Preventing errors and defects in the communication interface by a proper choice of an earthing concept

The earthing and grounding concept of devices installed in a system can strongly influence the risk of compensating GND currents through communication interface lines. Especially USB interfaces are sensitive for such stray electrical currents by the USB's GND. The USB port of the controller or even the PC's USB can be damaged by this.

Particularly high motor output currents of a controller and/or long supply voltage lines with a thin cross section can be critical concerning instable or different GND levels and stray electrical currents due to this. The resulting GND current can affect communication interfaces in a negative way or even destroy electronic components of the drive controller or the master.

Correct earthing, respectively selective galvanic isolation will solve the problem.

Please observe the following principles:

- Use accurately dimensioned cable cross-sections for the power supply to receive low resistance connections
- Make sure that the power supply, controller and additional components are mounted and connected following the local and statutory requirements
- Follow the recommendations for EMC-compliant installation

Please refer to different earthing variants listed on the following pages which are remarked as “RECOMMENDED” and “NOT RECOMMENDED”.

Important:
Please take care that your wiring corresponds to one of the "RECOMMENDED" earthing variants.

1. Not recommended Earthing Variants

The supply current consumed by the power supply generates a voltage drop across the supply voltage's ground line. This will result in a voltage difference between the supply voltage's ground and the earth potential ($U_{Shield-Gnd}$). Basically, DC parasitic current ($I_{parasitic}$) must be prevented to flow back to the power supply via the communication interface's grounding line and the equipment earth.

ATTENTION:

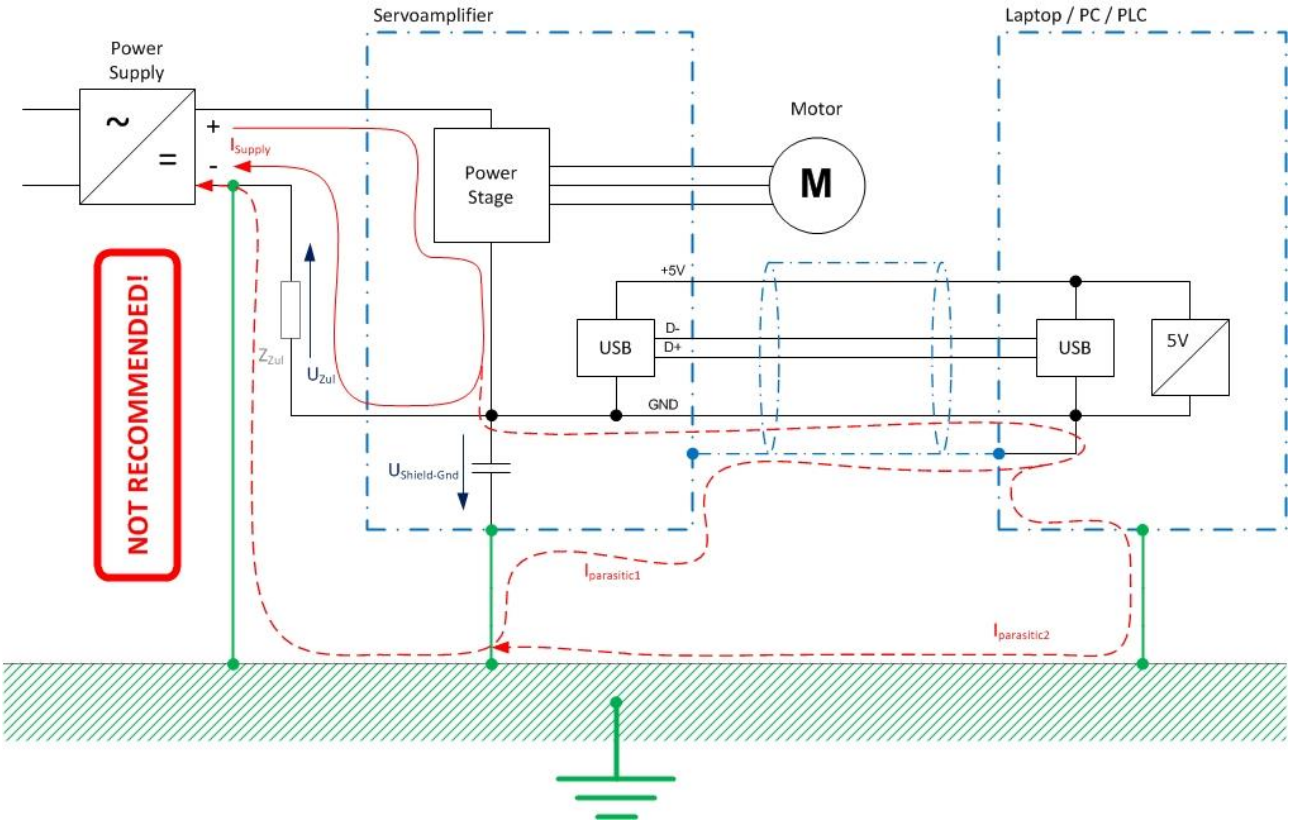
There are "NOT RECOMMENDED" wiring variants present on the pages 3 -5 which can result in some stray current by the communication GND wire and damage the communication interface.i n worst case.

