



# Grounding Instructions

## *TSP and TSD Drive Series*

Triamec Motion AG recommends the grounding instructions in this document to maximize performance and minimize overall machine EMC problems.

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# 1 General Recommendations

The following instructions are based on field experience and testing. Use the yellow *Advice* boxes as outlines of the most important recommendations.

## 1.1 Scope

Following the recommendations in this document, does not imply that no issues arise. Some recommendations may overlap and/or conflict with the guidelines of components manufacturers. In such case Triamec Motion AG strongly recommends to prioritize the manufacturers guidelines. Ideally all recommendations of all systems components are aligned.

## 1.2 Grounding

All *Triamec Motion AG* devices have a grounding point on the case for protective earth (PE). Refer to the manuals for device specific grounding points.

Additionally PE lines must run with the DC Bus lines in between each device in line. There are dedicated pins on the connectors.

**Advice** Each device (also if in line) must be grounded at its case grounding point for PE individually.  
Run PE lines close and in parallel with the DC Bus lines.  
Avoid physical loops of the DC Bus and ground lines.  
Keep the DC Bus and grounding lines as short as possible.

On the drive output side we strongly recommend to ground the motor and the axis structural parts where possible. Usually a PE line is run to the motor together with the motor phases. A dedicated pin is available on the motor connectors for PE coming from the motor.

If the application allows it, we recommend that the mechanical interface in between motor and structure is electroconductive. Refer to the motor manufacturers instructions as well.

**Advice** Ground the motor PE lines with the dedicated pin on the motor connector.  
Consider grounding the motor housing and the axis structure where possible.

## 1.3 Shielding

Triamec Motion AG strongly recommends to use shielded cables for all lines running from a drive to the stage. Especially the motor cable and the sensor cable must be shielded properly.

**Advice** Use shielded cables with at least 70% shield coverage on all lines in between stage and drive.

On the drive side, sheet metal parts are provided to connect the shield of the motor cable to. Samples on recommended motor cable fixations are displayed in chapter 3, according to the drive series. The sensor cable shield must be connected to the connector housing. A sample is shown in Figure 1.



Figure 1: Open encoder connector

## 2 Multi-Drive Setups

Different combinations are possible if multiple drives are in the system. Triamec drives rely on prepped TP devices, whereas up to four TSD can run on a single TP device. In this case it is recommended to add chokes to the DC-Bus lines between each drive and/or the TP. With this measure radiating noise is reduced significantly.

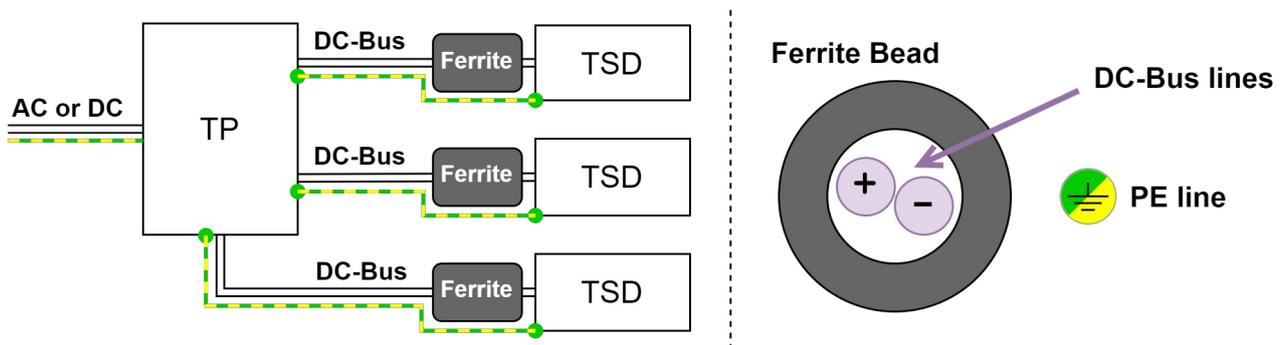


Figure 2: LHS: Multi-Drive setup with chokes. RHS: Assembly instruction for ferrite beads.

