# Time Current Curves

## Series G R-Frame

800-2500A, 240-690V

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**Digitrip 310+ Electronic Trip Unit types RGH, RGC**

- Long Delay Response and Short Delay with Flat Response and Override (LSI, LSIG, ALSI, ALSIG) | TC01210020E | 5 |
- Long Delay Response and Short Delay with $I^2T$ Response Curve and Override (LS, LSG) | TC01210021E | 6 |
- Ground Fault Delay Response Curve (LSG, LSIG, ALSIG) | TC01210022E | 7 |
- Maintenance Mode / Instantaneous Setting 1600A / 2000A (ALSI, ALSIG) | TC01210024E | 8 |
- Maintenance Mode / Instantaneous Setting 2500A (ALSI, ALSIG) | TC01210023E | 9 |

**Digitrip RMS 310 Electronic Trip Unit types**

- Typical Instantaneous Time-Phase Current Characteristic Curve Based on $I_n$ | SC-5629-93 | 10 |
- Typical Long Delay/Short Delay Time-Phase Characteristic Curve Based on $I_n$ | SC-5630-93 | 11 |
- Typical Ground Fault/Protection Time/Current Characteristic Curve Based on $I_n$ | SC-5631-93 | 12 |

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**Note:**

The following curves meet the requirements of UL, CSA, IEC, CCC and CE.
The following circuit breakers are derived from Eaton, Westinghouse, or Cutler-Hammer history.

Time Current Curves are engineering reference document for application and coordination purposes only.
Note: Unless noted below, all curves remain unchanged from their prior revision.

<table>
<thead>
<tr>
<th>Revision</th>
<th>Curve Number</th>
<th>Page</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous curve adjusted</td>
<td>TC01210020E</td>
<td>5</td>
<td>9 - 2015</td>
</tr>
<tr>
<td>to meet tolerances.</td>
<td>TC01210021E</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ZSI times added to short delay curves.</td>
<td></td>
<td>5</td>
<td>9 - 2015</td>
</tr>
<tr>
<td><a href="mailto:SIOPEG@eaton.com">SIOPEG@eaton.com</a></td>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Override curve tolerances adjusted to</td>
<td></td>
<td>5,6</td>
<td>9 - 2017</td>
</tr>
<tr>
<td>match numerical percentages for 310+</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Catalog Number Selection

This information is presented only as an aid to understanding catalog numbers. It is not to be used to build catalog numbers for circuit breakers or trip units.

### Table 1. RG Circuit Breaker/Frame

<table>
<thead>
<tr>
<th>Frame</th>
<th>Performance</th>
<th>Amperes</th>
<th>Trip Unit</th>
<th>Rating</th>
<th>Terminations</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG</td>
<td>600 480 415 240</td>
<td>160 200 250</td>
<td>33 = 310+ Electronic LS</td>
<td>Blank = 80% rated</td>
<td>M = Metric tapped line/load conductors</td>
<td>Blank = No feature</td>
</tr>
<tr>
<td></td>
<td>H 50 65 70 125</td>
<td>160 = 1600</td>
<td>32 = 310+ Electronic LSI</td>
<td>C = 100% rated (except 2500A)</td>
<td>E = Imperial tapped line/load conductors</td>
<td>B20 = High load alarm</td>
</tr>
<tr>
<td></td>
<td>C 65 100 100 200</td>
<td>200 = 2000</td>
<td>35 = 310+ Electronic LSD</td>
<td></td>
<td></td>
<td>B21 = Ground fault</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250 = 2500</td>
<td>35B22 = 310+ Electronic LSI(A), GFA, no trip</td>
<td></td>
<td></td>
<td>ZG = Zone selective interlocking</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>= 310+ Electronic LSIG</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>36 = 310+ Electronic LSIG</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>36B22 = 310+ Electronic LSI(A), GFA, no trip</td>
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<td></td>
<td></td>
<td></td>
<td>38 = 310+ Electronic ALSI</td>
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<td></td>
<td>with Maintenance Mode</td>
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<td></td>
<td></td>
<td></td>
<td>39 = 310+ Electronic ALSIG</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>with Maintenance Mode</td>
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<td></td>
<td></td>
<td></td>
<td>39B22 = 310+ Electronic ALSI(A)</td>
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<td></td>
<td></td>
<td></td>
<td>with Maintenance Mode and GFA, no trip</td>
<td></td>
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</tbody>
</table>
Figure 1. Digitrip 310+ Faceplates

*1600A/2000A Faceplates shown, 2500A Faceplates may differ
Figure 2. Digitrip 310+ Long Delay Response and Short Delay with Flat Response and Override Curve (LSI, LSIG, ALSI, ALSIG) - Curve Number TC01210020E, September 2017
Figure 3. Digitrip 310+ Long Delay Response and Short delay with \(I^2T\) Response Curve and Override

