

MCBs 60 V DC according to UL 489 for Branch Circuit Protection

System pro *M* compact



MCB 60 V DC according to UL 489 for Branch Circuit Protection

Series type S 201 DC-K and S 201 DC-Z with or without integrated auxiliary switch

This series - 1-pole with K- and Z-type characteristics for 60 V AC/DC - has been designed for **control circuits** in machinery and plant that have to meet the requirements provided for in **UL 489**, i.e. **branch circuit protection**.

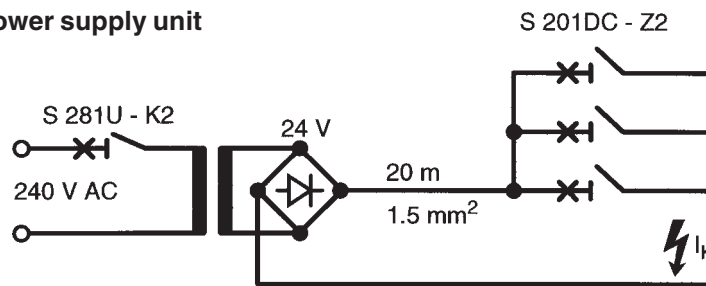
Planning notes

Overcurrent protection according to EN 60 204-1, protection of damageable components: A high degree of protection is only possible if the delayed release trips.

The parameters to be taken into account are:

- loop resistance ($R_i + R_L$)
 - (R_i = internal resistance MCB at 20 °C/63 °F and R_L = output resistance at 20 °C/63 °F)
- copper temperature: 80 °C/176 °F in the case of a short circuit/voltage drop, contact resistance
- **Result: a total derating factor of 2/3**

example 1: standard power supply unit



$$R_i = 0.62 \Omega$$

$$R_L = \frac{40 \text{ m}}{1.5 \times 56} = 0.48 \Omega$$

$$R = (0.62 + 0.48) \Omega = 1.1 \Omega$$

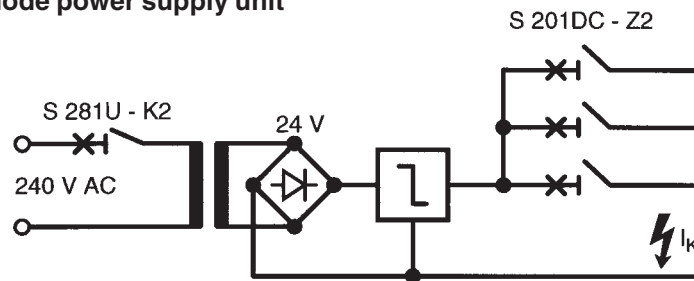
$$I_k = \frac{24 \text{ V} \times 2/3}{1.1 \Omega} = 14.5 \text{ A}$$

response value unchanged of S 201 DC-Z2 = $4.5 I_n = 9 \text{ A}$

result: trips within milliseconds

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example 2: switched mode power supply unit



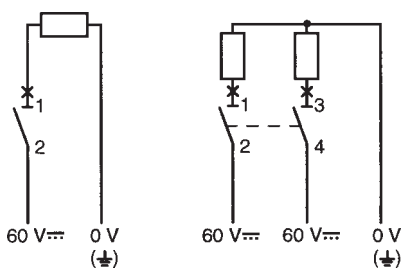
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MCB S 201 needs < 100 ms for undelayed tripping. If the switched mode power supply unit adjusts downwards undelayed when a short circuit occurs, the PSU adjusts quicker than the S 201-... is able to respond.

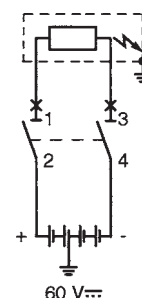
consequence: no selective fault recognition.

result: The output of the switched mode PSU must adjust in a delayed mode (> 100 ms) and the protection device must be adapted to this delayed reduced value in order to ensure selective fault recognition.

