

# FAQ – Frequently Asked Questions



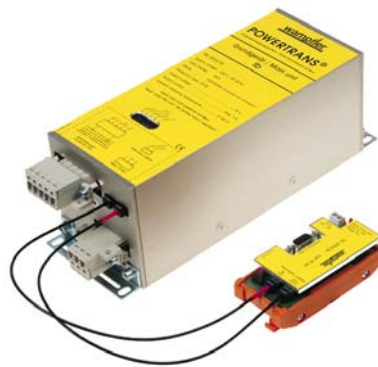
## Powertrans® 1a and 1b

FAQ0512-0001-E

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This document will be updated permanently. The actual version is provided at [www.wampfler.com](http://www.wampfler.com)

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## Powertrans<sup>®</sup> 1a and 1b

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### 1 Where is Powertrans<sup>®</sup>I used?

It's used for transmission of field bus data over

- Conductor bar
- Slip ring body
- Wire

### 2 Why is Powertrans<sup>®</sup>I used?

- Very high signal to noise ratio  
By increasing of the signal level of  $\pm 5$  V to  $\pm 70$  V there is a high noise immunity
- No shielding necessary  
Due to the high signal to noise ratio is no shielding necessary.
- Minimisation of contact problems  
Due to the high signal voltage and current the contaminations at the contact area will be disposed and so the signal transfer under tough conditions is warranted.

### 3 How does Powertrans<sup>®</sup>I operate?

- Powertrans<sup>®</sup>I increases the signal level of  $\pm 5$  V to  $\pm 70$  V (potential free) and reduces it at the output to the particular interface level.
- Powertrans<sup>®</sup>I works at the physical level, has no affect on the bus protocol and changes no telegrams

### 4 Which data rates are possible?

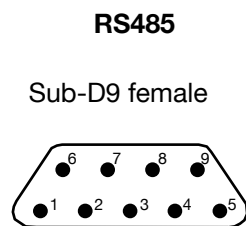
- Depending on the configuration, data rates from 9,6 kBit/s to 1,5 MBit/s are possible.  
(No modification of the device required, see item 21, page 10).
- For data transmission over conductor bar we advise a data rate of 187,5 kBit/s, but depending on several attributes of the installation, data rates up to 500 kBit/s are possible.  
For slirings data rates up to 1,5 MBit/s are possible.
- In general: the lower the data rate, the lower is the error rate! For the most installations a data rate of 187,5 kBit/s is sufficient.  
The bus cycle time should be the half of the program cycle time. The bus cycle time can be calculated or measured with a bus tester or protocol analyser.

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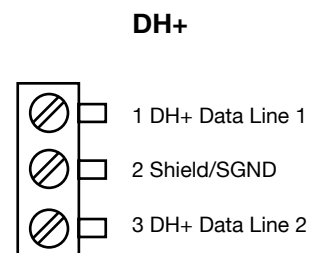
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### 5 Plug arrangement at the interface module?



PIN	RS 485
1	-
2	-
3	Rxd/Txd-P
4	-
5	SGND
6	+U
7	-
8	Rxd/Txd-N
9	-



PIN	DH+
1	Data Line 1
2	SGND
3	Data Line 2

### 6 Which bus cable should be used for the connection of Powertrans<sup>®</sup>I?

- To connect the bus system the same cable as the remaining bus cable should be used to avoid reflections.

### 7 What are reflections?

- A reflection causes the same signal twice at the receiver with a little time delay. Reflections result from changes of the impedance of the wire, esp. at an intersection of different wires or at the end of a not terminated wire (changeover of impedance  $Z_w \sim 150 \Omega$  to infinite).
- To avoid reflections at the end of a wire, the use of termination resistors is needed.

### 8 Is Powertrans<sup>®</sup>I adapted for multi-master-systems?

- Powertrans<sup>®</sup>I can be used for pure Master-Slave-Systems as well as for multi-master-systems.

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### 9 What is possible with Powertrans® I to transmit?

Powertrans® I only works at the physical layer. The bus telegram will not be changed, Powertrans® I is not an active bus user.

From the interface module's perspective, Powertrans® I is comparable to a Repeater or a Hub. At the conductor bar (high voltage) Powertrans® I works with its own physical layer

- **RS485**  
All RS-485 based bus systems can be transmitted, e.g. Profibus DP, Profibus-FMS, DH485.
- **DH+**  
The transmission of DH+ protocol is approved by Allen-Bradley's licence. In spite of the same physical layer (technically possible) the transmission of DH+ in association with the RIO-protocol of Allen-Bradley is not allowed.
- **RS232**  
RS232 connections can be transmitted by use of an interface converter (available from Wampfler).

