Controls for linear actuators

**FW 3-phase
frequency converter**
✓ Supports full Profibus connection

RK-Control servo technology
✓ Innovative and flexible device
technology

Features:
**FW 3-phase
frequency converter**

■ Supports full Profibus connec-
tions

■ Includes all components re-
quired for operation of three-
phase motors - pre-wired and
ready for connection

Features:
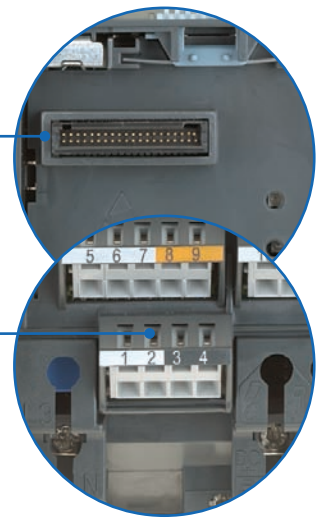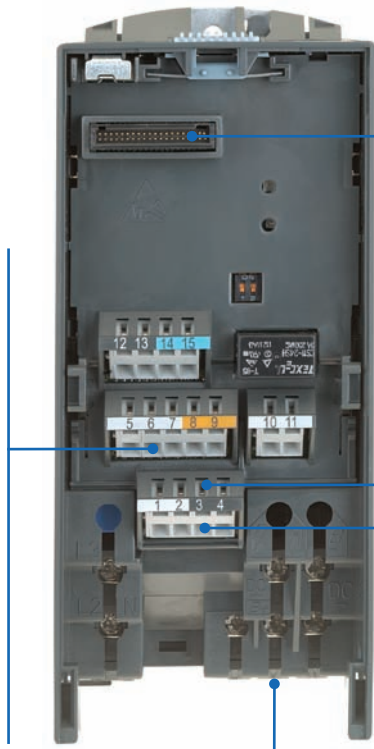**RK-Control servo technology**

■ Can be tailored to your applica-
tions

■ Ideal drive controller for
dynamic and high-precision
single and multiple solutions

■ Reliable and cost-effective solu-
tions

Controls for linear axes - Table of contents

Introduction

Selection aid

Move-Tec

Place-Tec

Control-Tec

Motors/
Controls

Modules

Appendix

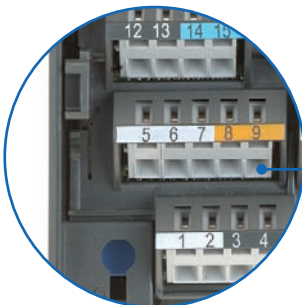## Frequency converter 120/250 W

Connection for control panel via standard interface
✓ Innovative and flexible technology

Digital inputs and outputs

Motor connection
✓ Low-noise motor

Analogue input
✓ Frequency control

Features:

- Manual operation via front panel or I/O
- Parameter input via front panel
- Integrated EMI filter (class A)
- Simple commissioning due to self adjusting
- Programmable acceleration/deceleration
- 3 programmable isolated digital inputs (e.g. for fixed frequencies)
- Integrated serial interface RS485 (USS protocol)
- Analogue output/input
- Storage of 7 fixed frequencies

Options:

- Separate plain text control panel available with multiple languages (optional)
- Various adaptors available on request

FW 3-phase frequency converter

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RK ROSE+KRIEGER

General information/operating conditions

Voltage	230 V AC (47-63 Hz)
Output frequency	0-650 HZ
Frequency resolution	0.01
Overload capability	150% for 60 s
Interfaces	RS485 analogue 0-10 V, various fieldbuses (optional), RS232 (optional)
Protection class	IP 20
Dimensions H x W x D	147 x 73 x 141 mm
Ambient temperature	-10°C to +50°C

Frequency converter 120/250 W

Code No.	Type	Version*
957500	Frequency converter FW 120	for motors 90 and120 W
957501	Frequency converter FW 250	for motors 180 and 250 W

* Other outputs available on request

Motor for cable drag chains

Code No.	Type	
957050 _ _ _	Motor cable 4 x 1.5 + 2 x (2 x 0.75) mm	for connection to a frequency converter; range of lengths

Length:
0 2 5 = 2.5 m
0 5 0 = 5.0 m
0 7 5 = 7.5 m
1 0 0 = 10.0 m
1 2 5 = 12.5 m
1 5 0 = 15.0 m
2 0 0 = 20.0 m
2 5 0 = 25.0 m

FW 3-phase frequency converter/accessories

Plain text control panel

- Upload/Download
- Storage of up to 10 parameter records of the frequency converters

- Up to 31 frequency converters can be controlled via RS485 (USS protocol) using a plain text control panel
- Switch between multiple languages

