized aluminium
Protection class	IP67
Wand length	380 mm, with plate 80 × 15 mm, 284 mm, with plate 65 × 15 mm
Scanning angle	Wand exchangeable Max. 300°
Control unit connection	Small circular connector M12×1, 8 pin
Ambient temperature	0 °C to +80 °C
Storage temperature	-25 °C to +85 °C
Scanning cycles	> 5 million at minimum scanning intensity

Mechanical Dimensions (mm)



TK91A: “high-drive” and highly precise

TK91 is ideally suited for scanning long tools and detecting smallest deviations.
This new development can take longer wands (up to 660 mm) with plates to monitor tool tips. Therefore, no space for lateral swivel range is required. The internal mechanical backstop limits the rotary movement of the wand. The TK91’s powerful gear motor – which also excels by the repeat accuracy of its monitoring function – makes it ideal for a wide scanning range.

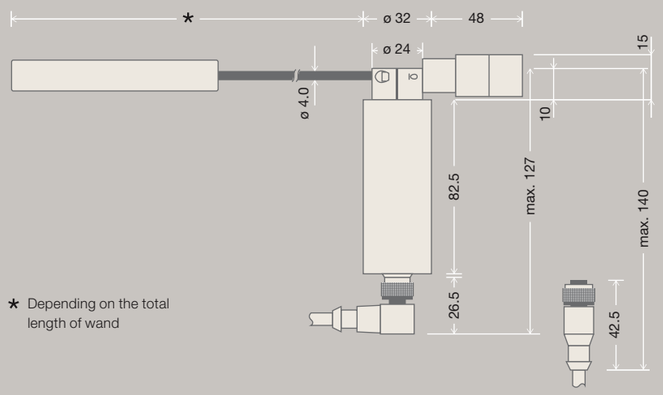
Scanning
· In one direction: right or left
· Axial (rotational)

Application
Tool/object monitoring and checking shapes

Technical Data

Housing	Anodized aluminium
Protection class	IP67
Wand length	Max. 660 mm, with plate 120 mm × 15 mm Wand exchangeable
Scanning angle	Max. 300°
Control unit connection	Small circular connector M12×1, 8 pin
Ambient temperature	0 °C to +80 °C
Storage temperature	-25 °C to +85 °C
Scanning cycles	> 5 million at minimum scanning intensity

Mechanical Dimensions (mm)



* Depending on the total length of wand

TK9LIN50: linear and precise

With its superb repeat accuracy, TK9LIN can be recommended for all uses where high-precision measurements (e.g. of tolerances or depths) are required.
TK9LIN is designed for testing functions in the longitudinal direction, if rotational scanning is not suitable or possible (as in cavities, bore holes or limited space). Any scanning area between the rest position and maximum stroke can be realized. To meet a wide range of testing applications, specific wand tips (brass, plastics, etc.) are available.

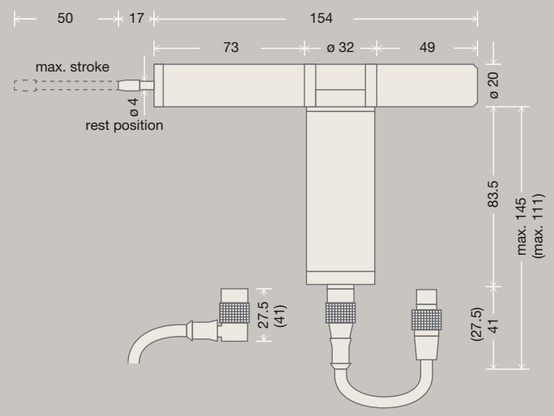
Scanning
· TK9 LIN50 in longitudinal direction: Stroke 50 mm
· Lateral (linear)
· Axial (linear)

Application
Position monitoring

Technische Daten

Housing	Anodized aluminium
Protection class	IP64
Wand tip	Exchangeable, thread M2 × 6
Control unit connection	Small circular connector M12×1, 6 pin
Ambient temperature	0 °C to +80 °C
Storage temperature	-25 °C to +85 °C
Scanning cycles	> 5 million at minimum scanning intensity
Wand length	TK9LIN50: 50 mm max. Hub

Mechanical Dimensions (mm)



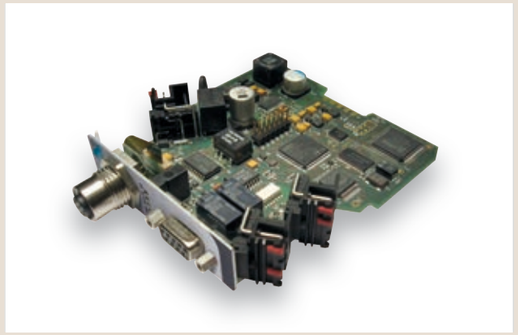
The control units: Compact with great performance.

