KOMflex precision spindle

Operating instructions

Contents

1 Introduction

1.1 Purpose of this document

These operating instructions are designed to familiarise users of the KOMflex precision spindle head with the following:

- Working principles
- Operation
- Safety information
- Maintenance

1.2 Obligations and liability

- An understanding of the fundamental safety information and safety regulations is a basic prerequisite for safe handling and trouble-free operation of the KOMflex precision spindle head.
- These operating instructions, and in particular the safety information, must be observed by all persons who work with the KOMflex precision spindle head.
- Furthermore, the accident prevention rules and regulations applicable for the place of use must be observed.
- The KOMflex precision spindle head is constructed according to the state of the art and recognised safety rules. Nevertheless, dangers may arise for the user or third parties or the KOMflex precision spindle head or other items may be damaged during use. The KOMflex precision spindle head must therefore only be used
    - for its intended use
    - in perfect condition in terms of safety.
- If a fault arises which could affect the safety of the KOMflex precision spindle head, it must be shut down. Please contact the manufacturer.
- Please note that the following causes may affect the operational safety of the KOMflex precision spindle head as well as the safety of persons working with it:
    - Improper use of the KOMflex precision spindle head.
    - Improper installation, commissioning, operation and maintenance of the KOMflex precision spindle head.
    - Operation of the KOMflex precision spindle head in a machine with faulty safety devices or improperly attached or non-functional safety and protection devices.
    - Non-compliance with the information in the operating instructions relating to transport, storage, assembly, commissioning, maintenance and setup of the device.
    - Unauthorised modifications to components of the KOMflex precision spindle head.
    - Inadequate monitoring of device parts which are subject to wear.
    - Repairs carried out incorrectly.
    - Catastrophes caused by external influences or force majeure.

  In isolated cases and under certain circumstances, this may also lead to limitation of liability or exclusion of liability of the manufacturer, whereby the contractual and statutory rights remain unaffected by the above.

2 Safety information

2.1 Operating personnel

Components must only be operated by trained personnel who are familiar with the working principles, operation and safety devices of the KOMflex precision spindle head.

Note
Always keep the operating instructions with the KOMflex precision spindle head. The instructions must always be to hand.

2.2 Intended use

The KOMflex precision spindle head is only intended for boring and boring out and over turning. The KOMflex must only be installed and operated in the machine tools intended for this purpose.

The KOMflex precision spindle head is only to be used as intended for this purpose.

Intended use also includes complying with all the information in these operating instructions. Only trained and instructed personnel may work with the device.

2.3 Improper use

Any other use aside from that listed above is not permitted, as improper use may result in danger which could cause injury to persons working with or in the vicinity of the KOMflex precision spindle head or cause damage to the device.

2.4 EC Declaration of Conformity

Declaration of incorporation KOMflex

According to the EC-Machinery Directive 2006/42/EC, from 17.5.2006
Preparation oft the document 20.03.2020

KOMET Deutschland GmbH
Zeppelinstraße 3
74354 Besigheim
Germany

Components	Typ	Serial Number
Fine spindle head	KOMflex M04 20040	SN0001-SN10000

We like to explain, that the product are developed, designed and manufactured in conformity with the above mentioned EC Directives 2006/42/EC.
The special technical documents according to Annex VII Part B (for the incomplete machine) have been created.

We undertake to provide the national authorities with the component's special documents in writing upon request.

The industrial property rights of KOMET-Deutschland GmbH will remain unaffected.

The operating instructions required to achieve this are available.

The product described above meets the requirements of the following documents:

Safety requirements 2006/42/EG Annex I

Applied standards:

EU-Regulations:

2014/30/EU	EMV-Regulations, (Electromagnetic compatibility)
2014/35/EC	Low voltage directive
2014/53/EU	FuAG (Radio Equipment Act)

Applied harmonized Standards:

EN 61000-6	Interference emission in the frequency domain 0Hz bis 400GHz (EMV)
EN 60204-1	General requirement of electrical equipment of machines
EN 12100	Machine safety - General principles for design - Risk assessment and risk reduction

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Declaration of conformity KOMflex

According to the EC-Machinery Directive 2006/42/EC, from 17.5.2006
Preparation oft the document 20.03.2020

EN 300328	Requirement for broadband transmission systems operating in the 2.4 GHz ISM band
EN 301489-17	Electromagnetic compatibility for radio equipment
EN 62368-1	Electrical and electronic devices up to a nominal voltage of 600V

National standards:

DIN VDE 0100-600	Commissioning of electrical systems
DIN VDE 0013	Testing of electrical systems and equipment

Authorized representative for the compilation of the technical documents:

KOMET Deutschland GmbH

This declaration was issued

Besigheim, 22.03.2020

Gerhard Ballom
Managing Director
KOMET Deutschland GmbH

Besigheim, 22.03.2020

i.V. Michael Renz
Manager Actuating tools
KOMET Deutschland GmbH

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2.5 Radio Approval

Japan: 〒 R 202LSJ048

"This device has been granted a designation number by Ministry of Internal Affairs and Communications under „Ordinance concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment (特定無線設備の技術基準適合証明等に関する規則)" Article 2-1-19.

USA: FCC ID: 2A2B9KOMFLEX FCC Part 15

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications made to this equipment not expressly approved by CERATIZIT USA, Inc. may void the FCC authorization to operate this equipment. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Canada: IC:27454-KOMFLEX

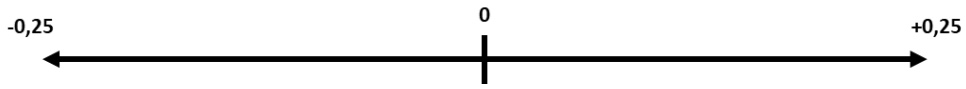
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment complies with IC Canada RF radiation exposure limits set forth for an uncontrolled environment as per RSS-102 Issue 4.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes (1) L'appareil ne doit pas produire de brouillage, et (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

3 Glossary

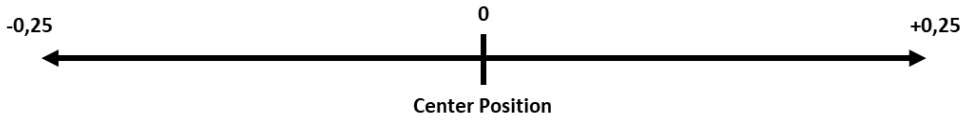
3.1 KOMflex adjustment range

The KOMflex can be adjusted between -0.25 mm and +0.25 mm in relation to the central position of the slide.



3.2 Centre position definition

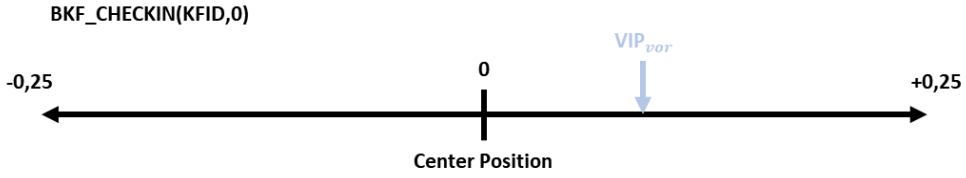
The centre position (CP) is the central position of the slide (zero point).