example for admissible voltages between conductors



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Technical Data

| | |
|---|---|
| specifications: | DIN VDE 0641 -11, IEC 60898, EN 60898, VDE 0660 -101 IEC 60947-2, EN 60 947 -2, UL 489 |
| No. of poles: | 1 |
| trip characteristics: | K, Z |
| rated current I_n : | K and Z 1 ... 25 A |
| rated voltage U_n : | 1-pole 60 V DC/60 V AC |
| min. operating voltage U_{Omin} : | 12 V- |
| rated switching capacity: | 14 kA |
| insulation coordination: | according to DIN VDE 0110 Part 1 und 2 |
| - overvoltage category: | III |
| - pollution degree: | 2 |
| - surge voltage U_{imp} (1.2/50 μ s): | 4 kV (test voltage 6.2 kV at N.N., 5 kV at 2000 m) |
| - power-frequency voltage strength: | 2.5 kV (50/60 Hz) |
| housing: | insul. mat. group I (CTI \geq 600) acc. to DIN IEC 112/VDE 0303 Part 1, RAL 7035 |
| operating lever: | insulating material group II (400 \leq CTI < 600) black, sealable |
| protection according to DIN VDE 0100: | IP 20, in the consumer unit IP 40 |
| degree of protection: | IP XXB |
| design: | according to DIN 43880, size code 1 |
| depth: | 68 mm |
| overall dimensions b x w x d: | 17.5 x 85 x 69 mm (with auxiliary contact 17.5 x 102.5 x 69) |
| mounting position: | optional |
| fixing: | snap-on on top-hat rail EN 60 715, 35 mm screw fixing onto mounting rail |
| connection: | bi-directional cylinder lift terminal (two-terminal chamber) at top and bottom. Suitable for the connection of single, multi- or finely stranded conductors up to 16 mm ² (if also connected to rails) |
| tightening torque: | 2.5 Nm |
| mechanical service life : | 20.000 switchovers |
| service life at rated load | 20.000 switchovers |
| climatic resistance | constant climate 23/73/83, 40/104/93, 55/131/20 [°C/°F/RH] |
| according to DIN IEC 68 Part 2-30: | alternating climate 25/77/95 - 40/104/93 [°C/°F/RH] |
| storage temperature: | $T_{max} + 70$ °C/158 °F, $T_{min} - 40$ °C/- 40 °F |
| ambient temperature: | $T_{max} + 55$ °C/131 °F, $T_{min} - 25$ °C/- 13 °F |
| shock protection: | 30 g, at least 2 impacts impact duration 13 ms |
| vibration resistance | |
| according to DIN IEC 68-2-6: | 5 g, 20 frequency cycles 5 ... 150 ... 5 Hz at 0.8 I_n |

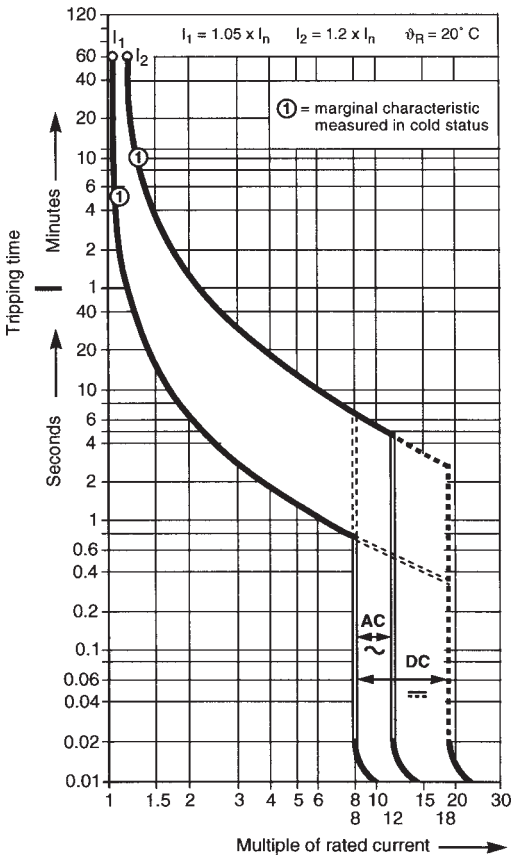
Technical data of the integrated auxiliary contact

| | |
|---|---|
| contact complement: | 1NO (1 normally open) 1NC (1 normally closed) |
| contact rating: | DC 12 identical DC 13 DC 13 30 V 2 A, 50 V 1 A |
| min. contact load: | 24 V, 4 mA |
| min. rated voltage: | 12 V AC/DC at 0.1 VA |
| short circuit protection: | with S 201 DC-K2 or -Z2 |
| electrical service life: | > 4000 switchovers |
| safe disconnection of auxiliary circuit and main circuit according to VDE 0106 Part 101 | |
| connection capacity: | 0.75 up to 2.5 mm ² (use connector sleeves for finely-stranded conductors) |
| tightening torque: | 0.5 Nm |