### 10 What is not possible with Powertrans® I to transmit?

- **RS422 e.g. Interbus-S (DIN 19258)**  
RS422 (full duplex)-transmission is possible with the main unit, but there is no interface module available yet. For full duplex connections there are 4 conductor bars or wires necessary.
- **Profibus-PA (IEC-1158-2)**  
Profibus-PA is based on IEC-1158-2 transfer system and can not be transmitted. But it's possible to realise the transmission with Profibus-DP (RS485) by using segment couplers or links. Powertrans® I must be installed outside the explosive atmosphere.
- **ASI (EN 50295)**  
The transmission can be realised with Profibus-DP (RS485) by using gateways.
- **CAN (ISO11898 und ISO 11519), DeviceNet, ControlNet**  
Transmission of CAN bus is not possible.
- **Ethernet (IEEE8802.3)**  
There are gateways Ethernet ↔ RS485. Ethernet has data rates of 10 MBit/s, 100 MBit/s or 1 GBit/s, Powertrans® I is able to transmit data with maximal 1,5 MBit/s, this has to be considered in the planning.

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### 11 What is to be considered for the MPI protocol?

For the transmission of MPI data signals, the system operates with only one segment. Changeover of segments or crossing of section points can't be realised due to technical limitations. Also see item 25 „segments“.

### 12 How many field bus units can be connected to one Powertrans® I unit?

Every Powertrans® I interface module generates a new field bus segment. How many field bus units can be connected to one segment, has to be found out from the field bus standard.

In one Profibus segment, for example, it is possible to connect 32 units. If there are more units to be connected, it is necessary to use repeaters to create new segments.

### 13 Is Powertrans® I certified for Profibus?

It is only possible to certificate active Profibus units. Powertrans® I is no active unit, so it can't be certified. The interface is electrically the same as Profibus units (RS485 standard), but with no change to the protocol.

### 14 Must Powertrans® I be considered within the bus design?

- At the electrical design Powertrans® I has to be considered. Powertrans® I cuts the bus in several segments, every segment has to be terminated at the electrical beginning and end. The termination at the bus side is done in general with bus connectors which have switchable termination resistors. At the high voltage side it is necessary to use termination resistors as specified in the catalog.
- No changes are needed to the parameters, but it is recommended to increase the “retry” parameter. We suggest to allow 7 retries before the bus stops. For Profibus this parameter is labelled „Retry-limit“.

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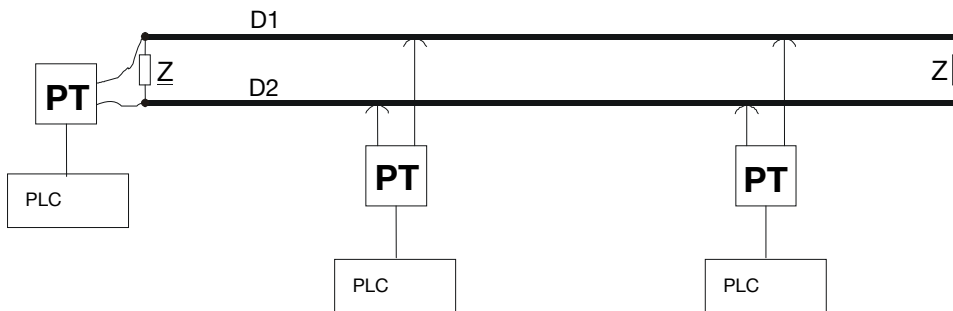
## Powertrans<sup>®</sup> 1a and 1b

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### 15 Which installation topologies can be realised?

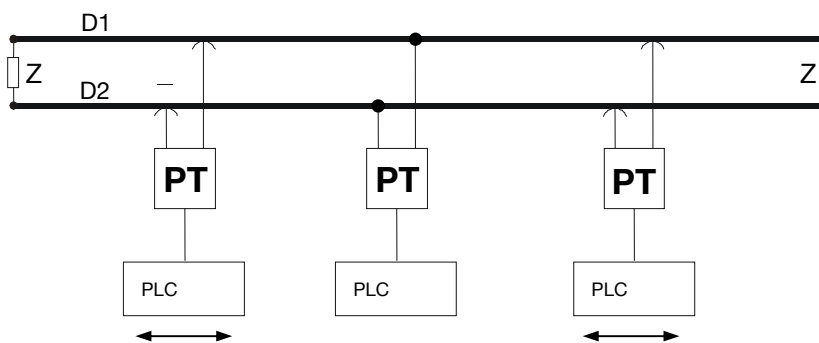
- **Straight lines**

Beginning and end of the straight line have to be terminated.



