Time current curves Power Defense MCCB, frame 4 thermal-magnetic and PXR electronic trip units

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Table 1. Revision notes

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>
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<tbody>
<tr>
<td>1 Power Defense frame 4 initial release</td>
<td></td>
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</tbody>
</table>
This information is provided only as an aid to understand the catalog numbers.
It is not to be used to build catalog numbers for circuit breakers or
trip units as all combinations may not be available.

Table 2. Catalog number convention

Table 3. Electronic trip unit catalog number convention

Note: IEC standard breakers include the CE mark; GB standard breakers include the CCC mark.
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Table 4. Magnetic trip unit thermal catalog number convention

Table 5. Symmetrical RMS interruption ratings (kA) for each breaker frame

Table 6. Curve notes

1. These curves apply for 50Hz and 60Hz applications
2. The maximum voltage rating for the frame style is stated in Table 5.
3. These curves are comprehensive for Power Defense style circuit breakers including frame sizes, ratings and constructions stated.
4. The total clearing times shown include the response time for the trip unit, the breaker opening and the interruption of the current. The bottom of the time band is the minimum commit to trip time.
5. The end of the curve is determined by the application or the interrupting rating of the circuit breaker.
6. Thermal magnetic trip unit calibration based on 40°C ambient, cold start. Tested with 4 feet of rated wire (75°C) per terminal. Tested in open air with current in all poles.
7. Thermal magnetic trip unit instantaneous calibration based on single pole testing.
8. All electronic trip units have an over temperature protection feature that will trip the breaker when the internal temperature of the ETU is over 105°C

Note: IEC standard breakers include the CE mark; GB standard breakers include the CCC mark.
Labels

PXR 25 and PXR 20D – unit with LSIG protection and maintenance mode pictured

PXR 20 – unit with LSIG protection and maintenance mode pictured

PXR 10 – unit with LSI protection pictured

Fixed thermal, adjustable magnetic unit pictured

Figure 1. Power Defense frame 4 trip unit front labels

Note: Trip unit drawings in Figure 1 are representative of the face plates provided. Values on the trip unit dials will change based upon the specific breaker and trip unit. Refer to the time current curve of the breaker or the PXR User Guide for the specific settings.
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Curves

Figure 2. PXR 20D / PXR 25 - I²t Long Delay and Flat Short Delay Curves

Time Current Curves
Power Defense Circuit Breakers
Style: Frame 4
Configuration: 3 and 4 Poles
Trip Unit Type: Power Xpert Release - PXR20D / PXR25
Curve: Long I²t Delay and Short Flat Delay

Current in Multiples of Long Delay Setting (I₀)

Notes:
1. Long Delay pickup is 110% of the Ir setting with ±5% tolerance.
2. Long Delay Time Settings adjustable from 0.5s - 24s at steps of 0.1s with +0%/-30% tolerance.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. Short Delay pickup settings adjustable from 1.5x - 8.0x at steps of 0.1x with ±5% tolerance.
5. Short Delay time settings adjustable from 0.05s - 0.500s at steps of 0.010s with +0%/-30% tolerance.
6. If the Long Delay time is projected to be faster than the Short Delay time, the Long Delay trip time will go no faster than the Short Delay time value.
7. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz.
Figure 3. PXR 20 - $I^2t$ long delay and flat short delay curves
Figure 4. PXR 20D / PXR 25 - I²t Long Delay and I²t Short Delay Curves

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Time Current Curves
Power Defense Circuit Breakers
Style: Frame 4
Configuration: 3 and 4 Poles
Trip Unit Type: Power Xpert Release - PXR20D / PXR25
Curve: Long I²t Delay and Short I²t Delay

Notes:
1. Long Delay pickup is 110% of the Ir setting with ±5% tolerance. Ir is set from Min to Max at steps of 10A.
2. Long Delay Time Settings adjustable from 0.5s - 24s at steps of 0.1s with +0%/-30% tolerance.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. Short Delay pickup settings adjustable from 1.5x - 8.0x at steps of 0.1x with ±5% tolerance.
5. Short Delay I²t slope time settings adjustable from 0.07s - 0.300s at steps of 0.010s with +0%/-30% tolerance, 0.1s times and lower have +0%/-40% tolerance.
6. If the Long Delay time is projected to be faster than the Short Delay time, the Long Delay trip time will go no faster than the Short Delay time value.
7. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz
Figure 5. PXR 20 I²t long delay and I²t short delay curves