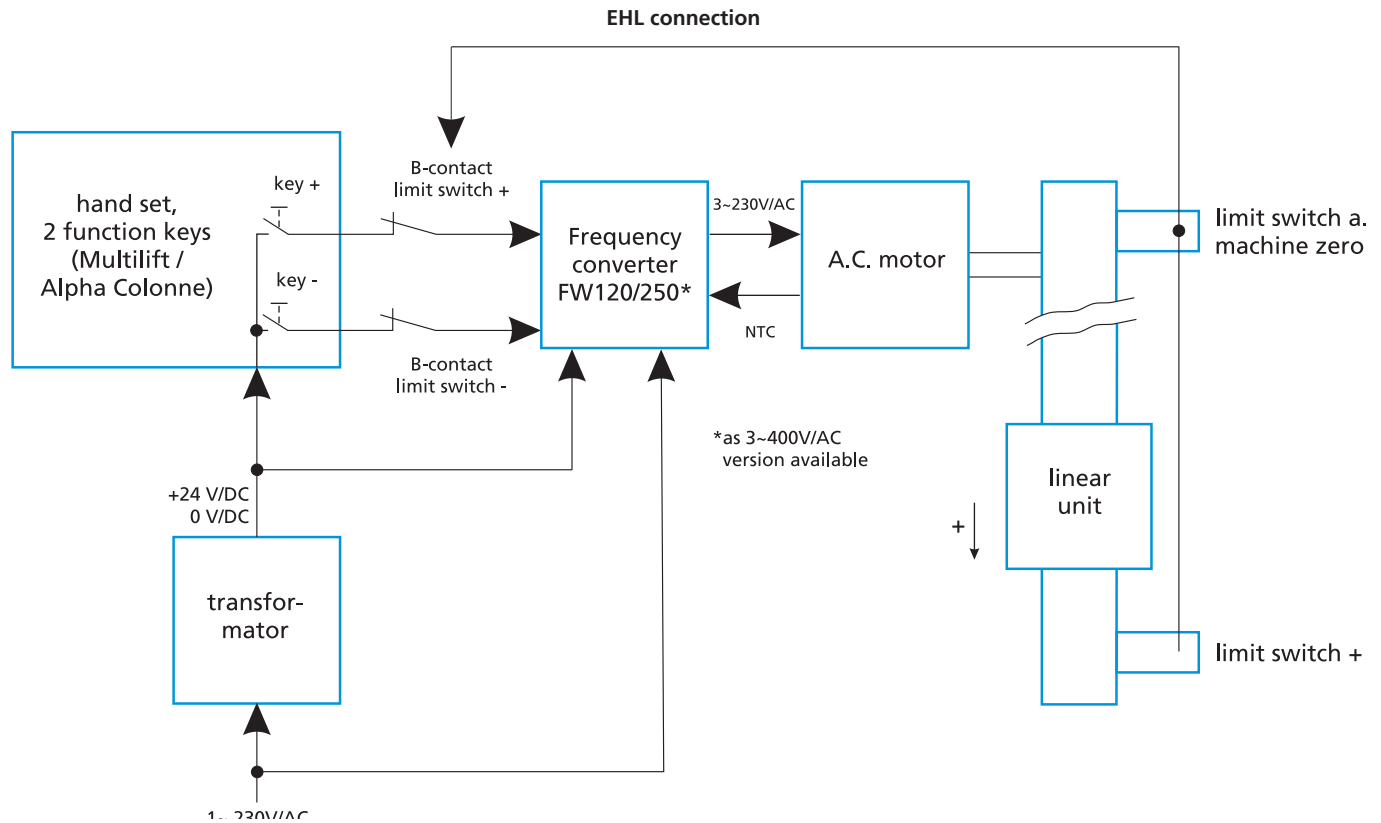| Code No.	Type
957510	Plain text control panel

Profibus module

- Supports full connection to Profibus ($\leq$ 12 V baud)
- Optional external supply with 24 V DC

- Connection via 9-pin SUB-D connector, customer-supplied

Code No.	Type
957513	Profibus module

PC converter

- Control of a frequency converter directly from PC
- Connection via 9-pin SUB-D connector, included in assembly kit

- RS232 standard cable (3 m)

Code No.	Type
957512	PC converter (assembly kit)

FW 3-phase frequency converter

RK ROSE+KRIEGER

Application example FW120/250
EHL simulation for special performance requirements or speeds

EHL connection

hand set,
2 function keys
(Multilift /
Alpha Colonne)

key +

key -

B-contact
limit switch +

B-contact
limit switch -

Frequency
converter
FW120/250*

3~230V/AC

A.C. motor

NTC

limit switch a.
machine zero

*as 3~400V/AC
version available

+24 V/DC
0 V/DC

transfor-
mator

linear
unit

+

limit switch +

1~ 230V/AC

- The frequency converter FW 120 or 250 is supplied via the transformer 24 V DC

- Two digital inputs are set on the frequency converter via the 2-key hand switch (1 x clockwise rotation, 1 x anticlockwise rotation)

- 2 types of speed setpoints:

  1) a fixed frequency set on the frequency converter
  2) (4.7 kiloohms, customer-supplied, infinitely variable frequency through to max. speed) controlled via potentiometer

Pressing the "+" key on the hand switch, moves the carriage in the + direction as far as the + limit switch, at most. The NC contact in the limit switch interrupts the hand switch signal. Then only return travel in the opposite direction is possible. We recommend the use of limit switches in order to prevent damage to the linear unit, the motor and the frequency converter.