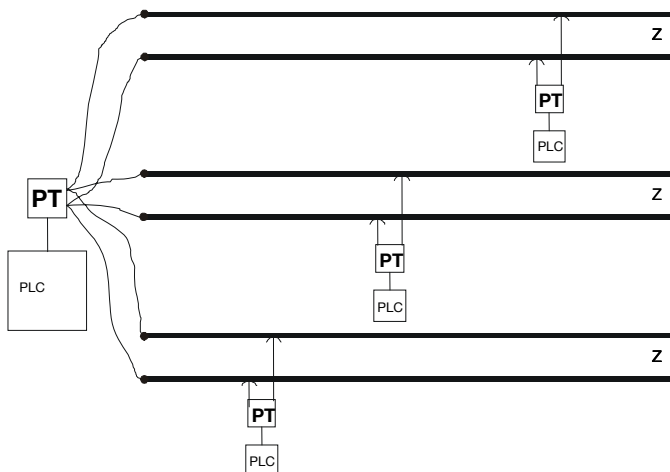
- **Straight lines with center feed**

Beginning and end of the straight line have to be terminated.



- **Many lanes**

Every end of lane has to be terminated.



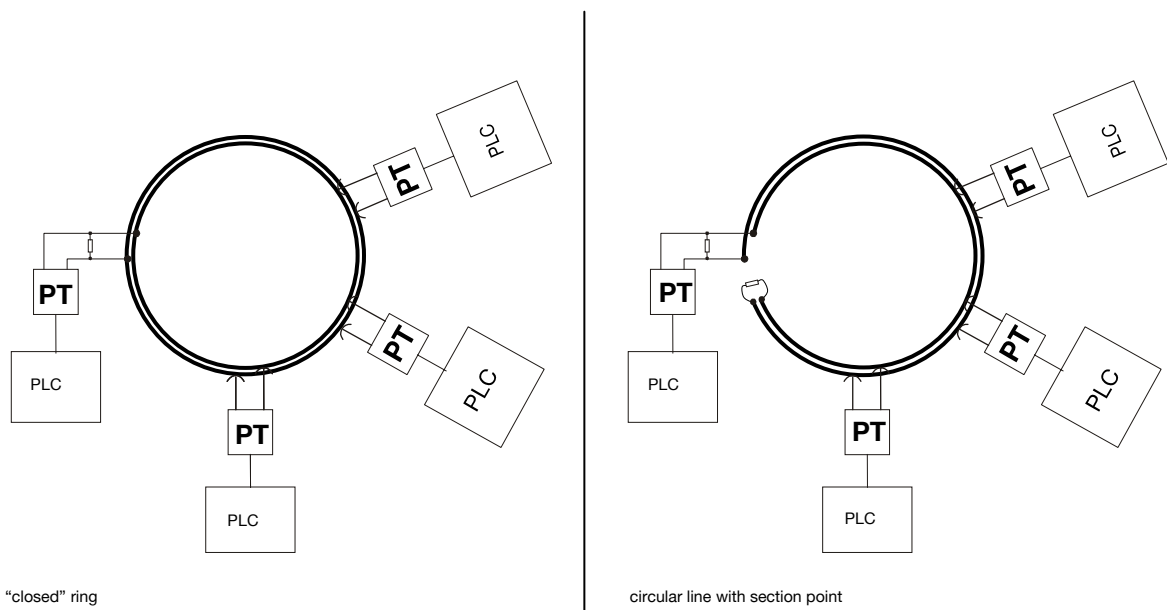
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- **Circular lines**

Circular, resp. closed lines, should be avoided, because multipath propagation leads to fading and therefore to interruptions. Multipath propagation is mainly critical in large installations. If possible, section points have to be inserted to make the line electrically “straight” (also see item 27, page 12).



### 16 Which material should be used for conductor bar and collector shoes?

For common applications copper busbars are used with copper-graphite collector-shoes.  
In aggressive ambient conditions (for example chemicals industry) the use of datametal busbar is recommendable.  
In dusty conditions (for example brickyard or concrete plant) a regular maintenance and cleaning is necessary.

### 17 How long does Powertrans® I need for initialisation?

After switch-on the power, Powertrans® I is ready within 5 ms.



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### 18 How long may the feed cable to the conductor bar or to the collector shoe be?

- The feed cable to the conductor bar should be shorter than 20 m, but for end feeding a straight line it can be much longer. In this case the termination resistor must not be at the beginning of the conductor bar, but directly at the (stationary) Powertrans unit.
- To avoid reflections, the connecting cable to the collector shoe should be as short as possible. In the following table the permitted length of the feed cable are specified (Sum of all feed cables!).