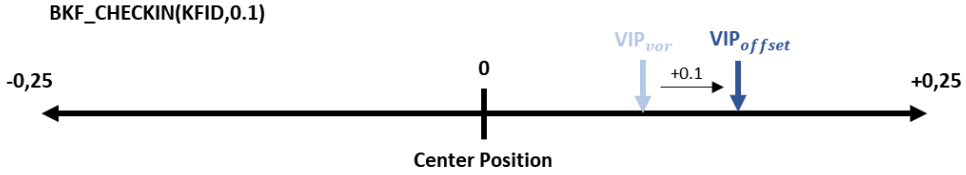
3.3 VIP definition

The VIP is a defined position in the KOMflex adjustment range which serves as a reference point, for example during the trial cut or for safe changeover of the indexable insert.

<u>VIP without offset:</u>
The VIP must be set manually by the user, for example on the presetting equipment, before automatic operation. The VIP can be set within the entire adjustment range of the KOMflex.



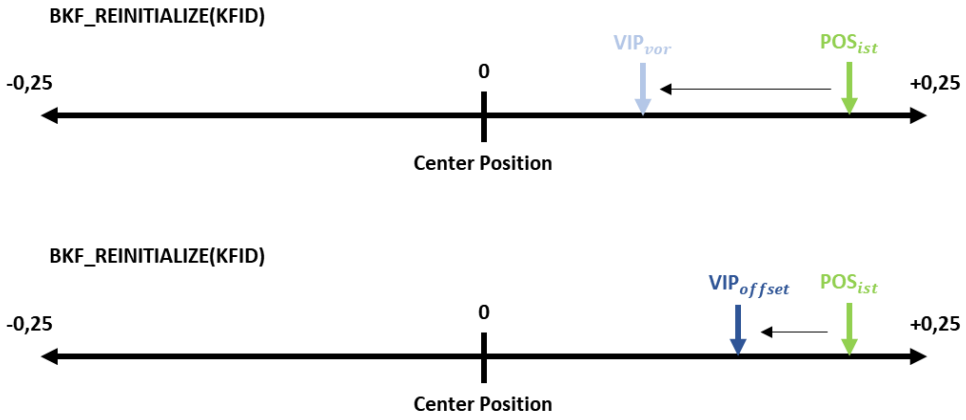
<u>VIP with offset:</u>
It is possible to subsequently overwrite the set VIP position by carrying out teach-in (initialisation) of the head again via the OFFSET input parameter in the BKF_CHECKIN NC program and thereby set it again.



The VIP preset by the user is then used by the BKF_CHECKIN NC program. (See section 8.2.4)

3.4 Reinitialisation

During reinitialisation, the KOMflex precision spindle head is reverted to its initial state. This means that the KOMflex travels to the VIP and the radius wear in the tool table is reset to 0. (See section 8.3)

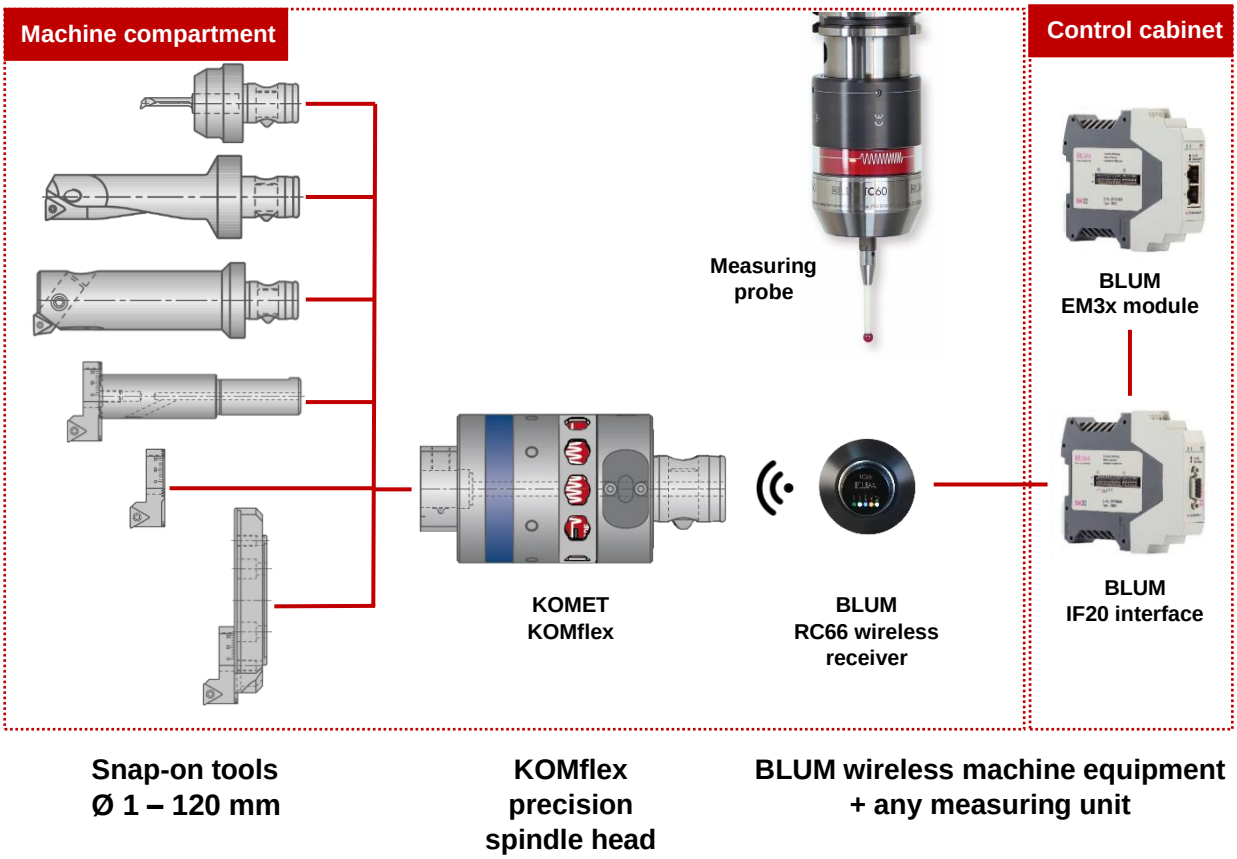


4 System overview

The KOMET KOMflex compensation system consists of the following components:

- KOMET KOMflex with BLUM wireless unit
- BLUM RC66 receiver
- BLUM IF20 interface
- BLUM EM3x extension module
- BLUM software
- Any measuring unit, e.g. measuring probe

The automatic KOMflex compensation system enables process-secure boring of holes and pins on a machine tool. The finished hole is measured with any measuring unit and compared to the target dimension. The precision spindle head then automatically corrects the set value deviation. To do so the dimension to be adjusted is transferred from the NC to the IF20 Interface via Ethernet or field bus. The value is then wirelessly transferred to the KOMET KOMflex.



5 Description of the RC66 wireless receiver

The RC66 is a compact wireless receiver with BRC technology which is suitable for all Blum measuring devices and the KOMflex with wireless transmission. It enables wireless communication between the measuring devices/the precision spindle head and the NC control. Data is transferred to the NC control via the IF20 interface.

The meaning of the RC66 display indicators is explained below, focusing on the KOMflex-specific operating modes.