Note: busbar system according to UL 489 under preparation

K-type trip characteristic

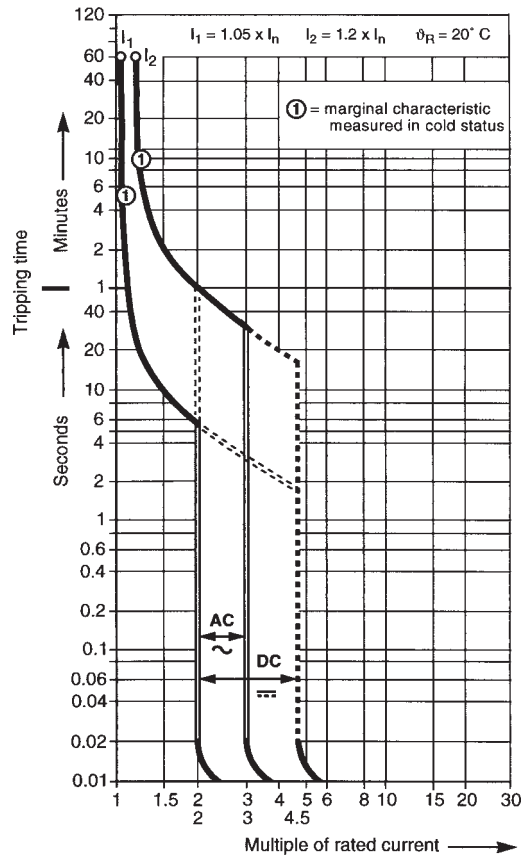
Reference temperature 20 °C/68 °F
 Deviating ambient temperatures influence the tripping behaviour by 6 % per 10 °C/50 °F



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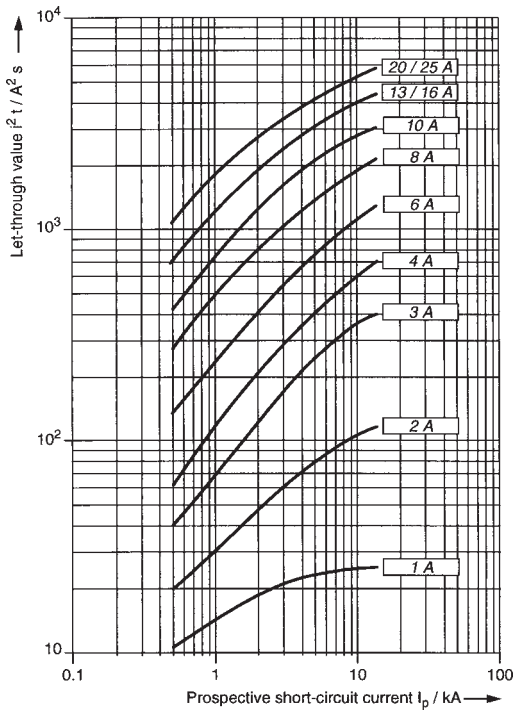
Z-type trip characteristic

Reference temperature 20 °C/68 °F
 Deviating ambient temperatures influence the tripping behaviour by 6 % per 10 °C/50 °F



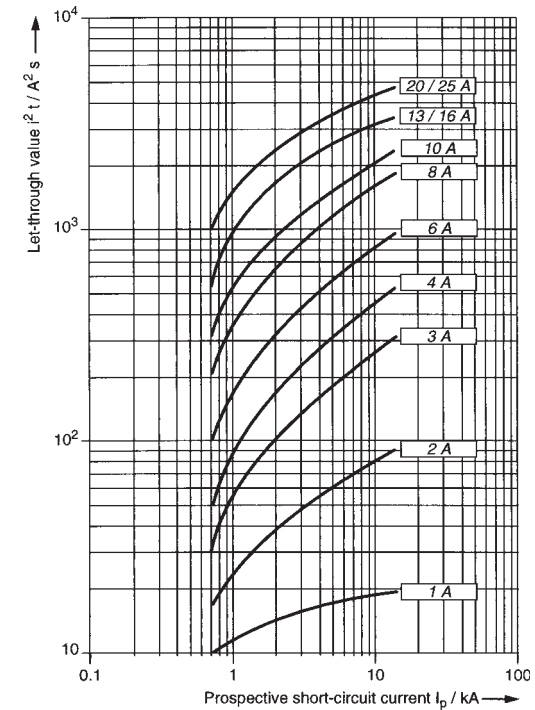
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Diagram of let-through values I^2t of S 200-K