Data rate	500 kBit/s	187,5 kBit/s	93,75 kBit/s	19,2 kBit/s	9,6 kBit/s
Permitted length sum of all feed cable	20 m	40 m	80 m	240 m	480 m

### 19 How to increase the reliability of the system?

- Increase the bus parameter „retry-limit“, so that the PLC doesn't stop at every telegram corruption caused by EMC.
- The PLC can be configured to restart itself after a bus error.
- The transmission network can be arranged redundant, e.g. with redundant couplers.

In designing an installation it must be considered whether there will be safety risks due to the interruption of communication or due to the self-restarting of the installation.

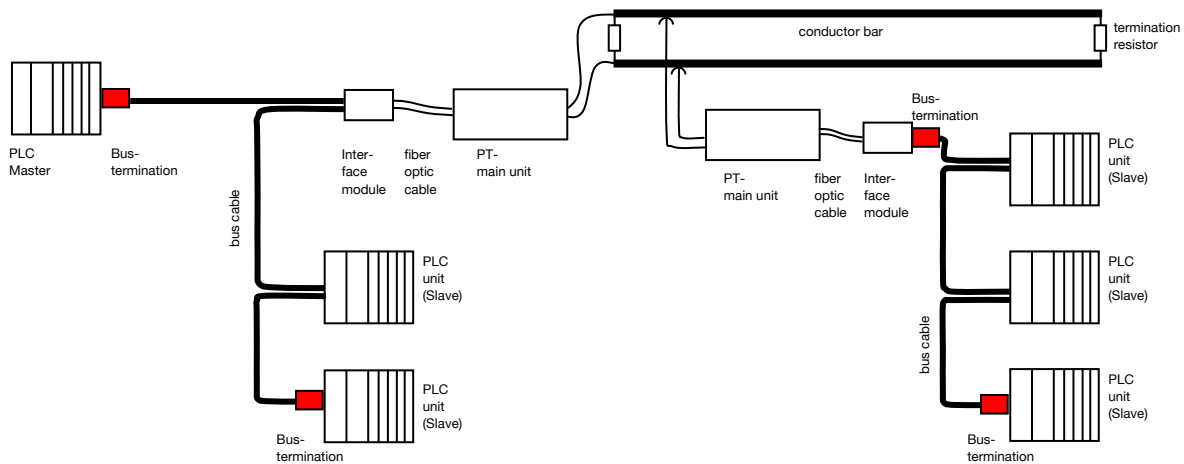
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### 20 What could be the cause if the bus system does not start?

- Missing supply voltage (green Power-LED must illuminate in all main units and interface modules).
- Wiring error → see LED-indication item. 37, page 17.
- Missing termination in the bus segment. For RS485 every bus segment must have an active bus termination at the beginning and end (see drawing). The supply voltage for the termination resistor is given by the interface module. It is recommended to use special bus connectors with switchable termination resistors.



### 21 Is a parameterisation of Powertrans<sup>®</sup>I necessary?

- **Powertrans<sup>®</sup>1a:** It is necessary to adjust the data rate and the mode full duplex or half duplex with jumpers (see Installation instructions MV0512-0001 Powertrans<sup>®</sup>1a).
- **Powertrans<sup>®</sup>1b:** No adjustments are needed.

### 22 Things to consider at start-up of the bus system

No, as soon as Powertrans<sup>®</sup>I is ready (after 5 ms), it sends and receives data. No start-up sequence has to be considered. The initialisation of the bus occurs like a bus without Powertrans<sup>®</sup>I.

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### 23 What to consider when using interface converters, links or gateways?

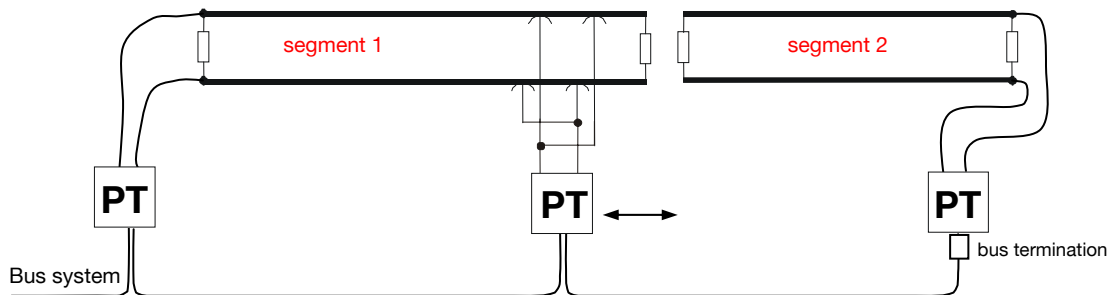
- The use of RS485 side termination resistors are imperative. The circuit is given in the catalog (KAT0512-0001) at the bottom of page 3.
- The data rate over the Powertrans-route could be different to those in the original bus system. Look for the specific data rate in the data sheet of the interface converter, link or gateway.

