

Control card RK 4003

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Explanation of symbols

→ = jobs to be performed

|| = important information and instructions

1. Function

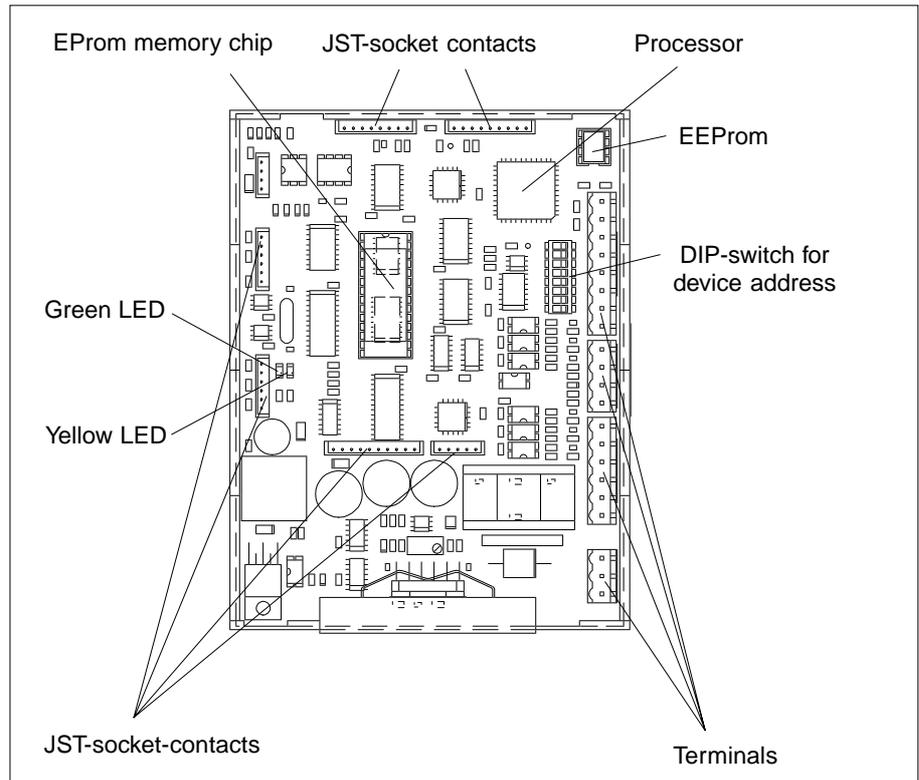
1.1 Purpose

Control card RK 40.. forms the centrepiece of a control loop. The control card receives all the necessary signals required for the control system. Acknowledging of the selected operating mode is performed by the control card to the command station. Sensor and command station signals are termed incoming signals. As control card output a motor is generally triggered that changes the position of the actuator. The control card establishes the deviation of the actual position from the set position and emits appropriate signals to harmonise the actual and set positions via the actuator.

1.2 Design

The control card consists of the following modules:

- one processor
- one memory chip with EProm and EEPROM
- one DIP switch for the device address
- several JST socket-contacts
- several terminals
- one green LED for the operating voltage
- and one yellow LED for displaying the active power output element



1.3 Operating principle

The operating principle depends on the operating mode selected. The following operating modes are possible:

Actuator manual mode:

In manual mode the actuator may be positioned to the left or right at a required location. The speed may be set in the appropriate parameter.

Actuator center position:

The actuator is moved to the set center position whereby first of all it is moved to the return-to-center switch and the internal position counter set to a defined value. The actuator is then moved to the set center position. The return-to-center switch should be mounted so that at the actuator center position the switching point of the return-to-center switch is crossed. This assures that the actuator may be moved to the center position without any major actuating movement.

Automatic mode:

In automatic mode the position of a web or the tool is controlled according to a guiding criterion. The latter may be an edge or the set position of an interface. The guider hereby tries to correct any deviation of the actual from the set position immediately. A prerequisite to guiding is that the guider be enabled.

Guider enable in automatic mode:

The guider enable only influences automatic mode and may be activated on control card RK 4... or via an interface.

Web offset:

A web offset may be set in automatic mode. A web offset means that the set position value may be changed negatively or positively.

In the case of fixed sensors or a single-motor support beam with two adjusting slides the web offset is limited to 75 % of the sensor measuring range. In the case of the remaining applications with support beams the web offset may be extended to the entire support beam actuating range.

Oscillation:

In automatic mode, a set oscillating value is added to the set position value. The oscillating mode, time and path may be set in the appropriate parameters or via the command station. In the case of fixed sensors, oscillation is only possible within 75 % of the measuring range.

Park sensor:

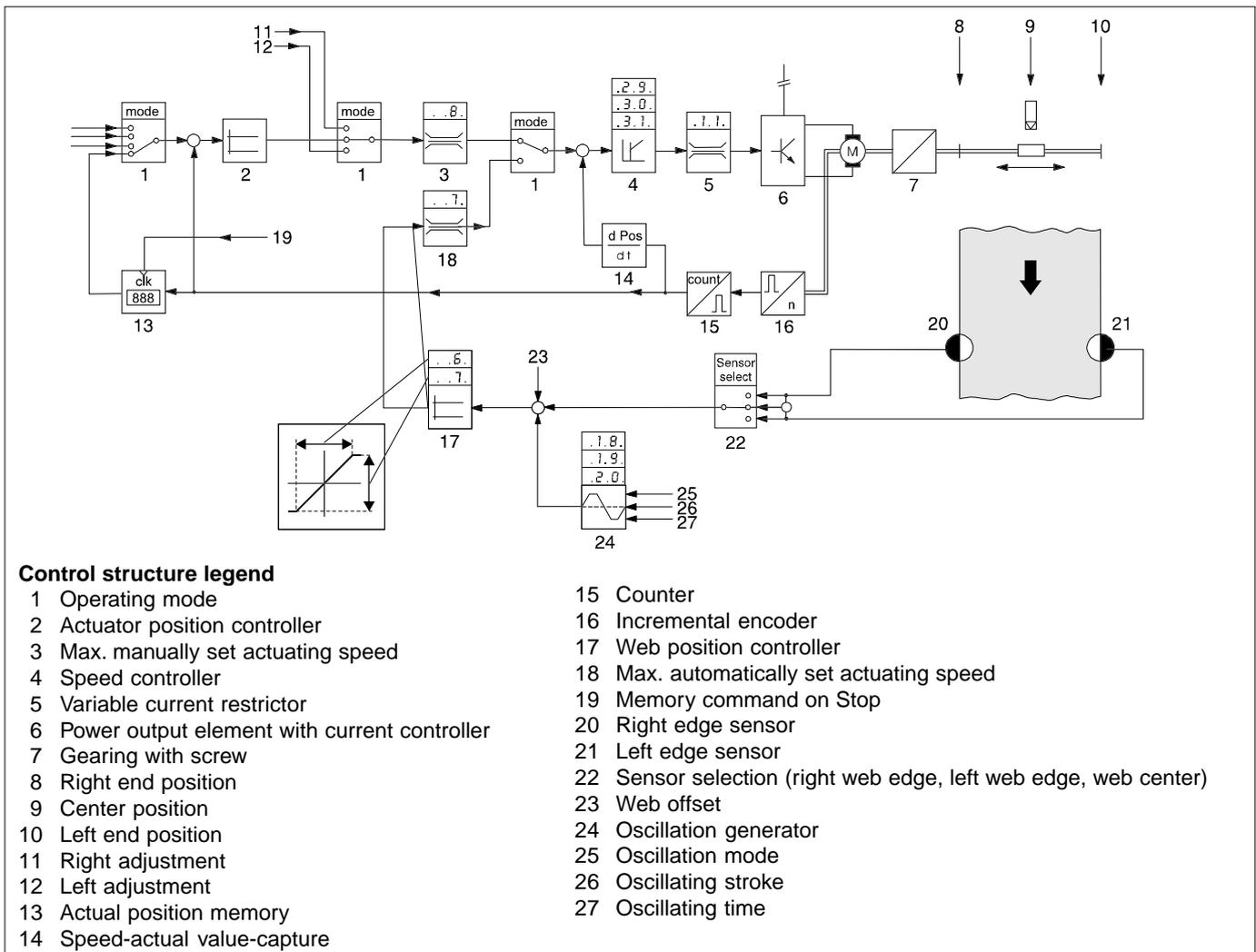
When a support beam is used the adjusting slide and sensor/tool mounted on it is moved to the outer end position (towards the outside).

Edge search:

The sensor/s searches for and follows the web edge until the operating mode is changed, i.e. by a guider enable.

1.4 Control structure with stegem control card for proportional actuators RK 4003-0001U_ZH

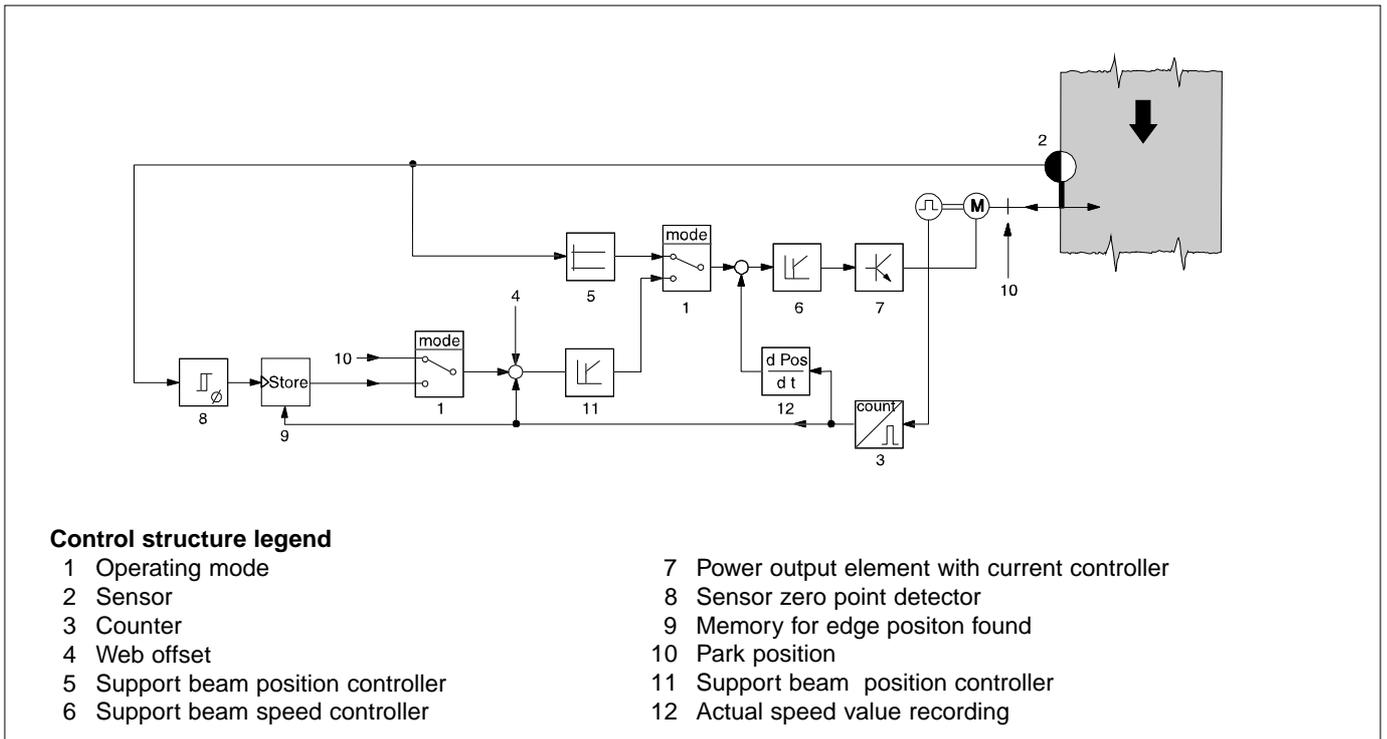
In the case of control structures for proportional actuators the web actual position value is compared with the required set position value and, in the event of a deviation is fed to a P position controller as a guiding difference. The resulting set speed value is compared with the actual speed value and fed to the PID speed controller. The latter outputs a pulse width-modulated signal to the power output element. The following are available as proportional actuators: DRS pivoting frame, VWS turning rod, SRS steering roller, WSS reel station, SVS push roller and VSS positioning and follow-up controls.



