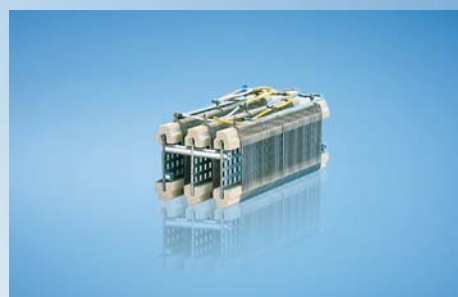
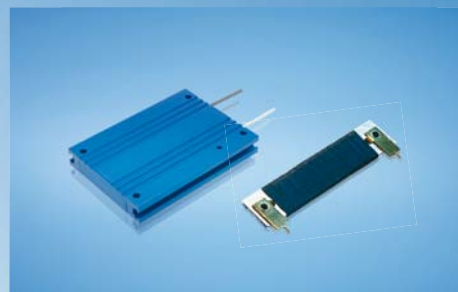


**DYNAMIK DURCH  
WIDERSTAND**

***DYNAMICS  
THROUGH RESISTANCE***



**FRIZLEN**  
LEISTUNGSWIDERSTÄNDE  
POWER RESISTORS

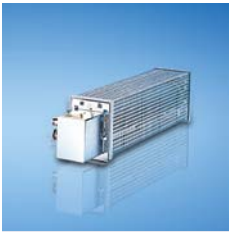


## **DYNAMIK DURCH WIDERSTAND**

**Wir über uns**

## **DYNAMICS THROUGH RESISTANCE**

**About us**



### **DIE KLASSIKER**

**Drahtgewickelte Rohrfestwiderstände**  
10 bis 6000 Watt

### **THE ORIGINAL ONES**

**Wirewound tubular fixed resistors**  
10 up to 6000 Watt

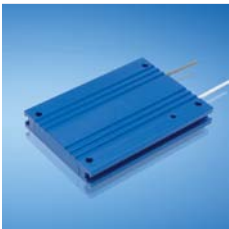


### **DIE FLEXIBLEN**

**Zementierte  
Drahtdrehwiderstände**  
16 bis 1500 Watt

### **THE FLEXIBLE ONES**

**Cement coated wirewound  
variable resistors**  
16 up to 1500 Watt



### **DIE INNOVATIVEN**

**Drahtgewickelte Flachwiderstände,  
auch gekapselt und in wassergekühlter  
Ausführung**  
5 bis 40000 Watt

### **THE INNOVATIVE ONES**

**Wirewound flat resistors,  
also enclosed and  
watercooled**  
5 up to 40000 Watt



### **DIE BELASTBAREN**

**Last- und Prüfwiderstände**  
0,01 bis 250 Kilowatt

### **THE LOADABLE ONES**

**Load- and test resistors**  
0.01 up to 250 Kilowatt



### **DIE MODULAREN**

**Drahtgewickelte  
Lamellenfestwiderstände**  
0,15 bis 30 Kilowatt

### **THE MODULAR ONES**

**Wirewound lamina type  
fixed resistors**  
0,15 up to 30 Kilowatt



### **DIE ROBUSTEN**

**Stahlgitterfestwiderstände**  
0,5 bis 250 Kilowatt

### **THE ROBUST ONES**

**Steel-grid fixed resistors**  
0,5 up to 250 Kilowatt



### **FRIZLEN SONDERGERÄTE**

**DC-POWERSWITCH**  
**Kundenspezifische Widerstandsgeräte**

### **FRIZLEN SPECIAL DEVICES**

**DC-POWERSWITCH**  
**Customised resistor units**

## Das richtige Produkt für Ihre Anwendung

## Suitable products for your application

| Anwendungen   | Application  | Typleistung [kW] |      | Produktgruppe |       |       |       |       |       |
|---|--|------------------|------|---------------|-------|-------|-------|-------|-------|
|   |  | min.             | max. | T 100         | T 200 | T 300 | T 400 | T 500 | T 600 |
| Bremswiderstände für Frequenzumrichter- und Gleichstromantriebe                               | <i>Braking resistors for frequency converters and DC drives</i>                          | 0,01             | 40,0 |               |       | X     |       | X     |       |
|   |  | 0,01             | 6,0  | X             |       |       |       | X     | X     |
|   |  | 6,0              | 30,0 |               |       |       |       | X     | X     |
|   |  | 30,0             | 250  |               |       |       |       |       | X     |
| Belastungswiderstände für Spannungsquellen, Batterien, USV-Geräte, Generatoren und Netzgeräte | <i>Load resistors for supply units, power packs, batteries, UPS units and generators</i> | 0,01             | 250  |               |       |       | X     |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Stufenlose Drehzahlverstellung von kleinen Gleich- und Wechselstrommotoren                    | <i>Stepless variable speed adjustment for small AC and DC motors</i>                     | 0,01             | 1,5  |               | X     |       | X     |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Feldsteller für Generatoren, Widerstände zur Strom- und Spannungsbegrenzung                   | <i>Field rheostats for generators, resistors for current and voltage limitation</i>      | 0,01             | 3,8  | X             | X     |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Motorische Potentiometer als fernbetätigte Sollwertgeber                                      | <i>Motorised potentiometers as nominal value setters</i>                                 | 0,01             | 1,5  |               | X     |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Widerstandsbaugruppen für Einbau in leistungselektronische Geräte                             | <i>Resistor modules fitting into electronic power devices</i>                            | 0,01             | 0,75 | X             |       | X     |       | X     |       |
|   |  | 0,3              | 2,0  |               |       |       |       | X     |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Anlass- und Stellwiderstände für Schleifringläufer- und Gleichstrommotoren                    | <i>Starting and regulating resistors for slip-ring rotor and DC motors</i>               | 0,15             | 30,0 |               |       |       |       | X     |       |
|   |  | 0,5              | 250  |               |       |       |       |       | X     |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Ständer-Vorschaltwiderstände für Kurzschlussläufermotoren                                     | <i>Stator series resistors for squirrel-cage motors</i>                                  | 0,5              | 250  |               |       |       |       |       | X     |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Strombegrenzungswiderstände zur Ladung und Entladung von Kondensatoren                        | <i>Resistors for current limitation e.g. for charging and discharging of capacitors</i>  | 0,01             | 1,0  | X             |       | X     |       | X     |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Experimentier- und Prüfwiderstände in Laboratorien, Schulen und Universitäten                 | <i>Resistors for experimenting and testing in laboratories, schools and universities</i> | 0,01             | 50   |               |       |       | X     |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
|   |  |                  |      |               |       |       |       |       |       |
| Widerstände zur Schutzbeschaltung, Filterwiderstände  | <i>Protective resistors, filter resistors</i>  | 0,01             | 0,75 | X             |       | X     |       | X     |       |
|   |  | 0,75             | 6,0  | X             |       |       |       | X     |       |
|   |  | 1,5              | 22,0 |               |       |       |       |       | X     |
|   |  |                  |      |               |       |       |       |       |       |



