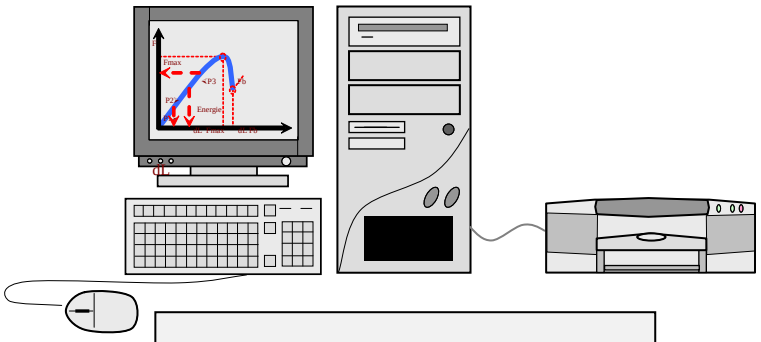
DoPE10
Documentation



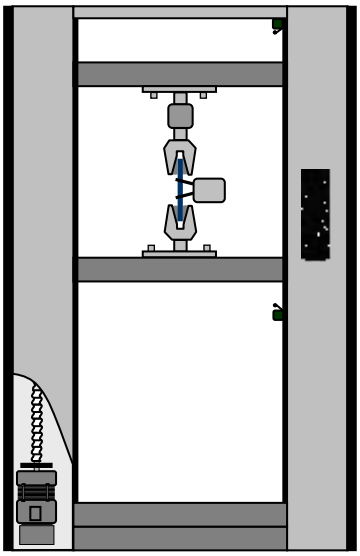
Application program

DoPE10 DLL

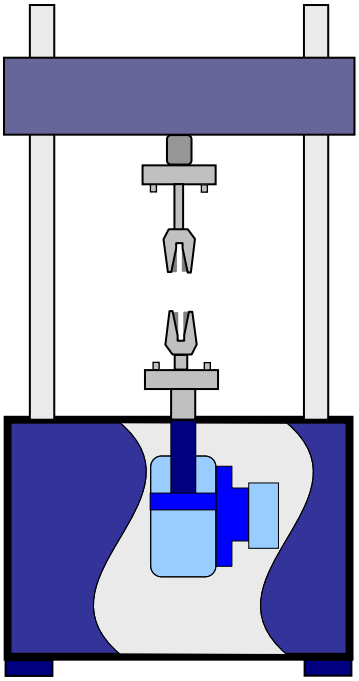
DPX safe protocol for USB and LAN

DPX safe protocol for USB and LAN

DOLI Sub System for Data acquisition and closed loop control for testing instruments



Power amplifier



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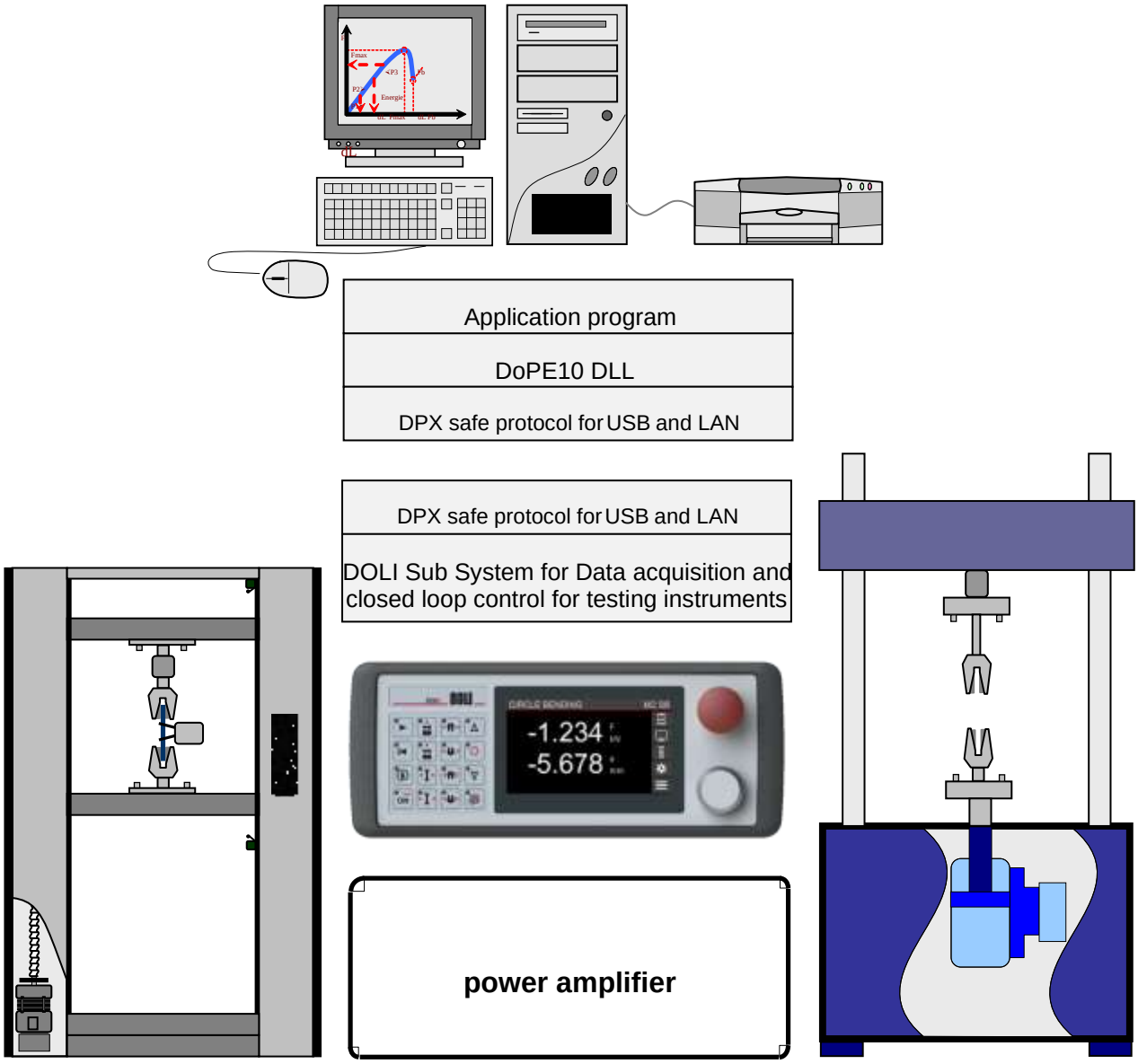
1 Overview

DOLI has very powerful software for data acquisition and closed loop control for testing instruments like tensile testers. This software runs on the DOLI EDCi hardware platform like EDCi50 (support for older hardware (EDC5 to EDC220V/580V) is discontinued). It is configurable within a wide range to satisfy all requirements at a testing instrument.

