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CAPABILITIES OF THE MRC CONTROL

The MRC control is designed to control one (MRC-1) X-, Y-, or Z-axis or two (MRC-2) independently operating axes (Y, Y, or Z). The module is operated either by means of the input panel or via the digital inputs and outputs connected to a host controller, or by both methods.

The microprocessor-controlled MRC module is offered in two software versions.

Each software version supports 4 different operating modes that have been defined by the factory by means of system parameters.

SOFTWARE VERSION 1 (AXIS V1.../8)

Mode 0 = 8 programs (data for 8 axis movements can be stored).

Mode 1 = 8 programs (data for 8 axis movements can be stored)

Mode 2 = 16 program steps (data for up to 16 program segments of an axis movement can be stored).

Mode 3 = 8 programs (data for 8 axis movements can be stored.

SOFTWARE VERSION 2 (AXIS V1.../16)

Mode 0 = 16 programs (data for 16 axis movements can be stored).

Mode 1 = 16 programs (data for 16 axis movements can be stored)

Mode 2 = 16 program steps (data for up to 16 program segments of an axis movement can be stored).

Mode 3 = 16 programs (data for 16 axis movements can be stored.

Changes to the system parameters (software adaptation to the system) should only be performed by trained personnel with the aid of the "MRC Technical Reference".
MRC-1

The power supply, as well as a microprocessor unit for controlling the axis are located in the MRC-1 housing while the power section for driving the motor is located in a separate housing.

**FRONT PANEL with INPUT KEYPAD**

![Front Panel with Input Keypad]

Power switch  Control panel for 1 axis

**Important:** The keypad should be operated with the tips of your fingers but under no circumstances with your finger nails or any hard objects!

**REAR PANEL**

![Rear Panel]

1 - Power inlet  
2 - Connector for AC supply to power section (frequency converter)  
3 - Connector for set point input (frequency converter)  
4 - Connector for incremental signal generator  
5 - Connector for control via digital inputs and outputs  
11 - Connector for control via the serial interface
Cabling MRC-1

SPS

Synchronization module

MRC 1

220 V

(Frequency converter)
Power section

Converter housing 730

X-, Y- or Z-axis
MRC-2

The MRC-2 is a 2-axis version of the MRC-1. There is only one power switch for both axes, but otherwise the two axes operate completely independently of each other. A housing with a 2-axis power section (frequency converter) is required for this module.

**Front Panel with Input Keypads**

![Image of front panel with input keypads]

**Important:** The keypads should be operated with the tips of your fingers but under no circumstances with your finger nails or any hard objects!

**Rear Panel**

![Image of rear panel]

1. Power inlet
2. Connector for AC supply to power section (frequency converter) axes 1 and 2
3. Connector for set point input (frequency converter) axis 1
4. Connector for incremental signal generator axis 1
5. Connector for control via digital inputs and outputs axis 1
6. Connector for set point input (frequency converter) axis 2
7. Connector for incremental signal generator axis 2
8. Connector for control via digital inputs and outputs axis 2
9. Connector for control via serial interface axis 1
10. Connector for control via serial interface axis 2
CABLING MRC-2

SPS

Synchronization module

5 8
11
12

MRC 2

Power section 1
(Frequency converter)

Power section 2
(Frequency converter)

Converter housing 730

220 V

X-, Y- or Z-axis 1

X-, Y- or Z-axis 2
CONTROL PANEL

Symbol for input value and mode
Display field 1

Program number
Display field 2

Input value
Display field 3

<table>
<thead>
<tr>
<th>S1</th>
<th>S3</th>
<th>S5</th>
<th>S7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S2</th>
<th>S4</th>
<th>S6</th>
<th>S8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Key Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Code</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Start Key" /></td>
<td>S1</td>
<td>Start key</td>
</tr>
<tr>
<td><img src="image" alt="Stop Key" /></td>
<td>S2</td>
<td>Stop key</td>
</tr>
</tbody>
</table>
| ![Reference Point Key](image) | S3 | Reference point key  
Acknowledgment key |
| ![Minus Key](image) | S4 | Minus key |
| ![Program Selection Key](image) | S5 | Program selection key |
| ![Plus Key](image) | S6 | Plus key |
| ![Function Selection Key](image) | S7 | Function selection key |
| ![Shift Key](image) | S8 | Shift key |
OPERATING MODES

MODE 0

This mode is intended for a Y-axis used in powder coating applications. Depending on the requirements, the user can create either 8 programs (software version 1) or 16 programs (software version 2). If fewer programs are needed than supported by the software version, the corresponding system parameters must be adjusted.

Each program contains data on the speed of the up and down stroke (v) of the reciprocator, the upper and lower turnaround point (OW, UW), and the dwell time (t) at the turnaround point.

