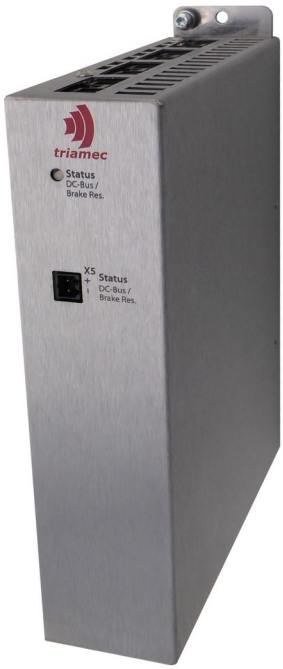
Hardware Manual

TPDC50 / TPDC80 / TPDC130 Revision 0



Keep all manuals belonging to this product during its life span. Pass all manuals to future owners and users of this product. This English version is the original version of the product manual.

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1 Safety Information

The user must have read and understood this documentation before carrying out any operation on Triamec Motion AG hardware. Please contact Triamec Motion AG in case of missing information or doubt regarding the installation procedures, safety or any other issue.

Caution Triamec Motion AG disclaims all responsibility to possible industrial accidents and material damages if the procedures & safety instructions described in this manual are not followed.

- Never use the device for purposes other than those described in this manual.
- The device must be installed by trained personnel only and in accordance with applicable regulations of the respective country concerning both safety and EMC aspects.
- Troubleshooting and servicing are permitted only by Triamec Motion AG technicians.
- The safety symbols placed on the device or written in this manual must be respected.
- If this device is integrated into a machine, the manufacturer of this machine must ensure that it fulfills the 2004/108EC directive on EMC before operating the system.

Danger To avoid electric arcing and hazards to personnel and electrical contacts, never connect/disconnect the device while the power source is on.

Danger Power cables can carry a high voltage, even when the motor is not in motion. Disconnect the hardware from all voltage sources before it is disassembled for servicing.

After shutting off the power and removing the power source from the equipment, wait at least 10 minutes before touching or disconnecting parts of the equipment that are normally loaded with electrical charges (such as capacitors or contacts). Measuring the electrical contact points with a meter before touching the equipment is recommended.

Caution The device contains hot surfaces and electrically-charged components during operation.

Caution The maximum DC power supply connected to this hardware must comply with the parameters outlined in this guide.

Caution Read the paragraph Overvoltage on possible mechanical damage that may occur if an external brake resistor is missing or improperly dimensioned.

2 Product Description

The TPDC50, TPDC80 and TPDC130 devices complement the TSD80 and TSD130 drive series.

TPDC devices contain:

- A large capacitance to recuperate motion energy
- An internal brake resistor or an optional connector for an external brake resistor to limit the DC-Bus voltage
- DC-Bus output connectors for up to four drives
- Status output and Status LED

The devices also include the following protective functions:

- Energy dissipation by internal or external brake resistor
- Short circuit protection of brake resistor (internal and external)
- Input overvoltage protection on power up. The device will actively limit the DC-bus voltage using the brake resistor. Restrictions of this protection: The maximal limiting current is limited by the braking resistor and maximal time of the thermal model of the braking resistor.
- Over temperature of the device

Caution TPDC devices have no voltage transformation built-in, nor rectifier functionality! Refer to Chapter 3.2 for the allowed input voltage range. An SMPS is needed in between main supply and TPDC in any case.

Advice The SMPS recommended by Triamec Motion AG for powering the TPDC are listed in [1].

2.1 Internal or external brake

All TPDC power supplies can be ordered with an internal brake resistor (standard) or a connector for an external brake resistor (order code BRK).

2.2 Tight Limits

All TPDC power supplies can be ordered with standard brake voltage (default). Contact Triamec Motion AG if the brake voltage with tighter limits is necessary.

