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TwinCAT Library for PLCInfo

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Library	
Title	PLCInfo
Version	1
TwinCAT version	V2.11.0
Name space	
Author	Daniel Sigg
Description	Information about PLC status/location Includes system information
Error Code	MasterInfoStruct_Errors: 0x0001 – Link error detected 0x0002 – IO reset required 0x0004 – Missing frame in redundancy mode 0x0008 – Watchdog triggered 0x0010 – Ethernet driver not found 0x0020 – I/O reset active 0x0040 – At least one device not in OP state 0x0080 – Distributed clock not in sync 0x0100 – Slave count mismatch 0x0200 – Frame working counter wrong 0x0400 – Illegal AMS address 0x0800 – Master not in OP state 0x1000 – Frame statistics error
Library Dependencies	Error, SaveRestore, TcSystem, TcEtherCAT

User Interface Type	
TYPE IfoldEnum : (IfoH1, IfoL1, IfoH2, IfoT1, IfoI1) END_TYPE;	
Type Name	IfoldEnum
Description	Identification of IFO
Definition	ENUM
Element	Name: IfoH1 Description: H1
Element	Name: IfoL1 Description: L1
Element	Name: IfoH2 Description: H2
Element	Name: IfoT1 Description: T1
Element	Name: IfoI1 Description: I1

User Interface Type	
TYPE LocationIdEnum : (Corner, EndX, EndY, MidX, MidY) END_TYPE;	
Type Name	LocationIdEnum
Description	Location of PLC
Definition	ENUM
Element	Name: Corner Description: Located in Corner station
Element	Name: EndX Description: Located in EX station
Element	Name: EndY Description: Located in EY station
Element	Name: MidX Description: Located in MX station
Element	Name: MidY Description: Located in MY station

User Interface Type	
TYPE PlcTaksInfoStruct :	
STRUCT	
Active: BOOL;	
Name: STRING(16);	
Priority: DINT;	
CycleCount: UDINT;	
CycleTime: LREAL;	
LastExecTime: LREAL;	
CycleTimeExceeded: BOOL;	
CycleTimeError: UDINT;	
END_STRUCT	
END_TYPE;	
Type Name	PlcTaksInfoStruct
Description	Structure used in the user interface to describe the information for all available tasks in the PLC.
Definition	STRUCT
Output Tag	Name: Active Type: BOOL Description: True if task is configured and active
Output Tag	Name: Name Type: STRING(16) Description: Name of task
Output Tag	Name: Priority Type: DINT Description: Priority of task
Output Tag	Name: CycleCount Type: UDINT Description: Cycle count of task
Output Tag	Name: CycleTime Type: LREAL Description: Predefined cycle time in μ s
Output Tag	Name: LastExecTime Type: LREAL Description: Cycle time of last executed cycle in μ s.
Output Tag	Name: CycleTimeExceeded Type: BOOL Description: True if cycle time exceeded allocated time.
Output Tag	Name: CycleTimeError Type: UDINT Description: Error counter (updated at rate of task running PLCInfo)

<p>User Interface Type TYPE PlcInfoStruct : STRUCT</p> <p> Ifold: IfoldEnum; LocationId: LocationIdEnum; Status: ErrorStruct; SvnRevision: DINT; StartTime: TIMESTRUCT; CurrentTime: TIMESTRUCT; Hostname: T_MaxString; CpuUsage: UDINT; SysLatencyActual: UDINT; SysLatencyMax: UDINT; RuntimeNumber: DINT; ProjectName: STRING(32); NumberOfTasks: DINT; OnlineChangeCount: DINT; RetainLoaded: BOOL; PersistantLoaded: BOOL; Task: ARRAY [1..4] OF PlcTaksInfoStruct;</p> <p>END_STRUCT; END_TYPE;</p>	
Type Name	PlcInfoStruct
Description	Structure used in the user interface
Definition	STRUCT
Output Tag	Name: Ifold Type: IfoldEnum Description: Interferometer identification
Output Tag	Name: LocationId Type: LocationIdEnum Description: Building Location
Output Tag	Name: Status Type: ErrorStruct Description: Calls error handler
Output Tag	Name: SvnRevision Type: DINT Description: Subversion Revision
Output Tag	Name: StartTime Type: TIMESTRUCT Description: PLC start time