1.5 Control structure with continuous-action control card RK 4003-0006U_ZB for support beams

On the basis of the sensor signal a support beam a set speed value is calculated by the P-position controller and fed to the speed controller in control structures for support beams. The resulting set speed value is compared to the actual speed value and fed to the PID speed controller. The latter outputs a pulse width-modulated signal to the power output element. In "Edge search" or "Hybird" operating mode the sensor is motor-driven when following up the web edge.

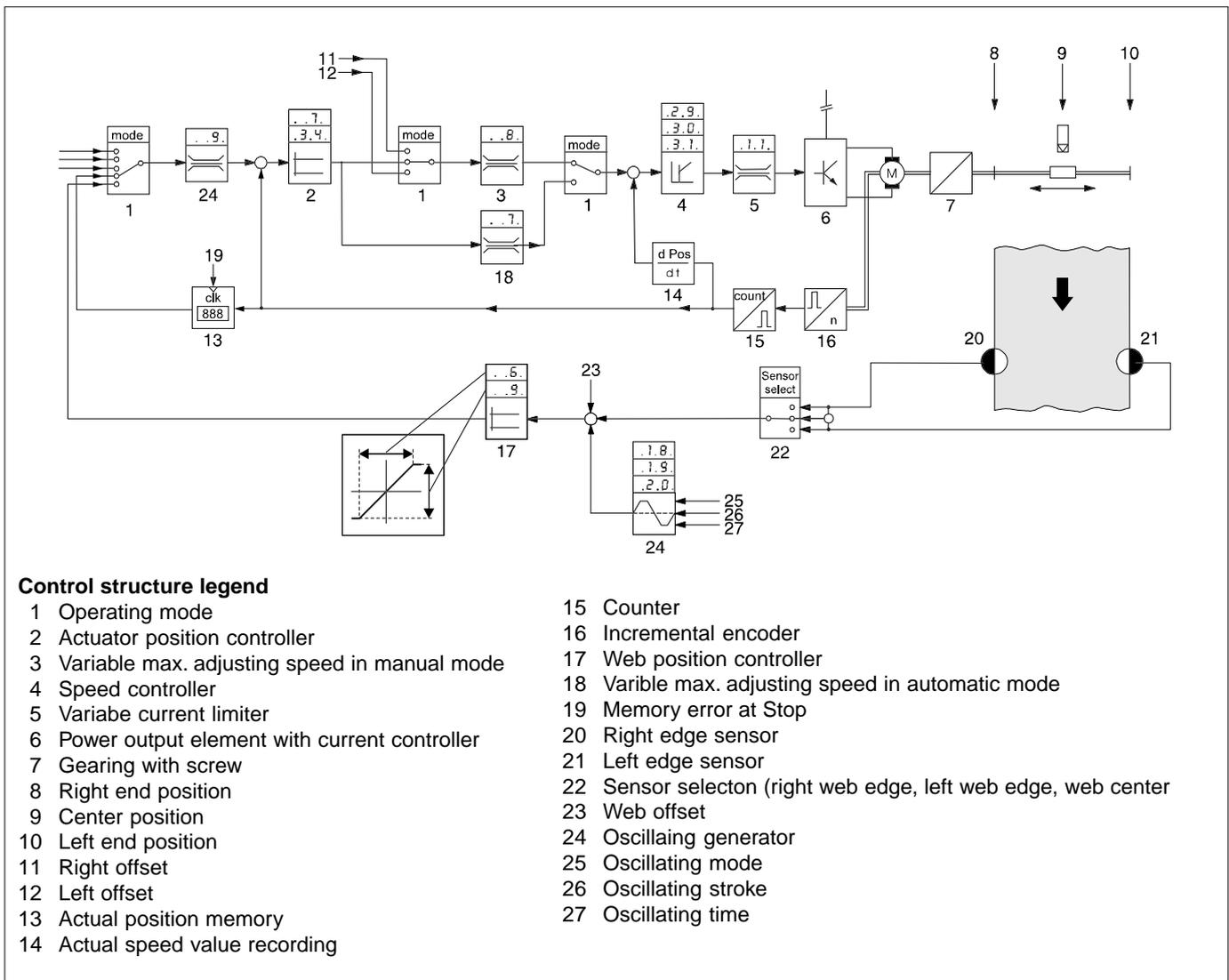
The following proportional actuator is available:
support beam VSS



1.6 Control structure with continuous-action control card RK 4003-0004U_ZB for integral actuators

In control structures for integral actuators the actual web position value is compared with the required set web position value and in the event of a deviation is sent to a P-position controller as a guiding difference. The latter produces the necessary set position value for the actuator. The actuator's current actual position value is compared with the required set position value and fed to the actuator's position controller as a guiding difference. The latter produces a set speed value which is compared with the actual speed value, the difference being fed to the PID speed controller. The latter outputs a pulse width-modulated signal to the power output element. The following are available as integral actuators:

Segmented roller guider SWS, steering roller VGA, edge and width spreader BCS.

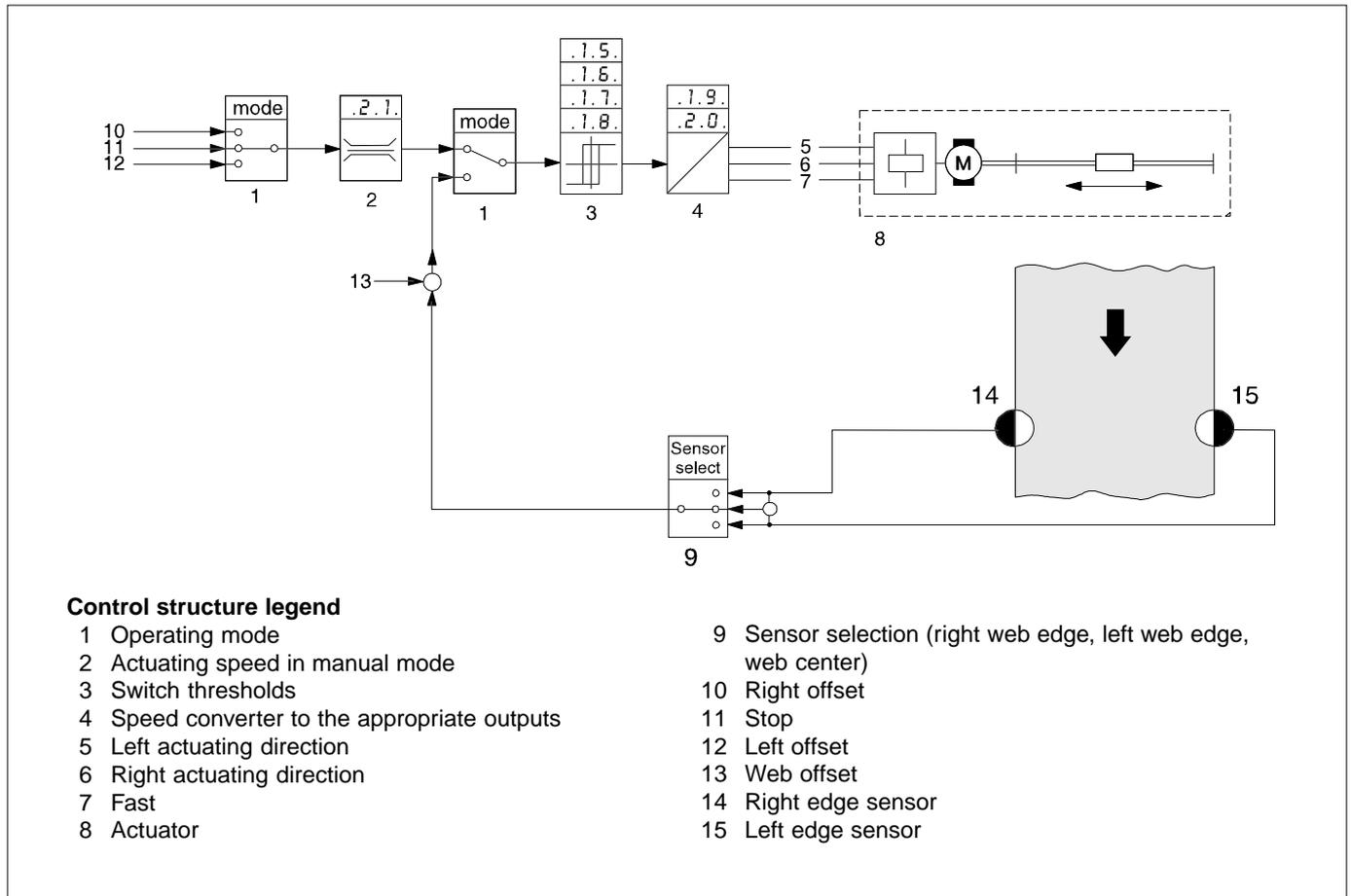


1.7 Control structure with continuous-action control card (three-position control card) RK 4003-0005U_ZC for proportional actuators

In control structures for proportional actuators the web or tool actual position value is compared to the required set web or tool position value. Should there be a deviation, the latter will be sent to a three-position control card. Depending on the set switch thresholds it switches an output. The actuator is controlled on-site. Should the difference be within the variably set window, none of the outputs are set.

The following proportional actuators are available:

Reel station WSS, turning rod VWS.



2. Type overview

The following table provides an overview of the most common digital controllers. The individual digital controllers (DC) are specified in the vertical columns. The crosses mark the accompanying components (PK, AK, LK, usw.).