BK Mikro control units have it all: compact design, powerful functionality and the right connections to the system network – and they deliver great flexibility for subsequent system adaptations.

Functional
The control unit integrates intelligent, micro-controller based logic, modern interface technology as well as all control elements for individualized configuration setting.

Practical
Galvanically isolated inputs and outputs ensure a high degree of operational safety. Furthermore, a cable break detection (IP67) is integrated into the scanner line.

Innovative
The system is based on an up-to-date ARM9-Risc-CPU with high performance and low power consumption.



Well equipped for all challenges

- Fieldbus interfaces for PLC connection PROFIBUS or DeviceNet
- Mini-USB connection for projecting via PC
- Quick identification of monitoring status by LEDs “OK” or “KO” on the front side
- Clockwise/counter-clockwise rotation of wand can be programmed
- Scanning intensity can be adjusted in eight steps (required for drills with small diameter)
- An individual profile can be stored for each tool
- EEPROM as residual data storage for all parameters transmitted
- One circular connector for all scanners

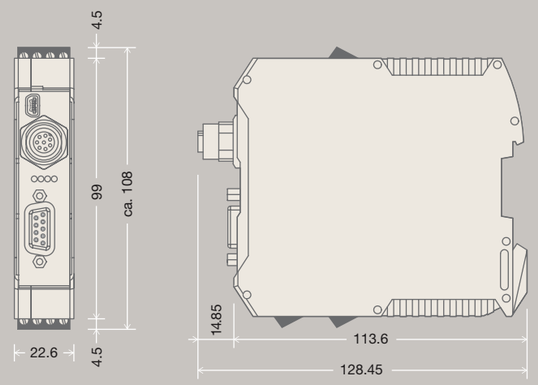
BK Mikro91 Premium

- PROFIBUS interface for direct fieldbus connection to machine control
- Mini-USB for PC-connection
- 3 digital control inputs (positive or negative logic): start and teach signal, as well as configurable channel
- 2 relay outputs (as N/C or N/O contact) with “OK” and “KO” signals
- Pluggable supply voltage and scanner connection
- Opening for top hat rail plug, for optional connection of I/0 extension module
- 4 LEDs for current status display

Technical Data

Housing	Insulation material, protection class II, built-in type
Protection class	IP20
Dimensions (W x H x D)	22.6 mm × 99 mm × 113.6 mm
Mounting of housing	Profile rail 35 mm acc. DIN EN 50022
Supply voltage	24 V DC ±20% PELV, Imax = 0.4 A
Power consumption	10 VA max.
Control voltage	24 V DC ±20% PELV
Inputs	Galvanically isolated Input current ca. 5 mA, Pulse duration 30 ms min.
Switch outputs	2 x relay 30 V DC, 2 A max., 10^5 switching cycles min.
Connections	· Pluggable screw terminals for voltage supply, relay outputs, control inputs · Circular connector, 8 pin (scanner connection) · Mini-USB · PROFIBUS (Sub-D-bush, 9 pin)
Climate conditions	Acc. class 3K3 acc. EN 50178
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C to +80 °C

Mechanical Dimensions (mm)



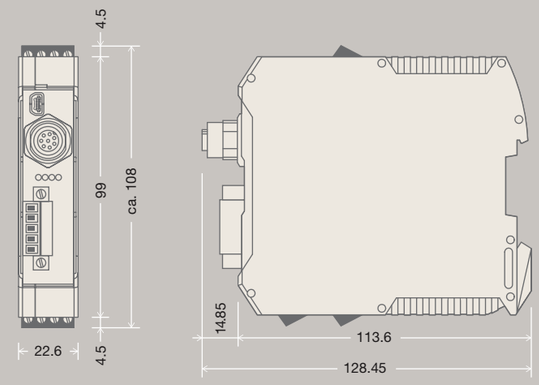
BK Mikro91D Premium

- DeviceNet interface for direct fieldbus connection to machine control
- Mini-USB for PC-connection
- 3 digital control inputs (positive or negative logic): start and teach signal, as well as configurable channel
- 2 relay outputs (as N/C or N/O contact) with “OK” and “KO” signals
- Pluggable supply voltage and scanner connection
- Opening for top hat rail plug for optional connection of I/0 extension module
- 4 LEDs for current status display