The application example is based on the use of standard components and offers a cost-effective unit for simple movement tasks. Alternatively, you can also connect a 4-key hand switch. This provides two speeds in each direction.
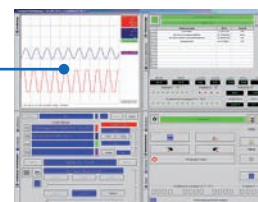
RK-Control 2S

**Innovative and flexible technology
for dynamic and high-precision single and multiple solutions**
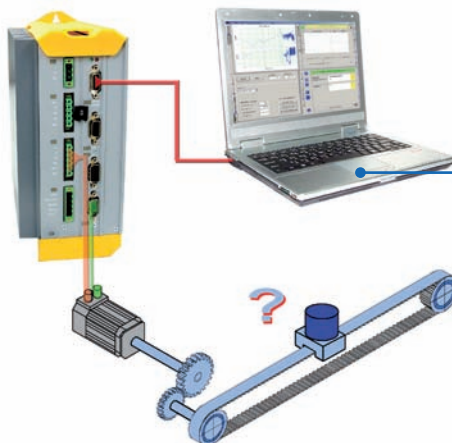
**Commissioning and
control optimisation**
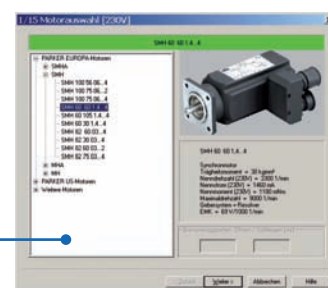
Motor manager

Control optimisation

Features:

- Quick and easy run in
- Guided parameterization
- All connections located on the front
- Optimally co-ordinated performance classes and technology functions

- Increased lifetime due to jerk-limited setpoint generation
- Low development costs due to safety technology
- Optimum motion control – minimal lag error
- Internal network filter

- Run in software included free of charge

RK-Control 2S

Standard

- 8 digital inputs/4 digital outputs
- RS232/RS485 interface
- 2 analogue inputs
- 2 analogue outputs
- CE, UL, cUL

Enhancements

- Optimally co-ordinated technology functions
- Expansion with an additional 12 inputs/outputs (input and output both freely configurable)
- Supports all standard fieldbuses

Performance levels

Device:	Current [A_{rms}]		Line voltage	Output [kVA]	Suitable for: servo motors
RK-Control 2S	I_{cont}	I_{peak} (< 5 s)	± 10%, 50-60 Hz		
2.5 A	2.5	5.5	1 * 230/240 VAC	1.0	RK-AC 112, 118 and 210
6.3 A	6.3	12.6		2.5	RK-AC 240, 260, 345 and 470
7.5 A	7.5	15	3 * 400/480 VAC	6.2	RK-AC 800, 1252
15 A	15	30		11.5	RK-AC 2521, 1776

Size/weight

[mm]
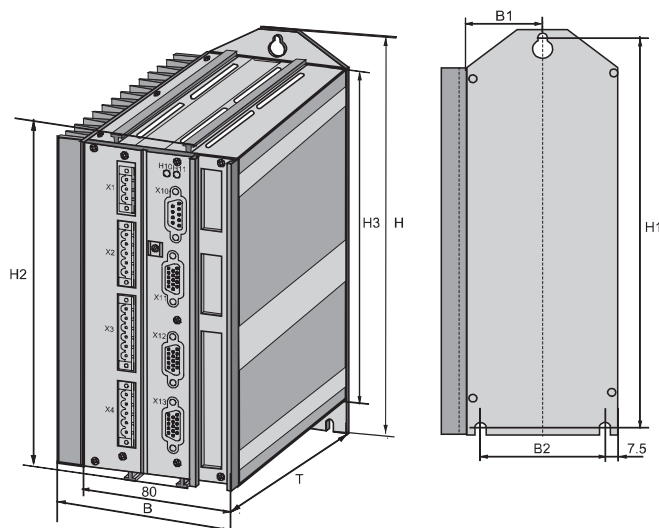
Device:	Dimensions					Clearances			Weight [kg]
RK-Control 2S	H	B	T	H2	H3	B1	B2	H1	
2.5 A	222	84	172	203	191	40	65	210	2.0
6.3 A	222	100	172	203	191	40	65	210	2.5
7.5 A	279	115	172	259	248	40	65	267	4.3
15 A	279	158	172	259	248	39	80	267	6.8

RK-Control 2S

Connection to superordinated controls

Connection can be implemented via digital inputs and outputs.

Digital inputs/outputs
The digital I/Os can be expanded by a further 12 I/Os (optional). This enables control of the full range of 31 motion functions, instead of just the 3 motion functions (e.g. • positions).

