

BK MIKRO 5-RL

Tool Monitoring System
for Paired Scanning Applications

Operating Instructions
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General Notice

Safety guidelines

These operating instructions contain 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:

**Immediate danger**

to life and limb of personnel and others.
Non-compliance may cause death or serious (crippling) injury.

**Hazardous situation**

to life and limb of personnel and others.
Non-compliance may cause death or serious injury.

**Potentially hazardous situation**

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

**Notes on correct handling**

Non-compliance may cause damage to the product
and/or damage to parts/items in the vicinity.

**Environmental protection**

Non-compliance may have an impact on the environment.

Intended use



BK MIKRO is a control system suitable for tool as well as for object and free space monitoring applications. It may only be used for the applications described in the technical documents, and only in connection with devices or components from other manufacturers which have been approved or recommended by us.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

Qualification of personnel

Only qualified personnel may carry out the following activities on the control system: installation, commissioning, operation, maintenance.

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.

Disclaimer of liability

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.

EEC directive EMC 89/336/EEC

The following applies to BK MIKRO control system:



Products which carry the CE symbol meet the requirements of the EEC directive 89/336/EEC on electromagnetic compatibility.

The EEC declarations of conformity and the related documentation will be maintained at the following address for inspection by the responsible officials in accordance with article 10(1) of the above stated EEC directive:

MSC Tuttlingen GmbH
Rudolf-Diesel-Straße 17
78532 Tuttlingen

BK MIKRO 5-RL corresponds the specification of UL 508.

Areas of use

Control systems of the BK MIKRO series meet the applicable, harmonized, European standards for the respective area of applications.

Fitting conditions

The fitting conditions and safety notes in the operating instructions must be adhered to when commissioning and operating the devices.

Copyright

These operating instructions are intended for the operator and the operator's personnel only. This document and its contents may not be disclosed to third parties, either in full or in part, by reproduction, transmission or any other means without express written authority.

Non-compliance may lead to prosecution under criminal law.

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Purpose



These operating instructions are part of the documentation of the BK MIKRO 5-RL. They provide service personnel and system advisors with the information required to install, commission, operate and maintain the system BK MIKRO 5-RL.

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1 Description

BK MIKRO 5-RL is a tool monitoring system customized for scanning of two tools only with one scanner.

The complete BK MIKRO 5-RL system comprises

- a control unit,
- a sensor (scanner),
- a connection cable.

BK MIKRO 5-RL is especially suitable for use in double spindle machines or other paired scanning applications:

- **Monitoring of two scanning positions** whose precise locations have been previously entered by "Teach-in", e.g. to carry out tool checks.
- **Scanning in both directions**, i.e. the scanner will travel in **clockwise and counter-clockwise** direction.

Further features enabling customized system configuration include:

- Relay contacts switch-selectable as normally open or normally closed
- Automatic detection of zero position (in the center between scanning points) or high-handed fixation of zero position
- Two settings for scanning intensity / speed
- Detection of cable breaks

Principle of Operation

Between two processing operations the system will monitor the presence of tools.

The monitoring system will first determine the exact position of the tools by a "Teach-in" cycle.

This is followed by "Start" cycle, during which the wand will be moved into the positions "just learned", and a comparison takes place.

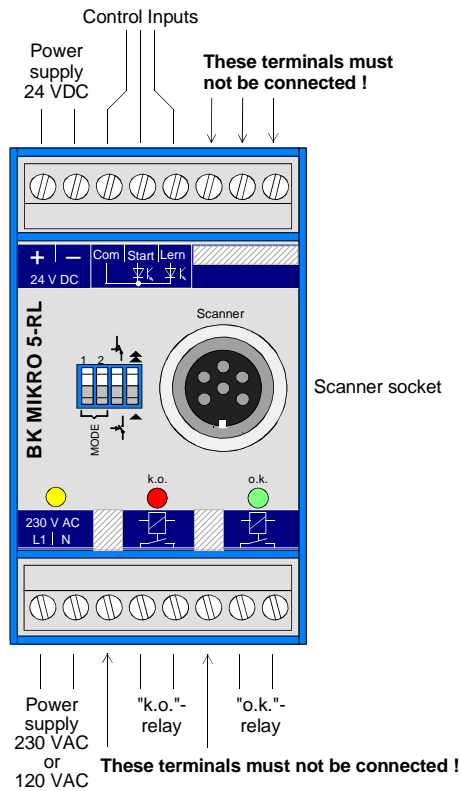
The zero position of the wand either will be calculated during the "Teach-in" cycle from the positions of the two objects to be scanned or the initial position of the wand before "Teach-in" will be defined as zero position. Starting from this position, any desired scanning angle can be implemented.

All outputs to the machine will be via two relay contacts, configurable as normally closed or normally open. For evaluation, the "O.K." relay, the "K.O." relay, or both may be used.