Output Tag	Name: CurrentTime Type: TIMESTRUCT Description: PLC current time
Output Tag	Name: ElapsedTime Type: DINT Description: Elapsed time since last restart in sec
Output Tag	Name: Hostname Type: T_MaxString Description: PLC host name
Output Tag	Name: CpuUsage Type: UDINT Description: CPU usage
Output Tag	Name: SysLatencyActual Type: UDINT Description: Actual system latency
Output Tag	Name: SysLatencyMax Type: UDINT Description: Max system latency
Output Tag	Name: RuntimeNumber Type: DINT Description: PLC runtime number
Output Tag	Name: ProjectName Type: STRING(32) Description: Name of PLC project
Output Tag	Name: NumberOfTasks Type: DINT Description: Number of active tasks in current PLC
Output Tag	Name: OnlineChangeCount Type: DINT Description: The number of online changes made since the last complete download
Output Tag	Name: RetainLoaded Type: BOOL Description: Valid retain data loaded
Output Tag	Name: PersistentLoaded Type: BOOL Description: Valid persistent data loaded
Output Tag	Name: Task Type: ARRAY [1..4] OF PlcTaksInfoStruct Description: Information on active tasks

```

Function Block
FUNCTION_BLOCK PlcInfoFB:
VAR_INPUT
    Request:          SaveRestoreEnum;
    Ifo:              IfoldEnum;
    Loc:              LocationIdEnum;
    Svn:              DINT;
    Status:           ErrorStruct;
END_VAR;
VAR_OUTPUT
    CurrentTime:      TIMESTRUCT;
    CurrentTimeValid: BOOL;
END_VAR;
VAR_IN_OUT
    Plc:              PlcInfoStruct;
END_VAR;
END_TYPE;
    
```

Type Name	PlcInfoFb
Description	Function block used to monitor the PLC status/location
Definition	Function Block
Input Argument	Name: Request Type: SaveRestoreEnum Description: Request for save/restore/safe mode or noop
Input Argument	Name: Ifo Type: IfoldEnum Description: IFO identification
Input Argument	Name: Loc Type: LocationIdEnum Description: Location ID
Input Argument	Name: Svn Type: DINT Description: Subversion status
Input Argument	Name: Status Type: ErrorStruct Description: Calls error handler
Output Argument	Name: CurrentTime Type: TIMESTRUCT Description: Current time

Output Argument	Name: CurrentTimeValid Type: BOOL Description: Current time valid
In/out Argument	Name: Plc Type: PlcInfoStruct Description: User interface structure

<p>User Interface Type</p> <pre> TYPE ECatCommStateEnum : (ECatCommStateUNDEFINED := 0, ECatCommStateINIT := 1, ECatCommStatePREOP := 2, ECatCommStateBOOT := 3, ECatCommStateSAFEOP := 4, ECatCommStateOP := 8); END_TYPE </pre>	
Type Name	ECatCommStateEnum
Description	EtherCAT state machine
Definition	ENUM
Element	Name: ECatCommStateUNDEFINED Description: Undefined
Element	Name: ECatCommStateINIT Description: INIT
Element	Name: ECatCommStatePREOP Description: PREOP
Element	Name: ECatCommStateBOOT Description: BOOT
Element	Name: ECatCommStateSAFEOP Description: SAFEOP
Element	Name: ECatCommStateOP Description: OP

<p>User Interface Type</p> <pre> TYPE MasterInfoFastInStruct : STRUCT FrmWcState: ARRAY[0..7] OF WORD; END_STRUCT END_TYPE </pre>	
Type Name	MasterInfoFastInStruct
Description	Structure used to interface the PLC at fast rate.
Definition	STRUCT
Input Tag	Name: FrmWcState Type: ARRAY[0..7] OF WORD Description: Set of frame working counter states