2CDC022 422 F0203

Diagram of let-through values I^2t of S 200-Z



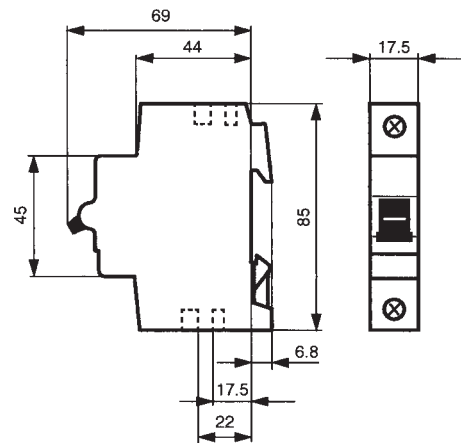
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Internal resistance and power loss of MCBs

Internal resistance per pole in mΩ, power loss per pole in W

| type | rated current I_n , A | cb series K | | Z | |
|-------------|----------------------------|----------------|------|------|------|
| | | mΩ | W | mΩ | W |
| S 200 DC | 1 | 1550 | 1.6 | 2270 | 2.3 |
| | 1.6 | 695 | 1.8 | 1100 | 2.8 |
| | 2 | 460 | 1.9 | 619 | 2.5 |
| | 3 | 165 | 1.5 | 202 | 1.8 |
| | 4 | 120 | 2.0 | 149 | 2.4 |
| | 6 | 52 | 1.9 | 104 | 3.7 |
| | 8 | 38 | 2.5 | 53.9 | 3.45 |
| | 10 | 12.6 | 1.26 | 17.5 | 1.7 |
| | 13 | 12.6 | 1.26 | – | – |
| | 16 | 7.7 | 2.0 | 10.9 | 2.8 |
| | 20 | 6.7 | 2.7 | 6.0 | 2.4 |
| | 25 | 4.6 | 2.9 | 4.1 | 2.6 |

Dimensions of S 201 DC



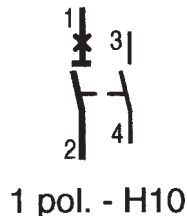
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Connection

Feeder optional from top or bottom, terminals designated according to EN 50 005

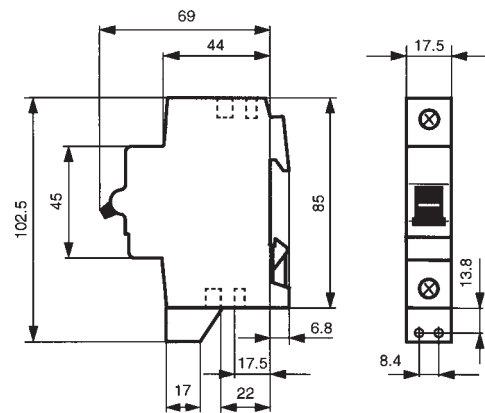


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Dimensions of S 201 DC.. H10



SK0045 Z01

Max. operating current values depending on the ambient temperature for a circuit-breaker in load circuit of characteristics type K and Z

