BKS601C/ BKS601C.P

Digital, Microprocessor Controlled Web Guide

Version 1.1 06/2009 ff

Firmware Version: from 3.0 onwards

Hardware Rev. D

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

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.
Bitte kontaktieren Sie die Vertretung im zuständigen Land.

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1 Safety Instructions

1.1 Description Conditions

High 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.

Risk of damage to machines

Caution

This symbol refers to risk of heavy mechanical damage. This warning has to be followed absolutely.

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

Proper function of the electronic unit is only guaranteed with the recommended application of the components. In case of an other arrangement, heavy malfunction can be the result. Therefore, the installation instructions on the following pages must be followed strictly.

Local installation regulations are to preserve safety of electrical equipment. They are not taken into consideration in this operation manual. However, they have to be followed strictly.

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

The processor board is mounted to the housing cover. Improper handling may damage the fragile electronic equipment! Don’t use rough tools such as screwdrivers or pliers! Operators handling the processor board must wear a well earthed bracelet in order to discharge static electricity.

If external parts are within the travel range of the linear units, the sensors can be damaged while moving. Make sure that there is enough space between the linear units and the external objects.

Wrong setting of the DIP-switches may cause malfunction of the electronic unit or the total system. The DIP-switches are factory set and need no adjustment by the customer.

2 Definitions

Left and Right: Left and right are always seen in direction of the running web.

Linear unit: Motorized Sensor adjustment (optional variant). The sensor is automatically adjusted by a linear guide to the edge or line that has to be detected.

Steering device: Steering frame, hydraulic cylinder with analog output or similar actuator.

Dead band: Programmable tolerance band in which the web is allowed to move freely without the control unit intervening. The web position is adjusted only when the difference between reference and feedback position is greater than the dead band value

Sub-Board: Electronic module usually plugged to the main board of the electronic unit. This modular approach allows to extended or change easily the features of the electronic.

3 System Components

The BKS601C web guiding system consists of the following components (see also **Fig. 1**):

Steering device
- Steering frame electrically driven with Plug & Drive stepper motor

Electronic unit BKS601C
- For all control functions
- With operation panel for menu controlled parametrisation
- Power amplifiers for the stepper motor drive and linear units
- *RS232, PROFIBUS-interface, CAN-bus or DeviceNet*
- Digital inputs and outputs
- *Remote control box*
- Robust aluminum housing

Sensors
- For detection of web edge or line
- 1 or 2 analog sensors (also line sensor)

Linear units
- *Linear units with Plug & Drive stepper motor and limit switch for reference*

(Variants or options are indicated in italic text)

4 System Description

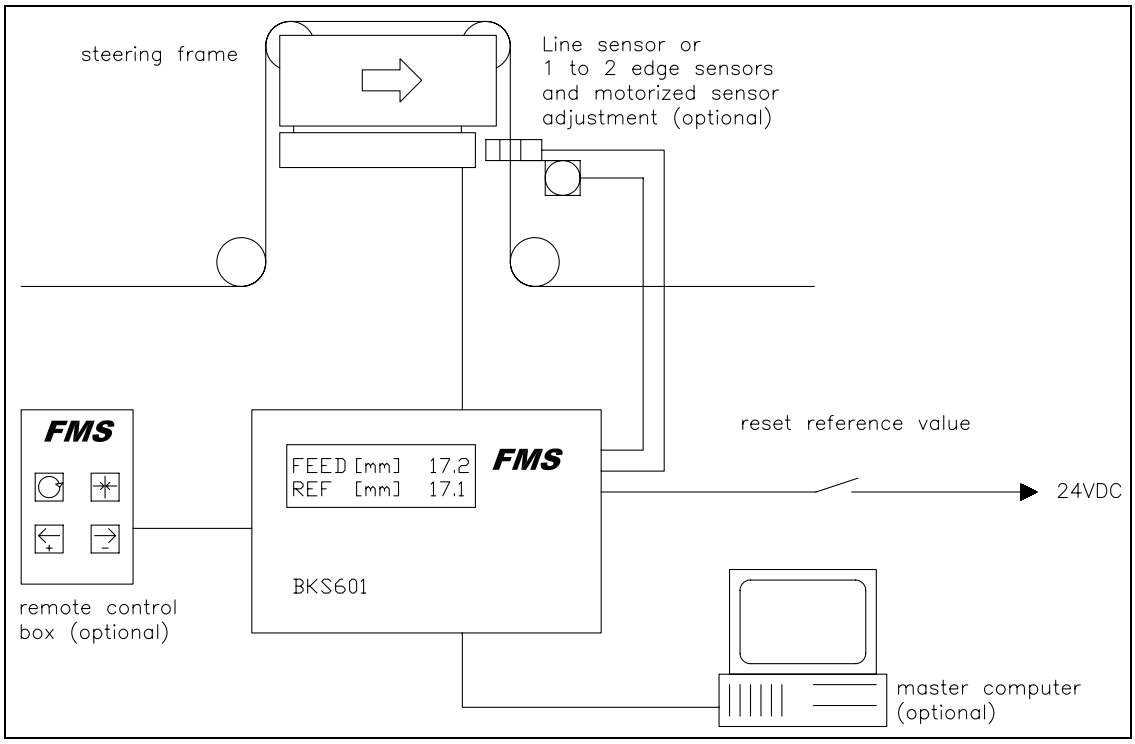


Fig. 1: Basic structure of the BKS601C web guide K610034e

4.1 Functional Description

The sensors measure the position of the web and send this feedback signal as an analog value to the electronic control unit. The control unit compares the position feedback signal with the reference. If the difference is higher than a parametrized value (dead band), the steering device is adjusted to bring the web into the right position.

If the sensors are equipped with linear units, the controller automatically let them follow the feedback position. The actual position of the sensors is taken into account for the calculation of the web position.

4.2 Steering Device

The steering device adjusts the web position laterally. The correction is depending from the web width.

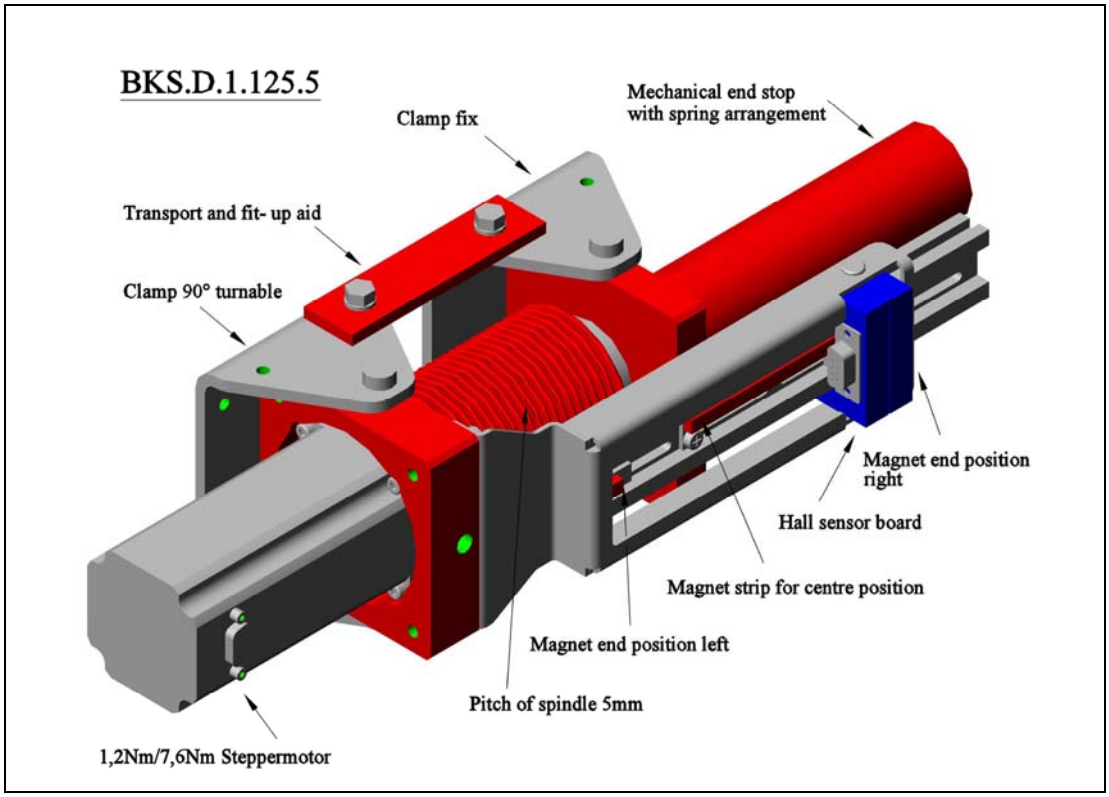


Fig. 1a: FMS winderGLIDE BKS.D.1.125.5 K0411041e

As controlling and steering unit both FMS products webMASTER and winderGLIDE can be used. The winderGLIDE BKS.D.1 is a dedicated devic for unwind- or rewind stands.

4.3 Electronic Control Unit

General Remarks

The electronic unit is delivered in a robust aluminum housing. It contains the power amplifiers for the actuator and the linear unit(s). The electronic unit goes with a minimum of control elements. No trimming is necessary to guarantee its exceptional long-time temperature stability and accuracy.

Operation

The large LCD display with 2x16 characters as well as the 4 LED’s and large keys make its operation simple and efficient. All information is in plain text. Several languages e.g. English, German, French and Italian are selectable. The most important functions are programmable. Their parametrisation is done at the push of a few buttons . All inputs are stored in none-volatile EEPROM memory. Additional settings can be made with jumpers or solder bridges.

Interface
The user can optionally choose among several available interfaces (RS232, PROFIBUS, CAN-Bus or DeviceNet). With the PROFIBUS interface, operation parameters and status values can be read.

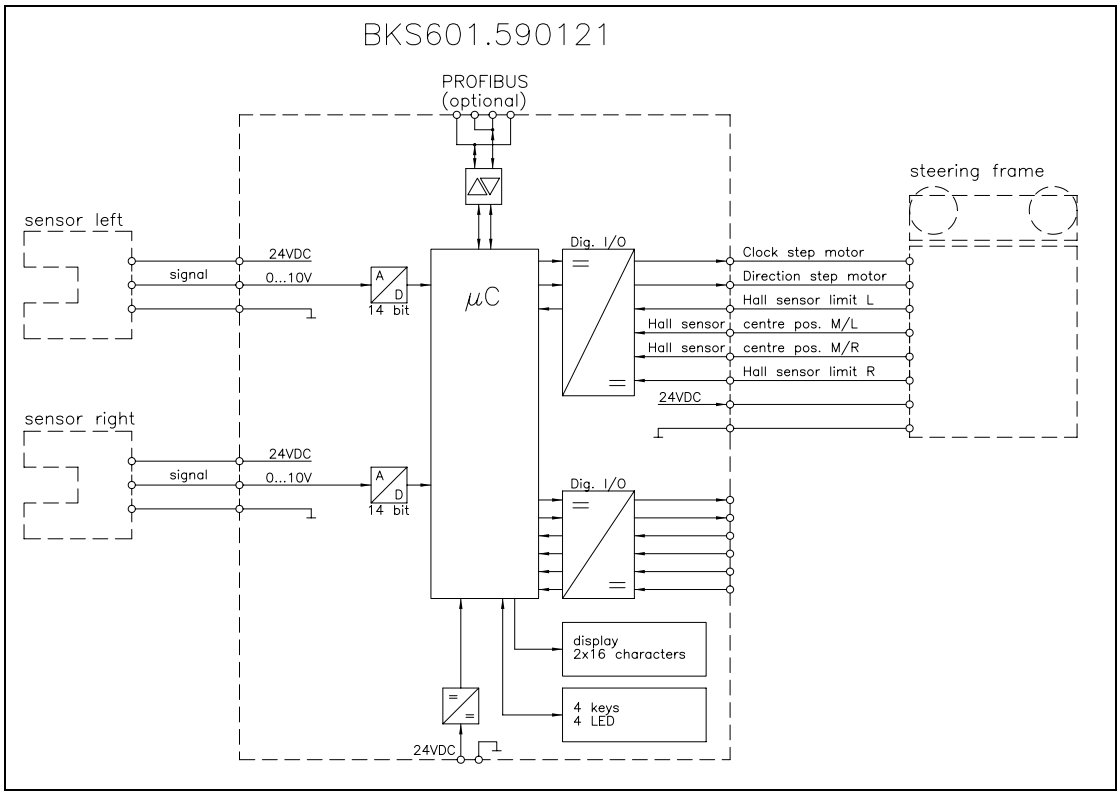


Fig. 2: Block diagram BKS601C K610035e

4.4 Sensors

Optical sensors (AZS01, AZS04A), ultrasonic sensors (US01B, US04B) and a digital line sensor (DLS) are offered by FMS to work in conjunction with the BKS601C. No special measures are required to operate these sensors with the electronic unit. The alignment is done automatically.

4.5 Manual Sensor Adjustment

Manual sensor adjustment allows an easy positioning of the sensor across the whole material width. Correct and stable focusing of the sensor is guarantied across operation life.

4.6 Linear Units

Linear units (also called motorized traverses) allow a comfortable and precise positioning of sensors. Control unit and sensors automatically scan the web for a material edge or guiding line.
The kit can accept 1 or 2 linear units. The number of liner units, their travel range and the assembly condition are specified by the customer. If required a fixed reference point (e.g. edge of machine frame) can be defined where all position values will be referred to.

4.7 Remote Control Box

The remote control box simplifies re-configuration the machine for a new job. Specially in cases where the machine is difficult to access. Explanation of the keys:

Key 

Use: Automatic On / Off. The automatic operation can be switched on or off. The LED shines during automatic operation.

Key 

Use: Center drive. The frame drives to the center position. (Not possible during automatic operation).

Key 

Use: During automatic operation, the reference value will be incremented by steps of 0.1mm, if the key is pushed. If the key is kept pressed for longer then 1 sec., the reference value will be increased continuously.

Key 

Use: During automatic operation, the reference value will be reduced by steps of 0.1mm, if the key is pushed. If the key is kept pressed for longer then 1 sec., the reference value will be decreased continuously.

5 Quick Installation Guide

- Check all your requirements such as:
  – Control mode (edge left, edge right, center guiding, line).
  – Number and position of the sensors?
  – Steering device type (FMS steering frame or external actuator)?
  – Configuration of digital inputs and outputs?

