

RDC 21-K Dip Coater

Translation of the original instructions



Table of Content

General.....	2	Operating.....	5
Technical Data.....	2	Loading of machine.....	9
EG- Declaration of Conformity.....	3	Maintenance.....	9
Intended Use.....	4	Spare part list.....	9
Safety Regulations.....	4	Amendment.....	10
Options.....	4	Guarantee.....	10
Set Up.....	4	Disclaimer of Warranty.....	10
		Copyright.....	10

General

The RDC 21-K is a machine designed for laboratory dip coating. They can be used to apply liquid photoresists to e.g. miniature etching parts or other substrates, to apply liquid solder mask or any other kind of protective or technical coating. Today a more and more popular application is the so called: "sol-gel-application". This machine was developed to meet the demand of a greater variety of speeds, iterations, dipping and dripping times and heavier work-pieces.

Features:

- numeric foil keyboard for easy data entry.
- illuminated Display 90 x 35 mm with 20 x 4 digits.
- up to 10 dip cycles can be stored and loaded again on demand.
- Lifting device operated by precision stepper motor.
- Setting of virtual offset and virtual end switch position prevents unnecessary travel paths and saves time.
- You can distinct between fast distance drive and rather slow dipping/coating drive. Each of the 4 different drives can be set with an individual speed. In addition the point of speed change can be adjusted. This way you can program fast drives to the vessel and precise drives into and out of the vessel and this in accordance to your work-piece and vessel size.
- Distance speed is separately adjustable from 1 to 9999 mm/min and dip drive and coat drive can be separately set between 1 and 3000 mm.
- On customer request, the RDC 21-K can be equipped with a 0.9° stepper motor. With this motor speeds between 0.5 and 4999,5 mm/min are possible.
- Other speeds can be achieved by customized gears or longer/shorter drive distances by adapting the aluminium frame. Ask for an offer!
- The dipping time as well as the drip-off-time (pause time up and pause time down) are separately adjustable from 0 s up to 99h : 59min : 59s. This enables the machine not only to coat but also to precisely develop. This is of great importance with certain photo coatings of the miniature etching technology.
- Up to 1000 iterations of a dip routine are possible.
- lift bar for several work-piece fittings. The dipping height and the sizes of the aluminium profiles can be easily adapted to even dip-coat bulky items.
- The working range of the lift bar can be adjusted via the control panel. The maximum size of the work-piece is therefore only limited by the maximum lift range of the machine and the size of your cuvette.
- A optional metal ruler on the side of the vertical bar makes it easy to define the necessary positions to be entered into the menu

Technical Data

Stroke length:	0-650 mm
Maximum load:	5 kg (reduced max. speed with maximum load)
Weight:	12 kg
Dimensions (BxTxH):	350 x 465 x 965 mm (with Controller H:1030mm)
Distance drive up/down:	1- 9999 mm/min or 0,5 – 4999,5 mm/min
Insertion/drawing drive:	1 - 3000 mm / min or 0,5 - 1500 mm/min
Dipping / Drip off Time:	0 s – 99 h : 59 min : 59 s
Power supply:	100-240 V, 50-60 Hz, 120 W
Iterations:	Up to 1000 times

With stepper motor 0.9° the display shows the same speeds as with the standard-1-8° motor. But the speed refers to a time of **2 minutes. (e.g. 1500mm/2min)**. This solution was chosen for storage and processor reasons.

Technical changes reserved

EG- Declaration of Conformity



EG-Konformitätserklärung/Declaration of Conformity

Hersteller / Supplier:	Bungard Elektronik GmbH & Co. KG Rilkestraße 1 51570 Windeck Germany
Bevollmächtigte Person für die Zusammenstellung der technischen Unterlagen: Person in charge	Jürgen Bungard, Geschäftsführer /general director Rilkestraße 1 51570 Windeck Germany
Product:	Tauchbeschichter RDC21-k Dip Coater RDC21-k

Hiermit erklären wir, dass die oben beschriebenen Maschinen allen einschlägigen Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.

Die oben genannte Maschine erfüllt die Anforderungen der nachfolgend genannten Richtlinien und Normen:

We hereby declare that the machines described above complies with all relevant provisions of the Machinery Directive 2006/42/EC.