### Ferrite Bead Requirement:

Minimal impedance:  $10 \Omega$  [1 to 10MHz]

Product recommendation: TDK, ZCAT3035-1330

**Advice** In case of multiple drives attached to one TP, add ferrite beads as chokes to each DC-Bus line to improve EMC (Figure 2 - LHS).

**Advice** Only run the DC-Bus lines through the ferrite beads and run the PE line around it (Figure 2 - RHS).

### 3 Templates

The following templates visualize the recommended grounding and shielding instructions from the previous chapters.

#### 3.1 TSD80 and TSD130

Refer to [3] for details on connectors and grounding points of the TSD80 and TSD130 devices.

Figure 3 shows schematically how a setup including TSD80 or TSD130 should be grounded.

All Triamec products run the power lines fully isolated to earth, therefore the customer can choose to reference DC or AC supplies to earth (PELV) or keep it isolated (SELV). In case of targeting PELV the reference to earth must be made before the TP/TPDC device.

**Warning** Connecting a DC-Bus line to earth (between TP/TPDC and TSD) can destroy the devices.

The TSD80 and TSD130 drives always require a TP/TPDC device on the incoming line to fulfill the EMC requirements. Although a high quality SMPS could take over the EMC filtering, a TP/TPDC is still needed to consume reverse energy flow. Refer to the hardware manuals [1] for TP, or [2] for TPDC, regarding details on connectors and grounding points.