- Install and wire all your components (refer to „7. Installation and Wiring“)

- Turn power on and run the setup procedure according to „8. Operation“

- Proceed with a test run with low speed

6 Dimensions

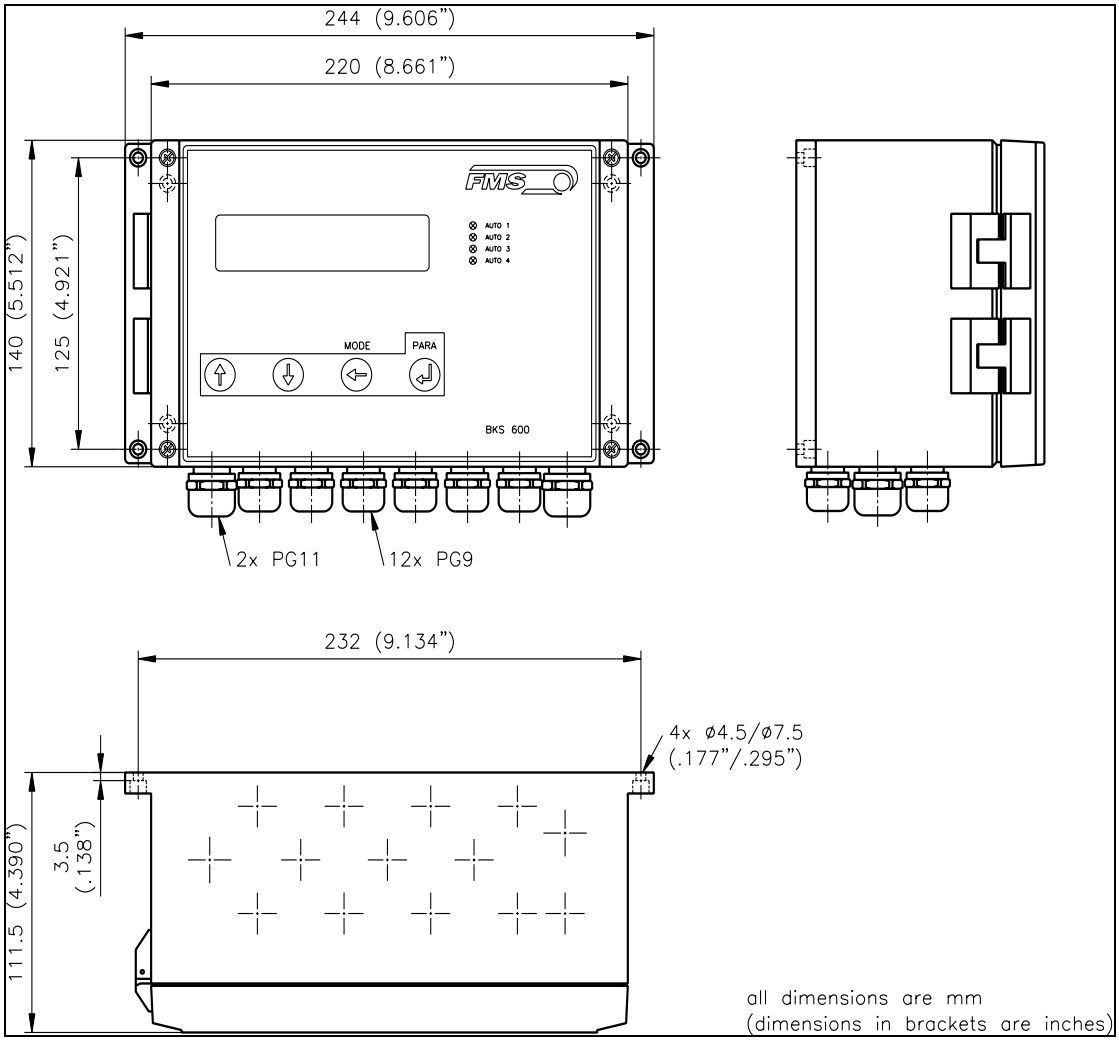


Fig. 3a: Dimensions of Electronic Unit for wall mounting BKS601C K600019e

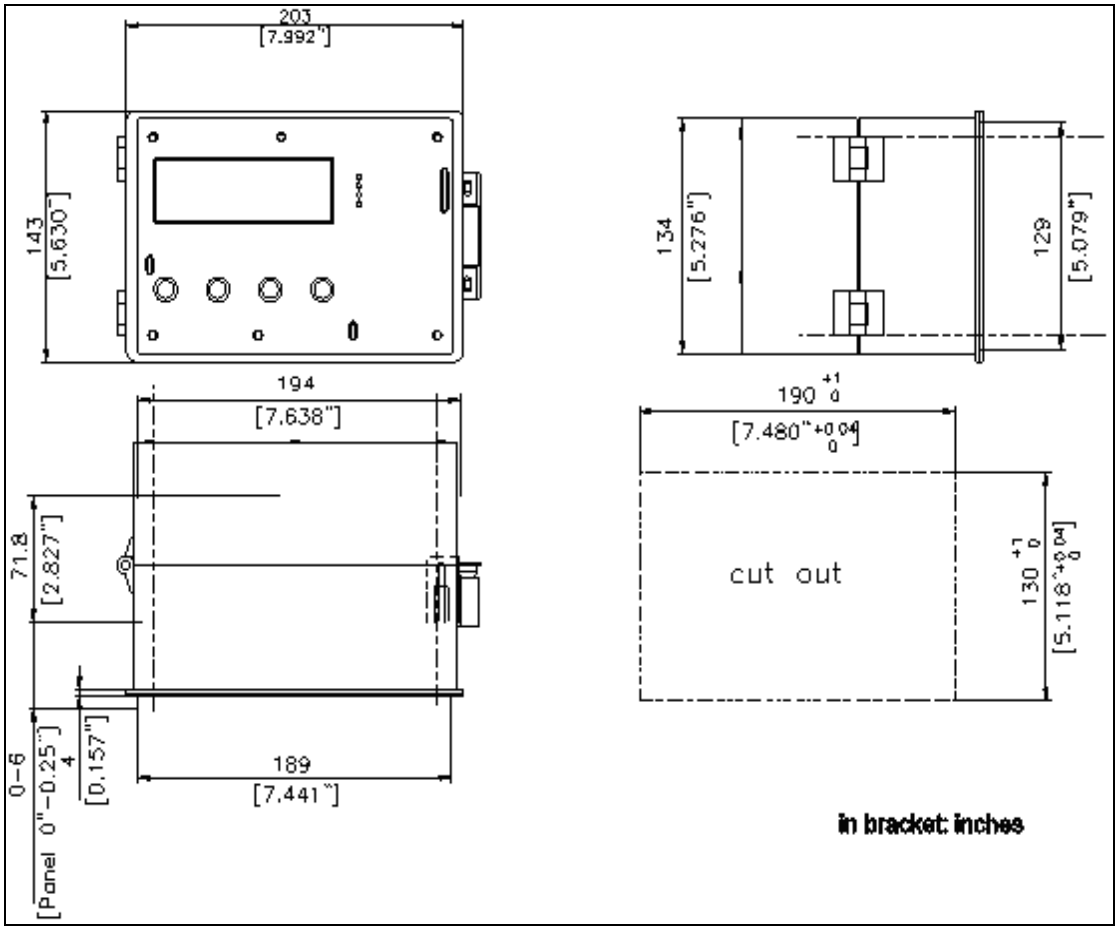


Fig. 3b: Housing for panel mounting BKS601B.S.590121 K601021e

Housing variant	**Description**
BKS601C	standard housing for wall mounting (fig. 3a)
BKS601B.S.590121	housing for panel mounting (fig. 3b)

7 Installation and Wiring

Caution

Proper function of the electronic unit is only guaranteed with the recommended application of the components. In case of an other arrangement, heavy malfunction can be the result. Therefore, the installation instructions on the following pages must be followed strictly.

Caution

Local installation regulations are to preserve safety of electrical equipment. They are not taken into consideration in this operation manual. However, they have to be followed strictly.

Caution

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

7.1 Mounting the Electronic Unit

The housing can be mounted in a control cabinet or directly beside the machine. All connections are led into the housing through glands and are connected to the plug-in screw terminals according to the wiring diagrams (**Fig. 7...12**).

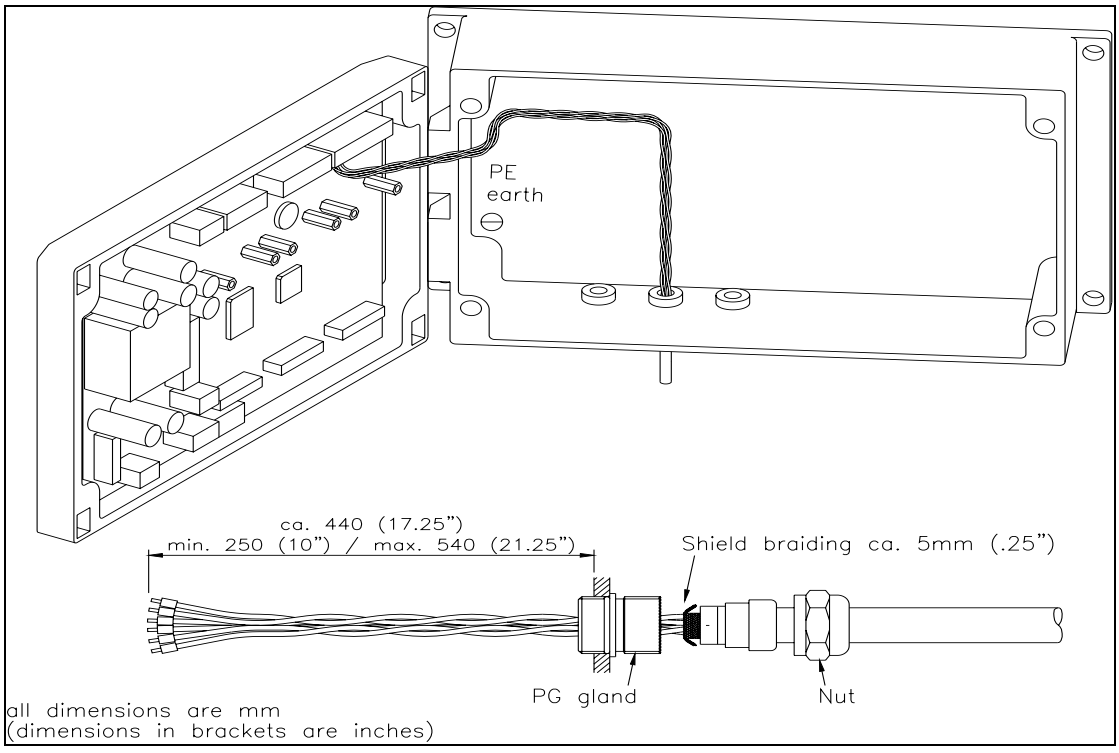


Fig. 4: Wiring inside the housing E600011e

Caution

The processor board is mounted to the housing cover. Improper handling may damage the fragile electronic equipment! Don't use rough tools such as screwdrivers or pliers! Operators handling the processor board must wear a well earthed bracelet in order to discharge static electricity.