2 System Components

2.1 Control Unit

Fig. 2-1: Control Unit – Front View



2.1.1 Characteristic Properties

The BK MIKRO 5-RL system control unit is housed in an insulating material housing of protection class II.

On its front panel, the control unit is fitted with plug-in screw terminals to connect all machine inputs and outputs as well as the supply voltage.

The scanner will be connected via a 6-wire cable to the scanner socket in the control unit.



Note:

The control unit – a built-in unit – is available in three models for **different supply voltages:**

- 24 VDC
- 120 VAC
- 230 VAC

2.1.2 Technical Data

Housing	Insulating Material Housing, Protection Class II, Built-in Unit
Protection Type	IP 20
Dimensions (W x H x D)	45 mm x 75 mm x 107.5 mm
Case Mountings	Sectional Rail, 35 mm, to DIN EN 50022
Power Supply Voltage	Depending on Model: 24 VDC, PELV ¹⁾ 120 VAC 230 VAC
Power Consumption	6 VA max.
Control Voltage	24 VDC (internal/external) PELV ¹⁾
Inputs	Galvanically Isolated
– Input Current	5 mA approx.
– Pulse Duration	6 ms min.
Switched Outputs	2 x 250 VAC / 30 VDC, 2 A
Making/Breaking Capacity	500 VA / 60 W (max.) 10 mA min. at 10 V
Operational Life of Relay	5 x 10 ⁷ Switching Cycles
Connections	Scanner Socket to DIN 45322, 6 pins Plug-in Screw Terminals for Connecting – Power Supply – Control Inputs – Relay Outputs
Climatological Conditions	Classification 3K3 under EN 50178
Ambient Temperature	0 °C to +50 °C
Storage Temperature	–25 °C to +80 °C

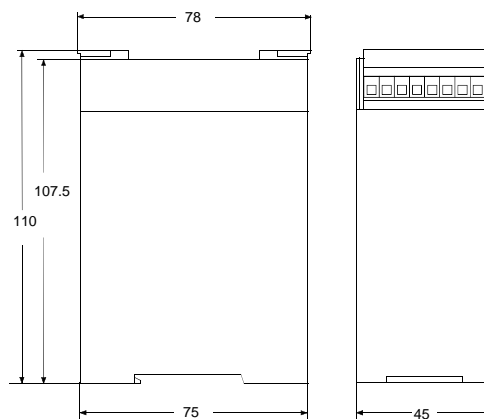


Fig. 2-2: Control Unit – Dimensions



Note:

The control unit of BK MIKRO 5-RL is a **built-in unit** (DIN EN 60950). The system is explicit approved for operation in closed rooms (control cabinet)!

¹⁾ PELV = Protected Extra Low Voltage

The voltage applied must meet the requirements for an extra low function potential with safe disconnection (PELV).

2.1.3 Screw Terminals

The screw terminals have been arranged on two plug-in terminal blocks. These blocks are keyed so that they cannot be accidentally plugged into the wrong socket.

When in operation, plastic caps cover the screws in the front. Wires to be connected are routed from the top or bottom of the unit.

Power supply, control inputs, and relay outputs are all connected via these screw terminals.

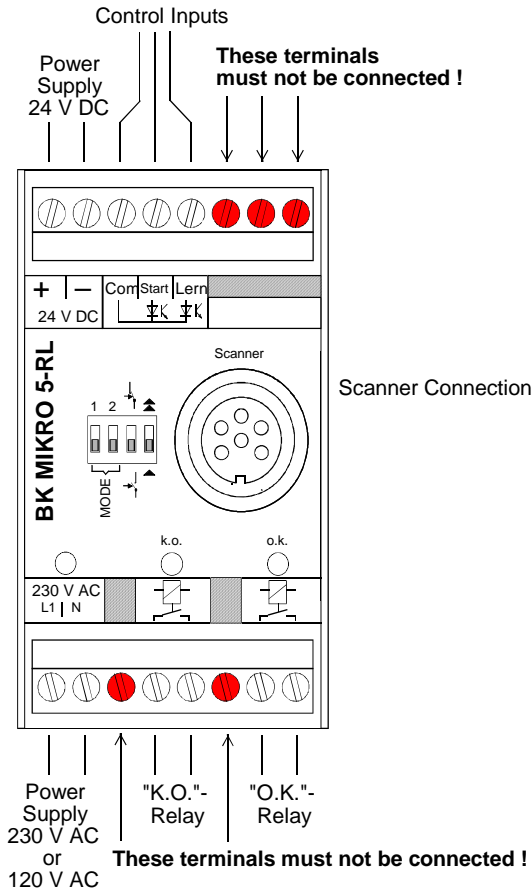


Fig. 2-3: Control Unit – Connections



Note:

These plugs may only be inserted or removed when the power supply has been disconnected.

Unmarked terminals must not be connected.



Note:

The nominal tightening torque for the clamping screws of the terminal connectors should be 0,5-0,6 Nm or 4,4-5,3 pound-inches (lbf in).