Control card RK 4003

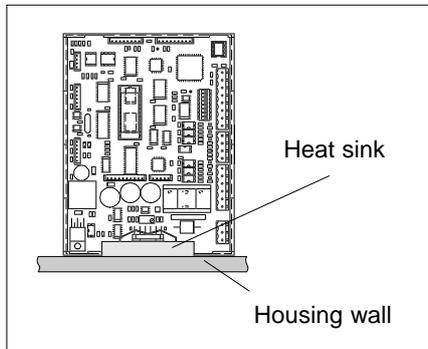
Type	RK 4003	PK 4002	AK 4002	AK 4012	LK 4002	LK 4010	RT 4011	RT 4019	RT 4070	ZC 4061
DC 0110	X		X							
DC 0111	X		X		X					
DC 0112	X		X				X			
DC 0113	X		X		X		X			
DC 0140	X									
DC 0141	X				X					
DC 0142	X						X			
DC 0143	X				X		X			
DC 0144	X					X	X			
DC 0145	X					X				
DC 0150	X			X						
DC 0151	X			X	X					
DC 0160	X		X							
DC 0162	X		X				X			
DC 0163	X		X		X		X			
DC 0210	X	X	X		X					
DC 0211	X	X	X				X			
DC 0212	X	X	X				X			
DC 0213	X	X	X		X		X			
DC 0214	X	X	X			X	X			
DC 0240	X	X								
DC 0241	X	X			X					
DC 0242	X	X					X			
DC 0243	X	X			X		X			
DC 0244	X	X				X	X			
DC 0245	X	X				X				
DC 0250	X	X		X						
DC 0263	X	X	X		X		X			
DC 1010	X		X					X		
DC 1040	X							X		
DC 1044	X					X		X		
DC 1050	X			X				X		
DC 1110	X		X					X		
DC 1111	X		X		X			X		
DC 1140	X							X		
DC 1141	X				X			X		
DC 1144	X					X		X		
DC 1147	X							X		X
DC 1150	X			X				X		
DC 1151	X			X	X			X		
DC 1161	X		X		X			X		
DC 1210	X	X	X					X		
DC 1240	X	X						X		
DC 1241	X	X			X			X		
DC 1247	X	X								X
DC 1250	X	X		X				X		
DC 2110	X		X						X	
DC 2111	X		X		X				X	
DC 2140	X								X	
DC 2141	X				X				X	
DC 2210	X	X	X						X	
DC 2211	X	X	X		X				X	
DC 2240	X	X							X	
DC 2241	X	X			X				X	

3. Assembly

Control card RK 40.. is normally mounted in a sheet steel housing or E+L device.

If the control card is supplied separately it should be mounted in a control cabinet apart from heavy current-carrying modules .

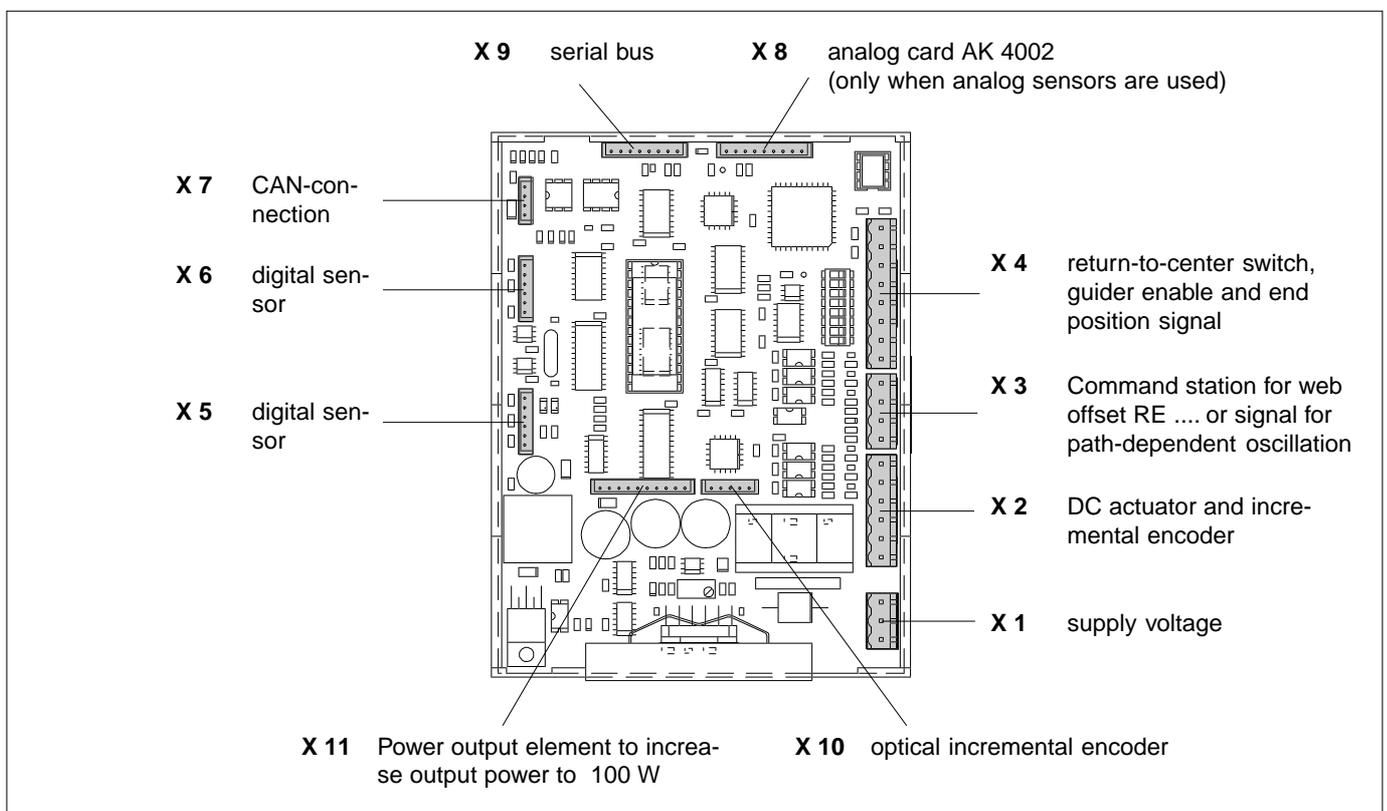
The maximum distance to the DC actuator may not exceed 10 m. If an output power greater than 20 W is required, the power transistor heat sink must be mounted on the control cabinet housing to improve heat dissipation or other suitable means of heat dissipation provided. On assembly please ensure that a heat conductive paste is applied between the connection and that the latter is additionally secured by a screw.



4. Installation

- Connect electrical leads according to the attached wiring diagram.
- Shield signal lines and run separately from heavy current-carrying leads.

The connecting line between the control card and DC actuator may be run in a cable up to a length of 3 m. Within a distance of 3 m to 10 m the motor cable and the incremental encoder **must** be run apart.



Pin assignment RK 40..

4.1 Terminal assignment X 1 to X 4

Terminal	No.	Assignment
X 1	1	+24 V DC supply voltage
	2	0 V
	3	Ground
X 2	1	DC actuator
	2	DC actuator
	3	Incremental encoder on DC actuator channel A
	4	Incremental encoder on DC actuator channel B
	5	+24 V DC
	6	0 V
X 3	1	+24 V DC
	2	Web offset signal or path-dependent oscillation signal
	3	0 V
	4	Range limit sensor
X 4	1	Guider block signal or Automatic mode signal (only for minimal operation)
	2	0 V potential for guider block
	3	+24 V DC return-to-center switch
	4	Return-to-center switch signal
	5	0 V return-to-center switch
	6	+24 V DC
	7	Actuator end position signal
	8	0 V

Which connectors are assigned is specified in the wiring diagram.

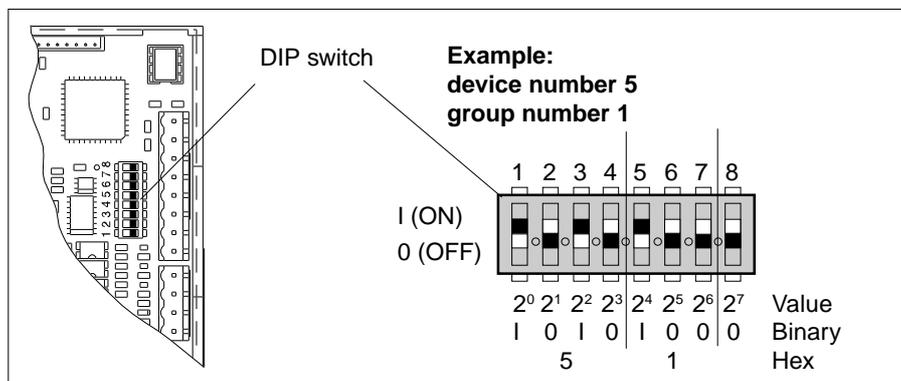
The guider blocking is intended for on-site customer requirements where the actuator is to remain in the current position. If the guider blocking feature is activated (make contact) the actuator will remain in this position until the contact is opened again.

5. Address setting

Each component in a control loop features its own device address which appears only once in the entire CAN network. The device address is set on the DIP switch as a binary code. The device address consists of the device and group number. Which device address must be set on the control card is specified in the block diagram. In it, both the device address and the position of the individual DIP switches are illustrated.

The DIP switch is assigned as follows:

- Switch 1 - 4 device number
- Switch 5 - 7 group number
- Switch 8 block SETUP mode (no significance for setting the device address)



When setting the device address please ensure that the binary number is set starting from the **left**.

The following device numbers are permissible:

- 5 = Position controller for web or tool actuator (e.g. pivoting frame)
- 6 = Position controller for sensor system actuator (support beam), with drive on right in direction of web travel
- 7 = Position controller for sensor system actuator (support beam), with drive on left in direction of web travel
- 8 = Slave controller 1 for device number 6 (special application)
- 9 = Slave controller 1 for device number 7 (special application)
- 10 = Slave controller 2 for device number 6 (special application)
- 11 = Slave controller 2 for device number 7 (special application)

6. Parameters

In setup mode, setup parameter may be displayed and some changed. To access the control card setup mode, a command station DO, operating panel RT or a CANMON program from E+L is required.

The parameter number is specified in the **Number** field of the table, the abbreviation in the **Name** field. The **Default** field indicates the standard settings, **Min** and **Max** are the permissible limit values in each case. The unit is specified in the **Unit** field. The **Description** field explains the parameter function.

6.1 Parameter list

RK 4003-0001U_ZH

RK 4003-0006U_ZB

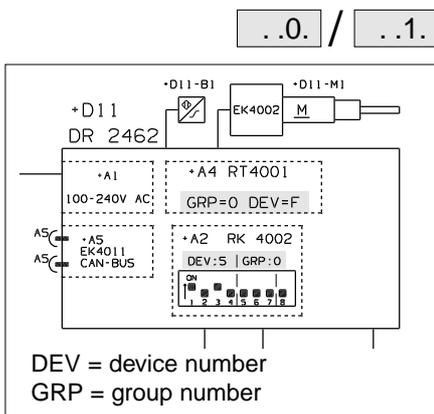
No.	Name	Default	Min.	Max.	Unit	Description
..0.	edit device	XX	01	0F	hex	Select device number See block diagram for device number
..1.	edit group	XX	00	07	hex	Select group number See block diagram for group number
..2.	reset settings	0	0	2	-	Factory settings 1 = customer-specific settings 2 = internal value specification (default)
..3.	start service	0	199	R/W	-	Starting a function 1 = reset guider 2 = save changed parameter 10 = AG calibration run (device x.5) 11 = Supp. beam cal. run (device x.6,x.7,x.8,x.9,x.10,x.11) 12 = AG calibration run with specification of gearing constants (device x.5) 42 = select expanded SETUP mode 44 = save changed parameters and additional backup 99 = delete data memory ! CAUTION !
..4.	motor controller	1.5	1.5	1.5	-	Software version
..5.	auto offset	0.0	-3250.0	3250.0	mm	Web offset User input (in automatic mode)
..6.	prop range +/-	2.0	-3250.0	3250.0	mm	Guider proportional range Web offset in mm with which the DC actuator runs at maximum speed. Reduce value in the case of inaccurate guiding! Increase value in the case of uneven guiding!
..7.	speed automatic	20	1	120	mm/s	Actuating speed in automatic mode
..8.	speed manual	5	1	120	mm/s	Actuating speed in manual mode
..9.	pos. range +/-	0	0	32500	mm	Actuatign range limitis
.1.0.	step width	0.1	0.1	10	mm	Step width in relation to parameter ..5.
.1.1.	motor current	0.4	0.0	6.4	A	See motor type plate for motor nominal current
.1.2.	motor direction	0	0	1	-	Motor direction of rotation 0 = normal 1 = reversed
.1.3.	motion range +/-	12	1	32500	mm	Maximum actuating path measured at outfeed roller
.1.4.	inv ext target	0	0	1	-	Web offset via command station RE 1721 0 = normal 1 = reversed
.1.5.	control mode	0	0	5	-	Operating mode 0 = edge search 1 = hybrid 2 = minimal operation 3 = hybrid minimal 4 = automatic centering 5 = hybrid edge guiding
.1.6.	zero offset	0.0	-3250.0	3250.0	mm	center position offset Value corresponds to difference between mechanical center and set center position.
.1.7.	reserved 1	0	0	0	-	no function