### 24 At what temperatures can the devices operate?

- Under operation the main unit could be 15°C above the ambient temperature. The maximum permissible ambient temperature is 50°C.
- For the interface unit an operating temperature of 60-70°C is usual.

### 25 What does a “Powertrans segment” mean?

A maximum of 15 mobile units can operate together with one stationary device. For more than 15 units a segmentation of the installation is necessary (see drawing).



### 26 How many Powertrans® I units can operate on one segment?

A maximum of 15 Powertrans units may operate on one segment. For more units, a segmentation is necessary (see above).

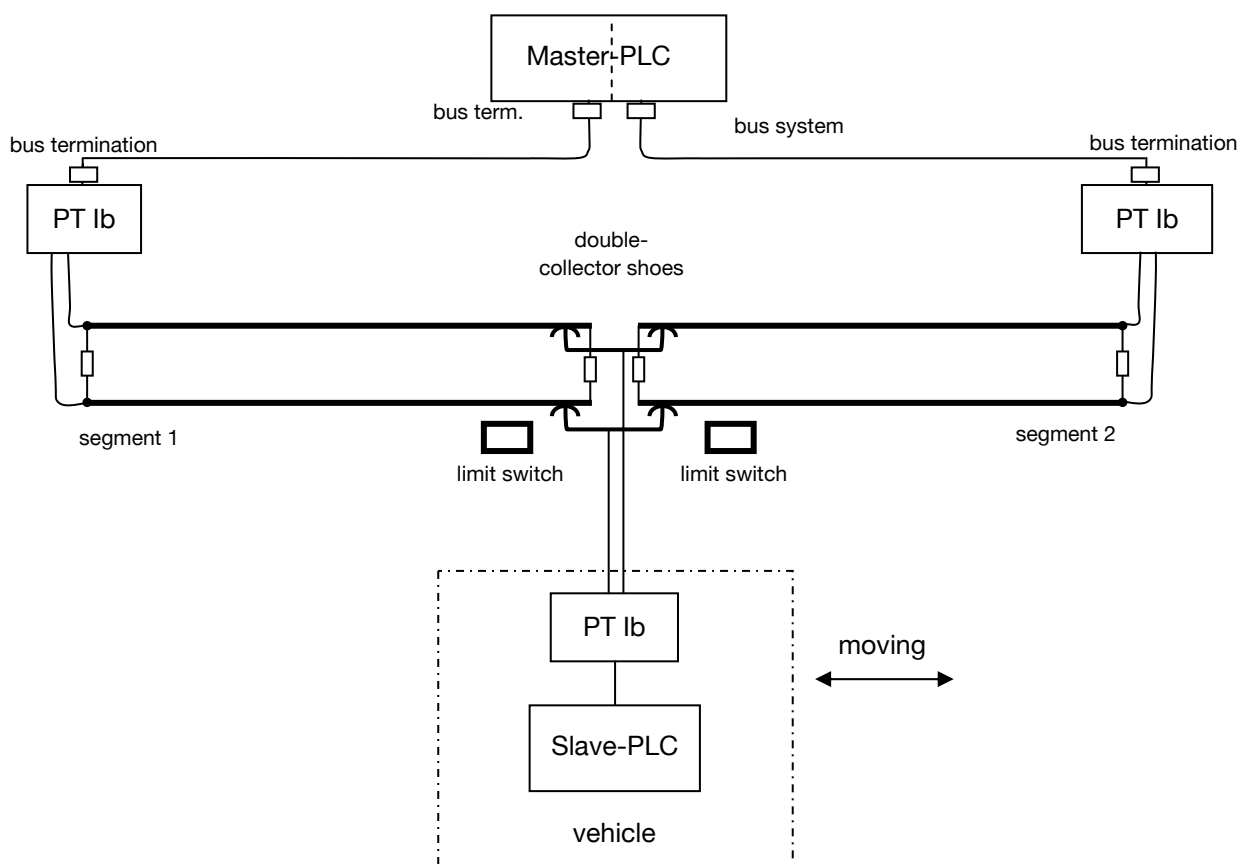
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### 27 How to realise a crossing from one segment to the next ?

