# Operating Manual BKS309

## Digital Web Guide Controller

| | |
|---|---|
| Document Version 2.34 | 02/2016 NS |
| Firmware Version | V2.37 |

This operation manual is also available in German.
Please contact your local FMS representative.

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.
Bitte kontaktieren Sie Ihren nächstgelegenen FMS Vertreter.

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# 1 Safety Instructions

## 1.1 Description Conditions

a) Danger of health injury or loss of life

***Danger***

***This symbol refers to high risk for persons to get health injury or loss life. It has to be followed strictly.***

b) Risk of damage of machines

***Caution***

***This symbol refers to information, that, if ignored, could cause heavy mechanical damage. This warning has to be followed absolutely.***

c) Note for proper function

***Note***

***This symbol refers to an important information about proper use. If not followed, malfunction can be the result.***

## 1.2 List of Safety Instructions

***Some contacts on the power supply board are under 230V tension! Mortal danger! Disconnect power supply before open the housing!***

⚠ ***Proper function of the FMS web guide is only guaranteed with the recommended application of the components. In case of other arrangement, heavy malfunction can be the result.***

⚠ ***Local installation regulations are to preserve safety of electric equipment. They are not taken into consideration by this operating manual. However, they have to be followed strictly.***

⚠ ***Bad earth connection may cause electric shock to persons, malfunction of the total system or damage of the control unit! It is vital to ensure that proper earth connection is done.***

⚠ ***The processor board is mounted directly behind the operation panel. Improper handling of the electronic boards may cause damage to the fragile equipment! Don't use rough tools such as screwdrivers or pliers! Operators handling the electronic boards must wear a well earthed bracelet in order to discharge static electricity***

# 2 System Description

## 2.1 Functional Description

**Figure 1** shows a typical web guiding system with its basic components.
The sensors measure the position of the web edge and send this information as an analogue signal to the electronic control unit. In our case a BKS309 web guide controller. The control compares the position feedback signal with the reference. If the difference of these two values is higher than the stored dead band value, the steering frame will be adjusted.

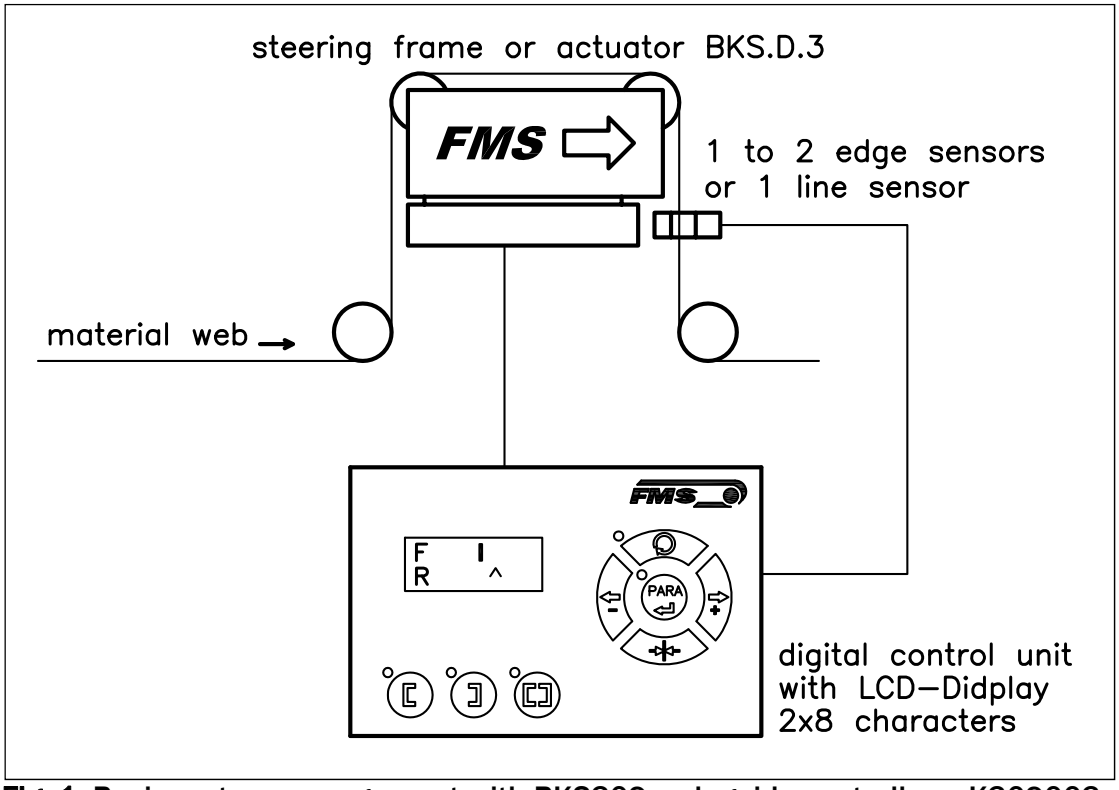



**Fig. 1:** Basic system arrangement with BKS309 web guide controller K309003e

## 2.2 Steering Frame or Actuator

The steering frame consists of a fixed lower and a moveable upper frame that supports the rollers. The upper frame is activated by a stepper motor. The rollers are manufactured and balanced according to customer specification. End positions are controlled via a linear potentiometer. A location rail for easy sensor attachment is integrated to the steering frame. For rewind und unwind stands a stepper motor based drive acts as actuator.

## 2.3 Electronic Control Unit

The micro-processor based electronic control unit handles all calculations and communications. Three buttons and a five key wind-rose serve as the man-machine interface. Parameter setting can be performed via the front panel keys or through a Web Browser. The controller is then either connected to a network (e.g. Ethernet) or via a peer-to-peer configuration to a laptop or local PC. All parameters are stored in a none-volatile EEPROM memory. The BKS309 controllers work in combination with FMS steering frames of the series **webMASTER BKS020, webMASTER BKS030, webMASTER BKS040, DIRECTOR BKS041/42,** and actuators of the **winderGLIDE BKS.D.3** and **winderGLIDE BKS.D.6** series.

## 2.4 Sensors

Optical sensors (**AZS01B/04B**), ultrasonic sensors (**US01B/4B**) and a digital line sensor (**DLS2**) are available from FMS. Adjustment is done automatically. These sensors provide a signal of 0...10V. With them, edge, center and line guiding applications can be covered.

# 3 Quick Installation Guide

In a Plug & Play configuration the set-up of the BKS309 controller and corresponding guiding unit is limited to only mounting the devices on the machine frame, wiring and powering up system.

## 3.1 Preparations for Set-up

- Read the Operation Manual of your web guide or actuator system.
- Check your system requirements such as:
  – Desired guiding form (edge, centre or line guiding)
  – Unit system (metric, imperial)
  – Relay or digital input requirements of your set-up
- Draw the wiring diagram for your configuration (ref. to chapter **5.1** to **5.6**)
- If required, determine special parameters (ref. to **8** "Parameter Setting over the Front Panel")

## 3.2 Installation Procedure

1. Mount and ajust your material sensor(s) to the steering frame (ref. to chapter **4.3**)
2. Mount the steering frame or actator to the machine
3. Wire the sensor(s) to the electronic unit (ref. to chapter **5**)
4. Wire the steering frame to the electronic unit (ref. to chapter **5.1** to **5.6**)
5. Mount the electronic unit on a place where it can be easily reached by the operator
6. Make sure the power supply voltage is in the range 18 to 30V DC (Vnom= 24V)
7. Power your system on
8. If required, make additional settings (ref. to **8.2** "Setting of Operation Parameters")

# 4 Installation

***Caution***

***Proper function of the FMS web guides and actuators is only guaranteed with the recommended application of the components. Other arrangements, can cause heavy malfunctions. Therefore, the installation instructions on the following pages must strictly be followed.***

***Caution***

***Local installation regulations are to preserve safety of electric equipment. They are not taken into consideration by this operating manual. However, they have to be followed strictly.***

## 4.1 Mounting the Steering Frame

The mounting orientation of the steering frame (indicated by an arrow), must correspond with the web running direction. The lower frame is mounted with four M8 screws to the machine frame. The machine must be prepared to accept the M8 mounting screws.

## 4.2 Mounting the Actuator to your Unwind or Rewind Station

The static part of the winderGLIDE actuator must be mounted to the machine frame e.g. to the spherical rod end on the gearbox. The moving rod end is mounted to the winding stand. For other assembly forms consult the operation manual of the BKS.D.3 respectively BKS.D.6
The BKS.D.3 / D.6 are designed for horizontal mounting positions. The machine frame must be prepared to accept the mounting devices of the winderGLIDE.

## 4.3 Mounting the Sensors

The sensors will be mounted with brackets to the rail of the steering frame or to the sensor arrangement of the unwind/rewind stand (refer to operation manual AZS01, US01 or DLS).
The sensors have to be installed after the steering frame if seen in running direction of the web. They have to be mounted so that the narrow side is closer to the steering frame (see **Fig. 2**).

**Definition of Left and Right:**
Left and right are always seen in direction of the running web (see **Fig. 2**).

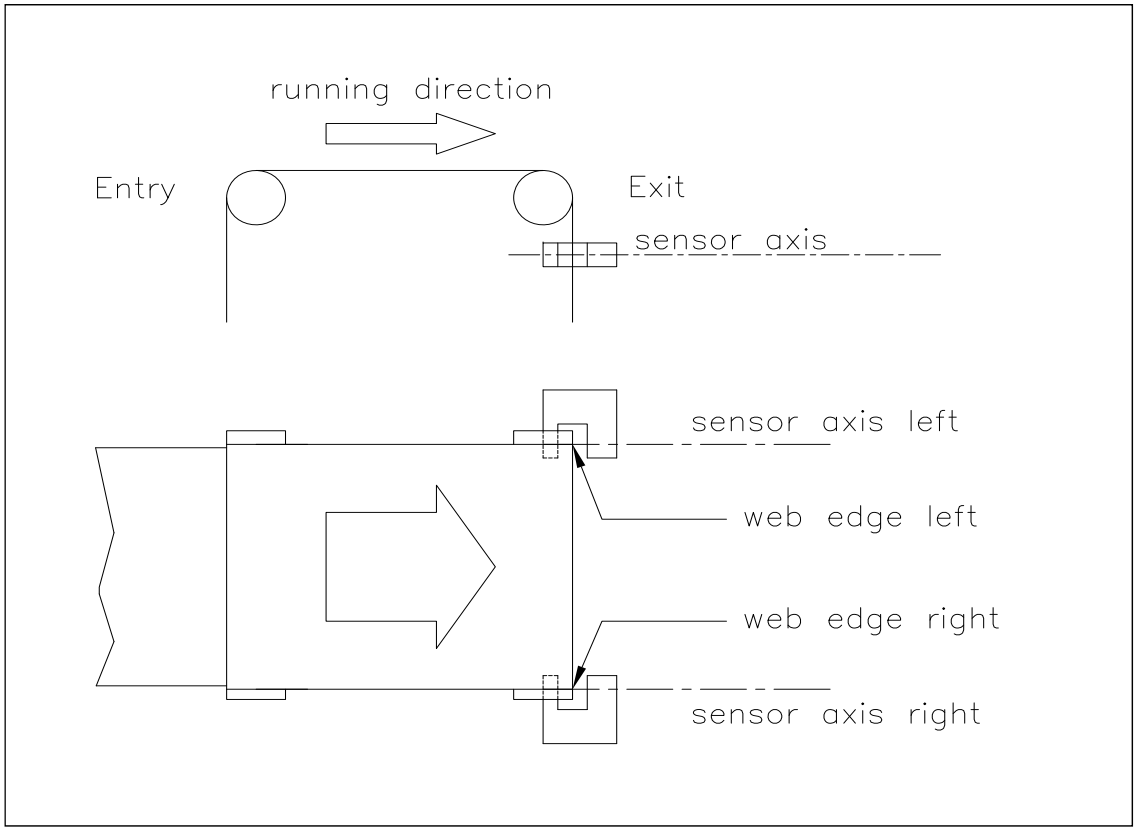



**Fig. 2:** Position of the sensors according to the web K400005e

> ***Note***
> ***Make sure that the sensor(s) are connected properly to the electronic unit by means of the delivered cables. For left / right orientation please refer to Fig. 2. If the connections are crossed over, malfunction can be the result.***

> ***Note***
> ***For optimum control results, the sensors have to be placed next to the exit roller of the steering frame. If the sensors are placed far from the steering frame, control dynamics will deteriorate.***

## 4.4 Mounting the Electronic Control Unit

The BKS309 series is available in four different housing options:

1. Rail mount housing (electrical connections via screw terminals)
2. Rail mount housing (electrical connections via connectors)
3. Wall mount housing
4. Panel mount housing

The mechanical dimensions can be seen in chapter **10** “Mechanical Dimensions”.