Power Supply

"24 VDC" Model

- "+" 24 VDC Terminal
Supply Voltage Input 24 VDC \pm 20%
Input Current 0.25 A max.

The voltage applied must meet the requirements for an extra low function potential with safe disconnection.

- "-" 24 VDC Terminal
Reference potential "Ground" of 24 VDC supply voltage

"120 VAC" and "230 VAC" Models

Depending on the specific model, the unit will be supplied preconfigured for "120 VAC" or "230 VAC". The relevant version will be marked on the label next to the supply connections on the front panel.

- "L1" Terminal
Supply Voltage Input, depending on model:
120 VAC ($I_{\max} = 0.05$ A) or
230 VAC ($I_{\max} = 0.025$ A)
- "N" Terminal
Supply Voltage Input, depending on model:
120 VAC ($I_{\max} = 0.05$ A) or
230 VAC ($I_{\max} = 0.025$ A)
- "+" 24 VDC Terminal
Control voltage for controlling inputs "Start" and "Lern" (Learn)
24 VDC (16 V ... 32 V) unregulated

The control voltage meets the requirements for an extra low function potential with safe disconnection.

Output Current 0.1 A max.

If an external control voltage is applied, this terminal is not connected.



Note:

The secondary voltage (24 V) of the 120/230V Versions can be used to supply the control inputs. It is not allowed to supply other accessories which are located outside the overall enclosure.

- "-" 24 VDC Terminal
When using the internal control voltage, this terminal must be connected to the control inputs terminal "Com".

If an external control voltage is applied, this terminal is not connected.



Note:

Alternatively, "120 VAC" and "230 VAC" models may also be supplied with 24 VDC.

In this case, terminals "L1" and "N" must not be connected.

Terminals "+24 VDC" and "-24 VDC" are to be connected as described above for model "24 VDC" (see capital " Installation Notes")..

Control Inputs

- "Com" Terminal
Reference potential for control inputs
- "Start" Terminal
An input level of +24 VDC relative to terminal "Com" will trigger a "Start" cycle (the real scanning process).
The input current is approximately 5 mA.
Pulses lasting less than 6 ms will be disregarded.
- "Lern" (Learn) Terminal
An input level of +24 VDC relative to terminal "Com" will trigger a "learning" cycle (the "Teach-in").
The input current is approximately 5 mA.
Pulses lasting less than 6 ms will be disregarded.
The position stored during the learning cycle will remain stored even after the unit has been switched off. Therefore, a new "Teach-in" session is required only when your tool geometry changes, the scanner is changed, or the switch "MODE 1" is switched.

Relay Outputs

The terminals have been designed as dry relay contacts. By switch selection, they may be configured as either normally open or normally closed.

The contacts have been designed for 250 VAC and, by additional internal circuits, protected against inductive switch-off peaks of up to 19 W (2 ms).



Maximum switching power is 500 VA.

Maximum switching current may not exceed 2 A.

- "K.O." Relay Terminals
These two terminals are used to indicate a fault message (K.O.).
- "O.K." Relay Terminals
These two terminals are used to indicate a no fault message, i.e. a good cycle (O.K.).



Note:

	Relay as normally closed contact: active = open inactive = closed
	Relay as normally open contact: active = closed inactive = open

When there is **no power** to the unit, the **contacts always** will be **open**.

Even when using relay as normally closed, they are open (like the active status) when the power supply is not connected.

2.1.4 Scanner Socket

For connecting scanner TK5K, a 6 pin socket to DIN 45322 is fitted on the control unit front panel.

Pin Configuration:

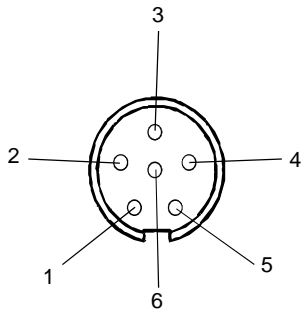


Fig. 2-4: Control Unit – Scanner Socket



Note:

Using a different scanner may damage the scanner and control unit.

2.1.5 Light-Emitting Diodes

Three light-emitting diodes (LEDs) on the front panel provide information about the current status of the BK MIKRO 5-RL monitoring system:

- Power Supply / Status → yellow LED to indicate supply voltage or status
- "K.O." Relay → red LED to indicate fault message
- "O.K." Relay → green LED to indicate no fault message

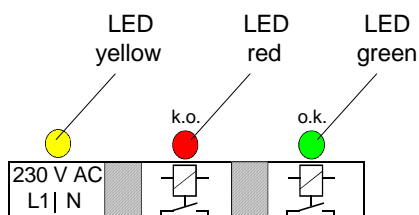


Fig. 2-5: Control Unit – Light-Emitting Diodes

2.1.6 Toggle Switches

Using the four toggle switches arranged next to each other on the control unit front panel, the following functions may be set.

