

Comment (Comment r02-119, r02-70 clause 145.4.1 page 217 line 39)

There are few errors in the text "Dual-signature PDs shall have less than or equal to 10 μ A of current between any one conductor of Mode A and any one conductor of Mode B when VPD, as defined in 145.1.3, of either Mode is less than VOff_PD min, as defined in Table 145–29. See Table 79–6f."

Problem #1: We can't ask for 10uA leakage current between any one conductor of Mode A and any one conductor of Mode B since at the PSE the positive pairs are shorted together to form the common point (due to the fact that in the PSE the switches must be on the negative pairs) which effectively shorts the positive pairs in the PD resulting with no benefit with forcing isolation on the positive pairs on the PD. The original intent of dual-signature PD vendors was to have isolation between pairs of the same polarity at the polarity where the PSE guarantee switching and measuring the current/voltage when doing connection check and/or detection. **This is the minimum spec required to guarantee interoperability.**

Problem #2: Requiring isolation on the positive pairs at the PD side has no value and technically is not needed by the PD nor by the PSE due to the following reasons:

- a) Only the negative pairs at the PD are guaranteed to be supported by the PSE negative pairs. There is no guarantee or mandatory PSE requirement to control the current (switch it ON/OFF) and measure it (implicit requirement) on the positive pairs. There is only mandatory requirement to switch the negative pairs.

The only way to support switches on the PSE positive/negative pairs is to measure the current on the pairs where the switches are located so it will meet *the controllability criteria* i.e. current can be controlled and monitored on the pairs where the switching elements are located since in 4-pairs the current i1 in the positive pairs is not equal to its return current i3 in the negative pairs (see drawings in the Annexes) and also the same applies for i2 and i4. As a result, even if there is no explicit requirement to measure the current in the negative pairs of the PSE, it is implicitly defined. If we want, we can explicitly require measuring the current at least at the negative pairs too but I believe it is not necessary due to the above discussion.

- (c) there is no point to mandate in the PD isolation on the positive pairs knowing that nobody will follow this requirement due to no technical need and no violation of interoperability criteria.

- (d) In a dual-signature PD with a single load, you must short the positive pairs (if the negative pairs in the PD are not the common point) to form close circuit. In the dual-signature PD dual load which is a much simpler case, we have inherent isolation on both negative and positive pairs HOWEVER, the PSE shorts its positive pairs effectively make the PD positive pairs not isolated so bottom line, in both load cases of dual-signature PD the requirement for isolation on positive pairs is technically not required and doesn't bring any value in addition to the fact that PSE is not required to support it.

- (e) Due to the above arguments, the minimum spec requirements to guarantee interoperability is to require isolation at least between the negative pairs at the PD.

Problem #3: The 10uA isolation requirement value is correct up to 10.1V but need to be higher than 10uA between 10.1V and 30V since the source of the leakage is voltage depended and leakage current is increased as voltage increased.



Proposed remedy:

1. **Change from:** "Dual-signature PDs shall have less than or equal to 10 μ A of current between any one conductor of Mode A and any one conductor of Mode B when VPD, as defined in 145.1.3, of either Mode is less than VOff_PD min, as defined in Table 145–29. See Table 79–6f."

To:

"Dual-signature PDs shall have less than or equal to 10 μ A of current between any negative conductor of Mode A and any negative conductor of Mode B when VPD, as defined in 145.1.3, is less than VOff_PD min, as defined in Table 145–29, on either mode. See Table 79–6f."

Add the following text to the PSE section:

[See Comment r02-119, r02-70 final proposed remedy]

End of proposed Remedy.



Annex A – PSE – PD configurations for specifying isolation.