# 5 Wiring Diagrams

**Use the original FMS cables to connect the steering frame respectively the actuator to the BKS309 controller. The connector end of the cable is connected either to a steering frame or a BKS.D.3 / D.6 actuator. The open ends of the cables must be wired to the cable terminals in the controller according to the wiring diagrams below (ref. also to Fig. 4)**

## 5.1 Wiring a Steering Frame with BKS309.R / .S or .W Controller

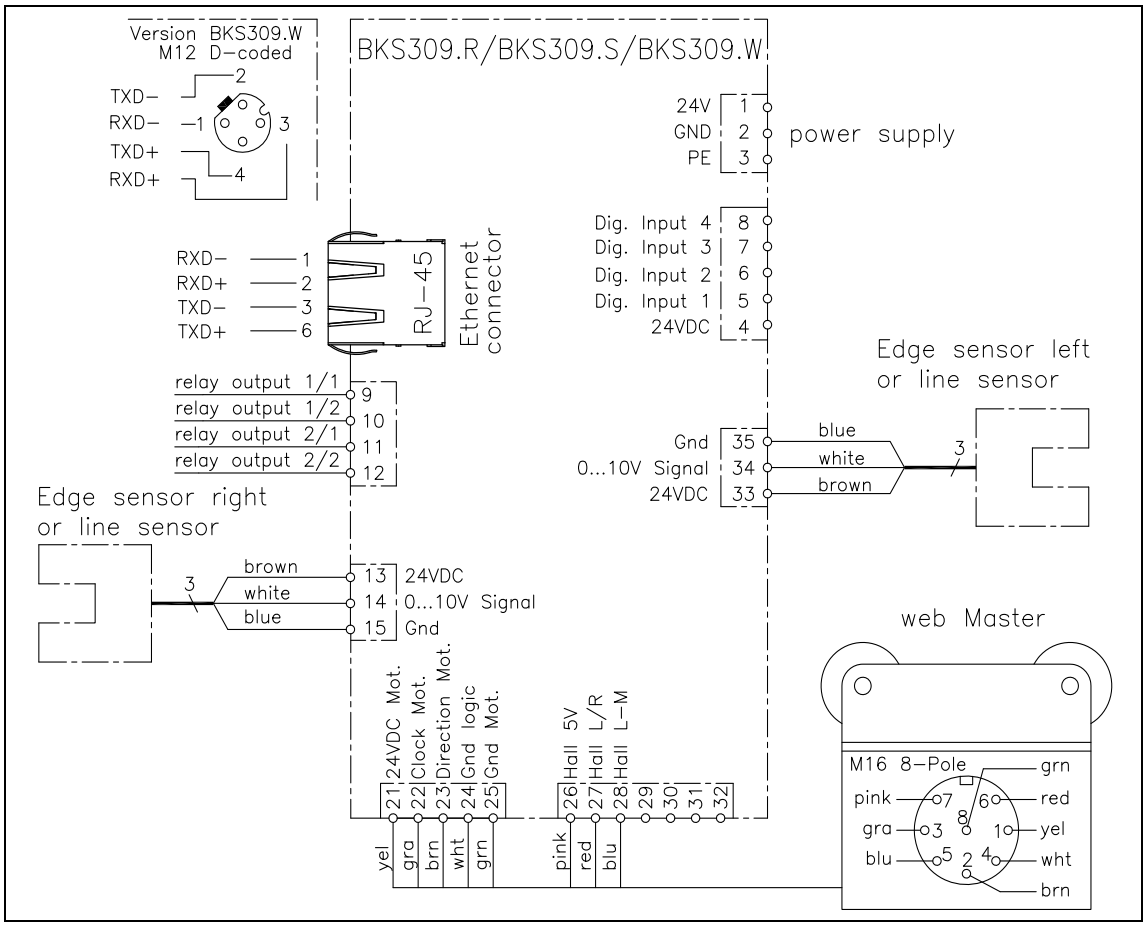



**Fig. 4: Wiring of Steering Frame with Web Guide Controller BKS309._.EE.CH (for BKS.020 with external electronics)** **K309040e**

## 5.2 Wiring an Actuator BKS.D.3 or Steering Frame BKS030

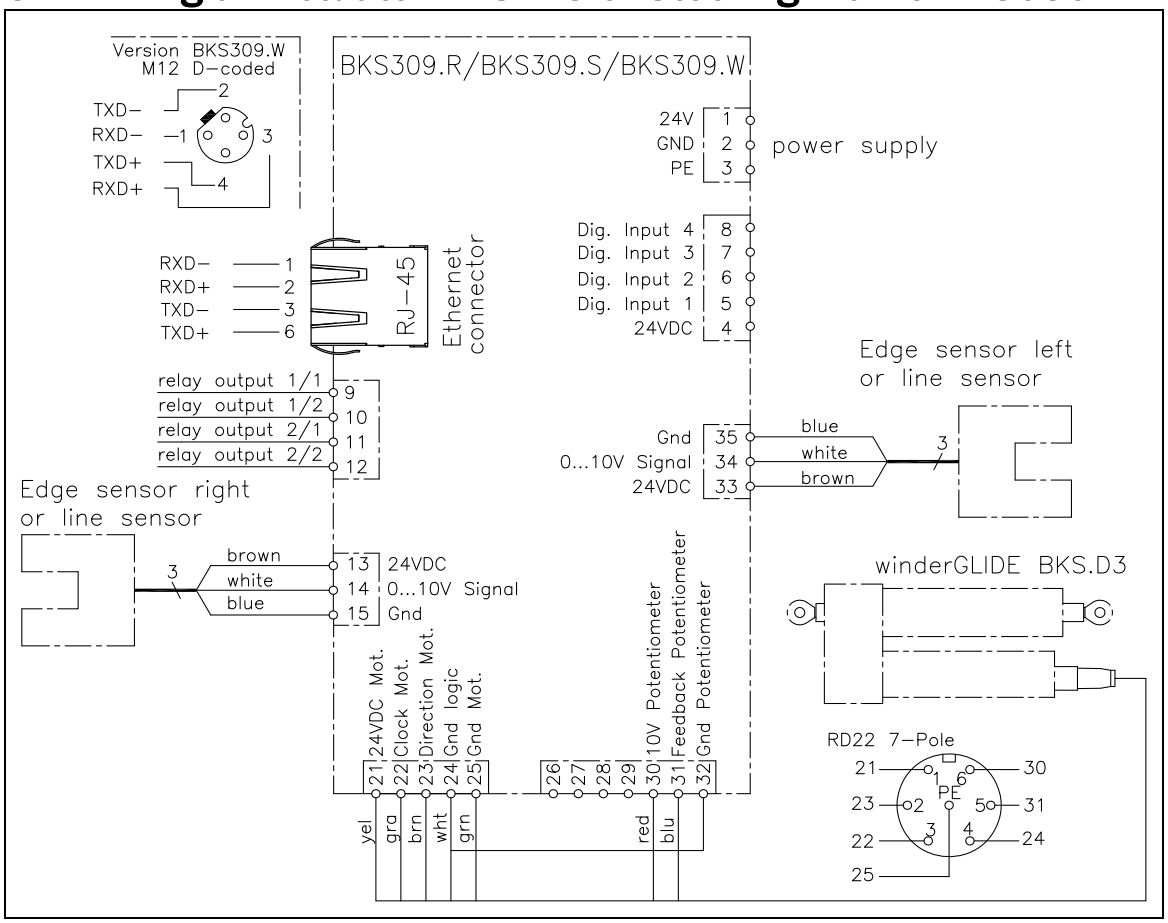



**Fig. 5:** Wiring main processor board – Actuator BKS.D.3 or BKS030 K309004e

## 5.3 Wiring an Actuator BKS.D.6

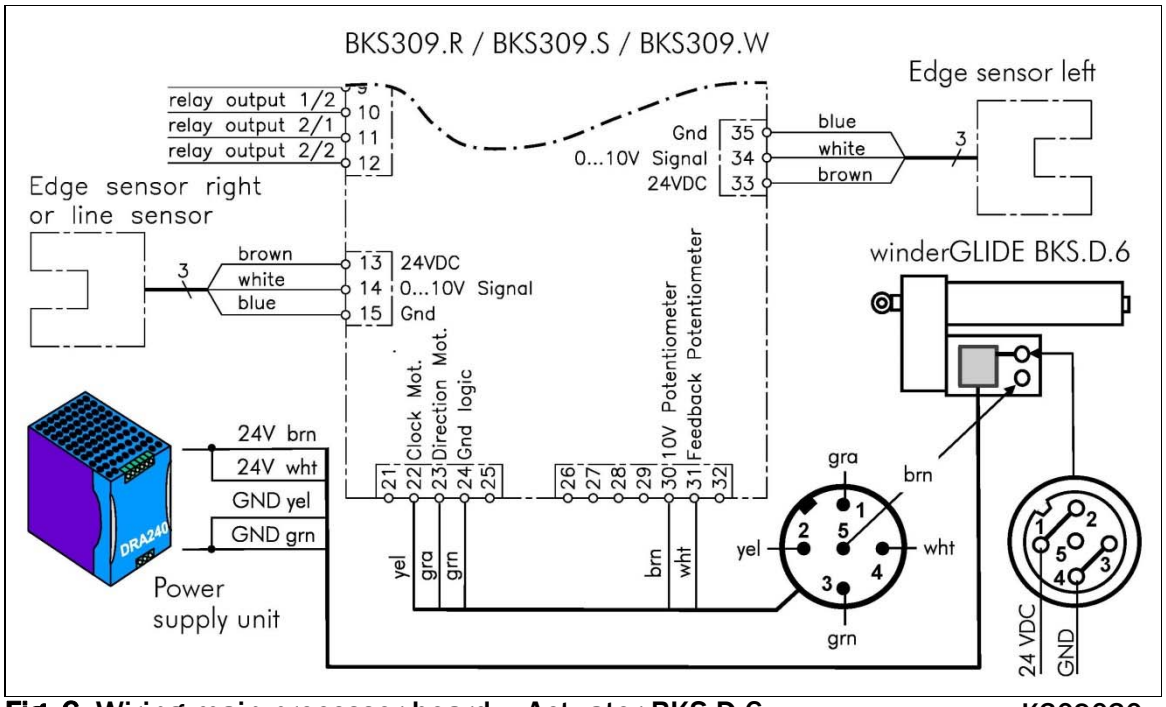



**Fig. 6:** Wiring main processor board – Actuator BKS.D.6 K309030e

## 5.4 BKS309.R.CH / BKS309.R.CP Housing with Connectors

Pin assignment for web guide controller BKS309.R.CH und BKS309.R.CP housing version with connectors (see also table on the next page):

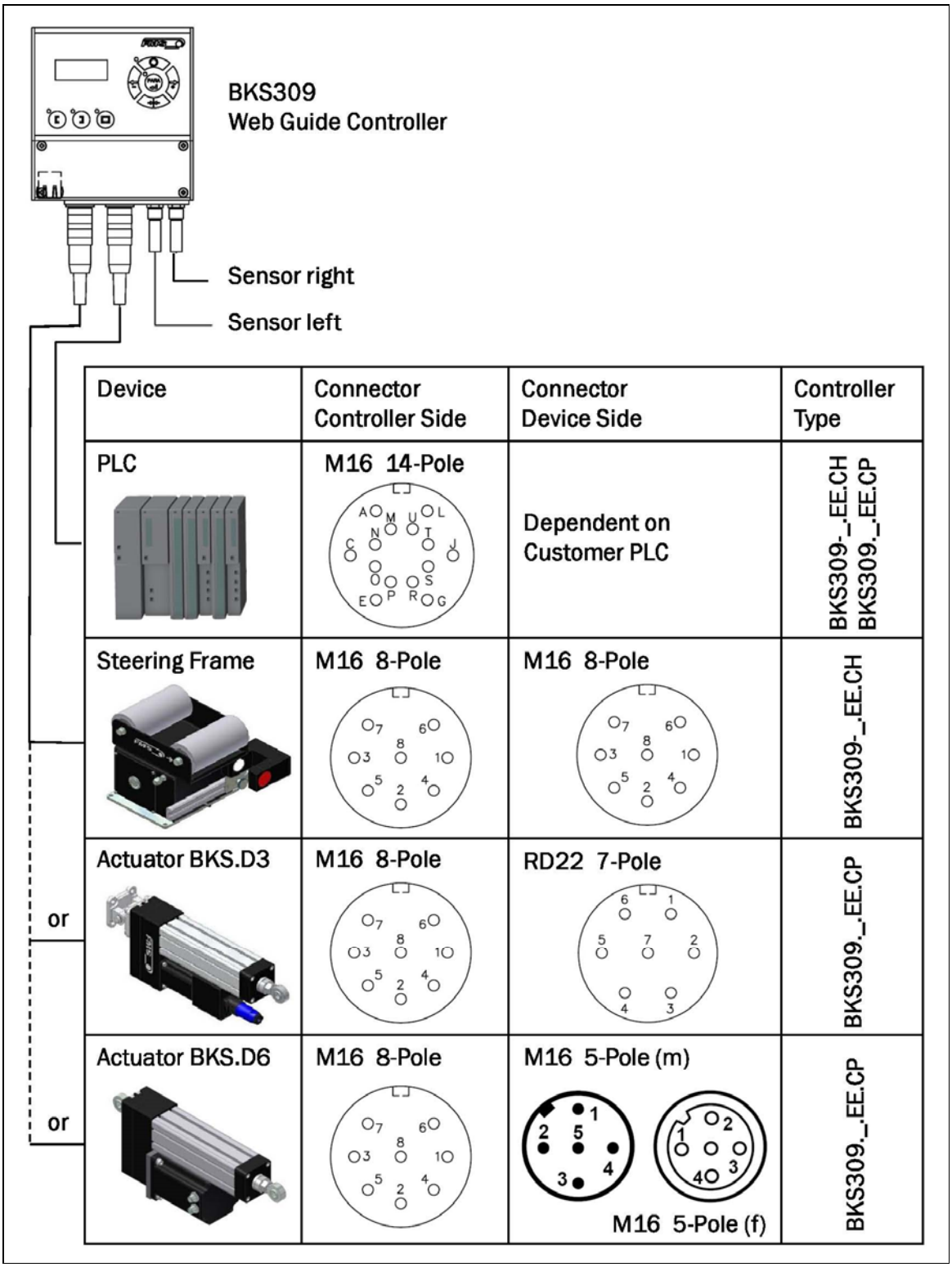



**Fig. 8**: Wiring Diagram BKS309.R.CH and BKS309.R.C K309020e
Connector view from soldering side

| Pin assignment M16 14-Pole Web Guide Controller | | Pin assignment M16 8-Pole Web Guide Controller and Steering Frame | | Pin assignment RD22 7-Pole Actuator WinderGLIDE BKS.D.3 | |
|---|---|---|---|---|---|
| **Pin** | **Signal name** | **Pin** | **Signal name** | **Pin** | **Signal name** |
| A | 24VDC Supply | 1 | 24VDC Motor | 1 | 24VDC Motor |
| C | 24VDC Supply | 2 | Direction Motor | 2 | Direction Motor |
| E | GND Supply | 3 | Pulse Motor | 3 | Clock Motor |
| G | GND Supply | 4 | GND Logic | 4 | GND Logic |
| J | PE | 5 | Hall sensor L/M | 5 | Feedback Potentiometer |
| L | 24VDC Digital | 6 | Hall sensor L/R | 6 | 10V Potentiometer |
| M | Dig. Input 1 | 7 | Hall sensor 5V | 7 | GND Motor |
| N | Dig. Input 2 | 8 | GND Motor | | |
| O | Dig. Input 3 | | | | |
| P | Dig. Input 4 | | | | |
| R | Relay 1/1 | | | | |
| S | Relay 1/2 | | | | |
| T | Relay 2/1 | | | | |
| U | Relay 2/2 | | | | |