| I_n (A) | ambient temperature T (°C/°F) | | | | | | | | | | | |
|-----------|-------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| 0.5 | 0.66 | 0.64 | 0.61 | 0.59 | 0.56 | 0.53 | 0.50 | 0.47 | 0.43 | 0.40 | 0.35 | 0.31 |
| 1.0 | 1.32 | 1.27 | 1.22 | 1.17 | 1.12 | 1.06 | 1.00 | 0.94 | 0.87 | 0.79 | 0.71 | 0.61 |
| 1.6 | 2.12 | 2.04 | 1.96 | 1.88 | 1.79 | 1.70 | 1.60 | 1.50 | 1.39 | 1.26 | 1.13 | 0.98 |
| 2.0 | 2.65 | 2.55 | 2.45 | 2.35 | 2.24 | 2.12 | 2.00 | 1.87 | 1.73 | 1.58 | 1.41 | 1.22 |
| 3.0 | 4.0 | 3.8 | 3.7 | 3.5 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.1 | 1.8 |
| 4.0 | 5.3 | 5.1 | 4.9 | 4.7 | 4.5 | 4.2 | 4.0 | 3.7 | 3.5 | 3.2 | 2.8 | 2.4 |
| 6.0 | 7.9 | 7.6 | 7.3 | 7.0 | 6.7 | 6.4 | 6.0 | 5.6 | 5.2 | 4.7 | 4.2 | 3.7 |
| 8.0 | 10.8 | 10.2 | 9.8 | 9.4 | 8.9 | 8.5 | 8.0 | 7.5 | 6.9 | 6.3 | 5.7 | 4.9 |
| 10.0 | 13.2 | 12.7 | 12.2 | 11.7 | 11.2 | 10.6 | 10.0 | 9.4 | 8.7 | 7.9 | 7.1 | 6.1 |
| 13.0 | 17.2 | 16.6 | 15.9 | 15.2 | 14.5 | 13.8 | 13.0 | 12.2 | 11.3 | 10.3 | 9.2 | 8.0 |
| 16.0 | 21.2 | 20.4 | 19.6 | 18.8 | 17.9 | 17.0 | 16.0 | 15.0 | 13.9 | 12.6 | 11.3 | 9.8 |
| 20.0 | 26.5 | 25.5 | 24.5 | 23.5 | 22.4 | 21.2 | 20.0 | 18.7 | 17.3 | 15.8 | 14.1 | 12.2 |
| 25.0 | 33.1 | 31.9 | 30.6 | 29.3 | 28.0 | 26.5 | 25.0 | 23.4 | 21.7 | 19.8 | 17.7 | 15.3 |
| 32.0 | 42.3 | 40.8 | 39.2 | 37.5 | 35.8 | 33.9 | 32.0 | 29.9 | 27.7 | 25.3 | 22.6 | 19.6 |
| 40.0 | 52.9 | 51.0 | 49.0 | 46.9 | 44.7 | 42.4 | 40.0 | 37.4 | 34.6 | 31.6 | 28.3 | 24.5 |
| 50.0 | 66.1 | 63.7 | 61.2 | 58.6 | 55.9 | 53.0 | 50.0 | 46.8 | 43.3 | 39.5 | 35.4 | 30.6 |
| 63.0 | 83.3 | 80.3 | 77.2 | 73.9 | 70.4 | 66.8 | 63.0 | 58.9 | 54.6 | 49.8 | 44.5 | 38.6 |

Mutual thermal interference when an even load is applied at the same time.

A correction factor must be taken into account in the case of butt-mounted MCBs and an evenly applied, high load: 2 and 3 MCBs multiply with factor 0.9/4 and 5 MCBs with factor 0.8/6 and more MCBs with factor 0.75

The interdependency becomes irrelevant if filling pieces or packing blocks FST...(9mm width) are used.