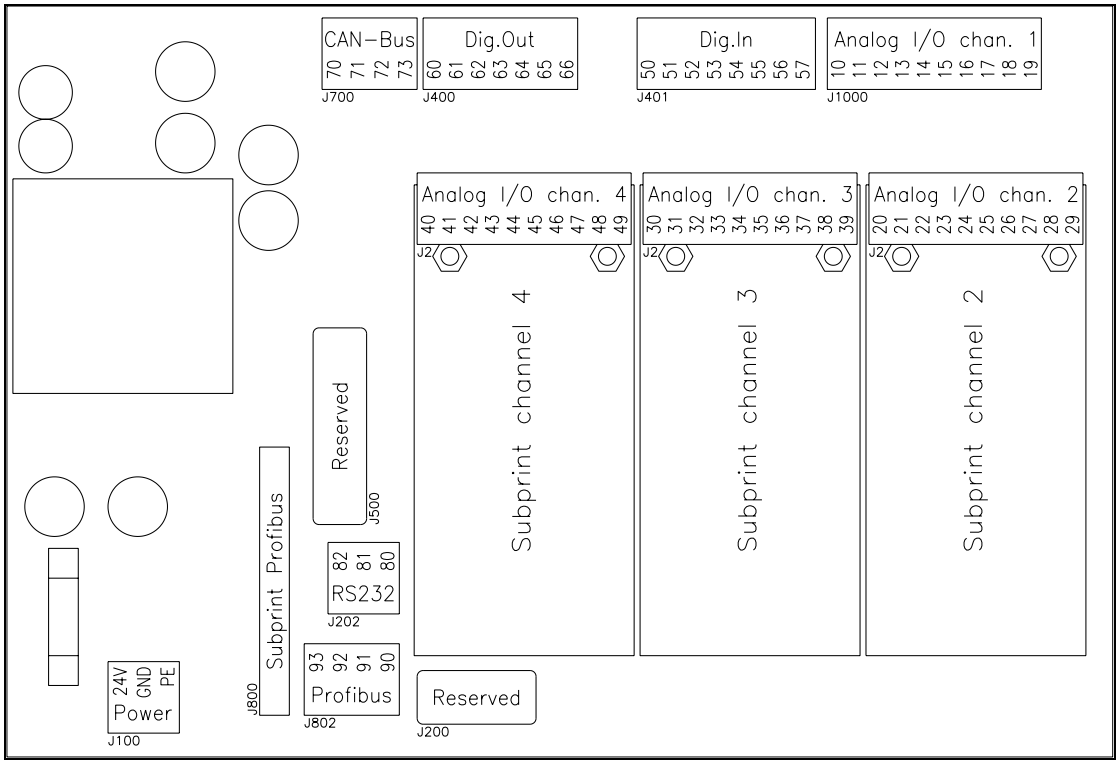


Fig. 5: Screw terminal arrangement on the processor board E600003e

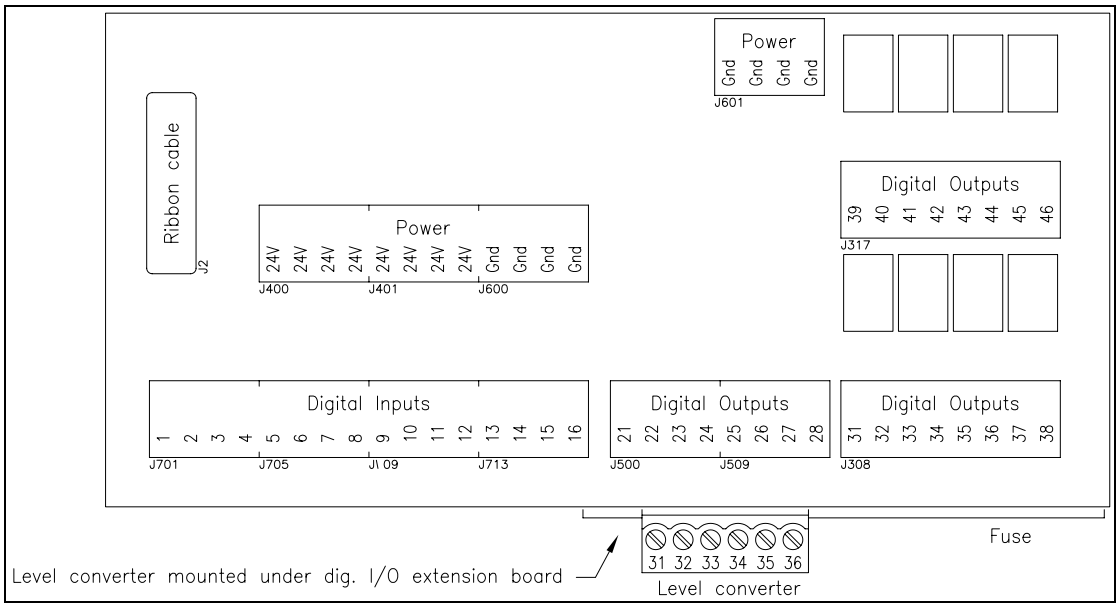


Fig. 6: Screw terminal arrangement on the extension board K610026e

7.2 Mounting BKS601C Wall Mounting Configuration

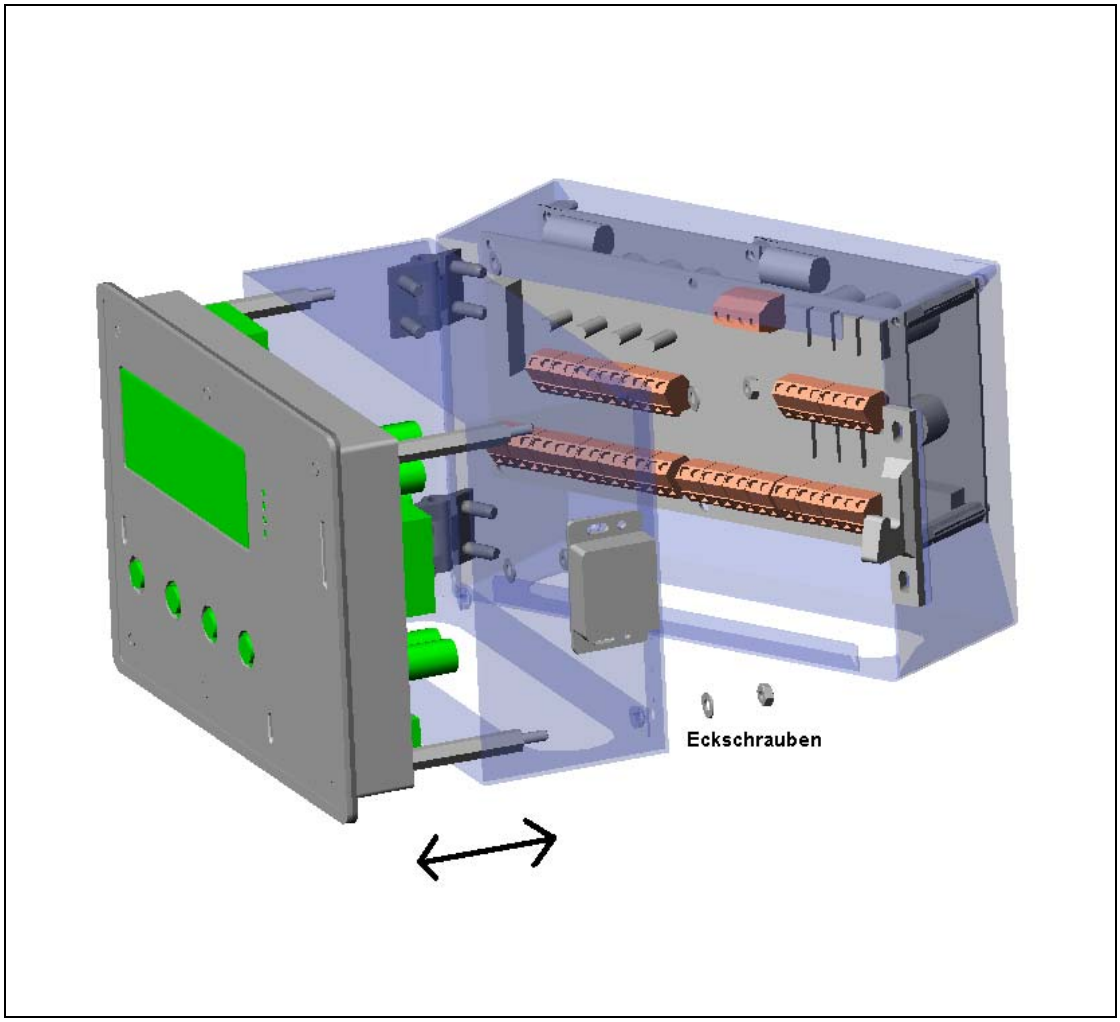


Fig. 6b: mounting BKS601C B600029d

Step by step assembly of the panel mounts housing:

1. Unscrew all 4 side screws (“Eckschrauben” see **Fig. 6b**)
2. Remove all cables connections of the electronic board on the front panel.
3. Detach the earth ground cable of the electronic board.
4. Remove the front panel from the box.
5. Now, the front panel can be mounted in the opening of the cabinet from the front side.
6. In the back side of the cabinet bring together the front and back side of the box.
7. Put in place and screw the 4 fixation screws.
8. Re-establish the original cable connections. Don’t forget to connect the earth ground cable.