| Pin Assignment winderGLIDE BKS.D.6 | | | |
|---|---|---|---|
| **Pin Assignment BKS309 on Screw Terminal** | **Pin** | **Connector M16 5-pol (m) to Electronics** | **Connector M16 5-pol (f) to Power Supply Unit** |
| 23 | 1 | Direction Motor | +24 VDC |
| 22 | 2 | Clock Motor | +24 VDC |
| 24 | 3 | GND Direction | GND |
| 31 | 4 | Feedback Potentiometer | GND |
| 30 | 5 | +10 V Potentiometer | NC |

## 5.5 Screw Terminal Arrangement

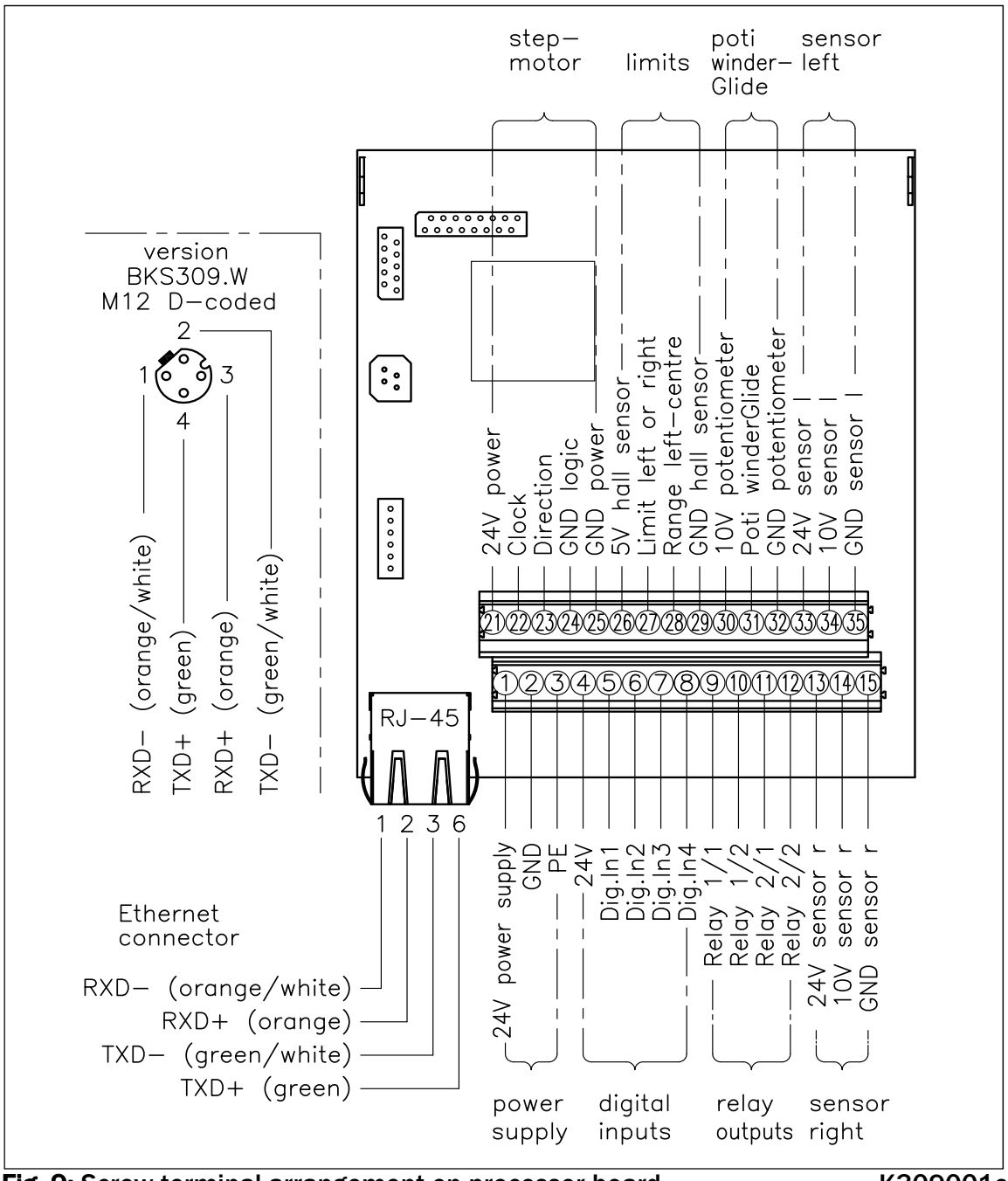



**Fig. 9:** Screw terminal arrangement on processor board K309001e

> ***Caution***
>
> ***Bad earth connection may cause electric shock to persons, malfunction of the total system or damage of the control unit! It is vital to ensure that there is a proper and secure earth connection.***

## 5.6 Relays Outputs

The BKS309 controller provides 2 programmable relay outputs. The outputs are software controlled. Electrically they are potential-free. Each relay output can be configured individually and can perform an assign special function. The outputs are configured in the Parameter Setting Mode. Following functions can be assigned to each output:

- Indicate centre position of web
- Indicated if web is loaded (material is present)
- Indicate if web is loaded and Automatic Mode on
- Indicate if no web is loaded and Automatic Mode on
- Indicate if Automatic Mode was chosen
- Indicate if steering frame or actuator is centred

For more details about the functions refer to chapter **8.6** "Description Operation Parameter".

Hardware access via screw terminals (see **Fig. 9**)

| Signal Name | Terminal # |
|---|---|
| Relay 1/1 | 9 |
| Relay 1/2 | 10 |
| Relay 2/1 | 11 |
| Relay 2/2 | 12 |

## 5.7 Digital Inputs

The BKS309 controller provides 4 digital inputs for special functions.
The digital inputs are edge or level triggered. An impulse of 100ms or longer activates the event. Each digital input can be configured individually and can perform an assign special function. The digital inputs are configured in the Parameter Setting Mode. Following function can be assign to each digital input:

- Toggle between Manual and Automatic mode (edge triggered)
- Toggle between Manual and Automatic mode (level triggered)
- Go to centre position
- Decrease reference value in 0.1mm steps (automatic mode) or move actuator in 0.1mm steps to the left
- Increase reference value in 0.1mm steps or move actuator in 0.1mm steps to the right
- Lock steering device (steering frame or actuator)
- Reset reference value

For more details about the functions refer to chapter **8.6** "Description Operation Parameter".

***Caution***

***If the function "***Toggle between Manual and Automatic mode***" is controlled via the digital inputs, the corresponding key***  ***on the operation panel will be deactivated.***

Hardware access via screw terminals (see **Fig. 9**)

| Signal Name | Terminal # |
|---|---|
| Dig.In 1 | 5 |
| Dig.In 2 | 6 |
| Dig.In 3 | 7 |
| Dig.In 4 | 8 |

.

***Caution***

***Bad earth connections may cause electric shocks to persons, malfunction of the total system or damage of the control unit! It is vital to ensure that the earth connection is properly done.***

## 5.8 Opening the Housing

The housing of the control unit BKS309.W.ACV can be opened by unscrewing the 4 Philips screws. This has to be handled with special care since some of the contacts in the power supply board are under a tension of 85 to 264V.

***Danger***

***Some of the wire terminals in the power supply board of the BKS309W.ACV controller are under a tension (85-264 VAC). Mortal danger! Only specially instructed and qualified personnel should handle this controller unit. In any case the power supply must be disconnected from the main supply before opening the housing.***

# 6 Configuring the System

After having mounted and wired the web guiding equipment on the machine, the system can now be configured to the specific requirements of the application.

## 6.1 Power up the BKS 309

1. Make sure the power supply voltage is in the range 18...30 VDC (Vnom= 24V)
2. Check, if the web is in the detection range of the sensors.
3. Switch-on your power supply
4. The web guide or actuator starts-up in Manual Operating Mode.

## 6.2 Adjustment of the Sensors

Align sensor axis to the web edge: Loosen the fixing nut on the bracket and adjust the sensor. Fix the sensor in the new position. The sensor will be positioned properly if the web edge goes through the sensor axis (center of active window (ref. to **Fig. 10**).

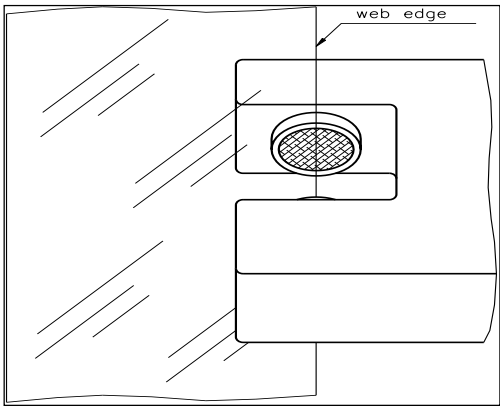



**Fig 10:** Alignment of the sensor axis to the web edge K100004e

# 7 Operation

## 7.1 Operation Panel

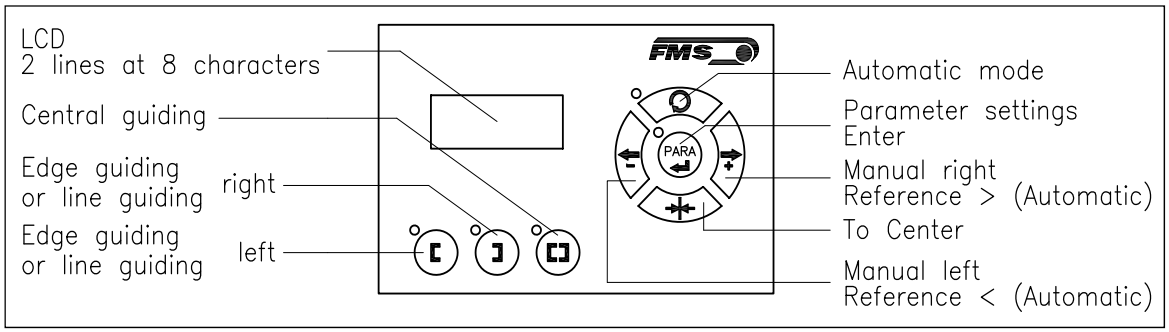



**Fig. 11:** View of the Operation Panel K309005e

## 7.2 Operating the Web Guiding System via the Front Panel

| Key | Key function during operation |
|---|---|
|  | The sensor is mounted on the left side of the frame and controls the material on the left edge or on the line, if a line sensor is used. One sensor is necessary. The LED indicates the left edge guiding mode. |
|  | The sensor is mounted on the right side of the frame and controls the material on right edge or on the line, if a line sensor is used. One sensor is necessary. The LED indicates the right edge guiding mode. |
|  | Two sensors are mounted on both sides of the frame. The frame is controlled in a way that the material position is kept centered with regard to both sensors position. The LED indicates the centre guiding mode. |
|   | To enter the Parameter Setting Mode, hold the key for longer than 3 sec. The LED will light and the first parameter will appear on the LCD display indicating that you entered the mode. A second press on the PARA key will cause the parameter to flash. Now it can be changed (ref. to 6 “Parameter Setting over the Front Panel”) |
|  | Automatic, Manual. With this key you can select between automatic and manual mode. The LED indicates the automatic mode. |
|  | Drive to center position. The frame moves to the center Position. Function is only available in manual mode. |

| | |
|---|---|
|  | **In manual mode** the frame will move to the left in 0.1mm steps by pressing the button once. By pressing the button longer than 1 sec. it will continuously move the frame to the left.<br>**In automatic mode** the frame set-point will be adjusted to the left in 0.1 mm steps by pressing the button once. Pressing the button longer than 1 sec. it will continuously move the set-point of the frame to the left.<br>**In Setup-Position** and independent if the device is in manual or |
|  | **In manual mode** the frame will move to the right in 0.1mm steps by pressing the button once. By pressing the button longer than 1 sec. it will continuously move the frame to the right.<br>**In automatic mode** the frame set-point will be adjusted to the right in 0.1 mm steps by pressing the button once. Pressing the button longer than 1 sec. it will continuously move the set-point of the frame to the right.<br>**In Setup-Position** and independent if the device is in manual or automatic mode, pressing the button increases continuously the parameter value. |

***Note***

***If DLS (digital line sensors) are used, it may happen that the web guide controller blocks the steering frame. This protective function is activated when the line is interrupted and impossible to detect the line anymore. The LED above the .key will start blinking and indicate to operator that the line quality is bad.***

## 7.3 Automatic Operation

- Start automatic mode with key or digital input. Reference position is taken from the middle of the sensor detection band (**Fig. 12**). Using center guide, reference position is in the middle between the 2 sensor axis. The controller starts to guide the web to reference position and to hold this guide point.
- The reference position can be adjusted during automatic operation by using the keys or using digital inputs (step width 0.1 mm). Using the key, the web moves out of the sensor; using the key, the web moves in.