5.1 RC66 standby mode

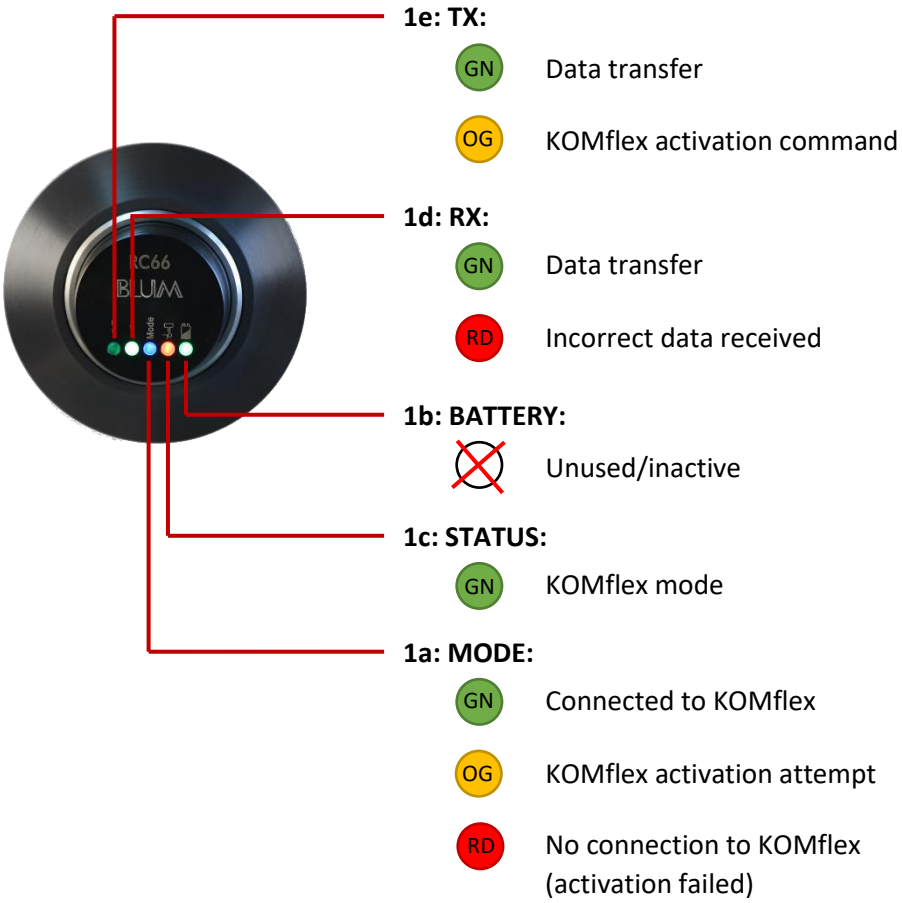
Only the *status LED* (1a) is active in standby mode. This will light up red, green and blue alternately.

The mode is set via the SET_STBY command.

5.2 KOMflex mode

In KOMflex mode, the *MODE* LED (1a) and the *RX* LED (1d) light up steady green and the *BATTERY* LED (1b) is inactive. The display indicators can be found in the following table.

This mode can be activated with the SET_KOMFLEX_MODE command.



5.3 Pairing mode

The *MODE LED* (1a) flashes white continuously in pairing mode. The *TX* and *RX LED* (1d, 1e) indicate that data is being transferred.

Once a KOMflex has been successfully taught-in, the *BATTERY* and the *STATUS* LED (1b, 1c) flash green. If pairing fails, due to timeout or a problem with the data transfer or an incorrect device type, for example, then the *BATTERY* and *STATUS* LED (1b, 1c) flash red.

The mode is set via the SET_KOMFLEX_MODE command.

1e: TX:
GN Data transfer

1d: RX:
GN Data transfer

1b: BATTERY:
GN Pairing successful
RD Pairing failed

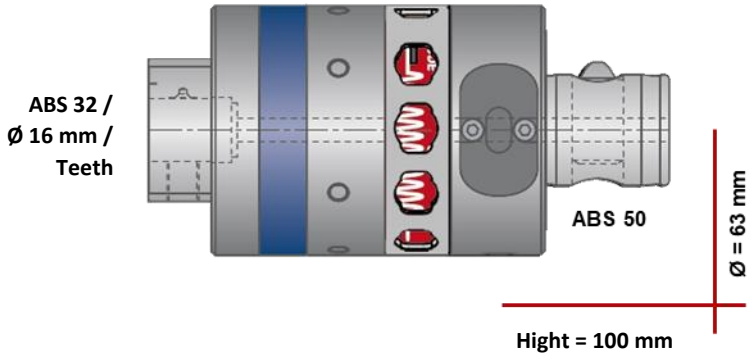
1c: STATUS:
GN Pairing successful
RD Pairing failed

1a: MODE:
WH Pairing mode active

6 Description of the KOMflex precision spindle head

The automatic precision spindle head communicates with the BLUM RC66 wireless interface and forms a closed-loop operation (process, measure, correct, process) in conjunction with any measuring unit. Therefore, the KOMflex enables automatic diameter correction for precision holes.

6.1 Technical data



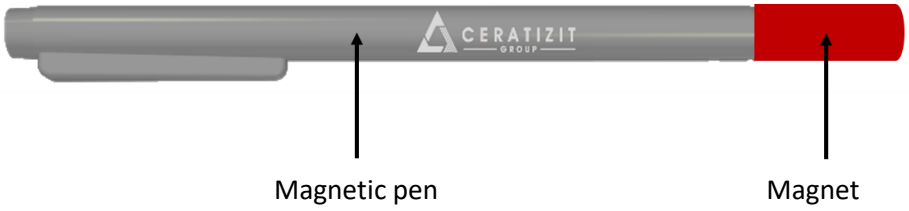
Adjustment accuracy	1 µm in radius
Adjustment range	± 0.25 mm
Boring range	Dia. 1 - 120 mm
Max. RPM	8000 RPM
Max. transmittable torque	16 Nm
Max. coolant pressure	30 bar
Height	100 mm
Outer diameter	63 mm
Weight of head without tool	1.536 kg
Operating temperature	+10 °C to +40 °C
Storage temperature	-20 °C to +60 °C
Interface	ABS 50
Protection class	IP67
Lithium thionyl chloride battery	2x AA Saft LS14500

6.2 KOMflex system description

①	ABS 50 adapter
②	Combined tool interface ABS 32 / dia. 16 mm / teeth
③	Slide
④	Inner and outer coolant supply
⑤	Battery compartment WAF2.5
⑥	ABS32 clamping screw WAF4 / 9-11 Nm
⑦	Battery polarity
⑧	MODE hall sensor
⑨	SET hall sensor
⑩	LED status (3x 120° = 360°)
⑪	Balance compensation

6.3 Required accessories

To operate the KOMflex in manual mode and to teach-in the precision spindle head on the machine tool, a magnetic pen or comparable magnet is required.