Selection table Accessories



S201 DC-K 25

S201 DC-Z 4 H10

| No. of poles | rated current I_n A | order details type code | product code -Nr. | bbn 40 12233 EAN | price 1 piece € | price group | wght. 1 pc. kg | pack. unit pc's | |
|--------------|--------------------------|----------------------------|-------------------|------------------------|-----------------------|----------------|----------------------|-----------------------|----|
| 1 | 1 | S201 DC-K 1 | 2CDS271217R0217 | | | | 0.125 | 10 | |
| | 1.6 | S201 DC-K 1.6 | 2CDS271217R0257 | | | | 0.125 | 10 | |
| | 2 | S201 DC-K 2 | 2CDS271217R0277 | | | | 0.125 | 10 | |
| | 3 | S201 DC-K 3 | 2CDS271217R0317 | | | | 0.125 | 10 | |
| | 4 | S201 DC-K 4 | 2CDS271217R0337 | | | | 0.125 | 10 | |
| | 6 | S201 DC-K 6 | 2CDS271217R0377 | | | | 0.125 | 10 | |
| | 8 | S201 DC-K 8 | 2CDS271217R0407 | | | | 0.125 | 10 | |
| | 10 | S201 DC-K 10 | 2CDS271217R0427 | | | | 0.125 | 10 | |
| | 13 | S201 DC-K 13 | 2CDS271217R0447 | | | | 0.125 | 10 | |
| | 16 | S201 DC-K 16 | 2CDS271217R0467 | | | | 0.125 | 10 | |
| | 20 | S201 DC-K 20 | 2CDS271217R0487 | | | | 0.125 | 10 | |
| | 25 | S201 DC-K 25 | 2CDS271217R0517 | | | | 0.125 | 10 | |
| | 1 | 1 | S201 DC-Z 1 | 2CDS271217R0218 | | | | 0.125 | 10 |
| 1.6 | | S201 DC-Z 1.6 | 2CDS271217R0258 | | | | 0.125 | 10 | |
| 2 | | S201 DC-Z 2 | 2CDS271217R0278 | | | | 0.125 | 10 | |
| 3 | | S201 DC-Z 3 | 2CDS271217R0318 | | | | 0.125 | 10 | |
| 4 | | S201 DC-Z 4 | 2CDS271217R0338 | | | | 0.125 | 10 | |
| 6 | | S201 DC-Z 6 | 2CDS271217R0378 | | | | 0.125 | 10 | |
| 8 | | S201 DC-Z 8 | 2CDS271217R0408 | | | | 0.125 | 10 | |
| 10 | | S201 DC-Z 10 | 2CDS271217R0428 | | | | 0.125 | 10 | |
| 16 | | S201 DC-Z 16 | 2CDS271217R0468 | | | | 0.125 | 10 | |
| 20 | | S201 DC-Z 20 | 2CDS271217R0488 | | | | 0.125 | 10 | |
| 25 | | S201 DC-Z 25 | 2CDS271217R0518 | | | | 0.125 | 10 | |
| 1 | | 1 | S201 DC-K 1 H10 | 2CDV271217R0217 | | | | 0.125 | 6 |
| | | 1.6 | S201 DC-K 1.6 H10 | 2CDV271217R0257 | | | | 0.125 | 6 |
| | 2 | S201 DC-K 2 H10 | 2CDV271217R0277 | | | | 0.125 | 6 | |
| | 3 | S201 DC-K 3 H10 | 2CDV271217R0317 | | | | 0.125 | 6 | |
| | 4 | S201 DC-K 4 H10 | 2CDV271217R0337 | | | | 0.125 | 6 | |
| | 6 | S201 DC-K 6 H10 | 2CDV271217R0377 | | | | 0.125 | 6 | |
| | 8 | S201 DC-K 8 H10 | 2CDV271217R0407 | | | | 0.125 | 6 | |
| | 10 | S201 DC-K 10 H10 | 2CDV271217R0427 | | | | 0.125 | 6 | |
| | 13 | S201 DC-K 13 H10 | 2CDV271217R0447 | | | | 0.125 | 6 | |
| | 16 | S201 DC-K 16 H10 | 2CDV271217R0467 | | | | 0.125 | 6 | |
| | 20 | S201 DC-K 20 H10 | 2CDV271217R0487 | | | | 0.125 | 6 | |
| | 25 | S201 DC-K 25 H10 | 2CDV271217R0517 | | | | 0.125 | 6 | |
| | 1 | 1 | S201 DC-Z1 H10 | 2CDV271217R0218 | | | | 0.125 | 6 |
| 1.6 | | S201 DC-Z 1.6 H10 | 2CDV271217R0258 | | | | 0.125 | 6 | |
| 2 | | S201 DC-Z 2 H10 | 2CDV271217R0278 | | | | 0.125 | 6 | |
| 3 | | S201 DC-Z 3 H10 | 2CDV271217R0318 | | | | 0.125 | 6 | |
| 4 | | S201 DC-Z 4 H10 | 2CDV271217R0338 | | | | 0.125 | 6 | |
| 6 | | S201 DC-Z 6 H10 | 2CDV271217R0378 | | | | 0.125 | 6 | |
| 8 | | S201 DC-Z 8 H10 | 2CDV271217R0408 | | | | 0.125 | 6 | |
| 10 | | S201 DC-Z 10 H10 | 2CDV271217R0428 | | | | 0.125 | 6 | |
| 16 | | S201 DC-Z16 H10 | 2CDV271217R0468 | | | | 0.125 | 6 | |
| 20 | | S201 DC-Z 20 H10 | 2CDV271217R0488 | | | | 0.125 | 6 | |
| 25 | | S201 DC-Z 25 H10 | 2CDV271217R0518 | | | | 0.125 | 6 | |



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