Variants 1.1 thru 1.3 are "NOT RECOMMENDED"!
These wiring variants can result in disturbed communication or, in the extreme case, can lead to a defective components of the communication interface. Please avoid these wiring variants.

1.1 NOT RECOMMENDED: Power Supply earthed / Amplifier Housing earthed / PC earthed

Not recommended configuration

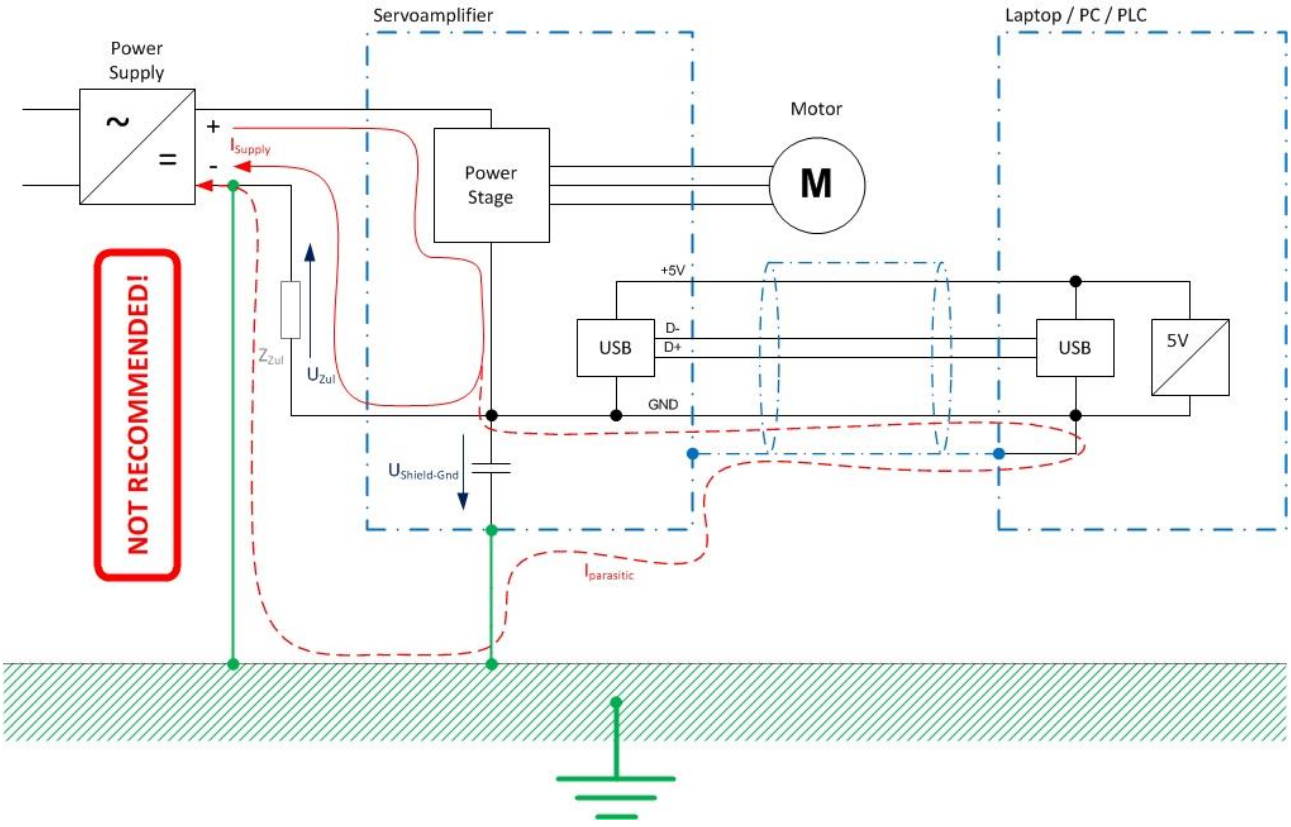
- Power supply: DC ground connected to earth
- Servo amplifier: Housing connected to earth
- PC: Housing connected to earth
- Communication interface: Shield connected on both sides



