Application note regarding the DC bus interfacing on all ServoPac series
January 28, 2010 – Issue 1.0

DC bus interfacing

2 – GENERAL DESCRIPTION

The DC bus is available on the power connector of any TRANSTECHNIK drive to allow paralleling or external capacitor box connection. The paralleling of the drive DC busses or adding an external capacitor box has many advantages:

- it reduces ripples of the DC bus voltage that can decrease performance in dynamic applications,
- it increases the DC bus capacitors' lifetime,
- it reduces heat dissipation into the braking resistor by storing more energy during deceleration phases,
- it reduces electricity consumption by storing more energy during deceleration phases.

2 – SERVOPAC DRIVES RANGE

In single-phase applications, the continuous power must be limited according the table below:

APPLICATION TYPE	RATING	CONTINUOUS POWER ALLOWED IN SINGLE-PHASE
Standalone ServoPac	230 V – 5 A to 11 A	650 W
Standalone ServoPac	230 V – 17 A	1000 W
CAPABOX		$P_{STANDALONE}$ + 2000 W
Paralleled DC bus		$\Sigma P_{STANDALONE}$

In applications with higher power, an external capacitor box (ref. CAPABOX) must be added, or the DC busses must be paralleled.

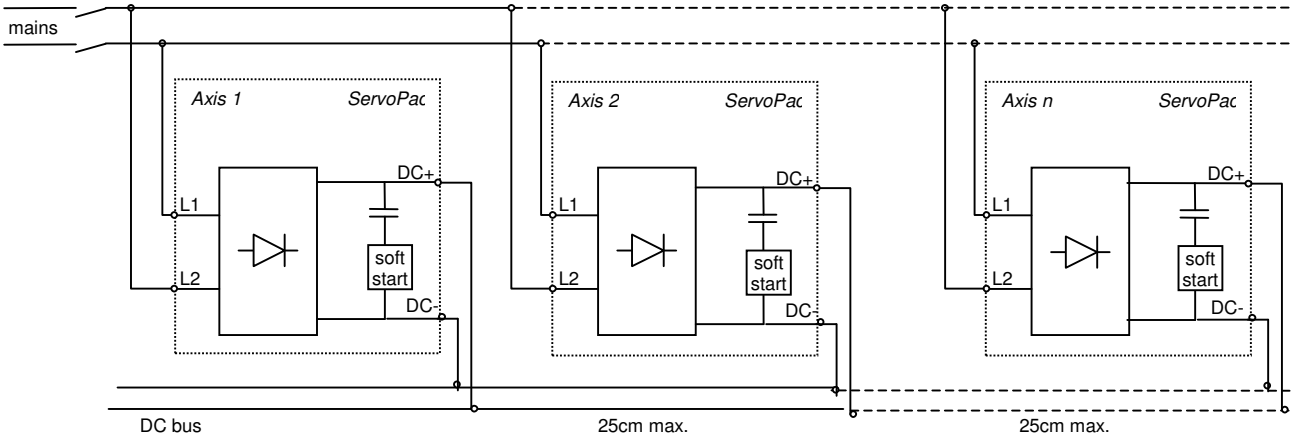
3 – DC BUS PARALLELING

Paralleling DC busses requires some precautions for the installation, in order to remain efficient and safe:

- all drives need to be powered by the mains;
- the same phases must be used on all drives. Especially in single-phase configuration, if drive axis 1 is powered by L1 and L2, the other drives must be powered by L1 and L2 as well;
- all drives must be powered at the same time. It is highly advised to use the same circuit breaker to switch on the power supply;
- In order to prevent EMI problems or loosing the paralleling benefits:
    - the maximum wire length between two drives is 25 cm,
    - large section wires must be used.

When DC busses are paralleled, the total continuous power must be limited to the sum of the continuous powers allowed for each axis.