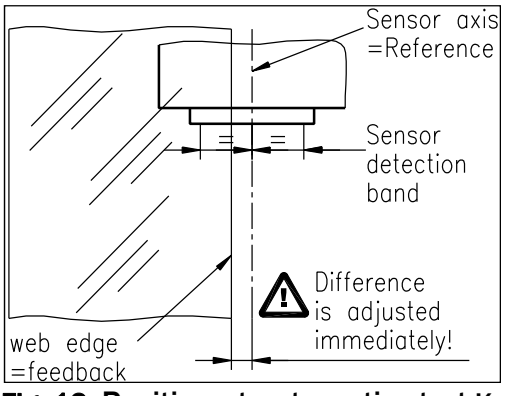



**Fig. 12: Position at automatic start K 100005e**

- Using center guide, this description refers to the right sensor.
- Terminate the automatic mode by using the key again.

***Note***

***If the web leaves the sensor detection band, control is no longer effective. Hold the web edge strictly inside the sensor detection band.***

***Note***

***If the web is not running, it can't be guided properly to the reference position! The steering frame moves in the limit-of-travel position and may damage the web. Start automatic mode only when web is slowly running.***

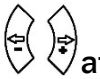
## 7.4 Manual Operation

In manual mode, possibilities as follows are available:

- *Center position*  *:* The steering frame will return to center position.
- *Frame position*  and  *:* The steering frame can be adjusted in 0.1mm steps. If key is held, steering frame is moving continuously. These functions can also be carried out via the digital inputs (see **5.7** "Digital Inputs").

## 7.5 Saving the Travel Limits

There are two possibilities to alter the limits for the Home Position, Middle Position and Maximum Positions of the actuator. Either you modify the parameters [**Home Pos**], [**Mid Pos**] and [**Max Pos**] in the parameter changing mode or you drive manually to the desired position and save it. The procedure for is then as follows:

1. Enable the change of the travel limits by pressing the two keys  at the same time. The LED above the  key will light.
2. Travel with the actuator to the desired position with the keys 
3. Press the  key. The LED above the key starts to flash and expects the definition of the setting.
4. The definition is done with  for the Home Position,  for the Maximal Position and  for the Middle Position
5. On the displayed following comments will report completion.
   **Display first line:** **[Save Pos]**
   **Display second line:** **[Done] or [Invalid]**
   In the case of [Invalid] the display flashes. The position couldn't be found e.g. because the "home" or "maximum" position was set over the middle position.

# 8 Parameter Setting over the Front Panel

## 8.1 Basic Instructions for Parameter Setting

The web guide controller has three operator modes:

- Operation mode
- Parameter Setting mode (parameter selection)
- Change mode (set or change chosen parameters)

The parameter setting can be performed via the keys on the front panel or via a web browser. When using the front panel, the user can toggle between these modes by pressing a key or a combination of keys. The keys have the following functions:

| Key | Key function during parameter setting |
|---|---|
|  | Enter |
|  | Change the selections or increase / decrease the values |

## 8.2 Setting of Operation Parameters

To enter the Parameter Setting Mode the web guide controller must be in the Manual Mode. In the Automatic Mode only the reference value can be changed.

Press the  key for longer than 3 sec. The LED will light and the first parameter will appear on the LCD display. With the  .keys the parameter list can be scrolled up and down. By pressing the  key again you will enter the parameter setting mode. The select parameter on the display flashes indicating that it can be changed.

The following state diagrams will help you to navigate through the Parameter Setting menu.

## 8.3 Setting of System Parameters

To enter the Parameter Setting Mode the web guide controller must be in the Manual Mode. Press the  and  key together for longer than 3 sec to enter the System Parameter List. The LED will light and the first parameter will appear on the LCD display. For changing parameters proceed like in chapter **8.2**.

## 8.4 List of Operation Parameters

| Parameter | LCD | Unit | Min | Max | Selection | Default |
|---|---|---|---|---|---|---|
| Adjust Reference Position | Ref Pos | mm | -5.00 | +5.00 | - | 0.00 |
| Set Reference Mode | Ref Mode | - | - | - | Manual<br>Auto | Manual |
| Save the Reference Position | SaveRef | - | - | - | No<br>Yes | No |
| Dead band | DeadBand | mm | 0.0 | 2.0 | - | 0.1 |
| Relay 1 or Relay 2 setting | Relay 1<br>Relay 2 | - | - | - | MidSenso<br>MatFound<br>Auto&Mat<br>Aut&Miss<br>Auto Centre<br>Disabled | R1= MidSenso<br>R2= MatFound |
| Digital Input 1, 2, 3 or 4 Modes | Input 1<br>Input 2<br>Input 3<br>Input 4 | - | - | - | Edge→Aut<br>Lv→Auto Centre<br>- Ref/←<br>+Ref/→<br>Lock<br>ResetRef<br>Disabled | I1= Edge→Aut<br>I2=Center<br>I3= -Ref/←<br>I4= +Ref/→ |
| Password | Password | - | - | - | No<br>Yes | No |
| Language | Language | - | - | - | English<br>German | English |
| LCD-Contrast | Contrast | % | 1 | 100 | - | 65 |
| Unit System | Unit Sys | - | - | - | Metric<br>Imperial | Metric |
| Gain Setting | Gain | - | 0.02 | 2.00 | - | 0.2 |
| Adjust Correction Speed | AdjSpeed | % | 1 | 100 | - | 100 |
| Power Modes | Power ON | - | - | - | Manual<br>Auto<br>Last Set | Manual |
| Behaviour when leaving Automatic Mode | Auto→Man | - | - | - | Manual<br>Centre | Manual |

| Parameter | LCD | Unit | Min | Max | Selection | Default |
|---|---|---|---|---|---|---|
| Home Position [3] | Home Pos | mm | 0.0 | 300.0 | - | 0.0 |
| Middle Position[3] | Mid Pos | mm | 0.0 | 300.0 | - | 62.5 [4] |
| Maximal Position[3] | Max Pos | mm | 0.0 | 300.0 | - | 125.0 [4] |
| Actuator | Actuator | - | - | - | Left Right | Left |
| IP Address | IP Addr | - | 0 | 125 | - | 192.168.0 .090 |
| Subnet | Subnet | | 0 | 255 | - | 255.255.2 55.0 |
| Factory Settings [5] | Default | - | - | - | Not set Yes | Not Set |

## 8.5 List of System Parameters

| Parameter | LCD | Unit | Min | Max | Selection | Default |
|---|---|---|---|---|---|---|
| Offset Centre | Offset>< | - | - | - | - | [4] |
| Position Detection | PosDetec | - | - | - | Potentio One Hal Two Hal | [4] |
| Centre Position | CentrPos | steps | 0.0 | 10‘000 | - | [4] |
| Right Limit | RightLim | steps | 0.0 | 10‘000 | - | [4] |
| Drive Direction | DriveDir | - | - | - | Standard Invers | Standard |
| Actuator Type | winderGL | - | - | - | D.3/6.125 D.3/6.200 D.3/6.300 | [4] |

[1] Permanent pressing of the keys expedites the changing speed.
[2] The display shows the unit of measure that was previously selected.
[3] Parameter only used in winderGLIDE (actuator) applications
[4] The default value is dependent on the actuator used
[5] System parameters are not reset, if the default function is used

## 8.6 . Description Operation Parameter

### Adjust Reference Position [Ref Pos]

**Purpose:** The reference position can be adjusted using this parameter.

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | -5.00 | to | +5.00 | **Default:** | 0.00 |
| **Increment:** | 0.01 | | | **Unit:** | [mm] |

### Set Reference Mode [Ref Mode]

**Purpose:** This parameter determinates how the reference position is defined. This can either be the position that is defined with parameter **[Ref Pos]** or the actual material position within the sensor when the controller is switched to automatic operation.

**Two settings are possible:**

**Setting:** **[Manual]**

**Purpose:** If **[Manual]** is chosen, the Reference Position is taken from the parameter [RefPos].

**Setting:** **Automatic [Auto]**

**Purpose:** If **[Auto]** behaviour is chosen, the Reference Position is determinate by taking the actual material position within the sensor when the controller is switched to automatic operation.

**Note:** The two parameters [RefMode] and [SafeRef] are conditionally dependent on each other. Either set [RefMode] to [Auto] or [SafeRef] to [Yes] if you require one of both functions.
Do not activate both functions simultaneously!

### Save the Reference Position [SaveRef]

**Purpose:** The parameter saves the last Reference Position change. It sets after re-booting the Reference Position to the last used value or to 0 (zero).

**Two settings are possible:**

**Setting:** **[No]**

**Purpose:** If **[No]** behaviour is chosen, the Reference Position is set to 0 after rebooting (default setting).

**Setting:** **[Yes]**

**Purpose:** If **[Yes]** behaviour is chosen, after rebooting the Reference Position is set to the last used value.

**Note:** The two parameters [RefMode] and [SafeRef] are conditionally dependent on each other. Either set [RefMode] to [Auto] or [SafeRef] to [Yes] if you require one of both functions.
Do not activate both functions simultaneously!

## Dead band [DeadBand]

**Purpose:** This parameter defines the dead band tolerance. Dead band is a free programmable range, in which the web may move freely without the steering readjusting the frame. Keep in mind that: A **[DeadBand]** of e.g. 0.3mm“ results in a tolerance band of ±0.3mm.
If the deviation is higher than the tolerance, the web will be readjusted into the range of the dead band.

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0.0 | to | 2.0 | **Default:** | 0.1 |
| **Increment:** | 0.1 | | | **Unit:** | [mm] |

## Relay 1 or Relay 2 setting [Relay 1 or 2] (two Parameters one for each relay)

**Purpose:** This parameter determines the relay behaviour.

**The user can choose between seven settings.**

**Setting:** **Middle Position [MidSenso]**

**Purpose:** If [**MidSenso]** is chosen then the relay goes on when the material is at the sensor’s middle position.
(Default setting for Relay 1)

**Setting:** **Material Found [MatFound]**

**Purpose:** If [**MatFound]** is chosen then the relay goes on when material is present. (Default setting for Relay 2)

**Setting:** **Automatic Mode and Material Found [Auto&Mat]**

**Purpose:** If [**Auto&Mat]** is chosen then the relay goes on when material is present and the controller is in Automatic Operation.

**Setting:** **Automatic Mode and Material Missing [Aut&Miss]**

**Purpose:** If [**Aut&Miss]** is chosen then the relay goes on when material is not present and the controller is in Automatic Operation.

**Setting:** **Automatic Operation [Auto]**

**Purpose:** If **[Auto]** is chosen then the relay goes on when the controller is in Automatic Operation.

**Setting:** **[Centre]**

**Purpose:** If [**Centre]** is chosen then the relay goes on as soon as the motor drive stands still after a centre run.

**Setting:** **[Disabled]**

**Purpose:** If **[Disabled]** is chosen then the relay function is disabled. The relay will never go on.

## Digital Input 1, 2, 3 or 4 Modes [Input 1...4]
These are actually fore parameters one for each digital input

**Purpose:** This parameter determines the functions of the digital inputs.

**The user can choose between seven settings.**

**Setting:** **Edge Triggered Automatic Mode [Edge→Aut]**

**Purpose:** The controller switches either to automatic or manual operation depending in which mode the controller currently is. The switching is taking place when a **rising edge** is detected on the digital input. (Default setting for dig. input 1)

**Setting:** **Level Controlled Automatic Mode [Lv→Auto]**

**Purpose:** The controller switches either to automatic or manual operation depending on the voltage level at the digital input. If the voltage is high then the controller switches to Automatic otherwise to Manual Operation.