### Catalog Types:
- RSG, RSC circuit breakers, three- and four-pole

### Trip Unit Types:
- 33 (LS), 35 (LSG)

### Available Long Delay Time (Long Delay Pickup = 115% of \(I_r\))
- Shown at 6 x \(I_r\) ± 30%

### Available Short Delay (See Notes 7 and 10)
- 2–8, 9 x \(I_r\) ± 5%

### Notes:
1. Curve accuracy applies from –20°C to +55°C ambient. For possible continuous ampere derating for ambient above 40°C, refer to Eaton. Temperatures above +85°C cause an over-temperature protection trip.
2. Application frequency is 50/60 Hz.
3. There is a memory effect that can act to shorten the long delay. If the breaker trips on a long delay overload and is quickly reset, the memory capacitor will still have charge, and a subsequent overload will cause the breaker to trip in a shorter time than normal. The amount of time delay reduction is five minutes is required between overloads to completely reset memory.
4. The right portion of the curve is determined by the interrupting rating of the circuit breaker.
5. The left portion of the curve is determined by the interrupting rating of the circuit breaker. (Long Delay Pickup = 115% of \(I_r\). Range is 110–125%)
6. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
7. The short delay pickup has nine settings/positions; 1600A/2000A - 2, 3, 4, 5, 6, 7, 8, 8, 9
   2500A - 2, 2, 2, 3, 4, 5, 6, 6
   8. For high fault current levels, an additional fixed instantaneous hardware override is provided to trip the breaker at 17500A. Instantaneous tolerance is ± 20%.
9. Short delay \(I^2T\) band has a tolerance of ± 15%.
10. Breakpoint back to FLAT response occurs at 8 x \(I_r\) for upper line of the \(I^2T\) curve.
11. Maximum clearing time when using zone selective interlocking is 62ms.
**Ground Fault Delay Response Curve**

**Catalog Types:**
- RGH, RGC circuit breakers, three- and four-pole

**Trip Unit Types:**
- 35 (LSG), 36 (LSIG), 39 (ALSIG)

**Ground fault delay response notes:**
1. Curve accuracy applies from –20°C to +55°C ambient. For possible continuous ampere derating for ambient above 40°C, refer to Eaton. Temperatures above +85°C cause an over-temperature protection trip.
2. Application frequency is 50/60 Hz.
3. Trip units are suitable for functional field testing with test kit cat no: MTST230V.
4. For LD Response and SD with Flat Responses curve, see TC01210020E.
5. For LD Responses and SD with I²T Response curve, see TC01210021E.
6. For testing information, please contact Eaton.

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**Figure 4. Ground Fault Delay Response Curve (LSG, LSIG, ALSIG) Curve Number TC01210022E, June 2012**
**Digitrip 310+ Circuit Breaker Time/Current Curves**

**Maintenance Mode/Instantaneous Setting (1600A/2000A)**

**Notes:**

1. The Maintenance Mode feature must be ENABLED for these curves to apply. The LED indicator is blue when in Maintenance Mode.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. Available pickup settings (\( I_n \times k \)) (tolerance is ±15%)
   - 1600A Frame: 2.5, 4, 6, 7, 8, 9
   - 2000A Frame: 2.5, 4, 6, 7, 8, 9
5. These curves are comprehensive for the complete family of Series G R-Frame electronic breakers, including all frame sizes, ratings, and constructions. The total clearing times shown are conservative and consider the maximum response times of the trip unit, the circuit breaker opening, and the interruption of the current in worst case conditions such as: maximum rated voltages, single-phase interruption, and minimum power factor. Faster clearing times are possible depending on the specific system conditions.

Contact Eaton for additional information.

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**Figure 5. Maintenance Mode/Instantaneous Setting 1600A/2000A (ALSI, ALSIG) - Curve Number TC01210024E, September 2015**
Notes:

1. The Maintenance Mode feature must be ENABLED for these curves to apply. The LED indicator is blue when in Maintenance Mode.
2. The end of the curve is determined by the interrupting rating of the circuit breaker.
3. Total clearing times shown include the response times of the trip unit, the breaker opening, and the interruption of the current.
4. Available pickup settings (\( I_i \) x \( I_n \)) (tolerance is \( \pm 15\% \)) 2.5, 4, 6, 6, 6, 7.
5. These curves are comprehensive for the complete family of Series G R-Frame electronic breakers, including all frame sizes, ratings, and constructions. The total clearing times shown are conservative and consider the maximum response times of the trip unit, the circuit breaker opening, and the interruption of the current in worst case conditions such as: maximum rated voltages, single-phase interruption, and minimum power factor. Faster clearing times are possible depending on the specific system conditions. Contact Eaton for additional information.

Figure 6. Maintenance Mode/Instantaneous Setting 2500A (ALSi, ALSiG) Curve Number TC01210023E, September 2015
AB DE-ION Circuit Breakers

Types RD, CRD, RDC, CRDC Equipped With Digitrip RMS 310 Trip Units
Typical Instantaneous Time-Phase Current Characteristic Curve Based on $I_n$

Figure 7. Typical Instantaneous Time-Phase Current Characteristic Curve Based on $I_n$ - Curve Number SC-5629-93, October 1997
AB DE-ION Circuit Breakers

Types RD, CRD, RDC, CRDC Equipped With Digitrip RMS 310 Trip Units

Typical Long Delay/Short Delay Time-Phase Current Characteristic Curve Based on $I_n$

Figure 8. Typical Long Delay/Short Delay Time-Phase Current Characteristic Curve Based on $I_n$ - Curve Number SC-5630-93, October 1997

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Effective September 2015
AB DE-ION Circuit Breakers

Types RD, CRD, RDC, CRDC Equipped With Digitrip RMS 310 Trip Units

Typical Ground Fault/Protection Time/Current Characteristic Curve Based on $I_n$

Figure 9. Typical Ground Fault/Protection Time/Current Characteristic Curve Based on $I_n$ - Curve Number SC-5631-93, October 1997