Technical Data

Housing	Insulation material, protection class II, built-in type
Protection class	IP20
Dimensions (W x H x D)	22.6 mm × 99 mm × 113.6 mm
Mounting of housing	Profile rail 35 mm acc. DIN EN 50022
Supply voltage	24 V DC ±20% PELV, Imax = 0.4 A
Power consumption	10 VA max.
Control voltage	24 V DC ±20% PELV
Inputs	Galvanically isolated, Input current ca. 5 mA, Pulse duration 30 ms min.
Switch outputs	2 x relay 30 V DC, 2 A max., 10^5 switching cycles min.
Connections	· Pluggable screw terminals for voltage supply, relay outputs, control inputs · Circular connector, 8 pin (scanner connection) · Mini-USB · DeviceNet (Open Style Connector), bush 5 pin, for direct cable wiring
Climate conditions	Acc. class 3K3 acc. EN 50178
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C to +80 °C

Mechanical Dimensions (mm)



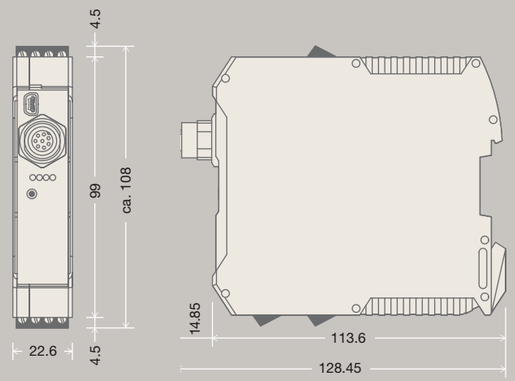
BK Mikro92 Premium

- Mini-USB for PC-connection
- 3 digital control inputs (positive or negative logic): start and teach signal, as well as configurable channel
- 2 relay outputs (as N/C or N/O contact) with “OK” and “KO” signals
- Pluggable supply voltage and scanner connection
- Opening for top hat rail plug for optional connection of I/0 extension module (in case of more than one tool monitoring)
- 4 LEDs for current status display

Technical Data

Housing	Insulation material, protection class II, built-in type
Protection class	IP20
Dimensions (W x H x D)	22.6 mm × 99 mm × 113.6 mm
Mounting of housing	Profile rail 35 mm acc. DIN EN 50022
Supply voltage	24 V DC ±20% PELV, Imax = 0.4 A
Power consumption	10 VA max.
Control voltage	24 V DC ±20% PELV
Inputs	Galvanically isolated Input current ca. 5 mA, Pulse duration 30 ms min.
Switch outputs	2 x relay 30 V DC, max. 2 A, 10^5 switching cycles min.
Connections	· Pluggable screw terminals for voltage supply, relay outputs, control inputs · Circular connector, 8 pin (scanner connection) · Mini-USB
Climate conditions	Acc. class 3K3 acc. EN 50178
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C to +80 °C

Mechanical Dimensions (mm)