1.2 NOT RECOMMENDED: Power Supply earthed / Amplifier Housing earthed / PC not earthed

Not recommended configuration

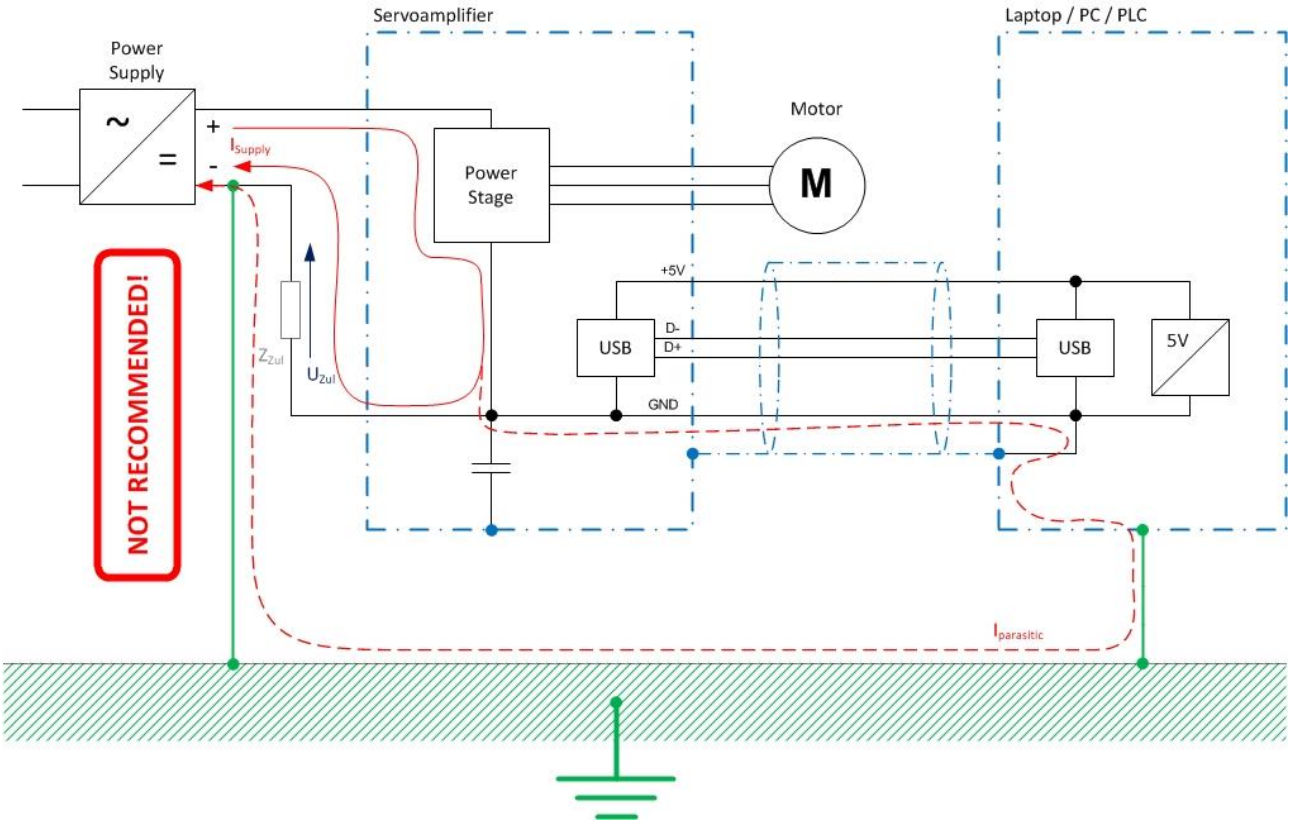
- Power supply: DC ground connected to earth
- Servo amplifier: Housing connected to earth
- PC: Housing not connected to earth
- Communication interface: Shield connected on both sides