## Wir über uns

Mit FRIZLEN Leistungswiderständen haben Sie elektrische Leistung voll im Griff.



Unser umfassendes Know-how zeigt sich im kompletten Spektrum vom Einzelstück bis zur Serie, für Leistungen von 5 Watt bis 250 Kilowatt.



Einsatz- und Anwendungsgebiete stellen die Anforderungen, die Lösungen entwickeln wir.

Ihrem Anforderungsprofil entsprechend berechnen und fertigen wir Widerstände und Widerstandskombinationen unter Berücksichtigung Ihrer Vorgaben. Natürlich beraten wir Sie gern und ermitteln auf Wunsch die Widerstandsdimensionierung mit Hilfe EDV-gestützter Berechnung und Simulation.

Hochwertige Standard- sowie Sonderlösungen von FRIZLEN sorgen für Dynamik im Verbund mit leistungselektronischen Geräten in Maschinen und Anlagen. Bewegung zu stoppen, konstant zu halten und exakte Abläufe zu ermöglichen – dabei unterstützen wir die elektrische Antriebstechnik und verbessern so die Dynamik Ihrer Antriebe.

## About us

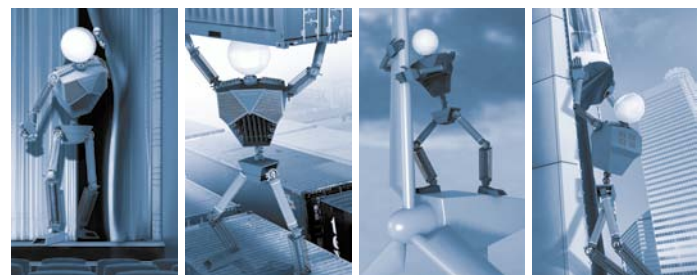
*Keep your electric power under control with FRIZLEN power resistors.*

*Our extensive know-how is demonstrated in a complete spectrum from single item up to series production, for power values from 5 watts up to 250 kilowatts.*

*Different ranges of use and application set the requirements, we provide the solutions.*

*We design and produce resistors and resistor combinations exactly to meet your requirements. We are, of course, happy to advise you according to your specification. Upon request, we can determine resistor dimensioning using our computer-supported calculation and simulation system.*

*High-quality standard and special solutions from FRIZLEN ensure dynamics when you are dealing with high performance electrical equipment in machines and processes. We support electrically driven power engineering by stopping movement, keeping it constant and ensuring exact sequences, which improves the dynamics of your drive systems.*





**Zementierte Drahtdrehwiderstände**

16 bis 1500 Watt

Zementierte Drahtdrehwiderstände in Grundausführung als Einzel-elemente.

- Mit angebauten Mikroschaltern, mit Skalenscheiben und Drehknopf
- In Reihenanordnung, mehrphasig oder parallel geschaltet
- Eingebaut in Gehäuse oder als staubgekapselte Ausführung
- Mit Motorantrieb, für Gleich- oder Wechselspannung, für verschiedene Spannungen und Durchlaufzeiten, mit Mikroschaltern, auch 10-Gang-Ausführung

**Cement coated wirewound potentiometers**

16 up to 1500 Watt

Cement coated wirewound potentiometers as individual components.

- With additional micro switches, with scale discs and adjusting knobs
- In in-line configuration, for multiple phases or switched in parallel
- Integrated in enclosure or dustproof encapsulated
- Motor driven, for different AC and DC operating voltages and operating times, with micro switches, also with precision ten turn potentiometer



## Contents

This list comprises cement coated wirewound variable resistors (potentiometers) as single devices in cemented version, that can be integrated in other units and composed to potentiometer units in different degrees of protections and mounting types. According to request these resistors are also manufactured with motor drive for AC and DC voltage.

| <i>maximum power</i> | <i>characteristics</i>                                 | <i>type series</i> | <i>page</i>  |
|----------------------|--|--------------------|--------------|
|                      | survey   |                    | <b>T221E</b> |
|                      | technical details                                      |                    | <b>T222E</b> |
| 160 W                | variable resistors, suitable for integration           | R 10 – R 80        | <b>T223E</b> |
| 1,0 kW               | variable resistors, suitable for integration           | R100 – R500        | <b>T224E</b> |
| 0,5 kW               | enclosures, special designs, accessories               | D, K, RK, RG...    | <b>T225E</b> |
| 1,5 kW               | variable resistors with AC motor drive                 | RM..               | <b>T226E</b> |
| 1,5 kW               | variable resistors with DC motor drive                 | RMC..              | <b>T227E</b> |
| 2 W                  | 10 turn precision potentiometer with AC/DC motor drive | RM 2Z../RMC 2Z..   | <b>T228E</b> |