7.3 Wiring Diagrams

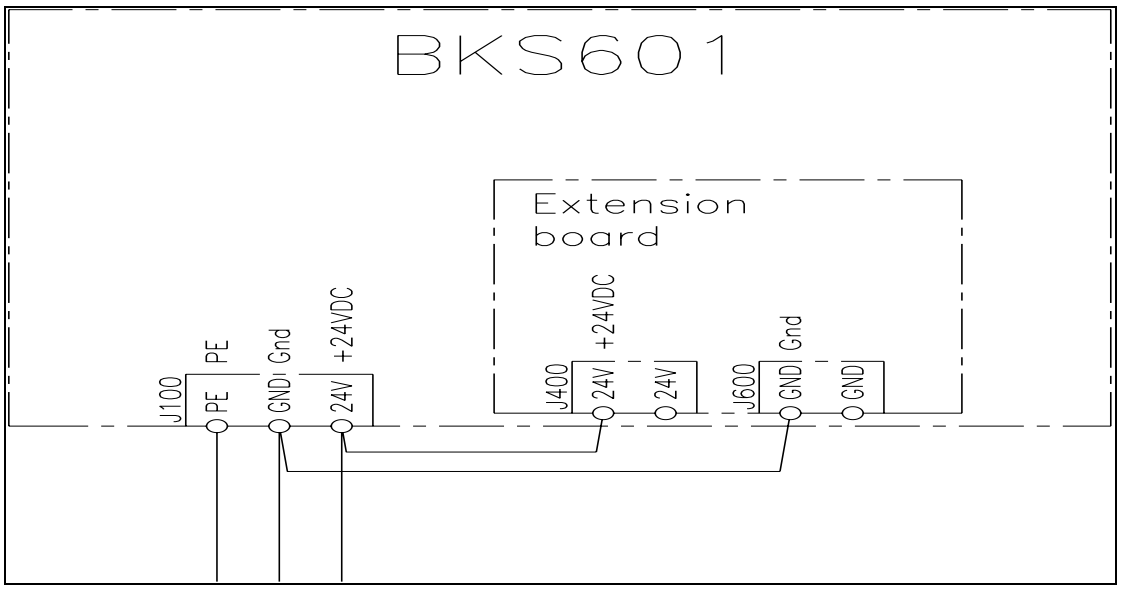


Fig. 7: Wiring of the power supply and electronic unit K601012e

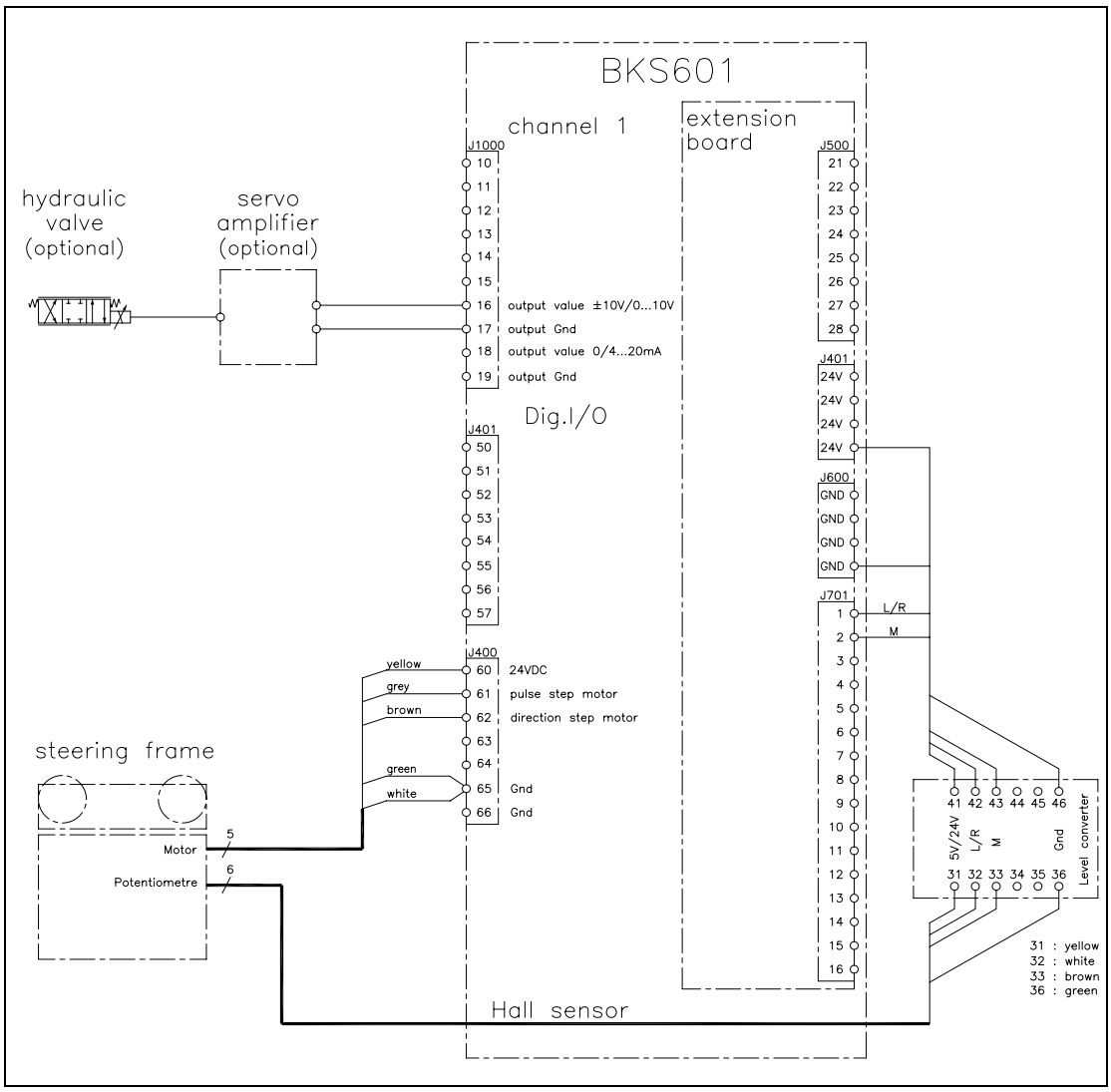


Fig. 8: Wiring of steering frame or other steering device K610029e

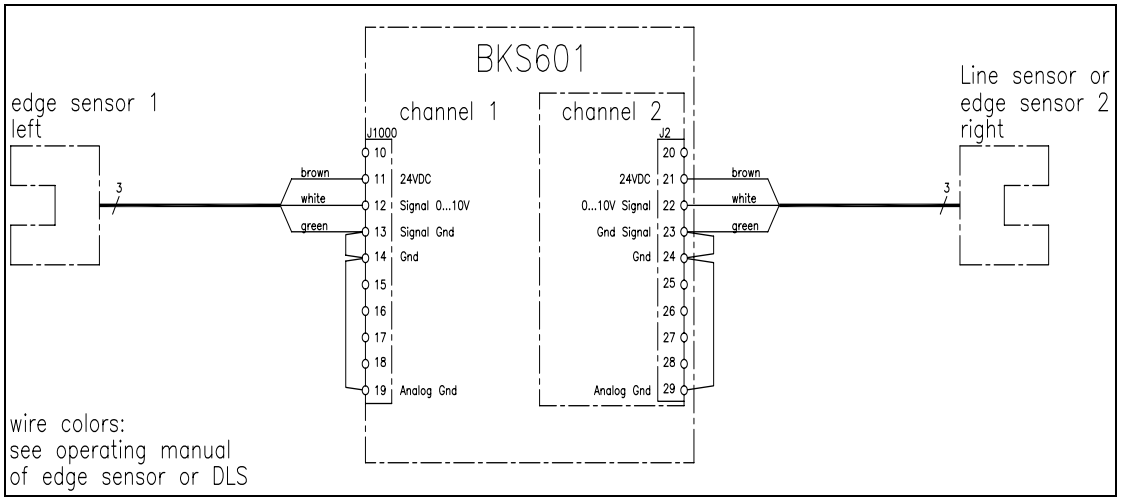


Fig. 9: Wiring of the edge sensors K610017e

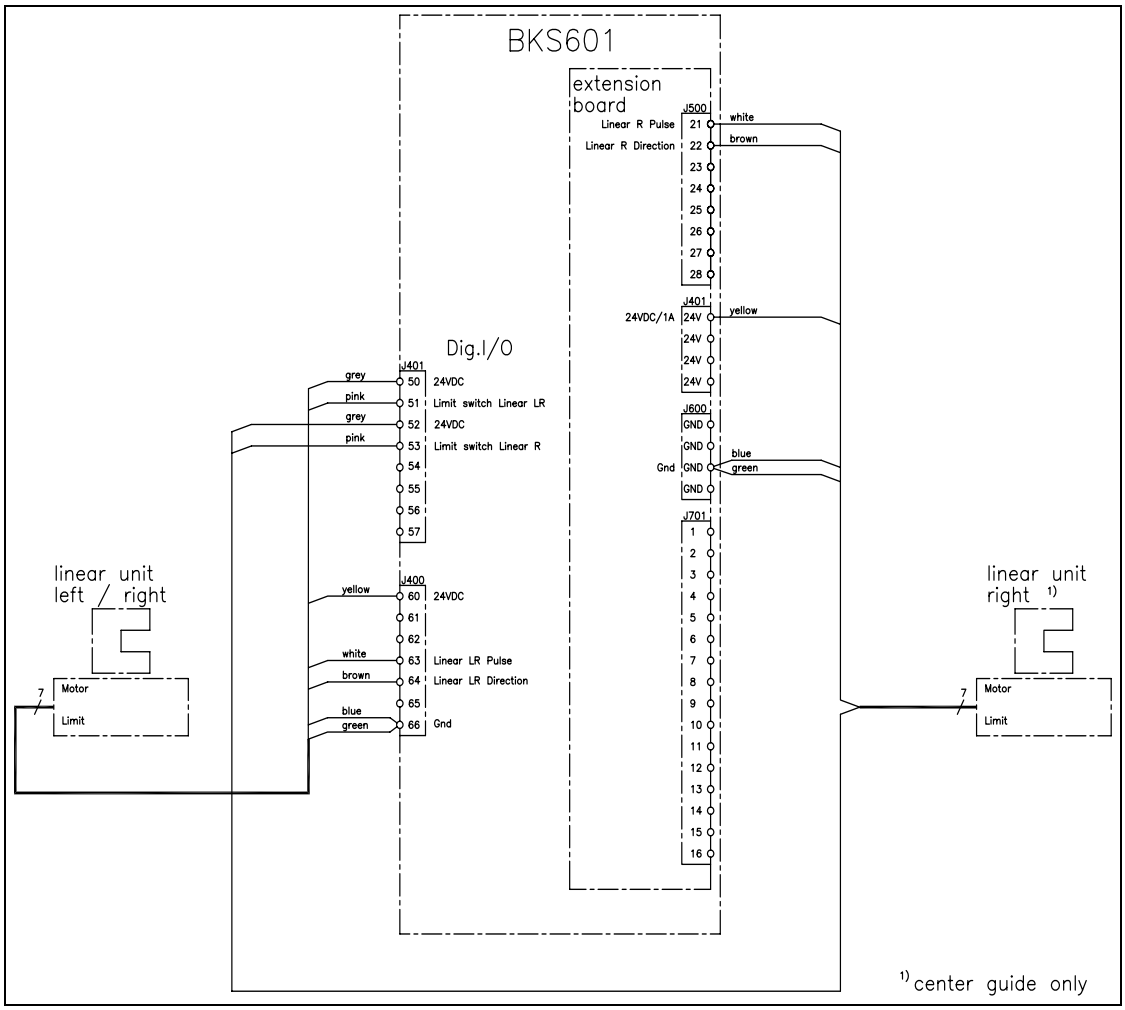


Fig. 10: Wiring of the linear units K610018e

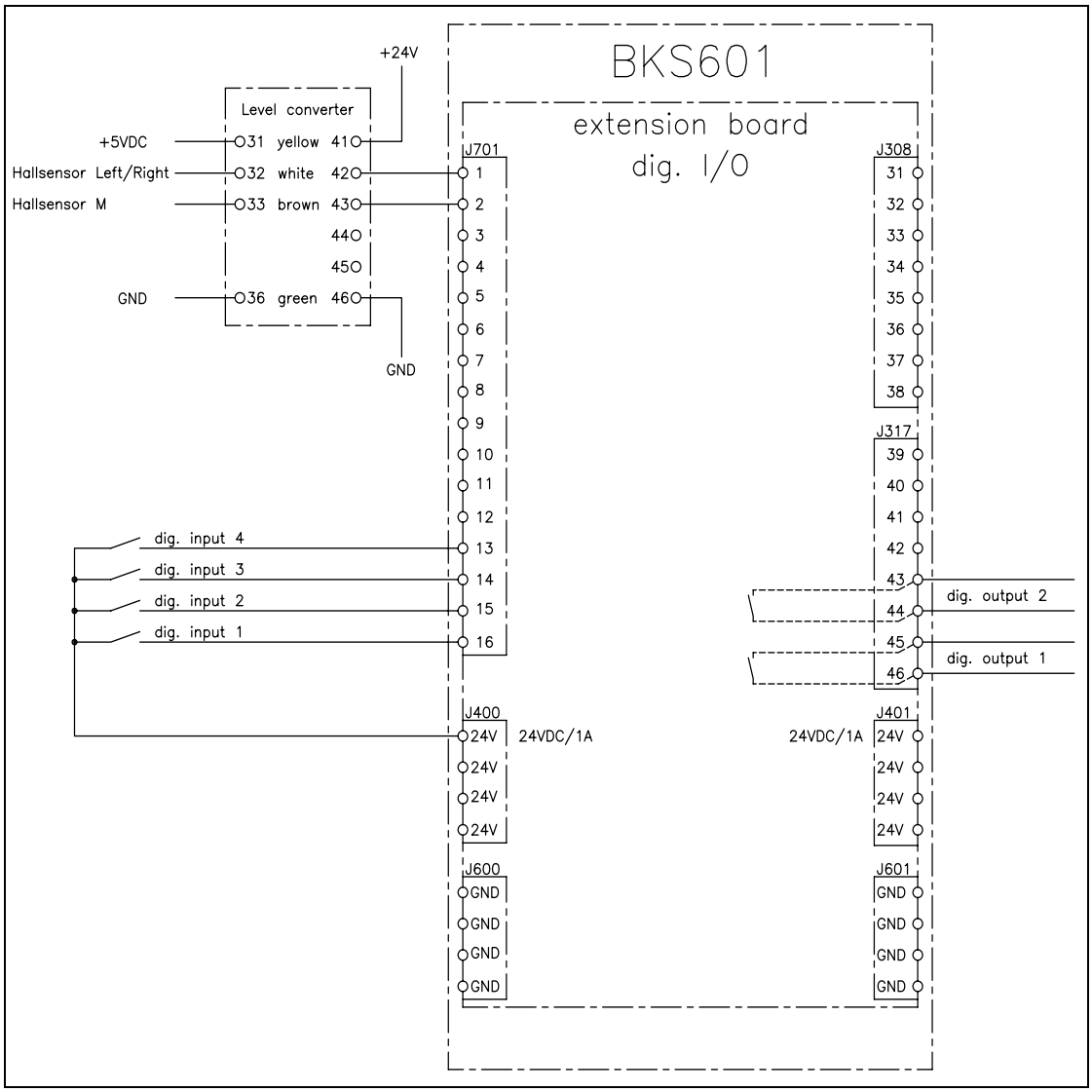


Fig. 11: Wiring of the digital inputs and outputs K610030e

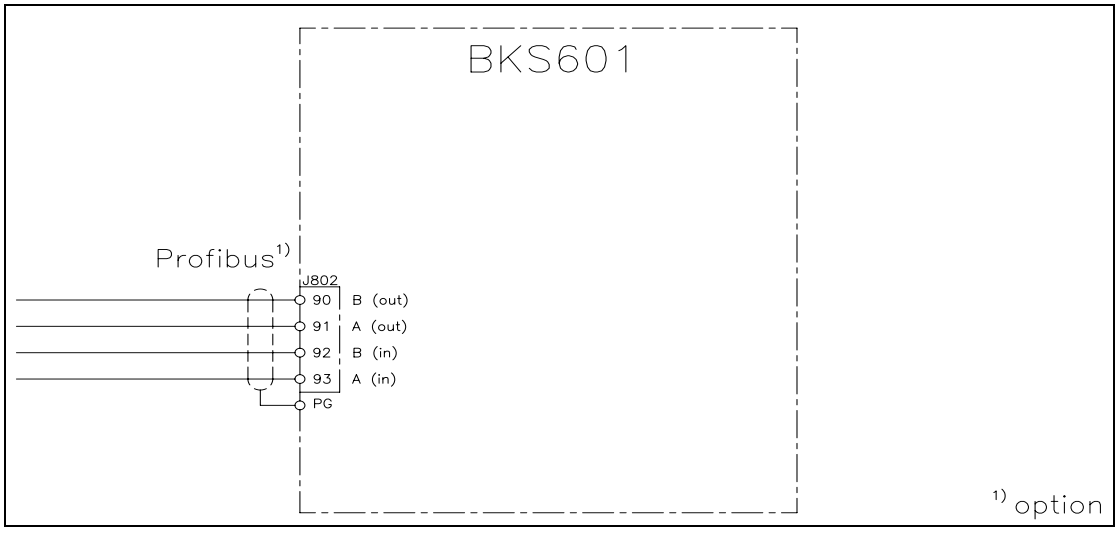


Fig. 12: Wiring of the Profibus interface K610020e

7.4 Mounting the Steering Device

Assembly and wiring of the steering device is performed according to the manufacturer's specification. Bear in mind that the steering device is mounted such that it takes into account the running direction of the web. If a steering frame is used, the pivot point must be located at the edge of the inbound roller. Sensors must be located at the exit side after the outbound rollers (**Fig. 13**).
Wiring is described in the wiring diagram (**Fig. 8**). The configuration of the screw terminals in the electronic unit are seen in (**Fig. 5**)

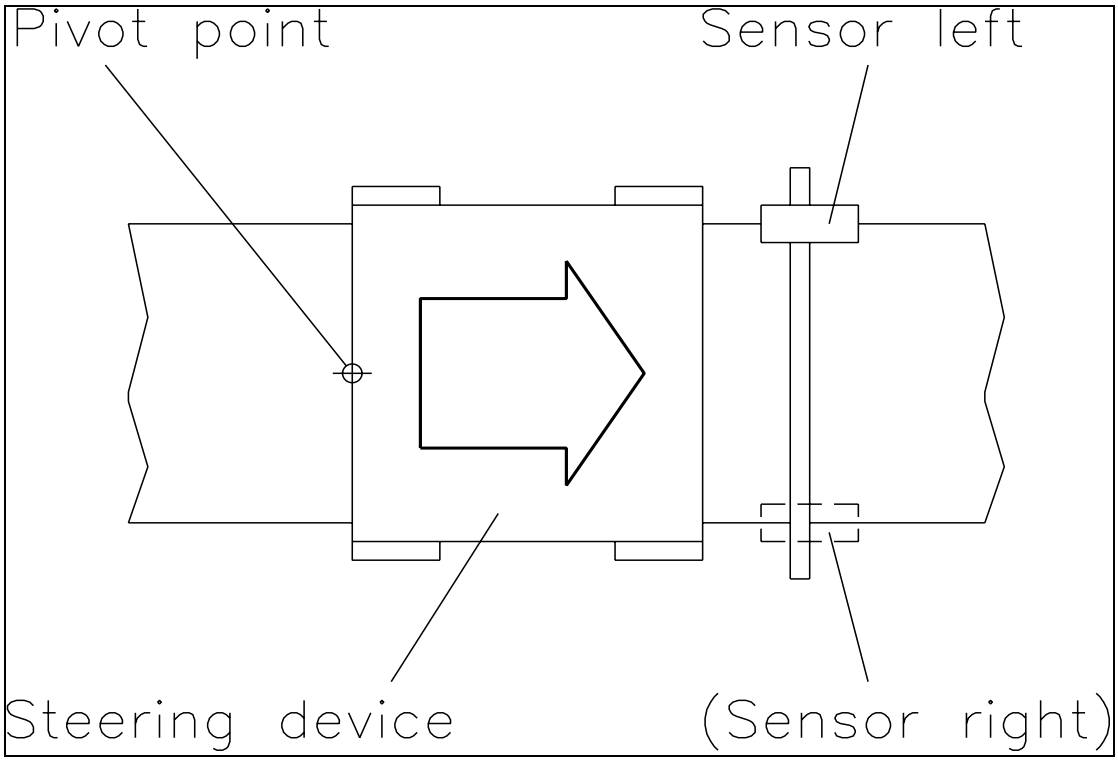


Fig. 13: Definition of running direction in the steering device K600005e

7.5 Mounting of Manual Sensor Adjustment

With regard to the running direction of the web, the manual sensor adjustment is installed **after** the steering device (**Fig. 13**). It has to be mounted on the static part of the machine frame. The sensors are movable on the square bar and can be locked with the retaining screw.

Note

In order to achieve an optimal controlling performance, the sensors must be placed near to the outbound roller of the steering frame. If the sensors are placed far from the steering frame, control dynamics will deteriorate drastically.

7.6 Mounting of the Linear Units

The linear units (**Fig.1**) must be installed **after** the steering frame referring to the running direction (**Fig. 13**). They have to be mounted on the static part of the machine frame using the provided brackets.
For the wiring of the linear units please consult the wiring diagram (**Fig. 10**). The electronic control unit detects automatically if 1 or 2 linear units are connected.

Note

In order to achieve an optimal controlling performance, the linear units must be placed near to the outbound roller of the steering frame. If the sensors are placed far from the steering frame, control dynamics will deteriorate drastically.

Caution

If external parts are within the travel range of the linear units, the sensors can be damaged while moving. Make sure that there is enough space between the linear units and the external objects.

7.7 Mounting of the Sensors

The edge sensors are mounted with brackets to the sensor adjustment (refer to operating manual AZS01 and US01). The sensors may be mounted to the left or right web edge.

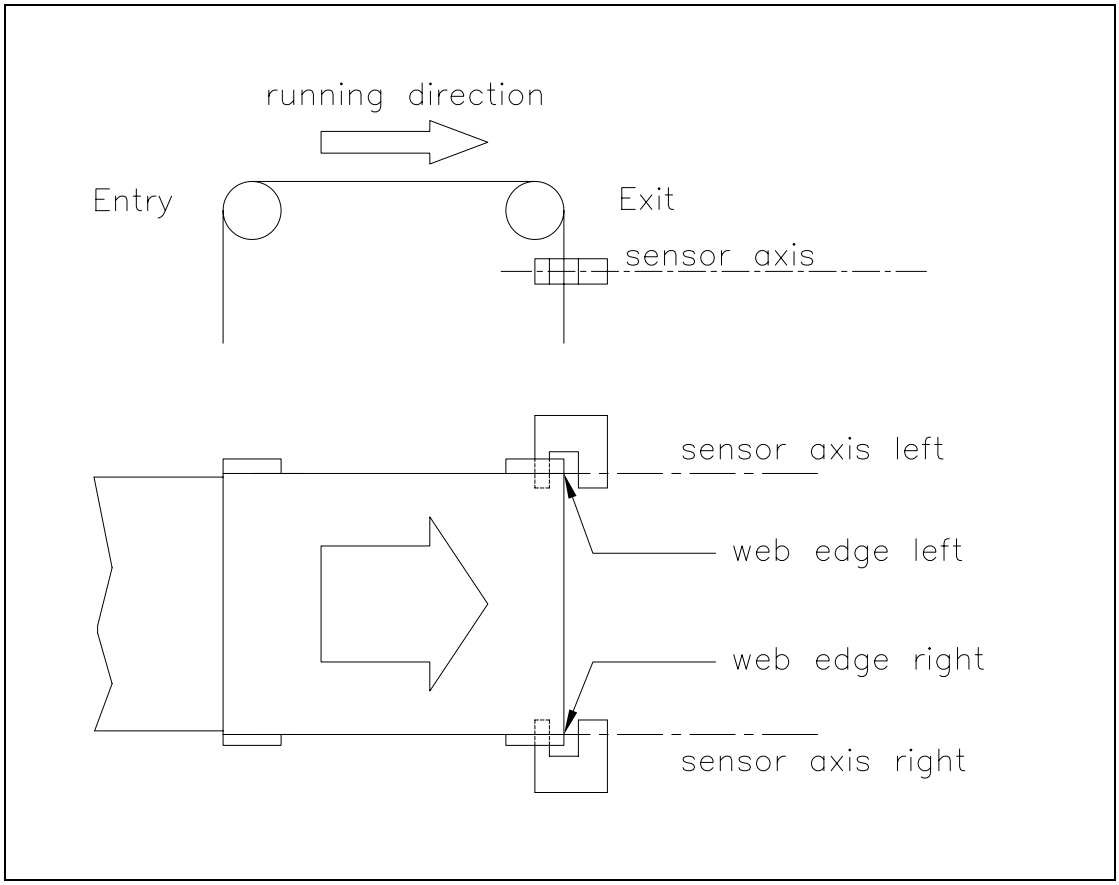


Fig. 14: Position of the sensors referring to the web running direction K400005e

Wiring of the sensors to the terminals is described in wiring diagram (**Fig. 9**).
FMS sensors provide a signal of 0...10V. If other sensors with different signaling are used, a new parametrisation is required (refer to „8.2 Configuring the Electronic Unit“).

Note

The inputs for the analog signals have different ground terminals (GND). As a result of this the terminals **Gnd** and **Signal Gnd** have to be connected together (e.g. by means of bridged). If neglected, malfunction may occur.