In addition, the following fieldbus types are also supported:

Profibus	
Profibus – characteristics	
DP versions:	DPV0/DPV1
Baud rate:	Up to 12 MHz
Profibus ID:	C320

CANopen	
CANopen – characteristics	
Baud rate [kBit/s]:	20 ... 1000
Service Data Object:	SDO1
Process Data Objects:	PDO1, ... PDO4

DeviceNet	
DeviceNet – characteristics	
I/O - data:	up to 32 byte
Baud rate [kBit/s]:	125 ... 500
Participants:	up to 63 slaves

Powerlink	
Ethernet Powerlink – characteristics	
Baud rate:	100 Mbits (FastEthernet)
Cycle time:	1 ms

EtherCAT	
EtherCAT – characteristics	
Baud rate:	100 Mbits (FastEthernet)
Cycle time:	1 ms

RK-Control 2S

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RK ROSE+KRIEGER

Safety technology

The standard EN ISO 13849-1 introduced the term Performance Levels for the design of safety-relevant controls. In compliance with the safety category 3 PL d as defined in EN ISO 13849-1, the RK Control 2S can be used for the following functions:

Safe standstill function (zero-torque drive)
■ **S**afe **T**orque **O**ff (STO)
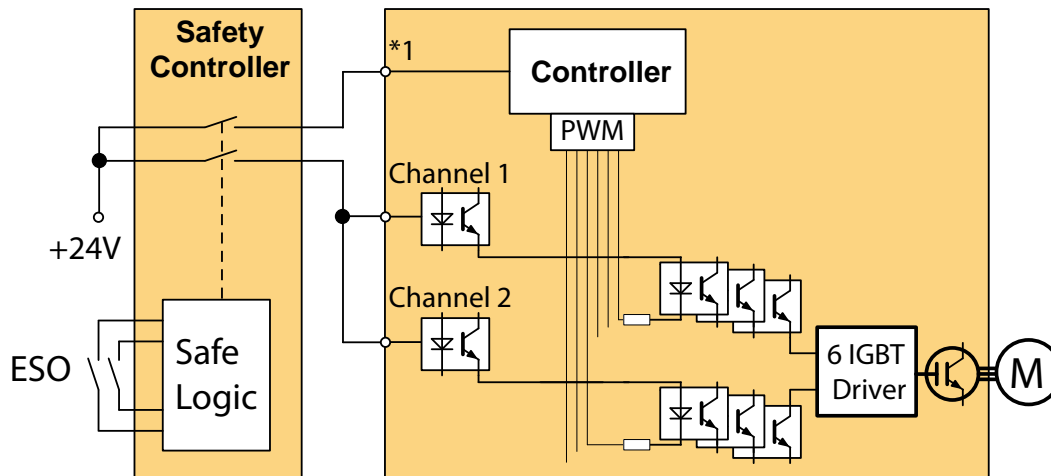
STO function on RK-Control 2S

In combination with an external emergency stop module (optional), the STO function on the RK Control 2S can be implemented as illustrated.

All safety motion functions require the use of a special external safety module SMX11 with the RK-Control 2S in conjunction with high-resolution absolute value encoders in the servo motors.

The SMX11 safety module and servo motors with absolute value encoders are available on request.

Safe movement functions
■ Safe Torque Off, STO
■ Safe Stop 1, SS1
■ Safe Stop 2, SS2
■ Safe Limited Speed, SLS
■ Safe Operating Stop, SOS
■ Safe Limited Increment SLI
■ Safe Direction, SDI

RK-Control 2S – Drive/positioning

## Device technology

Functions: standard version

With its analogue interface, or alternatively step/direction or encoder actuating signals, the RK-Control 2S offers simple and cost-effective access to the world of servo drive technology. The central control unit, e.g., PLC or PC, remains the same. This means that the RK-Control 2S is the ideal way to migrate from analogue ± 10 V drives to intelligent digital servo drives.
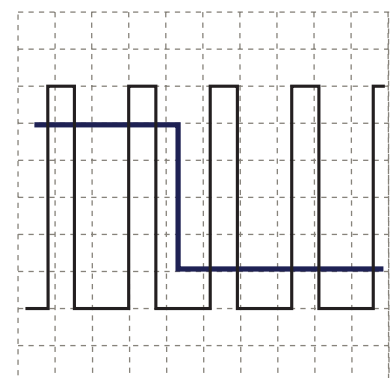
You can choose from a range of operating modes:

± 10 V - input
- ± 10 V set speed with encoder simulation as actual position feedback
- ± 10 V set current with encoder simulation as actual position feedback and configurable locking functions
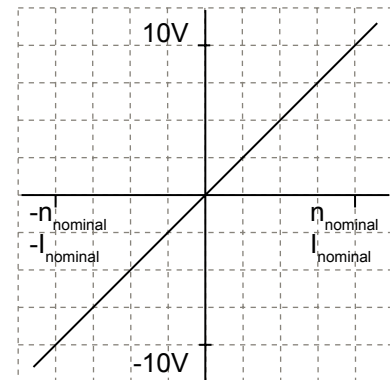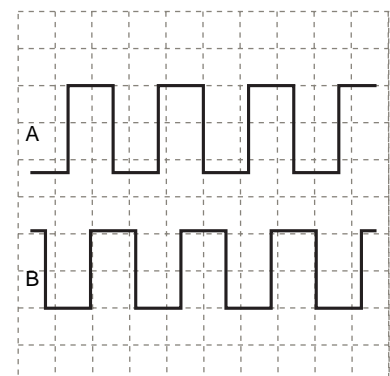