## Properties

- **low temperature coefficient**  
⇒ constant ohmic value at a large temperature range
- **fixation of wire by cementation**  
⇒ good heat conducting properties
- **stepless variable resistance value**  
⇒ change and/or adjustment or trimming by the user
- **various diameters and installation depths**  
⇒ can be integrated, compact construction
- **with motor drive for various voltages and operating times**  
⇒ remote control available
- **various accessories**  
⇒ like scale discs, adjusting knobs, micro switches

## Applications

- stepless variable adjustment for AC and DC motors
- field rheostats for generators
- resistors for current and voltage limitation
- starting resistor for DC voltage motors
- motorised potentiometers as nominal value setter
- integration in power supply units, power packs, switch cabinets and machines
- adjustable load resistors
- resistors for experimenting and testing in laboratories, schools and universities



### T 200 - Survey

| type series                   | R10<br>R20     | R40<br>R80 | R100<br>R150 | R250<br>R500 | RG    | RK    | RM    | RMC   | RM2Z  | RMC2Z |       |
|-------------------------------|----------------|------------|--------------|--------------|-------|-------|-------|-------|-------|-------|-------|
|                               | page<br>symbol | T223E      | T223E        | T224E        | T224E | T225E | T225E | T226E | T227E | T228E | T228E |
| characteristics               |                |            |              |              |       |       |       |       |       |       |       |
| typical power from [W]        |                | 16         | 50           | 120          | 300   | 8     | 8     | 16    | 16    | 2     | 2     |
| typical power up to [W]       |                | 60         | 160          | 360          | 1000  | 250   | 25    | 1500  | 1500  | 2     | 2     |
| dustproof                     |                |            |              |              |       |       | X     |       |       |       |       |
| micro switch available        |                | X          | X            | X            | X     |       |       | X     | X     | X     | X     |
| degree of protection IP00     | IP<br>00       | X          | X            | X            | X     |       |       | X     | X     | X     | X     |
| degree of protection IP20     | IP<br>20       |            |              |              |       | X     |       |       |       |       |       |
| integration                   | E              | X          | X            | X            | X     |       | X     | X     | X     | X     | X     |
| AC - motor drive              | Mot.<br>AC     |            |              |              |       |       |       | X     |       | X     |       |
| DC - motor drive              | Mot.<br>DC     |            |              |              |       |       |       |       | X     |       | X     |
| enclosure/ laboratory version |                |            |              |              |       | X     |       |       |       |       |       |

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 We refer to our terms of sales and delivery.

**Technical details**

This list comprises cement coated wirewound variable resistors (potentiometer) with continuous dissipation from 16 W up to 500 W.

**Construction**

The ring-shaped bodies are made from steatite. The wires and bands with a low temperature coefficient, which are used for the resistance winding, are made from CuNi 44 according to DIN 17 471, 46 460 and 46 461 (formerly WM 50) for low and medium ohmic values or from CrNi 6015 according to DIN 17 742 and 46 463 (formerly WM 110) for high ohmic values. They are wound on distance and fixed and protected by a layer or a special cement which also improves the heat dissipation. The wire windings with rated continuous dissipation of resistors from 16 W to 500 W are produced according to DIN 41 473, 41 475 and 41 476.

All resistors are manufactured with 3 connections and isolated shaft and can be used as voltage divider and as series resistance. The standard types of sizes R 10, R 20, R 40 und R 80 are equipped with fast-on terminals 4,8 x 0,8; all the others with screw connections. The contacts are usually made of silver. A coppered carbon contact can be used for high ohmic values and frequent operations.

**Continuous power rating**

The listed typical power values are valid during permanent operation and at a maximum ambient temperature of 40° C. They are valid under the condition that cooling air may enter incessantly and that the potentiometers are fixed onto metallic surfaces. If the resistors are fixed onto non-metallic surfaces, the power rates should be lowered to about 70% of the listed values. If the ambient temperature is essentially higher than 40° C, the typical power has to be reduced by 5% for any temperature rise of 10 K.

In addition to the mentioned maximum and minimum ohmic values other values can be achieved if required.

**Air and creepage distances**

Air and creepage distances are rated according to IEC 664 (DIN EN 0110 part 1) for the overvoltage category III and degree of pollution 3 for grounded three-phase mains supplies up to 3 x 500 V. Testing voltage 2.5 kV AC. The test voltage between shaft and the connections (50 Hz AC voltage) is 1000 V for the ten turn precision potentiometer, 2000 V for R 10 and R 20, 2500 V for all other sizes.

Do not conclude from the calculated relation between the rated power and the maximum producible ohmic value to the rated voltage!

**Storage temperature/  
Operation temperature/  
Installation altitude**

Storage temperature: - 40° C to 80° C

Operation temperature: - 30° C to 40° C. If the ambient temperature is higher than 40°C, you have to decrease the continuous dissipation by 4% per 10 K temperature rise!

Installation altitude: 2000 m above sea level, you have to decrease the continuous dissipation for 10% per 1000 m altitude, maximum altitude 5000 m above sea level

Restrictions are for the type series RM.. because of the technical build-in devices. Operation temperature: - 20° C to 40° C

**How to order**

When ordering resistors, following details should possibly be mentioned: size of resistor, ohmic value (serie E 12 preferably), tolerance of resistance, desired accessories like knob, switches or scale disc, special types, application, power length of shaft.

If there are no given details for a resistor, we feel free to furnish according to our own ideas.