No.	Name	Default	Min.	Max.	Unit	Description
.1.8.	osz. amplitude	0	0	500	mm	Oscillation stroke
.1.9.	osz. cyc. time	20	2	700	s	Oscillation time time-dependent = sec/ cycle path-dependent = pulse/ cycle
.2.0.	osz. mode	50	10	90	-	Oscillating mode 90 = triangular-wave 10 = square-wave
.2.1.	subsystem 0 adress	0.0	0.0	7.F	hex	Address serial bus card 0
.2.2.	subsystem 1 adress	0.0	0.0	7.F	hex	Address serial bus card 1
.2.3.	subsystem 2 adress	0.0	0.0	7.F	hex	Address serial bus card 2
.2.4.	subsystem 3 adress	0.0	0.0	7.F	hex	Address serial bus card 3
.2.5.	subsystem 4 adress	0.0	0.0	7.F	hex	Address serial bus card 4
.2.6.	subsystem 5 adress	0.0	0.0	7.F	hex	Address serial bus card 5
.2.7.	subsystem 6 adress	0.0	0.0	7.F	hex	Address serial bus card 6
.2.8.	subsystem 7 adress	0.0	0.0	7.F	hex	Address serial bus card 7
.2.9.	speed_P	11	0	50	-	P-component of internal speed controller may not be changed DR 127./227. = 8 20 W motor and VS 35.6 = 11 50 W/100 W motor = 22
.3.0.	speed_I	6	0	50	-	I-component of internal speed controller may not be changed DR 127./227. = 4 20 W motor und VS 35.6 = 6 50 W/100 W motor = 12
.3.1.	speed_D	12	0	50	-	D-compoent of internal speed controller may not be changed DR 127./227. = 2 20 W motor and VS 35.6 = 12 50 W/100 W motor = 24
.3.2.	chang nix/t/off/on	2	0	7	-	Time-dependent oscillation 0 = Oscillation is switched on and off on DO 0100/ 0101 or DO 0020/0021 via the "Oscillation" key 1 = Oscillation is switched on and off on DR keyboard DO alternately via the "Automatic" key or "Oscillation" key on DO 0100/ 0101 or DO 0020/ 0021 2 = Oscillation is always OFF 3 = Oscillation is always ON Path-dependent oscillation 4 = Oscillation is switched on and off on DO 0100/ 0101 or DO 0020/ 021 via the "Oscillation" key 5 = Oscillation is switched on and off on DR keyboard DO 1000/1001 alternately via the „Automatic" key or via the "Oscillation" key on DO 0100/ 0101or DO 0020/ 0021 6 = Oscillation is always OFF 7 = Oscillation is always ON

Control card RK 4003

No.	Name	Default	Min.	Max.	Unit	Description
.3.3.	reserved 2	0	0	0	-	no function
.3.4.	reserved 3	0	0	0	-	no function
.3.5.	reserved 4	0	0	0	-	no function
.3.6.	reserved 5	0	0	0	-	no function
.3.7.	reserved 6	0	0	0	-	no function
.3.8.	gearconstant	25.0	10.0	3200.0	Imp/mm	gear constant: The gear constant is calculated as follows: Value = (32* i) / S. i = gear (e.g. i= 8:1) S = screw pitch

6.2 Explanation of parameters for RK 4003-0001U_ZH RK 4003-0006U_ZB



Select device number/group number

(..0. edit device / ..1. edit group)

The device address is composed of the device number and the group number. Each device with a CAN connection (serial or parallel) features its own device address which may only be assigned once in the entire CAN network.

To allow a specific device to be addressed in the control loop, the device number must be set in parameter "..0. edit device" and the group number in parameter "..1. edit group". The device and group numbers are specified in the block diagram for each device with a CAN address.

These two parameters are only relevant for command stations with a SETUP-function.

..2.

Factory settings (..2. reset settings)

In the event of a malfunction or incorrect parameter entries the E+L basic settings or default values may be reloaded. The following settings are possible:

- 1 = Load E+L basic settings. This basic E+L setting is only possible for compact systems set by E+L prior to delivery whereby all parameter settings were saved in a backup list. These set values are thus reloaded.
- 2 = Load default values. The default values specified in the parameter list are loaded. The default values are however only loaded for the currently selected device. On the remaining devices **no** parameter values are changed.

.3.**Starting a function (..3. start service)**

These parameter are used to start various procedures that are specially required during system commissioning. The following functions are possible:

1 = Reset

Saving of all parameter values and restart of the selected device. When parameter values have been changed, setup mode should always be quit via 1 thus ensuring that all changed parameter values are saved.

2 = Save parameter

Function 2 is identical to function 1, the only difference being that no restart of the selected device is performed.

10 = Actuator initialization run with actuating path specification

Prior to the initialization run the actual actuating path must be determined and entered in parameter .1.3. . The actuator initialization run is started by entering value 10. Before starting, the actuator should be located in its center position as this start position will be saved as the new center position. This center position may be corrected manually at any time via parameter .1.6. .

11 = Support beam initialization run

The initialization run for all the support beams in this group is performed when value 11 is entered.

12 = Actuator initialization run with gear constant specification

In this initialization run the maximum actuating path is determined and entered in parameter .1.3. by first entering the gear constant (parameter .3.8.).

13 = Setting set position value

On follow-up control systems with camera scanning the current position of the actuator/tool is calibrated to the detected web edge of the camera. As the set position may be freely selected for the camera, the actuator position must be calibrated to the required camera set position. To do so, the actuator is moved manually to the required position and the web located in the camera scanning range at this position. Calibration has the effect of offsetting the actuator in the same direction and by the same degree as the web.

42 = Expanded setup mode

In setup mode all parameters featured may be selected and the parameter values viewed. Some of the parameter values may be changed immediately. Parameters with a higher degree of security may only be changed once the value 42 is entered. This entry permits access to what is known as "expanded setup mode". All parameters that may be changed can be changed in expanded setup mode.

44 = Save safety parameter list

Saving of the changed parameters and additional saving of a safety parameter list (backup list). Systems set by E+L are supplied with the afore-mentioned saving.

This command should only be used by E+L personnel as original settings and values are irreversibly deleted by this command.

99 = Delete parameter values

Deleting of all internal calibrations and parameter values. All parameter values are set to default values.

This command may only be performed by qualified personnel.

|| Commands are only performed after a parameter change!

.4.

Software version (.4. motor controller)

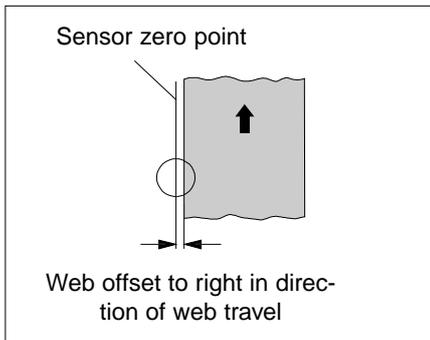
The current software version is displayed. The no. after the dot indicates the software version.

Parameter value	Software version
1.0	A
1.1	B
1.2	C
1.3	D
1.4	E
1.5	F
etc.	

.5.

Web offset (.5. auto offset)

The web offset feature allows the web set position to be offset to the left or right during automatic mode. The offset is set directly in this parameter by a command station or digital interface. The step width for the web offset may be set in parameter .1.0. . The set position offset is displayed in mm on the command device. Set web offsets are saved until a new entry is made, even when the operating voltage is switched off .

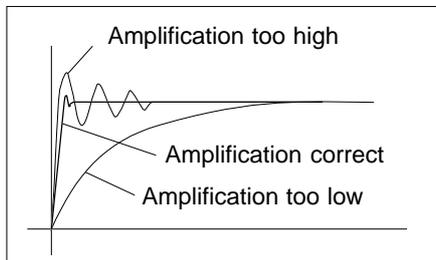


|| In the case of fixed sensors the web offset is limited to 75% of the sensor measuring range. In conjunction with a motorized support beam, the web offset is limited by the support beam actuating path.

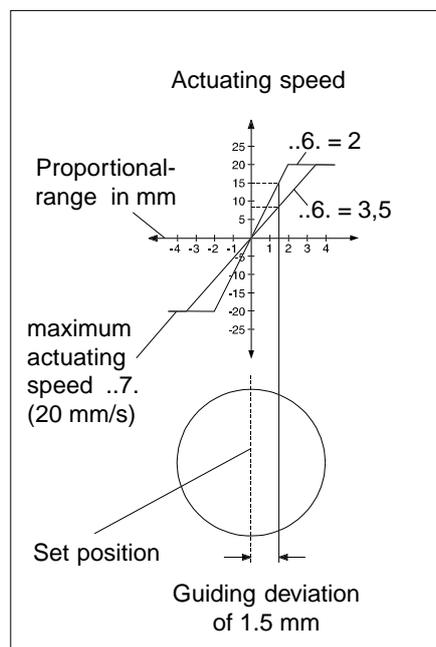
..6.

Proportional range (..6. prop range +/-)

The amplification of the position controller is set via parameters ..6. und ..7. Please also bear in mind that a change in the one of the two parameters will always have an effect on the amplification.



Amplification is correctly set if the error is rectified after overshooting briefly. If the position controller is set too sensitively, it will continue to hunt. If amplification is too low, the control loop is too sluggish. The optimum degree of amplification may be determined by a characteristic curve writer. In practice, the amplification may also be determined via trial and error.



Given a constant maximum actuating speed (parameter ..7.) the smaller the set proportional range is, the greater the amplification of the web guider will be.

A negative proportional range may **not** be set as the direction of rotation will thus be reversed.

By reducing the proportional range the characteristic curve (see diagram above) will become steeper. The steeper the characteristic curve, the greater the actuating speed will be in the event of a guiding deviation and thus the system will be more sensitive. The characteristic curve indicates at which actuating speed the actuator attempts to rectify an error.

In this example a proportional range of 2 mm or 3.5 mm is accepted, with a maximum actuating speed of 20 mm/s. Given a guiding deviation of 1.5 mm, the actuating speed amounts to 15 mm/s with a proportional range of 2 mm and 8.0 mm/s with a proportional range of 3.5 mm.

The values may also be calculated arithmetically:

Amplification (G) = Parameter ..7. / Parameter ..6.