Block scheme of a typical connection for ServoPac:



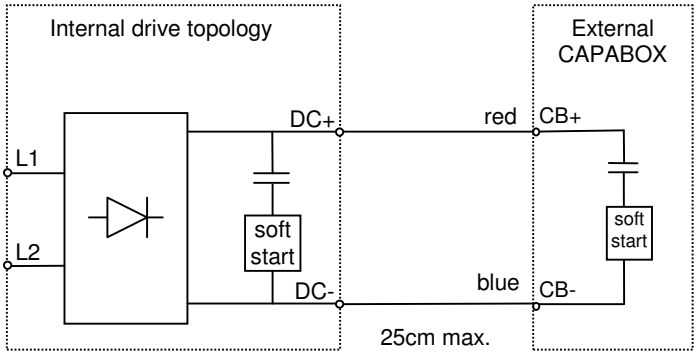
4 – ADDING AN EXTERNAL CAPACITOR BOX (CAPABOX)

Direct connection of external capacitors between DC+ and DC- lines is forbidden because the drive soft start system is by-passed. In this case, an important inrush current at power up can damage the drive.

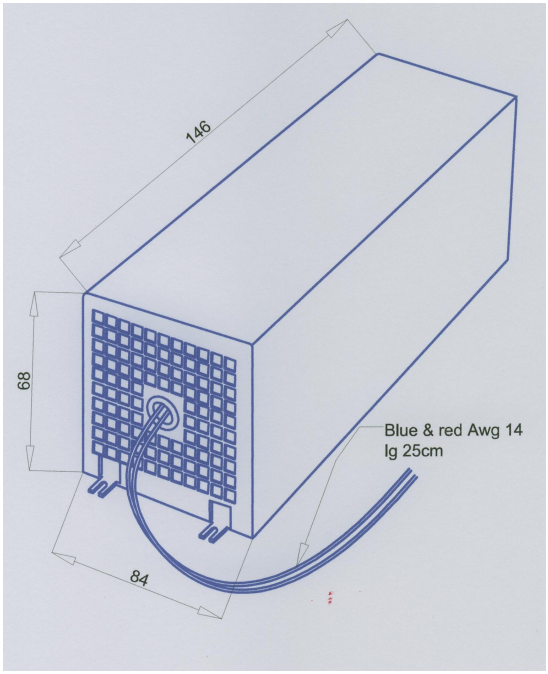
The available solution consists in an external capacitor box including a soft start system (ordering code: CAPABOX). This accessory is fully compatible with ServoPac drives.

4.1 – ELECTRICAL SPECIFICATIONS

Features of the CAPABOX capacitors box:
Cables length: 25 cm,
Rated voltage: 400 V,
Power capacity added to the application: 2000W



4.1 – MECHANICAL DIMENSIONS



5 – EXAMPLE

4.1 – EXAMPLE 1

Let us have a look at the following single-phase application:

AXIS	DRIVE TYPE	CONTINUOUS POWER REQUIRED BY THE APPLICATION	CONTINUOUS POWER ALLOWED IN STAND-ALONE MODE	CONTINUOUS POWER ALLOWED WITH PARALLELED DC BUS
1	ServoPac-CAN-230/05	300 W	650 W	2300 W
2	ServoPac-CAN -230/17	1100 W	⚠ 1000 W	
3	ServoPac-CAN -230/11	800 W	⚠ 650 W	

In stand-alone connection, axes 2 and 3 require more power than the continuous power allowed.
The drives' lifetime, with this topology, would be dramatically decreased.

By paralleling the DC bus, the total required power (2200 W) remains below the total continuous power allowed for each drive.

4.1 – EXAMPLE 2

In this example, the application is the same than the previous one but the required power for axis 2 is extended to 2000W.