1.3 NOT RECOMMENDED: Power Supply earthed / Amplifier Housing not earthed / PC earthed

NOT recommended Configuration

- Power supply: DC ground connected to earth
- Servo amplifier: Housing not connected to earth
- PC: Housing connected to earth
- Communication interface: Shield connected on both sides



2. Recommended Earthing Variants

By a systematic earthing, respectively by refraining from earthing particular components or by galvanic isolation of the communication interface, parasitic DC current across the communication interface's GND is prevented.

There are different "recommended" wiring variants shown on page 7 – 10.

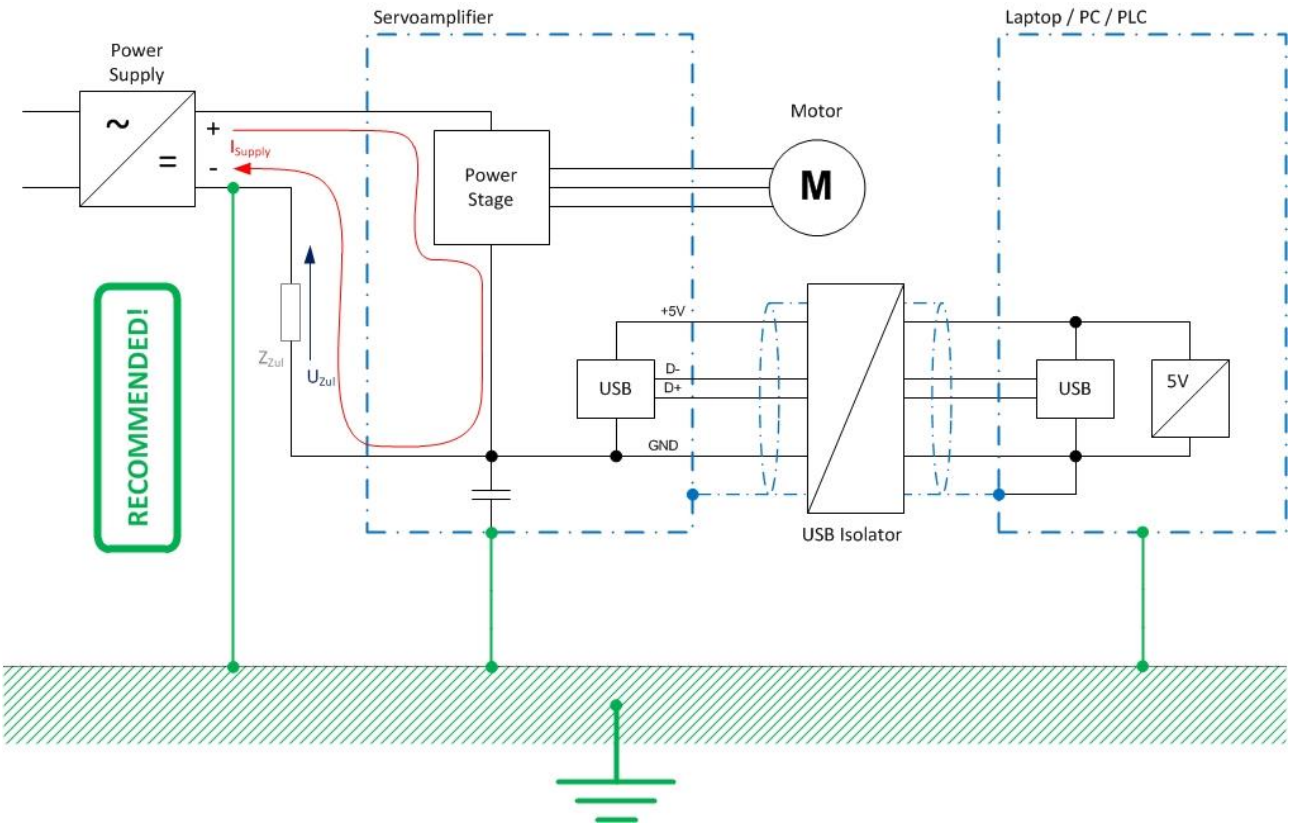
IMPORTANT:

Use variants 2.1 thru 2.4 (on the following pages)
to prevent communication faults or defective components.