User Interface Type TYPE MasterInfoInStruct : STRUCT SlaveCount: UINT; DeviceStatus: UINT; ChangeCount: UINT; DeviceId: UINT; NetId: T_AmsNetIdArr; ConfigSlaveCount: UINT; END_STRUCT END_TYPE	
Type Name	MasterInfoInStruct
Description	Structure used to interface the PLC at standard rate.
Definition	STRUCT
Input Tag	Name: SlaveCount Type: UINT Description: Number of slave terminals connected to the master
Input Tag	Name: DeviceStatus Type: UINT Description: Status of the master device (network interface)
Input Tag	Name: ChangeCount Type: UINT Description: Number of changes to the device image
Input Tag	Name: DeviceId Type: UINT Description: Device ID
Input Tag	Name: NetId Type: T_AmsNetIdArr Description: AMS address of master
Input Tag	Name: ConfigSlaveCount Type: UINT Description: Number of configured slave terminals

User Interface Type TYPE MasterInfoFastStruct : STRUCT State: ARRAY[0..7] OF WORD; Error: ARRAY[0..7] OF BOOL; Flag: BOOL; END_STRUCT END_TYPE	
Type Name	MasterInfoFastStruct
Description	Structure used to interface the PLC at fast rate.
Definition	STRUCT
Output Tag	Name: State Type: ARRAY[0..7] OF WORD Description: Array of working counter states
Output Tag	Name: Error Type: ARRAY[0..7] OF BOOL Description: Array of working counter errors
Output Tag	Name: Flag Type: BOOL Description: Working counter error flag

User Interface Type	
TYPE MasterInfoStruct :	
STRUCT	
Error:	ErrorStruct;
FrameWorkingCnt:	MasterInfoFastStruct;
Deviceld:	UINT;
NetId:	T_AmsNetIdArr;
NetIdStr:	T_AmsNetId;
AddressError:	BOOL;
ChangeCount:	UINT;
DeviceStatus:	WORD;
DeviceError:	BOOL;
LinkError:	BOOL;
ResetRequired:	BOOL;
MissingFrame:	BOOL;
Watchdog:	BOOL;
DriverNotFound:	BOOL;
ResetActive:	BOOL;
NotAllInOp:	BOOL;
DcNotInSync:	BOOL;
SlaveCountActual:	UINT;
SlaveCountConfig:	UINT;
SlaveCountError:	BOOL;
DeviceState:	ECatCommStateEnum;
LostFrames:	UDINT;
FrameRate:	LREAL;
LostQueuedFrames:	UDINT;
QueuedFrameRate:	LREAL;
StatisticsError:	BOOL;
END_STRUCT	
END_TYPE	
Type Name	MasterInfoStruct
Description	Structure used in the user interface for a master (network interface)
Definition	STRUCT
Output Tag	Name: Error Type: ErrorStruct Description: Error handling
Output Tag	Name: FrameWorkingCnt Type: MasterInfoFastStruct Description: Frame working counters

Output Tag	Name: FrameWorkingCounterError Type: ARRAY[0..7] OF BOOL Description: Array of working counter errors
Output Tag	Name: FrameWorkingCounterFlag Type: BOOL Description: Working counter error flag
Output Tag	Name: DeviceId Type: UINT Description: Device ID (optional)
Output Tag	Name: NetId Type: T_AmsNetIdArr Description: AMS network address of master
Output Tag	Name: NetIdStr Type: T_AmsNetId Description: AMS network address of master in string form
Output Tag	Name: AddressError Type: BOOL Description: Address error (all zeroes)
Output Tag	Name: ChangeCount Type: UINT Description: Number to changes to the device image
Output Tag	Name: DeviceStatus Type: WORD Description: Device status (bit encoded)
Output Tag	Name: DeviceError Type: BOOL Description: Device error derived from the status
Output Tag	Name: LinkError Type: BOOL Description: A link error is detected
Output Tag	Name: ResetRequired Type: BOOL Description: A IO reset is required
Output Tag	Name: MissingFrame Type: BOOL Description: A missing frame in redundant mode
Output Tag	Name: Watchdog Type: BOOL Description: Watchdog has triggered