**Advice** Triamec Motion AG recommends a setup with an SMPS. Refer to 4 for recommended products.

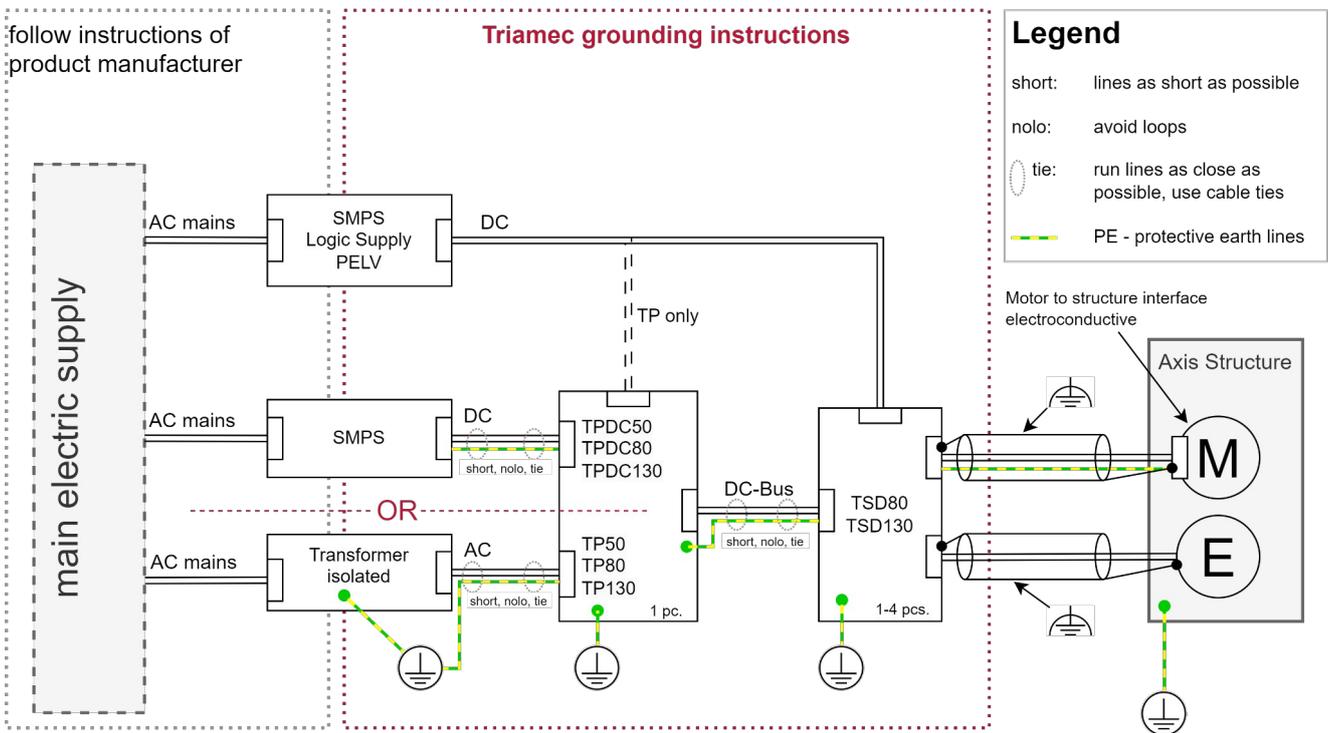


Figure 3: TSD80 and TSD130 grounding instructions diagram

## Motor Connector

To achieve best performance and avoid EMC issues, it is mandatory to clamp the motor cable shield to the sheet metal provided with the device. Figure 4 shows the recommended motor cable attachment.

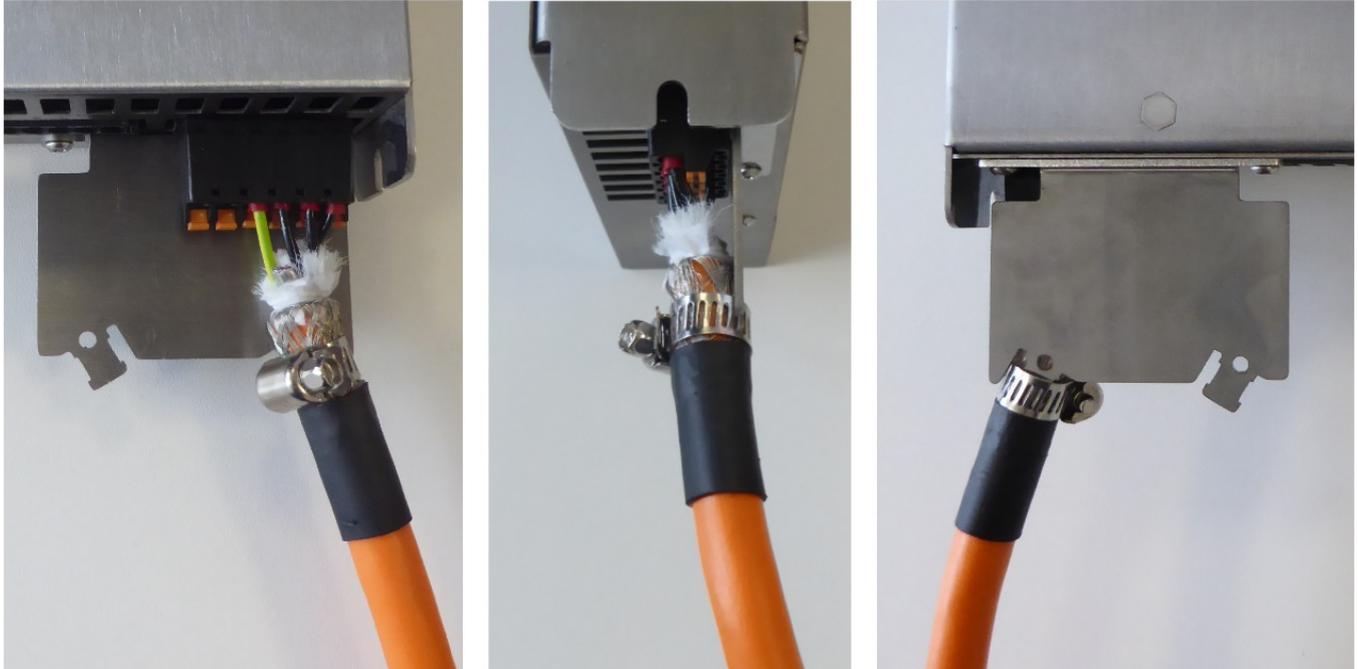


Figure 4: Motor cable shield attachment TSD80 and TSD130

**Advice** Keep the unshielded wires as short as possible and without loops.

**Advice** The connection of the shield to the sheet metal should be as electrically conductive as possible.

## 3.2 TSD350

Refer to [4] for details on connectors and grounding points of the TSD350 device series.