Communication between EDC and PC is handled by a communication layer, called DPX. DPX is a safe protocol and supports currently USB, and Ethernet (LAN) as transportation layer.

DoPE represents the interface to access all EDC-functions from any standard PC with Windows®.



1.1 Tasks of DoPE

- DoPE will initialize the EDC according to predefined set-up data, stored in EDC memory.
- DoPE provides the application program with measuring data in SI-units (N, m etc.)
- DoPE offers a wide range of machine control commands
  Simple commands like:
  „move Up in position control with 0.01 m/sec“
  Complex commands like:
  „move in position control with 0.02 m/sec to 500 N and keep 500 N in load control“
  Cycling commands like:
  „do 100 sinusoidal load cycles with an amplitude of 100N with 3 Hz“
- DoPE reports events like limit switch etc.

DoPE is available as a

- 32 Bit DLL for Windows /2000/XP/Vista/7/8/8.1/10
- 64 Bit Shared Object for x64 Linux
- ARMv6 Shared Object for Linux

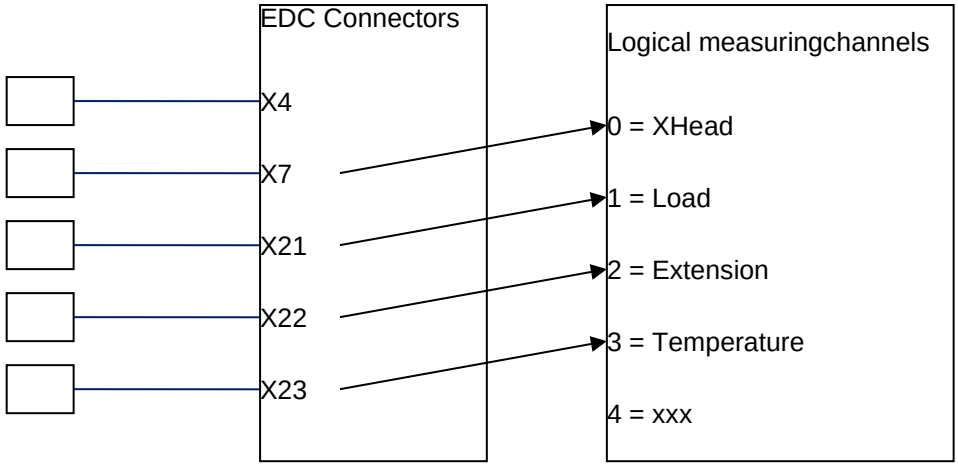
1.2 Initializing

The EDC firmware is able to handle up to:

- sixteen logical measuring channels
- sixteen logical analogue output channels
- ten logical Bit input devices
- ten logical Bit output devices

The above logical channels and devices must be assigned to physical interfaces. For assignment you just have to specify the connector number, the logical measuring channel and some transducer specific data.

Use DOLI InstallationCenter to edit all necessary set-up data.



All Set-up data will be stored in the EDC.

1.3 Supported programming languages

DoPE is delivered as a DLL running under Windows ® operating system. Each programming language that supports the use of DLL's can be used for the application program.

However, DOLI supplies only header files for "C", "Delphi/Pascal", and a .NET wrapper.

For these programming languages, simple sample programs are available.

Two DLL's are needed to use DoPE: DoPE10.DLL and DoDPX10.DLL. The .NET wrapper is placed in the DoPE10Net.DLL

2 Communication Principles

DoPE represents a library that uses functions inside the remote EDC-controller. Physically EDC and PC are connected via a standard communication port, like USB or LAN. A safe protocol is used for communication. This protocol, named DPX, detects ON/OFF-line transitions, transmits messages and measured data packets.

The user of DoPE must always be aware of the remote controller and due to this an asynchronous behavior of DoPE.

2.1 Open a connection

The application program establishes a connection by calling one of the **DoPEOpen...** functions. This function creates a thread with a priority depending on the priority of the application thread.

If the application thread has the priority THREAD_PRIORITY_NORMAL, DoPE thread will use the priority THREAD_PRIORITY_ABOVE_NORMAL.

If the application thread has the priority THREAD_PRIORITY_ABOVE_NORMAL, DoPE thread will use the priority THREAD_PRIORITY_TIME_CRITICAL.

The application thread should not start another thread with a higher priority than its own. Otherwise the communication with the EDC might be delayed. This will cause unpredictable problems.

By this mechanism it is safeguarded that DoPE and hence the communication with the EDC has always a higher priority than the application program.

2.2 Using Eventhandler

Whenever necessary, EDC will send a message, possibly with parameter to PC. There are many different reasons for such messages. E.g. if a positioning command has reached the destination, EDC will send a message to PC, reporting the destination has been reached.

To make it easy for the application program to get these messages, DoPE offers an event handler interface. For each event, the application program wants to process, an event handler must be installed. DoPE will call these event handlers, whenever the event occurs.

2.3 Transaction Number (TAN)

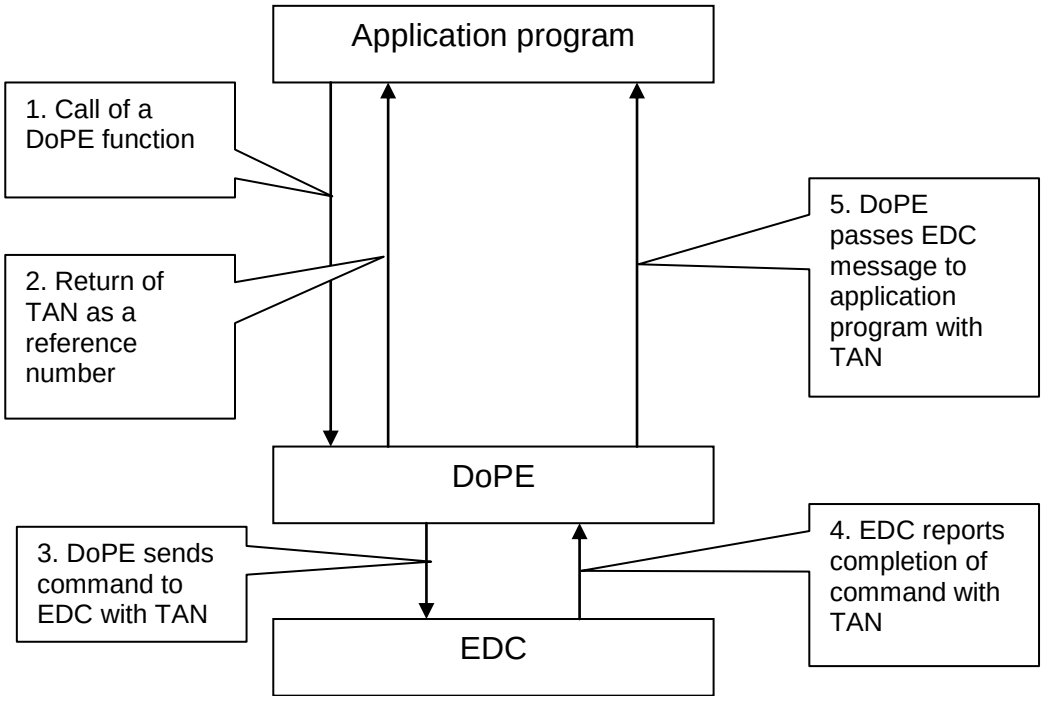
Some of the following commands have pointers to a transaction number (lpusTAN) as a parameter. This TAN may be used to identify messages, which are received asynchronously, to the command.