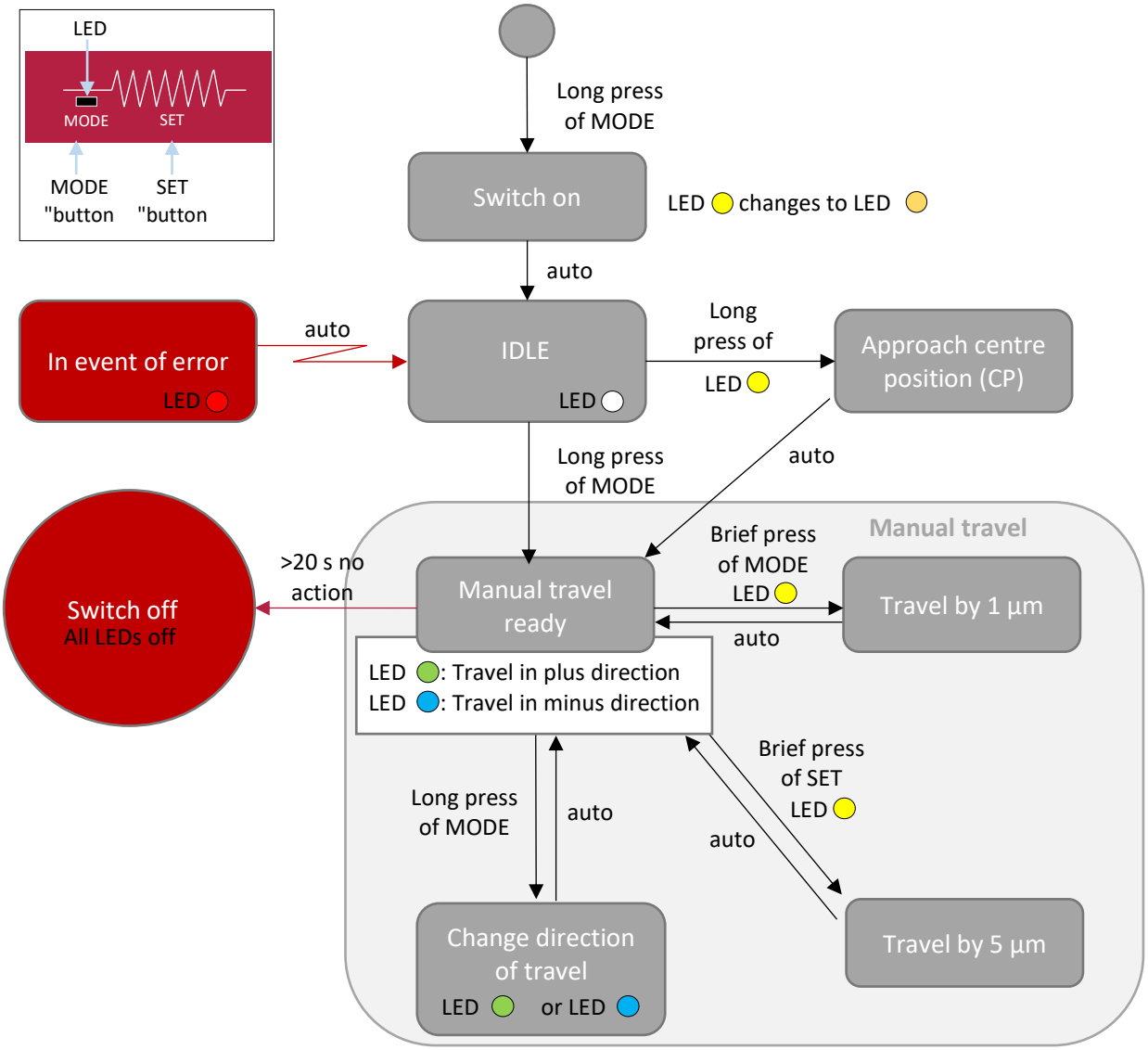
6.4 Description of the KOMflex modes

The KOMflex can be operated in manual or automatic mode. Both modes *Manual adjustment with magnetic pen* and *Automatic adjustment via NC cycle* are covered in more detail below.

6.4.1 Manual adjustment with magnetic pen

To operate the KOMflex in manual mode, for example on the presetting equipment, the precision spindle head must be in standby mode (all KOMflex LEDs off). The user can then activate manual mode with a prolonged touch of the "MODE" sensor with the magnetic pen. When the magnetic pen is removed from the sensor and the LEDs change from yellow to orange, "Manual adjustment" mode is active.

General information			
Brief touch of the button:	20 ms < t < 1.5 s	To the + stop: LED flashing	GN
Long touch of the button:	1.5 s < t < 5 s	To the + stop: LED flashing	BU



6.4.2 Automatic adjustment via NC cycle

Successful teach-in of the precision spindle head is the prerequisite for automatic operation of the KOMflex, see section 8.2.4. In standby mode (all KOMflex LEDs off), "Automatic adjustment" mode can be activated via the computerised numerical control (CNC). In this state, the precision spindle head indicates the key statuses via flashing LEDs. An overview of the statuses is given below.

Application scenarios
KOMflex active and ready for adjustment, waiting for commands

KOMflex active, "ready" not yet received from the KOMET module

KOMflex active, timeout ($t_{KOMflexReadyMax}$), no "Ready" received from the KOMET module


Battery status
KOMflex inactive, "low" battery status (CRITICAL). KOMET module does not carry out any actions

KOMflex inactive, "empty" battery status (BAD)


6.5 Emergency shutdown

If the KOMflex is in an active state, but does not receive any commands from the interface IF20, the head is deactivated after a timeout of 5 minutes and goes into standby mode.

Possible scenarios in which an emergency shutdown may occur

- Switch-off command does not reach the KOMflex, e.g. problems with radio connection
- The emergency stop or reset of the NC is activated.

7 Getting started and tool mounting

7.1 Initial commissioning of the KOMflex

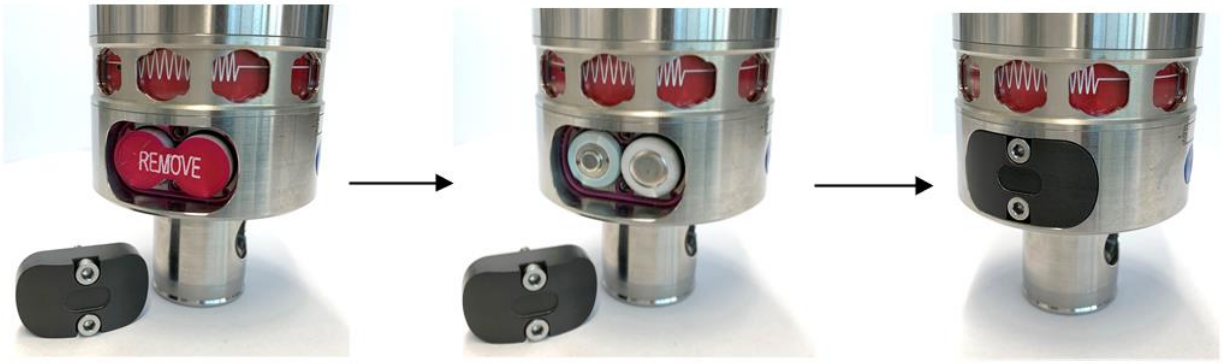
The insulation pad located in the battery compartment must be removed for initial commissioning. Then the precision spindle head can be put into operation.

Note

Note the correct position of the seal in the battery compartment. Keep the battery compartment completely clean and dry. Lightly grease the sealing surface of the lid before inserting the lid.

1. Unscrew the screws on the battery compartment lid.
2. Pull both screws out and remove the battery lid.
3. Remove the insulation pad from the battery compartment.
4. Check whether the seal is correctly inserted: small, even distance of the sealing lip to the wall.
5. Fit the battery compartment lid so it is straight and secure it (Md = 0.7 Nm).
6. When screwing the battery lid on, ensure it is positioned correctly and that the O ring is in perfect condition. If the O ring is damaged, replace it.

Pay attention to the battery polarity!
(See housing signature)



Open battery compartment during initial commissioning

Remove insulation pad

Screw the battery compartment lid back into place

7.2 Indicating the basic settings

Once the insulation pad has been removed/the batteries have been inserted, the basic settings are indicated. The magnetic pen is not needed for this. Once the basic settings have been indicated, the precision spindle head goes into standby mode.