2.3 Block Diagram

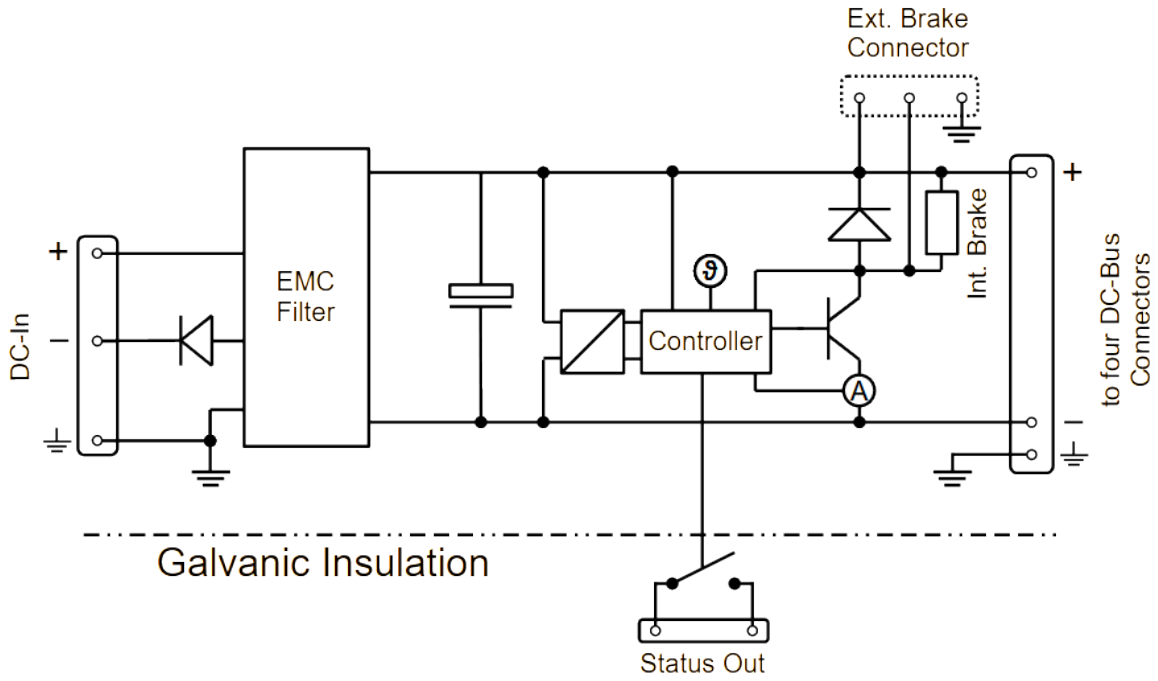

Figure 1: Block Diagram

3 Technical Specifications

3.1 Environmental Conditions

3.1.1 Transport and storage conditions

During the transport and the storage, the device must remain inside their original packaging which complies with the ESD standard.

- The transport conditions must respect the class 2K3 of the IEC 60721-3-2 standard (temperature between -25°C (-13°F) and +70°C (+158+C), and humidity <95% without condensation) and
- the storage conditions must respect the class 1K2 of the IEC 60721-3-1 standard (temperature between +5°C (+41°F) and +45°C (+113°F), and humidity between 5 and 85% without condensation). If either storing for more than two years or at temperatures higher than 35°C, observe the reforming procedure as shown under „Capacitor reforming“.

3.1.2 General Operating conditions

The device has the following electrical safety degree: IP 20 (according to EN 60529 standard).

The power supplies are designed to operate in a non-aggressive and clean environment, with a (non-condensing) humidity ranging between 5% and 85%, an altitude < 2000m (6562 ft), and a temperature ranging between +5°C (50°F) and +40°C (104°F).

The electronics must be in an enclosure respecting a pollution degree of 2 (refer to UL 508C and EN 61800-5-1 standards for more information). They are not designed or intended for use in the on-line control of air traffic, aircraft navigation and communications, explosive atmosphere, as well as critical components in life support systems or in the design, construction, operation and maintenance of any nuclear facility.

3.2 Electrical Specifications

All the specifications are given for an ambient temperature ranging from +10°C (50°F) to +40°C (104°F).

		TPDC 50	TPDC 80	TPDC 130	
DC-Line input	**Input voltage DC**	40...50 ±10%	64...80 ±10%	100...122 ±10%	VDC
	Input current	30 A max. requires limiting DC Supply with shutdown or hiccup-mode in case of short circuit			
DC-Bus output	**Voltage**	40...50 ±10%	64...80 ±10%	100...122 ±10%	VDC
	Current	continuous max. 30A peak: 40A for 4s			A
Capacitance	**DC-bus capacitance**	2.0 ±20%			mF
Braking voltage	**Standard Tolerance**	57 ±2%	90 ±2%	137.5 ±2%	V
	Tight Tolerance [1]	58 ±0.2%	93 ±0.2%	142 ±0.2%	V
Internal brake resistor	**Adiabatic dissipation energy E_A** **Continuous power P_C**	5000 50 (requires cooling)			J W
	Resistance	6			Ohm
Ext. brake resistor [2]	**Min resistance**	2.5	4	6	Ohm
Status out	**Isolated Switch**	24V on/off, 30mA			

Caution Before running an Insulation test or voltage test on a machine, disconnect all connectors from Triamec drives.

3.3 EN 61800-5-1

The TPDC devices conform to EN 61800-5-1 (2008), overvoltage category II. Depending on application the isolated AC/DC converter has to be conform to overvoltage category III. Safe electrical separation according to EN 61800 is guaranteed between the power circuit and Status Out and Earth.

1 Contact Triamec Motion AG if the brake voltage with tighter limits is necessary.
2 If an external brake resistor is used, it has the same brake-point U_{Brake} as if the internal brake resistor is used.