Figure 5 shows schematically how a setup including TSD350 drives should be grounded.

All Triamec products run the power lines fully isolated to earth, therefore the customer can choose to reference DC or AC supplies to earth (PELV) or keep it isolated (SELV). In case of targeting PELV the reference to earth must be made before the TP device.

**Warning** Connecting a DC-Bus line to earth (between TP and TSD) can destroy the devices.

The TSD350 drives always require a TP device on the incoming line to fulfill the EMC requirements. Although a high quality SMPS could take over the EMC filtering, a TP is still needed to consume reverse energy flow. Refer to [1] for details on connectors and grounding points of the TP device.

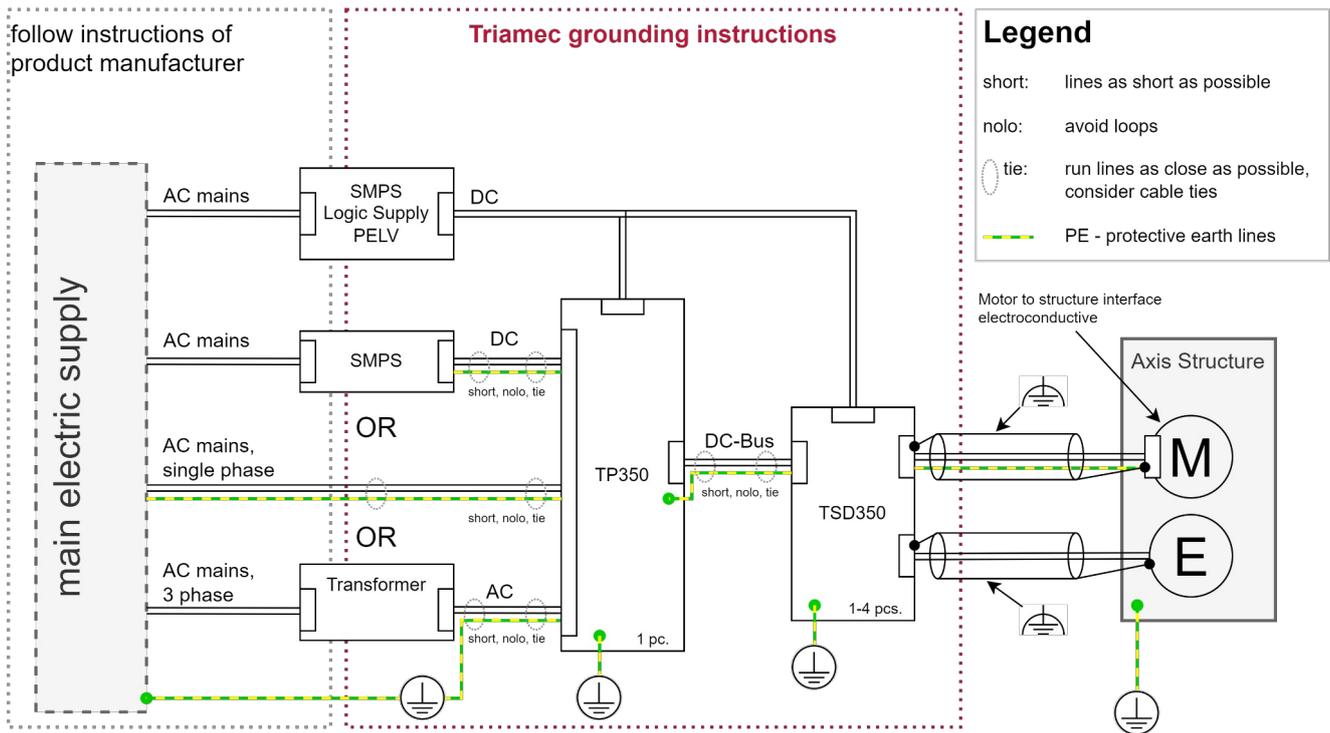


Figure 5: TSD350 grounding instructions diagram

### Motor Connector

To achieve best performance and avoid EMC issues, it is mandatory to clamp the motor cable shield to the sheet metal provided with the motor connector. Figure 6 shows the recommended motor cable attachment.