- Log-off the unit before leaving the segment.
- Self-controlled crossing of the section point without connecting the two segments.
- After achievement at the new segment log-on at the bus (see drawing). This will need to be considered in the PLC program.



A crossing is also possible without logging off and on. But then it must be ensured that the time without bus connection is so short that the bus doesn't stop. Or if the application is not time-critical, that the bus stops and afterwards starts again by itself.

**The electrical connection of the segments caused by the collector shoes is not allowed!**

In designing an installation it must be considered whether there will be safety risks due to the interruption of communication or due to the self-restarting of the installation.

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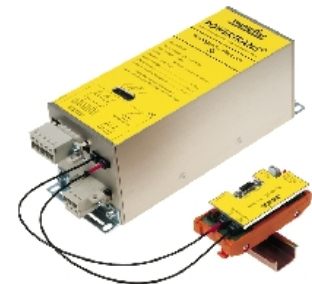
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### 28 What is to be considered in the change-over from Powertrans® 1a to Powertrans® 1b?

- For Powertrans® 1a units, RS485 bus termination resistors are integrated within the devices, but for Powertrans® 1b the bus termination resistors have to be externally mounted, in general with special bus connectors.
- The interface module needs an additional supply voltage of 24 V.
- An installation with Powertrans® 1a units can be extended with Powertrans® 1b units, that there is a mix of devices. The units are compatible in their function.



Powertrans® 1a



Powertrans® 1b  
with fiber optic and interface module

### 29 Are Powertrans® 1a und Powertrans® 1b units compatible?

Yes, the units are electrically compatible, Powertrans® 1b needs an additional supply voltage of 24 V.

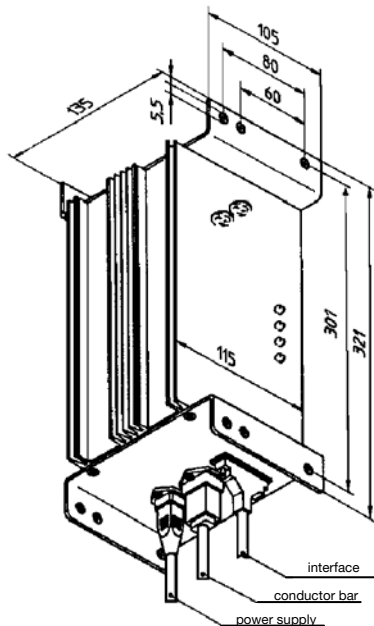
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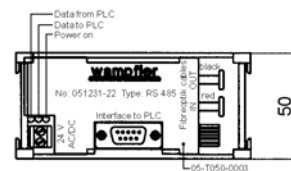
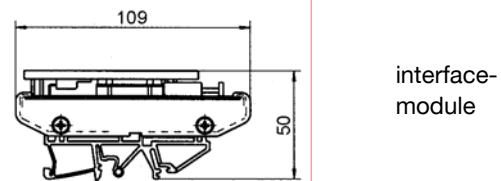
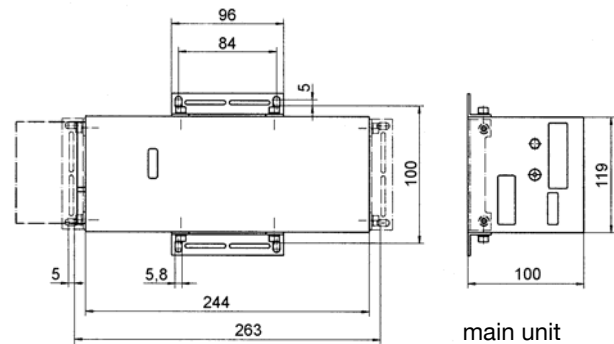
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### 30 Dimensions