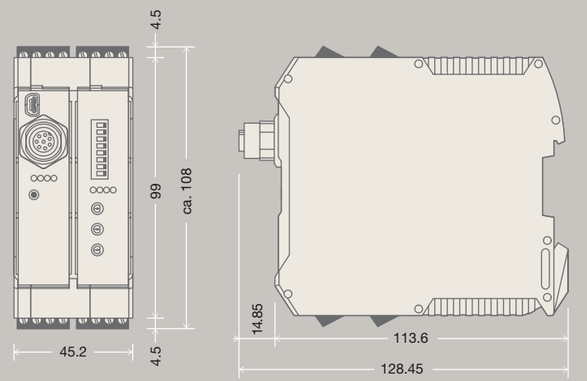
BK Mikro92 Kombi I/O

- Connections: mini-USB, supply voltage and scanner
- Digital control inputs (positive or negative logic):
  3 x start and teach signal as well as configurable channel,
  10 x to select / activate up to 512 different positions
- Digital outputs: 2 x relay with “OK” and “KO” signals (as N/C or N/O contact), 2 x for free configuration (active switching function for 24 V signal)
- 3 rotary switches: selection of scanner and feeding in the scanning angles (adjustable in 24°-steps from 0° to 360°)
- 8 toggle switches: selection monitoring type (object or free-space monitoring), selection rotational direction of wand (right and/or left), definition of relay outputs (N/C or N/O), setting of scanning intensity (2 steps), selection of tolerance range (±0,1° / ±1,0° / ±3,0° / ±10,0°)

Technical Data

Housing	Insulation material, protection class II, built-in type
Protection class	IP20
Dimensions (W x H x D)	45.2 mm × 99 mm × 113.6 mm
Mounting of housing	Profile rail 35 mm acc. DIN EN 50022
Supply voltage	24 V DC ±20% PELV, Imax = 0.4 A
Power consumption	10 VA max.
Control voltage	24 V DC ±20% PELV
Inputs	Galvanically isolated Input current ca. 5 mA, Pulse duration 30 ms min.
Switch outputs	2 x relay 30 V DC, 2 A max., 10^5 switching cycles min. 2 x high side switch, Imax = 0.5 A
Connections	· Pluggable screw terminals for voltage supply, relay outputs, control inputs · Circular connector, 8 pin (scanner connection) · Mini-USB
Climate conditions	Acc. class 3K3 acc. EN 50178
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C to +80 °C

Mechanical Dimensions (mm)



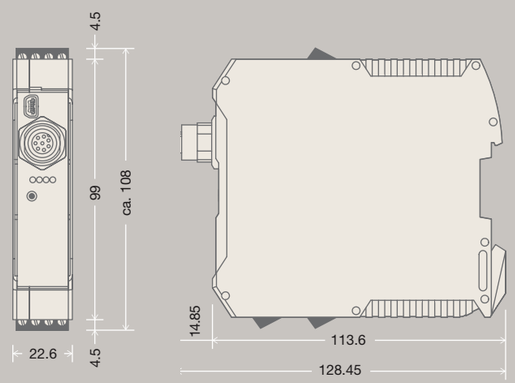
BK Mikro93 Basic

- Mini-USB for PC-connection
- 3 digital control inputs (positive or negative logic): start and teach signal, as well as configurable channel
- 2 relay outputs (as N/C or N/O contact) with “OK” and “KO” signals
- Pluggable supply voltage and scanner connection
- Opening for top hat rail plug for optional connection of I/0 extension module (in case of more than one tool monitoring)
- 4 LEDs for current status display

Technical Data

Housing	Insulation material, protection class II, built-in type
Protection class	IP20
Dimensions (W x H x D)	22.6 mm × 99 mm × 113.6 mm
Mounting of housing	Profile rail 35 mm acc. DIN EN 50022
Supply voltage	24 V DC ±20% PELV, Imax = 0.4 A
Power consumption	10 VA max.
Control voltage	24 V DC ±20% PELV
Inputs	Galvanically isolated Input current ca. 5 mA, Pulse duration 30 ms min.
Switch outputs	2 x relay 30 V DC, 2 A max., 10^5 switching cycles min.
Connections	· Pluggable screw terminals for voltage supply, relay outputs, control inputs · Circular connector, 8 pin (scanner connection) · Mini-USB
Climate conditions	Acc. class 3K3 acc. EN 50178
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C to +80 °C

Mechanical Dimensions (mm)