With corresponding settings in the system parameters it is possible to define whether the up and down stroke speed is to be different or the same.

With the system parameters you can also define the dwell times at the turnaround points and the number of programs that can be called during the operation.

If a new program is selected during the operation, the axis stops immediately. The function selection key can be actuated in any program regardless of whether the axis is stopped or not.

When new values are entered during the operation, they are immediately accepted by the axis.

In this mode it is possible to control the MRC via the existing digital inputs and outputs by means of a host controller (if the corresponding system parameters are enabled).
**Mode 1**

This mode is intended for a Y-axis used in conjunction with liquid painting applications. The axis movement can be subdivided into three sections. A different speed can be programmed for each segment.

Depending on the requirements the user can prepare 8 programs (software version 1) or 16 programs (software version 2). If fewer programs are needed than are supported by the software version, the system parameters must be set correspondingly.

Each program contains data on:
- The speed of the axis movement in each section (v)
- The position of the lower and upper intermediate point (UZ, OZ)
- The position of the lower and upper turnaround point (W, OW)
- The dwell time (t) at the turnaround points

In the system parameters you must define the number of programs that can be called during the operation as well as the applicable dwell time at the turnaround point, if any.

If a new program is selected during the operation, the axis stops immediately. The function selection key can be actuated in any program regardless of whether the axis is stopped or not.

When new values are entered during the operation, they are immediately accepted by the axis.

In this mode it is possible to control the MRC via the existing digital inputs and outputs by means of a host program controller (if the corresponding system parameters are enabled).
Mode 2

This mode is intended for a Y-axis or Z-axis in conjunction with coating applications that require special reciprocator movements. Depending on the software version up to 16 different positions (program steps) can be defined and executed sequentially. For each position a jump address (0, 1, 2, F) is specified, i.e. the designation of the next position to be searched. In this way it is possible to program a loop. A different speed (v) can be specified for each program section.

If dwell times (t) are to be executed when a position has been reached, the corresponding system parameters must be set.

The function selection key can be pressed during the operation or while the axis stands still. When new values are entered during the operation, they are immediately accepted by the axis. In this mode it is possible to control the MRC via the existing digital inputs and outputs by means of a host controller (if the corresponding system parameters are enabled).

In each program step you can define whether the existing digital outputs are to be set ON or OFF so that external system components can be interlocked.
Mode 3

In this mode you can move an X-axis or Z-axis to any position. Depending on the requirements up to 8 programs (software version 1) or 16 programs (software version 2) can be created. If fewer programs are needed, the corresponding system parameters must be set. Each program contains data on the position (A) and the speed (v) with which the axis is moved to the desired position. If a new program is selected during the operation, the axis does not stop. The function selection key (►) can be pressed during the operation or while the axis stands still. When new values are entered during the operation, they are immediately accepted by the axis. In this mode it is possible to control the MRC via the existing digital inputs and outputs by means of a host controller (if the corresponding system parameters are enabled).
**Mode 3 (Synchronization)**

In this mode it is possible to move an X-axis to any position and also to synchronize. For this purpose a synchronization module is connected to the MRC. This synchronization module determines the speed of the chain conveyor and supplies this value via the serial interface to the MRC module where these data are evaluated. The axis can thus be moved faster/slower or at the same speed (in synchronism) as the chain conveyor. The difference between the axis speed and the conveyor speed is referred to as the relative speed (coating speed).

If the axis should move faster than the chain conveyor, the relative speed must be entered in the operating parameters with a value of 0.1 to 9.9 cm/sec.

![Diagram](attachment:image.png)

Vx = Vk + Vrel
Vx = Axis speed
Vk = Chain conveyor speed
Vrel = Relative speed
If the axis should move slower than the chain conveyor, the relative speed must be entered in the operating parameters with a value of -0.1 to -9.9 cm/sec.

\[ V_x = V_k + V_{rel} \]
\[ V_x = \text{Axis speed} \]
\[ V_k = \text{Chain conveyor speed} \]
\[ V_{rel} = \text{Relative speed} \]

Since this operation mode is only used in conjunction with a host controller, the corresponding system parameter must be set.
The host controller switches the synchronization on or off, selects the corresponding program, and starts/stops the axis.
The user can create 8 programs (software versions 1 and 2).
### DISPLAY SYMBOLS