Correction speed (VK) = guiding deviation * amplification (G)

Example 1:

$$G = 20/2 = 10 \text{ 1/s}$$

$$VK = 1.5 \text{ mm} * 10 \text{ 1/s}$$

$$VK = 15 \text{ mm/s}$$

Example 2:

$$G = 20/3.5 = 5,71 \text{ 1/s}$$

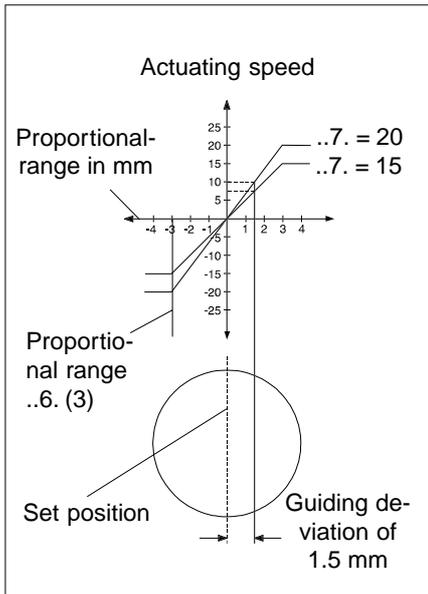
$$VK = 1.5 \text{ mm} * 5.71 \text{ 1/s}$$

$$VK = 8.6 \text{ mm/s}$$

Optimization:

Reduce the proportional range in small steps only. After each change in the parameter value the web should be diverted to automatic mode so that hunting may be immediately detected.

Reduce the proportional range until the guider begins to hunt. Then increase the proportional range again until hunting may no longer be observed.

..7.**Actuating speed in automatic mode (..7. speed automatic)**

Given a constant proportional range (parameter ..6.), the higher the set maximum actuating speed, the greater the amplification of the web guider will be.

By increasing the maximum actuating speed (see diagram on left) the characteristic curve will become steeper. Given a guiding deviation, the steeper the characteristic curve, the higher the actuating speed thus the system will react more sensitively. The characteristic curve indicates at which actuating speed the actuator attempts to rectify an error.

In this example a maximum actuating speed of 15 mm/s or 20 mm/s was accepted with a proportional range of 3 mm. At a maximum speed of 15 mm/s the actuating speed amounts to approx. 7.5 mm/s given a guiding deviation of 1.5 mm and approx. 10 mm/s with a maximum actuating speed of 20 mm/s.

The values may also be calculated arithmetically:

Amplification (G) = Parameter ..7. / Parameter ..6.

Correction speed (VK) = Guiding deviation * Amplification G

Example 1:

$$G = 15/3 = 5.0 \text{ 1/s}$$

$$VK = 1.5 \text{ mm} * 5.0 \text{ 1/s}$$

$$VK = 7.5 \text{ mm/s}$$

Example 2:

$$G = 20/3 = 6.71 \text{ 1/s}$$

$$VK = 1.5 \text{ mm} * 6.71 \text{ 1/s}$$

$$VK = 10.1 \text{ mm/s}$$

If the actuating speed is too high the web guider will begin to hunt.

|| The maximum actuating speed must be set higher than the maximum error speed, however it must not exceed the DC actuator nominal actuating speed.

..8.**Actuating speed in manual mode (..8. speed manual)**

The speed may be set independently of the automatic mode speed. With this speed setting the actuator may be positioned both in manual mode and when moving into center position. The speed may be set in steps of 1 mm/s.

..9.**Actuating range limit (..9. pos. range +/-)**

The actuating range limit prevents the DC actuator always reaching its mechanical screw stop or mechanical stop. The actuating range limit on compact systems is always works set to slightly less (approx. 2 mm) than the maximum actuating path (see parameter .1.3.) of the actuator. When the DC actuator is mounted by the customer, the actuating range limit must be set by the customer .

The set value is always in relation to the actuating range center at the outfeed (e.g. transfer roller).

The entry of a value of 15 means 15 mm to the left and right, thus a total of 30 mm.

|| This actuating range limit must not be used as a form or personnel or device protection. To protect personnel or equipment, end position limiting must be provided with additional limit switches or a stopping element.

.1.0. Web offset step width (.1.0. step width)

The web offset step width may be set in 1/10 mm.

.1.1. Nominal motor current (.1.1. motor current)

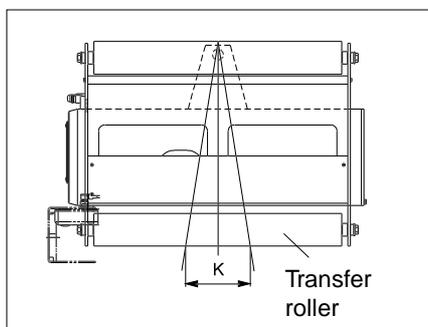
The nominal motor current specified on the DC actuator type plate should be set here. If the motor current is set too high, the DC actuator may be overloaded or even destroyed.

.1.2. Motor rotational direction (.1.2. motor direction)

The DC actuator motor rotational direction may be reversed via this parameter.

|| An initialization run must be performed once the motor rotational direction has been reversed.

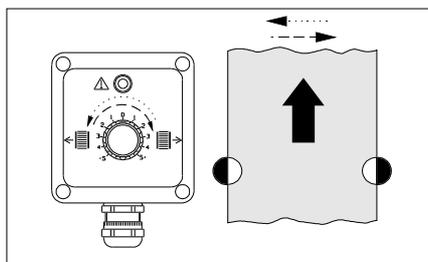
.1.3. Maximum actuating path (.1.3. motion range +/-)



The actual actuating path (dimension $K/2$) covered by the actuator at the outfeed (transfer roller) must be entered in this parameter. Since, in the case of certain actuators (e.g. pivoting frames) the actuating path of the actuator is not identical to that of the DC actuator, the exact value must be entered.

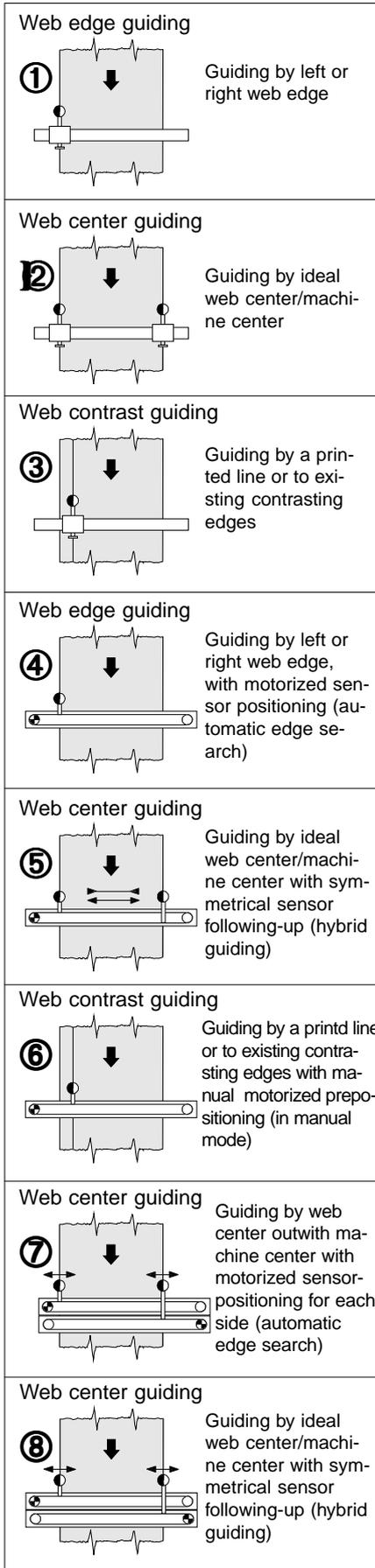
The gear constant (parameter 38) is determined on the basis of this setting during the initialization run. The gear constant effects the normalization of the actuating speed and path.

.1.4. Web offset effective direction (.1.4. inv ext target) only in conjunction with operating panel RE 1721



When the potentiometer is turned in a clockwise direction (to the right) a web offset to the right must also be effected. If the web offset is in the opposite direction (to the left) this parameter may be used to reverse the effective direction of the operating panel.

.1.5.



Operating modes (.1.5. control mode)

The following operating modes are available for the guider:

0 = "Edge search" (standard operating mode)

The following guiding types are possible:

- ①, ②, ③, ④, ⑥ and ⑦

1 = "Hybrid" (only in combination with a motorized support beam)

Guiding by the ideal web center/machine center with symmetrical sensor following-up (hybrid guiding) given changes in the web width. The web offset with a single-motor support beam (with symmetrical adjustment) may amount to max. $\pm 75\%$ of the sensor measuring range.

The following guiding types are possible:

- ⑤ and ⑧

2 = "Minimal operation"

The guider is switched between "Automatic" (0V) and "Center position" (24V) modes via the "Guider block" contact. In this operating mode the "Guider blocking" function is not possible. The following guiding types are possible:

- ①, ② and ③

3 = "Hybrid Minimal"

The "Automatic" and "Center position" keys are used to operate the support beam. On actuating the "Center position" key the sensors are parked (at the outside). In "Automatic" mode the sensors are positioned at the web edges. This operating mode is identical to operating mode 1, only the operating manner is changed.

The following guiding types are possible:

- ⑤ and ⑧

4 = "Automatic centering"

This operating mode is identical to operating mode 0. Once the operating voltage is supplied again, the actuator first moves to its return-to-center switch for position counter calibration then the most recently saved position and operating mode active before the voltage drop are resumed.

The following guiding types are possible:

- ①, ②, ③, ④, ⑥ and ⑦

5 = "Hybrid edge guiding"

Guiding by the ideal machine center with symmetrical sensor following-up or guiding by the left or right web edge. The prerequisite being either a two-motor support beam or a one-motor support beam with symmetrical adjustment. Fork sensors may only be implemented for this operating mode to a limited extent.

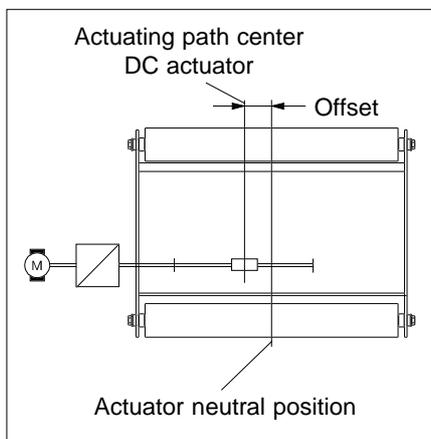
The required sensor is selected by the sensor keys for guiding by the web edge. The actuator and support beam are thus switched to "Manual" mode. On a two-motor support beam the deactivated sensor may also be manually moved to its outside position (outwards, away from the web). The selected sensor may be moved to the required set position via the manual support beam adjustment facility. By pressing the "Automatic" key the web is guided to this set position. If machine center guiding is again required, merely press the "Search edge" key which activates the second sensor which is positioned so that the web may be guided by the machine center again.

The following guiding types are now possible:

⑤, ⑦ and ⑧

.1.6.

Center position offset (.1.6. zero offset)



In "Center position" mode the DC actuator advances to the actuating path center established during calibration. If this position deviates from the actuator neutral position, the latter may be changed by entering an offset value. On a pivoting frame, the neutral position means that the positioning roller is parallel to the guide roller. The difference between the actuating path center and neutral position is known as the offset. The change in the offset value is immediately performed by the DC actuator.

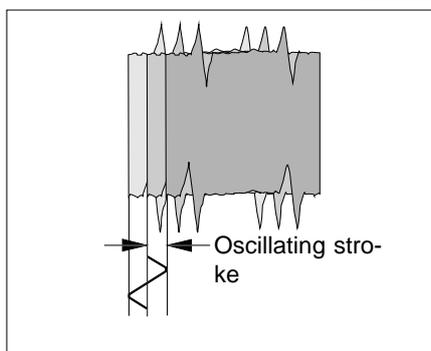
.1.7.