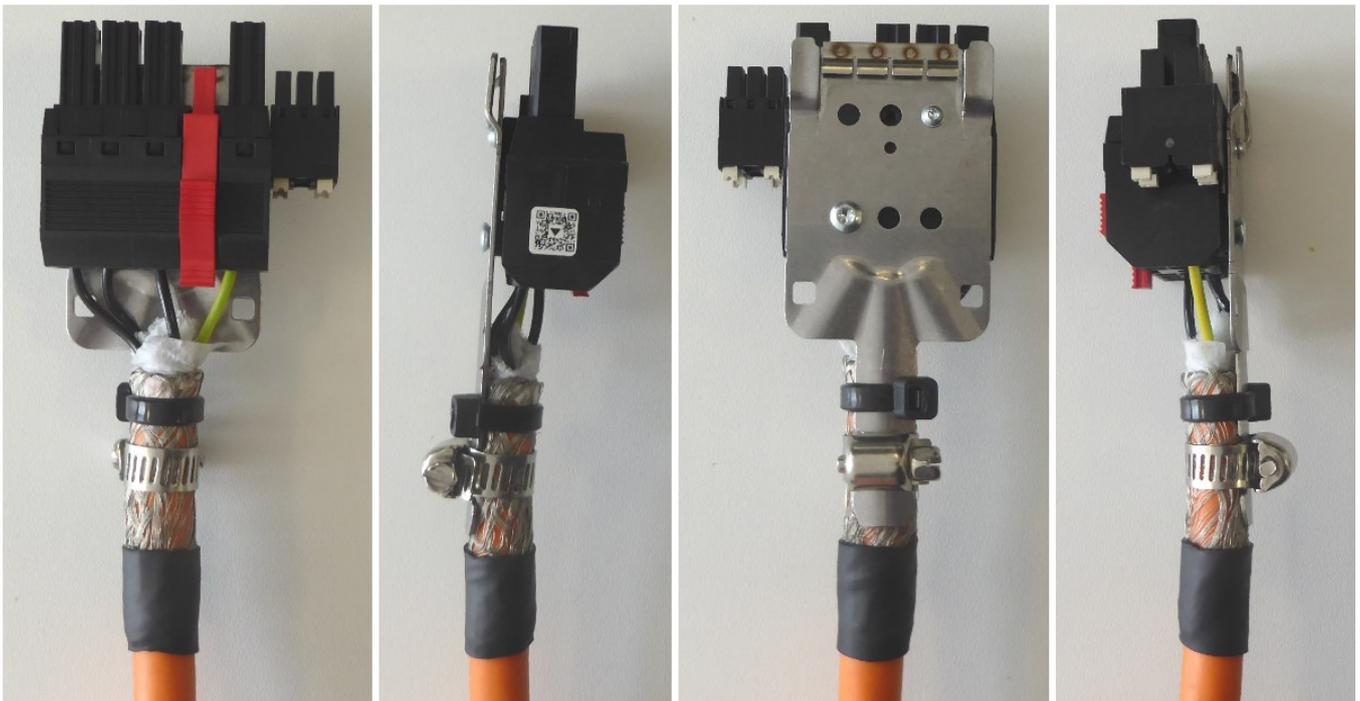


Figure 6: Motor cable shield attachment TSD350 and TSP700

**Advice** Keep the unshielded wires as short as possible and avoid loops.

**Advice** The connection of the shield to the sheet metal should be as electrically conductive as possible.

### 3.3 TSP700

Refer to [5] for details on connectors and grounding points of the TSP700 device series.

Figure 7 shows schematically how a setup including TSP700 drives should be grounded.

Refer to chapter TSD350, Motor Connector, for the recommendations on motor connector commissioning.