Powertrans®1a



Powertrans®1b

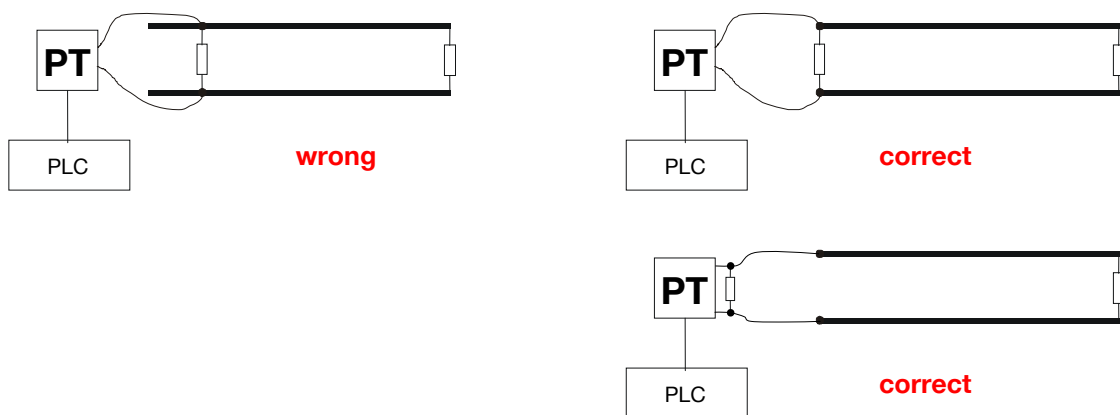


### 31 What must be considered when extending an old installation?

- Powertrans®1a units are not sold as new parts any more. But exchange units are available.
- Installations with Powertrans®1a can be extended by Powertrans®1b units.
- It should be noted, that the Powertrans®1b units have different dimensions and other connectors. An additional supply voltage of 24 V is necessary.
- For Powertrans®1b the bus termination resistors are externally connected, generally with special bus connectors.

### 32 Where do the termination resistors (at the high-voltage side) have to be connected?

- Powertrans® I separates the bus in several segments. At every electrical end of a bus segment a bus termination resistor has to be connected. See application examples (it. 15, page 7).



Suggestion:  
connect termination resistor  
directly at Powertrans® I unit

### 33 Which cable (between Powertrans® I and conductor bar) has to be used?

In general we do not prescribe the type of cable, but we recommend the use of shielded cable.

### 34 The installation was running a long time without problems, but now there are more and more problems?

- Aggressive ambient conditions, abrasion or dust could lead to contact problems at the collector shoes. Remedy: sandpaper the coals, clean the conductor bar, e.g. with cleaning coals.
- The collector shoes could be worn out. Remedy: exchange of the collector shoes.
- If the problems are always in the same area: check the fixing and connection of the conductor bar. Check the contact pressure of the collector shoes in this area.

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### 35 Can security relevant data (e.g. e-stop) be transmitted with Powertrans® I?

The system is not qualified to transmit security relevant data. Required precautions needs to be realised by the planner with suitable independent equipment.

### 36 What to do if the system stops working?

- Note the state of all LEDs and compare them with the table on page 17, and if possible, solve the problem.
- Switch on unit per unit and observe where/when the failure occurs.
- Swap Powertrans® I units pairwise and observe whether the failure remains or disappears.
- Bypass the conductor bar with a cable to localize the cause.
- Bypass Powertrans® I units with a bus cable to localize the cause.
- Plug-off all Powertrans® I units and measure the resistance of the installation (high voltage side). At the mobile unit it is possible to measure the resistance plus the transition resistance of the conductor bar. Reference value: 50...100 Ohms.
- If the error cannot be found, contact the appropriate person at Wampfler, or send an email to [powertrans@wampfler.com](mailto:powertrans@wampfler.com)
- See also 

catalogue	KAT0512-0001	Powertrans Ib
installation instructions	MV0512-0002	Powertrans Ib
installation instructions	MV0512-0001	Powertrans Ia

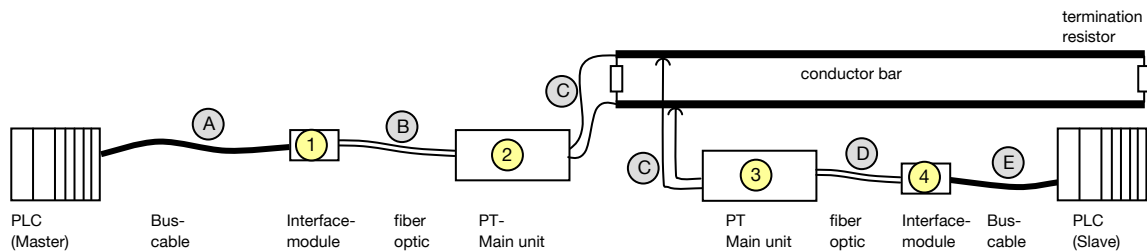


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### 37 What is the state of the LEDs on Powertrans® 1b?