Head active				
WH	IDLE			
MODE		**SET**		**Characteristics**
RD	Transmission mode (3 x MODE - SET)	GN	Normal*	• Standard setting
		RD	Robust	• Ambient conditions with radio interference • High chip load
OG	ON time (3 x MODE - SET)	BU	Fast	• Fast ON time • Setting reduces the battery life
		GN	Normal*	• Normal ON time • Standard setting
		RD	Slow	• Slow ON time • Setting increases the battery life
GN	Device type (3 x MODE - SET)	GN	Standard*	• Activation readiness[a] • Setting reduces the battery life
		OG	EcoMode	• Activation readiness[b] • Setting increases the battery life
		RD	TWIN A	
		BU	TWIN B	
BU	Battery (3 x MODE - SET)	GN	O.K.	
		RD	Low	
Standby				

* Standard settings

[a] The KOMflex is always ready for re-activation in standby mode.

[b] If the KOMflex:

- Is outside the reception range of the wireless receiver, the system goes into EcoMode.
- Is within the reception range, it is always ready for re-activation.

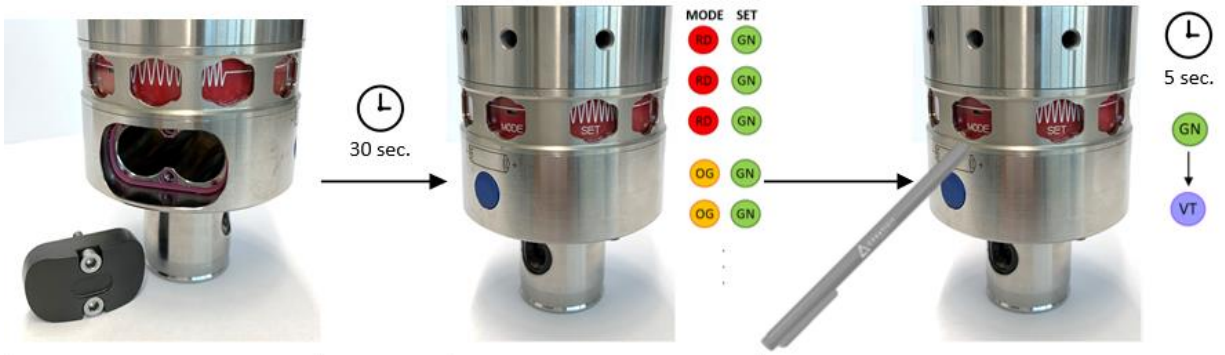
7.3 Manually configuring the basic settings

The basic settings can be changed in this mode.

Note
The magnetic pen is needed to operate the KOMflex in this section.

1. Remove the batteries.
2. After 30 seconds, re-insert the batteries in the battery compartment. Pay attention to the battery polarity. Refit the battery compartment lid.
3. The basic settings are indicated (indication phase).
4. During the indication phase, switch to programming mode:
   Hold the magnetic pen on the MODE text for 5 seconds until the status LED changes from green to violet.

Pay attention to the battery polarity!
(See housing signature)



Insert the batteries into the battery compartment

Indication phase for the basic settings

Switch to programming mode

5. In programming mode, you can perform two actions:
   - Change settings (SET):
     Hold the magnetic pen on the SET text.

   - Switch to another menu item (MODE)
     Hold the magnetic pen on the MODE text. The status LED briefly flashes violet to confirm the menu change has been detected.

6. After the last menu item, the basic settings are repeated (3 x MODE -SET) and saved*. During the indication phase, you can switch back to programming mode.
7. Once the basic settings have been indicated, the precision spindle head goes into standby mode.

*The set basic settings are retained after the battery is changed.

7.4 Mounting

7.4.1 Tool mounting

When fitting the tools, the indexable insert must point in the direction of the cutting edge shown on the base body. The permitted maximum RPM is $n_{per.}$ = 8000 RPM.

The permitted RPMs depend on the tool used (mass & type). The RPMs must be adjusted in line with the machining process and its conditions.

To achieve an ideal machining result, we recommend fine balancing the precision spindle head in the machining position. For balancing, the M6 threads arranged on the circumference or commercially available balancing rings can be used. Any screws or grub screws used must be secured against loosening after balancing. The balancing ring must not be clamped on the blue jacket or in the radio range.

7.4.2 Tools with ABS connection

All existing ABS32 tools for fine machining can also be used in conjunction with the KOMflex precision spindle head.

The clamping screw must be used to clamp ABS tools.

7.4.3 Tool with cylindrical shank

Flexibility with the overhang length: The B05 boring bars can be clamped at various lengths. These should not rest on the bottom of the hole.

Boring bars can be axially extended to a maximum of 5 mm. Clamp the boring bar with the clamping screw M8x1x10.

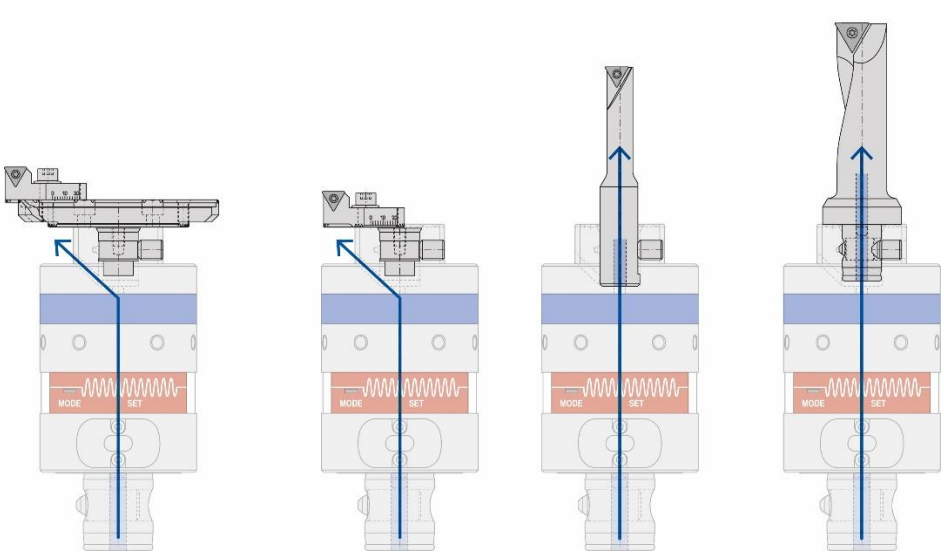
Boring bars with cylindrical shank: DIN 1835-B and E are only suitable to a certain degree; DIN1835-A possible (no cutting edge positioning).

7.4.4 Coolant

The precision spindle head has a thro' coolant supply.

Usage of the central coolant supply is mandatory and ensures optimal chip formation and chip removal.

The coolant pressure must not fall below the minimum level of 5 bar. An increase in coolant pressure to 10-20 bar improves the machining process and should therefore be the aim. The maximum coolant pressure is 30 bar.



When using the boring bars and the serrated body, the coolant is transferred centrally, through the inside of the boring bar body.

From a diameter of 62 mm, the filling piece for diverting the coolant must be fitted. The filling piece prevents coolant escaping from the centre and diverts the coolant internally. The filling piece must be retained with the clamping screw M8x1x10.

8 Commissioning the KOMflex

8.1 Presetting equipment

Before the KOMflex precision spindle head can be taught-in with the IF20 and therefore initialised, the VIP must be approached in manual mode, on the presetting equipment for example. This step always needs to be carried out if:

- KOMflex is being commissioned for the first time.
- A new machining process (new VIP) is taking place.
- A new tool is being used.

1. Activate "Manual travel"

a. The "Manual travel" mode (section 6.4.1) can be activated with a prolonged touch of the "MODE" sensor with the magnetic pen.