8 Operation

8.1 View of the Operating Panel

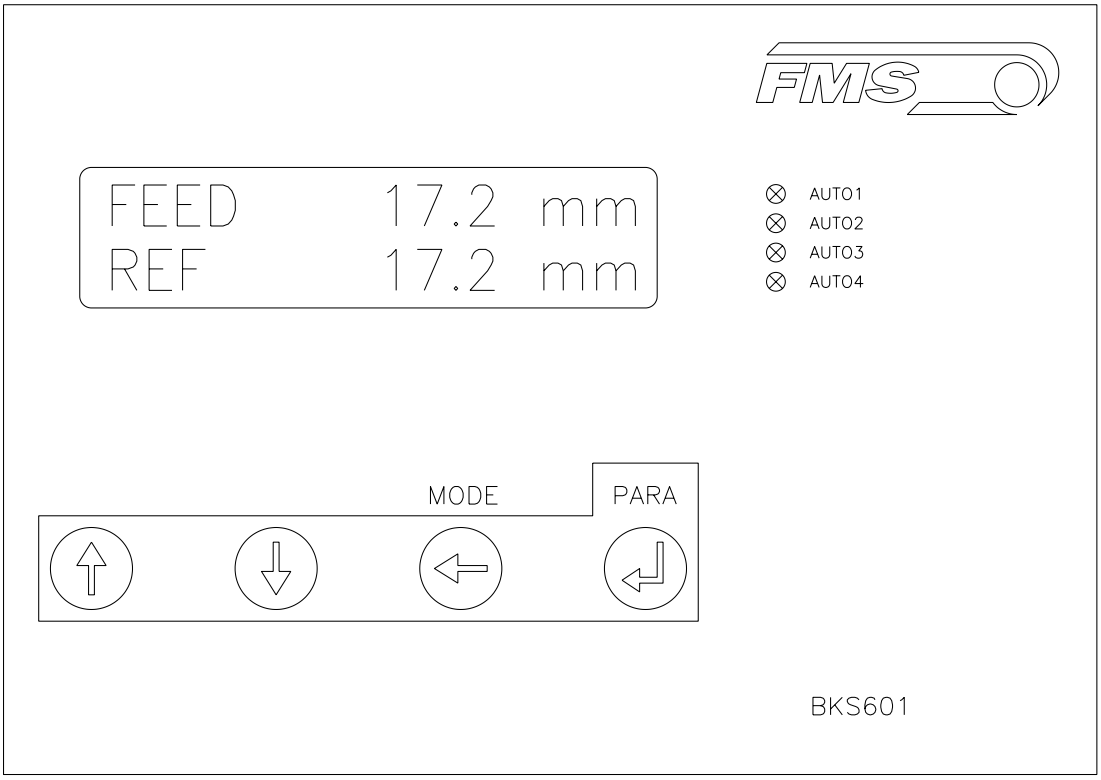


Fig. 15: Operation Panel BKS601C K601014d

8.2 Configuring the Electronic Unit

Prior to the initial calibration, the following settings must be applied (ref. to „9. Parametrization“ and „15. Technical Reference“):

System parameters	
Language	Desired display language

Service parameters	
Motor config. [1)]	Standard
Length of rail left	(only if left rail is used)
Length of rail right	(only if right rail is used)
Sensor covered	depending on sensor used
Sensor uncovered	depending on sensor used
Sensor range	depending on sensor used

[1)] only if no steering frame is used

Parameters BKS601C	
Control mode	Detection requirements (Edge left or right, Centre or Line guiding)
Dead band	Set at default value 0.1mm
Analog output [2)]	*Control output*[2)] or *Feedback Sensor*
Manual output [2)]	Signal value at manual operation (dependent from equipment)
Offset output [2)]	Set at default value 0
Output limit [2)]	Set at default value 100.0%
P value output [2)]	Set at default value 1.00
I value output [2)]	Set at default value 1.00
Config. output [2)]	Range of output signal for actuator (dependent from equipment)
Control output [2)]	Polarity of output signal (set to standard)

[2)] only if analog control output is used

Caution

Wrong parameter settings may cause malfunction of the electronic unit or the total system. The parameter setting must be performed with reasonable care before start-up.

8.3 Main Operating Menu and Special Functions

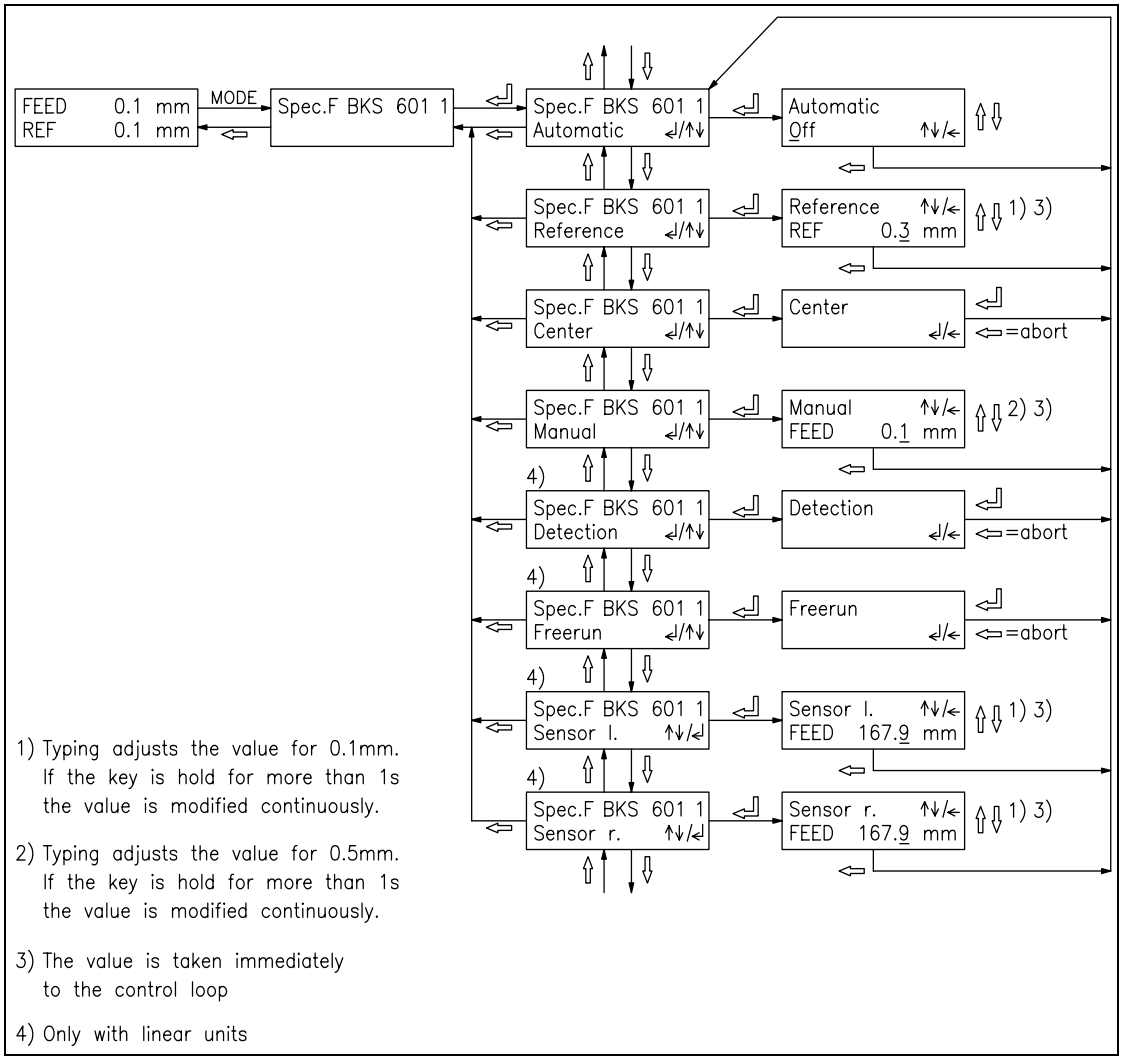


Fig. 16: Main Operating Menu BKS601CK 601008e

Special function	Operation
Automatic	↑ ↓ = automatic on / off ← = commit settings
Reference	↑ ↓ = enlarge / reduce reference value [1) 3)] ← = quit input mode
Center	↵ = drive to center position ← = (abort)
Manual	↑ ↓ = move steering frame manually left / right [2) 3)] ← = quit input mode
Detection [4)]	↵ = proceed for edge detection ← = (abort)
Freerun [4)]	↵ = proceed for sensor freerun ← = (abort)
Sensor l. [4)]	↑ ↓ = move left sensor [1) 3)] ← = quit input mode
Sensor r. [4)]	↑ ↓ = move right sensor [1) 3)] ← = quit input mode

[1)] Typing adjusts the value at 0.1mm steps. If the key is kept pressed for longer then 1 sec., the value is continuously modified.
[2)] Typing adjusts the value at 0.5mm steps. If the key is kept pressed for longer then 1 sec., the value is continuously modified.
[3)] The value is taken immediately to the control loop
[4)] Only with linear units

8.4 Manual Operation

Special functions for manual operation (**Fig. 16**) provide the following possibilities:

Manual operation, generally

- *Center* (Only with FMS steering device): The steering device will return to its center position with the ↵ key (also possible over digital input).
- *Manual:* The steering device can be moved manually in steps of 0.1mm to the left with the ↑ `LEFT` key and to the right with the ↓ `RIGHT` key. If the key is hold for longer than 1s, the steering frame moves continuously in the respective direction.

Manual operation with linear units

- *Detection:* With ↵ key edge detection can be started. The centre of the sensor will be aligned to the web edge. During the process it can happen that the sensors are moved away from and back again to the web edge. The process is completed, if the edge is detected. At this point the web edge is exactly at the centre of the active detection window of the censor.
- *Freerun:* The sensor free-run function is started with ↵ key. The sensors will move to the reference position of the linear units.
- *Sensor left / Sensor right:* The left or right sensor can be moved manually in steps of 0.1mm to the left with the ↑ `LEFT` key and to the right with the ↓ `RIGHT` key. If the key is hold for longer than 1s, the sensor moves continuously in the respective direction.

8.5 Operation without Linear Units

Alignment of the sensors

- Alignment of sensor axis to the web edge: Loosen the retaining screw on the sensor and adjust it. The sensor is well positioned, if the web edge goes through the sensor axis or the middle of the active window (fig. 17). Fix the sensor in the new position.

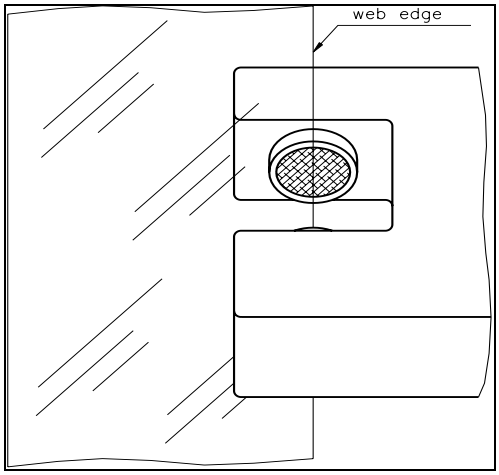


Fig. 17: Aligning the sensor axis to the web edge K100004e

Automatic Operation

- **Start Automatic Mode:** With the special function *Automatic* (see **Fig. 16**) or the corresponding signal on the digital input the control can be enabled. The control LED *Auto* shines. As the reference position is taken the middle of the sensor detection band (**Fig. 18**). Reference position for centre guiding is the middle between the 2 sensor axis. The controller starts to guide the web to the reference position and to hold this position.

- **Reference Position:** With the special function *Reference* or the digital inputs the reference position can be adjusted during automatic operation (**Fig. 16**). Step increment is 0.1mm. With the ↑ key, the web moves out of the sensor; with the ↓ key, the web moves in the sensor range. For centre guiding, above statements apply for the right sensor.

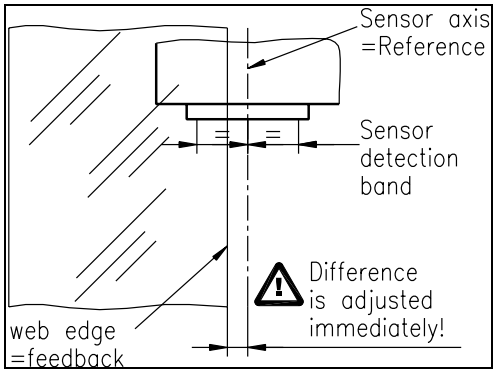


Fig. 18: Calculation of reference position at auto K100005e

- **Quit Automatic Mode:** Automatic operation is closed by calling the special function *Automatic* again (**Fig. 16**). The control LED *Auto* shines.

Note

If the web leaves the sensor detection range, control is no longer effective. Keep web edge inside the sensor detection range.

Note

At a web standstill a guidance to the reference position is not possible. The steering frame will move in the limit-of-travel position and may damage the web. Start automatic mode only when web is slowly running over the rollers.

8.6 Operation with Linear Units

Start of Detection

- If an edge or line is found with the preceding settings, the control LED on the back side of the sensor shines (Exception: The ultrasonic sensor US01 has no LED).
- If no edge or line is found, a detection run can be started with the special function *Detection* (**Fig. 16**) or via the digital input. The linear units will then start searching for the material edge.
- If for all that no edge or line was found, the sensor must be aligned more precisely to the material edge. If the problem persists it may have one of the following reasons:
  – Ultrasonic sensor US01: The material web is sound transmissive.
  – Optical sensor AZS01: The material web is too much light transmissive.
  – Digital line sensor DLS: The material reflects or the focus distance is wrongly adjusted.
- If automatic mode is started without the sensor having found an edge, the control unit automatically starts detecting.

Automatic Operation (without reference point on the machine frame)

- Start automatic operation with special the function *Automatic* (ref. to **Fig. 16**) or via digital input. The control LED *Auto* lights up. Reference position is taken from the actual web position (**Fig. 19**). The controller starts to guide the web to the reference position and to hold it there.
- The reference position can be adjusted during automatic operation with the special function *Reference* (**Fig. 16**) or using the digital inputs (incremental step 0.1mm). The sensors will follow the web edge automatically.
- Quit automatic mode by calling the special function *Automatic* again (**Fig. 16**). The control LED *Auto* goes off.

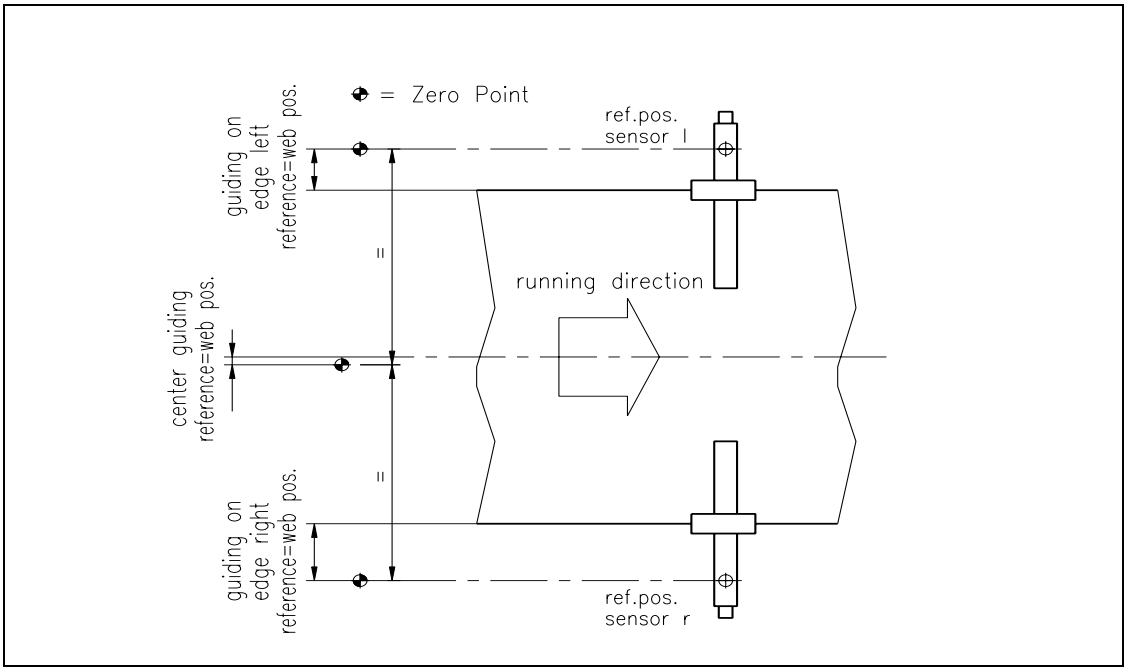


Fig. 19: Calculation of the reference value during automatic start using linear units (without reference point on the machine frame) K601009e

Automatic Operation (with reference point on the machine frame)

If a reference point on the machine frame was chosen (ref. to „8.7 Measuring from a Reference Point on the Machine Frame“), the reference position is calculated different compared with a reference point outside the machine frame. Automatic operation works then as follows:

- Start automatic operation with special the function *Automatic* (ref. to **Fig. 16**) or the digital input. The control LED *Auto* lights up. The current feedback position is adopted as reference position. For centre guiding, the middle between the reference points of the linear units is taken as reference (**Fig. 20**). The controller starts to guide the web to reference position and to hold it there.
- The reference position can be adjusted during automatic operation with the special function *Reference* (**Fig. 16**) or using the digital inputs (incremental step 0.1mm). The sensors will follow the web edge automatically.
- Quit automatic mode with calling the special function *Automatic* again (**Fig. 16**). The control LED *Auto* goes off.