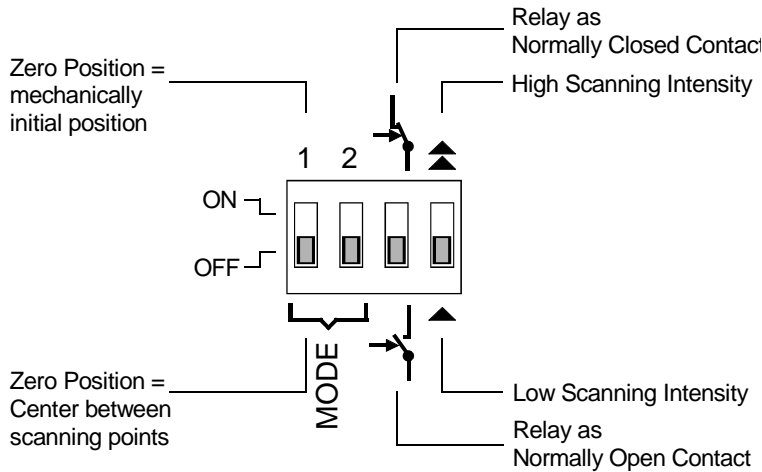


Fig. 2-6: Control Unit – Toggle Switches



Note:

Setup on delivery: All switches are toggled downwards !
 When using scanner TK7RL: "Scanner" switch to the left !

"MODE 1" Switch

MODE 1 = ON : Take mechanically initial position as zero position
 MODE 1 = OFF : Calculate automatically zero position as the center between two scanning points

"MODE 2" Switch

Switch "MODE 2" has been reserved for future new features.

"Normally Open Contact / Normally Closed Contact" Switch

Mode of operation for the two output relays

"Scanning Intensity" Switch

Speed of scanner in its scanning range



Note:

If this switch is in the "low" position, the lower impact force of the scanner will protect the wand from wear and tear.

2.1.7 Notes on Technical Safety

The control unit comprises the following **circuits, all isolated** from each other:

K.O. Output (2 terminals)	safely isolated from all other circuits
O.K. Output (2 terminals)	safely isolated from all other circuits
AC Power Supply (L1, N)	safely isolated from all other circuits
DC Power Supply (+24 V, -24 V)	safely isolated from K.O. output, O.K. output, and AC power supply
	simply isolated from control inputs
	no isolation from scanner connections
Control Inputs (Com, Start, Lern)	safely isolated from K.O. output, O.K. output, and AC power supply
	simply isolated from DC power supply and scanner connections
Scanner Connections	safely isolated from K.O. output, O.K. output, and AC power supply
	simply isolated from control inputs
	no isolation from DC power supply

2.2 Scanner TK5K

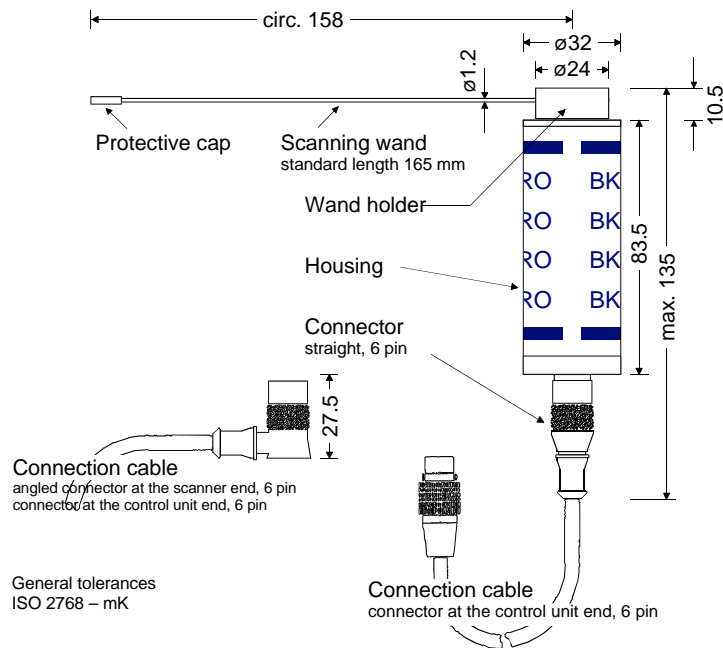


Fig. 2-7: Scanner TK5K

2.2.1 Characteristic Properties

The scanner housing is cylindrical and smooth, thus permitting easy installation (e.g. by using a collet chuck). The scanner is designed for easy access for servicing and changing the wand. Aligning the scanner is easy and requires no additional instruments or aids.

When a supply voltage is applied, the scanner persists in its momentarily set position. Only after a pulse on the "Lern" (Learn) or "Start" screw, it moves into its zero position and will be held there by applying a low voltage.

Using scanner TK5K with a different control unit than BK MIKRO 5-RL may damage the scanner and control unit.



Note:

- Due to its small diameter, a wand is easily overlooked.
- Your wand is a wearing part! Each contact with a rotating object will cause corresponding wear on the wand. This may even lead to the metal wand breaking.