3.4 EN 61800-3

The interference suppression filter in this device complies to EN 61800-3 C2 under the following conditions.

- Guidelines for proper grounding and shielding of the TPDC and the respective drive hardware must be applied, see [1].
- Restrictions regarding EMC, stated in the drive hardware manual, are mandatory.

3.5 Overvoltage

A system of a motor coupled with a load has a certain amount of energy. This energy is mainly kinetic when the load is moving or rotating. While stopping these loads, the energy must either be stored or dissipated. The same applies during moves where gravitational energy or spring energy is involved.

The drives recuperate this energy back to the TPDC and the bridge voltage rises.

3.5.1 Internal Brake Capability

The following measures are provided device internally to store and dissipate energy. The internal capacitors can store a certain amount of energy

$$E_C = 0.5 * C * (U^2 - U_{dcSupply}^2)$$

Since the maximum voltage is given, the energy stored is defined by the rectified supply voltage $U_{dcSupply}$. See technical electrical specification sheet.

Above U_{Brake}, the brake (internal or external) will be activated to dissipate energy. The internal resistor can dissipate a short term energy E_A but only a small continuous power P_C. If high mechanical energy is involved the internal brake resistor might reach its thermal limit. It will turn off and the DC-bus voltage might increase further until the drives turn off. Then the axis does not stop and might cause mechanical damage.

This failure is avoided by using an external brake resistor or reducing the deceleration of the drives. Slower stopping reduces the load on the brake resistor.

3.5.2 External Brake Resistor

The optional external brake resistor must be dimensioned properly to account for the amount of energy to be dissipated in the axis system.

It is recommended to use a resistor that is protected against over-temperature. Contact brake resistor manufacturer for dimensioning.

3.5.3 Overvoltage Protection

If the external braking resistor is not dimensioned correctly, the DC-Bus voltage may exceed the maximum DC voltage level. The TPDC indicates this by switching the Status output to 0V. If the voltage further increases and reaches the internal limit of the drives, they will protect themselves by turning off their semiconductor switches. The axis is not decelerated anymore and the voltage will not increase any

further. However, turning off the drives during fast motion leaves the axis at the original speed. The axis might crash into its end-limits, which might cause significant damage to the mechanical system.

Therefore it is important to choose a well dimensioned braking resistor. Also, the Status output signal and the overvoltage error message of the drives may be used by the control system for damage prevention.

3.6 LED Diagnostics and Status

There is a green and a red LED for diagnostics. The green LED indicates the DC-Bus voltage. Steady on means the voltage is in its normal range. Flashing short means the voltage is too low and flashing long means the voltage is too high. The red LED indicates any caution or error.

	Green LED	Red LED	Status
No line power	off	off	open
Charging DC-Bus	flashing short	off	open
Ready	on	off	closed
Line disturbance check (20ms)	on	on	closed
Line disturbance (1s)	on	on	open
Discharging DC-Bus	flashing short	off	open
Brake active	[according to device state]	on	closed
Overvoltage or Diode Fault	flashing long	on	open
Brake open	[according to device state]	flashing 1 times then pause	open
Brake short [3]	[according to device state]	flashing 2 times then pause	open
Over-temperature	[according to device state]	flashing 3 times then pause	open
Internal error	[according to device state]	flashing 4 times then pause	open

Flashing short: On for 0.2s / Off for 0.2s
Flashing long: On for 0.8s / Off for 0.8s

3 cleared after restarting the device

Mounting and Wiring

4 Mounting and Wiring

The device should be protected against any splashes of liquid and any contacts with smoke and dust. It must be installed inside a closed cabinet and mounted as mentioned below.

4.1 Mechanical Specifications

Weight: 1.2kg

Dimensions:

Width	48.6 mm
Height	230 mm
Depth	166.5 mm

Recommended distance for the mounting screws is 220mm.

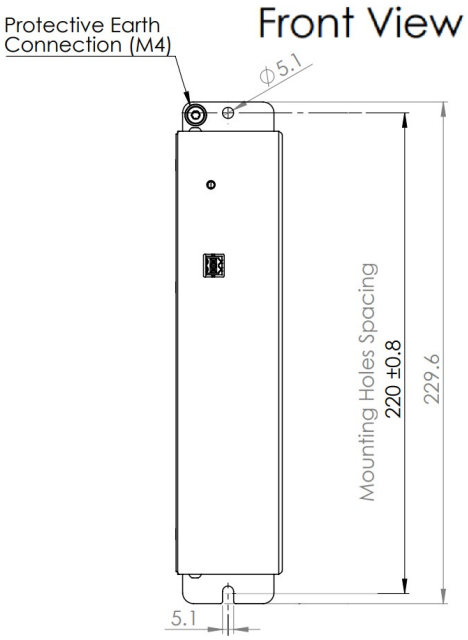

Figure 2: TPDC mounting dimensions

4.2 Cooling

The maximum allowable ambient temperature is 40°C. Keep the required space of 50mm clear above and below the TPDC and do not cover air inlets and outlets with cables. Laterally gap to other device should be at least 10mm.