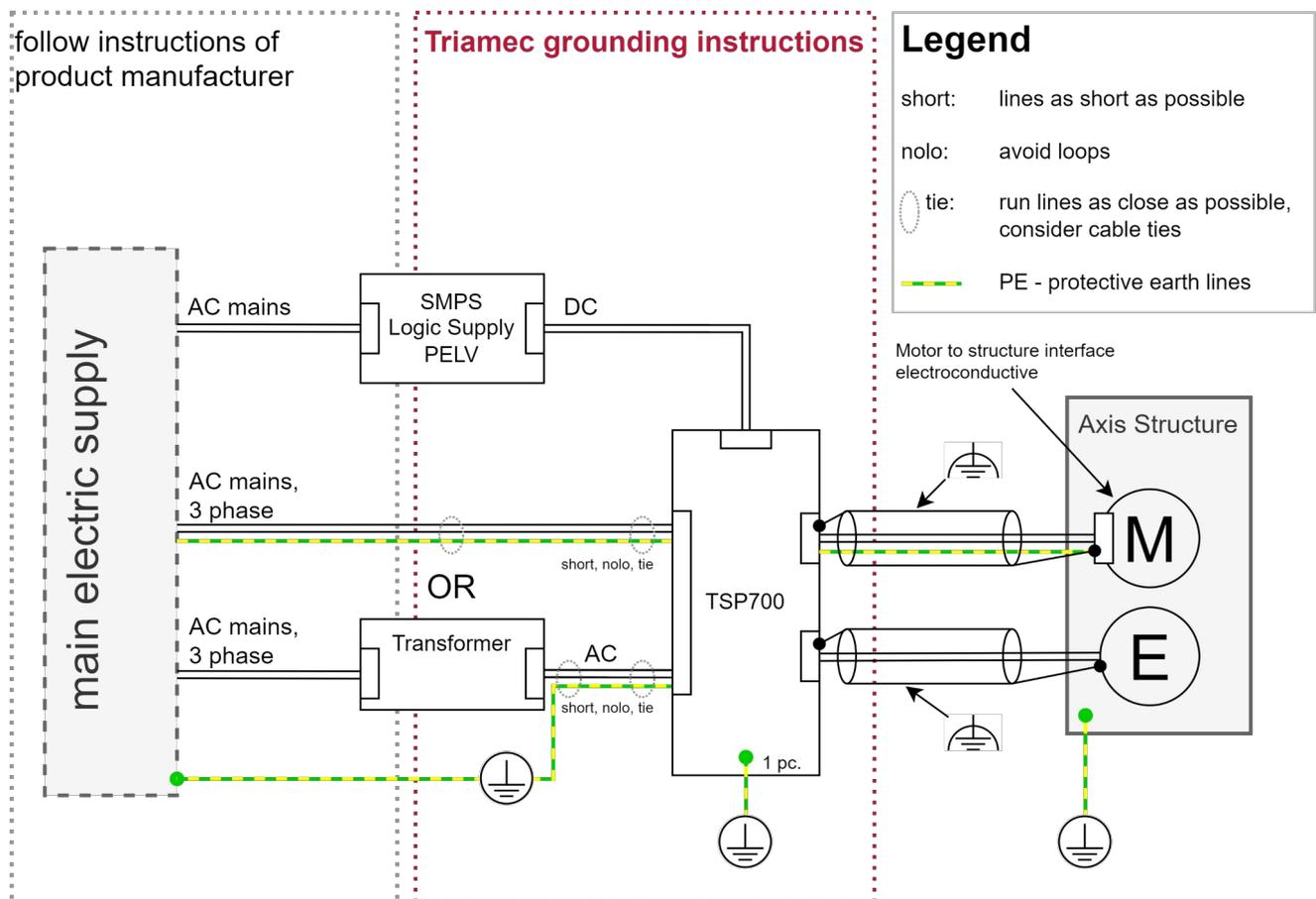


Figure 7: TSP700 grounding instructions diagram

## 4 Third Party Products

The following products are tested and recommended for setups with Triamec Motion AG products involved. Follow the instructions of the product manufacturer on grounding, wiring and general setup.