Example: A positioning command is sent to the EDC. After 30 seconds the desired position is reached and a message “position reached” is received. This message comes with the TAN of the positioning command.

The TAN is generated by DoPE for all commands, which may send a message later on.

Some DoPE commands will send more than one command to the EDC. In this case two pointers to transaction numbers are needed (lpusTANFirst, lpusTANLast). All messages with TAN’s between lpusTANFirst and lpusTANLast belong to this single DoPE command.

Of course to analyze the TAN is optional. If NULL-Pointers are passed, no TAN’s are returned.



3 Establish communication to EDC

3.1 DoPEOpenDeviceID / DoPEOpenFunctionID

Open the given DoPE link with a matching device or function ID. All USB and LAN communication ports are scanned, starting with USB. All LAN ports of the PC are included to the scan. The link parameters are set and the link is established. If DoPEOpenDeviceID / DoPEOpenFunctionID returns DoPERR_TIMEOUT, connection to the EDC did not go online. You must connect the EDC, switch it on and try the open function again. If the return code is DoPERR_VERSION an EDC went online but either the DoPE API version or the EDC type didn't match.
If the parameter DeviceID in DoPEOpenDeviceID is set to ZERO, DoPE will open communication to the first EDC that answers. This method is recommended for systems with only one EDC.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description
extern unsigned DLLAPI	DoPEOpenDeviceID / DoPEOpenFunctionID (	Function returns Error constant (DoPERR_xxxx)
unsigned	DeviceID/ FunctionID	EDC Device ID / Function ID
unsigned	RcvBuffers	Number of requested receiver buffers for messages.This number of messages can be stored inside DoPE until they are read with DoPEGetMsg function.
unsigned	XmitBuffers	Number of requested transmitter buffers for messages.This number of messages can be stored inside DoPE.They will be transmitted by DoPE to EDC.
unsigned	DataBuffers	Number of requested data buffers.The measuring data record will be stored inside DoPE in a circular buffer. If data are not read with DoPEGetData the oldest record will be overwritten!
unsigned	APIVersion	DoPE API version used by the DoPE user.
void	*Reserved	Reserved for future use
DoPE_HANDLE	DoPEHdl	Pointer to memory for DoPE link handle **This handle has to be used for all further DoPE commands as a reference for this link.**

.NET <Edc object> = new Edc(DoPE.OpenBy.DeviceId/FunctionId, 0);

3.2 DoPEwOpenAll

Open all available DoPE links and fill the open link info table. All USB and LAN communication ports are scanned, starting with DoPEPORT_USB. All LAN ports of the PC are included to the scan.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration			Description
extern unsigned DLLAPI		DoPEwOpenAll (	Function returns Error constant (DoPERR_xxxx)
	unsigned	RcvBuffers	Number of requested receiver buffers for messages.This number of messages can be stored inside DoPEuntilthey are read with DoPEGetMsg function.
	unsigned	XmitBuffers	Number of requested transmitter buffers for messages.This number of messages can be stored inside DoPE.They will be transmitted by DoPE to EDC.
	unsigned	DataBuffers	Number of requested data buffers.The measuring data record will be stored inside DoPE in a circular buffer. If data are not read with DoPEGetData the oldest record will be overwritten!
	unsigned	APIVersion	DoPE API version used by the DoPE user.
	void	*Reserved	Reserved for future use
	unsigned	InfoTableMaxEntries	Number of entries that can be stored to the info table.
	unsigned	*InfoTableValidEntries	Pointer to storage for the number of valid entries in the info table.
	DoPEwOpenLinkInfo	InfoTable[ ])	Infotable will be filled by with all detected EDC's

```
typedef struct
{
  DoPE_HANDLE     DoPEHdl;
  unsigned        PortType;              /* DoPEPORT_USB or DoPEPORT_LAN    */
  DoPE_wPORTINFO  PortInfo;
  DoPEwModuleInfo ModuleInfo;
} DoPEwOpenLinkInfo;
```

.NET <EdcList object> = new EdcList(int MaximumNumberOfEdcs)

3.3 DoPEwCloseAll

Close all DoPE links previously opened by DoPEwOpenAll.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration			Description
extern unsigned DLLAPI		DoPECloseAll (	Function returns Error constant (DoPERR_xxxx)
	unsigned	InfoTableValidEntries	Number of valid entries in the info table.
	DoPEOpenLinkInfo	InfoTable[ ])	Info table containing valid DoPE handles for all links to close. All DoPE handles in the InfoTable are set to NULL.
extern unsigned DLLAPI		DoPEwCloseAll (	Function returns Error constant (DoPERR_xxxx)
	unsigned	InfoTableValidEntries	Number of valid entries in the info table.
	DoPEwOpenLinkInfo	InfoTable[ ])	Info table containing valid DoPE handles for all links to close. All DoPE handles in the InfoTable are set to NULL.

.NET <EdcList object>.Dispose()

3.4 DoPEwPortInfo / DoPEwCurrentPortInfo

Get the port information for PC-communication ports (USB, LAN)

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEwPortInfo (unsigned Port, unsigned First, DoPE_wPORTINFO *pPortInfo)	Function returns Error constant (DoPERR_xxxx) (DPXERR_BADPORT if no more port info is available) Communication Port Type. (DoPEPORT_USB, DoPEPORT_LAN) != 0: get the first port information == 0: get the next port information pointer to port info structure

.NET RdPortInfo(DoPE.Port Port, bool First, ref DoPE.PortInfo PortInfo)