Symbols on the display (1) for identifying the input function

<table>
<thead>
<tr>
<th>Display</th>
<th>Operating Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Display" /></td>
<td>Position indication</td>
</tr>
</tbody>
</table>
| ![Display](image) | Operating mode 0: Lower turnaround point  
Operating mode 1: Lower turnaround point  
Operating mode 2: Position  
Operating mode 3: Position |
| ![Display](image) | Operating mode 0: Does not exist  
Operating mode 1: Lower intermediate point  
Operating mode 2: Does not exist  
Operating mode 3: Does not exist |
| ![Display](image) | Operating mode 0: Does not exist  
Operating mode 1: Upper intermediate point  
Operating mode 2: Does not exist  
Operating mode 3: Does not exist |
| ![Display](image) | Operating mode 0: Upper turnaround point  
Operating mode 1: Upper turnaround point  
Operating mode 2: Does not exist  
Operating mode 3: Does not exist |
| ![Display](image) | Operating mode 0: Speed / speed downward  
Operating mode 1: Speed in bottom section (between lower turnaround point and lower intermediate point)  
Operating mode 2: Speed  
Operating mode 3: Speed |
| ![Display](image) | Operating mode 0: Does not exist  
Operating mode 1: Speed in center section (up / down between lower intermediate point and upper intermediate point)  
Operating mode 2: Does not exist  
Operating mode 3: Relative speed with “Synchronization on” |
Symbols on the display (1) that identify the input functions

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![Symbol](image) | Operating mode 0: Does not exist / speed upward  
Operating mode 1: Speed in top section (up/down between upper turn point and lower intermediate point)  
Operating mode 2: Does not exist  
Operating mode 3: Does not exist |
| ![Symbol](image) | Dwell time at lower turnaround point  
Operating mode 3: Does not exist |
| ![Symbol](image) | Dwell time at upper turnaround point  
Operating mode 2: Does not exist  
Operating mode 3: Does not exist |
| ![Symbol](image) | Operating mode 0: Does not exist  
Operating mode 1: Does not exist  
Operating mode 2: Set digital output  
Operating mode 3: Does not exist |
| ![Symbol](image) | Operating mode 0: Does not exist  
Operating mode 1: Does not exist  
Operating mode 2: Next program step number  
Operating mode 3: Does not exist |
| ![Symbol](image) | Applicable to all symbols:  
The decimal point is light after the program has been started. |

The input values have the following units of measure:

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positioning and turnaround points</td>
<td>m</td>
<td>1 cm</td>
</tr>
<tr>
<td>Speeds</td>
<td>m/s</td>
<td>0.01 m/s</td>
</tr>
<tr>
<td>Dwell times</td>
<td>sec</td>
<td>0.1 s</td>
</tr>
<tr>
<td>Functions</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>Jump addresses</td>
<td>program step number</td>
<td></td>
</tr>
</tbody>
</table>
SAFETY RECOMMENDATIONS

1. **IMPORTANT: The motor power of the axis far exceeds the human power!** During the operation the axis should be protected against possible access by personnel.

2. The connectors between the MRC module, the power section, and the axis may only be separated when the MRC module is switched off.

3. The connecting cables between the power section and the axis must be routed in such a way that they cannot become damaged while the axis is in operation. Please also follow the local safety regulations.

4. Changes to the system parameters (software adaptation) should only be performed by trained personnel based on the "MRC Service Manual". Incorrect entries can cause damage to the axis or the booth.

5. The MRC module must be disconnected from the AC power source before any repairs are made.
**OPERATION**

**SWITCHING ON THE MRC MODULE**

1. *Power ON = turn the master switch to position 1*
   
The error message E10 is displayed (reference point not searched). The axis stops.

2. *Press the key*
   
The axis searches the reference point and stops there. The display shows:
   
P 0 0.00
P = Position
0 = Current program number
0.00 = Position of the reference point

Depending on the settings of the system parameters, the reference point can be searched manually as well as automatically through the I/O.

**SWITCHING OFF THE MRC MODULE**

1. *Power OFF = turn the master switch to position 0*
   
All program data are preserved because the data memory is battery buffered.

**SWITCHING ON THE AXIS MOVEMENT**

1. *Press the Start key when the symbol P is shown on the display 1.*
   
The decimal point after the P lights up. The axis starts to reciprocate in accordance with the stored program.

**SWITCHING OFF THE AXIS MOVEMENT**

1. *Press the stop key when the symbol P is shown on the display.*
   
The axis stops immediately. The decimal point after the P is dark.
OPERATING PARAMETERS

Operating parameters are entries through which the individual coating programs are defined. In each program the axis movements such as the upper turnaround point, the axis speed, etc. can be defined. A new matching program can thus be created for each application.

The number of programs that can be created depends on the software version of the MRC module. (Refer to “Capabilities of the MRC control”)

The operating parameters must be reentered:
1. When the equipment is put into service for the first time
2. After any changes to the system parameters (immediately after the input of the system parameters)
3. During the operation (Adaptation to the workpieces to be coated)

SETTING UP THE OPERATING PARAMETERS IN MODE 0

Before you can set up the operating parameters the number of the program must be selected in which the entries are to be made.

Depending on the software version of the MRC module, a number of programs is available that can be selected while the axis is in operation or standing still.