Notes:
1. Long Delay pickup is 110% of the Ir setting with ±5% tolerance.
2. Long Delay Time Settings as shown have +0%/-30% tolerance.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. Short Delay pickup settings as shown have ±5% tolerance.
5. Short Time delay I²t slopes as shown have a +0%/-30% tolerance, 0.067s slope has a +0%/-40% tolerance.
6. If the Long Delay time is projected to be faster than the Short Delay time, the Long Delay trip time will go no faster than the Short Delay time value.
7. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz.
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Figure 6. PXR 20D / PXR 25 - I₄t Long Delay and Flat Short Delay Curves

Notes:
1. Long Delay pickup is 110% of the Ir setting with ±5% tolerance. Ir is set from Min to Max at steps of 10A.
2. Long Delay Time Settings adjustable from 0.5s - 7s at steps of 0.1s with ±0%/-30% tolerance.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. Short Delay pickup settings adjustable from 1.5x - 8.0x at steps of 0.1x with ±5% tolerance.
5. Short Delay time settings adjustable from 0.050s - 0.500s at steps of 0.010s with ±0%/-30% tolerance. 0.1s times and lower have ±0%/-40% tolerance.
6. If the Long Delay time is projected to be faster than the Short Delay time, the Long Delay trip time will go no faster than the Short Delay time value.
7. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz.
Figure 7. PXR 20D / PXR 25 ground (earth) flat delay
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**Figure 8. PXR 20D / PXR 25 - ground (earth) I²t Delay Curves**

- **Time Current Curves**
- **Power Defense Circuit Breakers**
- **Style:** Frame 4
- **Configuration:** 3 and 4 Poles
- **Trip Unit Type:** Power Xpert Release - PXR20D / PXR25
- **Curve:** Ground (Earth) I²t Delay

**Notes:**
1. Ground Pickup settings adjustable from 0.2x - 1.0x at steps of 0.01x are for Residual sensing with a tolerance of ± 10%.
2. Ground slope I²t time adjustable from 0.067s – 0.300s at steps of 0.010s with tolerances as shown in the curve.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz.
Figure 9. PXR 20 - ground (earth) flat delay

Notes:
1. Ground Pickup settings as shown are for Residual sensing with a tolerance of ±10%.
2. Ground slope Flat time setting are shown with tolerances.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz
Time current curves Power Defense MCCB, frame 4 thermal-magnetic and PXR electronic trip units

**Figure 10. PXR 20 - ground (earth) I²t Delay Curves**

- **Time Current Curves**
- **Power Defense Circuit Breakers**
- **Style:** Frame 4
- **Configuration:** 3 and 4 Poles
- **Trip Unit Type:** Power Xpert Release - PXR20
- **Curve:** Ground (Earth) I²t Delay

**Notes:**
1. Ground Pickup settings as shown are for Residual sensing with a tolerance of ± 10%.
2. Ground slope I²t time settings are shown with tolerances.
3. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
4. With ZSI enabled and no auxiliary power, tripping times for 3-phase faults will be a maximum of 60ms for 60Hz and 63ms for 50Hz.

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**Figure 10. PXR 20 - ground (earth) I²t delay**

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Figure 11. PXR 20D / PXR 25 - instantaneous and override for 800A frame

Notes:
1. The instantaneous pickup settings adjustable from 2x – 8.5x(Max) at steps of 0.10x with ±10% tolerance.
2. For high fault current levels a fixed instantaneous override is provided at 6800A and has ±15% tolerance.
**Time current curves Power Defense MCCB, frame 4 thermal-magnetic and PXR electronic trip units**

**Figure 12. PXR 20D / PXR 25 - instantaneous (1000A)**

- **Style:** Frame 4
- **Configuration:** 3 and 4 Poles
- **Trip Unit Type:** Power Xpert Release - PXR20D / PXR25
- **Curve:** Instantaneous and Override for 1000A frame

**Notes:**
1. The Instantaneous pickup settings adjustable from 2x – 8x(Max) at steps of 0.10x with ±10% tolerance.
2. For high fault current levels a fixed instantaneous override is provided at 8000A and has ±15% tolerance.

---

**1000A Frame Override Curve**

- **Setting range:**
- **Current in Multiples of Rating (Iₙ):**
- **Current in Amps:**
- **Time in Seconds:**

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Figure 13. PXR 20 / PXR 10 - instantaneous (800A)
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**PXR 20 / PXR 10 - 1000A Frame Instantaneous Curves**

- **Style:** Frame 4
- **Configuration:** 3 and 4 poles
- **Trip Unit Type:** Power Xpert Release – PXR20 / PXR10
- **Curve:** Instantaneous
- **Override for 1000A frame**

**Notes:**
1. The instantaneous pickup settings as shown with a ±10% tolerance.
2. For high fault current levels a fixed instantaneous override is provided at 8000A and has a ±15% tolerance.

