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TwinCAT Library for
PZT Driver

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Library	
Title	PztDriver
Version	1
TwinCAT version	2.11
Name space	–
Author	Daniel Sigg
Description	<p>Interfaces the PZT driver, D1001200.</p> <p>This library provides a function block to support a single channel of the 4-channel PZT driver. The board has a voltage monitor that represents the PZT output driver voltage, and an offset adjustment. The offset adjustment is controlled locally or externally using the front panel D-sub connector.</p> <p>Calibration parameters and min/max voltages are used to calibrate the voltage monitor and the offset adjustment.</p> <p>Each PZT driver also supports optional low and high limits; the user chooses which ones to enforce.</p> <p>The hardware readbacks of the power ok and external switch are daisy chained among the 4 channels of a board.</p>
Error codes	<p>0x01 – Power supply voltages out-of-range</p> <p>0x02 – External offset adjustment switch</p> <p>0x04 – PZT gain is zero</p> <p>0x08 – PZT monitor gain is zero</p> <p>0x10 – Drive voltage out-of-range</p> <p>0x20 – PZT voltage too low</p> <p>0x40 – PZT voltage too high</p> <p>0x80 – Power limits exceeded (either too low or too high)</p>
Library dependencies	Error, ReadADC, WriteDAC, SaveRestore

Hardware Input Type TYPE PztDriverInStruct: STRUCT Monitor: INT; PowerOk: BOOL; External: BOOL; END_STRUCT END_TYPE	
Type name	PztDriverInStruct
Description	Structure of the hardware inputs that are wired up for the PZT
Definition	STRUCT
Element	Name: Monitor Type: INT Description: Monitors the PZT voltage
Element	Name: PowerOk Type: BOOL Description: Voltage monitor readback
Element	Name: External Type: BOOL Description: Monitors the external switch state

Hardware Output Type TYPE PztDriverOutStruct: STRUCT Offset: INT; PowerOk: BOOL; External: BOOL; END_STRUCT END_TYPE	
Type name	PztDriverOutStruct
Description	Structure of the hardware output that are wired up for the PZT
Definition	STRUCT
Element	Name: Offset Type: INT Description: Offset applied to the PZT
Element	Name: PowerOk Type: BOOL Description: Voltage monitor readback (daisy chained from input)
Element	Name: External Type: BOOL Description: Monitors the external switch state (daisy chained from input)

User Interface Type	
TYPE PztDriverEnum : (HVPZT, MVPZT, LVPZT); END_TYPE	
Type name	PztDriverEnum
Description	List of available PZT driver configurations
Definition	ENUM
Enum Tag	Name: HVPZT Description: High voltage PZT driver (-120V to +240V)
Enum Tag	Name: MVPZT Description: Medium voltage PZT driver (-10V to +200V)
Enum Tag	Name: LVPZT Description: Low voltage PZT driver (-10V to +120V)

User Interface Type	
TYPE PztDriverLimitsEnum : (PztLimitsNone, PztLimitsLow, PztLimitsHigh, PztLimitsHiLo); END_TYPE	
Type name	PztDriverLimitsEnum
Description	List of optional limit choices
Definition	ENUM
Enum Tag	Name: PztLimitsNone Description: No limit
Enum Tag	Name: PztLimitsLow Description: Check low limit
Enum Tag	Name: PztLimitsHigh Description: Check high limit
Enum Tag	Name: PztLimitsHiLo Description: Check low and high limit