Type series R10 / R20  
R40 / R80

### Cement coated wirewound variable resistors

IP  
00

E



| size   | R10            | R20      | R40      | R80    |
|--|----------------|----------|----------|--------|
| production range in ohm $\pm 10\%$   | 1,5-10 k       | 2,2-15 k | 3,9-27 k | 1-33 k |
| typical power in W at 40° C ambient temperature  | 16             | 30       | 50       | 80     |
| connections, fast-on (solderable) or on request screw connections M3 in special design(only R40,R80) | 4,8 x 0,8      |          |          |        |
| rotation angle, start to stop  | 290°           | 290°     | 300°     | 293°   |
| rotation angle over winding  | 272°           | 275°     | 285°     | 278°   |
| line of resistance   | linear         |          |          |        |
| slider   | silver contact |          |          |        |
| excess temperature by nominal power  | ca. 260° C     |          |          |        |
| test voltage in kV, 50 Hz  | 2              | 2        | 2,5      | 2,5    |
| weight approx. g   | 50             | 80       | 150      | 200    |

| basic construction<br>standard shaft length measured from mounting plate is 35 mm | dim.                   | R10 | R20 | R40 | R80 |    |    |    |    |
|---|------------------------|-----|-----|-----|-----|----|----|----|----|
| available<br>special shaft lengths<br>18, 21, 24, 40 mm                           | <p>12M-0802-00-001</p> | A   | B   | C   | D   |    |    |    |    |
| shaft length fitting to<br>switches D30 and<br>D41: 21 mm                         |                        |     |     |     |     | 34 | 42 | 54 | 68 |
|   |                        |     |     |     |     | 28 | 30 | 40 | 50 |
|   |                        |     |     |     |     | 40 | 48 | 60 | 75 |
|   |                        |     |     |     |     |    |    |    | 30 |
|   |                        |     |     | M4  |     |    |    |    |    |

| with attached micro switch with solder connections<br>change over contact 250 V~, 4 A (in special design fast-on connectors 6,3x0,8) | dim.                   | R10 | R20 | R40 | R80 |    |    |    |    |
|--|------------------------|-----|-----|-----|-----|----|----|----|----|
| Rxx ML1 1-pol. left (dim. B1)  | <p>12M-0802-01-001</p> | A   | B1  | B2  | C   |    |    |    |    |
| Rxx MR1 1-pol. right (dim. B1)   |                        |     |     |     |     | 60 | 64 | 70 | 75 |
| Rxx ML2 2-pol. left (dim. B2)  |                        |     |     |     |     | 55 | 55 | 66 | 73 |
| Rxx MR2 2-pol. right (dim. B2)   |                        |     |     |     |     | 66 | 66 | 77 | 84 |
|  |                        |     |     |     |     | 40 | 48 | 60 | 80 |
|  | 17                     | 21  | 27  | 34  |     |    |    |    |    |

| in 2fold in-line configuration<br>(on request also in 3, 4 or 5fold in-line configuration available) | dim.                   | R10 | R20 | R40 | R80 |    |    |    |     |
|--|------------------------|-----|-----|-----|-----|----|----|----|-----|
| RZ.. configuration of 2<br>equal resistors on<br>1 shaft   | <p>12M-0802-00-001</p> | A   | B   | C   | D   |    |    |    |     |
| example:<br>2 equal resistors (each R20), with<br>equal ohmic values (each 1k):<br>type: RZ20-2x1k   |                        |     |     |     |     | 34 | 42 | 54 | 68  |
|  |                        |     |     |     |     | 66 | 71 | 91 | 119 |
|  |                        |     |     | 60  | 80  |    |    |    |     |



Type series R100 / R150  
R250 / R500

**Cement coated wirewound variable resistors**

|          |   |
|----------|---|
| IP<br>00 | E |
|----------|---|



| size  | R100           | R150     | R250     | R500     |
|---|----------------|----------|----------|----------|
| production range in ohm ± 10%                   | 1,2-39 k       | 1,5-47 k | 1,8-47 k | 3,3-10 k |
| typical power in W at 40° C ambient temperature | 120            | 180      | 300      | 500      |
| screw connections                               | M 4            | M 4      | M 4      | M 5      |
| rotation angle, start to stop                   | 300°           |          |          |          |
| rotation angle, over winding                    | 286°           | 286°     | 291°     | 290°     |
| line of resistance                              | linear         |          |          |          |
| slider  | silver-contact |          |          | carbon-  |
| excess temperature by nominal power             | approx. 285° C |          |          |          |
| test voltage in kV, 50 Hz                       | 2,5            |          |          |          |
| weight approx. g                                | 500            | 600      | 1300     | 2700     |

| basic construction<br>standard shaft length measured from mounting plate is 45 mm                            | dim.                   | R100                  | R150                        | R250                        | R500                          |                               |
|--|------------------------|-----------------------|-----------------------------|-----------------------------|-------------------------------|-------------------------------|
| available special shaft lengths:<br><br>25, 33 mm<br><br>shaft length fitting to switches D57 and D70: 25 mm | <p>12M-0802-00-002</p> | A<br>B<br>C<br>D<br>E | 86<br>62<br>98<br>36<br>M 4 | 86<br>82<br>98<br>36<br>M 4 | 142<br>80<br>153<br>60<br>M 4 | 198<br>98<br>210<br>80<br>M 5 |

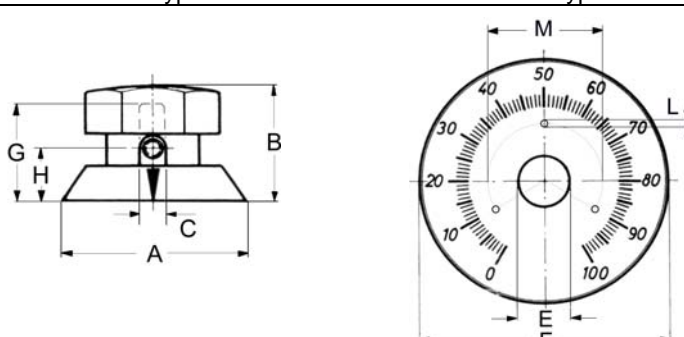
| with attached micro switch with solder connections<br>change over contact 250 V~, 4 A (in special design fast-on connectors 6,3x0,8)                      | dim.                   | R100               | R150                  | R250                    | R500                    |                          |
|---|------------------------|--------------------|-----------------------|-------------------------|-------------------------|--------------------------|
| <p>Rxxx ML1 1-pol. left (dim. B1)</p> <p>Rxxx MR1 1-pol. right (dim. B1)</p> <p>Rxxx ML2 2-pol. left (dim. B2)</p> <p>Rxxx MR2 2-pol. right (dim. B2)</p> | <p>12M-0802-01-002</p> | A<br>B1<br>B2<br>C | 86<br>85<br>96<br>108 | 86<br>106<br>117<br>108 | 142<br>94<br>105<br>168 | 198<br>118<br>129<br>225 |