4.3 Brake resistor

Use only resistors with thermal shutdown protection. The use of an undersized power and energy with-stand capability resistor might cause damage to the system. See section 3.5 for dimensioning.

Caution The cables connected to the external brake resistor must be shielded.

4.4 Capacitor reforming

Caution If the device has been stored without power for more than two years after shipment or after last time use, the internal capacitors require reforming. The same applies if storing above 35°C for more than one month without power.

Reforming instructions:

Add a resistor 470 Ohm/5W into each of the DC power wires ore one 1000 Ohm/10W on DC+ power wire. Apply power for half an hour without enabling the drives. Then shut down and disconnect the device for 4 hours, remove the resistors and the TPDC is ready to use [4].

4.5 Wiring and Connectors

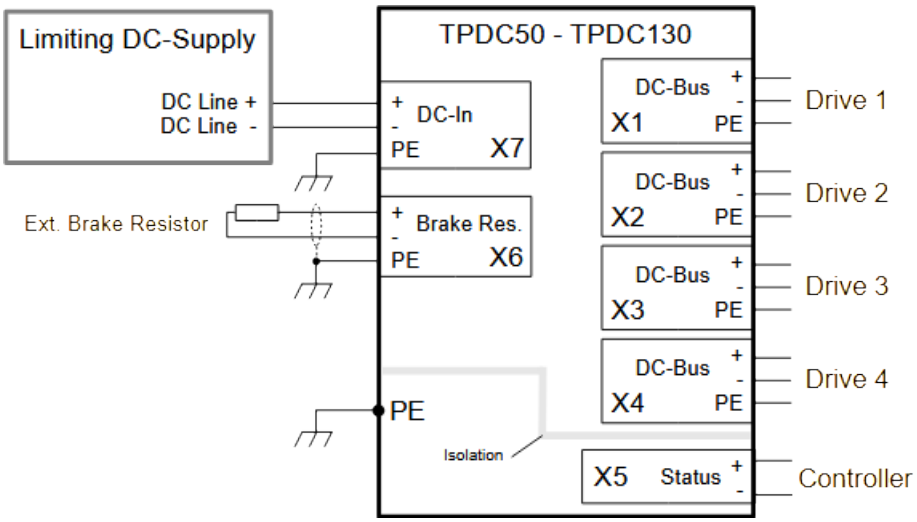

Figure 3: TPDC connections

	Dir.	Name	Mating Connector Type	Conductor Size
X1-X4	out	DC-Bus	Weidmüller BVF 7.62HP/03/180MF2 SN BK BX Order-No.: 1060570000 3 pins, 7.62mm ptich	1.5mm^2 min, 4mm^2 typ
X5	out	Status Out	Weidmüller BL 3.50/02/180 SN BK BX Order-No: 1615670000 2 pins, 3.5mm pitch	0.5mm^2 typ, 1.5mm^2 max
X6	out	External brake res.	Weidmüller, SLF 7.62HP/03/180G SN BK BX Order-No.: 1043600000, 3 pins 7.62mm pitch	1.5mm^2 min, 2.5mm^2 typ
X7	in	DC-Line in	Weidmüller BVF 7.62HP/03/180MF2 SN BK BX Order-No.: 1060570000 3 pins, 7.62mm ptich	1.5mm^2 min, 4mm^2 typ
PE		Protective Earth	M4 (top left corner of the housing)	Same or larger than DC-Line

4 See JIS C 5101-4 clause 4.1 for details.

To ensure personal safety and EMC requirements, the following measures must be taken:

- There must be two connections to earth. Each must have at least the same conductor cross section as the DC-Line wires.

Danger Must! Always connect first the protective earth (PE) to the dedicated screw in the housing!

5 Appendix

5.1 Warranty Information

The products covered in this manual are warranted to be free of defects in material and workmanship and conform to the specifications stated either within this document or in the product catalog description. All *Triamec Motion AG* products are warranted for a period of 12 months from the time of installation, or 18 months from time of shipment, whichever comes first. No other warranties, expressed or implied – and including a warranty of merchantability and fitness for a particular purpose – extend beyond this warranty.

5.2 Service

We are committed to quality customer service. In order to serve in the most effective way, please contact the Customer Support at *Triamec Motion AG*.

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References

The documents referenced in this manual.

[1] “Grounding Instructions”, AN144_GroundingInstructions_EP003.pdf, Triamec Motion AG, 2023

Revision History

Version	Date	Editor	Comment
001	2023-04-21	sm, re, ab	First Release
002	2024-01-04	ab	Changed connector designation to Mating Connector Type, added weight

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