---

**1000A Frame Override Curve**

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**Figure 14. PXR 20 / PXR 10 - instantaneous and override 1000A frame**

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Figure 15. PXR 20 / PXR 20D / PXR 25 - maintenance mode
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Figure 16. PXR 10 LI 800A frame

Notes:
1. Long Delay pickup is 110% of the Ir setting with ±5% tolerance.
2. Long Delay Time Setting has +0%/-30% tolerance.
3. Instantaneous pickup settings have ±10% tolerance.
4. For high fault current levels a fixed instantaneous override is provided at 6800A and has a ±15% tolerance.
5. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
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**Figure 17. PXR 10 LI 1000A frame**

**Notes:**
1. Long Delay pickup is 110% of the Ir setting with ±5% tolerance.
2. Long Delay Time Setting has ±0%/-30% tolerance.
3. Instantaneous pickup settings have ±10% tolerance.
4. For high fault current levels a fixed instantaneous override is provided at 8000A and has a ±15% tolerance.
5. If Thermal Memory is enabled, trip times may be shorter than indicated in this curve.
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Figure 18. PXR 10 LSI profile for short flat curves

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<th>( Isd ) (n x Ir)</th>
<th>( tsd ) (s)</th>
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</tr>
<tr>
<td>B</td>
<td>2</td>
<td>0.300</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>( I^t )</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>0.150</td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>( I^t )</td>
</tr>
<tr>
<td>F</td>
<td>6</td>
<td>0.150</td>
</tr>
<tr>
<td>G</td>
<td>6</td>
<td>0.300</td>
</tr>
<tr>
<td>H</td>
<td>8</td>
<td>0.150</td>
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<tr>
<td>J</td>
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<td>0.300</td>
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</table>
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Figure 19. PXR 10 LSI profile for I²t short curves

Notes:
1. Long Delay pickup is 110% of the Ir setting with ±5%
tolerance.
2. Long Delay Time Setting has +0%/-30% tolerance.
3. Instantaneous pickup settings have ±10% tolerance.
4. Short Delay pickup settings as shown have ±5%
tolerance.
5. If Thermal Memory is enabled, trip times may be
shorter than indicated in this curve.
6. When Profile K is selected, PXR10 LI style curve should
be used.
7. Setting J in the table is the default value but can be
programmed from a minimum of 2x to a maximum of 8x in
steps 0.5x and a time delay of 50ms to 300ms in steps of
50ms using the Power Xpert Protection Manager software
(PXPM).

<table>
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<tr>
<th>Profile</th>
<th>Isd (n x Ir)</th>
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<tr>
<td>B</td>
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<td>0.300</td>
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<td>C</td>
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<tr>
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Figure 20. Fixed thermal adjustable magnetic 300A-600A
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Figure 21. Fixed thermal adjustable magnetic 700A-800A

Notes:
1. Utilization Category A
   \( U_{imp} = 8kV \)
2. DC Instantaneous trip values are approximately 40% higher.
3. Magnetic settings are a multiple of In rating
4. Thermal setting is a function of Ir setting or rating

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Figure 22. Adjustable thermal adjustable magnetic 630A-1000A

Notes:
1. Utilization Category A
   \[ U_{IMP} = B kV \]
2. DC Instantaneous trip values are approximately 40% higher.
3. Magnetic settings are a multiple of In rating
4. Thermal setting is a function of Ir setting or rating
5. The Ir adjustment range is 100% to 80% of In
PD4 800A 240V
Peak Let Through Current

Available Short Circuit Current, kA \text{rms}

Figure 23. 240V let through current

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Figure 24. 240V peak let through energy
Figure 25. 415V-480V let through current
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Figure 26. 415V-480V let through energy

**PD4 800A 415V - 480V**

**Peak Let Through Energy**

<table>
<thead>
<tr>
<th>Available Short Circuit Current, kA$_\text{rms}$</th>
<th>Peak Let Through Energy $I^2t$, A$^2$ sec</th>
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<td>10</td>
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</tr>
<tr>
<td>100</td>
<td>10000000</td>
</tr>
<tr>
<td>1000</td>
<td>10000000</td>
</tr>
</tbody>
</table>

415V - 480V
**PD4 800A 600V**

**Peak Let Through Current**

![Graph showing peak let-through current vs. available short circuit current for PD4 800A 600V](image)

- **Peak Let-Through Current, kA**
- **Available Short Circuit Current, kA_{rms}**

---

Figure 27. 600V let through current

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Figure 28. 600V let through energy
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