**Setting:** **Drive to Center Position [Centre]**

**Purpose:** If [**Centre**] is chosen then the motor drive moves to the centre position. The event is edge triggered. (Default setting for dig. input 2)

**Setting:** **Decrease Reference Value or Move to the Left [-Ref/←]**

**Purpose:** The controller behaves in two different ways depending on the current operation mode. If the controller is in manual operation then the motor drive moves to the left respectively to the retracted position. If it is in automatic mode then the reference value is decreased. Default setting for dig. input 3)

**Setting:** **Increase Reference Value or Move to the Right [+Ref/→]**

**Purpose:** The controller behaves in two different ways depending on the current operation mode. If the controller is in manual operation then the motor drive moves to the right respectively to the extended position. If it is in automatic operation then the reference value is increased.
(Default setting for dig. input 4)

**Setting:** **Lock Guide [Lock]**

**Purpose:** The motor drive is immediately locked when this parameter is chosen and the digital input voltage is high.
Dig. Input *Lock,* Operation State *Automatic and* Parameter *Auto→Man* work in a combinative manner. Their interdependency is described in the following table:

| Dig. In. Lock | Op. State Automatic | Parameter Auto→Man | Function |
|---|---|---|---|
| 0 | inactive | Centre | Move to middle position |
| 0 | active | irrelevant | Automatic operation |
| 1 | inactive | Manual | Stop at actual position |
| 1 | inactive | Centre | Move to middle position |
| 1 | active | irrelevant | Stop at actual position |

**Setting:** **Reset of Reference Value [ResetRef]**

**Purpose:** This function resets the reference value to 0, if a positive signal edge is applied to the digital input.

**Setting:** **Disabled**

**Purpose:** With [**Disabled**] parameter the digital input is disabled.

## Password

**Purpose:** The web guide controller can be protected from unauthorised access by means of password. If *Password Yes* is chosen, the system will request the password to change parameters and other setting. The password itself can't be changed. It is always **3231**

**The user can choose between two settings.**

**Language:** **[No]**

**Purpose:** The Password protection is deactivated (default setting)

**Language:** **[Yes]**

**Purpose:** The Password protection is activated

## Language

**Purpose:** This parameter determines the displayed language.

**The user can choose between two languages.**

**Language:** **[English]**

**Purpose:** If [**English**] is chosen, the display shows all texts in English. The web browser is always in English.

**Language:** **[German]**

**Purpose:** If [**German**] is chosen, the display shows all texts in German.

## LCD-Contrast [Contrast]

**Purpose:** The parameter **[Contrast]** changes the contrast of the LCD to achieve optimal readability.

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 1 | to | 100 | **Default:** | 65 |
| **Increment:** | 1 | | | **Unit:** | [%] |

## Unit System [Unit Sys]

**Purpose:** This parameter determines the unit system used.

**The user can choose between two settings.**

**Setting:** **[Metric]**

**Purpose:** If [**Metric**] is chosen, the controller displays all data in metric units.

**Setting:** **[Imperial]**

**Purpose:** If [**Imperial**] is chosen, the controller shows all data in imperial units.

## Gain Setting [Gain]

**Purpose:** This parameter defines the gain of the feedback value.

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0.02 | to | 2.00 | **Default:** | 0.20 |
| **Increment:** | 0.01 | | | **Unit:** | [ - ] |

## Adjusting Correction Speed [AdjSpeed]

**Purpose:** This parameter determines the maximum used speed.

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 1 | to | 100 | **Default:** | 100 |
| **Increment:** | 1 | | | **Unit:** | [%] |

## Power Modes [Power ON]

**Purpose:** This parameter determines the operation mode after power on.
**The user can choose between three behaviours.**

**Setting:** **[Manual]**

**Purpose:** The controller goes to Manual Operation Mode after power on.

**Setting:** **Automatic [Auto]**

**Purpose:** The controller goes to Automatic Operation Mode after power on.

**Setting:** **Last Setting Used [Last Set]**

**Purpose:** The controller restores the operation mode that was previously chosen before power off.

## Behaviour when leaving Automatic Mode [Auto→Man]

**Purpose:** This parameter determines the behaviour of the controller leaving the automatic mode.

**The user can choose between two behaviours.**

**Setting:** **[Manual]**

**Purpose:** The controller stops guiding. The motor drive is locked at the current position (Manual Mode).

**Setting:** **[Centre]**

**Purpose:** The controller stops guiding. Afterwards the motor drive moves to the centre.

## Home Position [Home Pos]

**Purpose:** This parameter determines the position of the actuator spindle in its retracted position. An actuator stops at this position and moves no further backwards (ref. also to chapter **7.5** " Saving the Travel Limits").

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0.0 | to | 300.0 | **Default:** | 0.0 |
| **Increment:** | 0.1 | | | **Unit:** | [mm] |

**Condition:** **This parameter appears on the display only if an actuator / winderGLIDE is connected to the controller.**

## Middle Position [Mid Pos]

**Purpose:** The [**Mid Pos**] parameter determines the centre position of the actuator spindle. An actuator stops at this position, if you press the centre key  . In Automatic Operation this parameter has no meaning.

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0.0 | to | 300.0 | **Default:** | 62.5 [4)] |
| **Increment:** | 0.1 | | | **Unit:** | [mm] |

[4)] The default value is dependent on the used actuator

**Condition:** **This parameter appears on the display only if an actuator / winderGLIDE is connected to the controller.**

## Maximal Position [Max Pos]

**Purpose:** This parameter determines the limit for the extended position. An actuator stops at this position and moves no further forward. (ref. also to chapter **7.5** " Saving the Travel Limits").

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0.0 | to | 300.0 | **Default:** | 125.0 [4)] |
| **Increment:** | 0.1 | | | **Unit:** | [mm] |

[4)] The default value is dependent on the used actuator

**Condition:** **This parameter appears on the display only, if an actuator / winderGLIDE is connected to the controller.**

## Actuator [Actuator]

**Purpose:** The parameter [**Actuator**] determines the control logic of the web guide controller BKS309.

**Condition:** **This parameter appears on the display only if an actuator / winderGLIDE is connected to the controller.**

**The user can choose between two control directions.**

**Action:** **[Left]**

**Purpose:** [**Left**] is the control direction when the actuator is mounted on the left side of the unwind/rewind station seen in direction of the running web (see **Fig. 2**)

**Action:** **[Right]**

**Purpose:** [**Right**] is the control direction when the actuator is mounted on the right side of the unwind/rewind station seen in direction of the running web (see **Fig. 2**)

## [IP Addr]

**Purpose:** The parameter assigns an IP address to the controller. This enables the user to communicate via a web browser with the controller that is imbedded in a network. The IP address must be entered in 4 separate blocks (IP Bl. 1; IP Bl. 2; IP Bl. 3; and IP Bl. 4)

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0 | to | 255 | **Default:** | 192.168.0.090 |
| **Increment:** | 1 | | | **Unit:** | [ - ] |

## [Subnet]

**Purpose:** The parameter assigns the Subnet Mask of the controller in the Ethernet network. This enables the user to communicate via a web browser with the controller. The Subnet Mask must be entered in 4 separate blocks (Sub. Bl 1; Sub. Bl 2; Sub. Bl 3; and Sub. Bl 4).

| | | | | | |
|---|---|---|---|---|---|
| **Range:** | 0 | to | 255 | **Default:** | 255.255.255.0 |
| **Increment:** | 1 | | | **Unit:** | [-] |

## Factory Settings [Default]

**Purpose:** This menu point is a command. It resets the parameters to the factory settings.

**The user can choose between two actions.**

**Action:** **[Not Set]**

**Purpose:** If [**Not Set**] is chosen, all parameters stay as set by the user.

**Action:** **[Yes]**

**Purpose:** If [**Yes**] is chosen, the default parameters are loaded.

***Note***

***The operation parameters [Home Pos], [Mid Pos], [Max Pos], [Teach-in] as well as all system parameters are not reset with the factory setting command [Default].***

## 8.7 Description of System Parameters

***Caution***

***System parameters are factory settings and should not be changed without contacting the service department of FMS. An unauthorised change can cause malfunctions in the system or damage in the machine.***

To enter the System Parameter Setting Mode hold the two PARA + keys for longer then 3 sec. The LED will light and the first parameter will appear on the LCD display

### Offset Centre [Offset><]

**Purpose:** This parameter adjusts the position of a steering frame exactly to the centre.

### Position Detection [PosDetec]

**Purpose:** This parameter determines what devices that are used to detect the limit positions.

**The user can choose between three types.**

**Type:** **[Potentio]**

**Purpose:** A potentiometer is used to detect the Home position, Middle Position and Maximum Position. It is automatically set, if an actuator / winderGLIDE of the type BKS.D.3 is used.

**Type:** **[One Hall]**

**Purpose:** One hall sensor is used to detect the Home position, Middle Position and Maximum Position.

**Type:** **[Two Hall]**

**Purpose:** Two hall sensors are used to detect the Home position, Middle Position and Maximum Position.

## Centre Position [CentrPos]

**Purpose:** The [**CentrPos**] parameter is only used with the position detection system based on hall sensors. For all other position detection system this parameter is not used and hence not displayed. The parameter determines the centre position of the actuator spindle in motor steps (measured from the left reference position). The actuator stops at this position, if you press the centre key  . In Automatic Operation this parameter has no meaning.

## Right Limit [RightLim]

**Purpose:** The [**RightLim**] parameter is only used with the position detection system based on hall sensors. For all other position detection system this parameter is not used and hence not displayed. The parameter limits the maximum travel to the right side of the actuator spindle in motor steps (measured from the left reference position). In the operation or in manual mode this limit will never be exceeded

## Drive Direction [DriveDir]

**Purpose:** This parameter determines the guiding orientation of the controller. Usually turn stepper motors clockwise. This setting changes the turning direction of the motor. There are two other possibilities to change the guiding direction:

a) Changing the electrical polarisation of the stepper motor
b) Mounting the actuator in the opposite direction

**The user can choose between two settings**

**Setting:** **[Standard]**

**Purpose:** [**Standard**] is chosen when standard motors and standard frames are used.

**Setting:** **[Invers]**

**Purpose:** [**Invers**] is chosen when motors are used that turn anticlockwise. If a FMS actuator of the type winderGLIDE is used, the controller sets the drive direction automatically.

| Actuator Type [winderGL] | |
|---|---|
| **Purpose:** | This parameter determines the used actuator type. The product name of FMS actuators is winderGLIDE.<br><br>**The user can choose between three types.** |
| **Type:** | **[D.3.125] or [D.6.125]** |
| **Purpose:** | If type **[D.3.125]** or **[D.6.125]** is chosen, the maximum travel of the spindle will be 125mm (4.92in). It is the maximum travel position. |
| **Type:** | **[D.3.200] or [D.6.200]** |
| **Purpose:** | If type **[D.3.200]** or **[D.6.200]** is chosen, the maximum travel of the spindle will be 200mm (7.87in). It is the maximum travel position. |
| **Type:** | **[D.3.300] or [D.6.300]** |
| **Purpose:** | If type **[D.3.300]** or **[D.6.300]** is chosen, the maximum travel of the spindle will be 300mm (11.81in). It is the maximum travel position. |

## 8.8 Reset to Default Parameter Set

Factory settings of your BKS309 web guide controller can be re-established either over the parameter setting menu (see chapter **8.2** "Setting of Operation Parameters", parameter **[Default]**) or by:

Holding the two keys  +  while powering –up the controller.

***Note***

***The operation parameters [Home Pos], [Mid Pos], [Max Pos], [Teach-in] as well as all system parameters are not reset with the factory setting command [Default].***

# 9 Parameter Setting via a PC

The BKSZ309 web guide controller can be embedded in an Ethernet network and the parameter setting can be done over this network by means of a web browser (Internet Explorer 7). The devices have a static IP-address that can be set over the user interface. The IP-address is not automatically received over DHCP.
The parameter setting can also be carried out with a desktop- or laptop computer via a peer-to-peer connection (see chapter **9.2**)

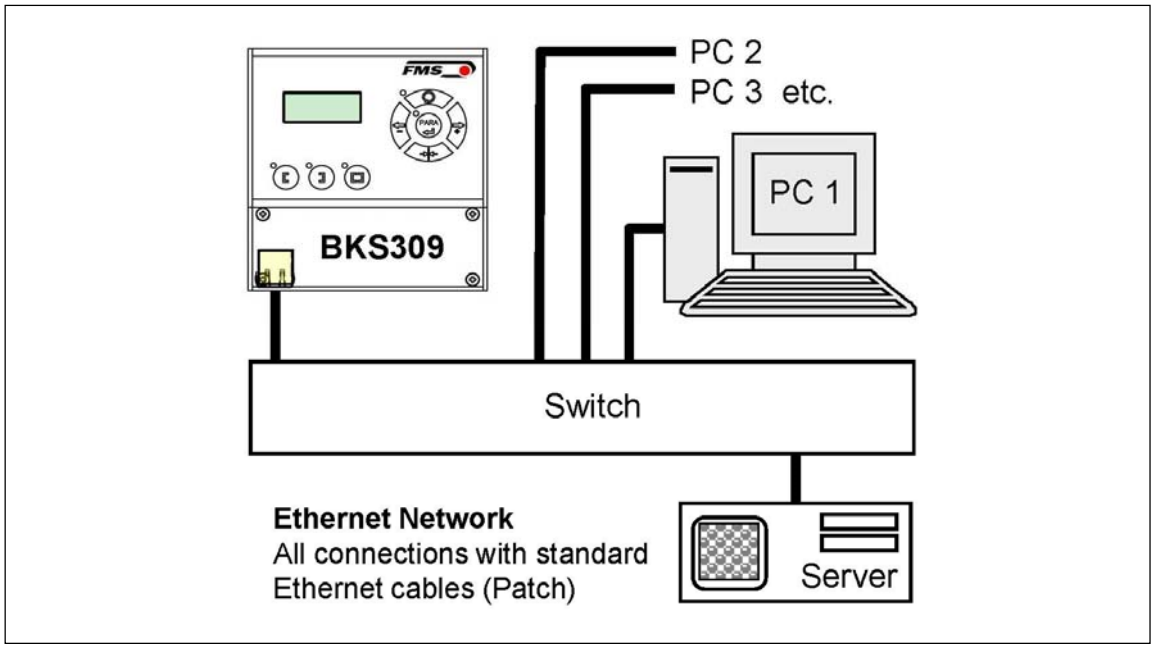



**Fig. 18:** BKS309 configuration in a LAN (Local Area Network) K309058e

The parameter setting can also be carried out with a desktop or laptop computer directly connected to the BKS309 Controller (see **chapter 9.2**).