The above machine meets the requirements of the following guidelines and standards:

- **Maschinenrichtlinie 2006/42/EG / Machinery Directive 2006/42/EC**
- **EMV-Richtlinie 2014/30/EG / EMC Directive 2014/10830EC**
- **Niederspannungsrichtlinie 2014/35/EG / Low Voltage Directive 2014/35/EC**

• **DIN EN 60204-1** Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen / Safety of machinery - Electrical equipment of machines - Part 1: General requirements

• **DIN EN ISO 14121-1** Sicherheit von Maschinen - Risikobeurteilung - Teil 1: Leitsätze / Safety of machinery - Risk assessment - Part 1: Principles

• **DIN EN ISO 12100-1** Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze, Risikobeurteilung und Risikominderung / Safety of machinery - Basic concepts, risk assessment and risk reduction

• **DIN EN 55014-1 2012-05** Elektromagnetische Verträglichkeit, Anforderungen an Haushaltsgeräte, Elektrowerkzeuge und ähnliche Elektrogeräte, Teil 1: Störaussendung / Electromagnetic compatibility Requirements for household appliances, electric tools and similar electrical appliances Part 1: Emission

• **DIN EN 55014-2-2009-06** Elektromagnetische Verträglichkeit - Anforderungen an Haushaltgeräte, Elektrowerkzeuge und ähnliche Geräte - Teil 2: Störfestigkeit - / Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity

• **Niederspannungsrichtlinie / Low Voltage Directive 2014/35/EG**

• **Maschinenrichtlinie / Machinery Directive 2006/42/EG/37/EG**

Windeck, 10.1.2022

Jürgen Bungard Geschäftsführer

Intended Use

The machines are designed for coating positive and negative photoresists and solder masks as well as other paints or SolGel liquids.

All other applications require our written consent or are at full risk of the user. Bungard GmbH & Co. KG assumes no liability whatsoever for any damage that may result from the use of the machine.

Safety Regulations

Please apply the general safety rules for working with electrical machines.

There are no tools needed to operate the machine. With any intervention on the machine the warranty will void.

First switch off mains, then pull the plug. When you pull the plug while the machine is under current, electronic components may get defective.

Do not run the machine in corroding, humid, dusty, extremely hot or explosive atmosphere. If you do run the machine in an atmosphere as described above be aware that this happens on your own risk and responsibility.

The operator has to provide appropriate safety precautions and equipment. We explicitly exclude any warranty for damages resulting from running the machine in an atmospheres as described above.

Important: the motor holds the lift bar only when the power supply is switched on. Mount items only to the holder with power on. Otherwise the lift bar will move downwards. The maximum load is 2 kg at maximum speed.

Attention: Change the step resolution of the microcontroller only when the power is switched off !

Please take great care when adjusting stroke length and speeds. Consider the height of the liquid container and additional stirring devices.

We do not warrant damages caused by wrong settings.

Options

- metal ruler
- stepper motor with 0.9° step angle resolution for speeds between 0,5 and 4999,5 mm
- remote controller
- wall holder for remote controller
- customer specific frame, drive distances and speeds

Set Up

Examine the machine for possible transport damages. If you encounter any problems inform us **and** the carrier immediately.

Carefully transport the machine to its operation site. Do not use the motor or other extending parts as a handle.

Strip off the packing. Make sure not to damage the tooth belt.

Operating



Menu structure RDC 21-K

On the whole menu, you can correct your entries with the **CE**-key. With the **ENTER**-key you jump to the next position and confirm your input. To edit a value in a screen, you must press the **C**-key.

Line	Comment	Display
1	After switching on: Welcome screen with the software version.	Bungard BEL RDC 21-k version xx-xx-xx
2	Call for reference drive.	For home position (end switch up) press 1
3	Drive to HOME POSITION (upper limit switch).	Drive home position
4	Here you can adjust the offset (= virtual upper end switch), if you press 2. With 1 the machine drives to the last set or loaded offset and you can here continue reading in line 6.	Change offset pos. 1=no 2=yes
5	If you have pressed 2, you can adjust the offset (upper virtual end switch). If you have to dip small work pieces, you can avoid unnecessary drives and save time. Values between 0 and 999mm can be inserted. With the standard machine the lower mechanical end switch will limit the drive at 565mm .	Offset position virtual end switch up (in mm/max. 999)
6	Then you are asked to drive to the set virtual home position.	For offset position (virtual end switch) press 1
7	The RDC21-K moves to the VIRTUAL HOME POSITION...	Drive offset position (virtual end switch)
8and calls for confirmation. If you now press "not ok = 2", the menu starts again with line 2. If you press 1, you continue with line 9.	Offset position ok press 1 not ok press 2
9	Pressing 1 you will reach the main menu. Pressing 2.....	Change calib. cycle 1=no 2=yes
10	... you can now set 1 to 50 calibration cycles before you reach the main menu. If you set a 2 in this menu, the machine will make a reference drive after 2 iterations; if you set 20, the reference drive will be done after 20 iterations. A recommended value is 10. A calibration after a certain amount of iterations can be necessary, because the machine can lose steps due to arithmetical reasons when changing between half-, quarter-, 1/8-, 1/16-step size in the motor resolution.	Calibrate cycle: (min.1/max.50)