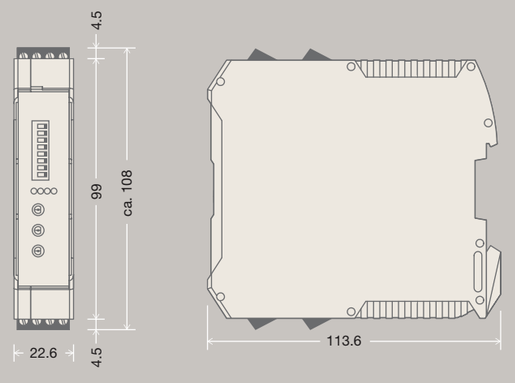
BK Mikro9 I/O Extension module

- 10 digital inputs to select / activate up to 512 different tool positions (positive or negative logic)
- 2 digital outputs for free configuration (active switching function for 24 V signal)
- 3 rotary switches for selecting the scanner and for feeding in the scanning angle (adjustable in 24°-steps from 0° to 360°)
- 8 toggle switches: selection monitoring type (object or free-space monitoring), selection rotational direction of wand (right and/or left), definition of relay outputs (N/C or N/O), setting of scanning intensity (2 steps), selection of tolerance range (±0,1° / ±1,0° / ±3,0° / ±10,0°)
- 4 LEDs for current status display

Technical Data

Housing	Insulation material, protection class II, built-in type
Protection class	IP20
Dimensions (W x H x D)	22.6 mm × 99 mm × 113.6 mm
Control voltage for outputs	24 V DC ±20% PELV
Inputs	Galvanically isolated Input current ca. 5 mA, Pulse duration 30 ms min.
Switch outputs	2 × High Side Switch, Imax = 0.5 A
Connections	Pluggable screw terminals for 10 inputs, 2 outputs (with voltage supply)
Climate conditions	Acc. class 3K3 acc. EN 50178
Ambient temperature	0 °C to +50 °C
Storage temperature	-20 °C to +80 °C

Mechanical Dimensions (mm)

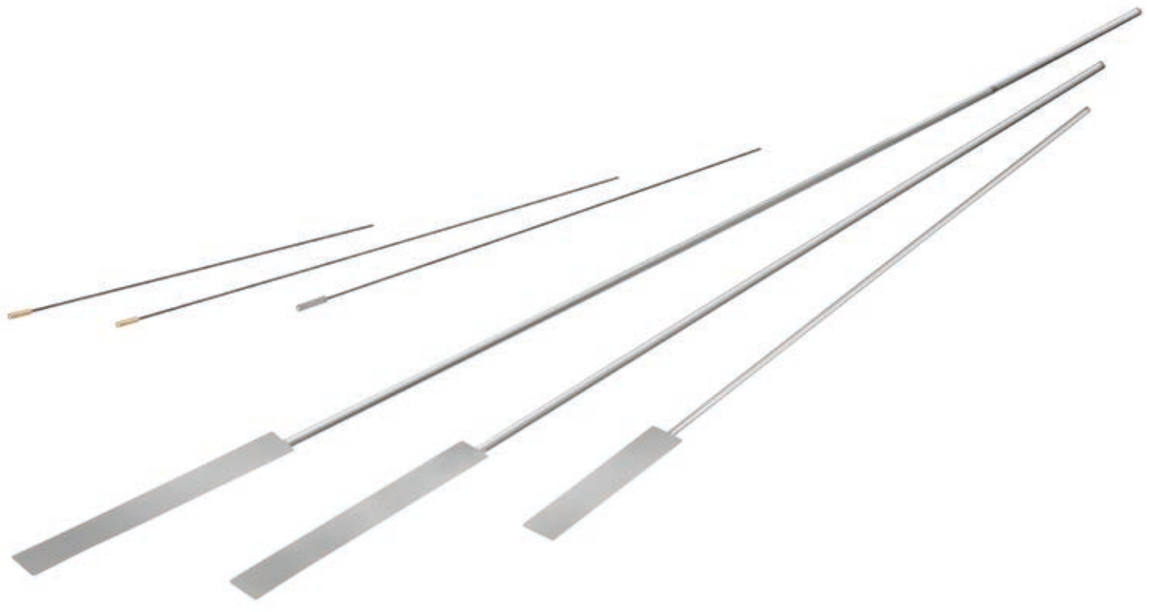


Accessories: A wide range to meet all requirements.

In order to perfectly meet the requirements of specific monitoring tasks, BK Mikro offers a comprehensive assortment of accessories and spare parts. The system can therefore be attuned to a variety of tasks and the most difficult operational environments.