Step/direction input
- Step/direction signals as 24 V level or
- Step/direction signals in accordance with RS422

#### Encoder input
- RS422
- 24 V level

RK-Control 2S

RK ROSE+KRIEGER

Functions: positioning version

Due to its excellent functionality, the positioning version of RK-Control 2S forms an ideal basis for many applications in high-performance motion automation.

- Up to 31 motion functions can be created using the PC software included
- Storage of the motion profiles is non-volatile
- Adjustable jerk limitation

- Optional expansion of digital inputs/outputs
- Comprehensive selection of machine zero modes for adaptation of the RK-Control 2S to your application

Motion control via inputs/ outputs or serial

- Up to 31 motion functions via set table
- Status bits for each motion set
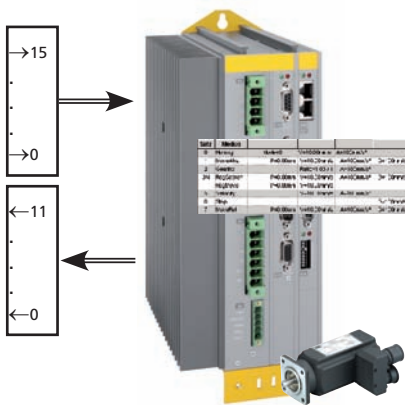
Via digital inputs and outputs
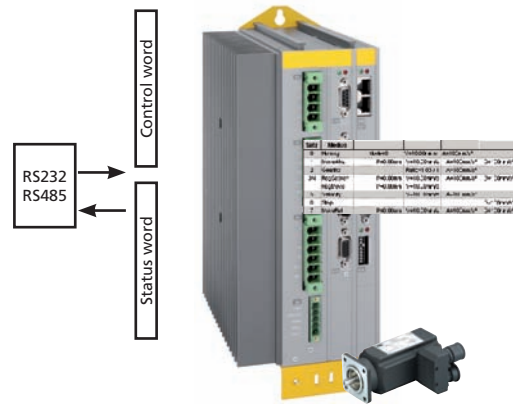
Via RS232/RS 485 by means of control and status word

Motion control via field bus

- Direct set specification via bus telegram or
- set selection (31 motion functions in set table)
- Status bits for each motion set

- Operating modes:
  – Speed controller
  – Direct positioning
  – Positioning with set selection
- Profile-compliant via Profibus, CANopen, DeviceNet, Ethernet Powerlink, EtherCAT
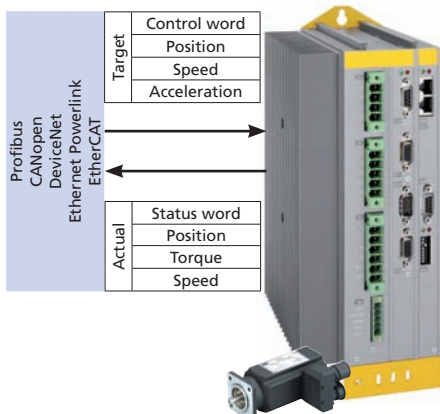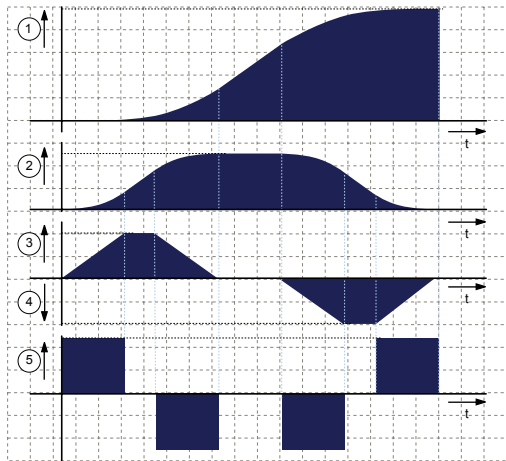
RK-Control 2S – Positioning

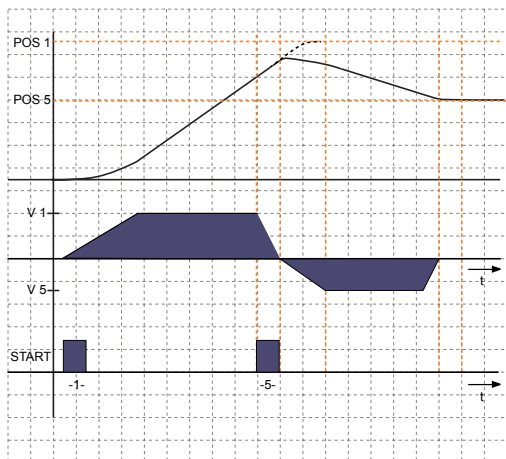## Motion functions of positioning version