1. Press the program selection key [++]

If you select a new program while the equipment is running, the axis stops immedi-
ately. The designation of the new program (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, or F) is displayed. The [++] key in conjunction with the shift key [↑] causes the previously displayed program number to be reselected.

a) Entering the lower turnaround point

1. Press the function selection key [→] several times until the symbol of the lower turnaround point [↓] appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key [→] in conjunction with the shift key [↑] causes the previously displayed function to be reselected.

If the axis is switched on, it immediately moves from the lower turnaround point [↓] to the corresponding position and stops.
1a. Press the start key 1
The axis switches on. The decimal point on the display is light.

1b. Press the stop key 0
The axis switches off. The decimal point on the display is dark.

2. With the + or - key you can shift the lower turnaround point upward (plus) or downward (minus) in steps of one cm. When the + or - key is pressed in conjunction with the shift key ↑ the step width is 10 cm.

If the axis is switched on, it immediately executes the specified change so that the lower turnaround point can be accurately determined.

b) Entering the upper turnaround point

1. Press the function selection key → several times until the symbol of the upper turnaround point ñ appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key → in conjunction with the shift key ↑ causes the previously displayed function to be reselected.

If the axis is switched on, it immediately moves from the upper turnaround point ñ to the corresponding position and stops.

1a. Press the start key 1
The axis switches on. The decimal point on the display is light.

1b. Press the stop key 0
The axis switches off. The decimal point on the display is dark.

2. With the + or - key you can shift the upper turnaround point upward (plus) or downward (minus) in steps of one cm. When the + or - key is pressed in conjunction with the shift key ↑ the step width is 10 cm.

If the axis is switched on, it immediately executes the specified change so that the upper turnaround point can be accurately determined.
c) **Entering the speed**

**IDENTICAL UP/DOWN STROKE SPEED**

1. *Press the function selection key [ → ] several times until the speed symbol [ ] appears on the display 1.*

   Each time this key is pressed the next function and its value are displayed. The function selection key [ → ] in conjunction with the shift key [ † ] causes the previously displayed function to be reselected.

2. *With the [ ] or [ ] key you can modify the speed of the up / down stroke. When the [ ] or [ ] key is pressed in conjunction with the shift key [ † ] you can enter values that are 10 times larger.*

   If the axis is switched on it immediately executes the specified change so that the desired speed can be accurately determined.

**INDIVIDUAL UP / DOWN STROKE SPEEDS**

1. *Press the function selection key [ → ] several times until the down stroke speed symbol [ ] appears on the display 1.*

   Each time this key is pressed the next function and its value are displayed. The function selection key [ → ] in conjunction with the shift key [ † ] causes the previously displayed function to be reselected.

2. *With the [ ] or [ ] key you can modify the downstroke speed. When the [ ] or [ ] key is pressed in conjunction with the shift key [ † ] you can enter values that are 10 times larger.*

   If the axis is switched on it immediately executes the specified change so that the desired downstroke speed can be accurately determined.

3. *Press the function selection key [ → ] several times until the upstroke speed symbol [ ] appears on the display 1.*

   Each time this key is pressed the next function and its value are displayed. The function selection key [ → ] in conjunction with the shift key [ † ] causes the previously displayed function to be reselected.

4. *With the [ ] or [ ] key you can modify the upstroke speed. When the [ ] or [ ] key is pressed in conjunction with the shift key [ † ] you can enter values that are 10 times larger.*

   If the axis is switched on, it immediately executes the specified change so that the desired upstroke speed can be accurately determined.
d) Entering the dwell time at the lower turnaround point

1. **Press the function selection key ← several times until the symbol for the dwell time at the lower turnaround point ә appears on the display 1.**

   Each time this key is pressed the next function and its value are displayed. The function selection key ← in conjunction with the shift key ↑ causes the previously displayed function to be reselected.

2. **With the + or − key you can modify the dwell time at the lower turnaround point within the range of 0 to 25.5 seconds. When the + or − key is pressed in conjunction with the shift key ↑ you can enter values that are 10 times larger.**

   If the axis is switched on it immediately executes the specified change.

e) Entering the dwell time at the upper turnaround point

1. **Press the function selection key ← several times until the symbol for the dwell time at the upper turnaround point appears ә on the display 1.**

   Each time this key is pressed the next function and its value are displayed. The function selection key ← in conjunction with the shift key ↑ causes the previously displayed function to be reselected.

2. **With the + or − key you can modify the dwell time at the upper turnaround point within the range of 0 to 25.5 seconds. When the + or − key is pressed in conjunction with the shift key ↑ you can enter values that are 10 times larger.**

   If the axis is switched on it immediately executes the specified change.
SETTING UP THE OPERATING PARAMETERS IN MODE 1

Before you can set up the operating parameters you must select the program (program number) in which the entries are to be made. Depending on the software version of the MRC module a number of programs is available that can be selected while the equipment is running or standing still.