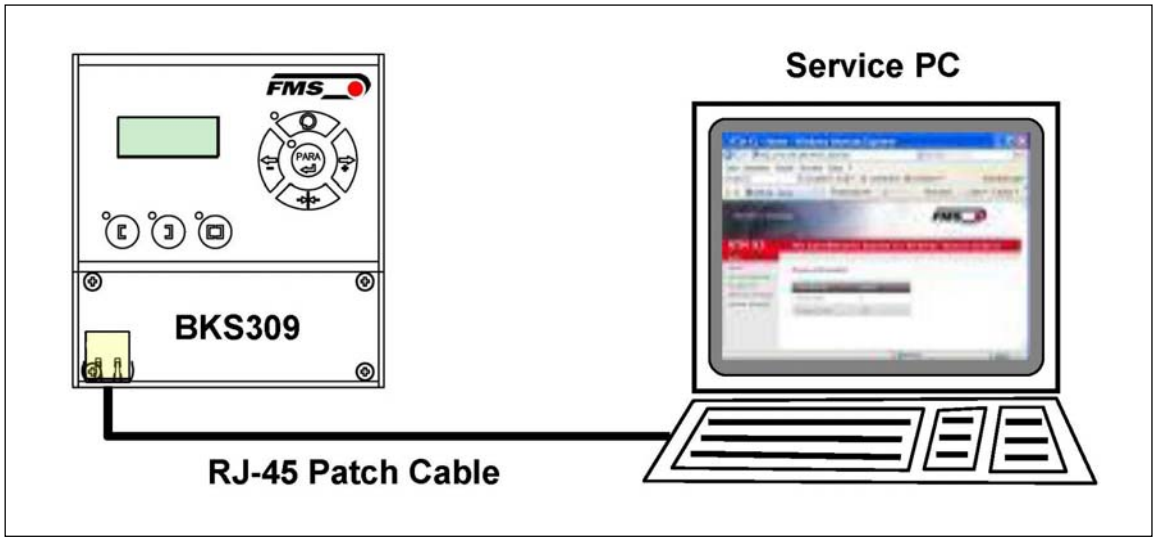



**Fig. 19:** Direct connection BKS309 – PC with a RJ-45 patch cable K309059e

## 9.1 Parameterization in a Network via Web Browser

Before the parameterization of the BKS309 it must be certain that the BKS309 uses an IP address in a static block. For the integration of a BKS309 web guide controller in your Ethernet network please contact your IT system administrator. Once the BKS309 was integrated in the network you can address the device e.g. with http://192.168.0.92. After establishing the link, the screen **Fig. 21** will open up.

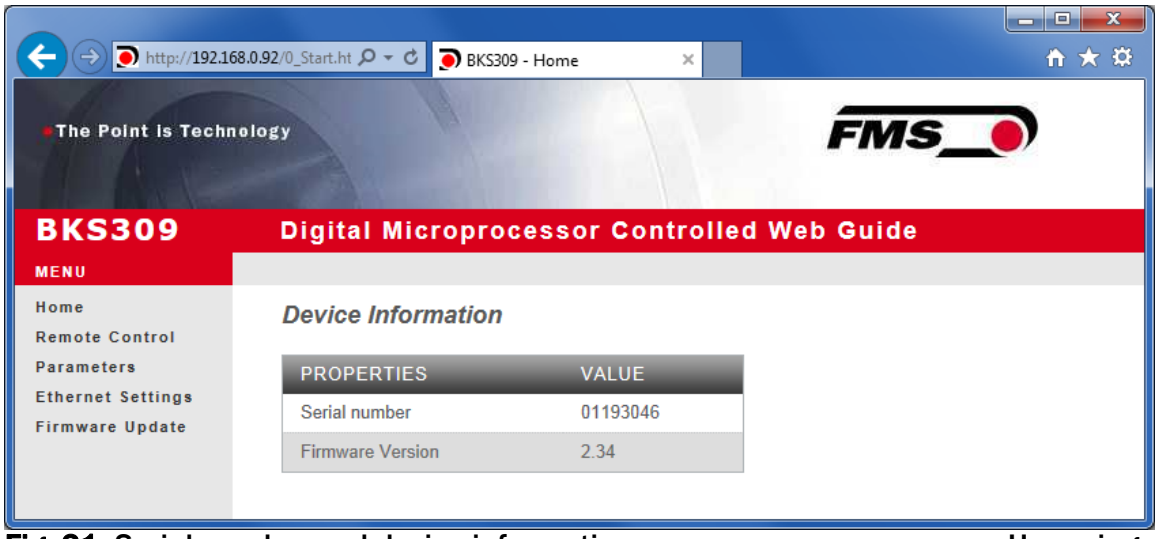



**Fig. 21:** Serial number and device information Home.jpg

With the menu on the left side of the screen you can navigate through the web page.