Absolute/relative positioning
MoveAbs and MoveRel

A motion set defines a complete movement with all configurable parameters:

- (1) Target position
- (2) Traversing speed
- (3) Maximum acceleration
- (4) Maximum delay
- (5) Maximum jerk
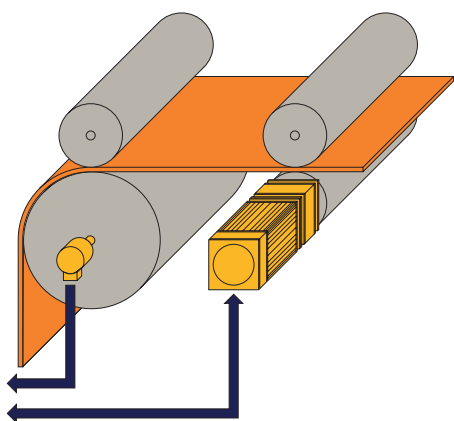
Dynamic positioning

- During positioning, you can switch to a new motion profile – the transition is dynamic.

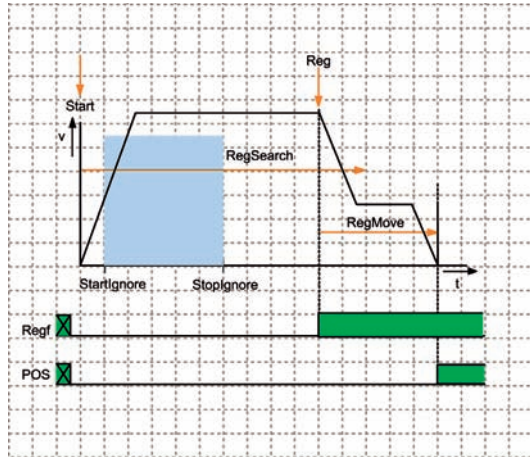### Electronic gears
Gearing

Synchronisation of two linear units via:

- Encoder simulation at the master and
- encoder input at the slave
- Motion synchronised to a leading axis with any
- transmission ratio
- ± 10 V analogue input
- Step/direction input
- Encoder input

RK-Control 2S

R K   R O S E + K R I E G E R

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Registration mark-related positioning
Reg Search, RegMove

2 motions are defined for registration mark-related positioning:

- **RegSearch:** Search for an external signal – from a registration mark, such as an identification mark on a product.

- **RegMove:** an external signal interrupts the search motion, which is immediately followed by the second motion.

- Accuracy of mark detection < 1µs

Input of motion sets
via set table

Satz	Modus						
0	Homing	Mode=0	V=10.00mm/s	A=100mm/s²			000
1	MoveAbs	P=10.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	1XX
2	Velocity		V=30.00mm/s	A=100mm/s²			X1X
3	Gearing		Ratio=0.25 / 1	A=1000mm/s²			XX1
4	Stop				D=100mm/s²	J=1000000mm/s³	XX0
5/6	RegSearch	P=50.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	0XX
	RegMove	P=60.00mm	V=10.00mm/s				X0X
7	MoveRel	P=-100.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	11X
8	Gearing		Ratio=0.33 / 1	A=100mm/s²			XX1
9	MoveAbs	P=20.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	XXX
10	Stop				D=100mm/s²	J=1000000mm/s³	0XX
11	MoveAbs	P=40.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	1XX
12/13	RegSearch	P=100.00mm	V=10.00mm/s	A=1000mm/s²	D=1000mm/s²	J=1000000mm/s³	000
	RegMove	P=0.00mm	V=10.00mm/s				111
14	MoveRel	P=-40.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	XXX
15	Stop				D=100mm/s²	J=1000000mm/s³	XXX
16	Velocity		V=25.00mm/s	A=100mm/s²			XXX
17	Gearing		Ratio=1.00 / 1	A=100mm/s²			XX1
18/19	RegSearch	P=70.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	0XX
	RegMove	P=0.00mm	V=10.00mm/s				1XX
20	MoveAbs	P=0.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	XXX
21	Gearing		Ratio=0.13 / 1	A=100mm/s²			XXX
22	MoveAbs	P=0.00mm	V=10.00mm/s	A=100mm/s²	D=100mm/s²	J=1000000mm/s³	XXX
23	Stop				D=100mm/s²	J=1000000mm/s³	XXX
24	Empty						000

Speed control
Velocity

- Defined by the speed and the acceleration

Stop movement
Stop

- The Stop set interrupts the current motion set

RK-Control 2S – Positioning

Functions: positioning with function blocks

- Device-specific function blocks:
  - for generating an input process image
  - for generating an output process image
  - as access to motion set table

■ PLC open function blocks

■ Programmable according to IEC 61131-3

■ Programming system: Codesys

■ Up to 6,000 instructions
  – IEC 61131-3 standard modules, such as timers, triggers, counters, etc.