Due to the injury hazard this causes, users should exercise particular caution within any BK MIKRO rotating area.

2.2.2 Technical Data

Housing	Anodized Aluminum
Protection Type	IP 67
Wand Length	165 mm (standard)
Scanning Angle	360° max.
Control Unit Connection	Connector, M12x1, 6 pins
Ambient Temperature	0 °C to +80 °C
Storage Temperature	-25 °C to +85 °C
Scanning Cycles	> 5 million at minimum scanning intensity



Note:

To prevent injury, your wand will be supplied complete with a protective cap.

2.2.3 Scanning Wand

Initial Position

The wand is to be positioned at random between the two objects to be monitored. Using switch "MODE 1" the zero position can be set on two different ways.

- **MODE 1 = ON**
The mechanically set position of the wand is taken as zero position.
- **MODE 1 = OFF**
The "Teach-in" cycle determines the position of the objects to be monitored and calculates the zero position as the center of the two positions.

At the end of "Teach-in" the wand will move into its zero position in any case.

As the scanner does not possess an internal stop for wand's zero position, scanning angles of together up to 360° can be implemented.

How to change

After undoing hollow screw (M3), the wand can easily be removed from its holder. Insert new wand into holder and tighten.



Option: Wand Holder for Small Chips

If BK MIKRO 5-RL is used to monitor manufacturing processes where materials with **small chips** are processed (e.g. cast iron, diecast aluminum, brass), we recommend the use of our specially designed wand holder for this purpose.

Scanning Angle

Any scanning angle between 0° and 360° can be used.

Angle tolerances for a good message is $\pm 10^\circ$, in relation to the "learned" position.

Scanning Intensity

Scanning intensity of the scanner can be set via toggle switch in the control unit front panel.

Scanning intensity and scanning speed are directly interdependent.
There are two switch positions for setting intensity.

Wand Impact Forces

Depending on preset scanning intensity and length of wand, the scanner strikes the object to be monitored with different impact forces.

Switch Position	at a wand length of	
	150 mm	100 mm
▲	350 mN	500 mN
▲▲	500 mN	750 mN

2.3 Connection Cable

Control unit and scanner are connected by a **6-wire cable**:

- connector to DIN 45322 at the control end unit
- molded plug at the scanner end
- length 5 m, can be extended to a maximum length of approximately 25 m.

Pin Configuration (at the control unit end)

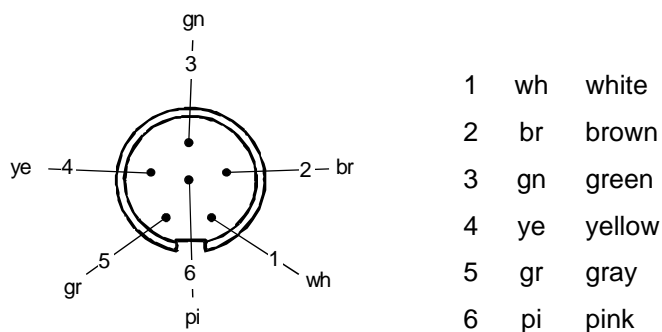


Fig. 2-8: Connection Cable – Pin Configuration



Note:

- To avoid unnecessarily reducing the operational life of this cable, it should not be subject to more than a minimum amount of movement during operating cycles.
- If this plug needs to be removed during fitting, please ensure that this pin configuration is followed on reassembly.

3 Functions

3.1 Teach-in

The learn cycle, the "Teach-in", will be started by an active input signal (duration 6 ms min.) on the "Lern" (Learn) screw terminal. Both relay outputs for "O.K." and "K.O." will become inactive.

- The wand will **first** travel from its momentary position **in clockwise direction** with its preset speed. If a tool is detected, its position will be stored.

Then the wand will travel **in counter-clockwise direction** with its preset speed to determine the position of the second tool. The position of this second tool will also be stored.

- Switch „MODE 1“ = ON:
The initial position before "Teach-in" will become zero position of the wand.

- Switch „MODE 1“ = OFF:
Using this two positions the system will calculate the new zero position of the wand as the center between the two tools.

Finally the wand will turn into its zero position, the stop position. In addition the "O.K." relay will be activated.

- If the system can detect only one tool or not a single one, the "K.O." relay will be activated.

After such a faulty learning action, the wand will return to its old zero position.

Following "Start" pulses will detect "K.O.".

The LEDs "O.K." and "K.O." will indicate the result.



Note:

A **position** learned during "Teach-in" **will remain stored**, even after removal of power to the unit.

Switching of switch "MODE 1" will **require a new learn cycle**.

Ensure that **tool geometry** (layout and dimensions) at "Teach-in" corresponds to the geometry used during monitoring in the "Start" mode.