2. Approach centre position

b. Approach the centre position (CP) with a prolonged touch of the "SET" sensor.

→ LEDs change from (WH) to (YE), when the CP is reached.

3. Approach new VIP

c. Approach VIP

→ Briefly touch the "MODE" sensor to move 1 µm. → LEDs are (YE).

→ Briefly touch the "SET" sensor to move 5 µm. → LEDs are (YE).

→ Use a prolonged touch of the "MODE" sensor to change direction of travel.

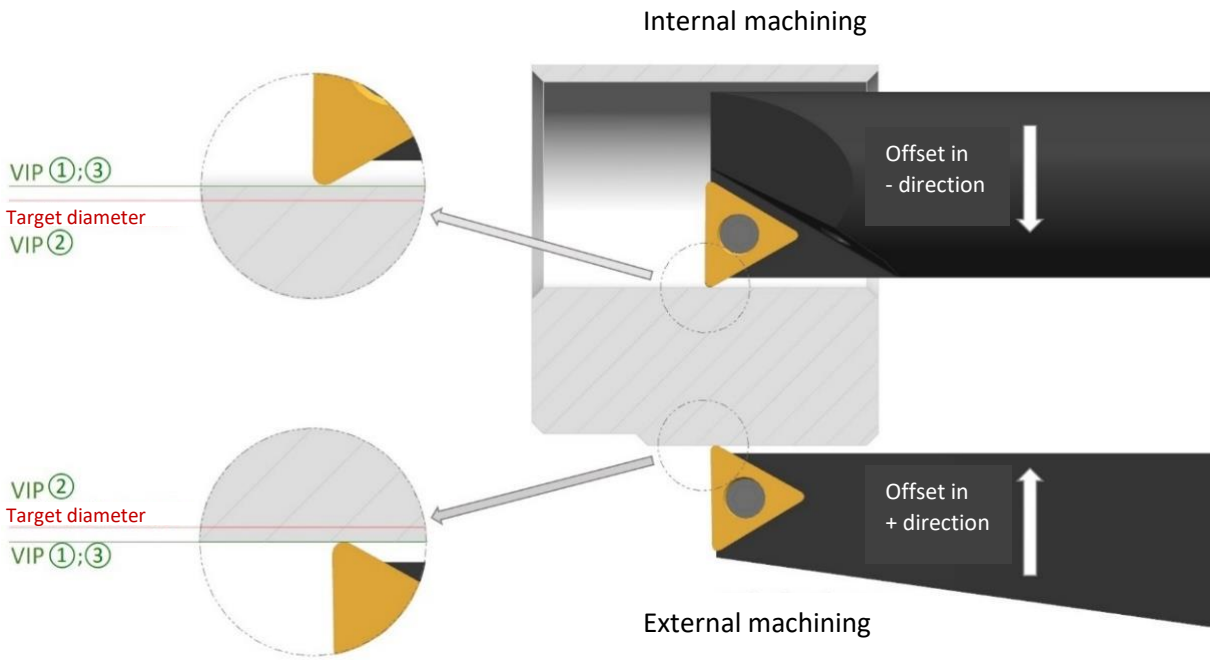
LEDs are (BU) (positive direction of travel) (GN) or (negative direction of travel).

4. Standby mode

d. If no actions are performed for 20 s, the head goes into standby mode.

There are three ways of defining the VIP on the presetting equipment:

① Trial cut	② Without trial cut	③ Offset trial cut
No correction through offset; value for the trial cut is included in VIP.	Target diameter of the cutting edge corresponds to the position of the VIP.	The VIP position is corrected by means of offsets via the R-parameter in the Global User Definition (GUD) on the Siemens CNC.
Internal machining: • VIP < target diameter	Internal machining: • VIP = target diameter	Internal machining: • VIP - R-parameter < target diameter
External machining: • VIP > target diameter	External machining: • VIP = target diameter	External machining: • VIP - R-parameter > target diameter



8.2 Use of the KOMflex on the machine

8.2.1 Overview of the product range

Range	Description	Reference
BKF_USERPARATABn	Subprogram for defining the customer program	Section 8.2.2
BKF_CONTROLLER	Subprogram for NC ←→ IF20 communication	
BKF_CHECKIN	Program for teaching-in the KOMflex	Section 8.2.4
BKF_CORRECTION	Program for automatic correction of the KOMflex	Section 8.2.5
BKF_OFF	Program for switching off the KOMflex	Section 8.2.6
BKF_REINITIALIZE	Program for reinitialising the KOMflex	Section 8.3

8.2.2 Subprogram for defining the customer program

The basic settings for the customer program can be set in the BKF_USERPARATABn program. The NC program should be modified and adapted to the application by the machine operator before commissioning the precision spindle head.

In addition to defining the display language, the communication module for machine control can be defined. You can choose between a bus connection and a client server.

General parameters

Parameter	Meaning
_BKF_LANGUAGE	Language selection, for example • "GR" = German • "UK" = English • "FR" = French
_BKF_IO[1]/IO[2]	Definition of the communication module • 20xxx DualPortRam(PLC) • 30xxx direct Profibus • 10000x Client Server

The KOMflex tool data can also be defined in more detail in the BKF_USERPARATABn subprogram. The following table gives further information about the most important parameters.

Definition of the tool data

Parameter	Meaning
_BKF_TOOLNAME	• "NAME", if a tool name is needed. • "NUMBER", if a tool number is needed.
_BKF_TOOLD	The tool's D number
_BKF_WEAR_LIMIT	Maximum wear limit of the indexable insert up to which the KOMflex makes a correction. If this is exceeded, the indexable insert must be changed and the KOMflex must be reinitialised.
_BKF_MIN_DELTA	Minimum correction value which must be exceeded for the KOMflex to be adjusted in the BKF_CORRECTION program.
_BKF_LIMIT	Limit value for manual correction of the KOMflex in automatic mode
_BKF_TOOLT	Tool table • 1 = in radius • 2 = in diameter
_BKF_DIAMCALL	Offset in call • 1 = in radius • 2 = in diameter
_BKF_OPTION[0]	If the tolerance limits have been exceeded, • 0 = the radius wear in the tool table must be manually reset to 0 and is not automatically reinitialised. • 1 = the KOMflex is automatically reinitialised, i.e. the KOMflex moves to the VIP position (teach-in position).

8.2.3 Parameter overview when calling up programs

If no call parameters are transferred in the program calls, the parameters in the BKF_USERPARATAB1.SPF program are effective.

Parameter	Explanation
KFID	ID number with which teach-in was carried out for the KOMflex. Up to 16 KOMflex can be taught-in with an RC66. |1| <= KFID <= |16| The teach-in process can be skipped for an already taught-in KOMflex with negative KFID.
OFFSET	Offset with which the KOMflex is taught-in in relation to its current position. In the case of adjustment movements, the offset is added to the correction value from the tool table. This is to ensure, for example, that the trial cut has sufficient material for correction when the tool is first used/after changing the indexable insert. -0.5 <= OFFSET <= +0.5
DIR	Defines the machining direction: 0 = hole // 1 = pin
MIN_DELTA	Minimum correction value which must be exceeded for the KOMflex to be adjusted in the BKF_CORRECTION program.
MEASCUT	Measurement cut. 1 = Measurement cut is performed. The wear limit monitoring is inactive. The reference position for a wear correction is updated. 0 = No measuring cut. The wear limit is active.
WEAR_LIMIT	Maximum wear limit of the indexable insert up to which the KOMflex makes a correction. If this is exceeded, the indexable insert must be changed and the KOMflex must be reinitialised.