1. Press the key

If you select a new program while the equipment is running, the axis stops immediately and the designation of the new program (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, or F) is shown on the display 2.

a) Entering the lower turnaround point.

1. Press the function selection key several times until the symbol of the lower turnaround point appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key in conjunction with the shift key is displayed function to be reselected.

If the axis is switched on, it immediately moves from the lower turnaround point to the corresponding position and stops.

1a. Press the start key

The axis switches on. The decimal point on the display 1 is light.

1b. Press the stop key

The axis switches off. The decimal point on the display 1 is dark.

2. With the or key you can shift the lower turnaround point upward (plus) or downward (minus) in steps of one cm. When the or key is pressed in conjunction with the shift key , the step width is 10 cm.

If the axis is switched on, it immediately executes the specified change so that the lower turnaround point can be accurately determined.
b) Entering the lower intermediate point

1. Press the function selection key \( \rightarrow \) several times until the symbol of the lower intermediate point \( \text{u} \) appears on the display 1.

Each time this key is pressed, the next function and its value are displayed. The function selection key \( \rightarrow \) in conjunction with the shift key \( \uparrow \) causes the previously displayed function to be reselected.

If the axis is switched on, it immediately moves from the lower intermediate point to the corresponding position and stops.

1a. Press the start key \( 1 \)

The axis switches on. The decimal point on the display 1 is light.

1b. Press the stop key \( 0 \)

The axis switches off. The decimal point on the display 1 is dark.

2. With the \( + \) or \( - \) key you can shift the lower intermediate point upward (plus) or downward (minus) in steps of one cm. When the \( + \) or \( - \) key is pressed in conjunction with the shift key \( \uparrow \), the step width is 10 cm.

If the desired value of the lower intermediate point cannot be entered, the lower turnaround point must be shifted.

If the axis is switched on, it immediately executes the specified change so that the lower intermediate point can be accurately determined.

c) Entering the upper intermediate point

1. Press the function selection key \( \rightarrow \) several times until the symbol of the upper intermediate point \( \text{u} \) appears on the display 1.

Each time this key is pressed, the next function and its value are displayed. The function selection key \( \rightarrow \) in conjunction with the shift key \( \uparrow \) causes the previously displayed function to be reselected.

If the axis is switched on, it immediately moves from the upper intermediate point to the corresponding position and stops.

1a. Press the start key \( 1 \)

The axis switches on. The decimal point on the display 1 is light.

1b. Press the stop key \( 0 \)

The axis switches off. The decimal point on the display 1 is dark.
2. With the \[\text{+}\] or \[\text{-}\] key you can shift the upper intermediate point upward (plus) or downward (minus) in steps of one cm. When the \[\text{+}\] or \[\text{-}\] key is pressed in conjunction with the shift key \[\text{↑}\], the step width is 10 cm.

If the desired value of the upper intermediate point cannot be entered, the lower turnaround point must be shifted.
If the axis is switched on it immediately executes the specified change so that the upper intermediate point can be accurately determined.

d) Entering the upper turnaround point

1. Press the function selection key \[\rightarrow\] several times until the symbol of the upper turnaround point \[\text{↑}\] appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key \[\rightarrow\] in conjunction with the shift key \[\text{↑}\] causes the previously displayed function to be reselected.

If the axis is switched on, it immediately moves from the upper turnaround point to the corresponding position and stops.

1a. Press the start key \[\text{I}\]

The axis switches on. The decimal point on the display lights up.

1b. Press the stop key \[\text{O}\]

The axis switches off. The decimal point on the display is dark.

2. With the \[\text{+}\] or \[\text{-}\] key you can shift the upper turnaround point upward (plus) or downward (minus) in steps of one cm. When the \[\text{+}\] or \[\text{-}\] key is pressed in conjunction with the shift key \[\text{↑}\] the step width is 10 cm.

If the axis is switched on, it immediately executes the specified change so that the lower turnaround point can be accurately determined.

e) Entering the value for speed between the lower turnaround point and the lower intermediate point (same speed for up / down stroke)

1. Press the function selection key \[\rightarrow\] several times until the symbol for the speed in the bottom section \[\text{–}\] appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key \[\rightarrow\] in conjunction with the shift key \[\text{↑}\] causes the previously displayed function to be reselected.
2. With the \( \text{[+] or [-]} \) key you can modify the speed of the up/down stroke in the bottom section. When the \( \text{[+] or [-]} \) key is pressed in conjunction with the shift key \( \text{[\uparrow]} \) you can enter values that are 10 times larger.