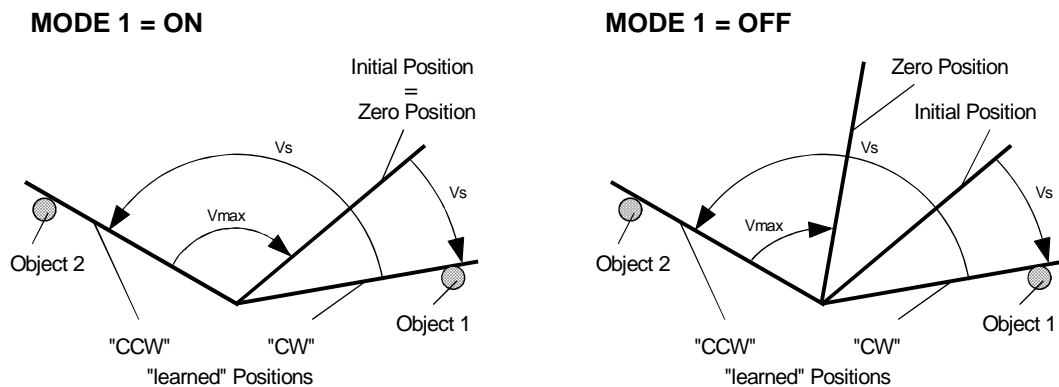


Fig. 3-1: Learn Cycle

v_{max} = max. speed of scanner
 v_s = speed of scanner preset by toggle switch

CW = clockwise direction of rotation
CCW = counter-clockwise direction of rotation

3.2 Start

A "Start" cycle will be triggered by an active input signal (duration 6 ms min.) on the "Start" screw terminal. Both relay outputs for "O.K." and "K.O." will become inactive.

The scanner will travel to the previously "learned" positions of the objects to check for their presence. In so doing, the wand will **first move in clockwise, then in counter-clockwise direction**.

The scanner will travel at maximum speed to the start of a given monitoring range. However, its motor will slow down to a preselected scanning speed in time before a learned position is reached.

The monitoring range will then be traversed at the preset scanning speed and its related force which is to be used to scan an object.

During the entire operation, all pulses generated by the scanner's internal encoder will be continuously processed.

If the system detects that the scanner no longer moves or has exceeded the end of the monitoring range, the direction of rotation immediately changes, and the scanner will return at maximum speed into its stop position.

- If the tools are in their "correct" positions, the "O.K." relay will be activated. Angle tolerance for a good signal (O.K.) is $\pm 10^\circ$ in relation to the learned position.
- If one of the two tools is not detected, i.e. either it is missing or there is an obstacle within the scanner rotating area, the "K.O." relay will be activated.

In addition, the LEDs "O.K." and "K.O." on the control unit will indicate the result.

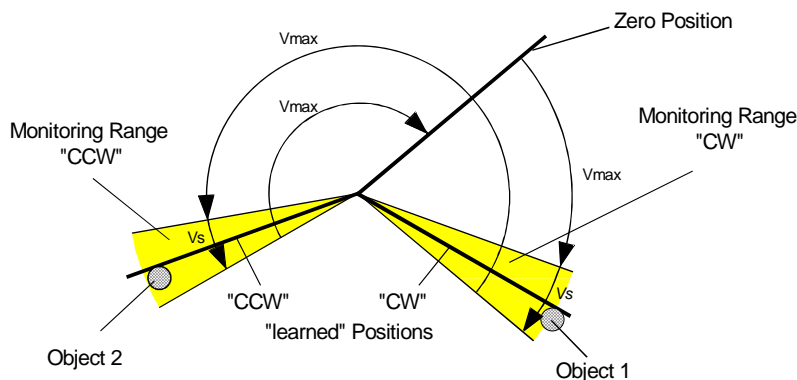


Fig. 3-2: Start Cycle

Remarks:

- V_{max} = max. speed of scanner
- V_s = speed of scanner preset by toggle switch
- CW = clockwise direction of rotation
- CCW = counter-clockwise direction of rotation
- Monitoring Range: $\pm 10^\circ$ respectively around the "learned" position, corresponds to the angle tolerances for a good message.
- The example applies to a "Start" cycle with switch "MODE 1" = ON:
The zero position of the wand is its start position before "Teach-in", that is it isn't absolutely in the center between the objects.

3.3 Worth Knowing for Operation

3.3.1 Direction of Rotation for the Scanner

Clockwise rotation is effected when rotating to the right, scanner viewed from behind (the connection side), looking up length of scanner.

3.3.2 Angle Tolerances

Angle tolerances for a good message is $\pm 10^\circ$, in relation to the "learned" position.