2.1 Power Supply earthed / Amplifier Housing earthed / PC earthed / Communication Interface galvanically isolated

Recommended Configuration

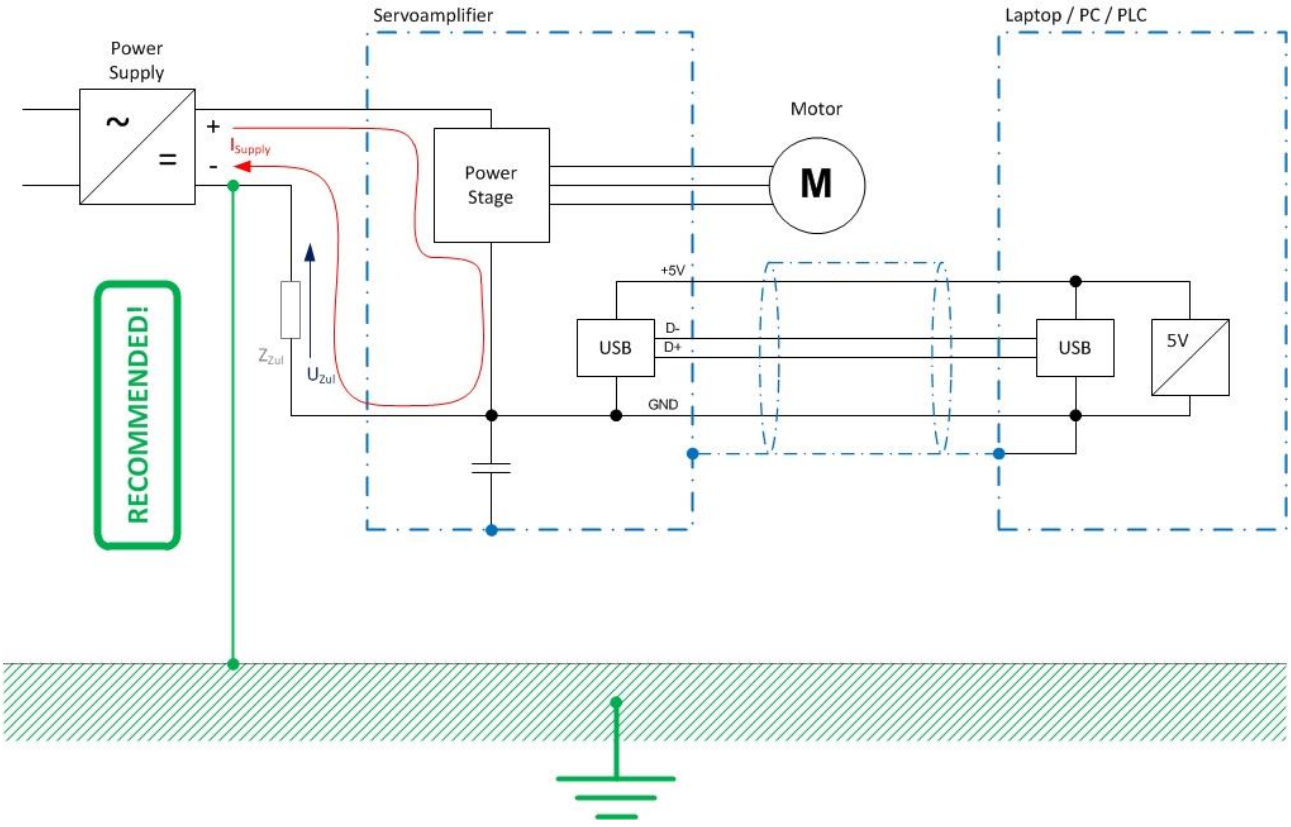
- Power supply: DC ground connected to earth
- Servo amplifier: Housing connected to earth
- PC: Housing connected to earth
- Communication interface: Galvanically isolated (e.g. USB isolator)