Get the current port informationof an established link

Function declaration	Description
extern unsigned DLLAPI DoPECurrentPortInfo (DoPE_HANDLE DoPEHdl, DoPE_PORTINFO *pPortInfo)	Function returns Error constant (DoPERR_xxxx) DoPE link handle pointer to port info structure
extern unsigned DLLAPI DoPEwCurrentPortInfo (DoPE_HANDLE DoPEHdl, DoPE_wPORTINFO *pPortInfo)	Function returns Error constant (DoPERR_xxxx) DoPE link handle pointer to port info structure

```
typedef struct
{
  unsigned  Ix;                       /* Device index                    */
  wchar_t   Name[DoPE_PORTNAMELEN];   /* Device name                     */
  unsigned  PortType;                 /* DoPEPORT_USB or DoPEPORT_LAN    */
  MAC       NicMAC;                   /* NIC address                     */
} DoPE_wPORTINFO;
```

.NET <EdcList object>.PortInfo

3.5 DoPECloseLink

Close the link and free all allocated memory.
After this call DoPEHdl is invalid and all further calls with this DoPEHdl will return with an error.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPECloseLink (DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle

.NET <Edc object>.Dispose()

4 Message and Data handling

4.1 DoPECurrentData

Get current samples from receiver buffer. DoPE receives measuring data in an adjustable time scale. The data record is stored inside DoPE in a circular buffer. You can read the latest data record with this function. For definition of DoPEData record refer to Page 133.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPECurrentData(DoPE_HANDLE DoPEHdl, DoPEData *Sample)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to storage for data record.
.NET <Edc object>.Data.CurrentData(ref DoPE.Data Sample)	

4.2 DoPEClearReceiver

Discard all received messages. If you want to get rid of old messages, that are of no interest any more, use this command.	
Function declaration	**Description**
extern unsigned DLLAPI DoPEClearReceiver (DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle
.NET not available	

4.3 DoPEClearTransmitter

Discard all unsent transmitter buffers	
Function declaration	**Description**
extern unsigned DLLAPI DoPEClearTransmitter (DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle
.NET not available	

4.4 DoPEGetErrors

Get current error counter values. DoPE counts all sort of communication errors. You may read these errors by using this command.
The DoPEError-structure contains several communication error counters. Whenever an error is detected, the appropriate counter is increased by one. This error counters are useful to analyze communication problems.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEGetErrors(DoPE_HANDLE DoPEHdl, DoPEError * Error)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to buffer for error counters
typedef struct { unsigned Overrun; unsigned InvACK; unsigned NoBuffer; unsigned BccErr; unsigned MwError; } DoPEError;	Error counters DoPE link handle LAN Packet Overrun errors Invalid ACKs received No receiver buffer available Checksum error Invalid sample encoding

.NET not available

4.5 DoPEClearErrors

Clear current error counter values.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEClearErrors(DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle

.NET not available

4.6 DoPEGetState

Get state information structure.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEGetState (DoPE_HANDLE DoPEHdl DoPEState *Status)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to buffer for state information
typedef struct { unsigned ComState; unsigned RcvBuffer; unsigned XmitBuffer; } DoPEState; **Constants for ComState** COM_STATE_OFF COM_STATE_OFFLINE COM_STATE_INITCYCLE COM_STATE_ONLINE	 Communication state Number messages in receive queue Number of messages to be transmitted Link is disabled Link is offline Link is initializing Link is established and Online

.NET not available

5 Movement commands

DoPE provides several commands for moving the cross head of a machine. The movement may be in different control modes, such as position, load or extension control. There are simple commands like move up, or down with a certain speed without explicit destination, or commands with a given destination. Furthermore DoPE supplies commands with a destination in another control channel such as go in position control to a load destination, and cyclic commands.

For most of the movement commands DoPEprovides a command that uses default acceleration e.g. DoPEPos and another where acceleration and deceleration are specified in the command e.g. DoPEPos_A.

After a movement has been finished, the event OnPosMsg will be activated.

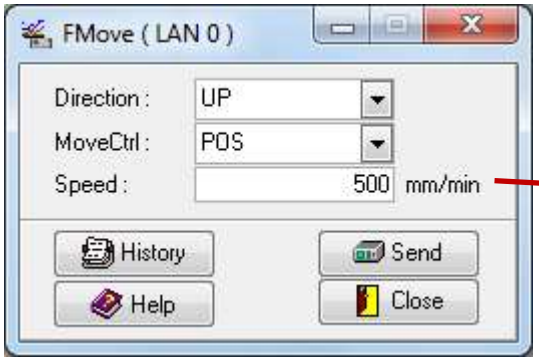
A new movement command terminates an active movement command.

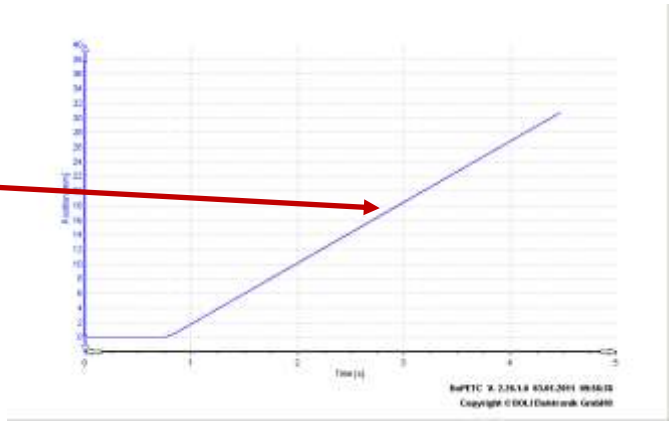
5.1 Simple movement commands

5.1.1 DoPEFMove, DoPEFMove_A

Move crosshead in the specified control mode and speed UP or DOWN. As an implicit limit of this command, softend's are used, if active.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00