Note

At a web standstill also with centre guiding a reliable guidance to the reference position is not possible. The steering frame will move in the limit-of-travel position and may damage the web. Start automatic mode only when web is slowly running over the rollers

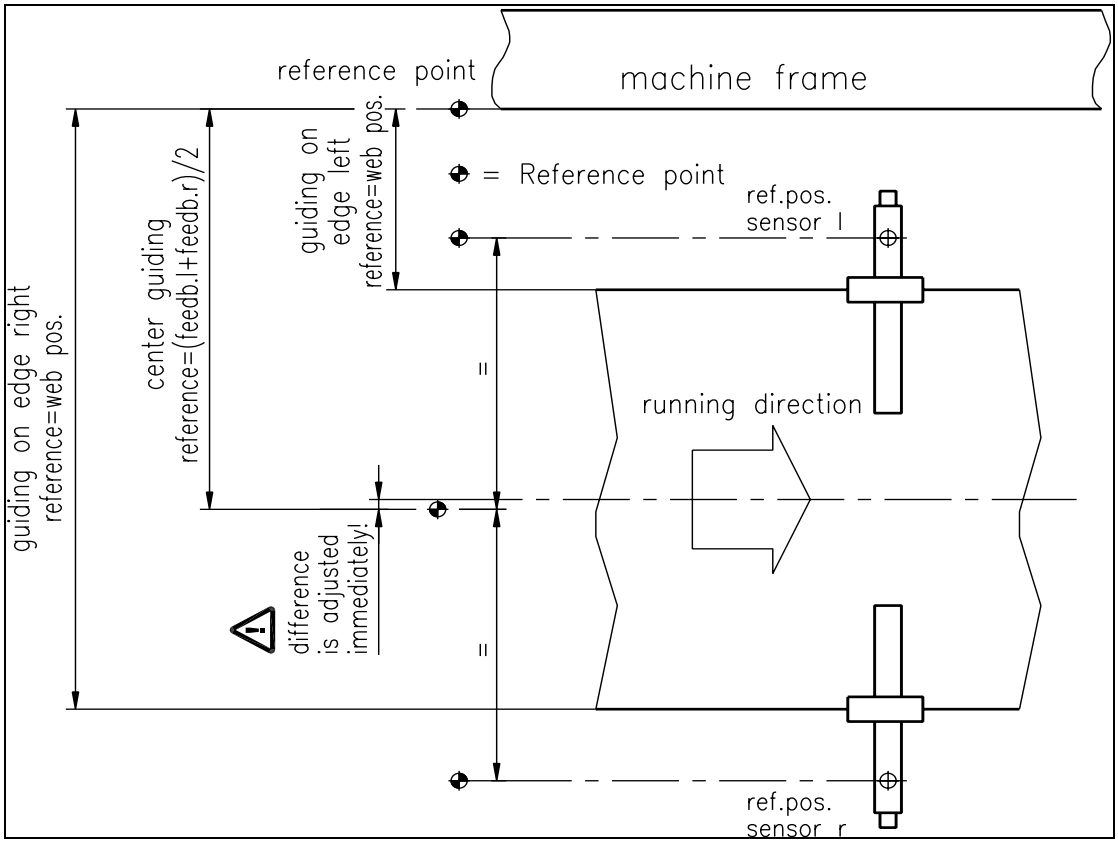
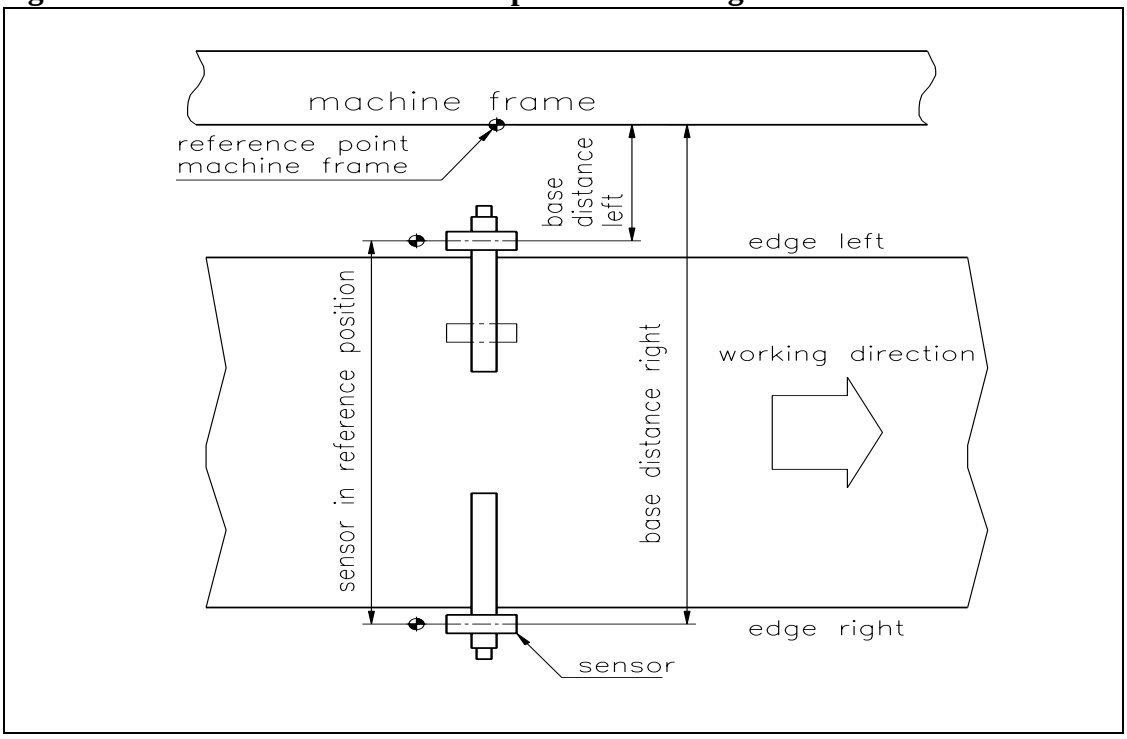


Fig. 20: Calculation of the reference value during automatic start using linear units (with reference point on the machine frame) K601010e

8.7 Measuring from a Reference Point on the Machine Frame

Irrespective if linear units are used or not a reference point can be defined. All position values will then be referred to this reference point. The reference point can be on the machine frame (see example in **Fig. 21**).

Fig. 21: Base distances and reference point when using linear units K400007e



If measuring from a reference point is activated, the parameters *base distance left* and *base distance right* have to be set as follows (see also „9. Parametrization“):

- Execute the special function *Freerun* (**Fig. 16**) to move the sensors to the reference positions of the linear units.
- In parameter *Base distance left* enter the distance between reference point (i.e. machine frame) and axis of left sensor (**Fig. 21**).
- In parameter *Base distance right* enter the distance between reference point (i.e. machine frame) and axis of right sensor (**Fig. 21**).

Note

The reference point (on the machine frame) must always be further away from the web edge than from the reference point of the linear units (**Fig. 21**). For centre guiding, the same reference point must be chosen - no matter if the reference point is on left or on the right side of the web.

If reference point measurement is not required, the parameters *base distance left* and *base distance right* have to be set to Zero. In this case, the position values refer to the sensor positions. If linear units are used, the position values refer to the reference positions of the linear units (**Fig. 21**).

9 ParametriSation

9.1 Flow Chart ParametriSation

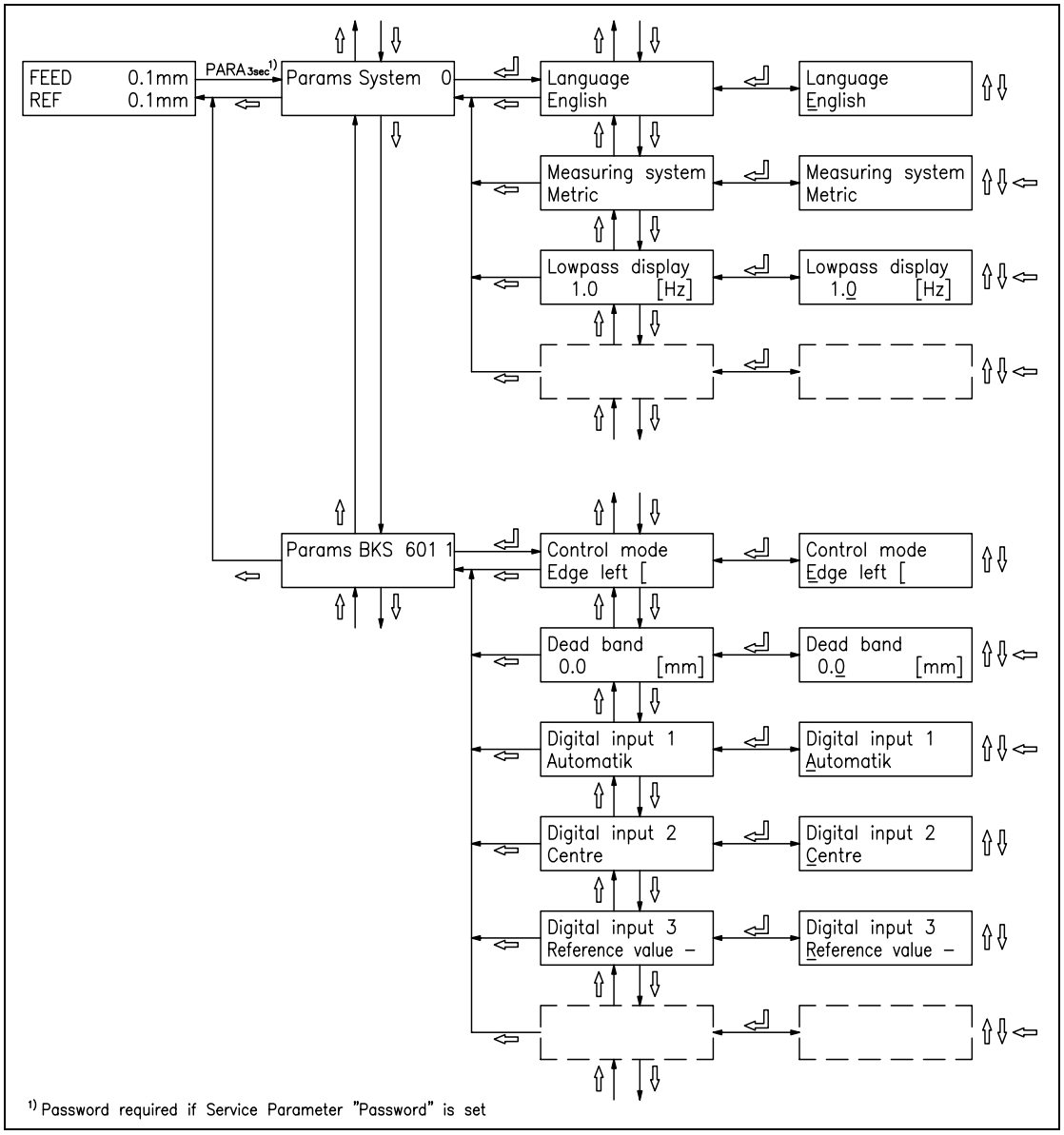


Fig. 22: Parametrisation BKS601C K610031e

The parameters are split into the modules *system parameters* and parameters *BKS601.1*. The changing mode for the parameters is activated by pressing the PARA ↵ key for 3 seconds. The required module can be searched by scrolling the keys ↑ ↓ and be selected with the PARA ↵ key (**Fig. 22**). Each module has its own parameter set. The parameter content can be changed using the keys as follows:

↵	choose and enter
↑ ↓	switch the selections or increase / decrease numeric values, as well as change the sign
←	change the decimal (while inputting a numeric value) or abort setting

9.2 List of the System Parameters

Parameter	Unit	Min	Max	Default	Selected
Language	English, French, Italian, German				
Measuring System	Metric, US standard			Metric	
Lowpass display	[Hz]	0.1	10.0	1.0	
Identifier	[-]	2	125	84	

9.3 List of the Parameters BKS601C

Parameter	Unit	Min	Max	Default	Selected
Control mode	Edge left, Edge right, Center, Line				
Dead band	[mm]	0.0	2.0	0.1	
Digital input 1	Automatic, Centre pos, Reference –, Reference +, Start detection, Sensor freerun			Automatic	
Digital input 2	*(same as digital input 1)*			Center pos	
Digital input 3	*(same as digital input 1)*			Reference –	
Digital input 4	*(same as digital input 1)*			Reference +	
Digital output 1	Automatic OK, Centre pos, Detection OK, Edge missing,			Auto OK	
Digital output 2	*(same as digital output 1)*			Edge miss.	
Base distance left	[mm]	0.0	3200.0	0.0	
Base distance right	[mm]	0.0	3200.0	0.0	
Analog output	Feedback Sensor, Control Output			Feedback Sensor	
Scale current value	[mm]	0.1	3200.0	10.0	
Manual output	[%]	–100.0	100.0	5.0	
Offset output	[Digit]	–500	+500	0	
Output limit	[%]	10.0	100.0	100.0	
P value output	[-]	0.01	320.00	1.00	
I value output	[s]	0.01	320.00	1.00	
Configuration output	0...10V and 0...20mA, 0...10V and 4...20mA, ±10V				
Control meaning output	Standard, Inverted			Standard	

9.4 Description of the System Parameters

The mode for parameter changing is activated by pressing the PARA ↵ key for 3 seconds. By pressing the PARA ↵ key again, the system parameters are selected (see **Fig. 22**).

Language

Use: This parameter determines the display language.

Range: English, French, Italian, German

Measuring system

Use: This parameter determines the measuring system that will be used.

Range: Metric, US standard **Default:** Metric

Note: *(not used from the BKS601C)*

Lowpass display

Use: The electronic unit has a build-in lowpass filter that filters noise which might interfere with the display signal. The filter improves the reading by making the display more stable against highly fluctuating force values. This parameter determines the cut off frequency. The lower the cut off frequency, the more sluggish the output signal will be. The lowpass display filter is independent from the other filters.

Range:	0.1	to	10.0	**Default:**	1.0
Increment:	0.1			**Unit:**	[Hz]

Identifier

Use: This parameter is used to identify the device in a PROFIBUS interface network.

Range:	2	to	125	**Default:**	84
Increment:	1			**Unit:**	[-]

9.5 Description of the Parameters BKS601C

The mode for parameter changing is activated by pressing the PARA ↵ key for 3 seconds. The module *Params BKS 601C* is then found by scrolling the ↑ ↓ keys and selecting with the PARA ↵ key (ref. also to **Fig. 22**).

Control mode

Use: This parameter defines on which side of the material web the sensors are used. For centre guiding sensors must be mounted on both sides of the web. If an FMS line sensor (DLS) is used, set this parameter to Line.

Range: Edge left, Edge right, Center, Line **Default:** Edge left

Dead band

Use: This parameter determines the tolerance band for the web position. The web position is adjusted only when the difference between reference and feedback position is greater than the dead band value. „0.3mm dead band“ means a tolerance of ±0.3mm.