If the axis is switched on, it immediately executes the specified change so that the desired speed can be accurately determined.

f) Entering the value for speed between the lower and the upper point (same speed for up / down stroke)

1. Press the function selection key \( \text{[\rightarrow]} \) several times until the symbol for the speed in the middle section \( \text{[\leftarrow]} \) appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key \( \text{[\rightarrow]} \) in conjunction with the shift key \( \text{[\uparrow]} \) causes the previously displayed function to be reselected.

2. With the \( \text{[+] or [-]} \) key you can modify the speed of the up / down stroke in the middle section. When the \( \text{[+] or [-]} \) key is pressed in conjunction with the shift key \( \text{[\uparrow]} \) you can enter values that are 10 times larger.

If the axis is switched on, it immediately executes the specified change so that the desired speed can be accurately determined.

g) Entering the value for speed between the upper intermediate point and the upper turnaround point (same speed for up / down stroke)

1. Press the function selection key \( \text{[\rightarrow]} \) several times until the symbol for the speed in the top section \( \text{[\leftarrow]} \) appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key \( \text{[\rightarrow]} \) in conjunction with the shift key \( \text{[\uparrow]} \) causes the previously displayed function to be reselected.

2. With the \( \text{[+] or [-]} \) key you can modify the speed of the up/down stroke in the top section. When the \( \text{[+] or [-]} \) key is pressed in conjunction with the shift key \( \text{[\uparrow]} \) you can enter values that are 10 times larger.

If the axis is switched on, it immediately executes the specified change so that the desired speed can be accurately determined.

h) Entering the dwell time at the lower turnaround point

1. Press the function selection key \( \text{[\rightarrow]} \) several times until the symbol \( \text{[\alpha]} \) for the dwell time at the lower turnaround point appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key \( \text{[\rightarrow]} \) in conjunction with the shift key \( \text{[\uparrow]} \) causes the previously displayed function to be reselected.
2. With the \( \text{+} \) or \( \text{-} \) key you can modify the dwell time at the lower turnaround point within the range of 0 to 25.5 seconds. When the \( \text{+} \) or \( \text{-} \) key is pressed in conjunction with the shift key \( \text{↑} \) you can enter values that are 10 times larger.

If the axis is switched on, it immediately executes the specified change.

i) Entering the dwell time at the upper turnaround point

1. Press the function selection key \( \rightarrow \) several times until the symbol for the dwell time at the upper turnaround point \( \text{□} \) appears on the display 1.

Each time this key is pressed the next function and its value are displayed. The function selection key \( \rightarrow \) in conjunction with the shift key \( \text{↑} \) causes the previously displayed function to be reselected.

2. With the \( \text{+} \) or \( \text{-} \) key you can modify the dwell time at the upper turnaround point within the range of 0 to 25.5 seconds. When the \( \text{+} \) or \( \text{-} \) key is pressed in conjunction with the shift key \( \text{↑} \) you can enter values that are 10 times larger.

If the axis is switched on, it immediately executes the specified change.

**SETTING UP THE OPERATING PARAMETERS IN MODE 2**

Before you can set up the operating parameters you must select the program (program number) in which the entries are to be made. In this mode the program sequence always starts with step 0.

If the axis is switched on when the operating parameters are set, it executes the complete program (all program steps). For this reason we recommend that you switch the axis off before you enter the parameters.

1. Press the \( \text{□} \) key

   The designation of the new program step (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, or F) is shown on the display 2.

   If a new program step is chosen during operation, the axis will stop immediately.

a) Entering the position

1. Press the function selection key \( \rightarrow \) several times until the symbol \( \text{P} \) for the position appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key \( \rightarrow \) in conjunction with the shift key \( \text{↑} \) causes the previously displayed function to be reselected.
2. With the [+] or [−] key you can shift the position upward (plus) or downward (minus). When the [+] or [−] key is pressed in conjunction with the shift key [↑] the step width is 10 cm.

b) Entering the speed

1. Press the function selection key [←] several times until the symbol for the speed [−] appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key [←] in conjunction with the shift key [↑] causes the previously displayed function to be reselected.

2. With the [+] or [−] key you can modify the up/down stroke speed. When the [+] or [−] key is pressed in conjunction with the shift key [↑] you can enter values that are 10 times larger.

c) Entering the dwell time

1. Press the function selection key [←] several times until the symbol for the dwell time [⊙] appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key [←] in conjunction with the shift key [↑] causes the previously displayed function to be reselected.

2. With the [+] or [−] key you can modify the dwell time at the lower turnaround point within the range of 0 to 25.5 seconds. When the [+] or [−] key is pressed in conjunction with the shift key [↑] you can enter values that are 10 times larger.

d) Entering the function in the program step (setting the dialog output)

1. Press the function selection key [←] several times until the symbol for the function [F] appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key [←] in conjunction with the shift key [↑] causes the previously displayed function to be reselected.