Reserved (.1.7. reserved 1)

Not assigned at present.

.1.8.

Oscillating stroke (.1.8. osz. amplitude)



How far the actuator swivels to the left and right in oscillating mode is determined via the oscillating stroke. The setting may be entered by a command station with oscillation function or directly in this parameter.

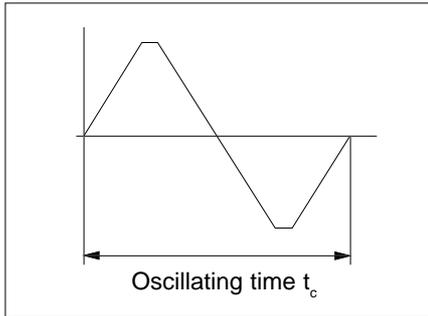
|| In the case of fixed sensors the oscillating stroke may be max. 75 % of the sensor measuring range.

.1.9.

Oscillating time (.1.9. osz. cyc. time)

Time-dependent:

The cycle time (oscillating time t_c) for an oscillating period is determined here. The longer the period, the slower the actuator will oscillate. Entries may be made directly in the parameter or via a command station with oscillating function.

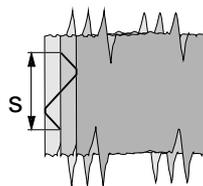
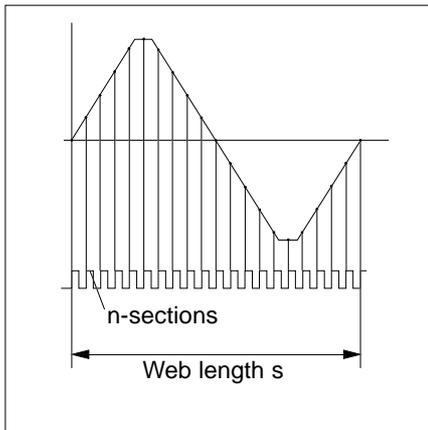


Path-dependent:

In the case of path-dependent oscillation, the oscillating period is determined by path-dependent, external pulses. The oscillating period is divided into n -sections. The maximum number of pulses must not exceed a rate of 20 pulses per second.

The number of pulses to be set may be calculated as follows:

1. Determine path length per oscillating period



s = web length per oscillating period

2. Determine maximum oscillating frequency

$$f_{c \max} = \frac{V_{\max}}{s \times 60}$$

$f_{c \max}$ = maximum oscillating frequency (1/s)

V_{\max} = maximum web speed (m/min)

s = web length per oscillating period (m)

3. Determine no. of pulses

The maximum no. of pulses per period is limited by the maximum input frequency of $f_{e \max}$ 20 Hz.

$$n = \frac{f_{e \max}}{f_{c \max}}$$

$f_{e \max}$ = maximum input frequency 20 Hz

$f_{c \max}$ = oscillating frequency (Hz)

n = no. of pulses per period

The no. of pulses n is entered in the parameter.

The calculation for the external pulse generator may be determined as follows:

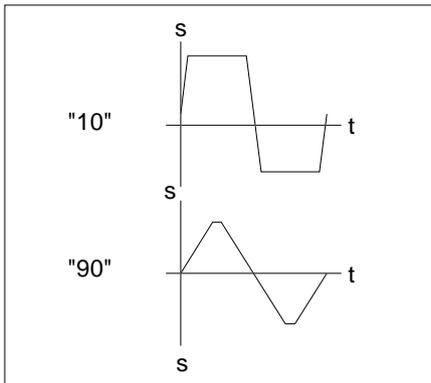
$$f_{a \max} = \frac{n}{s}$$

$f_{a \max}$ = maximum pulse generator output frequency (Hz)

s = web length per oscillating period (m)

n = no. of pulses per period

At maximum web speed the external pulse generator must emit the calculated no. of pulses $f_{a \max}$.

.2.0.**Oscillating mode** (.2.0. osz. mode)

The oscillating mode determines the oscillating pattern. By entering a value between 10 and 90 the pattern may be changed from square to triangular wave.

10 = **Square** (steep rise/fall of the oscillating signal, long dwelling period in the oscillating end position)

90 = **Triangular** (gentle rise/fall of the oscillating signal, short dwelling period in the oscillating end position)

.2.1. **.2.8.****Serial bus cards 1 to 8**

(.2.1. subsystem 0 address - .2.8. subsystem 7 address)

Control card RK 40.. features a serial bus connection. Up to 8 CAN-compliant devices (e.g. command station, several logic cards etc.) may be serially connected via this serial bus. The addresses of the serial devices are entered automatically, from the bottom up, beginning in parameter 21 (1st slot = address in parameter 21, 2nd slot = address in parameter 22 etc.). In the case of a double address, the address must be changed in the relevant parameter. The place in front of the dot specifies the group number and the place after the dot the device number.

Example:

Device number:	A	9	F	C
Group number:	0	0	3	7
Entry in parameter	0.A	0.9	3.F	7.C

.2.9. **.3.0.** **.3.1.****P-component** (.2.9. speed_P); **I-component** (.3.0. speed_I); **D-component** (.3.1. speed_D)

The P, I and D components of the speed controller may not be changed. The values are already optimized ex works.

|| A change to these 3 parameter impairs guider operation. Changing these values may lead to impaired guiding and even total system failure.

The following table specifies the parameter values that must be entered for the various device types. The main difference, apart from the devices, recorded type-wise, is that of motor power.

Devices	Parameter values in parameter:		
	.2.9. P	.3.0. I	.3.1. D
AG 257. (50 W) AG 259. (50 W) AG 267. (100 W) AG 269. (100 W) AG 457. (50 W) AG 459. (50 W) AG 467. (100W) AG 469. (100 W) DR 246. (50 W) VG 18.. VS 50.. VS 60..	22	12	24
DR 127. DR 227. DR 2292	8	4	2
AG 249. (20 W) AG 408. DR 21.. DR 22.. DR 246. (20 W) VG 14.. (20 W) VS 35.6	11	6	12
DR 2261 with FR 1051	15	10	24
AG 2593 DR 246. with AG 2593	11	3	3
DR 247.	30	3	1

.3.2.**Start oscillation** (.3.2. chang nix/t/off/on)

Oscillating mode may be started in different ways depending on the command station featured. In addition it must be distinguished whether oscillation is time or path-dependent in each case.

In the case of time-dependent oscillation, the duration of an oscillating cycle depends on the set time and in the case of path-dependent oscillation on the external pulses. See parameter .1.9. .

When oscillating mode is switched off the cycle which has been started will continue to the next zero point. In the case of path-dependent oscillation the appropriate no. of pulses must be supplied until zero point is reached.

The following table illustrates the various setting options:

Parameter value:		Explanation:
Time-dependent	Path-dependent	
0	4	Oscillation is switched to automatic mode or off via a command station with oscillation key or digital interface (command code) regardless of the automatic key.
1	5	If no command station with oscillation key or digital interface is featured, switching oscillating on or off may in this case be effected via the automatic key. Once automatic mode has been started, by again pressing the automatic key, oscillation is started or stopped while the actuator always remains in "Automatic" mode.
2	6	Oscillation is generally switched off. Even if a oscillation key is featured, oscillation can still not be started.
3	7	Oscillation is always active. Automatic mode without oscillation is not possible. Oscillation starts together with automatic mode!

.3.3.3.7.

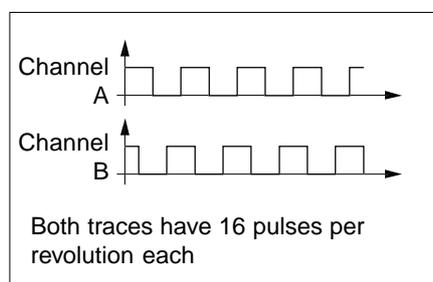
Reserved (.3.3. reserved 2) to (.3.7. reserved 6)

Not assigned at present.

.3.8.

Gear constant (.3.8. gearconstant)

The gear constant corresponds to the incremental encoder pulses per 1 mm of actuating path. This is calculated as follows:



$$\text{Gear constant} = \frac{\text{Enc} \times 4 \times i}{s}$$

Enc = no. of encoder pulses (Encoder) per revolution

i = gear transmission

s = spindle pitch (mm)

Calibrating the gear constant with actuating path specification:

The gear constant is automatically determined during the initialization run (parameter 3, value 10) and entered in the parameter. The prerequisite being that the maximum actuating path is determined before the initialization run and entered in parameter .1.3. .

Calibrating the actuating path with gear constant specification:

The mechanical actuating path is automatically determined during initialization via parameter 3, value 11 or 12 and entered in parameter .1.3. . The prerequisite being that the gear constant is determined before initialization and entered in parameter .3.8. .

Support beam	Gear constant
VS 35.6	25.0
VS 50..	16.4
VS 60..	30.7

|| If the gear constant is changed an initialization run (parameter 3, value 11 or 12) must be performed.

6.3 Parameter list RK 4003-0004U_ZB

No.	Name	Default	Min.	Max.	Unit	Description
..0.	edit device	XX	01	0F	hex	Select device number See block diagram for device number
..1.	edit group	XX	00	07	hex	Select group number See block diagram for group number
..2.	reset settings	0	0	2	-	Works settings 1 = customer-specific settings 2 = internal value specification (default)
..3.	start service	0	0	199	-	Starting a function 1 = reset guider 2 = save changed parameters 10 = AG calibration run (device x.5) 11 = support beam cal. run (device x.6,x.7,x.8,x.9) 12 = AG calibration run with specification of gear constant (device x.5) 13 = guiding adoption of DC actuator 42 = select expanded SETUP mode 44 = save changed parameters and additional backup 99 = delete data memory ! CAUTION !
..4.	motor controller	1.1	1.1	1.1	-	Software version
..5.	auto offset	0.0	-3250.0	3250.0	mm	Web offset User entry (in automatic)
..6.	prop range +/-	2.0	-3250.0	3250.0	mm	Guider proportional range Web offset in mm, with which DC actuator moves to pos. set in parameter ..9. at automatic speed. Reduce value when guiding is inaccurate! Increase value when guiding is uneven!
..7.	speed automatic	20	1	120	mm/s	Actuating speed in automatic mode
..8.	speed manual	5	1	120	mm/s	Actuating speed in manual mode
..9.	pos. range +/-	0	0	32500	mm	Actuating range limit
.1.0.	step width	0.1	0.1	10	mm	Step width in relation to parameter ..5.
.1.1.	motor current	0.4	0.0	6.4	A	See motor type plate for nominal motor current
.1.2.	motor direction	0	0	1	-	Motor rotational direction 0 = normal 1 = reversed
.1.3.	motion range +/-	12	1	32500	mm	Maximum actuating path measured at outfeed roller
.1.4.	inv ext target	0	0	1	-	Web offset via operating panel RE 1721 0 = normal 1 = reversed
.1.5.	control mode	0	0	5	-	Operating mode 0 = edge search 1 = hybrid 2 = minimal operation 3 = hybrid minimal 4 = automatic centering 5 = hybrid edge guiding
.1.6.	zero offset	0.0	-3250.0	3250.0	mm	Center position offset Value equivalent to difference between mechanical center and set center position.
.1.7.	reserved 1	0	0	0	-	No function