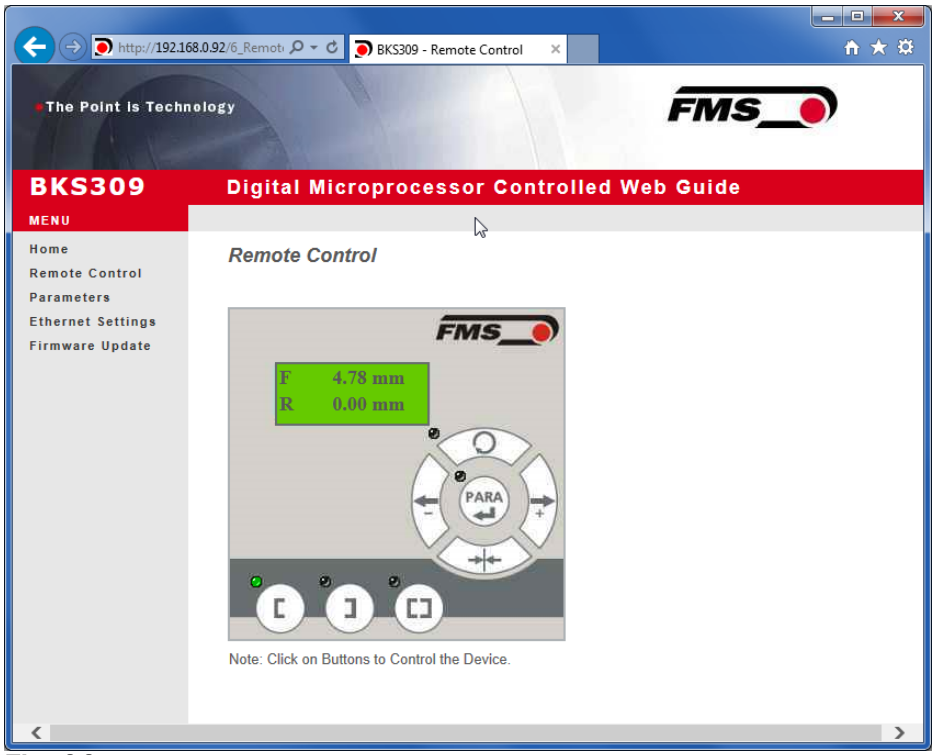



**Fig. 22:** Parameter setting and Remote Control Remote Control

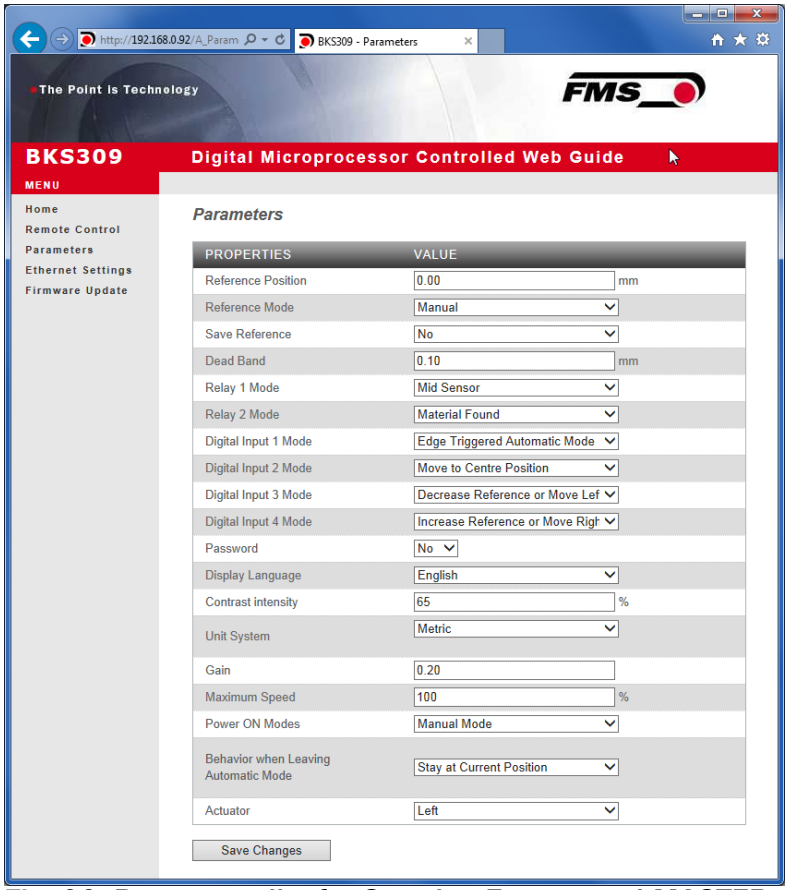



**Fig. 23:** Parameter list for Steering Frames webMASTER Parameters w/o winderGLIDE

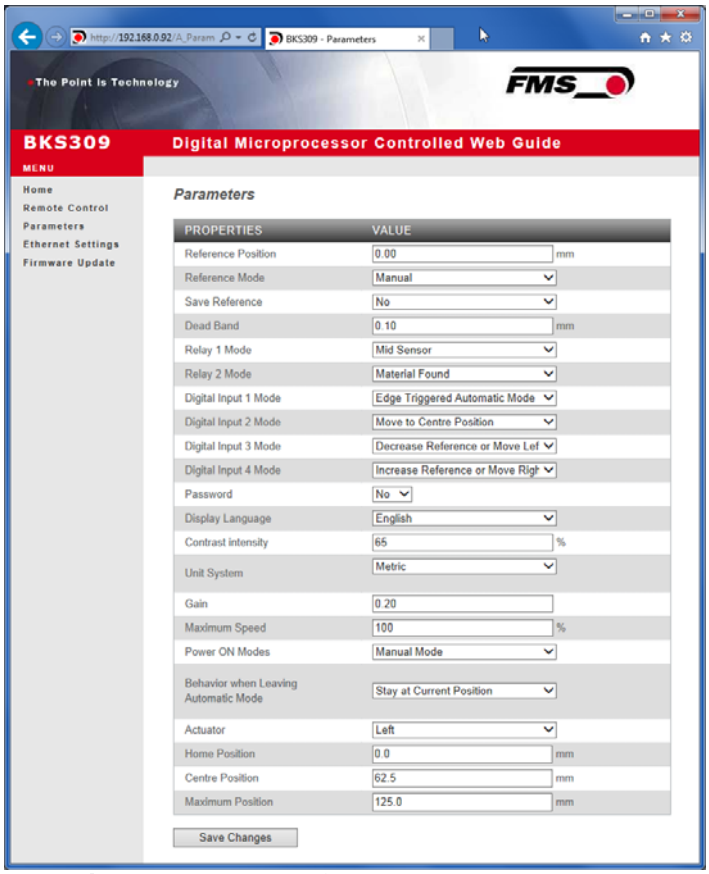



**Fig. 24:** Parameter list for Actuators winderGLIDE Parameters with winderGLIDE

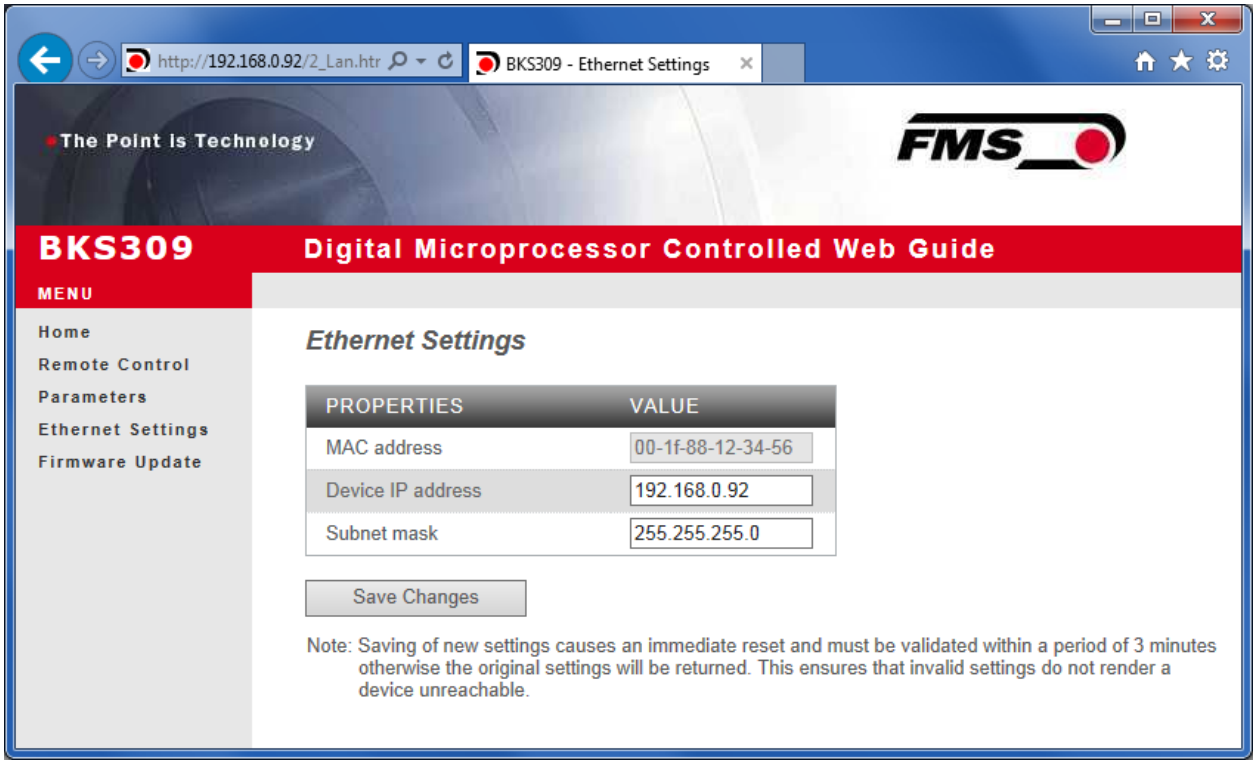



**Fig. 25** Ethernet settings and device addresses Ethernet Settings

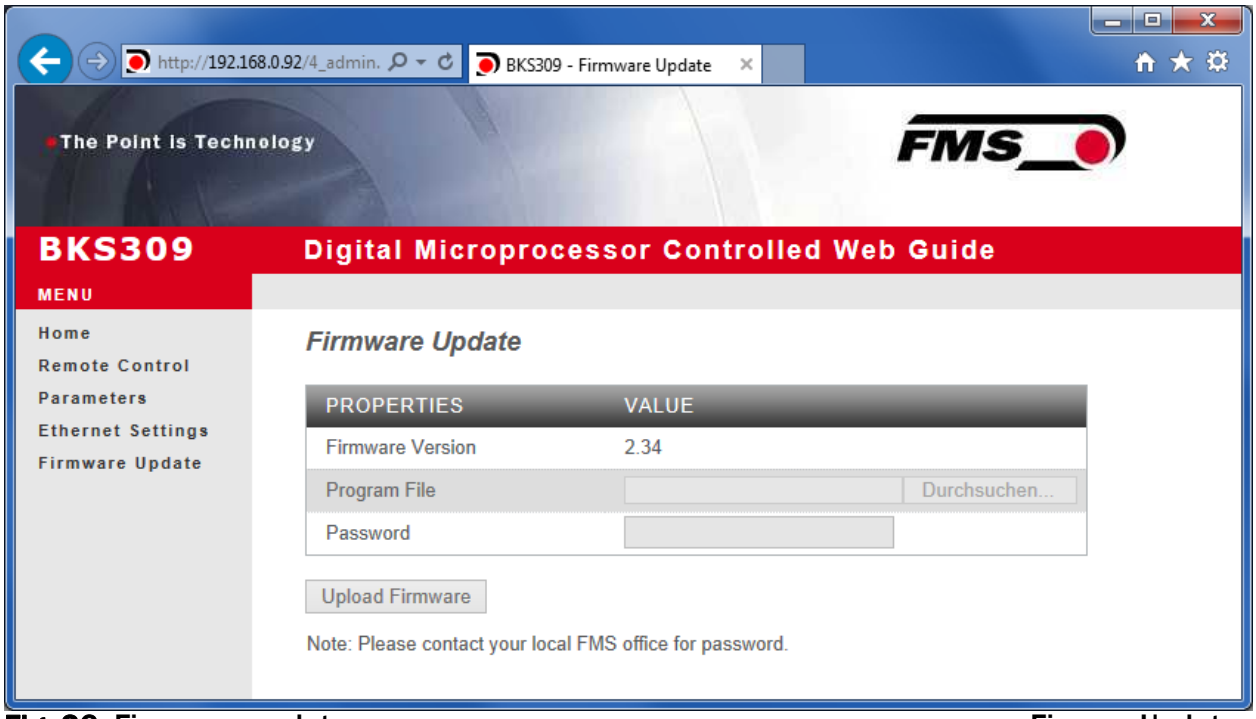


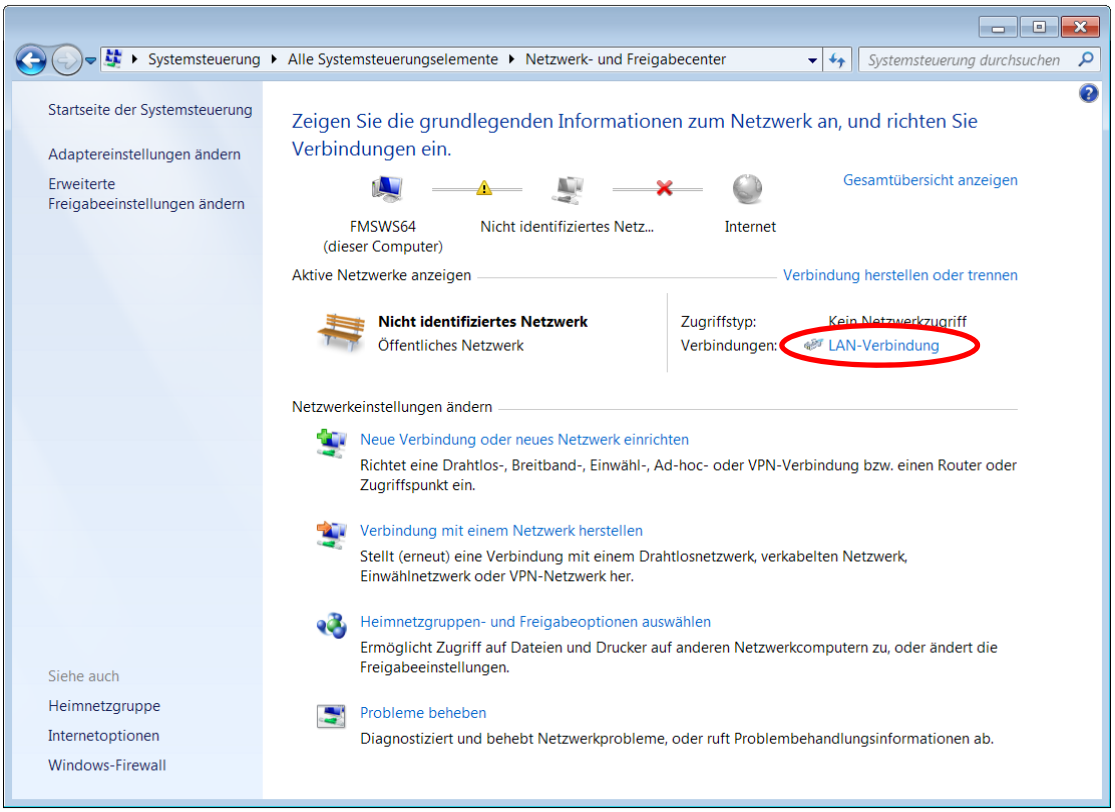

**Fig. 26:** Firmware update Firware Updates

## 9.2 Parameterization via a PC (peer-to-peer connection)

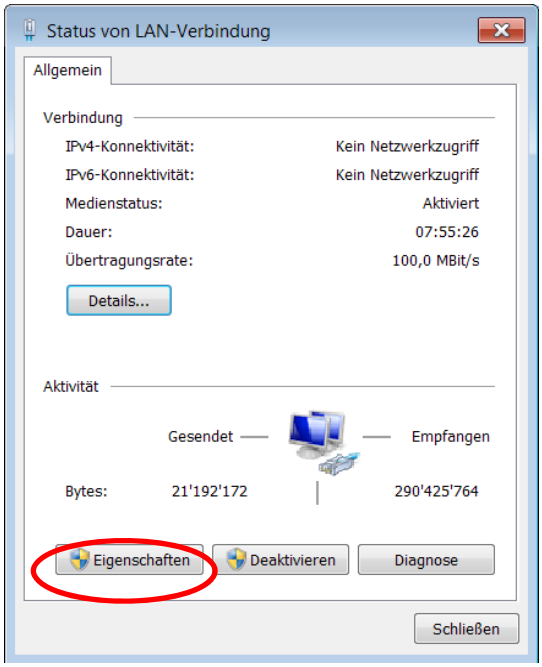
The parameter setting can also be carried out with a desktop or laptop computer directly connected to the FMS BKS309 web guide controller. This chapter describes the procedure for setting up a computer to communicate with the controller. Before connecting the FMS BKS309 controller with a batch cable directly to a PC, the computer must be configured with a “static” IP address. If the BKS309 controller is connected to a network by using e.g. a switch, the following procedure is not necessary. To establish the connection between your PC and the BKS309 follow the steps below.

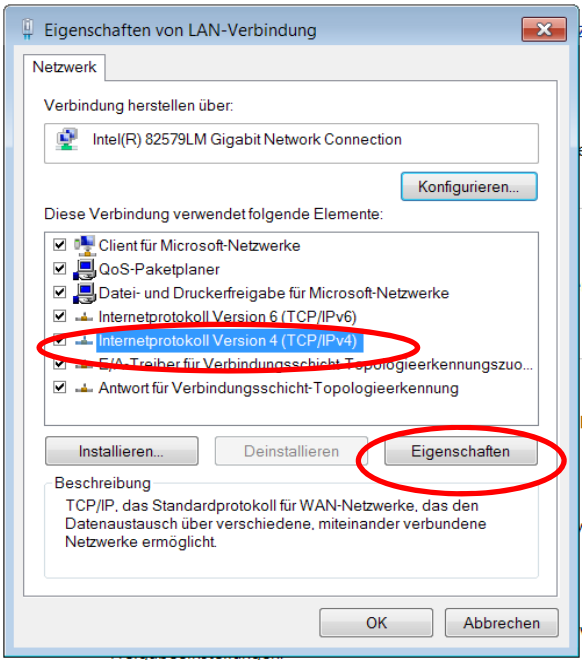
**Setup for OS Window 7:**

1. Connect PC and BKS309 Controller with a “RJ-45 patch cable”
2. Power-up PC and BKS309 Controller
3. In order to recognize the BKS309 System your PC must be configured with a “static” IP-address. Click on the Windows button (lower left-hand corner).
4. Click on Control Panel
5. Double click on Network ... Center.

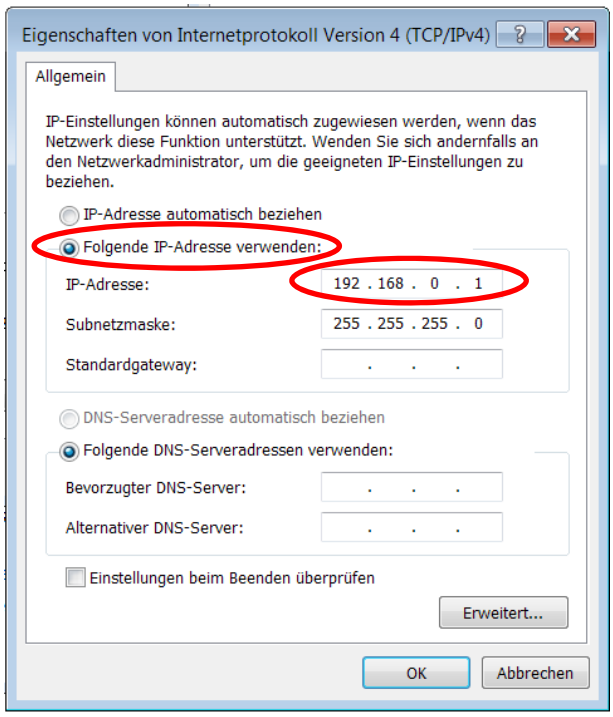



6. Double click on “Local Area Network”. The dialog box “Status of LAN connection” will open up.




7. Click on Properties
8. On the next dialog box select the network adapter that is used for the connection. In our case “Internet protocol version 4 (TCP/IP)”
9. Click on Properties. The following dialog box “Internet protocol Version 4 (TCP/IPv4) Properties” will appear.




10. Select the radio button “Use the following IP address:”
11. Enter the IP address for the computer that could be **192.168.0.1**
12. In the Subnet mask, enter **255 255 255 000**, as shown above.
13. Click the “OK” button.
14. Close all windows

The computer is now ready to communicate with the web guide controller:

1. Open Microsoft Internet Explorer or Mizilla Firefox.
2. The default IP address for the BKS309 is **192.168.000.090** as long as it was not changed over the operating penal. Enter the IP address e.g. with http://192.168.000.090 in the address bar and hit the Enter key.
3. If a different IP address and subnet mask is configured at the BKS309 make sure that the computer is setup appropriate.
4. The screen **Fig. 21** will open up. Continue then with the procedure described in **9.1** "Parametrization in a Network via a Web Browser"
5. Once you return to your office, don't forget to reconfigure your PC to "Automatic assignment of the IP-address" (see last dialog box).

# 10 Mechanical Dimensions

The BKS309 series is available in three different housing options. The mechanical dimensions can be seen in the following pages.