2.2 Power Supply earthed / Amplifier Housing not earthed / PC not earthed

Recommended Configuration

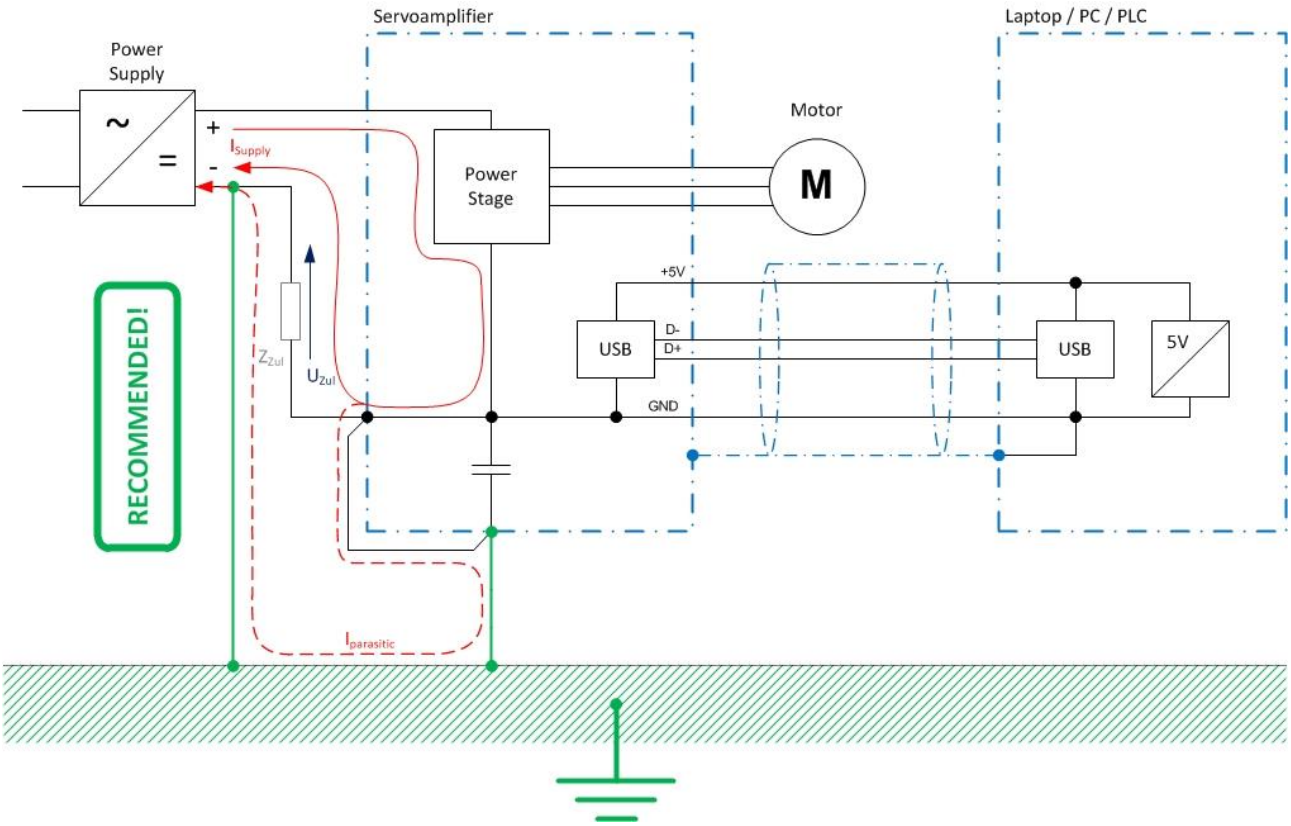
- Power supply: DC ground connected to earth
- Servo amplifier: Housing not connected to earth
- PC: Housing not connected to earth
- Communication interface: Shield connected on both sides



2.3 Power Supply earthed / Amplifier Housing earthed Capacitor short-circuited / PC not earthed

Recommended Configuration

- Power supply: DC ground connected to earth
- Servo amplifier: Housing connected to earth
DC ground connected to earth
(Capacitor short-circuited)
- PC: Housing not connected to earth
- Communication interface: Shield connected on both sides



2.4 Power Supply not earthed / Amplifier Housing earthed / PC earthed

Recommended Configuration

- Power supply: DC ground not connected to earth
- Servo amplifier: Housing connected to earth
- PC: Housing connected to earth
- Communication interface: Shield connected on both sides