User Interface Type	
TYPE PztDriverStruct:	
STRUCT	
Error:	ErrorStruct;
PztDriverType:	PztDriverEnum;
Volts:	LREAL;
Offset:	LREAL;
Monitor:	LREAL;
Drive:	LREAL;
PztLow:	LREAL;
PztHigh:	LREAL;
PztGain:	LREAL;
PztMonGain:	LREAL;
PztOffset:	LREAL;
Limits:	PztDriverLimitsEnum;
Range:	BOOL;
Low:	LREAL;
High:	LREAL;
Normalized:	LREAL;
External:	BOOL;
ExternalNom:	BOOL;
PowerOk:	BOOL;
END_TYPE	
Type name	PztDriverStruct
Description	Structure of the user interface tags that are used to control the PZT driver
Definition	STRUCT
Output Tag	Name: Error Type: ErrorStruct Description: Error handling
Output Tag	Name: PztDriverType Type: PztDriverEnum Description: PZT driver type
Output Tag	Name: Volts Type: LREAL Description: Represents the PZT driver output voltage in V
In/out Tag	Name: Offset Type: LREAL Description: Offset to the PZT driver output in V
Output Tag	Name: Monitor Type: LREAL Description: Monitor readback voltage (used to derive Volts)

Output Tag	Name: Drive Type: LREAL Description: Output drive voltage for offset (derived from Offset)
Output Tag	Name: PztLow Type: LREAL Description: Low limit of PZT drive
Output Tag	Name: PztHigh Type: LREAL Description: High limit of PZT drive
Output Tag	Name: PztGain Type: LREAL Description: Gain of the PZT drive
Output Tag	Name: PztMonGain Type: LREAL Description: Inverse of the PZT monitor gain
Output Tag	Name: PztOffset Type: LREAL Description: Intrinsic offset of the PZT drive (usually 0)
Output Tag	Name: Limits Type: PztDriverLimitsEnum Description: Specifies optional limits
Output Tag	Name: Range Type: BOOL Description: True, if limits exceeded
Output Tag	Name: Low Type: LREAL Description: Low limit for PZT output voltage
Output Tag	Name: High Type: LREAL Description: High limit for PZT output voltage
Output Tag	Name: Normalized Type: LREAL Description: Normalized output voltage, 100% is the absolute maximum of the allowed output voltage
Output Tag	Name: External Type: BOOL Description: Monitors the external switch state
In/Out Tag	Name: ExternalNom Type: BOOL Description: Nominal setting of the external switch state

Output Tag	Name: PowerOk Type: BOOL Description: Voltages are ok
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Function Block FUNCTION_BLOCK PztDriverFB VAR_INPUT Request: SaveRestoreEnum; PztType: PztDriverEnum := LVPZT; PztDriverIn: PztDriverInStruct; PztMin: LREAL := -1E9; PztMax: LREAL := +1E9; PztGain: LREAL := 0; PztMonGain: LREAL := 0; PztOffset: LREAL := 0; END_VAR VAR_OUTPUT PztDriverOut: PztDriverOutStruct; END_VAR VAR_IN_OUT PztDriverInit: PztDriverStruct; PztDriver: PztDriverStruct; END_VAR	
Name	PztDriverFB
Description	Controls a channel of the PZT driver The values for min, max, gain, mongain and offset will be initialized according to the selected PZT driver type, if left untouched.
Input argument	Name: Request Type: SaveRestoreEnum Description: Save/restore command
Input argument	Name: PztType Type: PztDriverEnum Default: LVPZT Description: PZT driver type
Input argument	Name: PztDriverIn Type: PztDriverInStruct Description: Input hardware structure
Input argument	Name: PztMin Type: LREAL Description: Minimum voltage of the PZT output
Input argument	Name: PztMax Type: LREAL Description: Maximum voltage of the PZT output

Input argument	Name: PztGain Type: LREAL Description: PZT gain
Input argument	Name: PztMonGain Type: LREAL Description: Inverse of PZT monitor gain
Input argument	Name: PztOffset Type: LREAL Description: Intrinsic PZT offset (usually 0)
Output argument	Name: PztDriverOut Type: PztDriverOutStruct Description: Output hardware structure
In/out argument	Name: PztDriverInit Type: PztDriverStruct Description: Interface structure for save/restore
In/out argument	Name: PztDriver Type: PztDriverStruct Description: User Interface structure