	<p>These step losses can add up after many iterations to a range of millimetres, so the machine will minimally fail to reach the set positions. With the calibration cycle you can compensate these step losses.</p> <p>Insert the desired iterations after those the machine shall make a reference drive and confirm with ENTER. You will automatically enter the main menu.</p>									
11	<p>Main menu</p> <p>1. view: you can view the current work cycle</p> <p>2. edit: you can edit the current work cycle</p> <p>3. load: you can load one of 10 possible cycles</p> <p>4. save: you can save the current cycle</p> <p>5 home pos: leave the main menu and make a reference drive</p> <p>6. power: controls the energy settings (standard = 75%)</p> <p>7. start: starts the dipping cycle</p>	<table border="1"> <tr> <td>1. View</td> <td>5. homepos</td> </tr> <tr> <td>2. edit</td> <td>6. power</td> </tr> <tr> <td>3. load</td> <td>7. Start</td> </tr> <tr> <td>4. save</td> <td></td> </tr> </table>	1. View	5. homepos	2. edit	6. power	3. load	7. Start	4. save	
1. View	5. homepos									
2. edit	6. power									
3. load	7. Start									
4. save										

Sub menus to the main menu

Line	Key	Comment	Display								
12	1 View	Here you can view the parameters of the current cycle. Press the according number to view each setting. In the first line it shows the current file you have loaded	<table border="1"> <tr> <td>view param. file:1</td> </tr> <tr> <td>1. V.up</td> <td>4. time</td> </tr> <tr> <td>2. V.down</td> <td>5. iter</td> </tr> <tr> <td>3. dist.</td> <td>6. back</td> </tr> </table>	view param. file:1	1. V.up	4. time	2. V.down	5. iter	3. dist.	6. back	
view param. file:1											
1. V.up	4. time										
2. V.down	5. iter										
3. dist.	6. back										
13	1-1 View-V.up	Speed for distance and for the coating drive (UP) in mm per minute. With one you go back to the overview.	<table border="1"> <tr> <td>V.dist.up: xxxx</td> </tr> <tr> <td>V.dip .up: xxxx</td> </tr> <tr> <td>mm/min</td> </tr> <tr> <td>back press 1</td> </tr> </table>	V.dist.up: xxxx	V.dip .up: xxxx	mm/min	back press 1				
V.dist.up: xxxx											
V.dip .up: xxxx											
mm/min											
back press 1											
14	1-2 View-V.down	Speed for distance and for the dipping drive (DOWN) in mm per minute. With one you go back to the overview.	<table border="1"> <tr> <td>V.dist.down: xxxx</td> </tr> <tr> <td>V.dip .down: xxxx</td> </tr> <tr> <td>mm/min</td> </tr> <tr> <td>back press 1</td> </tr> </table>	V.dist.down: xxxx	V.dip .down: xxxx	mm/min	back press 1				
V.dist.down: xxxx											
V.dip .down: xxxx											
mm/min											
back press 1											