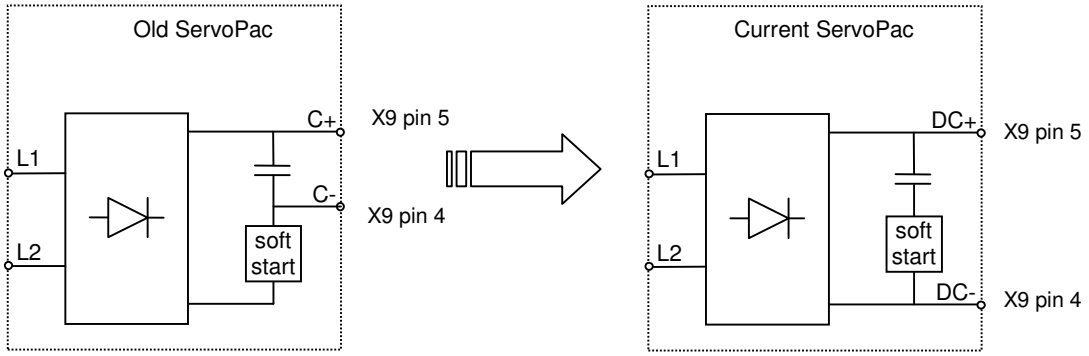
AXIS	DRIVE TYPE	CONTINUOUS POWER REQUIRED BY THE APPLICATION	CONTINUOUS POWER ALLOWED IN STAND-ALONE MODE	CONTINUOUS POWER ALLOWED WITH PARALLELED DC BUS + CAPABOX
1	ServoPac-CAN -230/05	300 W	650 W	4300 W
2	ServoPac-CAN -230/17	2000 W	⚠ 1000 W	
3	ServoPac-CAN -230/11	800 W	⚠ 650 W	

This time, by paralleling the DC bus, the total required power (3100 W) is higher than the total continuous power allowed.

The CAPABOX adds a power capability of 2000 W to the application.
Consequently, a CAPABOX is required to extend the allowed continuous power to 4300 W.

6 – SERVOPAC RANGE COMPATIBILITY ISSUE

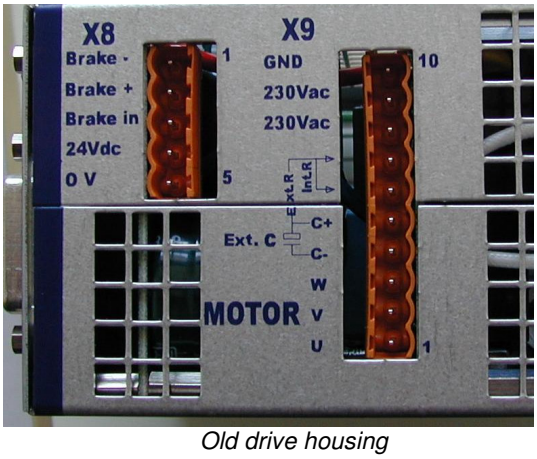
The first delivered ServoPac has got a different topology of the DC bus link. This topology offered the advantage to allow direct connection of external capacitors. However, for compatibility reasons, this topology has been changed. The differences are presented below.



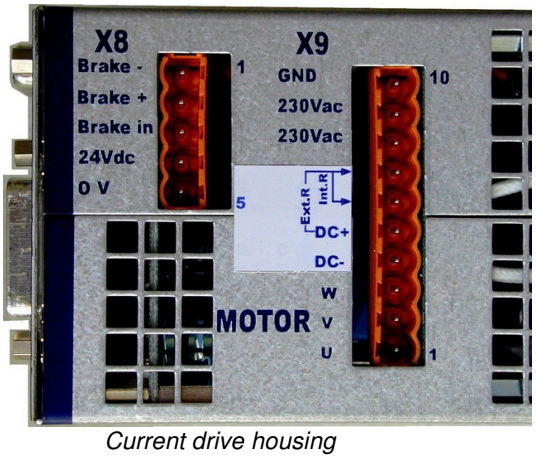
The compatibility issue between the current ServoPac and the old one is summarized below.

Application	Compatibility issue
Single-axis with AC supply	No compatibility problem
Single-axis with AC supply and external capacitors	External capacitors must be replaced by a CAPABOX
Single-axis or multi-axis with DC bus supply	No compatibility problem (improved reliability because inrush current is limited)
Multi-axis with AC supply	No compatibility problem
Multi-axis with AC supply and DC bus paralleling	Mixing current ServoPac and first ServoPac is forbidden. All drives must be replaced simultaneously.

The difference (DC+/- vs C+/-) can be easily identified on the drive housing.
The drive modification index has been incremented to 'I' on the drive label sticker for traceability.
The change is effective in production from serial number 327828 (index "I" on the drive ID sticker).



Old drive housing



Current drive housing