

DSP Controlboard for Power Electronic Converters



The control board has been designed to control power electronic converters in the power range up but not limited to 300 kVA and for converter voltage up to 1000 V. It generates PWM patterns and acquires the converter internal analog and digital signals. For large multilevel or interleaved parallel converters, interconnected DSP control boards allow synchronized PWM generation.

Main Feature List

- Single 24 V power supply
- DSP TI TMS320F28335, floating point (150MHz)
- Generation of up to 12 PWM signals
- Direct control of the power electronic converters, signal interface to IGBT drivers
- Fiber optic PWM synchronization interface
- Data acquisition interface to converter module (DC voltage, AC current etc.)
- 15 fast analog Inputs (ADC) incl. analog signal processing and filtering
- 8 additional multiplexed analog inputs (e.g. for temperature / process signals)
- 8 EMI protected digital inputs
- 8 digital open collector outputs
- 2 Speed Control Interfaces for Fans
- 2 isolated CAN bus interfaces
- Serial interface USB isolated (virtual COM Port)
- Parallel bus interface for extension modules
- Buffered real-time clock
- Optional field bus interfaces (e.g. PROFIBUS)

Data			
CAN1			12 PWM CH & Feddback
CAN2			
USB isolated			FO PWM Sync In & Out
RS485 Anybus			PWM_FAN1
15 analog input CH 12 bit			PWM_FAN2
6 Analog input CH MPX 12 bit			8 Digital Output CH
8 Digital Input CH	Flash 2MB	RTC	
		TI C2000 F28335 DSP @150Mhz 512KByte Flash 68KByte RAM	

Internal Power Supply Circuits

Proper design of the internal power supply circuits is essential for robust and accurate operation of the DSP controller card. Therefore, separate power supplies for digital and analog circuits have been provided to ensure accurate operation even in EMI critical environments. The critical voltages are monitored and a LED indicates either red for

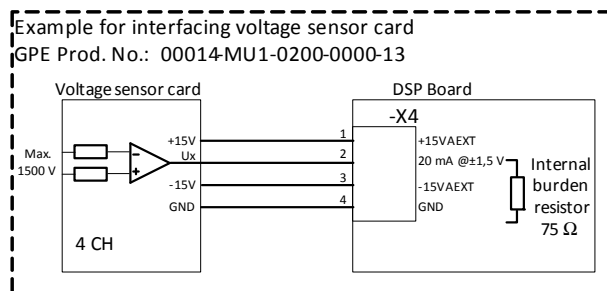
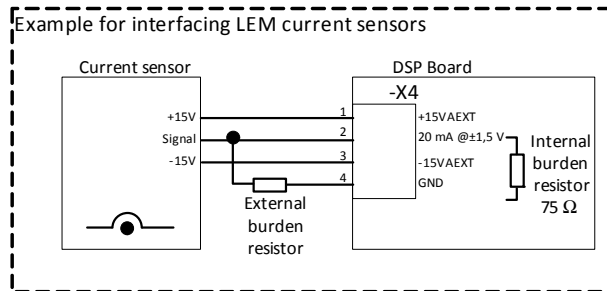
failure or green for normal status of power section. Additionally, the status can be checked in the DSP software via digital input.

Converter Voltage and Current Acquisition

The board is equipped with 15 analog input channels which are designed but not limited to fast voltage or current acquisition. They are equipped with signal filters and high frequency overvoltage protection.

Design properties are:

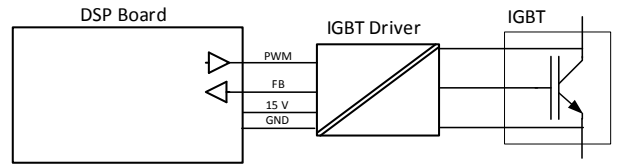
- 12 bit ADC resolution
- bipolar ($\pm 1,5$ V) or unipolar (+3 V) signal range, configurable by solder jumpers
- EMI robust 20 mA input current
- ± 15 V sensor power supply
- Anti-aliasing filters
- Overvoltage spikes protection
- Interfacing LEM current sensors directly
- Interfacing GPE voltage sensor board 00014-MU1-0200-0000-13



IGBT Driver Interface (PWM)

The interface to the power electronic stage of the converter contains 12 firing signals (PWM) and 6 status feedback signals. PWM digital outputs are equipped with sufficient driver circuits to connect directly to commercial available IGBT driver boards. The PWM signals can be generated in the DSP or alternatively on an additional hardware (e.g. FPGA) which can be installed on the extension connector. The signal origins can be selected via jumpers. If IGBT drivers are to be used, which are not compatible to the layout of the signal connectors, an extension card can be easily manufactured to adapt the PWM and feedback

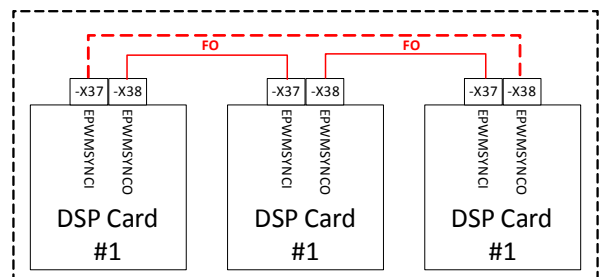
signals to almost any IGBT driver card. The DSP Board contains a dedicated 15 V Power supply for the IGBT driver board, which is separated from the internal power stages.



Fibre Optic PWM Synchronization

For accurate synchronization of the PWM patterns of several DSP cards, the dedicated EPWM1SYNCO and the EPWM1SYNCI signals are accessible via a bidirectional fibre optic interface. The external synchronization interface can be used in inverters which contain more than 12 power semiconductors. Application examples are:

- Interleaved parallel converters
- Multilevel converters
- Matrix converters
- Converter arrays



The structure has to be designed according to the availability requirements of the system. Using a dedicated synchronization controller allows to operate the system with any number of available DSP card, as the patterns can be changed in real-time.

Isolated CAN 1 / CAN 2 Interfaces

Two independent CAN interfaces are equipped with isolated transmitters and DC/DC Converters. Connectors are RJ45 type.

Each CAN interface can be equipped with an additional (parallel) RJ45 connector, which can be used for interconnection of several DSP control boards.

An isolated 5 V power supply for external CAN devices can be provided

Digital Inputs / Outputs

The digital inputs and the digital outputs can be configured for 15 V or 24 signal levels. They are equipped with signal filters and high frequency overvoltage protection.