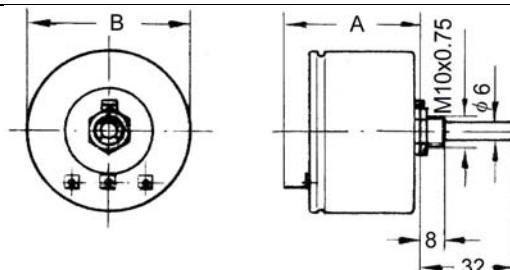
| in 2fold in-line configuration<br>(on request also in 3, 4 or 5fold in-line configuration available)   | dim.                   | R100        | R150             | R250             | R500              |                   |
|--|------------------------|-------------|------------------|------------------|-------------------|-------------------|
| <p>RZ... configuration of 2 equal resistors on 1 shaft</p> <p>example:<br/>2 equal resistors (each R100), with different ohmic values (100 and 1k):<br/>type: RZ100-100/1k</p> | <p>12M-0802-00-002</p> | A<br>B<br>C | 86<br>132<br>108 | 86<br>172<br>108 | 142<br>166<br>168 | 198<br>215<br>225 |

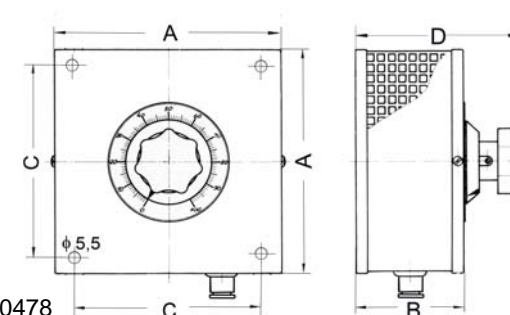
To type series R10 - R500

Enclosure, special designs, accessories



| knob and scale disc for variable resistors  |                     |        | R10<br>R20 | R40<br>R80 | R100<br>R150 | R250<br>R500 |
|---|---------------------|--------|------------|------------|--------------|--------------|
| knob – type D   | scale disc – type K | type D | 30         | 41         | 57           | 70           |
|  |                     | ∅ A    | 31         | 41         | 57           | 70           |
|   |                     | B      | 22         | 26         | 30           | 43           |
|   |                     | ∅ C    | 6          | 6          | 8            | 8            |
|   |                     | G      | 16         | 19         | 27           | 27           |
|   |                     | H      | 9          | 13         | 12           | 11           |
|   |                     | type K | 28         | 38         | 55           | 68           |
|   |                     | ∅ E    | 10,5       | 10,5       | 8,5          | 8,5          |
|   |                     | ∅ F    | 48         | 65         | 80           | 100          |
|   |                     | ∅ L    | -          | -          | 4,5          | 4,5          |
|   |                     | ∅ M    | -          | -          | 36           | 44/60        |

| <u>type series RK....</u>   | dim.  | RK10<br>RK20 | RK40 |    |  |
|---|---|--------------|------|----|--|
| variable resistors<br>dustproof encapsulated,<br>maximal load 0,5 x<br>typical power, with<br>push-on connections<br>4,8 x 0,8 (solderable) |  | A            | 53   | 59 |  |
|   |   | B            | 57   | 71 |  |

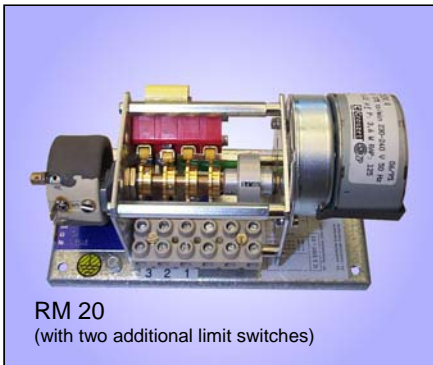
| <u>type series RG...</u>   | dim.  | RG10<br>RG20<br>RG40 | RG80<br>RG100<br>RG150 | RG250 | RG500 |     |
|--|---|----------------------|------------------------|-------|-------|-----|
| variable resistor,<br>integrated in enclosure,<br>with adjusting knob and<br>scale disc, degree of<br>protection IP 20,<br>connections at the resistor<br><br>maximal load 0,5 x<br>typical power<br><br>12 M 0478 |  | A                    | 90                     | 120   | 175   | 240 |
|  |   | B                    | 60                     | 100   | 100   | 110 |
|  |   | C                    | 70                     | 100   | 150   | 215 |
|  |   | D                    | 88                     | 132   | 132   | 155 |

| <u>special designs and accessories</u>  |
|---|
| <ul style="list-style-type: none"> <li>- zero position</li> <li>- locking device (only R10, R20, R40, R80, R100, R150)</li> <li>- screw driver slot (only R10, R20, R40, R80)</li> <li>- different shaft length</li> <li>- centre tap</li> <li>- reduced tolerance</li> <li>- sector winding (all sizes besides R10)</li> <li>- in laboratory version, please look at our list T400E</li> </ul> |



Type series RM...

Variable resistors with AC-motor drive



|          |   |            |
|----------|---|------------|
| IP<br>00 | E | Mot.<br>AC |
|----------|---|------------|

Variable resistor driven by a single phase synchronous motor 230 V,50 Hz, mounted on a base plate, with adjustable safety clutch between motor and resistor, with 2 limit switches, motor terminals wired on terminals, operating times: 8/12/16/24/47/90s.