15	1-3 View-dist.	Here you can control the set stop and speed change points. The distances are relative! Please check: the sum of offset+dip+distance must be equal or less than the maximum drive distance (standard machine = 565mm). If this is not the case, the machine will not drive correct!	<table border="1"> <tr> <td>dist.: xxxx mm</td> </tr> <tr> <td>dip .: xxxx mm</td> </tr> <tr> <td>offset: xxxx mm</td> </tr> <tr> <td>back press 1</td> </tr> </table>	dist.: xxxx mm	dip .: xxxx mm	offset: xxxx mm	back press 1				
dist.: xxxx mm											
dip .: xxxx mm											
offset: xxxx mm											
back press 1											
16	1-4 View-time	Check upper and lower waiting time.	<table border="1"> <tr> <td>t.down: 00:00:00</td> </tr> <tr> <td>t.up : 00:00:00</td> </tr> <tr> <td>back press 1</td> </tr> </table>	t.down: 00:00:00	t.up : 00:00:00	back press 1					
t.down: 00:00:00											
t.up : 00:00:00											
back press 1											
17	1-5 View-iter	View number of iterations in this cycle, the number of iterations after which the machine will make a reference drive and which motor power is set. Standard motor power setting is 75%.	<table border="1"> <tr> <td>iteration: x</td> </tr> <tr> <td>calibrate cycle: x</td> </tr> <tr> <td>power_75%</td> </tr> <tr> <td>back press 1</td> </tr> </table>	iteration: x	calibrate cycle: x	power_75%	back press 1				
iteration: x											
calibrate cycle: x											
power_75%											
back press 1											
18	1-6 View-back	with 6 you go back to main menu.	<table border="1"> <tr> <td>1. View</td> <td>5. home pos</td> </tr> <tr> <td>2. edit</td> <td>6. power</td> </tr> <tr> <td>3. load</td> <td>7. Start</td> </tr> <tr> <td>4. save</td> <td></td> </tr> </table>	1. View	5. home pos	2. edit	6. power	3. load	7. Start	4. save	
1. View	5. home pos										
2. edit	6. power										
3. load	7. Start										
4. save											
19	2 edit	In the edit sub menu you can edit all parameters. Pressing the numbers you will reach the sub-sub-menus:	<table border="1"> <tr> <td>1. V.up</td> <td>5. time up</td> </tr> <tr> <td>2. V.down</td> <td>6. time down</td> </tr> <tr> <td>3. dist.</td> <td>7. iteration</td> </tr> <tr> <td>4. dip</td> <td>8.back</td> </tr> </table>	1. V.up	5. time up	2. V.down	6. time down	3. dist.	7. iteration	4. dip	8.back
1. V.up	5. time up										
2. V.down	6. time down										
3. dist.	7. iteration										
4. dip	8.back										
20	2-1 edit-V.up	Speed up distance: Speeds for distance drive UP can be set between 1 and 9999 mm/min. Press the C -key to enter the edit-mode:	<table border="1"> <tr> <td>Speed up distance</td> </tr> <tr> <td>=xxxx mm/min</td> </tr> <tr> <td>change=C or OK=Enter</td> </tr> <tr> <td>(min.1/max. 9999)</td> </tr> </table>	Speed up distance	=xxxx mm/min	change=C or OK=Enter	(min.1/max. 9999)				
Speed up distance											
=xxxx mm/min											
change=C or OK=Enter											
(min.1/max. 9999)											
		Enter your desired speed and confirm with ENTER and you	<table border="1"> <tr> <td>Speed up distance</td> </tr> </table>	Speed up distance							
Speed up distance											