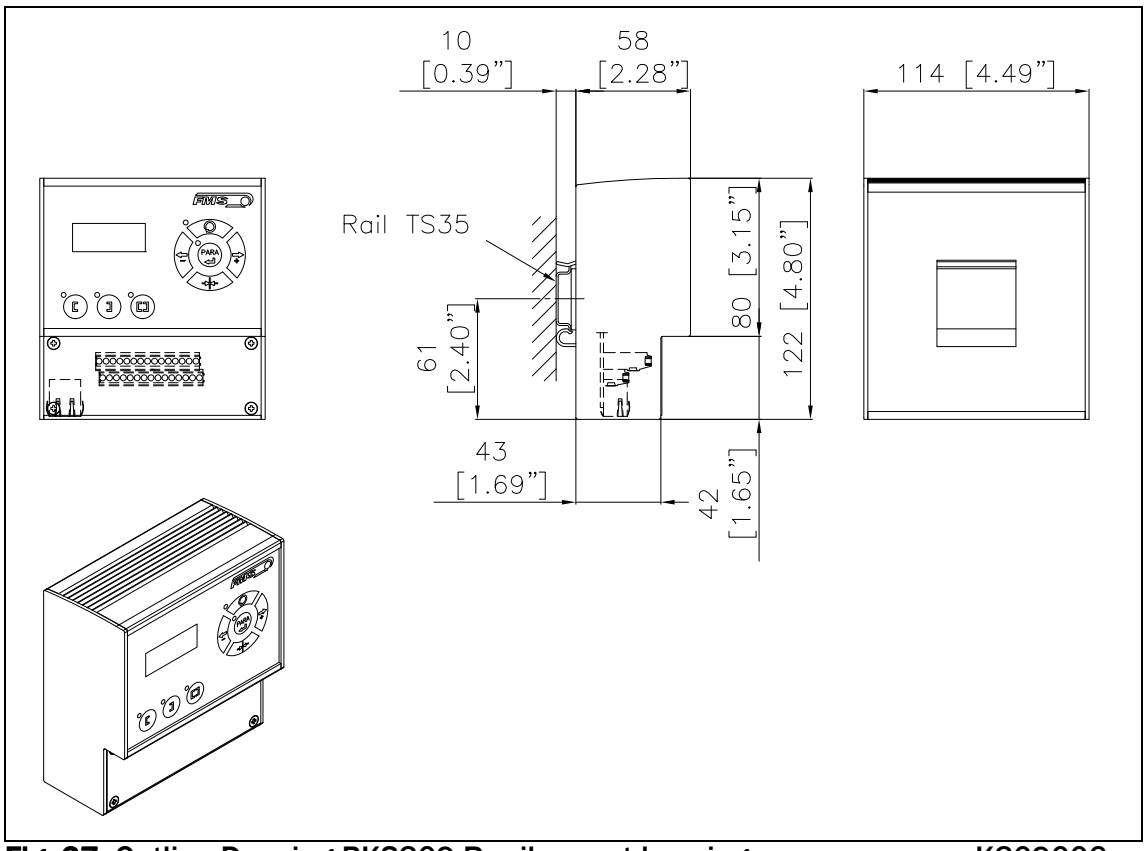



**Fig. 27:** Outline Drawing BKS309.R rail mount housing K309006us

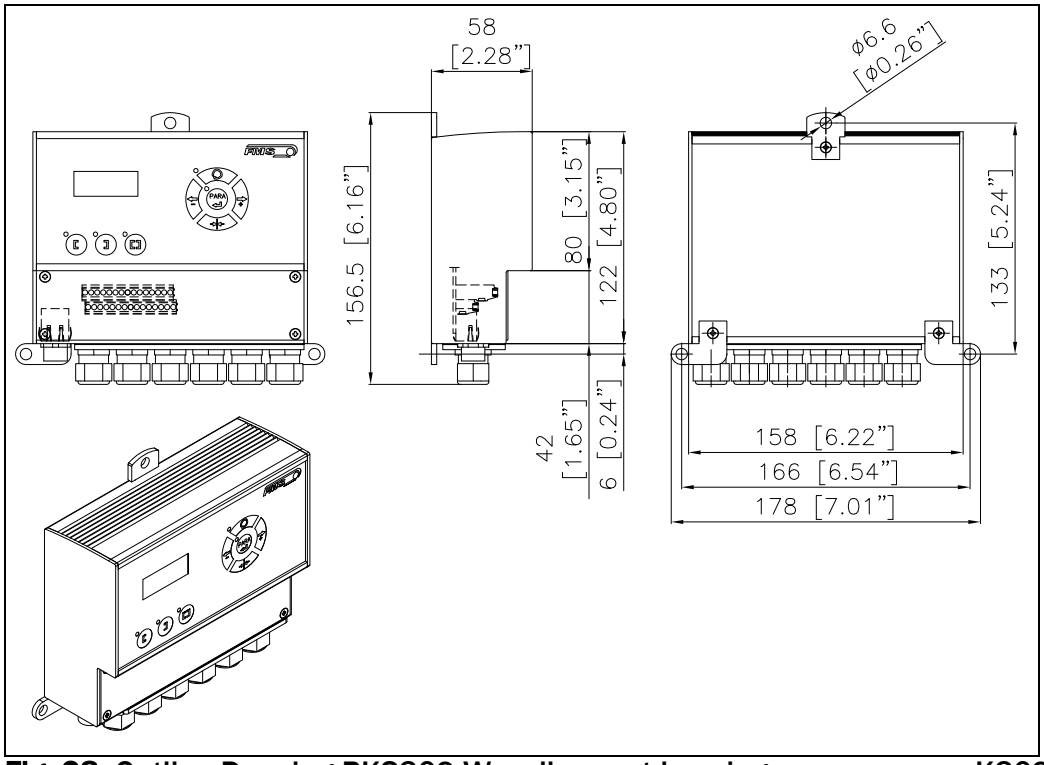



**Fig. 28:** Outline Drawing BKS309.W wall mount housing K309008us

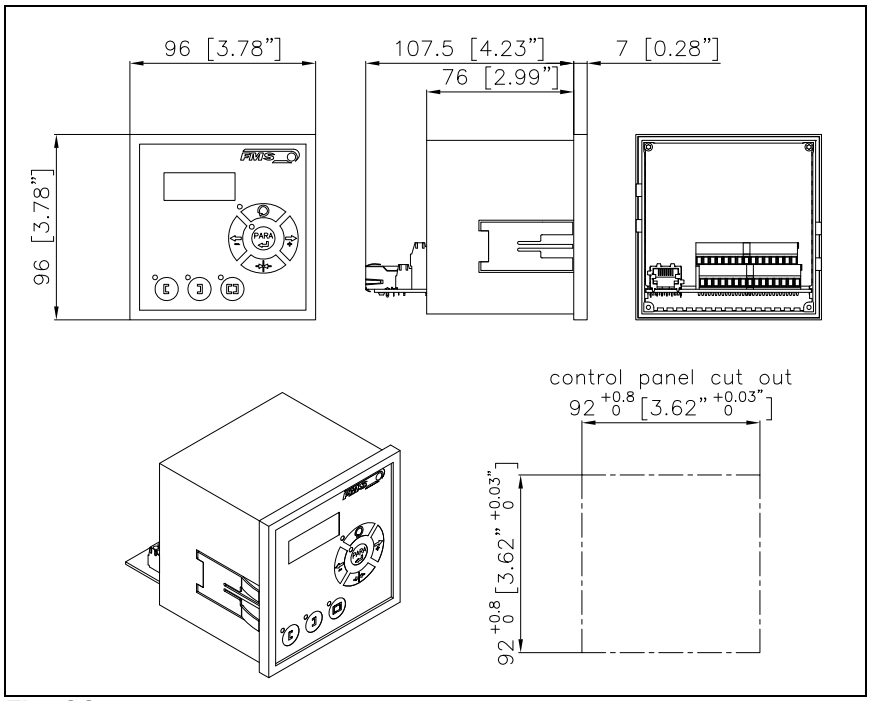



**Fig. 29:** Outline Drawing BKS309.S panel mount housing K309007us

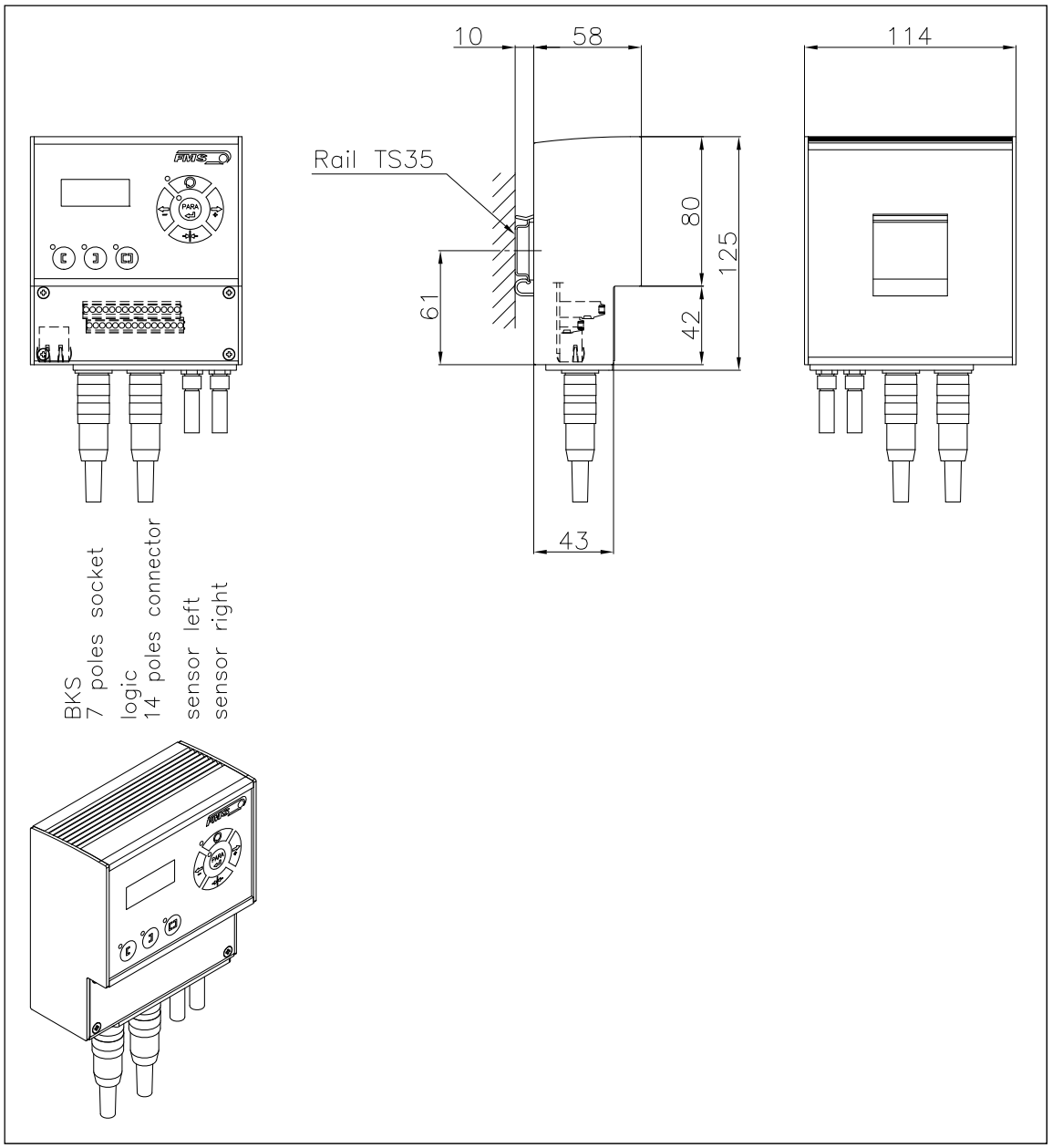



**Fig. 30: Outline Drawing BKS309.R.C for DIN real mounting with connectors**

**K309016e**

# 11 Trouble Shooting

| Error | Cause | Corrective action |
|---|---|---|
| **Edge outside detection band** | Edge has moved outside the sensor detection band | Adjust sensor more accurately to the web edge;<br>Adjust reference position less during automatic operation |
| **BKS guides web edge immediately out of the sensor** | Sensor is mounted on the wrong side | Mount sensor to the correct side (right sensor for „Edge right“, etc.) |
| | Sensor is connected to the wrong socket | Connect sensor plug to the correct socket (left plug to left socket, etc.) |
| **Steering frame does not move** | No signal; sensor not correctly connected | Connect sensor correctly according to screw terminal arrangement and installation guide |
| | No signal; cable interruption | Replace cable or send sensor to FMS |
| | No signal; sensor defect | Send sensor to FMS; use other sensor |
| **No response of the interface** | Wiring not correct | Check wiring |
| **Display shows nothing, frame doesn’t react** | Fuse blown | Replace Fuse on power supply board |
| | Power supply defect | Check or correct power supply installation |
| | Electronic control unit defect | Contact FMS customer service |
| **Frame moves abrupt to one of the end positions** | Stepper motor driver defective | Exchange actuator of the frame.<br>Contact FMS service department for spare parts and installation guide. |

# 12 Technical Specification

| | |
|---|---|
| Cycle time processor | 1ms |
| Drive of steering frame | Stepper motor. Power amplifier 24V integrated in housing |
| Dead band | 0...2mm, adjustable in 0.1mm steps |
| Position reference | ±5mm, adjustable in 0.1mm steps |
| Control modes | edge left / edge right / center guiding / line guiding |
| Interface | Web browser Ethernet Explorer 7 or higher |
| Operation | 3 keys and 5–key wind rose pad |
| Analogue inputs | 2 inputs 0...10V (for sensors) |
| Digital inputs | 4 dig. inputs 24VDC galvanic insulated |
| Relay outputs | 2 relay outputs. DC: 220V/2A/60W; AC:250V/2/62.3VA |
| Supply voltage | 18...30 VDC (Vnom.= 24 VDC), version .ACV 85...264 VACV / 80W |
| Temperature range | -10 ... 60°C (14...140°F) |
| Protection class | IP 30 (Standard) / IP65 (.W), IP00 (.S) |

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