Output Tag	Name: DriverNotFound Type: BOOL Description: the network driver (miniport) was not found
Output Tag	Name: ResetActive Type: BOOL Description: A reset is active
Output Tag	Name: NotAllInOp Type: BOOL Description: Not all terminals are in OP mode
Output Tag	Name: DcNotInSync Type: BOOL Description: The distributed clock is out-of-synchronization
Output Tag	Name: SlaveCountActual Type: UINT Description: Number of actual slaves connected to the master
Output Tag	Name: SlaveCountConfig Type: UINT Description: Number of configured slaves in the master
Output Tag	Name: SlaveCountError Type: BOOL Description: A slave count error has been detected
Output Tag	Name: DeviceState Type: ECatCommStateEnum Description: The operational state of the master
Output Tag	Name: LostFrames Type: UDINT Description: The number of lost frames
Output Tag	Name: FrameRate Type: LREAL Description: The frame rate in Hz
Output Tag	Name: LostQueuedFrames Type: UDINT Description: The number of lost queued frames
Output Tag	Name: QueuedFrameRate Type: LREAL Description: The queued frame rate in Hz
Output Tag	Name: StatisticsError Type: BOOL Description: An error occurred in reading the frame statistics

Function Block FUNCTION_BLOCK MasterInfoFastFB VAR_INPUT Request: SaveRestoreEnum; MasterIn: MasterInfoFastInStruct; END_VAR VAR_IN_OUT Master: MasterInfoFastStruct; END_VAR	
Type Name	MasterInfoFastFB
Description	Function block used to process the fast master information
Definition	Function Block
Input Argument	Name: Request Type: SaveRestoreEnum Description: Request for save/restore/safe mode or noop
Input Argument	Name: MasterIn Type: MasterInfoFastInStruct Description: master info input structure
In/out Argument	Name: Master Type: MasterInfoFastStruct Description: User interface structure

Function Block FUNCTION_BLOCK MasterInfoFB VAR_INPUT Request: SaveRestoreEnum; MasterIn: MasterInfoInStruct; END_VAR VAR_IN_OUT Master: MasterInfoStruct; END_VAR	
Type Name	MasterInfoFB
Description	Function block used to process the master information
Definition	Function Block
Input Argument	Name: Request Type: SaveRestoreEnum Description: Request for save/restore/safe mode or noop
Input Argument	Name: MasterIn Type: MasterInfoInStruct Description: master info input structure
In/out Argument	Name: Master Type: MasterInfoStruct Description: User interface structure

Program Example:

```
(* Global variables *)
```

```
VAR_GLOBAL
```

```

    Device0:                MasterInfoStruct;
    Device0In               AT %IB*:  MasterInfoInStruct;
    Device0FB:              MasterInfoFB;
    Device0FastIn           AT %IB*:  MasterInfoFastInStruct;
    Device0FastFB:          MasterInfoFastFB;

    SaveRestore:            SaveRestoreFB;
    GotoSafe:               BOOL;
    Request:                 SaveRestoreEnum;

```

```
END_VAR
```

```
(* Call from fast task with 1 ms update rate *)
```

```
PROGRAM DeviceFast
```

```

    Device0FastFB (
        Request := Request,
        MasterIn := Device0FastIn,
        Master := Device0. FrameWorkingCnt);

```

```
END_PROGRAM
```

```
(* Call from standard task with 10 ms update rate *)
```

```
PROGRAM Device
```

```

    SaveRestore( SaveInterval := T#1m,
        GotoSafe := GotoSafe,
        Request => Request );
    Device0FB (
        Request := Request,
        MasterIn := Device0In,
        Master := Device0);

```

```
END_PROGRAM
```