		will automatically get to...	xxxxx mm/min mm/min (min. 1/max. 9999)
21	2-1-1 edit-V.up	Speed up dip: Speeds for coating drive UP can be set between 1 and 3000 mm/min (speeds are reduced for safety reasons). Press the C -key to enter the edit-mode:	Speed up dip xxxxx mm/min change=C or OK=Enter (min. 1/max. 3000)
		Enter your desired speed and confirm with ENTER and you will go back to edit menu.	Speed up dip xxxxx mm/min mm/min (min. 1/max. 3000)
22	2-2 edit-V.down	Speed down distance: Speeds for distance drive DOWN can be set between 1 and 9500 mm/min. Press the C -key to enter the edit-mode. Insert your desired values and confirm with ENTER and you will automatically get to...	Speed down distance =xxxx mm/min change=C or OK=Enter (min. 1/max. 9999)
23	2-2-1 edit-V.down	Speed down dip: Speeds for dipping drive DOWN can be set between 1 and 3000 mm/min (speeds are reduced for safety reasons). Press the C -key to enter the edit-mode. Insert your desired values and confirm with ENTER and you will automatically get back to edit menu.	Speed down dip xxxx mm/min change=C or OK=Enter (min. 1/max. 9999)
24	2-3 edit-Dist.	Setting of speed change height. Position where the fast distance drives changes to the rather slow dip drive (and vice versa). The value for this position adds to the set virtual home position (offset). Press the C -key to enter the edit-mode. Insert your desired values and confirm with ENTER You can insert values between 50 and 1000 mm. With the standard machine the lower mechanical end switch will limit the drive at 565mm .	distance distance: xxxx mm change=C or OK=Enter min. 50/max.1000 mm
25	2-4 edit-DIP	Setting of the lower virtual end switch (dipping depth) in mm. Press the C -key to enter the edit-mode. Insert your desired values and confirm with ENTER . You can insert values between 0 and 1000 mm. The value for this position adds to the set virtual home position (offset) and the speed change height (maximum for standard machine: 565mm!)	distance DIP distance: xxxx mm change=C or OK=Enter min. 0/max.1000 mm
26	2-5 edit-time up	Setting of the upper waiting time (drip off time) between each iteration. Press the C -key to enter the edit-mode.....	time up : 00:00:00 change=C or OK=Enter
		You can insert between 0 seconds and 99 hours : 59 minutes : 59 seconds . Confirm each inserted digit with ENTER -key to store the value. If you entered the wrong value and you did not yet confirm with the ENTER -key, then you can correct the value by pressing the CE -key.	time up = 00:00:00 : : : successively enter (E=OK /max9/CE=k
27	2-6 edit-time down	Setting of the upper waiting time (drip off time) between each iteration. Press the C -key to enter the edit-mode.....	time down: 00:00:00 change=C or OK=Enter
		You can insert between 0 seconds and 99 hours : 59 minutes : 59 seconds. Confirm each inserted digit with ENTER -key to store the value. If you entered the wrong value and you did not yet confirm with the ENTER -key, then you can correct the value by pressing the CE -key.	time down = 00:00:00 : : : successively enter (E=OK /max9/CE=k

28	2-7 iteration	Setting the number of iterations of the complete cycle. You can insert between 1 and 1000 iterations. Press the C -key to enter the edit-mode.	Iteration: xxxx change=C or OK=Enter min. 1/max.1000 mm
29	2-8 Back	Back to main menu.	1. View 5. home pos 2. edit 6. power 3. load 7. Start 4. save
30	3 Load	Here you can load one of the 10 possible stored programs. Insert the number of the desired program and confirm with ENTER-. If you load a new program you have to perform a reference drive (main menu 5 home pos.). When being asked for changing offset, insert 1= no) for using the loaded offset.	Load parameter file Number: xx min.1/max.10
31	4 Save	If you have completely set a dipping cycle you can store this cycle for later use. Press a (free) value and confirm with ENTER. Note: if you store a program it will not be automatically active for making dip drives. Example: Loaded is program #3. You make some changes in this program and then save these changes as program #5. Now you are still in program #3 with the changed parameters. These changed parameters remain active (even if you switch off the machine) and they can be seen in the view menu. You can delete these current values by loading another program (e.g. program 3 with the old parameters, program 5 with the new parameters).	save parameter file Number: xx min.1/max.10
32	5 Home pos	Pressing 5 you can make a reference drive. You will jump back to line 6 in the menu. When you have entered this menu, you have to make a reference drive. No option to cancel or go back.	For home position (end switch up) press 1
33	6 Power	Setting motor power. 100% is only needed for high loads and drives at maximum speed. Standard setting is 75%. Setting 50% can be used to reduce vibrations when dipping small loads and/or slow speeds. If you use this setting with heavy loads, step loss might be the result, In this case make a reference drive.	Power ratio 1. 100% 2. 75% 3. 50%
34	7 start	Start of the chosen program. The RDC processes the chosen cycle with no interaction of the operator. You can interrupt the cycle by switching of power supply. The Display informs you on the drive which is being performed in this moment and the parameters used (example on the right).	Drive distance down: 200 mm speed : 900 mm/min iteration: 3
35		After a cycle is completely finished, the display shows „job completed“. Pressing 1 you jump to line 11 in the main menu, with 2 you start the current cycle one more time.	Job complete press 1 for menu press 2 for start

Selected parameters - except OFFSET - are stored and can be used next time the machine is switched on. All measures relate to the lower edge of the mounting beam for holding the samples. An optional metal ruler at the side of the machine makes entry of the necessary heights very easy.

To attach the holder to the beam special nuts with M4 threads are part of delivery. Additional special nuts M3 / M4 / M5 are available from us.

