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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 | Interfaces the PZT driver, [D1001200](https://dcc.ligo.org/LIGO-D1001200).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.Calibration parameters and min/max voltages are used to calibrate the voltage monitor and the offset adjustment.Each PZT driver also supports optional low and high limits; the user chooses which ones to enforce.The hardware readbacks of the power ok and external switch are daisy chained among the 4 channels of a board. |
| Error codes | 0x01 – Power supply voltages out-of-range0x02 – External offset adjustment switch0x04 – PZT gain is zero0x08 – PZT monitor gain is zero0x10 – Drive voltage out-of-range0x20 – PZT voltage too low0x40 – PZT voltage too high0x80 – Power limits exceeded (either too low or too high) |
| Library dependencies | Error, ReadADC, WriteDAC, SaveRestore |

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| **Hardware Input Type**TYPE PztDriverInStruct:STRUCT Monitor: INT; PowerOk: BOOL; External: BOOL;END\_STRUCTEND\_TYPE |
| Type name | PztDriverInStruct |
| Description | Structure of the hardware inputs that are wired up for the PZT |
| Definition | STRUCT |
| Element | Name: MonitorType: INTDescription: Monitors the PZT voltage |
| Element | Name: PowerOkType: BOOLDescription: Voltage monitor readback |
| Element | Name: ExternalType: BOOLDescription: Monitors the external switch state |

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| **Hardware Output Type**TYPE PztDriverOutStruct:STRUCT  Offset: INT; PowerOk: BOOL; External: BOOL;END\_STRUCTEND\_TYPE |
| Type name | PztDriverOutStruct |
| Description | Structure of the hardware output that are wired up for the PZT |
| Definition | STRUCT |
| Element | Name: OffsetType: INTDescription: Offset applied to the PZT |
| Element | Name: PowerOkType: BOOLDescription: Voltage monitor readback (daisy chained from input) |
| Element | Name: ExternalType: BOOLDescription: Monitors the external switch state (daisy chained from input) |

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| **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: HVPZTDescription: High voltage PZT driver (-120V to +240V) |
| Enum Tag | Name: MVPZTDescription: Medium voltage PZT driver (-10V to +200V) |
| Enum Tag | Name: LVPZTDescription: Low voltage PZT driver (-10V to +120V) |

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| **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: PztLimitsNoneDescription: No limit |
| Enum Tag | Name: PztLimitsLowDescription: Check low limit |
| Enum Tag | Name: PztLimitsHighDescription: Check high limit |
| Enum Tag | Name: PztLimitsHiLoDescription: Check low and high limit |

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| **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: ErrorType: ErrorStructDescription: Error handling |
| Output Tag | Name: PztDriverTypeType: PztDriverEnumDescription: PZT driver type |
| Output Tag | Name: VoltsType: LREALDescription: Represents the PZT driver output voltage in V |
| In/out Tag | Name: OffsetType: LREALDescription: Offset to the PZT driver output in V |
| Output Tag | Name: MonitorType: LREALDescription: Monitor readback voltage (used to derive Volts) |
| Output Tag | Name: DriveType: LREALDescription: Output drive voltage for offset (derived from Offset) |
| Output Tag | Name: PztLowType: LREALDescription: Low limit of PZT drive |
| Output Tag | Name: PztHighType: LREALDescription: High limit of PZT drive |
| Output Tag | Name: PztGainType: LREALDescription: Gain of the PZT drive |
| Output Tag | Name: PztMonGainType: LREALDescription: Inverse of the PZT monitor gain |
| Output Tag | Name: PztOffsetType: LREALDescription: Intrinsic offset of the PZT drive (usually 0) |
| Output Tag | Name: LimitsType: PztDriverLimitsEnumDescription: Specifies optional limits |
| Output Tag | Name: RangeType: BOOLDescription: True, if limits exceeded |
| Output Tag | Name: LowType: LREALDescription: Low limit for PZT output voltage |
| Output Tag | Name: HighType: LREALDescription: High limit for PZT output voltage |
| Output Tag | Name: NormalizedType: LREALDescription: Normalized output voltage, 100% is the absolute maximum of the allowed output voltage |
| Output Tag | Name: ExternalType: BOOLDescription: Monitors the external switch state |
| In/Out Tag | Name: ExternalNomType: BOOLDescription: Nominal setting of the external switch state |
| Output Tag | Name: PowerOkType: BOOLDescription: Voltages are ok |

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| **Function Block**FUNCTION\_BLOCK PztDriverFBVAR\_INPUT Request: SaveRestoreEnum; PztType: PztDriverEnum := LVPZT; PztDriverIn: PztDriverInStruct; PztMin: LREAL := -1E9; PztMax: LREAL := +1E9; PztGain: LREAL := 0; PztMonGain: LREAL := 0; PztOffset: LREAL := 0;END\_VARVAR\_OUTPUT PztDriverOut: PztDriverOutStruct;END\_VARVAR\_IN\_OUT PztDriverInit: PztDriverStruct; PztDriver: PztDriverStruct;END\_VAR |
| Name | PztDriverFB |
| Description | Controls a channel of the PZT driverThe values for min, max, gain, mongain and offset will be initialized according to the selected PZT driver type, if left untouched. |
| Input argument | Name: RequestType: SaveRestoreEnumDescription: Save/restore command |
| Input argument | Name: PztTypeType: PztDriverEnumDefault: LVPZTDescription: PZT driver type |
| Input argument | Name: PztDriverInType: PztDriverInStructDescription: Input hardware structure |
| Input argument | Name: PztMinType: LREALDescription: Minimum voltage of the PZT output |
| Input argument | Name: PztMaxType: LREALDescription: Maximum voltage of the PZT output |
| Input argument | Name: PztGainType: LREALDescription: PZT gain |
| Input argument | Name: PztMonGainType: LREALDescription: Inverse of PZT monitor gain |
| Input argument | Name: PztOffsetType: LREALDescription: Intrinsic PZT offset (usually 0) |
| Output argument | Name: PztDriverOutType: PztDriverOutStructDescription: Output hardware structure |
| In/out argument | Name: PztDriverInitType: PztDriverStructDescription: Interface structure for save/restore |
| In/out argument | Name: PztDriverType: PztDriverStructDescription: User Interface structure |