Wands

- Wands in different lengths and designs (e.g. HSS-tips)
- Wands for lateral or axial scanning (with plate for axial applications only)
- Wands – solid or hollow – for individual shortening
- Easy replacement



Wand holders

- Different designs
- Easy replacement
- Protection against fine to large chips
- Protection against clumped cooling liquid
- Pre-configured wand holders with wands also available

Counterweights

- For balancing longer wands which do not scan in horizontal direction
- For wands with a thickness of 4 mm
- The better the balancing, the better the scanning results
- Available as set (one small + two large weights) or single weight adapted to wand

Wand tips for TK9LIN

- Set specially designed for linear scanning
- Wand tips made of brass or plastics
- Tips with predetermined breaking points (prevents damaging of scanner in error condition)
- Easy replacement

Mounting brackets

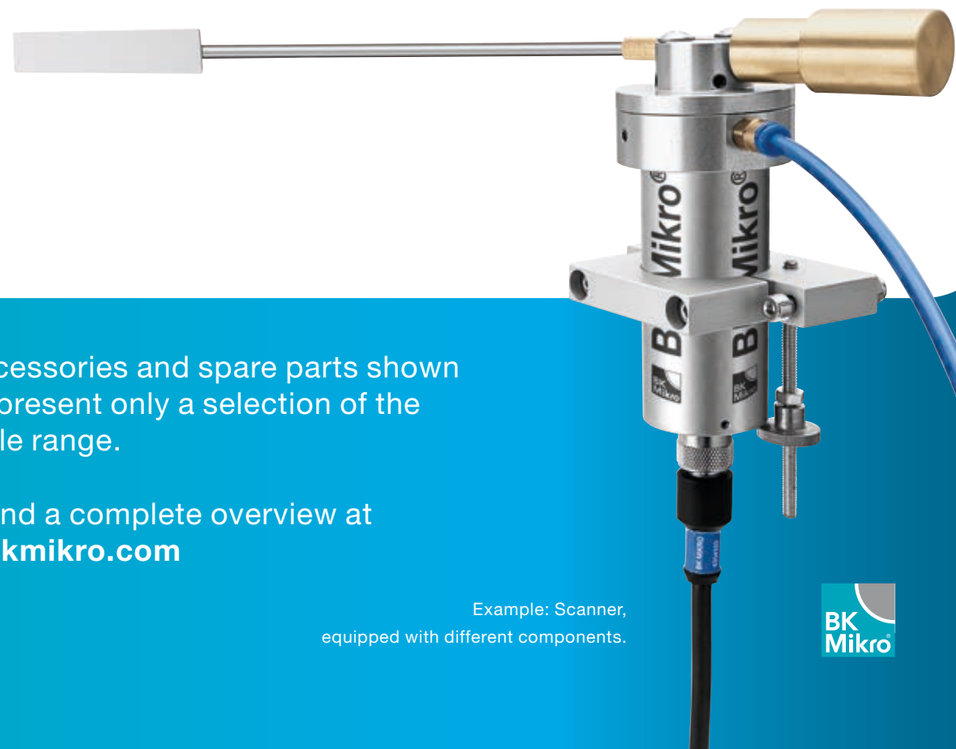
- Different designs available for the respective scanner variants in ø 12 mm, ø 20 mm, ø 32 mm
- Universal fixing options
- Perfect fixation of the scanner: safe reception, highly flexible orientation
- Bracket with adjustment aid
- Self-locking screw connection
- Anodized aluminum or stainless steel model

Air barrier adapters

- Use with aggressive composition of coolants or emulsions
- Keeps dust, liquids and chips away from seals and increases scanner lifetime
- Consists of air barrier ring and air barrier wand holder
- For scanner axes with a diameter of 20 mm or 32 mm
- For wands with a thickness of 1.2 mm, 3 mm, 4 mm
- With air connection 90° or 180°
- Recommended pressure: 0.5 bar
- Quick and easy assembly

Cables

- To connect control unit and scanner
- Lengths: 0.3 m / 5 m / 7 m /10 m / 15 m
- Also usable as extension cable
- 8 core PUR-cable with extruded plugs and small circular connectors (suitable for drag chains)
- Available with straight or angular plug (for scanner connection)



The accessories and spare parts shown here represent only a selection of the available range.

You'll find a complete overview at **www.bkmikro.com**

Example: Scanner, equipped with different components.

BK Mikro®
Tool and Process Monitoring

www.bkmikro.com

Edition 2014

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