Range: 0.0 to 2.0 **Default:** 0.1

Increment: 0.1 **Unit:** [mm]

Digital input 1

Use: The parameter defines the event that will be initiated by the digital input 1. The different event options are seen below (see Range). The event is activated by applying 24VDC to input terminal for at least 100ms. This has the same effect as pressing the key on the operation panel. The functions of the possible settings are equal to the special functions of the web guide (ref. to „8.3 Main Operating Menu and Special Functions“).

Note*:*

1. If the digital input is set to „Automatic“, the web guide will be in automatic mode as long as the signal acts on the digital input 1
2. If the service parameter “Restore Operation Mode” is chosen, the automatic mode control is disabled by a digital input (see “9.10 Description of the Service Parameters”).

Range: Automatic, Center Position, Reference –, Reference +, Manual left, Manual right, Start detection, Sensor freerun

Digital input 2

Use: Identical with *Digital input 1* but the parameter acts to the digital input 2.

Digital input 3

Use: Identical with *Digital input 1* but the parameter acts to the digital input 3.

Digital input 4

Use: Identical with *Digital input 1* but the parameter acts to the digital input 4.

Digital output 1

Use: This parameter defines at which event the digital output 1 shell be activated.

Range: Automatic OK, Centre pos, Detection OK, Edge missing,

Definition:

Automatic OK:	Controller is active; edge is read
Edge missing:	No edge found during detection run
Detection OK:	Detection was successful; an edge was found.

Digital output 2

Use: Identical with *Digital output 1* but the parameter acts to the digital output 2.

Base distance left

Use: This parameter stores the distance between reference point on the machine frame and the reference point of the left linear unit.

Range:	0.0	to	3200.0	**Default:**	0.0
Increment:	0.1			**Unit:**	[mm]

Base distance right

Use: Identical with *base distance left* but the parameter refers to the reference point of the right linear unit.

Analog output

Use: This parameter defines the signal that will be read-out at the analog output. With the option *control output*, an actuator with analog signal can be operated. Instead of an FMS steering frame e.g. a. hydraulic valve can then be used (see parameter *Configuration output*). With the option *Feedback Sensor*, the current web position is sent to the output (during automatic operation).

Range:	Feedback Sensor, Control Output	**Default:**	Feedback Sensor

Scale feedback value

Use: If the parameter *analog output* is set to the option *Feedback Sensor*, this parameter indicates the scale in mm corresponding to the max. amplitude of the signal (0...10 V; 0/4...20mA ; +/-10V).

Range:	0.1	to	3200.0	**Default:**	10.0
Increment:	0.1			**Unit:**	[mm]

Manual output

Use: Provided that the parameter *analog output* is set to the option *control output*, this parameter (***manual output***) defines the signal size which controls the steering device during manual operation. If the algebraic sign is changed, the polarity of the signal will changed. E.g. „+5%“ would mean 5% of the maximal amplitude of the signal (±10V / 0...10 V / 0...20mA / 4...20mA; see parameter *Configuration output*)

Range:	–100.0	to	+100.0	**Default:**	+5.0
Increment:	0.1			**Unit:**	[%]

Offset output

Use: This parameter compensates unwanted movements of the steering device. Such unwanted motion can happen despite of the control electronic not sending a signal to the control output. The steering device stays at the position in which it is supposed to be.
This parameter can be changed during automatic operation.

Range:	–500	to	500	**Default:**	0
Increment:	1			**Unit:**	[Digit]

Output limit

Use: If the parameter *analog output* is set to *control output*, the maximal output signal can be adjusted. „80%“ means 80% of the maximal amplitude of the signal (±10V / 0...10 V / 0...20mA / 4...20mA; see parameter C*onfiguration output*).
This parameter can be changed during automatic operation.

Range:	10.0	to	100.0	**Default:**	100.0
Increment:	0.1			**Unit:**	[%]

P value output

Use: If the parameter *analog output* is set to *control output*, this parameter defines the P-fraction of the PI-controller.
This parameter can be changed during automatic operation.

Range:	0.01	to	320.00	**Default:**	1.00
Increment:	0.01			**Unit:**	[-]

I value output

Use: If the parameter *analog output* is set to *control output*, this parameter defines the I-fraction of the PI-controller.
This parameter can be changed during automatic operation.

Range: 0.01 to 320.00 **Default:** 1.00

Increment: 0.01 **Unit:** [s]

Configuration output

Use: This parameter defines the range of the actuator signal for the analog output (control output).

If the parameter *analog output* is set to *Feedback Sensor*, it defines the range of the signal.

Range: 0...10V and 0...20mA,
0...10V and 4...20mA, ±10V

Default: 0...10V and 0…20mA

Control meaning output

Use: With this parameter, the polarity of the actuator signal can be changed and so also control system can be inverted.

Range: Standard, Inverted **Default:** Standard

9.6 Flow Chart Service Mode

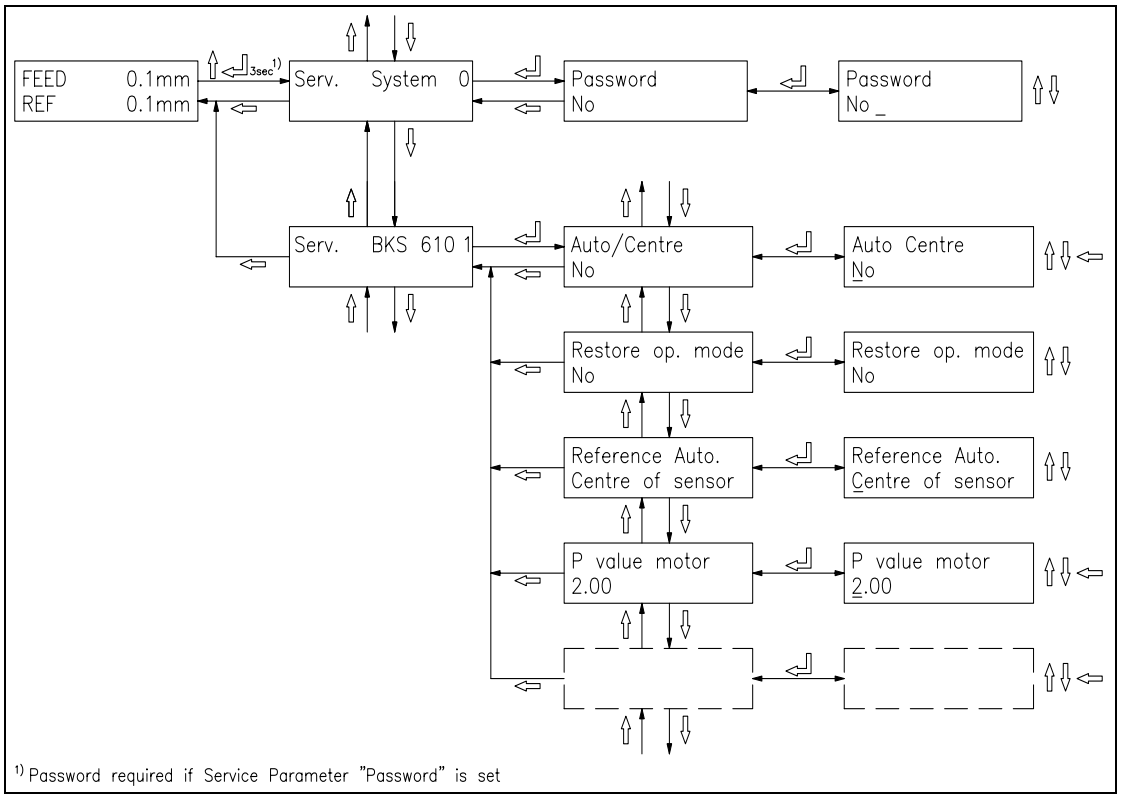


Fig. 23: Service Mode Overview K610032e

The service mode contains parameters for configuration of the connected devices. If a FMS steering frame and FMS linear units are used, these parameters are factory-adjusted and need no modification. New settings are only needed, if web guides with steering devices or linear units of other brands are used. Each function module has its own set of service parameters.

Note

Wrong parameter settings in the service module may cause malfunction of the electronic unit or the total system. The parameter setting must be performed with reasonable care before start-up.

The service mode is activated by pressing the ↑ and ↵ keys during 3 seconds. Generally the service mode parameters can be modified the same way as the other parameters.

9.7 List of the system service parameters BKS601C

Parameters	Unit	Min	Max	Default	Selected
Password	No, Yes			No	

9.8 List of the service parameters BKS601C

Parameters	Unit	Min	Max	Default	Selected
Auto. / center	No, Yes			No	
Reference auto.	Center of Sensor, Feedback Sensor			Center of Sensor	
P value motor	[-]	0.01	100.00	2.00	
Motor config.	Standard, Inverted			Standard	
Spindle pitch	[mm]	1.0	20.0	5.0	
Motor steps	[-]	200	1600	800	
V_max (Max. Speed)	[mm/s][1]	5	40	40	
Motor frequency	[kHz]	4kHz, 2kHz, 1.25kHz Motor pulse frequency		4	
Offset center	[steps]	-10’000	10’000	factory set	
Length of rail left	[mm] [1]	100.0	1300.0	200.0	
Length of rail right	[mm] [1]	100.0	1300.0	200.0	
Pitch of spindle (rail)	[mm] [1]	2.0	20.0	5.0	
Rail auto-follow	Off, On			Off	
Speed auto-follow	Min., Slow, Medium, Max.			Max.	
Left sensor covered	[V]	0.000	10.000	0.000	
Left sensor uncovered	[V]	0.000	10.000	10.000	
Left sensor range	[mm] [1]	0.00	100.00	10.00	
Right sensor covered	[V]	0.000	10.000	0.000	
Right sensor uncovered	[V]	0.000	10.000	10.000	
Right sensor range	[mm]	0.00	100.00	10.00	

[1] Irrespective of the chosen Measuring System these parameter are always indicated in metric values.

9.9 Description of System Service Parameters BKS601C

Irrespective of the chosen Measuring System the parameters are always indicated in metric values. The reason for that is the metric design of this device.

Password

Use: The user can define a Password in order to access parameters and several special functions. This enhances security against unwanted modifications. The default Password is „3231“.

Range: No, Yes **Default:** No

9.10 Description of the Service Parameters BKS601C

Auto. / Center

Use: This parameter defines, if the steering frame should hold its position or drive to the center position after automatic operation.

Range:
No: After automatic operation, the steering frame holds its actual position.
Yes: After automatic operation, the steering frame moves to the center position

Default: No

Restore Operation Mode

Use: When the device is switched-on this parameter defines if the last operation mode is restored or not. If e.g. the operation mode was before switch-off at “Automatic Operation”, after switch-on “Automatic Operation” will be restored.

Range:
No: Don’t restore last operation mode
Yes: Restore last operation mode

Default: No

Reference Auto.

Use: This parameter defines during automatic operation, if the reference position should be equal to the center position of the sensor or to the actual current position of the sensor.

Range:
Center of Sensor: Reference value is equal to the center position of the sensor.
Feedback Sensor: Reference value is equal to the actual current position of the sensor

Default: Center of Sensor

P value motor

Use: This parameter defines the P-value (amplification) of the steering frame controller (Plug & Drive stepper motor).

Range:	0.01	to	100.00	**Default:**	2.00
Increment:	0.01			**Unit:**	[-]

Motor config.

Use: With this parameter, the polarity of the actuator signal can be changed. Due to that, the meaning of control system changes too.

Range:	Standard, Inverted	**Default:**	Standard

Spindle pitch

Use: Defines the pitch of the ball bearing spindle of the steering frame or actuator (Plug & Drive stepper motor).

Range:	1.0	to	20.0	**Default:**	5.0
Increment:	0.1			**Unit:**	[mm]

Motor steps

Use: This parameter defines the number of steps for one revolution of the stepper motor (Plug & Drive stepper motor).

Range:	200	to	1600	**Default:**	800
Increment:	1			**Unit:**	[-]

V_max (Max. Speed)

Use: This parameter limits the maximum adjustment speed of the actuator (Plug & Drive stepper motor). The acceleration and deceleration ramp does not change.

Range:	5	to	40	**Default:**	40
Increment:	1			**Unit:**	[mm/s]

Motor frequency

Use: This parameter defines the pulse frequency of the motor. A lower frequency reduces also the maximal adjustment speed of the actuator (Plug & Drive stepper motor) as well as the acceleration and deceleration ramp.

Range:	4, 2, 1.25	**Default:**	4
		Unit:	[kHz]

Offset center

Use: This parameter adjusts the center position of the steering frame.
This is factory setting and shouldn't be changed by the user.

Range:	0	to	32000	**Default:**	factory set
Increment:	1			**Unit:**	[steps]

Length of rail left

Use: This parameter defines the stroke of the left linear unit. The value determine the stop position on the left side

Range:	100.0	to	1300.0	**Default:**	200.0
Increment:	0.1			**Unit:**	[mm]

Length of rail right

Use: This parameter defines the stroke of the left linear unit. The value determine the stop position on the right side

Range:	100.0	to	1300.0	**Default:**	200.0
Increment:	0.1			**Unit:**	[mm]

Pitch of rail

Use: This parameter stores the spindle pitch of the linear units. The value is used to calculate the current position of the sensors. The parameter is used for both left and right linear units.

Range:	5.0	to	20.0	**Default:**	5.0
Increment:	0.1			**Unit:**	[mm]

Rail auto-follow

Use: During automatic operation and center guiding the sensors follow the web automatically. If the parameter is set to *On* and the web edge is more than ±2mm outside the sensor center, the center of the sensors are readjusted to the web edge.

Range:	Off, On	**Default:**	Off

Speed auto-follow

Use: Defines the speed to readjust the sensors to the web edge. This parameter is only active if parameter *Rail auto-follow* is set to *On*.

Range:	Min., Slow, Medium, Max.	**Default:**	Max.

Left Sensor covered

Use: The parameters *Sensor covered*, *Sensor uncovered* and *Sensor range* determine the scaling of any sensor signal. In this case, the signal of the covered left sensor is stored.

Range:	0.000	to	10.000	**Default:**	0.000
Increment:	0.001			**Unit:**	[V]

Left Sensor uncovered

Use: The signal of the uncovered left sensor is stored.

Range:	0.000	to	10.000	**Default:**	10.000
Increment:	0.001			**Unit:**	[V]

Left Sensor range

Use: The left sensor detection range is stored.

Range:	0.00to	100.00		**Default:**	10.00
Increment:	0.01			**Unit:**	[mm]

Right Sensor covered

Use: The parameters *Sensor covered*, *Sensor uncovered* and *Sensor range* determine the scaling of any sensor signal. In this case, the signal of the covered right sensor is stored.

Range:	0.000	to	10.000	**Default:**	0.000
Increment:	0.001			**Unit:**	[V]

Right Sensor uncovered

Use: The signal of the uncovered right sensor is stored.

Range:	0.000	to	10.000	**Default:**	10.000
Increment:	0.001			**Unit:**	[V]

Right Sensor range

Use: The right sensor detection range is stored.

Range:	0.00	to	100.00	**Default:**	10.00
Increment:	0.01			**Unit:**	[mm]

10 PROFIBUS Interface Description

10.1 Wiring the PROFIBUS Data Cable

Wiring the PROFIBUS cables
A standardized PROFIBUS cable type A (STP 2x0.34[2]) [AWG] has to be used. The cables isolation is stripped as shown in **Fig. 4** and connected to the terminals according to the wiring diagram.
The shield is connected with the bracket to the shoulder inside the housing.