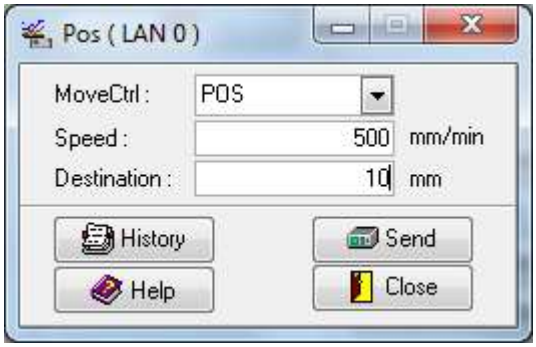


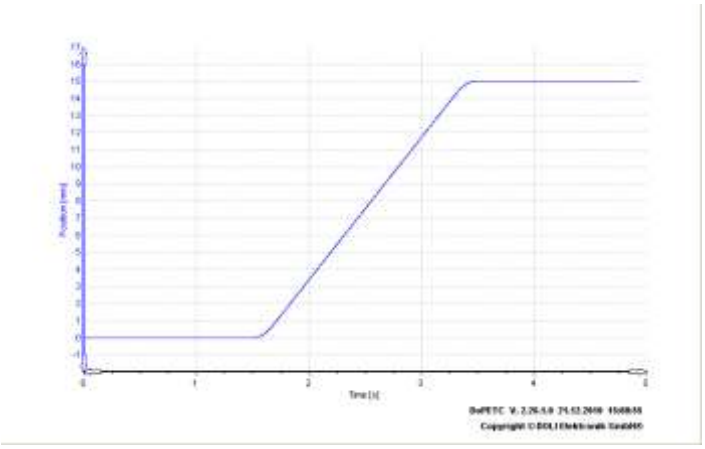
Function declaration	Description	Unit
extern unsigned DLLAPI DoPEFMove(DoPE_HANDLE DoPEHdl, unsigned short Direction, unsigned short MoveCtrl, double Speed, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Direction of movement Control mode ofmovement (CTRL_xxx) Speed for movement Pointer to transaction number.	 Unit/s
.NET <Edc object>.Move. FMove(DoPE.MOVE Direction, DoPE.CTRL MoveCtrl, Double Speed, ref Int16 Tan)		
extern unsigned DLLAPI DoPEFMove_A(DoPE_HANDLE DoPEHdl, unsigned short Direction, unsigned short MoveCtrl, double Acc double Speed, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Direction of movement Control mode of movement(CTRL_xxx) Acceleration Speed for movement Pointer to transaction number.	 Unit/s² Unit/s
.NET <Edc object>.Move.FMove_A(DoPE.MOVE Direction, DoPE.CTRL MoveCtrl, Double Acc, Double Speed, ref Int16 Tan)		

5.1.2 DoPEPos, DoPEPos_A

Move cross-head in the specified control mode and speed to the given destination.
DoPEPos will use the default acceleration while DoPEPos_A uses the given acceleration.

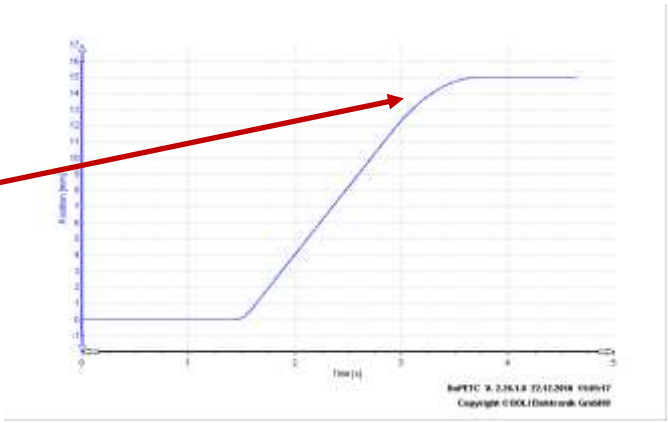
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEPos (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl,	DoPE link handle	
unsigned short	MoveCtrl,	Control mode (CTRL_xxx)	
double	Speed,	Speed for movement	Unit/s
double	Destination	Final destination	Unit
unsigned short *	lpusTAN);	Pointer to transaction number.	

.NET <Edc object>.Move.Pos(DoPE.CTRL MoveCtrl, Double Speed, Double Destination, ref Int16 Tan)



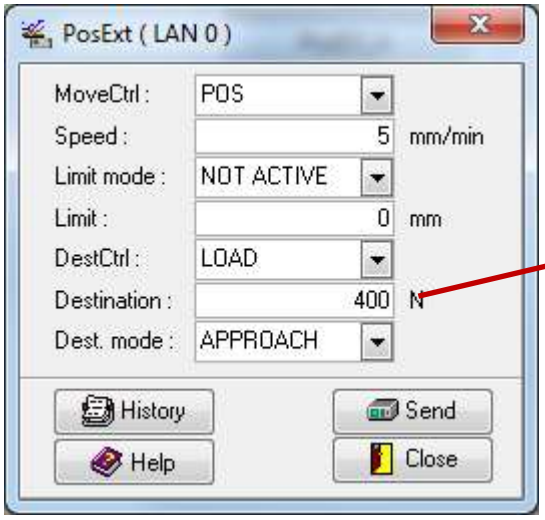
Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEPos_A (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl,	DoPE link handle	
unsigned short	MoveCtrl,	Control mode (CTRL_xxx)	
double	Acc	Acceleration	Unit/s²
double	Speed,	Speed for movement	Unit/s
double	Dec	Deceleration	Unit/s²
double	Destination	Final destination	Unit
unsigned short *	lpusTAN);	Pointer to transaction number.	

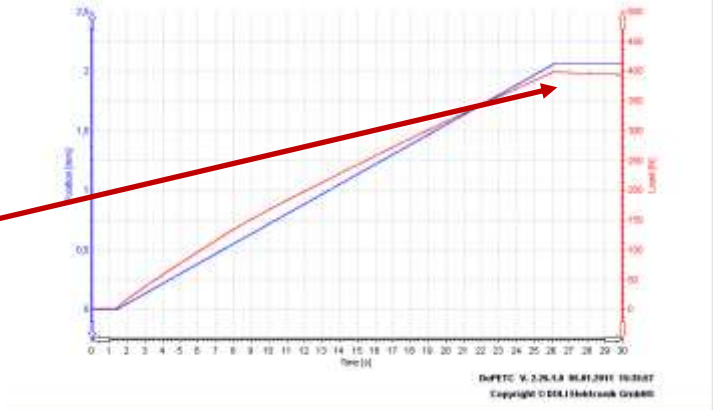
.NET <Edc object>.Move.Pos_A(DoPE.CTRL MoveCtrl, Double Acc, Double Speed, Double Dec, Double Destination, ref Int16 Tan)

5.1.3 DoPEPosExt, DoPEPosExt_A

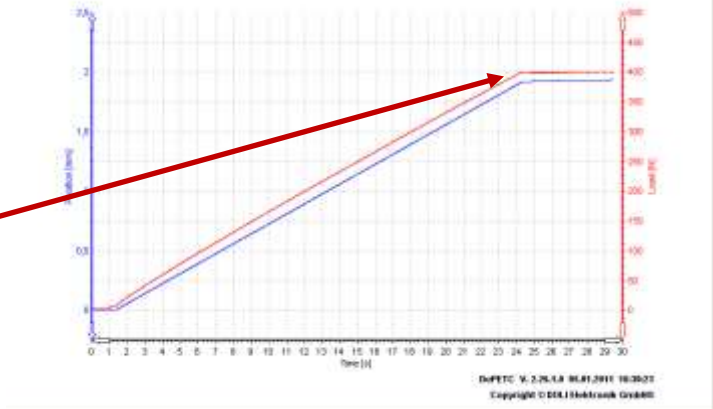
Move cross-head in the specified control mode ‘MoveCtrl’ and ‘Speed’ to the given ‘Destination’.
‘DestinationCtrl’ may be different to ‘MoveCtrl’. Default acceleration and deceleration will be used.
The Parameter ‘DestinationMode’ specifies how to reach destination position and the action after reaching it.
In case the limit position is reached before destination position, cross-head will be halted in ‘MoveCtrl’ at limit position.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