No.	Name	Default	Min.	Max.	Unit	Description
.1.8.	osz. amplitude	0	0	500	mm	Oscillating stroke
.1.9.	osz. cyc. time	20	2	700	s	Oscillating time time-dependent = sec/ cycle path-dependent = pulse/ cycle
.2.0.	osz. mode	50	10	90	-	Oscillating mode 90 = triangular wave 10 = square wave
.2.1.	subsystem 0 adress	00	00	7F	hex	Address serial bus card 0
.2.2.	subsystem 1 adress	00	00	7F	hex	Address serial bus card 1
.2.3.	subsystem 2 adress	00	00	7F	hex	Address serial bus card 2
.2.4.	subsystem 3 adress	00	00	7F	hex	Address serial bus card 3
.2.5.	subsystem 4 adress	00	00	7F	hex	Address serial bus card 4
.2.6.	subsystem 5 adress	00	00	7F	hex	Address serial bus card 5
.2.7.	subsystem 6 adress	00	00	7F	hex	Address serial bus card 6
.2.8.	subsystem 7 adress	00	00	7F	hex	Address serial bus card 7
.2.9.	speed_P	11	0	50	-	P-component of internal speed controller may not be changed 20 W motor = 11 50 W/100 W motor = 22
.3.0.	speed_I	6	0	50	-	I-component of internal speed controller may not be changed 20 W motor = 6 50 W/100 W motor = 12
.3.1.	speed_D	12	0	50	-	D-Anteil interner The speed controller must not be changed 20 W motor =12 50 W/100 W motor = 24
.3.2.	chang nix/t/off/on	2	0	7	-	Time-dependent oscillation 0 = Oscillation is switched on and off on DO 0100/ 0101 or DO 0020/0021 via the "Oscillation" key 1 = Oscillation is switched on and off on DR keyboard DO alternately via the "Automatic" key or "Oscillation" key on DO 0100/ 0101 or DO 0020/ 0021 2 = Oscillation is always OFF 3 = Oscillation is always ON Path-dependent oscillation 4 = Oscillation is switched on and off on DO 0100/ 0101 or DO 0020/ 021 via the "Oscillation" key 5 = Oscillation is switched on and off on DR keyboard DO 1000/ 1001 alternately via the „Automatic“ key or via the "Oscillation" key on DO 0100/ 0101or DO 0020/ 0021 6 = Oscillation is always OFF 7 = Oscillation is always ON
.3.3.	SourcePos adress	0	0	0	hex	Follow-up control entry of address of master DR
.3.4.	pos prop range±	1,0	0,5	50,0	mm	Proportional range in automatic mode

Control card RK 4003

No.	Name	Default	Min.	Max.	Unit	Description
.3.5.	reserved 4	0	0	0	-	no function
.3.6.	reserved 5	0	0	0	-	no function
.3.7.	enable AG-Photo	0	0	1	-	Calibration photo of actuator position
.3.8.	gearconstant	25,0	10,0	3200,0	Imp/mm	gear constant: The gear constant is calculated as follows: Value = $(32 \cdot i) / S$. i = Gear (e.g. i= 8:1) S = Screw pitch

6.4 Explanation of parameters for RK 4003-0004U_ZB

.0.0.5.

.8.

.1.0.3.2.

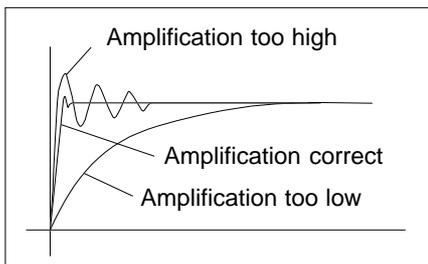
.3.8.

.6.

Parameter ..0. to ..5., ..8., ..1.0. to ..3.2. and ..3.8.

Parameters 0 to 5, 8, 10 to 32 and 38 are identical to the parameters of control card software RK 4003-0001U_ZH. The explanations may be found in the relevant sections. As far as default values are concerned differences may exist between the two parameter lists.

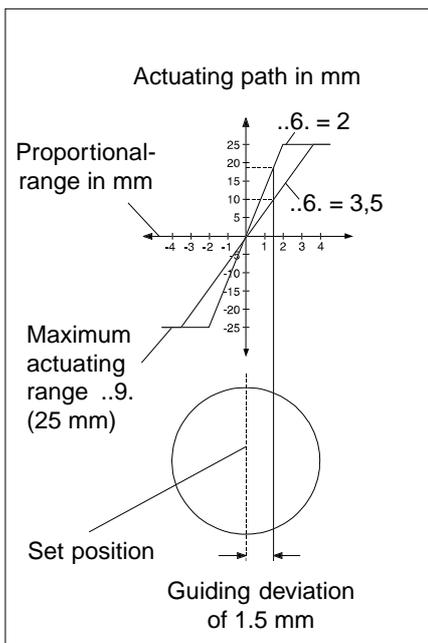
Proportional range (..6. prop range +/-)



Amplification is correctly set if the error is rectified after overshooting briefly. If the position controller is set too sensitively, it will continue to hunt. If amplification is too low, the control loop is too sluggish. The optimum degree of amplification may be determined by a characteristic curve writer. In practice, the amplification may also be determined via trial and error.

Given a constant maximum actuating speed (parameter ..7.), the smaller the set proportional range, the greater the amplification of the web guider will be.

|| A negative proportional range may **not** be set as the direction of rotation will thus be reversed.



By reducing the proportional range the characteristic curve (see diagram on left) will become steeper. The steeper the characteristic curve, the greater the actuating speed will be in the event of a guiding deviation and thus the system will be more sensitive. The characteristic curve indicates at which actuating speed the actuator attempts to rectify an error.

In this example a proportional range of 2 mm or 3.5 mm is accepted, with a maximum actuating speed of 25 mm. Given a guiding deviation of 1.5 mm, the actuating speed amounts to 18 mm with a proportional range of 2 mm and approx. 10.0 mm with a proportional range of 3.5 mm.

The values may also be calculated arithmetically:

Amplification (G) = Parameter ..9. / Parameter ..6.

Correction path (SK) = guiding deviation * amplification (G)

Example 1:

$$G = 25/2 = 12.5$$

$$SK = 1.5 \text{ mm} * 12.5$$

$$\mathbf{VK = 18.75 \text{ mm}}$$

Example 2:

$$G = 25/3.5 = 7.14$$

$$SK = 1.5 \text{ mm} * 7.14$$

$$\mathbf{VK = 10.71 \text{ mm}}$$

Optimization:

Reduce the proportional range in small steps only. After each change in the parameter value the web should be diverted to automatic mode so that hunting may be immediately detected.

Reduce the proportional range until the guider begins to hunt. Then increase the proportional range again until hunting may no longer be observed.

..7.

Actuating speed (..7. speed automatic)

The actuating speed may not be set higher than the nominal actuating speed of the DC actuator.

..9.

Actuating range limit (..9. pos. range +/-)

The actuating range limit prevents the DC actuator always reaching its mechanical screw stop or mechanical stop. The actuating range limit on compact systems is always works set to slightly less (approx. 2 mm) than the maximum actuating path (see parameter .1.3.) of the actuator. When the DC actuator is mounted by the customer, the actuating range limit must be set by the customer .

The set value is always in relation to the actuating range center .

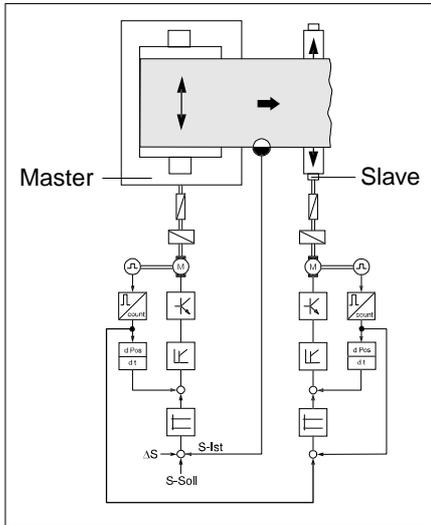
The entry of a value of 15 means 15 mm to the left and right, thus a total of 30 mm.

|| This actuating range limit must not be used as a form or personnel or device protection. To protect personnel or equipment the end position limiting must be provided with additional limit switches or a mechanical stopping element.

.3.3.

Follow-up guiding (.3.3. SourcePos adress)

In the case of follow-up guiding (Master/Slave) a second actuator (slave) without sensor scanning follows another actuator (master) exactly. In the control card of the second actuator (slave) the control card device address (X.5) of the so-called master must be entered.



.3.4.

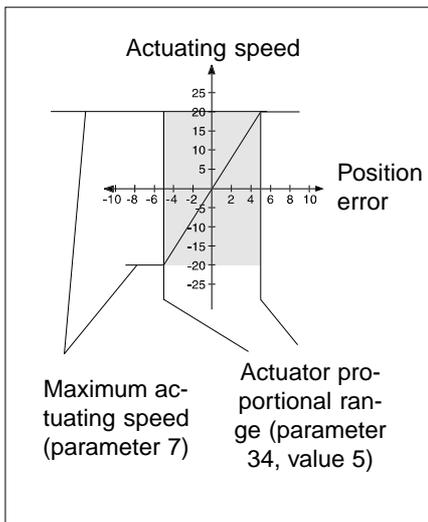
Actuator proportional range (.3.4. pos prop range±)

In parameter 34 "pos prop range +/-" the P component of the actuator position controller is indirectly set for automatic mode.

A deviation of the web actual position from the web set position produces a corresponding actuator set position. The actuator position controller operates according to the characteristic curve opposite. If the position error is greater than the set "Actuator proportional range" then the adjusting speed corresponds to the set "Actuating speed in automatic mode". If the position error is within the set "Actuator proportional range" the result will be a lower actuating speed corresponding to the characteristic curve.

Example:

A web set position deviation of 1 mm results in an actuator set position of 15 mm on the basis of the set values (parameters 6 and 9). The DC actuator covers the first 10 mm at maximum actuating speed as these values are outwith the grey area. Once the 10 mm have been covered, 5 mm still remain. These 5 mm lie within the grey area and as such, speed is reduced linearly to 0 until the 15 mm actuating range is reached.



This parameter may be increased to dampen the DC actuator position controller for untidy edges (fabric). The static precision of the web guider is hereby retained.

The value of parameter .3.4. should be maximally equivalent to half the sensor scanning range.

.3.5.

.3.6.

Reserved (.3.5. reserved 4) (.3.6. reserved 5)

Not assigned at present.

.3.7. Calibration photo (.3.7. enable AG-Photo)

Via parameter 37 „enable AG-photo“ the function is activated by which easy calibration of the DC actuator is enabled for follow-up controls with cameras. To this end, value 1 must be entered. Refer to the relevant section in the command station or camera description for details of how the calibration photo is triggered.

|| The "enable photo" function must be switched off in camera OL 80xx.

Explanation:

On follow-up controls with camera scanning the current position of the actuator/tool is calibrated to the web edge detected by the camera. As the set position may be freely selected for the camera, the position of the actuator must be calibrated to the required camera set position. To do so, the actuator is set to the required position in manual mode and the web inserted at the position in the camera scanning range. Calibration has the effect of offsetting the actuator in the right direction and by the same degree as the web.