Caution
The shield of the PROFIBUS cable is only grounded if the bracket inside the housing clamps directly to the shield. Therefore the isolation has to be fixed only with the PG gland (referring to **Fig. 4**)

Termination
If both cables are connected (Bus in and Bus out), the two termination dip switches must be set in the “off” position.
If only one cable is connected (Bus in), both termination dip switches have to be set in “on” position.

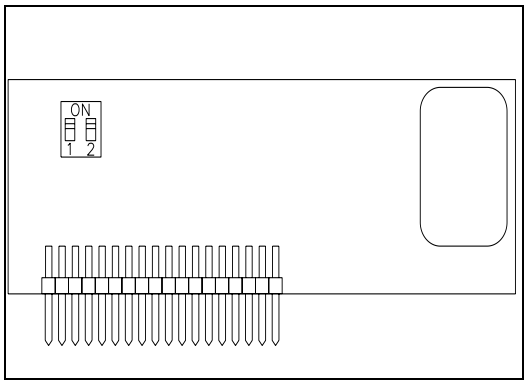


Fig. 24: Profibus board E621009

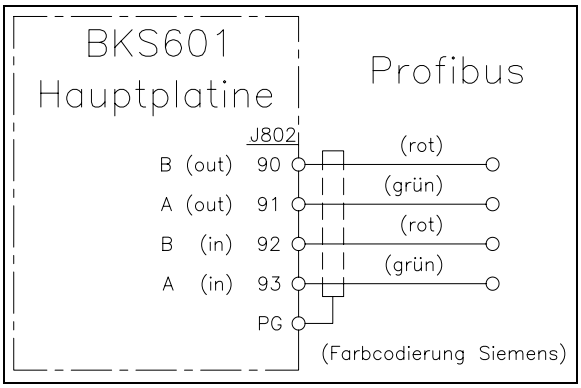


Fig. 25A: connection Profibus K610024

Note
The PROFIBUS network has to be terminated properly. Otherwise the installation cannot be set into operation. It has to be ensured that only the last device of the PROFIBUS chain is terminated.

10.2 Setting the PROFIBUS Address

The tension controller requires a unique PROFIBUS address which indicates it definitely in the whole PROFIBUS network. Therefore no other PROFIBUS device in the network may use the same address. The address has to be between 2...125.

The PROFIBUS address is set with the system parameter *Identifier*. (See 9.4 Description of the system parameters). After switching the tension controller off and on, the new address is valid.

10.3 GSD File

The PROFIBUS DP Master has to know which devices are connected to the PROFIBUS network. For this purpose the GSD file is required. The GSD file for the CMGZ600A-series tension controller can be taken fron the following internet address:
http://www.fms-technology.com/gsd
The GSD file can also be supplied on a floppy disk on request. In this case please contact FMS customer service.

Read in the GSD file into the PROFIBUS DP Master
How to read in the GSD file into the control system (DP Master) is depending on the used control system. For further information, refer to the documentation of the control system.

Note
The GSD-file version must match with the firmware version of the tension controller. Otherwise there may be problems while setup. Version numbers of firmware and GSD file are printed to the cover page of this operating manual.

10.4 BKS601C.P DP Slave Functional Description

The tension controllers of the BKS601C.P-series supports a PROFIBUS link which operates according to the PROFIBUS DP protocoll according to EN 50170. Hereby the tension controller operates as DP slave and the control system as DP Master. Several parameters have to be set and met by the control system.

10.5 Initial Parameters

Initial parameters are sent from the control system to the tension controller once while initialization. They are normally set to a fixed value for a machine with the programming tool of the control system.
The first bytes of the parameter telegram are specified in the EN 50170 standard. an user segment of 4 bytes is defined manufacturer-specific for the tension controller

Byte	Use	Value	Meaning
0	initial parameter	0	(not used)
1		0	(not used)
2		0	(not used)
3		0	(not used)

10.6 Configuration

The configuration defines how many process data (byte and word) are sent during the cyclic communication from the control system to the web guide controller and from the web guide controller to the control system.
To ensure maximum flexibility using the web guide controller, there are different modules supplied in a single web guide controller only one module can be set active at a time.

Module 1: Basic telegram
4 bytes (2 word) re transmitted from the control system to the web guide controller and also 4 bytes (2 word) from the web guide controller to the control system in each data cycle.

	byte 0	byte 1	byte 2	byte 3
request telegram (master → slave)	function code	module number	empty	empty
response telegram (slave → master)	function code	module number	data (higher byte)	data (lower byte)

Modul 2: Reserved

Modul 3: Basic telegram and 4 word operation value (CMGZ611A, CMGZ630A)
The web guide controller responses with 4 bytes of the basic telegram and the 4 word (feedback, reference, control error, output per channel).

	Byte 0	Byte 1	Byte 2	Byte 3
request telegram (master → slave)	function code	module number	empty	empty
response telegram (slave → master)	function code	module number	data (higher byte)	data (lower byte)

Word 0	Word 1
Feedback (HB)/(LB)	Reference (HB)/(LB)

10.7 Function Code

Master → Slave

Function Values

Value	Meaning	Remarks
01h	Feedback	feedback tension controller
02h	Reference	reference tension controller

11 Serial Interface (RS232)

(Optional)

12 Interface CAN-Bus

(Optional)

13 Interface DeviceNet

(Optional)

14 Technical Reference

14.1 Additional Setting Elements

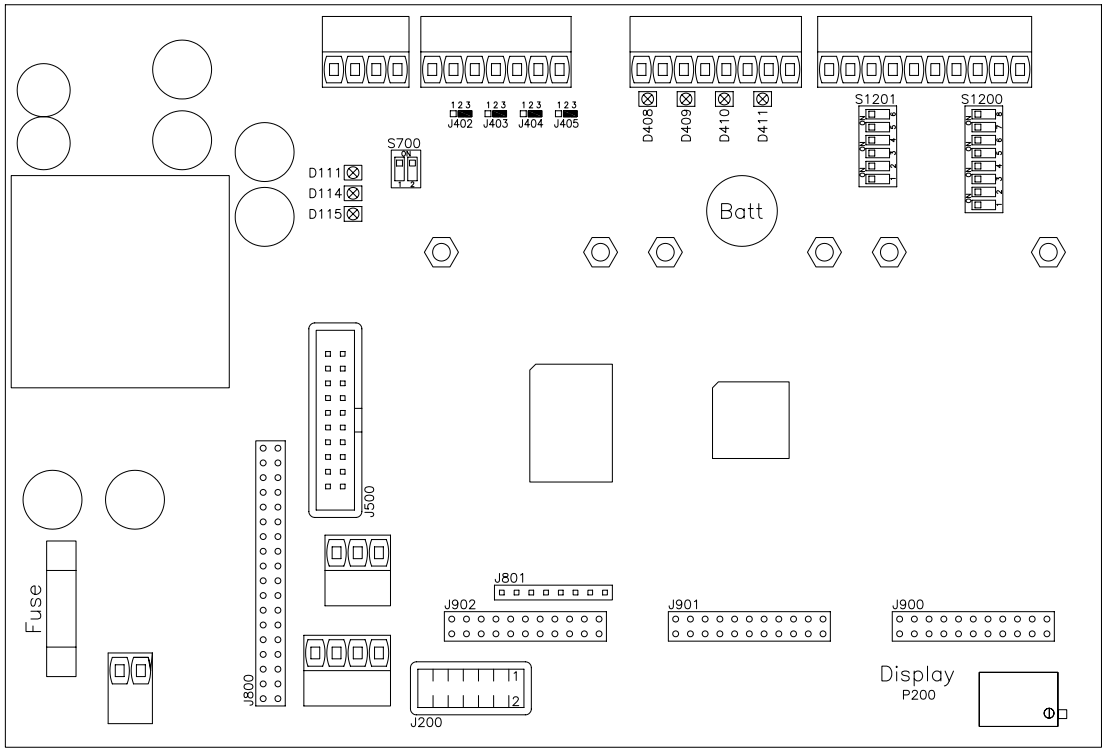


Fig. 25: View microprocessor board wit screw terminals K61025e

Element	Function
D111	Status LED power supply: VCC ok
D114	Status LED power supply: +15VDC ok
D115	Status LED power supply: –15VDC ok
D408	Status LED dig. input 1
D409	Status LED dig. input 2
D410	Status LED dig. input 3
D411	Status LED dig. input 4
J200	Programmable plug Tyco 12p.
J402...405	Solder bridges for dig. output 1...4 (24V)
J500	Add-on board for digital inputs and outputs
J800	Socket sub-board PROFIBUS
J900	Socket sub-board channel 2
J901	Socket sub-board channel 3
J902	Socket sub-board channel 4
P200	LCD display contrast
S700	CAN Bus termination
Fuse	Fuse of the power supply, 1A / 250V (delayed-action)

14.2 Setting Elements on the Extension Board

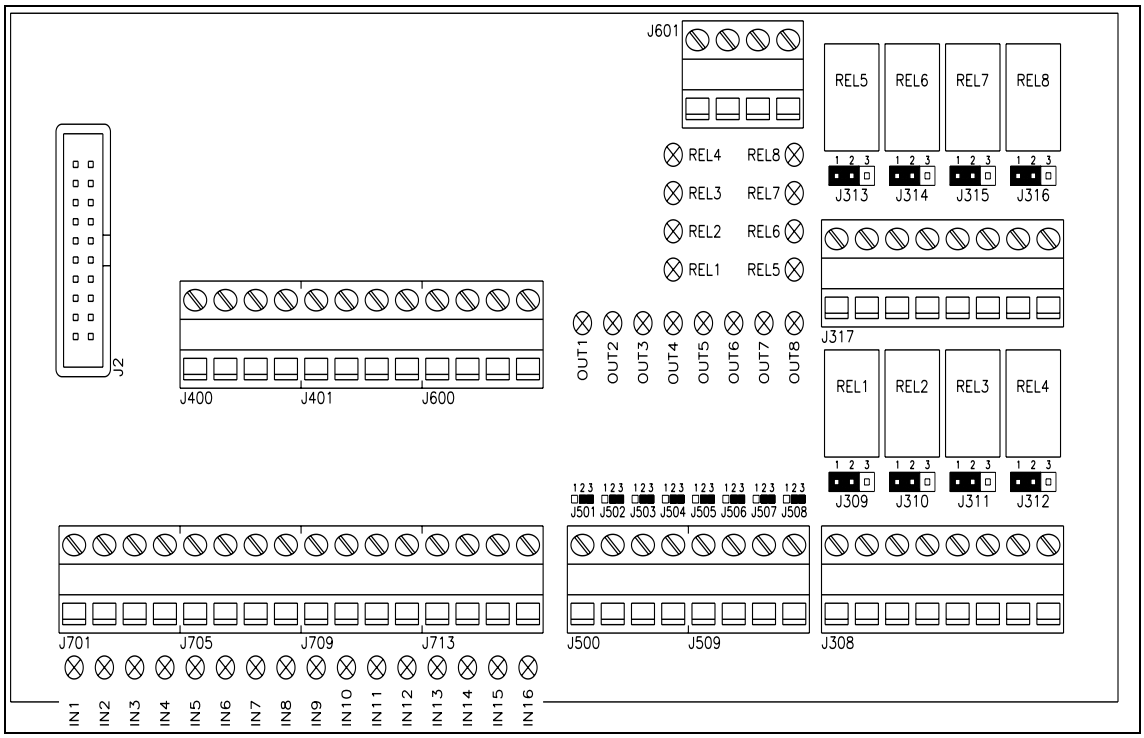


Fig. 26 Extension Board K600002

Element	Function
IN1...16	Status LED dig. input 1...16
OUT1...8	Status LED dig. output 1...8 (24V)
REL1...8	Status LED and relay dig. output 9...16
J308 / J317	Terminal for dig. output 9...16 (relay)
J309...316	Jumper for dig. output 9...16 (relay)
J400 / 401	8 x Terminal +24VDC
J500 / J509	Terminal for dig. output 1...8 (24V)
J501...508	Solder bridges for dig. output 1...8 (24V)
J600 / 601	8 x Terminal Gnd
J701...713	Terminal for dig. input 1...16
J2	Ribbon cable to processor board

Setting of the relay contacts (jumper)

Jumper	Relay operates as „make contact“ (Default)	Relay operates as „break contact“
J309...316	**1-2**	**2-3**

14.3 Technical Data

Function	Web guide
Number of actuators (steering frames)	1
Drive of the actuator	FMS steering frame with integrated Plug & Drive stepper motor or actuator with +/-10V, 0...10V or 0/4...20mA input (e.g. hydraulic valve)
Analog output feedback	0...10V and 0...20mA, 0...10V and 4...20mA or +/-10V If parameter *Analog output* is set to *Feedback Sensor*
Reference value	In steps of 0.1mm
Dead band	±2mm, adjustable in steps of 0.1mm
Number of edge sensors	1 or 2 edge sensors 1 line sensor
Resolution A/D converter	±8192 Digit (14 Bit)
Measuring error	<0.05% FS
Motorized sensor adjustment	For up to 2 sensors, with stepper motor
Cycle time	2ms
Operation	4 keys, 4 LED's, LCD display 2x16 characters (8mm height) programmable
Digital inputs	4 (programmable)
Digital outputs	2 (programmable)
Interface RS232	Optional
Interface PROFIBUS	PROFIBUS DP (EN50170), optional
Interface CAN-Bus	Optional
Interface DeviceNet	Optional
Power supply	24VDC (18...36VDC) / max. 140W (6A) depending on device configuration
Temperature range	0...45°C (32...113°F)
Weight	1.5kg (3.35lbs)

15 Trouble Shooting

Error	Cause	Corrective action
Controller guides web edge immediately out of the sensor	Control mode was wrongly parametrized	Set parameter *Control mode* according to the sensor position
	Parameter *Output config.* is set wrongly	Change parameter *Output config.*
	Sensor signal was wrongly parametrized	Set service parameters *Sensor covered, Sensor uncovered, Sensor range* correct
No edge/line found **Edge/line missing**	The sensor is not adjusted properly	Adjust sensor more accurately
Steering frame does not move	No sensor signal. Sensor is not correctly connected	Connect sensor correctly according to wiring diagram and installation guide
	No signal; cable break	Replace cable or send sensor to FMS
	No signal; sensor defect	Send sensor to FMS; use other sensor
	Steering device not correctly connected	Connect steering device correctly according to wiring diagram and installation guide
Steering device moves in the wrong direction	Service parameter *Motor config.* is set wrongly	Change service parameter *motor config.*
	Sensor signal wrongly parametrized	Set service parameters *Sensor covered, Sensor uncovered, Sensor range* correct
Motors of the linear units don’t move	Motors are not correctly connected	Connect motors correctly referring to wiring table
	Hardware error	Contact FMS customer service
Linear units don’t move properly to its reference positions	Limit switches are connected wrongly	Connect limit switches correctly referring to wiring diagram
Dig. outputs do not work	Wiring error	Check wiring of the dig. outputs (ref. to wiring diagram)
	Grounding not connected	Connect Grounding wire to the PE terminal (ref. to wiring diagram)
`Sub-Board missing contact FMS AG`	One or more sub-boards are missing or are not detected	Check if sub-boards are connected correctly (ref. to „15.1 Additional Setting Elements “) Contact FMS customer service

`System Error contact FMS AG`	Electronic unit defect	Contact FMS customer service
No message on the display	Display contrast setting is bad	Set display potentiometer P200 correctly (ref. to „15.1 Additional Setting Elements“)
	Blown fuse	Replace fuse (ref. to „15.1 Additional Setting Elements“)
	Power supply not correct	Check status LED’s of the power supply (D111...D115, ref. to „15.1 Additional Setting Elements “) Check / correct power supply

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