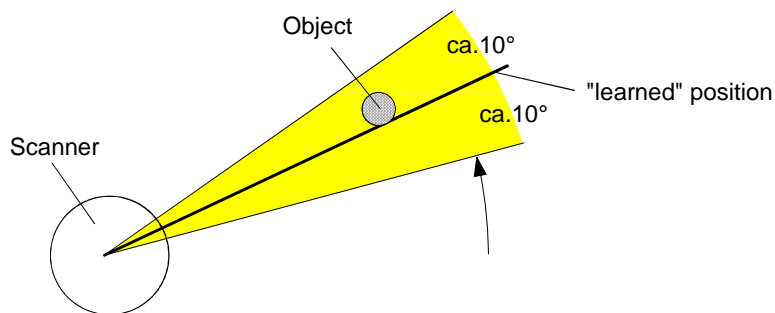


Fig. 3-3: Angle Tolerances

3.3.3 Changing of Zero Position During Operation by 2 x "Learn"

The zero position of the wand shall be changed during operation, i.e. voltage remains connected and scanner is not removed.

This is done by manually turning the wand from its momentary stop position to its desired new zero position against the restoring force of the scanner, and the wand will be held there – e.g. by operator's finger.

Only if switch "**MODE 1**" = **ON**, BK MIKRO 5-RL accepts this changed position as the new stop position.

- **During the first learn pulse** the system will learn the position of the one object as well as the position of the finger which it will store as the new zero position simultaneously.
- **By a second learn cycle** after that, the system can learn the position of the two objects starting at the new stop position (without additional obstacles like the finger).

3.3.4 Reference Traveling With First "Start"

With the first "Start" pulse which the BK MIKRO 5-RL obtains after power-up but without any preceding "Teach-in", the system will carry out a reference traveling, i.e. the object dates and the zero position stored by the last learn cycle are traveled. For a good message the position of the wand may be changed – the position of the tools not at all.

- The wand will turn towards the first object with the speed selected for learning, because first it looks for the reference point.
- From this the position of the second object and the "old" zero position are known. Therefore the system will continue the usual sequence of a "Start" cycle.

Further "Start" pulses are treated as if a learn cycle was made.

3.4 Output of Results

- Fault message (K.O.)

A fault message will be output immediately on detection.
The scanner will return to its stop position.

- Good cycle message (O.K.)

On reaching the stop position, scanning process results will be indicated.
This ensures that the scanner will have left the monitoring range at the time the results are output and that there are no further waiting periods to be considered.

In the **"O.K." state**, the "O.K." relay will be active, while the "K.O." relay remains inactive.

In **all other cases**, "K.O." will be indicated, i.e. the "O.K." relay will be inactive, the "K.O." relay will be active.



Note:

"K.O." will not only be indicated when a tool has broken but also when the scanner cannot leave its stop position for any reason (e.g. mechanical "sticking", cable break etc.).

The results of a scanning cycle will remain latched until the following cycle starts.

3.5 Scanning Times During "Start" Cycle

Pulse Duration: ≥ 6 ms
 Measuring Time: Results will be indicated.
 Cycle Time: Scanner back in stop position.

Angle	Scanning Intensity	Cycle Time
±15°	low/high	300 ms
±180°	low/high	1200 ms

Depending on the length of the path to be traveled, different scanning times will result.

There is only a small difference in the times for low and high scanning intensities, since the monitoring ranges, where the wand is turned with preset speed, are very petty compared with the total distance.

3.6 Status Indication

3.6.1 Yellow LED

Fast Flashing = Self-Test

After power-up, the system will carry out a self-test indicated by fast flashing of this yellow LED.

Steady Illumination = Ready to Operate

Following its self-test, the system is ready to operate. The LED stops flashing and remains steady.

Slow Flashing = Motor Fault / Cable Break

The system has detected a motor fault or cable break. Outputs will be switched inactive, the unit will remain in its present state, indicated by slow flashing of this yellow LED.

3.6.2 Red/Green LED

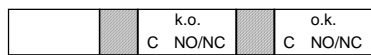
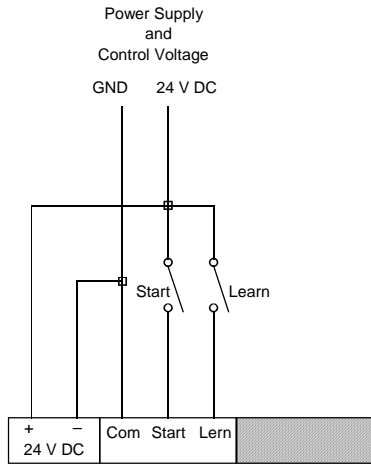
Steady Illumination = Indication following Scanning Cycle

The red LED indicates a fault message.

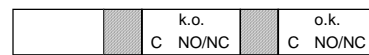
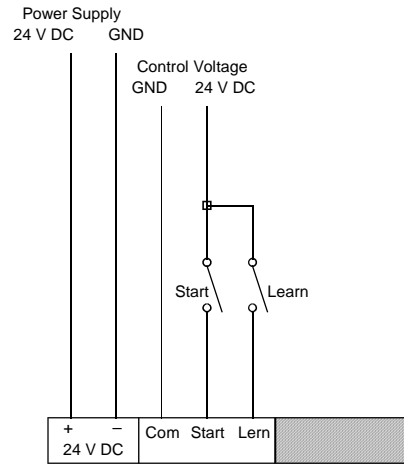
The green LED indicates a no fault message.