8.2.4 Teaching in the KOMflex

In this phase, a non-taught-in KOMflex can be taught-in in IF20 or an already taught-in KOMflex can be initialised. **This means that the position of the head at the moment of teach-in is saved.** If the precision spindle head used has already been taught-in on the machine and pairing is not to take place again, then this step can be skipped.

This cycle takes place in automatic mode.

1. Standby mode

Precision spindle head is in standby mode.

→ All LEDs are off.

2. Execute "KOMflex teach-in" program

Call up the **BKF_CHECKIN (KFID, OFFSET, DIR)** program

Parameter

- KFID KOMflex ID number: 1 - 16
- OFFSET Offset for moving the teach-in position
- DIR Defines the machining direction: 0 = hole // 1 = pin

Optional

- KFID KOMflex ID number: -1 – -16

An already taught-in KOMflex can skip the teach-in process with a negative KFID.

3. Pair with KOMflex

- After calling up the program, the following command appears on the controller: "Pair KOMflex to ID=”<<_BKF_ID<<", hold the magnetic pen on label SET! "
- To teach-in the head on the IF20, touch the "SET" sensor with the magnetic pen until:

  KOMflex LED switches from BU to. GN

This step is skipped with a negative KFID → continue with step 4.

4. Switch KOMflex on

- The precision spindle head is automatically switched on after initial teach-in of a new KOMflex or initialisation of an already taught-in KOMflex.

5. Set VIP

- VIP 1 is set in the program.
- Optional: VIP 2 is used in the program as the monitoring value for detecting manual intervention.

6. Approach VIP

- VIP is approached.

7. Standby mode

The precision spindle head is automatically switched off by the machine control after approaching the VIP and the head goes to standby mode.

→ All LEDs are off.

8.2.5 Correction in automatic mode

In this cycle, the KOMflex is automatically readjusted in the process. To correct the measured value, the difference to the set value must be written in the wear parameter of the tool table for the relevant KOMflex, using measurement software. The wear parameter is used with the transferred offset to correct the KOMflex.

Range: BKF_CORRECTION (KFID, OFFSET, MEASCUT, WEAR_LIMIT)

Parameter

- KFID KOMflex ID number: 1 - 16
- OFFSET Offset for moving the teach-in position
- MEASCUT Value if a trial cut is carried out
- WEAR_LIMIT Maximum wear limit of the indexable insert

8.2.6 Manually switching off

The KOMflex can be manually switched off with the BKF_OUT () program.

Range: BKF_OUT (KFID)

Parameter

- KFID KOMflex ID number: 0 - 16
  If the KFID = 0, the switch-off signal is sent to all KOMflex.

8.3 Reinitialisation of the KOMflex

During reinitialisation, the KOMflex can move back to its original position, set during teach-in (position for a trial cut). This can be done manually in the case of an insert change or automatically if the wear limit is reached. The entered radius wear for the KOMflex is always set to 0.

Range: BKF_REINITIALIZE (KFID)

Parameter

- KFID KOMflex ID number: 1 - 16

8.4 Extension of the machine with further KOMflex

To integrate a new KOMflex into the machine, the program must be extended with a new BKF_USERPARATABn, whereby n is the KOMflex ID. This allows the system to be extended with ease, without losing clarity.

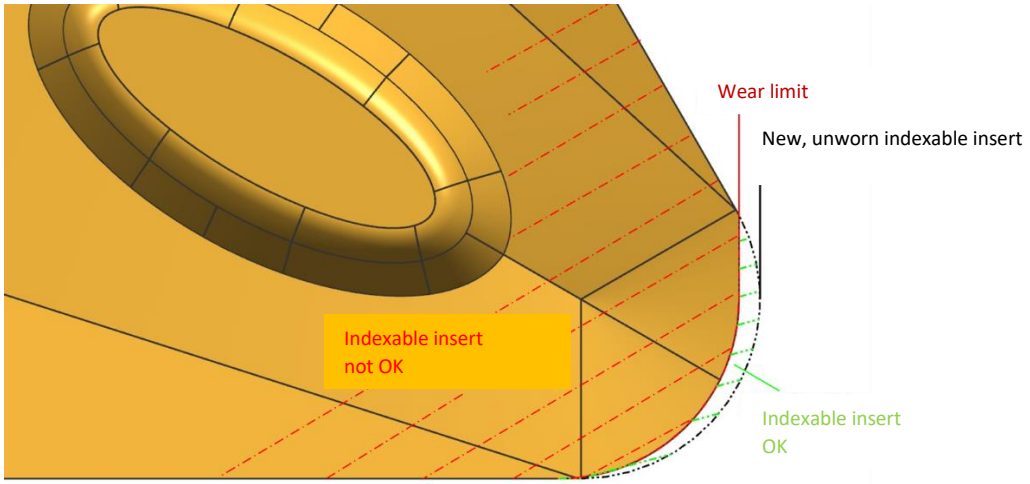
The machine can be extended with up to 16 KOMflex systems.

KOMflex tool data	KOMflex 1 KFID 1	KOMflex 2 KFID 2	KOMflex 3 KFID 3
NC cycles	BKF_USERPARATAB1	BKF_USERPARATAB2	BKF_USERPARATAB3

8.5 Changing the cutting edge

With the KOMflex system, the maximum wear limit for internal or external machining can be specifically adapted to the customer application via the _BKF_WEAR_LIMIT parameter in the BKF_USERPARATABn subprogram (section 8.2.2). If one of these values is dropped below or is exceeded, the program is stopped and the error message "Error E7 – Out of tolerance" appears on the machine control.

As soon as the wear limit is reached, the indexable insert must be turned or replaced if there are no more unworn cutting edges on the indexable insert.



When handling the indexable insert please note that it has sharp edges and therefore poses a risk of injury. Therefore, always proceed with care when replacing the indexable insert.

To replace the indexable insert, please follow the following steps:

1. Hold the indexable insert and release the fixing screw with the key provided for this.
2. Remove both the indexable insert and the fixing screw.
3. Clean any dirt off the indexable insert.
4. Carry out a visual inspection of the indexable insert:
    a. If there are unworn cutting edges on the indexable insert, then place it to one side with the fixing screw.
    b. If all cutting edges are worn, dispose of the indexable insert properly and place the fixing screw to one side.
5. After assessment, clean and check the indexable insert seating for damage.
6. Then insert the new indexable insert or the unworn side of the indexable insert and secure with the fixing screw.
7. Gently press the indexable insert against the seating contact surfaces and tighten with the key provided for this. (Note torque specifications).

8.6 Battery replacement

The KOMflex's batteries must be checked when:

- The status LED flashes red or lights up red.
- The error message *1117* – warning battery: battery voltage in critical state – appears on the CNC control.