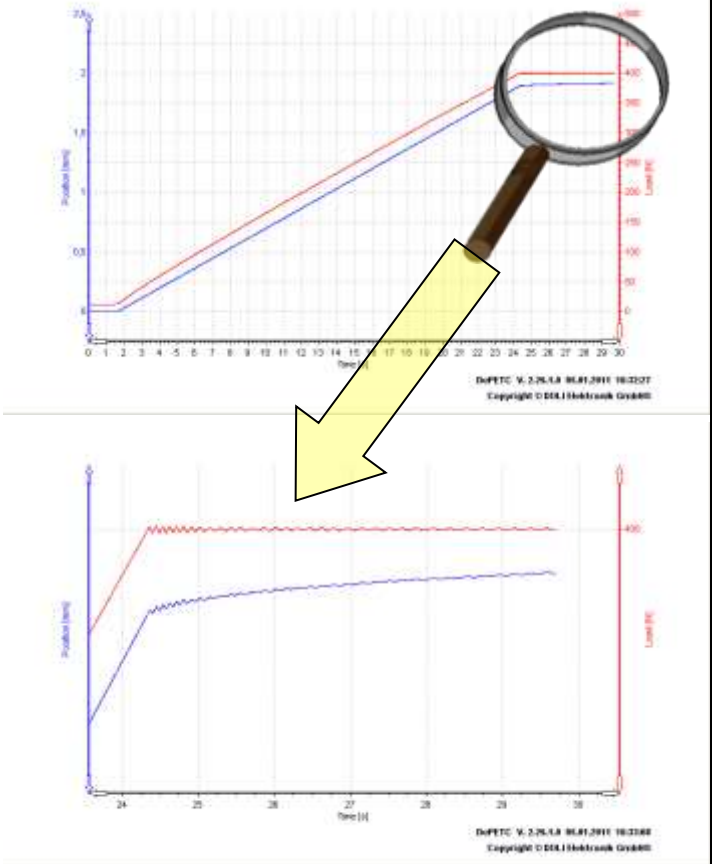




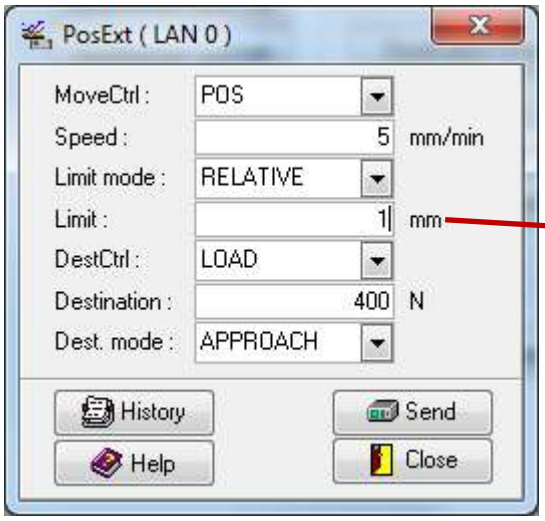
Halt in position control after load destination is reached.
Due to specimen relaxation, load will decrease!

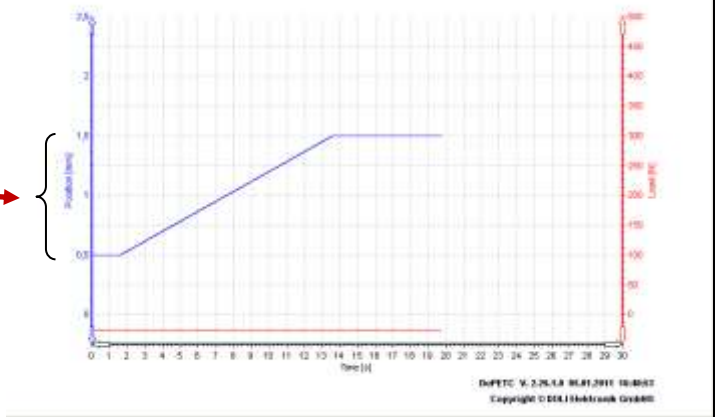


Switch to load control just before load destination is reached. Load is kept constant, position is increasing, due to specimen relaxation.

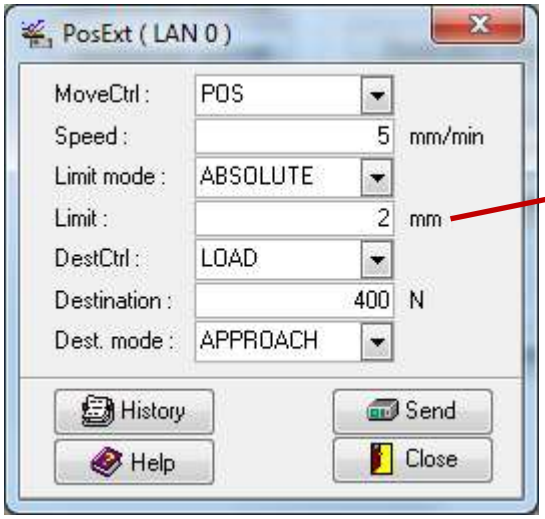


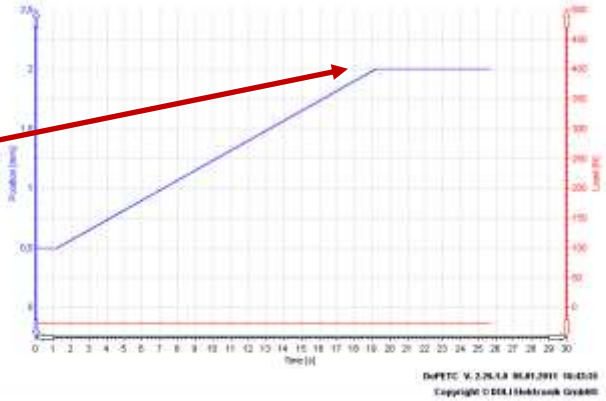
Halt in position control after load destination is reached and maintain this load destination in position control.





Load destination cannot be reached after 1 mm relative movement. Movement command is terminated.





Load destination cannot be reached after the absolute position of 2mm is reached. Movement command is terminated.