Function blocks for the RK-Control 2S
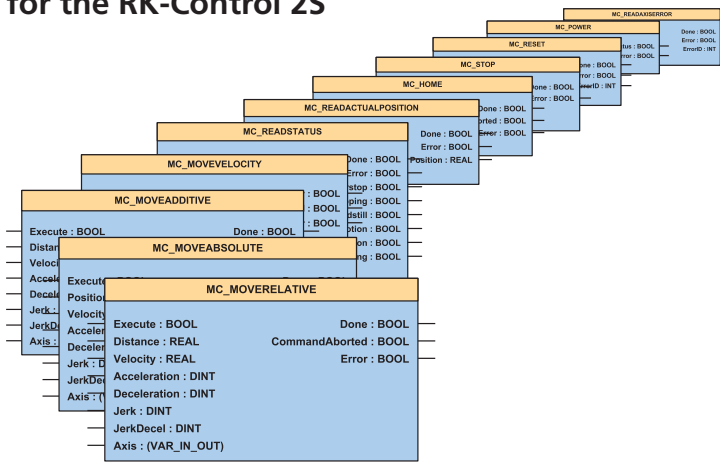
■ Absolute positioning

■ Stop

■ Reading the axis error

■ Relative positioning

■ Machine zero

■ Acknowledgement of errors

■ Additive positioning

■ Energising the output stage

■ Reading the current position

■ Continuous positioning

■ Reading the device status
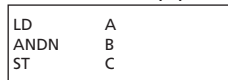
■ Electronic gears

IEC 61131-3

IEC 61131-3 is the only globally supported programming language for industrial automation that is company and product-independent.

IEC 61131-3 includes graphical and textual programming languages.

■ Instruction list

■ Structured text

■ Ladder diagram

■ Sequential function chart

■ Function block diagram

Instruction list (IL)
```
LD        A
ANDN      B
ST        C
```

Structured text:
`C := A AND NOT B`

Ladder diagram:
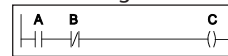
Function block diagram:
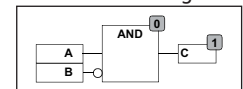
Programming with CoDeSys

CoDeSys is a development environment for programming that enables considerable time savings when creating your application.
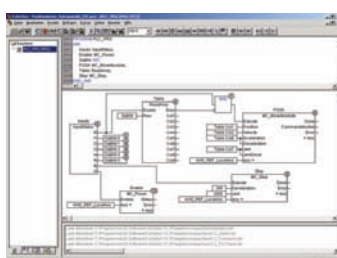
■ Globally established high-performance development environment

■ Complete offline simulation

■ Visual elements

■ Data exchange between devices of different manufacturers

■ Complete online functionality

■ Sophisticated technical features

■ Comprehensive project management

■ Included free of charge

RK-Control 2S/accessories

RK ROSE+KRIEGER

Order data - RK-Control 2S

Code No.	Control	Standard	Positioning	Positioning with function blocks	Fieldbus	Additional I/O
79391A0A11	2.5A	•	–	–	–	–
79391A1A11	2.5A	–	•	–	–	–
79391A1B11	2.5A	–	•	–	–	•
79391A2A11	2.5A	–	•	•	–	–
79391A3A11	2.5A	–	•	–	Profibus DP	–
79391A4A11	2.5A	–	•	•	Profibus DP	–
79391A5A11	2.5A	–	•	–	CANopen	–
79391A6A11	2.5A	–	•	•	CANopen	–
79392A0A11	6.3A	•	–	–	–	–
79392A1A11	6.3A	–	•	–	–	–
79392A1B11	6.3A	–	•	–	–	•
79392A2A11	6.3A	–	•	•	–	–
79392A3A11	6.3A	–	•	–	Profibus DP	–
79392A4A11	6.3A	–	•	•	Profibus DP	–
79392A5A11	6.3A	–	•	–	CANopen	–
79392A6A11	6.3A	–	•	•	CANopen	–
79393A0A11	7.5A	•	–	–	–	–
79393A1A11	7.5A	–	•	–	–	–
79393A1B11	7.5A	–	•	–	–	•
79393A2A11	7.5A	–	•	•	–	–
79393A3A11	7.5A	–	•	–	Profibus DP	–
79393A4A11	7.5A	–	•	•	Profibus DP	–
79393A5A11	7.5A	–	•	–	CANopen	–
79393A6A11	7.5A	–	•	•	CANopen	–
79394A0A11	15A	•	–	–	–	–
79394A1A11	15A	–	•	–	–	–
79394A1B11	15A	–	•	–	–	•
79394A2A11	15A	–	•	•	–	–
79394A3A11	15A	–	•	–	Profibus DP	–
79394A4A11	15A	–	•	•	Profibus DP	–
79394A5A11	15A	–	•	–	CANopen	–
79394A6A11	15A	–	•	•	CANopen	–