2. With the [+] and [−] keys you can enter the desired value:
   000 = Dialog output switched off
   001 = Dialog output switched on
e) Entering the jump address (number of next program step)

1. Press the function selection key ![arrow right] several times until the symbol for the jump address ![jump] appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key ![arrow right] in conjunction with the shift key ![shift up] causes the previously displayed function to be reselected.

2. With the ![arrow up] and ![arrow down] keys you can enter the jump address: (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, or F).

   This entry identifies to the MRC control the program step with which the program will continue.

   To ensure that the program executes without interruption, the last entered jump address should point to a previously defined program step.

**Setting up the Operating Parameters in Mode 3**

Before you can set up the operating parameters you must select the program (program number) in which the entries are to be made.

Depending on the software version of the MRC module, a number of programs is available that can be selected while the equipment is running or standing still.

1. Press the ![home] key

   If you select a new program while the equipment is running, the axis immediately executes the program. The designation of the new program (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, or F) is shown on the display 2.

a) Entering the position

1. Press the function selection key ![arrow right] several times until the position symbol ![P] appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key ![arrow right] in conjunction with the shift key ![shift up] causes the previously displayed function to be reselected.

2. With the ![arrow up] or ![arrow down] key you can shift the position forward (plus) or backward (minus). When the ![arrow up] or ![arrow down] key is pressed in conjunction with the shift key ![shift up] the step width is 10 cm.
b) Entering the speed

1. Press the function selection key $\rightarrow$ several times until the speed symbol $\equiv$ appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key $\rightarrow$ in conjunction with the shift key $\uparrow$ causes the previously displayed function to be reselected.

2. With the $\rightarrow$ or $\leftarrow$ key you can modify the forward/backward stroke speed. When the $\rightarrow$ or $\leftarrow$ key is pressed in conjunction with the shift key $\uparrow$ you can enter values that are 10 times larger.

   This entry determines the speed with which the axis is moved into the desired position.

**SETTING UP THE OPERATING PARAMETERS IN MODE 3**

( SYNCHRONIZING )

Before you can set up the operating parameters you must select the program (program number) in which the entries are to be made. In each software version of the MRC module there are 8 programs which can be selected while equipment is running or standing still.

1. *Press the $\rightarrow$ key*

   If you select a new program while the equipment is running, the axis immediately executes the program. The designation of the new program (0, 1, 2, 3, 4, 5, 6 or 7) is shown on the display 2.

a) Entering the position

1. Press the function selection key $\rightarrow$ several times until the position symbol $\equiv$ appears on the display 1.

   Each time this key is pressed the next function and its value are displayed. The function selection key $\rightarrow$ in conjunction with the shift key $\uparrow$ causes the previously displayed function to be reselected.

2. With the $\rightarrow$ or $\leftarrow$ key you can shift the position forward (plus) or backward (minus). When the $\rightarrow$ or $\leftarrow$ key is pressed in conjunction with the shift key $\uparrow$ the step width is 10 cm.
b) Entering the speed

1. Press the function selection key ➔ several times until the speed symbol ➖ appears on the display.

   Each time this key is pressed the next function and its value are displayed. The function selection key ➔ in conjunction with the shift key ↑ causes the previously displayed function to be reselected.

2. With the ➕ or ➖ key you can modify the forward / backward stroke speed. When the ➕ or ➖ key is pressed in conjunction with the shift key ↑ you can enter values that are 10 times larger.
   This entry determines the speed with which the axis is moved into the desired position.

c) Entering the relative speed

1. Press the function selection key ➔ several times until the symbol ➖ for the relative speed appears on the display.

   Each time this key is pressed the next function and its value are displayed. The function selection key ➔ in conjunction with the shift key ↑ causes the previously displayed function to be reselected.

2. With the ➕ or ➖ key you can modify the relative speed. When the ➕ or ➖ key is pressed in conjunction with the shift key ↑ you can enter values that are 10 times larger.
   If the axis should move faster than the chain conveyor, the value of the relative speed is to be entered as 0.1 to 9.9 cm/s by means of the ➕ key. If the axis should move slower than the chain conveyor, the value of the relative speed is to be entered as -0.1 to -9.9 cm/s by means of the ➖ key. Press the ➖ key repetitively until the negative sign "-" appears on the display.
SELECTING THE PROGRAM

Depending on the software version of the MRC module, a number of programs is available that can be selected while the equipment is running or standing still.

1. *Press the [**] key*

   If you select a new program while the equipment is running, the axis stops immediately (except in mode 3). The designation of the new program (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, or F) is shown on the display 2.

DISABLING THE KEYPAD

1. *Simultaneously press the stop [0] key and the shift key [↑] during 15 seconds.*

   The decimal point of the program designation lights up. All keys of the keypad are now disabled. In this condition the axis can only be controlled via the digital inputs and the serial interface.