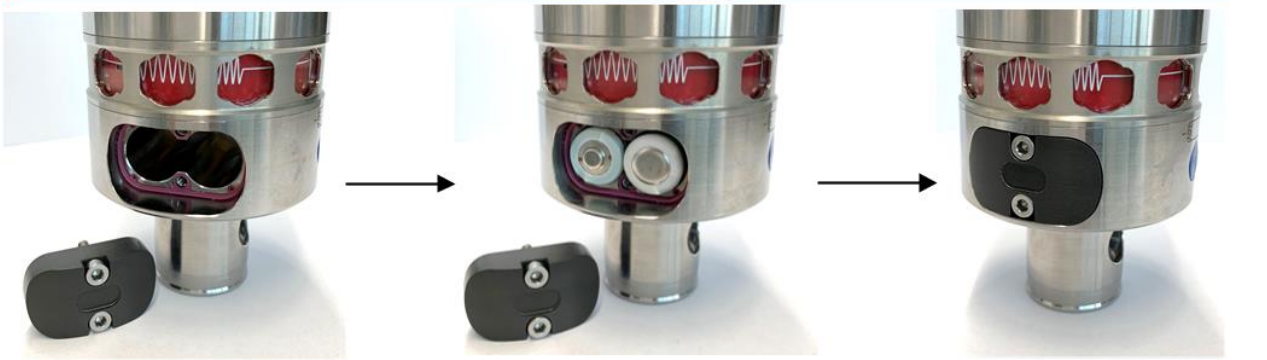
8.6.1 Changing the battery

Recommended type:

Type	Saft Lithium LS14500	Tadiran SL-360
mAh	2600	2400
Nominal voltage	3.6 V	3.6 V
Size	AA	AA

1. Unscrew the screws on the battery compartment lid.
2. Pull both screws out and remove the battery lid.
3. Remove the battery.
4. Carefully clean and dry the battery compartment with absorbent paper.
5. Insert new batteries. Pay attention to the battery polarity.
6. Check whether the seal is correctly inserted: small, even distance of the sealing lip to the wall.
7. Fit the battery compartment lid so it is straight and secure it (Md = 0.7 Nm).
8. When screwing the battery lid on, ensure it is positioned correctly and that the O ring is in perfect condition. If the O ring is damaged, replace it.

Pay attention to the battery polarity!
(See housing signature)



Open battery compartment

Insert new batteries

Screw the battery lid back into place

8.6.2 Disposal of batteries

The KOMflex precision head spindle must be disposed of in compliance with national and local regulations as part of the normal recycling process. Once it is no longer being used, statutory disposal regulations apply. In general, observe the following during disposal: Separate components for recycling into electronic waste, scrap iron, aluminium, plastic and battery.

In accordance with UK battery legislation, we are required to state the following

Used batteries do not belong in household waste. You can return used batteries to our dispatch warehouse free of charge. As a consumer, you are legally obliged to return old batteries. Batteries containing hazardous material are marked with a crossed-out wheelie bin symbol and the chemical symbol (Cd, Hg or Pb) which determines the classification as a heavy metal containing hazardous substances.

8.7 KOMflex errors in machine operation

Code	Value	Description of error
1100	1	Timeout: Position could not be reached in the specified time.
1102	1	Absolute VIP could not be set: Index outside range.
	2	Relative VIP could not be set: Index outside range.
	3	"Go to VIP" requested with invalid index.
1103	1	Requested position is outside the limit: Position greater than maximum.
1104	1	Requested position is outside the limit: Position less than minimum.
1105	20	Invalid data during input with the magnetic pen.
	21	Invalid data during status output.
	28	Protocol error: Missing data during the "Go to absolute position" request (position).
	29	Protocol error: Missing data during the "Go to absolute position" request (internal/external machining).
	31	Protocol error: Missing data during the "Receive VIP" request (index).
	32	Protocol error: Missing data during the "Set absolute VIP" request (index).
	33	Protocol error: Missing data during the "Set absolute VIP" request (position).
	34	Protocol error: Missing data during the "Set relative VIP" request (index).
	35	Protocol error: Missing data during the "Set relative VIP" request (value).
	36	Protocol error: Missing data during the "Go to VIP" request (index).
	37	Protocol error: Missing data during the "Go to VIP" request (offset).
	38	Protocol error: Missing data during the "Go to VIP" request (internal/external machining).
	39	Protocol error: Missing data during the "Go to CP" request (internal/external machining).
	41	Invalid data for position request: Incorrect value for internal/external machining.
	42	Invalid data for VIP request: Index outside range.
	43	Invalid data for "Go to VIP" request: Index outside range.

Code	Value	Description of error
1106	2	Plausibility error detected: Motor blocked.
	3	Plausibility error detected: Motor overcurrent.
	4	Plausibility error detected: Motion in opposite direction detected (positive direction of travel expected).
	5	Plausibility error detected: Motion in opposite direction detected (negative direction of travel expected).
	6	System is in an error state (battery empty for example).
	8	Release time cannot be carried out during positioning.
	9	Upon recognition of the release time, the CP cannot be approached.
	10	Upon recognition of the release time, no motion can be detected after 3 seconds.
1109	1	Current position cannot be measured.
	2	Position detection is not available once position has been reached.
	3	Position detection is not available during positioning.
	4	No motion possible: Position detection is not available.
	5	Offset cannot be adopted: Position detection is not available.
	6	Position cannot be received: Position detection is not available.
	7	VIP cannot be set: Position detection is not available.
1110	1	Position could not be reached after the maximum number of position attempts.
1117	-	Battery warning: Battery voltage at a critical level.
1118	-	Incorrect status: KOMflex module is not ready.

8.8 BLUM errors in machine operation

In the event of an error, the error number is set, and an error message appears on the screen. The program must be interrupted with the RESET button, the cause of the error must be resolved, and the program must be restarted.

In the event of messages (e.g. E7), the program processing is interrupted by "M0". The cycle can be continued with "Cycle start".

E4 "Incorrect call parameters"

Description: The cycle cannot be carried out with the set call parameters.

Solution: Enter valid values for calling up the program.

Error number	Digits after point	Description of error
4	.04	Check the KFID parameters
4	.09	Check the OFFSET parameters
4	.23	Check the DIR parameters
4	.31	CALL VIP not set
4	.32	CALL VIP < 4
4	.44	KFID program parameter: KOMflex not taught-in
4	.51	|CALL WEAR_LIMIT| > 0.5
4	.61	|MIN_DELTA| > 0.1

E7 "Tool limits exceeded"

Description: KOMflex correction value exceeds the permitted limit value.

Solution: Correctly set _BKF_WEAR_LIMIT in USERPARATAB1 or in the call.

Error number	Digits after point	Description of error
7	.51	Minimum tolerance violated
7	.52	Maximum tolerance exceeded

E22 "Communication error"

Description: Connection error between NC and IF20.

Solution: Ensure that a connection is established between NC and IF20.
Also check all the connecting elements between them.
Correctly configure the network or the field bus.

Error number	Digits after point	Description of error
22	.1	Timeout communication
22	.2	IF or EM not connected
22	.02010	Error RC66 timeout
22	.02011	Error RC66

E25 "Manual intervention"

Description: The KOMflex has been manually adjusted during automatic mode.

Solution: Execute the BKF_REINITIALIZE program.

Error number	Digits after point	Description of error
25	.01	Manual intervention

E26 "Incorrect tool/tool name"

Description: The tool data entered in USERPARATAB1 is incorrect.

Solution: Enter the correct tool data in USERPARATAB1.

Error number	Digits after point	Description of error
26	.01	Incorrect tool name
26	.02	Incorrect tool number

9 KOMflex recycling – Our recycling service

Our joint contribution to the environment - beyond the lifetime of the tool: We take back your used fine adjustment heads KOMflex and recondition them professionally. This saves you costs and effort for disposal.

10 List of abbreviations used

Abbreviation	Meaning
CNC	Computerized Numerical Control
CP	Centre Position, slide central position
EM	Extension module
GUD	Global User Definition
IF	Interface
IP	International Protection
NC	Numeric Control
VIP	Cutting edge change position
II	Indexable insert