Initiator box

■ For the wiring of initiators or limit switches to the RK-Control 2S

■ Prefabricated and shielded cables with connector for the RK-Control 2S

Code No.	Type		For control unit
95706011_ _ _	Initiator box	Drag chain-compatible	All RK-Control 2S units

Cable length:
0 2 5 = 2.5 m   1 2 5 = 12.5 m
0 5 0 = 5.0 m   1 5 0 = 15.0 m
0 7 5 = 7.5 m   2 0 0 = 20.0 m
1 0 0 = 10.0 m

RK-Control 2S

Shielded cables

- Prefabricated with connectors from RK-AC 112 to RK-AC 800 and ring terminals from RK-AC 1252 to RK-AC 2521
- The connectors of motor and feedback cables contain a special surface shield

Code No.	Type	For motors
Cable for fixed, static installation		
95702611_ _ _	Resolver cable	All RK-AC servo motors
95702511_ _ _	Motor cable	Servo motors from RK-AC 112 to RK-AC 800
95702711_ _ _		Servo motors from RK-AC1252 to RK-AC2521
Cables for use in drag chains		
95702611_ _ _FLEX	Resolver cable	All RK-AC servo motors
95702511_ _ _FLEX	Motor cable	Servo motors from RK-AC 112 to RK-AC 800
95702711_ _ _FLEX		Servo motors from RK-AC1252 to RK-AC2521

Cable length (cable lengths > 20 m available on request):
0 2 5 = 2.5 m   0 7 5 = 7.5 m   1 2 5 = 12.5 m   2 0 0 = 20.0 m
0 5 0 = 5.0 m   1 0 0 = 10.0 m   1 5 0 = 15.0 m

Interface cable

Code No.	Type	For control unit
957010_ _ _	Interface cable SSK 1	RS232, PC <–> RK-Station

Cable length (cable lengths > 20 m available on request):
0 2 5 = 2.5 m   0 7 5 = 7.5 m   1 2 5 = 12.5 m   2 0 0 = 20.0 m
0 5 0 = 5.0 m   1 0 0 = 10.0 m   1 5 0 = 15.0 m

Ballast resistors

- The energy generated during braking is initially absorbed by the internal storage capacity of the RK-Control 2S. If this capacity is insufficient, the braking energy is discharged via a ballast resistor

Code No.	Type		For control unit
95701011	Ballast resistor BRM 08/01	100 ohms, 60 W continuous	RK-Control 2S 2.A
95700811	Ballast resistor BRM 05/01	56 ohms, 180 W continuous	RK-Control 2S 6.3A and 7.5A
95702311	Ballast resistor BRM 05/02	56 ohms, 570 W continuous	RK-Control 2S 7.5A
95700511	Ballast resistor BRM 10/02	47 ohms, 1500 W continuous	RK-Control 2S 15A

Network filter

- If the length of the motor cable does not exceed 10 m, the internal network filter in the RK-Control 2S is sufficient to ensure adherence to the emission limit values for CE-compliant operation
- If the length of the motor cable is > 12.5 m, the network filters shown below are required

Code No.	Type		For control unit
95710811	Network filter 16 FC 10	16 FC 10	RK-Control 2S 2.5A and 6.3A
95710911	Network filter 16 FCD 10	16 FCD 10	RK-Control 2S 7.5A and 15A

RK-Control 2S

RK ROSE+KRIEGER
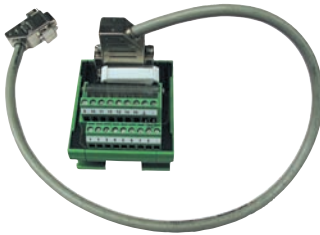
Terminal block

- For the further wiring of inputs and outputs + additional inputs and outputs
- An extra terminal block is required for additional inputs and outputs
- Can be mounted in control cabinet on a standard DIN rail
- Incl. 2.5 m prefabricated cable, from the RK-Control 2S to the terminal block

Code No.	Type	Cable length	For control unit
95701611	Terminal block	2.5 m	All RK-Control 2S units

Display & Diagnostics

- Device swapping without PC
- Supply via RK-Control 2S
- Hot-pluggable

Code No.	Type		For control unit
95703211	Control module	BDM01/01	All RK-Control 2S units

Fieldbus connector

- Profibus: Connector with 2 cable inputs (1 x for incoming and 1 x for continuing Profibus cable), one switch for activating the terminating resistor
- CANbus: Connector with 2 cable inputs (1 x for incoming and 1 x for continuing CANbus cable), one switch for activating the terminating resistor

Code No.	Type		
95703311	Profibus connector	BUS08/01	Without cable
95703411	CANbus connector	BUS10/01	Without cable

Transformer

- The transformer is required if no 24 V DC is available

Code No.	Type	For control unit
957014	Transformer 24 V DC, 4 A	All RK-Control 2S units
957030	Transformer 24 V DC, 8 A	All RK-Control 2S units