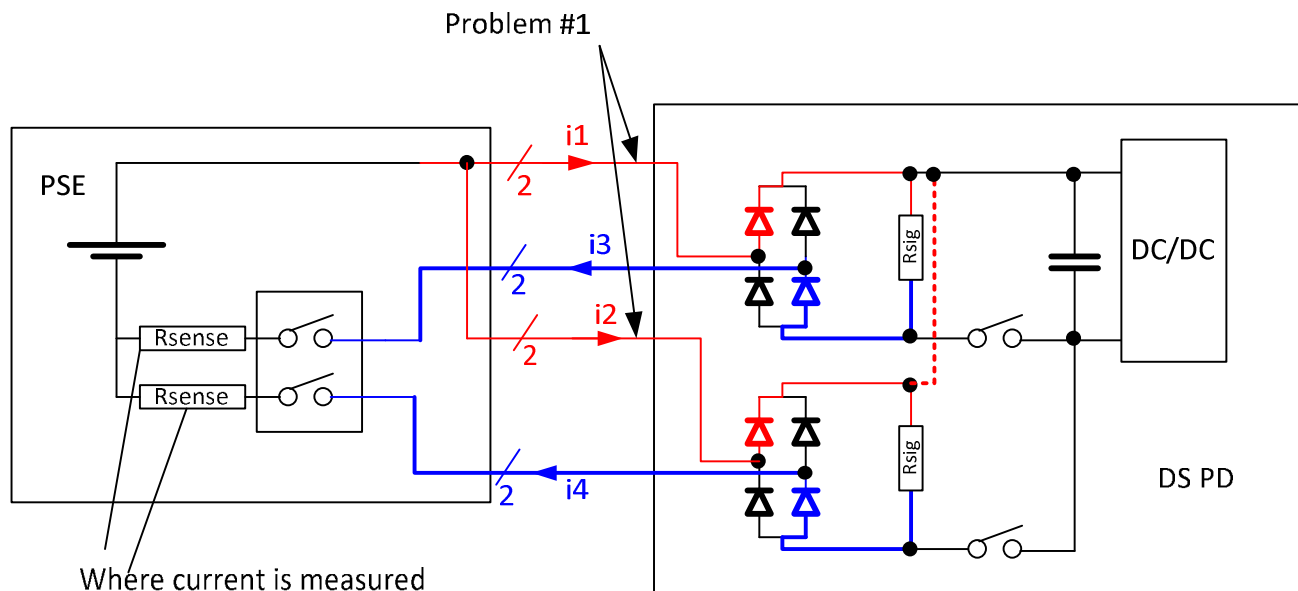


Figure 1: Dual-signature, single load PD.

Figure 1:

- Switching on the negative is mandatory
- Measuring current on the negative when switching on the negative is the only possible choice for 4-pair operation since measuring on the positive will result with pairs currents that are not correlated to the negative pairs currents due to unbalance. As a result, it is guaranteed only in the negative pairs, that PSE will support PD successfully when measuring the pair current for connection check, detection and classification circuits in dual-signature PDs.
- In addition, the positive side is tied together at the PSE side which effectively, tied the positive pairs at the PD side as well.

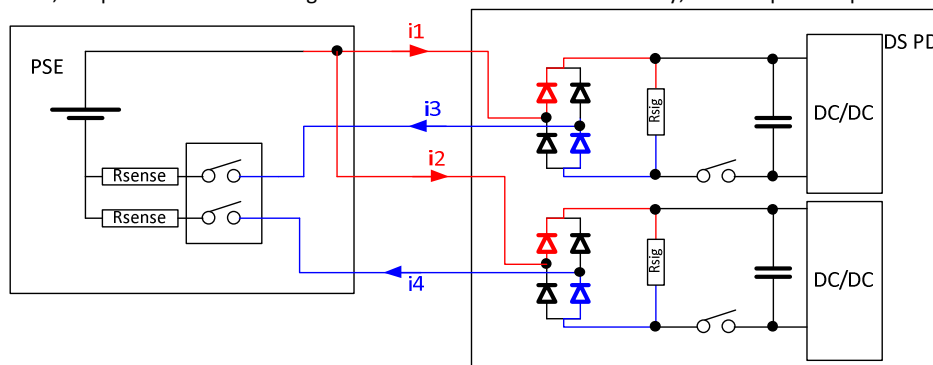


Figure 2: Dual-signature, dual load PD.

Figure 2:

By definition, the positive pairs and negative pairs are isolated in the PD primary side (secondary may have common GND and typically this is the case). However, since as in the previous case the PSE is required to support switching on the negative pairs, PD is not guaranteed to be supported on the positive pairs making the isolation requirements on the PD positive pairs with no value.



How to determine if the current is measured on the negative pairs?

Example (there are many methods):

Test 1: Voltage source implementations: Connecting 25K for each mode A and B. Shorting positive pairs and check if the signature is still valid. Same doing in the negative pairs. If not valid in the negative pairs it means that the current is measured at the negative pairs.

Test 2: Current source implementations: Checking where we have constant currents on the negative or positive. If in the negative than we prove the point.

Only one of the Tests need to pass