Interface module ① Master-side	PT-Main unit Master-side ②	PT-Main unit Slave-side ③	Interface module ④ Slave-side	Cause
● ● ●	● ● ● ●	● ● ● ●	● ● ●	correct operation
● *	● ●	● ●	● *	bus cable master side (A) interrupted or fiber optic „IN“ Main unit Master (B) interrupted or fiber optic Main unit Master (B) reverse-poled
● *	● ● ● ●	● ● ● ●	● ● ●	fiber optic „OUT“ Main unit Master (B) interrupted
● *	● ● ● ●	● ●	● *	feed cable of conductor bar or conductor bar (C) interrupted
● *	● ● ● ●	● ● ●	● *	fiber optic „OUT“ Main unit Slave (D) interrupted or fiber optic Main unit Slave (D) reverse-poled
● *	● ● ● ●	● ● ●	● ● ●	feed cable cond.bar or cond.bar (C) reverse-poled or fiber optic „IN“ Main unit Slave (D) interrupted Bus cable Slave side (E) interrupted

\* Depending on data traffic the yellow and/or the orange LED at the interface module could illuminate. After restarting the Interface module (power supply OFF/ON) only the green LED illuminates.

● Power ON	power OK, device ready
● Data to PLC	data flow from Powertrans® 1b to PLC
● Data from PLC	data flow from PLC to Powertrans® 1b
● Direction	red LED „on“: data direction from Powertrans® 1b to conductor bar red LED „off“: data direction from conductor bar to Powertrans® 1b
● Monitor	LED has no function

Depending on the data rate the Data-LEDs may flicker or light constantly.

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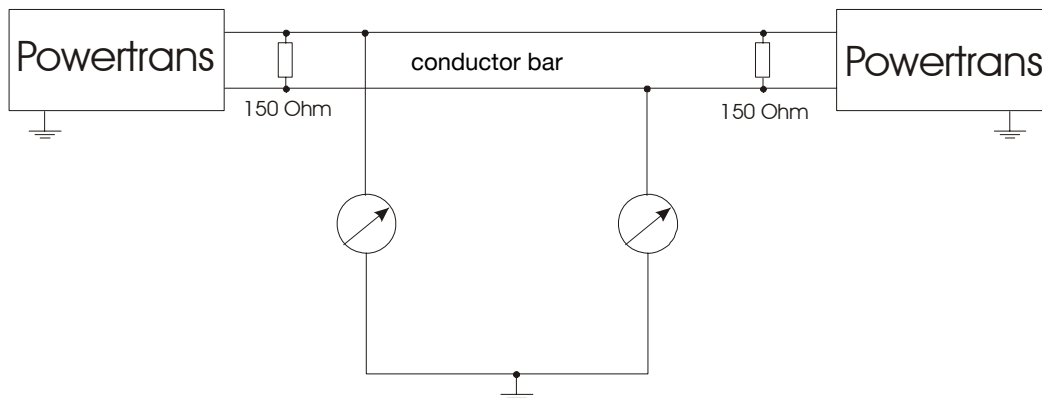
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### 38 How to measure the waveform on the high-voltage side?

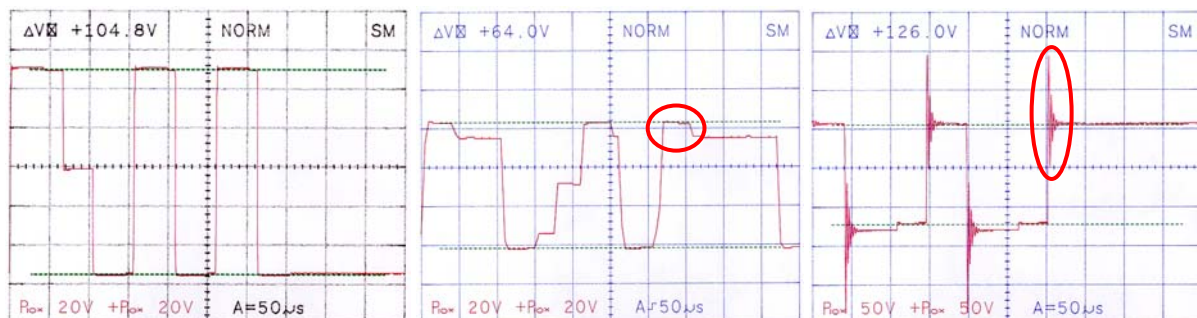
The waveform at the high voltage side can be checked with an oscilloscope. Thereby the correct voltage level, distortion, wrong circuit of termination resistors and other problems can be identified.

The measurement is made between earth potential and each data line. At the oscilloscope a third measure channel has to be activated to make the automatic subtraction of Channel 1 – Channel 2.



### 39 How does the waveforms on the high-voltage side look like for different termination resistors?

Example: data rate 19,2 kBit/s



R = 150 Ohm

correct

R = 47 Ohm

not correct

R = ∞ (without termination resistor)

not correct

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