Another limit switch prevents down drives that exceed the maximum possible way.

Please take great care when adjusting stroke length and speeds. Consider the height of the liquid container and additional stirring devices.

We do not warrant damages caused by wrong settings.

Loading of machine

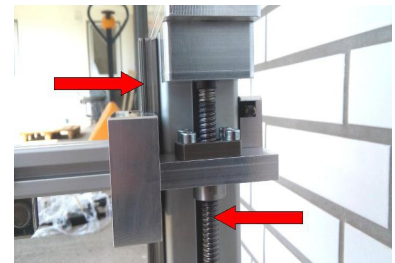
Important: The tool should be loaded only when the machine is under voltage, otherwise there is no holding torque of the engines and the beam will lower.

The machine is equipped with a universal carrier.

Inserted into these four are found special nuts M4. You can attach your coating substrates with a screw and a clip sheet.

Maintenance

The machine is mostly maintenance free. We only recommend to grease once a week the driving rails with a non corrosive oil (e.g. sewing machine oil).



Spare part list

Machine	Article	Short Text	Long Text German	Long Text English
RDC21-k	CCD4X021	Schrittmotor		stepper motor
RDC21-k	CCD3X014	Zahnriemen Getriebekasten	Zahnriemen Getriebekasten	Timing belt gearbox
RDC21-k	CCD3X057	Zahnriemen 14 mm	Zahnriemen 14 mm	Tooth belt 14 mm CCD
RDC21-k	CCD4X022	Microschalter	Microschalter XY	Microswitch XY
RDC21-k	RDC085	Schaltnetzteil extern	Schaltnetzteil extern	Switching power supply external
RDC21-k	RDC083	Controllerplatine	Controllerplatine RDC21-MAIN-V13 best.m.Systemklemmen	Controller board RDC21MAIN-V13 best.m.system terminals
RDC21-k	RDC082	Schrittmotor-Endstufe	Schrittmotor-Endstufe RD-C31DRV-B bestückt m. Systemklemmen	Stepper motor output stage RDC31DRV-B populated m. system terminals
RDC21-k	RDC081	Folientastatur 4x4	Folientastatur 4x4	Membrane keypad 4x4

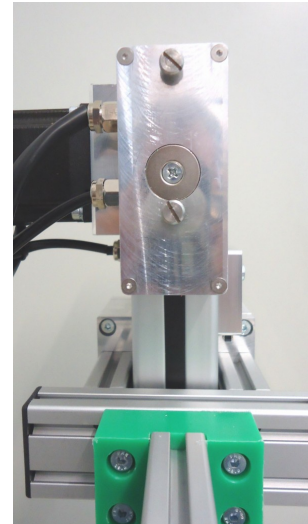
Amendment:

From September 2013 the RDC21-k is equipped with a removable controller.

As you can see on the pictures, the controller is fitted onto the bolts of the machine and secured by pushing downwards.



Pic. 2



Pic. 1

Guarantee

All machines are submitted before distribution to examination on function and continuous operation firmness. On the machine we grant a work warranty of 12 months to our customers starting from purchase date on accuracy in material and processing. We warrant at our choice by exchange of incorrect parts or by repair of the machine in our house. Old parts change into our possession.

Disclaimer of Warranty

All parts subjected to wear are excluded from this warranty. Non-observance of this manual shall void all warranty claims.

We cannot accept subsequent claims from damage or destruction of work-pieces worked on in the machine, because we have no knowledge or control over the operating conditions at your site. This is valid in a general manner also for requirements from damage to articles, buildings and persons as well as the environment.

We do not warrant that the function of the machine will meet the customer's requirements or that the operation of the machine will to this regard be error free.

In no event will we be liable to the customer for any incidental, consequential, or indirect damages of any kind, including loss of profit and prosecution for environmental pollution, even if we could have been aware of the possibility of such damages.

All information was arranged with great care. We reserve ourselves however mistake and technical changes without previous announcement.

Running the machine in corroding, humid, dusty, extremely hot or explosive atmosphere happens at the operator's own risk and responsibility.

We explicitly exclude any warranty for damages resulting from running the machine in in corroding, humid, dusty, extremely hot or explosive atmosphere.

Copyright

© 2023 Bungard Elektronik GmbH & Co. KG

Setting the RDC21-K : Sample Programming
Offset: 210mm / distance: 140mm / DIP: 80mm