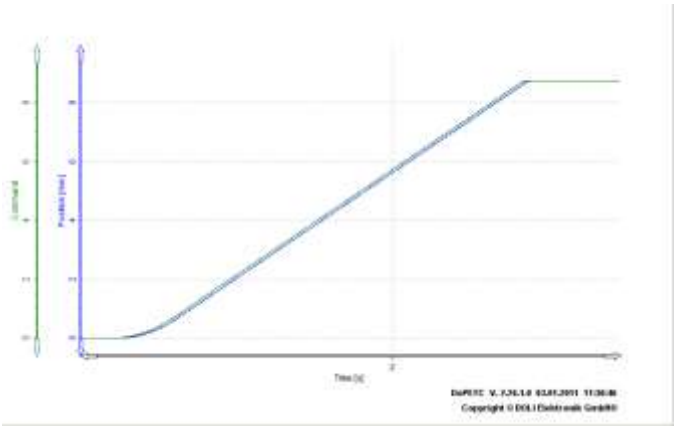
Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEPosExt (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl,	DoPE link handle	
unsigned short	MoveCtrl,	Control mode (CTRL_xxx)	
double	Speed,	Speed for movement	Unit/s
unsigned short	LimitMode,	**LIMIT_ABSOLUTE**: Limit is a absolute position **LIMIT_RELATIVE**: Limit is a distance (relative) position **LIMIT_NOT_ACTIVE**: No Limit is active	
double	Limit,	Limit position in case Destination cannot be reached	Unit
unsigned short	DestinationCtrl,	Channel definition for destination (CTRL_xxx)	
double	Destination	Final destination	Unit
unsigned short	DestinationMode,	**DEST_APPROACH**: Halt after reaching destination, do not change control mode. **DEST_POSITION**: Switch to 'DestinationCtrl'just before 'Destination' is reached. Thenmove to 'Destination'. **DEST_MAINTAIN**: No change of control mode at destination but maintain destination in 'MoveCtrl'mode.	
unsigned short *	lpusTAN);	Pointer to transaction number.	
.NET	<Edc object>.Move.PosExt(DoPE.CTRL MoveCtrl, Double Speed, DoPE.LIMITMODE LimitMode, Double Limit, DoPE.CTRL DestinationCtrl, Double Destination, DoPE.DESTMODE DestinationMode, ref Int16 Tan)		
extern unsigned DLLAPI	DoPEPosExt_A (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl,	DoPE link handle	
unsigned short	MoveCtrl,	Control mode (CTRL_xxx)	
double	Acc,	Acceleration	Unit/s²
double	Speed,	Speed for movement	Unit/s
double	DecLimit,	Deceleration at Limit	Unit/s²
unsigned short	LimitMode,	**LIMIT_ABSOLUTE**: Limit is a absolute position **LIMIT_RELATIVE**: Limit is a distance (relative) position **LIMIT_NOT_ACTIVE**: No Limit is active	
double	Limit,	Limit position in case Destination cannot be reached	Unit
unsigned short	DestinationCtrl,	Channel definition for destination (CTRL_xxx)	
double	DecDestination,	Deceleration at Limit	Unit/s²
double	Destination	Final destination	Unit
unsigned short	DestinationMode,	**DEST_APPROACH**: Halt after reaching destination, do not change control mode. **DEST_POSITION**: Switch to 'DestinationCtrl'just before 'Destination' is reached. Thenmove to 'Destination'. **DEST_MAINTAIN**: No change of control mode at destination but maintain destination in'MoveCtrl'mode.	
unsigned short *	lpusTAN);	Pointer to transaction number.	
.NET	<Edc object>.Move.PosExt_A(DoPE.CTRL MoveCtrl, Double Acc, Double Speed, Double DecLimit, DoPE.LIMITMODE LimitMode, Double Limit, DoPE.CTRL DestinationCtrl, Double DecDestination, Double Destination, DoPE.DESTMODE DestinationMode, ref Int16 Tan)		

5.2 Halt commands

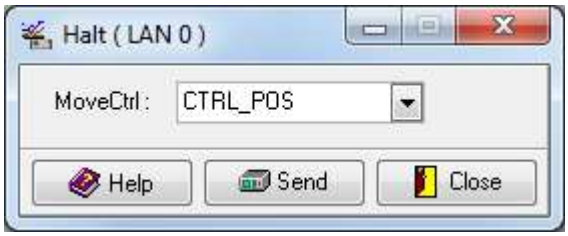
5.2.1 DoPEHalt, DoPEHalt_A

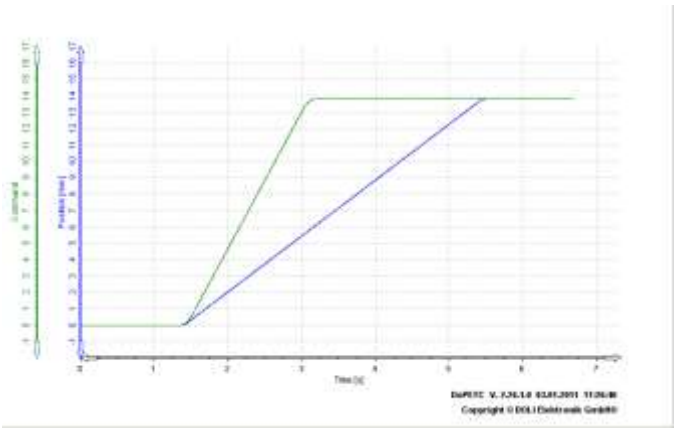
HALT is understood as a deceleration from current speed to speed zero. This is done by the build in position generator. If not specified by the halt command default deceleration will be used. The final destination position cannot be specified, it depends on current speed and deceleration.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00



DoPEHalt will terminate a current moving command. The Command will be decelerated to ZERO speed.





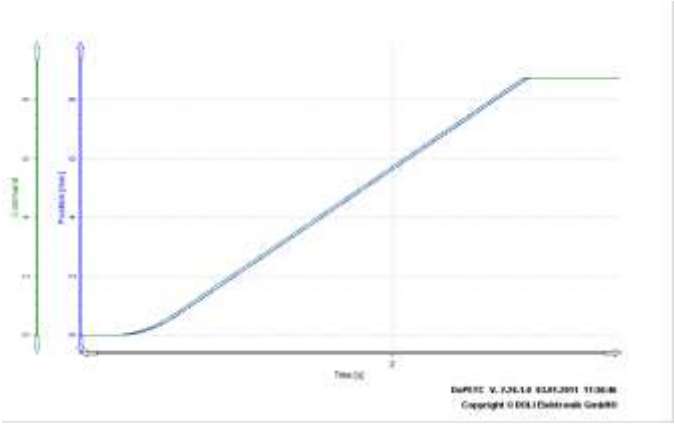
The machine cannot follow the desired speed.
(nominal speed in set-up is too high)
Command will be decelerated to ZERO speed.
After the command has decreased speed to zero, the machine is still moving, until the command position has been reached.