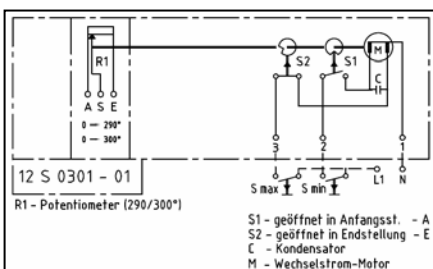
Technologies

- mounted on a base plate
- for 230 V AC, 50 Hz
- with safety clutch
- various operating times

The motor version of these variable resistors can be manufactured in a one-, two- or three-fold construction. In the standard version each resistor has the same ohmic value, however different ohmic values can also be combined. For the increase of the rated power and/or the current the variable resistors can also be switched in parallel.

Up to 3 further freely adjustable limit switches are optionally available. Thus further control functions can be realized by the customer.

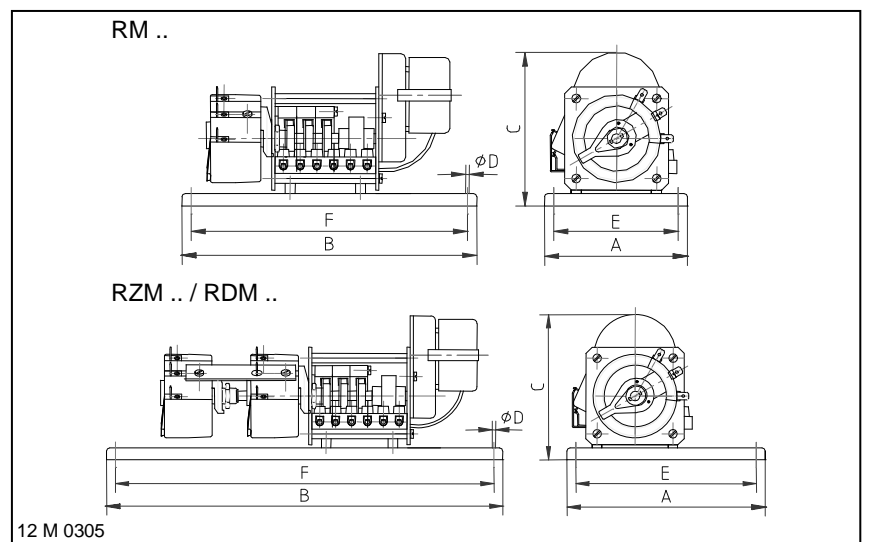
Example of a wiring diagram:



Illustr.: standard wiring diagram of type RM... with 2 limit switches

Electrical and mechanical data

| type    | production range<br>$\Omega$ - value |       | dimension in mm |     |     |                 |     |     | approx. weight.<br>in kg |
|---------|--------------------------------------|-------|-----------------|-----|-----|-----------------|-----|-----|--------------------------|
|         | from                                 | up to | A               | B   | C   | $\varnothing D$ | E   | F   |                          |
| RM 10   | 1,5                                  | 10k   | 75              | 155 | 92  | 4,5             | 60  | 140 | 0,8                      |
| RM 20   | 2,2                                  | 15k   | 75              | 155 | 92  | 4,5             | 60  | 140 | 0,8                      |
| RM 40   | 3,9                                  | 27k   | 75              | 155 | 97  | 4,5             | 60  | 140 | 0,9                      |
| RM 80   | 1,0                                  | 33k   | 110             | 220 | 98  | 4,5             | 95  | 205 | 1,1                      |
| RM 100  | 1,2                                  | 39k   | 110             | 220 | 110 | 4,5             | 95  | 205 | 1,4                      |
| RM 150  | 1,5                                  | 47k   | 110             | 240 | 110 | 4,5             | 95  | 225 | 1,5                      |
| RM 250  | 1,8                                  | 47k   | 160             | 225 | 165 | 5,5             | 140 | 205 | 2,4                      |
| RM 500  | 3,3                                  | 10k   | 220             | 250 | 220 | 5,5             | 200 | 230 | 4,3                      |
| RZM 10  | 1,5                                  | 10k   | 110             | 220 | 92  | 4,5             | 95  | 205 | 1,0                      |
| RZM 20  | 2,2                                  | 15k   | 110             | 220 | 92  | 4,5             | 95  | 205 | 1,1                      |
| RZM 40  | 3,9                                  | 27k   | 110             | 220 | 97  | 4,5             | 95  | 205 | 1,2                      |
| RZM 80  | 1,0                                  | 33k   | 110             | 240 | 98  | 4,5             | 95  | 225 | 1,4                      |
| RZM 100 | 1,2                                  | 39k   | 110             | 290 | 110 | 4,5             | 95  | 275 | 2,0                      |
| RZM 150 | 1,5                                  | 47k   | 160             | 335 | 110 | 4,5             | 140 | 315 | 2,7                      |
| RZM 250 | 1,8                                  | 47k   | 160             | 335 | 165 | 5,5             | 140 | 315 | 3,7                      |
| RZM 500 | 3,3                                  | 10k   | 220             | 420 | 220 | 5,5             | 200 | 400 | 7,8                      |
| RDM 10  | 1,5                                  | 10k   | 110             | 290 | 92  | 4,5             | 95  | 275 | 1,1                      |
| RDM 20  | 2,2                                  | 15k   | 110             | 290 | 92  | 4,5             | 95  | 275 | 1,2                      |
| RDM 40  | 3,9                                  | 27k   | 110             | 290 | 97  | 4,5             | 95  | 275 | 1,4                      |
| RDM 80  | 1,0                                  | 33k   | 110             | 350 | 98  | 4,5             | 95  | 335 | 1,8                      |
| RDM 100 | 1,2                                  | 39k   | 110             | 350 | 110 | 4,5             | 95  | 335 | 2,6                      |
| RDM 150 | 1,5                                  | 47k   | 160             | 440 | 110 | 4,5             | 140 | 420 | 3,6                      |
| RDM 250 | 1,8                                  | 47k   | 160             | 440 | 165 | 5,5             | 140 | 420 | 5,1                      |
| RDM 500 | 3,3                                  | 10k   | 220             | 570 | 220 | 5,5             | 200 | 550 | 11,1                     |