4 Installation Notes

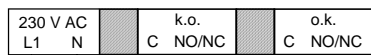
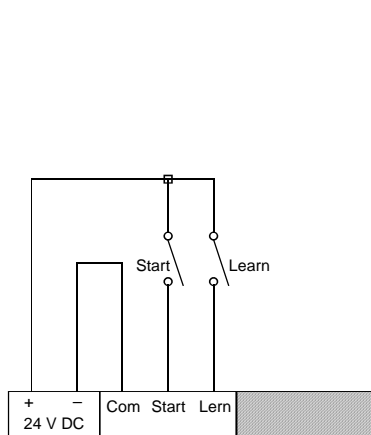
4.1 Control Voltage Connection



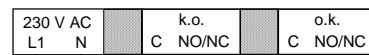
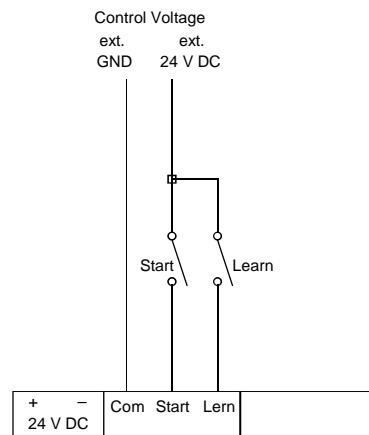
BK MIKRO 5-RL
24 V DC
common power and control voltage supply



BK MIKRO 5-RL
24 V DC
separate control voltage



BK MIKRO 5-RL
230 V AC (120 V AC)
internal control voltage



BK MIKRO 5-RL
230 V AC (120 V AC)
external control voltage

Fig. 4-1: Control Voltage Connection

4.2 Mounting Bracket

The delivering program offers a mounting bracket for the scanner as accessories.

Article no. 61 07 082 contains the following parts:

Mounting Bracket	AlCuMgPb, F 38, thickness 10, naturally anodized
2 cheese head screws c/w hexagonal hole M4x60	8.8 zincd
2 self-securing nuts M4	8.8 zincd

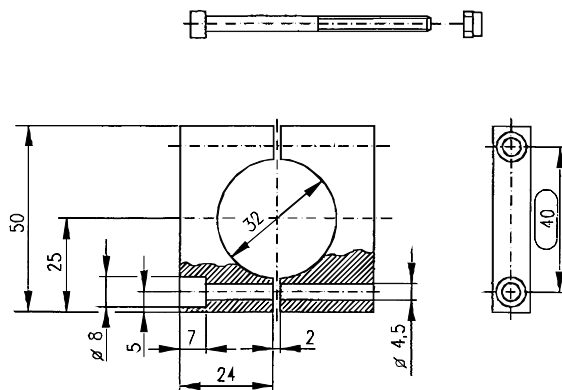


Fig. 4-2: Mounting Bracket

4.3 Interference Prevention

All inputs are opto-decoupled and thus maximally protected against interference voltage peaks, as caused, for example, by inductive sources.

Relay outputs are protected by varistors against inductive interference voltage peaks. Depending on the type of load used, further interference suppression measures may be necessary.

To ensure optimum operational safety, suppression measures, if required, must be taken at source, i.e. directly where interference is caused.



Possible additional noise filters:

- RC combination (included in the contactor suppliers' product ranges)
- Varistors
- Diodes

5 Ordering Information

Control Unit	Article Number
BK MIKRO 5-RL 24 VDC	63 04 207
BK MIKRO 5-RL 120 VAC	63 04 202
BK MIKRO 5-RL 230 VAC	63 04 203

Scanner	Article Number
TK5K (without cable)	63 04 209

Connection BK MIKRO 5-RL: Control Unit - Scanner	Length	Article Number
Control Cable Conprox, Straight Connector	5 m	62 04 217
Control Cable Conprox, Straight Connector	15 m	62 04 228
Control Cable Conprox, Angular Connector	5 m	62 04 226
Extension Cable	5 m	62 04 210
Extension Cable	10 m	62 04 211
Extension Cable	15 m	62 04 212
Extension Cable c/w Mounting Socket	2 m	62 04 213

Accessories and Spare Parts	Article Number
Scanning Wands BK MIKRO 4 / BK MIKRO 5-RL:	
– Length 165 mm (standard)	10 pcs. 62 04 022
– Length 250 mm	10 pcs. 62 04 216
– HSS, Length 165 mm	1 piece 62 04 215
– HSS, Length 250 mm	1 piece 62 04 231
Wand Holder (standard) c/w Wand	62 04 023
Wand Holder for Small Chips c/w Wand	62 04 214
Mounting Bracket	61 07 082

Operating Instructions	Article Number
BK MIKRO 5-RL	68 36 173