### 4.1 SMPS

Type	Mfg.	Output DC [V]	Output continuous [A]	In Series	Mounting	Input
<b>QS40.481</b>	PULS GmbH	48 to 54	20	Yes	DIN rail	Single phase
<b>QS20.481</b>	PULS GmbH	48 to 54	10	Yes	DIN rail	Single phase
<b>QS40.361</b>	PULS GmbH	36 to 42	26.7	Yes	DIN rail	Single phase
<b>QS20.361</b>	PULS GmbH	36 to 42	13.3	Yes	DIN rail	Single phase

#### Examples:

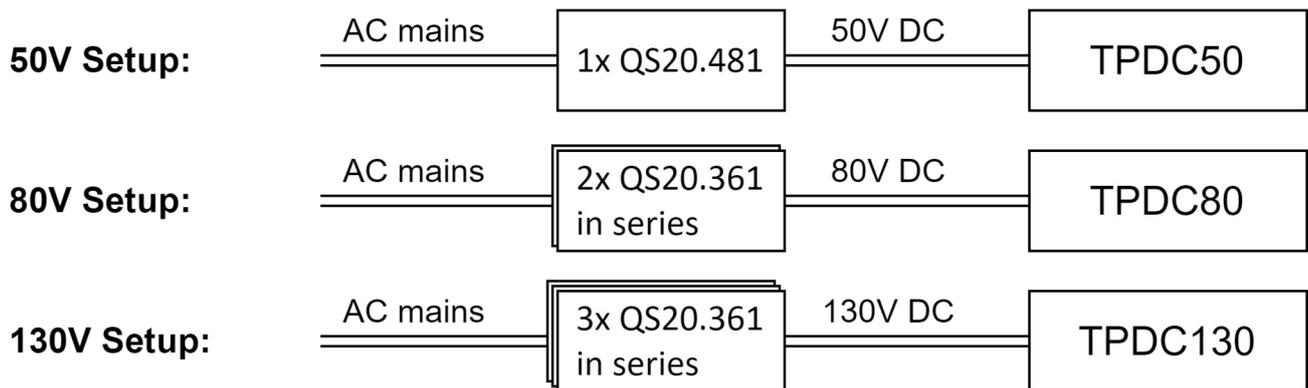


Figure 8: Example configurations with SMPS in series

## Glossary

<b>EMC</b>	Electromagnetic Compatibility
<b>SMPS</b>	Switching Mode Power Supply
<b>PELV</b>	Protected Extra Low Voltage (max. 50V AC or 120V DC)
<b>SELV</b>	Separated Extra Low Voltage (max. 50V AC or 120V DC)
<b>TP / TPDC</b>	Triamec Power Supply

## References

- [1] “Hardware Manual, TP50 / TP80 / TP130 / TP350 Revision E”,  
HWTP50-TP350\_E\_HardwareManual\_EP010.pdf, Triamec Motion AG, 2023
- [2] “Hardware Manual, TPDC50 / TPDC80 / TPDC130 Revision 0”,  
HWTPDC50-TPDC130\_HardwareManual\_EP001.pdf, Triamec Motion AG, 2023
- [3] “Hardware Manual, TSD80-06, TSD80-10, TSD80-15, TSD130-10, Revisions 4 and 5”,  
HWTSD80-TSD130\_4-5\_HardwareManual\_EP010.pdf, Triamec Motion AG, 2023
- [4] “Hardware Manual, TSD350-10, TSD350-15, Revisions 0 and 1”,  
HWTSD350\_0-1\_HardwareManual\_EP008.pdf, Triamec Motion AG, 2023
- [5] “Hardware Manual, TSP700-10, TSP700-20, TSP700-40, Revisions 0 to 2”,  
HWTSP700\_0-2\_HardwareManual\_EP002.pdf, Triamec Motion AG, 2023

## Revision History

Version	Date	Editor	Comment
001	2022-07-04	sm	Document creation
002	2022-07-06	sm	Remove 3 <sup>rd</sup> party devices without OVC III approval.
003	2023-04-21	sm	Add TPDC, update references, add SMPS config examples, change owner

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