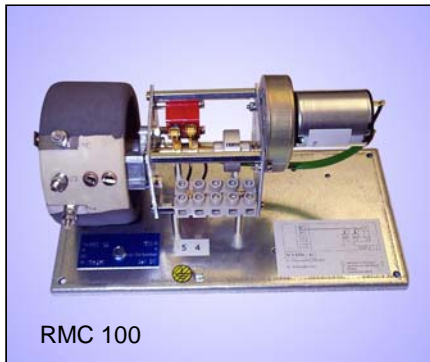


Special designs

- combination of different typical powers (potentiometer)
- multiple in-line configuration (max. 4 to 5-fold)
- further operating times

### Type series RMC...

### Variable resistors with DC-motor drive



|          |   |            |
|----------|---|------------|
| IP<br>00 | E | Mot.<br>DC |
|----------|---|------------|

Variable resistor driven by a DC current motor 24 V, mounted on a base plate, with adjustable safety clutch between motor and resistor, with 2 limit switches, motor connections on terminals, operating times: 8/24/47/90s

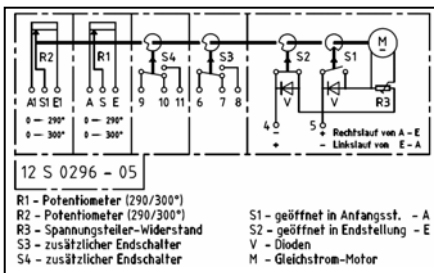
### Technologies

- mounted on a base plate
- for  $\pm 24$  V DC
- with safety clutch
- various operating times

The motor version of these variable resistors can be manufactured in a two or three-fold construction. In the standard version each resistor has the same ohmic value, however different ohmic values can also be combined. For the increase of the rated voltage and/or the current the variable resistors can also be switched in parallel.

Up to 3 further freely adjustable limit switches are optionally available. Thus further control functions can be realized by the customer.

### Example of a wiring diagram:



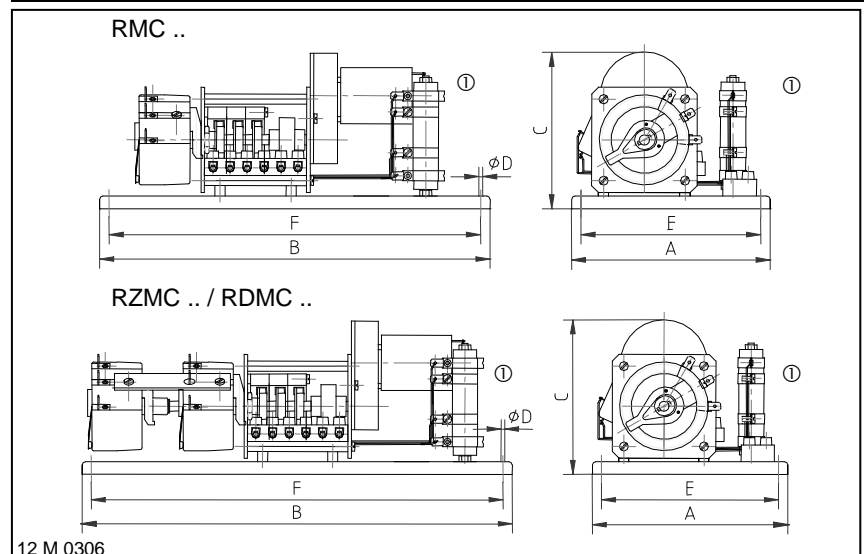
Illustr.: standard wiring diagram of type RZMC..., with 2 additional limit switches and voltage divider

### Special designs

- combination of different typical powers (potentiometer)
- multiple in-line configuration (max. 4 to 5-fold)
- further operating times
- adjustable operating time with additional voltage divider resistor
- different mains voltages
- reversing relay type RMCW .. (for pole switching)

### Electrical and mechanical data

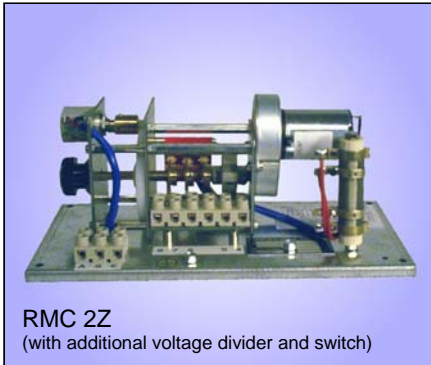
| type     | production range $\Omega$ - value |       | dimension in mm |     |     |                 |     |     | approx. weight kg |
|----------|-----------------------------------|-------|-----------------|-----|-----|-----------------|-----|-----|-------------------|
|          | from                              | up to | A               | B   | C   | $\varnothing D$ | E   | F   |                   |
| RMC 10   | 1,5                               | 10k   | 110             | 220 | 92  | 4,5             | 95  | 205 | 0,7               |
| RMC 20   | 2,2                               | 15k   | 110             | 220 | 92  | 4,5             | 95  | 205 | 0,7               |
| RMC 40   | 3,9                               | 27k   | 110             | 220 | 97  | 4,5             | 95  | 205 | 0,8               |
| RMC 80   | 1,0                               | 33k   | 110             | 220 | 98  | 4,5             | 95  | 205 | 1,1               |
| RMC 100  | 1,2                               | 39k   | 110             | 220 | 110 | 4,5             | 95  | 205 | 1,3               |
| RMC 150  | 1,5                               | 47k   | 110             | 240 | 110 | 4,5             | 95  | 225 | 1,5               |
| RMC 250  | 1,8                               | 47k   | 160             | 225 | 165 | 5,5             | 140 | 205 | 2,2               |
| RMC 500  | 3,3                               | 10k   | 220             | 250 | 220 | 5,5             | 200 | 230 | 4,2               |
| RZMC 10  | 1,5                               | 10k   | 110             | 220 | 92  | 4,5             | 95  | 205 | 0,9               |
| RZMC 20  | 2,2                               | 15k   | 110             | 220 | 92  | 4,5             | 95  | 205 | 1,0               |
| RZMC 40  | 3,9                               | 27k   | 110             | 240 | 97  | 4,5             | 95  | 225 | 1,1               |
| RZMC 80  | 1,0                               | 33k   | 110             | 240 | 98  | 4,5             | 95  | 225 | 1,4               |
| RZMC 100 | 1,2                               | 39k   | 110             | 290 | 110 | 4,5             | 95  | 275 | 1,9               |
| RZMC 150 | 1,5                               | 47k   | 110             | 350 | 110 | 4,5             | 95  | 335 | 2,6               |
| RZMC 250 | 1,8                               | 47k   | 160             | 335 | 165 | 5,5             | 140 | 315 | 3,6               |
| RZMC 500 | 3,3                               | 10k   | 220             | 420 | 220 | 5,5             | 200 | 400 | 7,7               |
| RDMC 10  | 1,5                               | 10k   | 110             | 290 | 92  | 4,5             | 95  | 275 | 1,1               |
| RDMC 20  | 2,2                               | 15k   | 110             | 290 | 92  | 4,5             | 95  | 275 | 1,2               |
| RDMC 40  | 3,9                               | 27k   | 110             | 290 | 97  | 4,5             | 95  | 275 | 1,4               |
| RDMC 80  | 1,0                               | 33k   | 110             | 350 | 98  | 4,5             | 95  | 335 | 1,8               |
| RDMC 100 | 1,2                               | 39k   | 110             | 350 | 110 | 4,5             | 95  | 335 | 2,6               |
| RDMC 150 | 1,5                               | 47k   | 160             | 440 | 110 | 4,5             | 140 | 420 | 3,6               |
| RDMC 250 | 1,8                               | 47k   | 160             | 440 | 165 | 5,5             | 140 | 420 | 5,1               |
| RDMC 500 | 3,3                               | 10k   | 220             | 570 | 220 | 5,5             | 200 | 550 | 11,1              |