6.5 Parameter list RK 4003-0005U_ZC

No.	Name	Default	Min.	Max.	Unit	Description
..0.	edit device	XX	01	0F	hex	Select device number See block diagram for device number
..1.	edit group	XX	00	07	hex	Select group number See block diagram for group number
..2.	reset settings	0	0	2	-	Works settings 1 = customer-specific settings 2 = internal value specification (default)
..3.	start service	0	0	199	-	Starting a function 1 = reset guider 2 = save changed parameters 42 = select expanded SETUP mode 44 = save changed parameters and additional backup 99 = delete data memory ! CAUTION !
..4.	simple mot. contro	1.1	1.1	1.1	-	Software version
..5.	subsystem 0 adress	00	00	7F	hex	Address serial bus card 0
..6.	subsystem 1 adress	00	00	7F	hex	Address serial bus card 1
..7.	subsystem 2 adress	00	00	7F	hex	Address serial bus card 2
..8.	subsystem 3 adress	00	00	7F	hex	Address serial bus card 3
..9.	subsystem 4 adress	00	00	7F	hex	Address serial bus card 4
.1.0.	subsystem 5 adress	00	00	7F	hex	Address serial bus card 5
.1.1.	subsystem 6 adress	00	00	7F	hex	Address serial bus card 6
.1.2.	subsystem 7 adress	00	00	7F	hex	Address serial bus card 7
.1.3.	auto offset	0.0	-3250.0	3250.0	mm	Web offset
.1.4.	step width	0.1	0.0	10	mm	Step width in relation to parameter .1.3.
.1.5.	hysteresis	0,1	0	3000,0	mm	Hysteresis for switch limits (parameters .1.6. to .1.8.)
.1.6.	stop->pulse tr. ±	2,0	0	3000,0	mm	Switch threshold from stop to pulse output
.1.7.	pulse->slow tr. ±	0,1	0	3000,0	mm	Switch threshold from pulse output to slow
.1.8.	slow-> fast tr. ±	0,1	0	3000,0	mm	Switch threshold from slow to fast
.1.9.	ON time (pulse)	1,0	0,1	10,0	s	Switch ON time (pulse output)
.2.0.	OFF time (pulse)	1,0	0,1	10,0	s	Switch OFF time (pulse output)
.2.1.	manual speed fast	0	0	1	-	Manual positioning additionally with fast output
.2.2.	output LK adress	00	00	7F	hex	Address of LK 4002 for motor signals
.2.3.	control mode	0	0	5	-	Operating mode 0 = edge search 1 = hybrid

6.6 Explanation of parameters for RK 4003-0005U_ZC

.0. **.4.**

Parameters ..0. to ..4.

Parameters 0 to 4 are identical to the parameters of control card software RK 4003-0001U_ZH. Refer to the relevant section for explanations. In the case of the default values there may be differences between the two parameter lists.

.5. **.1.2.**

Serial bus cards 1 to 8

(.5. subsystem 0 address - .1.2. subsystem 7 address)

Control card RK 40.. features a serial bus connection. Up to 8 CAN-compliant devices (e.g. command station, several logic cards etc.) may be serially connected via this serial bus. The addresses of the serial devices are entered automatically, from the bottom up, beginning in parameter 21 (1st slot = address in parameter 21, 2nd slot = address in parameter 22 etc.). In the case of a double address, the address must be changed in the relevant parameter. The place in front of the dot specifies the group number and the place after the dot the device number.

Example:

Device number:	A	9	F	C
Group number:	0	0	3	7
Entry in parameter	0.A	0.9	3.F	7.C

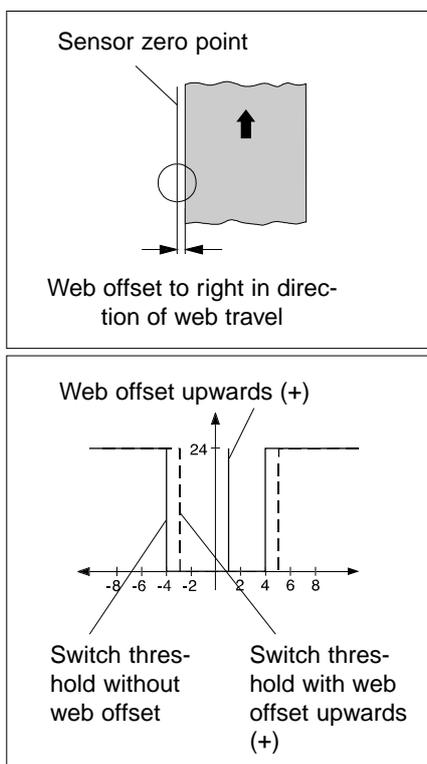
.1.3.

Web offset (.1.3. auto offset)

The web offset function permits the web set position to be offset to the left or right during automatic mode. The offset is set directly in this parameter by a command station or via a digital interface. The step width for the web offset may be set in parameter .1.4. . The set position offset is displayed in mm on the command station. A set web offset is saved until a new one is entered, even if the operating voltage is switched off.

In the case of fixed sensors the web offset is limited to 75% of the sensor measuring range. In conjunction with a motorized support beam, the web offset is limited by the support beam actuating path.

The switch thresholds are offset upwards (+) or downwards (-) by the degree of web offset.



.1.4. Web offset step width (.1.4. step width)

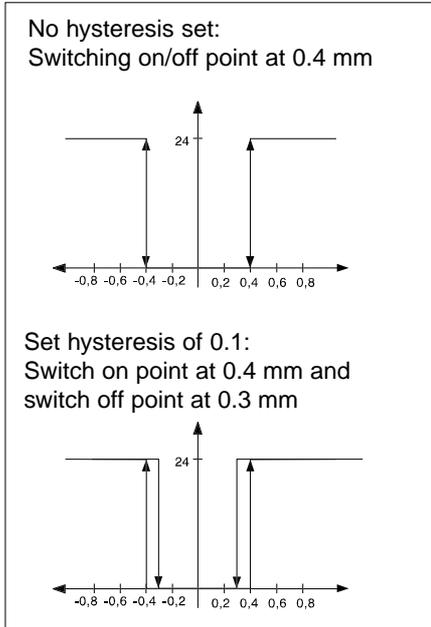
The web offset step width may be set in 1/10 mm.

.1.5. Switch threshold hysteresis (.1.5. hysteresis)

A hysteresis may be set for the three existing switch thresholds (pulsed, slow and fast). The hysteresis permits the switch-off point to be less than the switch-on point by the degree of hysteresis.

The set value is valid for all three switch thresholds.

|| Hysteresis may not be set higher than the minimum distance between two switch thresholds or one switch threshold to the set position.



.1.6. .1.7. .1.8.

Switch thresholds (.1.6. stop->pulse tr. ±) (.1.7. pulse->slow tr. ±) (.1.8. slow->fast tr. ±)

The software for the three-position control card features 3 switch thresholds.

Switch threshold 1(.1.6.)	pulsed output	left or right
Switch threshold 2 (.1.7.)	continuous output	left or right
Switch threshold 3(.1.8.)	additional output	fast (in additional to continuous output)

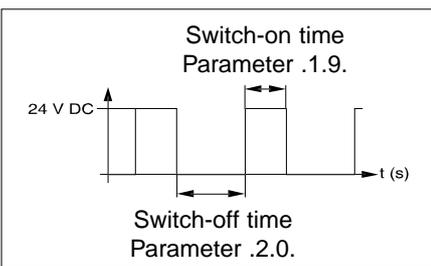
The switch thresholds should be entered in the appropriate parameters. The value entered corresponds to the unit mm.

|| If a switching point is not required, the value "0" must be set in the appropriate parameter.

.1.9. .2.0.

Switch-on time (.1.9. ON time) Switch-off time (.2.0. OFF time)

The switch-on and off time may be set separately for switch threshold 1. The switch-on period is entered in parameter .1.9. and in parameter .2.0. the switch-off period.



.2.1. Manual offset with additional output 3 (.2.1. manual speed fast)

In manual mode the fast output may be additionally switched along with the left or right output. To activate the fast output the value "1" must be entered.

.2.2. LK 4002 address (.2.2. output LK adress)

The device address of logic card LK 4002 on which the output signals of the three outputs, left and right and fast, are output, must be entered here. The address is specified in the block diagram.

.2.3.

Operating modes (.2.3. control mode)

The following operating modes are available for the guider:

0 = "Edge search" (standard operating mode)

The following guiding types are possible:

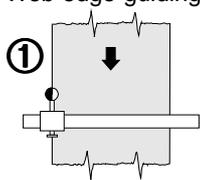
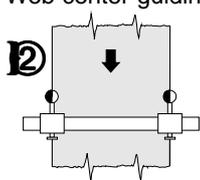
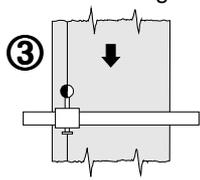
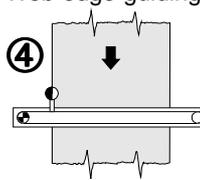
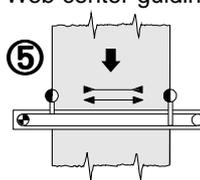
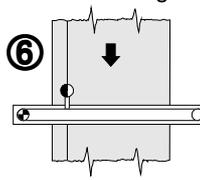
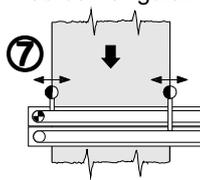
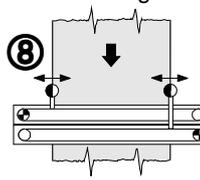
①, ②, ③, ④, ⑥ and ⑦

1 = "Hybrid" (only in combination with a motorized support beam)

Guiding by the ideal web center/machine center with symmetrical sensor following-up (hybrid guiding) given changes in the web width. The web offset with a single-motor support beam (with symmetrical adjustment) may amount to max. $\pm 75\%$ of the sensor measuring range.

The following guiding types are possible:

⑤ and ⑧

<p>Web edge guiding</p> 	<p>① Guiding by the left or right web edge</p>
<p>Web center guiding</p> 	<p>② Guiding by the ideal web center/machine center</p>
<p>Web contrast guiding</p> 	<p>③ Guiding by a printed line or existing contrasting edges</p>
<p>Web edge guiding</p> 	<p>④ Guiding by the left or right web edge, with motorized sensor positioning (automatic edge search)</p>
<p>Web center guiding</p> 	<p>⑤ Guiding by the ideal web center/machine center with symmetrical sensor follow-up (hybrid guiding)</p>
<p>Web contrast guiding</p> 	<p>⑥ Guiding by a printed line or existing contrasting edges, with manual motorized pre-positioning (manual mode)</p>
<p>Web center guiding</p> 	<p>⑦ Guiding by the web center outwith the machine center with motorized sensor positioning for each side (automatic edge search)</p>
<p>Web center guiding</p> 	<p>⑧ Guiding by the ideal web center/machine center with symmetrical sensor follow-up (hybrid guiding)</p>

7. Technical data

Operating voltage	
Nominal value	24 V DC
Nominal range (incl. ripple)	20 - 30 V DC
Power input (depending on output loading)	30 W to 100 W
Output voltage on motor terminal	±22 V (PWM) (PWM-pulse width-modulated)
Protection class	IP 00
Output current (not on three-position control card)	
without additional heat sink	maximum 1.2 A
with additional heat sink (control cabinet fixture)	maximum 3.0 A
with external power output element	maximum 5.0 A
CAN bus	
CAN bus level	+ 5 V (potential-free)
CAN baud rate	250 KBaud
Switch level coding input	
Terminal X 2.3 / X 2.4	
Low "0"	0 to 3 V DC
High "1"	10 to 30 V DC
Position counter range	
DC actuator	maximum ±64000 pulses
Incremental encoder frequency	maximum 5 kHz
Technical data subject to modification without notice	

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