ENABLING THE KEYPAD

1. *Simultaneously press the stop [0] key and the shift key [↑] during 15 seconds.*

   The decimal point of the program designation lights up. All keys of the keypad are now enabled.
ERROR MESSAGES

E 09  Emergency OFF

If an emergency OFF has been actuated on any part of the coating system, the fault message E 09 is shown on the display 3.

It is essential to determine the fault source. After the fault has been remedied the message E 10 appears on the display 3. (See E 10)

E 10  Reference point not searched

Press the key
The axis searches the reference point and stops there. The message P 0 0.00 is displayed.
P = Position
0 = Designation of current program
0.00 Location of reference point

Depending on the settings of the system parameters, the reference point can be searched manually as well as automatically through the I / 0.

E 12  System parameter not set

This fault message is always displayed when the content of the data memory (RAM) has been erased (refer to “MRC Service Manual”).

E 20  Upper turnaround point exceeded.

If the stored program controller activates the axis in synchronized mode longer than the available stroke length, the message E 20 is displayed.
Press the key after this fault has occurred. The message E 10 is subsequently displayed. (See E 10)
In order to clear this fault you must either adjust the program of the host controller or reenter the upper stroke limit in the system parameters. (Refer to “MRC Service Manual”).

E 21  Position error

This fault message is displayed when the control difference between the set point and the actual value becomes too large.
Press the key after this fault has occurred. The Message E 10 is subsequently displayed. (See E 10)
E 22  Axis movement monitoring trip

In coating applications that require very short reciprocator movements, the drive motor can eventually become overloaded. In order to protect the motor from such overloads, the minimum time for 5 two-way strokes of the axis is set in the system parameters. If the actual time is shorter than the preprogrammed time, the axis stops immediately and the error message E 22 is displayed.

Press the key after this fault has occurred. The message E 10 is subsequently displayed. (See E 10)

In order to clear this fault you must either select a lower speed or a greater stroke length in the operating parameters.

**TECHNICAL DATA**

Number of axes per module: 1 or 2
Number of axes per control cabinet: max. 4
Power requirements:
- 220 V/50 Hz
- 1,5 kVA single phase

Maximum number of programs
- in modes 0,1,3: 16
- in mode 3 synchronizing 8

Maximum number of program steps in mode 2: 16

Maximum stroke length: 9.99 m

Positioning error: < 5 mm

Maximum speed with corresponding drive 1.2 m/s

Maximum speed for powder version 0.6 m/s

Minimum speed: 0.01 m/s

Dwell times at the turnaround points: 0 to 15.5 sec.

Acceleration: 0.5 to 2.5 m/s²
Spare Parts List

How to order spare parts

With your order for spare parts we require the following information:

Quantity, Description and order number of each part

Example:

6 pcs.       Fuse F 0.10 A  
1 pcs.       Power supply PCB, complete  

229 520
325 691

When installing spare parts please observe the following:

• The MRC module must be disconnected from the AC power source!

• Do not touch the pins of the data memory (EPROM) and the program memory (RAM) with ungloved hands because electrostatic discharges can destroy these sensitive semiconductor components.

• When inserting the EPROM or RAM make sure that the chip is firmly seated and that the pins are not bent!

MRC-1
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESIGNATION</th>
<th>ORDER NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Data memory (EPROM) software version 1 (Axis V1.../8)</td>
<td>333 352</td>
</tr>
<tr>
<td>1.1</td>
<td>Data memory (EPROM), software version 2 (Axis V1.../16)</td>
<td>333 360</td>
</tr>
<tr>
<td>2</td>
<td>Program memory (RAM)</td>
<td>228 265</td>
</tr>
<tr>
<td>3</td>
<td>Grip switch</td>
<td>201 286</td>
</tr>
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<td>3.1</td>
<td>Switch base</td>
<td>201 294</td>
</tr>
<tr>
<td>3.2</td>
<td>Contact element</td>
<td>201 243</td>
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<td>4</td>
<td>Fuse holder</td>
<td>200 131</td>
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<td>5</td>
<td>Fuse F 10.00 A Slow</td>
<td>200 174</td>
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<td>6</td>
<td>Fuse F 0.10 A</td>
<td>229 520</td>
</tr>
<tr>
<td>7</td>
<td>Power supply PCB, complete</td>
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<td>8</td>
<td>Fuse F 0.125 A slow</td>
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<td>9</td>
<td>Fuse F 0.025 A slow</td>
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<td>11</td>
<td>Fuse F 1.00 A slow</td>
<td>210 242</td>
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<tr>
<td>12</td>
<td>Mini PC board, axis module without EPROM</td>
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</table>

**MRC-2**

![Diagram of MRC-2 with labels for items 1 to 12]
Dokumentation MRC-1 / MRC-2

Edition May 1989

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