

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 there are pins that connected to Transformers that forms very low resistance. 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 the current i_1 in the positive pairs is not equal to its return current i_3 in the negative pairs (see drawings in the Annexes) and also the same applies for i_2 and i_4 . 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 require explicitly to measure the current at least at the negative pairs too but I believe it is not necessary due to the above discussion.

(b) Even if we require isolation on the positive pairs at the PD it is not guaranteed that it will be supported by the PSE since at the PSE side we will have short between the positive pairs if PSE switches only at the negative pairs.

There is no technical reason or need to switch on the positive pairs at the PSE if it is mandatory to switch on the negative pairs.

(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) at the PD side to form close circuit. In dual-signature PD dual load it is 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 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:

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 ILeak_dual of current between any negative pairs when VPD, as defined in 145.1.3, of either Mode is in the range as defined in Table 145–X1. See Table 79–6f."

2. Add Table 145-X1 as follows:

| Item | Value | VPD range |
|------------|------------|--|
| ILeak_dual | 10 μ A | $0 \text{ V} \leq \text{VPD} \leq 10.1 \text{ V}$ |
| | 30uA | $10.1 \text{ V} < \text{VPD} \leq \text{VOff_PD min}$ |

End of proposed Remedy.



Annex A – PSE – PD configurations for specifying isolation.

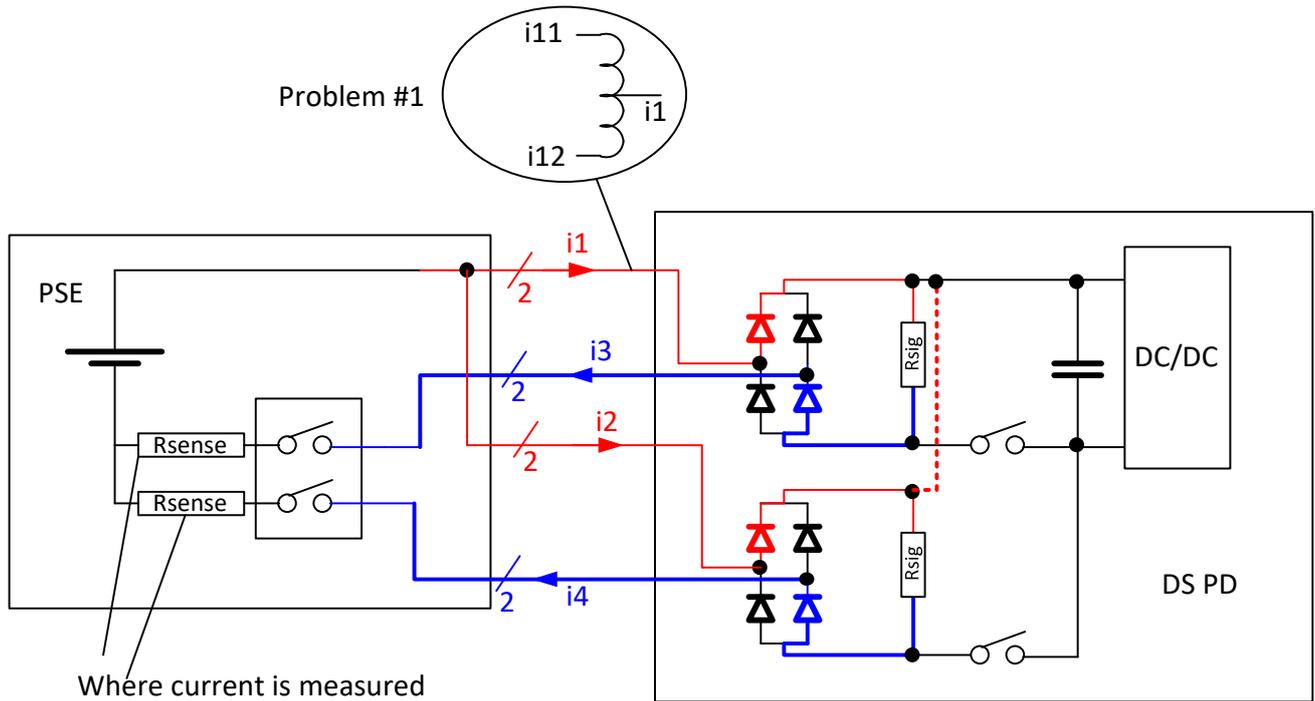


Figure 1: Dual-signature, single load PD.

Figure 1:

- Switching on the negative is mandatory
- Measuring current on the negative when switching on the negative is the only practical choice 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.

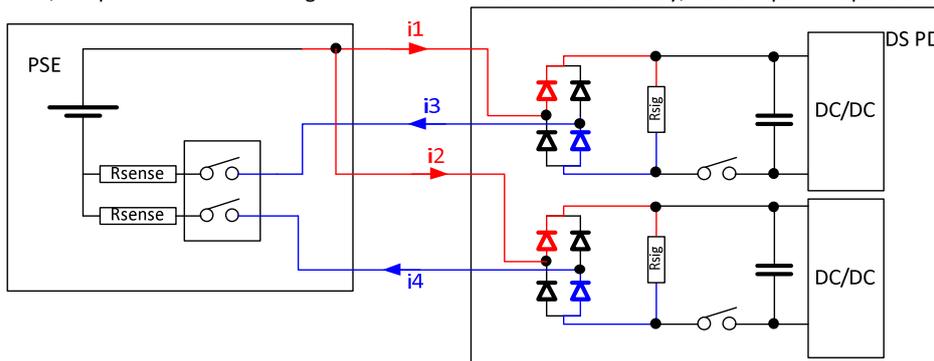


Figure 2: Dual-signature, dual load PD.

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.

