33.2.8.5 Continuous output current capability in the POWER_ON state

For Type 1 and Type 2 PSEs, IPort-2P is defined in 33.1.3. For Type 3 and Type 4 PSEs, IPort-2P and IPort-2P-other are the currents on the pairs with the same polarity of the two pairsets and are defined in Equation (33–5) and in Equation (33–6).

$$I_{\text{Port-2P}} = \left\{ \begin{array}{ll} I_{\text{Port-2P-pri}} & \text{for the Primary Alternative} \\ I_{\text{Port-2P-sec}} & \text{for the Secondary Alternative} \end{array} \right\}_{\text{A}} \quad (33\text{–}5)$$

$$I_{\text{Port-2P-other}} = \left\{ \begin{array}{ll} I_{\text{Port-2P-sec}} & \text{for the Primary Alternative} \\ I_{\text{Port-2P-pri}} & \text{for the Secondary Alternative} \end{array} \right\}_{\text{A}} \quad (33\text{–}6)$$

where

IPort-2P-pri is the output current sourced by the Primary Alternative, defined in 33.2.5.9
IPort-2P-sec is the output current sourced by the Secondary Alternative, defined in 33.2.5.9

IPort is the total current on both pairs with the same polarity and is defined in Equation (33–7).

$$I_{\text{Port}} = \{I_{\text{Port-2P}} + I_{\text{Port-2P-other}}\}_{\text{A}} \quad (33\text{–}7)$$

PSEs shall be able to source ICon-2P, the current the PSE supports on each powered pairset, as specified in Equation (33–8).

$$I_{\text{Con-2P}} = \left\{ \begin{array}{ll} P_{\text{Class}}/V_{\text{PSE}} & \text{when in 2-pair mode} \\ \min(I_{\text{Con}} - I_{\text{Port-2P-other}}, I_{\text{Con-2P-unb}}) & \text{when 4-pair powering a single-signature PD} \\ P_{\text{Class-2P}}/V_{\text{PSE}} & \text{when 4-pair powering a dual-signature PD} \end{array} \right\}_{\text{A}} \quad (33\text{–}8)$$

where

PClass	is PClass as defined in Equation (33-2)
PClass-2P	is PClass-2P as defined in Equation (33-3)
VPSE	is the voltage at the PSE PI as defined in 33.1.3
ICon	is the total current a PSE is able to source as defined in Equation (33–9)
ICon-2P-unb	is the current a PSE is able to source on a pairset due to unbalance as defined in Table 33–18
IPort-2P-other	is the output current on the other pairset as defined in Equation (33–6).

When powering a single-signature PD over 4 pairs, a Type 3 or Type 4 PSE supports:

- A total current of Icon, defined in Equation (33–9), over both pairs with the same polarity
- A minimum current of Icon-2P-unb over one of the pairs of the same polarity under maximum unbalance condition (see 33.2.8.5.1) in the POWER_ON state.

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$$I_{Con} = \left\{ \frac{P_{Class}}{V_{PSE}} \right\}_A \quad (33\text{–}9)$$

The PSE shall support the AC current waveform parameter $I_{Peak\text{-}2P}$, defined in Equation (33–10), on each powered pairset while within the operating voltage range of $V_{Port\_PSE\text{-}2P}$, for a minimum of $T_{CUT\text{-}2P}$ and a duty cycle of at least 5%.

$$I_{Peak\text{-}2P} = \left\{ \begin{array}{ll} I_{Peak} & \text{when in 2-pair mode} \\ \min(I_{Peak} - I_{Port\text{-}2P\text{-}other},\ I_{Peak\text{-}2P\_unb}) & \text{when 4-pair powering a single-signature PD} \\ \dfrac{V_{PSE} - \sqrt{V_{PSE}^2 - 4 \times R_{Chan\text{-}2P} \times P_{Peak\_PD\text{-}2P}}}{2 \times R_{Chan\text{-}2P}} & \text{when 4-pair powering a dual-signature PD} \end{array} \right\}_A \quad (33\text{–}10)$$

where

IPeak	is the total peak current a PSE supports per Equation (33–11)
IPort-2P-other	is the output current on the other pairset as defined in Equation (33–6).
IPeak-2P-unb	is the minimum current due to unbalance effects a PSE must support on a pairset as defined in Equation (33–12).
VPSE	is the voltage at the PSE PI as defined in 33.1.3
RChan-2P	is the pairset loop resistance; this parameter has a worst-case value of RCh defined in 33.1.3. RCh is defined in Table 33–1.
PPeak_PD-2P	is the total peak power a dual-signature PD may draw per its Class on a pairset; see Table 33–30

IPeak, defined in Equation (33–11), is the total current of the powered pairs with the same polarity that a PSE supports, when powering a PD over 2 pairs or powering a single-signature PD over 4 pairs.

$$I_{Peak} = \left\{ \frac{V_{PSE} - \sqrt{V_{PSE}^2 - 4 \times R_{Chan} \times P_{Peak\_PD}}}{2 \times R_{Chan}} \right\}_A \quad (33\text{–}11)$$

where

VPSE	is the voltage at the PSE PI as defined in 33.1.3
RChan	is the channel loop resistance as defined in 33.1.3
PPeak_PD	is the total peak power a PD may draw for its Class; see Table 33–30

IPeak-2P-unb, defined in Equation (33–12), is the minimum current due to unbalance effects that a PSE supports on a pairset when powering a single-signature PD over 4-pair.

$$I_{Peak\text{-}2P\_unb} = \left\{ (1 + K_{IPeak}) \times \frac{I_{Peak}}{2} \right\}_A \quad (33\text{–}12)$$

where

KIPeak	The value of KIPeak, defined in Equation (33–13), is based on a curve fit and is dimensionless

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IPeak is the total peak current a PSE supports per Equation (33–11)

$$K_{Ipeak} = \begin{cases} \min(0.214 \times (R_{chan\text{-}2P})^{-0.363}, 0.331) & \text{for Class 5} \\ \min(0.199 \times (R_{chan\text{-}2P})^{-0.350}, 0.304) & \text{for Class 6} \\ \min(0.180 \times (R_{chan\text{-}2P})^{-0.335}, 0.270) & \text{for Class 7} \\ \min(0.176 \times (R_{chan\text{-}2P})^{-0.347}, 0.260) & \text{for Class 8} \end{cases} \quad (33\text{–}13)$$

where

RChan-2P is the channel DC loop resistance per pairset, as defined in 33.1.3. RChan-2P has a minimum value of 0.2 Ω when used in Equation (33–13).

Editing Instruction: Add new top row to KIpeak Equation with values:

1 Classes 0-4

Alternatively, an over-margined value of IPeak-2P-unb_IPeak-2P-unb_max which is defined by Equation (33–14), may be used.

$$I_{Peak\text{-}2P\_unb\_max} = \{I_{LIM\text{-}2P} - 0.002\}_A \quad (33\text{–}14)$$

where

ILIM-2P is the ILIM-2P min value per pairset for the PSE, as defined in Table 33–18

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