① Optional (voltage divider to extend the operation time and/or to adjust to higher mains voltage)



## Type series RM 2Z / RMC 2Z

Variable resistors with motor drive  
ten turn precision potentiometerRMC 2Z  
(with additional voltage divider and switch)

|          |   |            |            |
|----------|---|------------|------------|
| IP<br>00 | E | Mot.<br>AC | Mot.<br>DC |
|----------|---|------------|------------|

RM 2Z Variable resistor driven by a single phase-synchronous motor 230 V, 50 Hz, operating times: 8/12/16/24/47/90s

RMC 2Z: Variable resistor driven by a DC motor 24 V, operating times: 8/24/47/90s

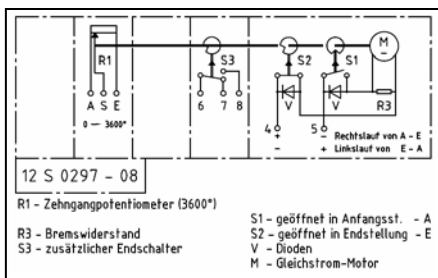
Both mounted on a base plate, with adjustable safety clutch between motor and resistor, with 2 limit switches, motor connections on terminals.

**Technologies**

- ten turn precision potentiometer
- mounted on a base plate
- for  $\pm 24$  V DC or 230 V AC, 50Hz
- with safety clutch
- various operation times
- typical power 2 W

The motor version of these variable resistors can be manufactured according to the necessary operating voltage for AC or DC version.

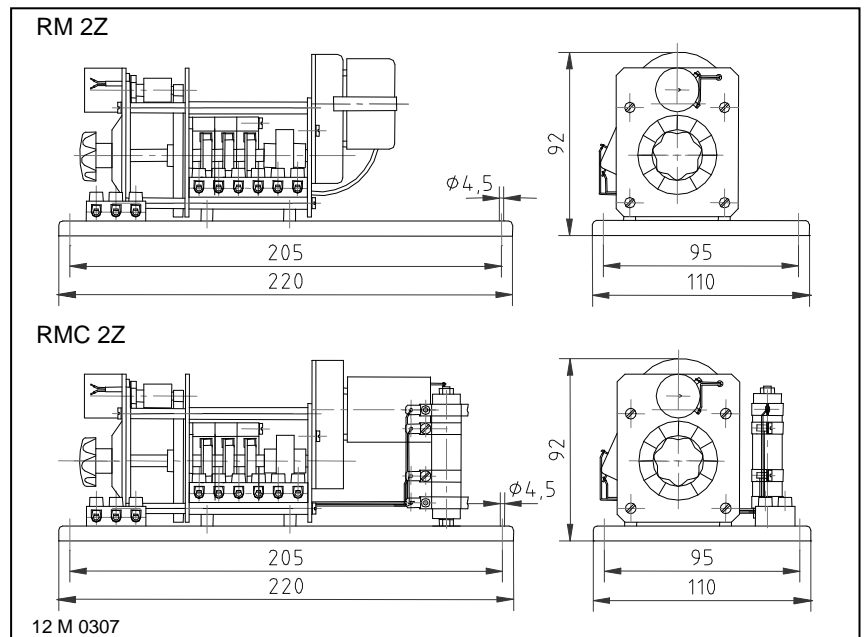
Up to 3 further freely adjustable limit switches are optionally available. Thus further control functions can be realized by the customer.

**Example of a wiring diagram:**

Illustr.: wiring diagram of type RMC 2Z..., with 1 additional limit switch

**Electrical and mechanical data**

| type   | possible $\Omega$ -values  | approx. weight in kg |
|--------|----------------------------|----------------------|
| RM 2Z  | 100/200/500/1k/5k/10k/100k | 1,0                  |
| RMC 2Z | 100/200/500/1k/5k/10k/100k | 1,1                  |

**Special designs**

- further operating times
- adjustable operating time (only RMC 2Z) with additional voltage divider resistor
- different mains voltages
- with reversing relay type RMCW 2Z (for pole switching)
- further potentiometer
- typical power 3 W