Function declaration	Description	Unit
extern unsigned DLLAPI DoPEHalt(DoPE_HANDLE DoPEHdl, unsigned short MoveCtrl, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Pointer to transaction number.	
.NET <Edc object>.Move.Halt(DoPE.CTRL MoveCtrl, ref Int16 Tan)		
extern unsigned DLLAPI DoPEHalt_A(DoPE_HANDLE DoPEHdl, unsigned short MoveCtrl, double Dec unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode of movement (CTRL_xxx) Deceleration Pointer to transaction number.	Unit/s²
.NET <Edc object>.Move.Halt_A(DoPE.CTRL MoveCtrl, Double Dec, ref Int16 Tan)		

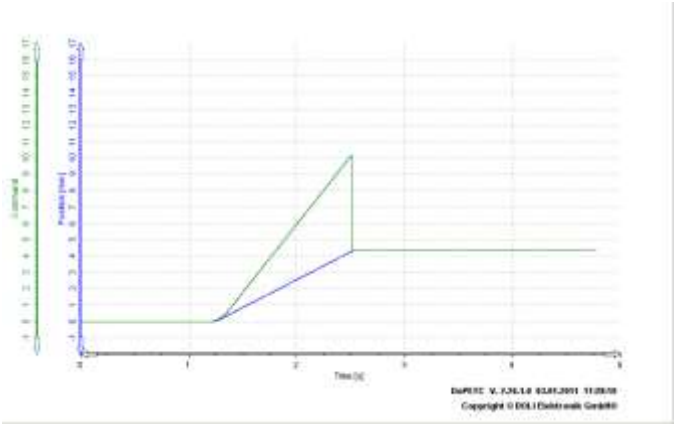
5.2.2 DoPESHalt

Instant Halt of cross-head in position control mode. If needed, the control mode is changed to position control. Before decelerating with default deceleration, the command is set to the current position.
This is the fastest method to halt the machine in position control.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00



DoPESHalt will terminate a current moving command.
If nominal speed is set correctly, there is no difference to DoPEHalt command.



The machine cannot follow the desired speed.
(nominal speed in set-up is too high)
Command will be set to current position and then decelerated to ZERO speed.

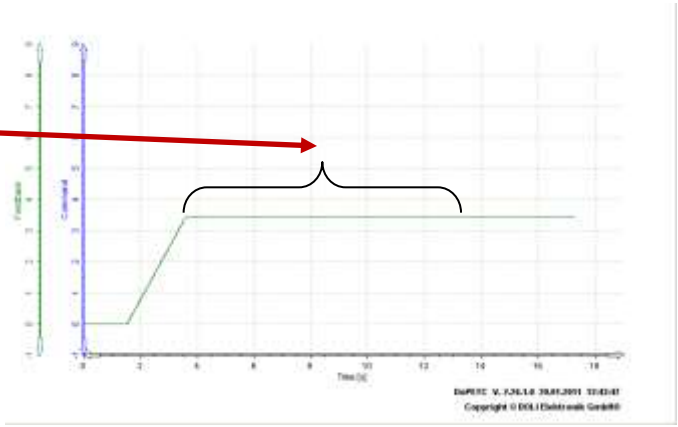
Function declaration	Description	Unit
extern unsigned DLLAPI DoPESHalt(DoPE_HANDLE DoPEHdl, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to transaction number.	

.NET <Edc object>Move.SHalt(ref Int16 Tan)

5.2.3 DoPEHaltW, DoPEHaltW_A

Decelerate from current speed to speed zero and wait delay time. After delay time has expired, the command has finished and a position reached message is generated.
This command is only useful inside a combined movement command.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00



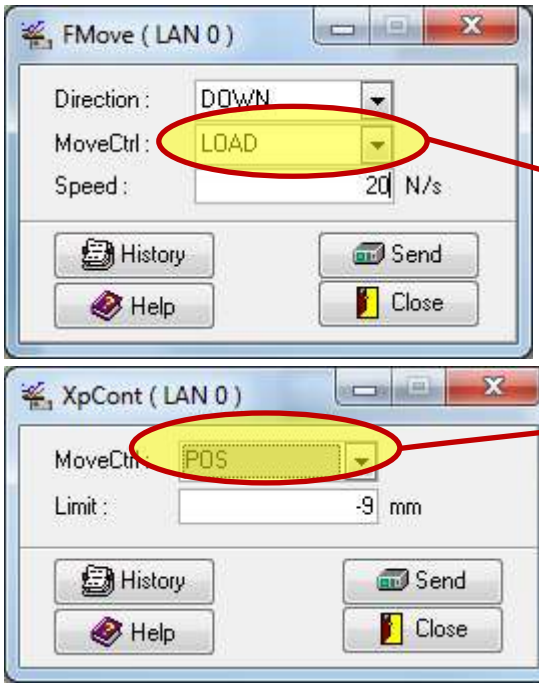
DoPEHalt will terminate a current moving command. The message, indicating the end of this command will be delayed. (here 10 seconds)

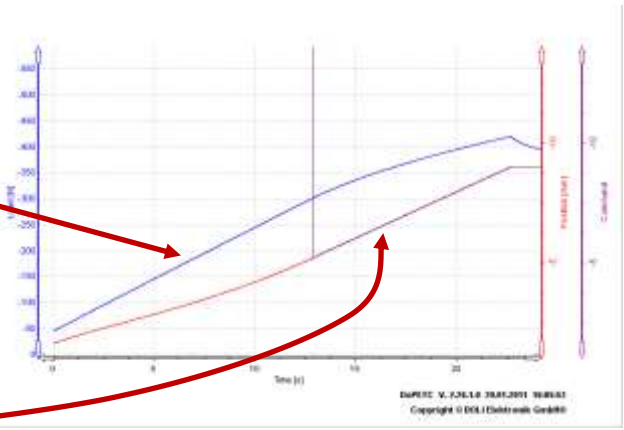
Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEHaltW(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl,	DoPE link handle	
unsigned short	MoveCtrl,	Control mode (CTRL_xxx)	
double	Delay	Delay time	s
unsigned short *	lpusTAN);	Pointer to transaction number.	
.NET	<Edc object>.Move.HaltW(DoPE.CTRL MoveCtrl, Double Delay, ref Int16 Tan)		
extern unsigned DLLAPI	DoPEHaltW_A(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl,	DoPE link handle	
unsigned short	MoveCtrl,	Control mode of movement (CTRL_xxx)	
double	Dec	Deceleration	Unit/s²
double	Delay	Delay time	s
unsigned short *	lpusTAN);	Pointer to transaction number.	
.NET	<Edc object>.Move.HaltW_A(DoPE.CTRL MoveCtrl, Double Dec, Double Delay, ref Int16 Tan)		

5.2.4 DoPEXpCont

Change control mode and continue movement in the new control mode with the current speed.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





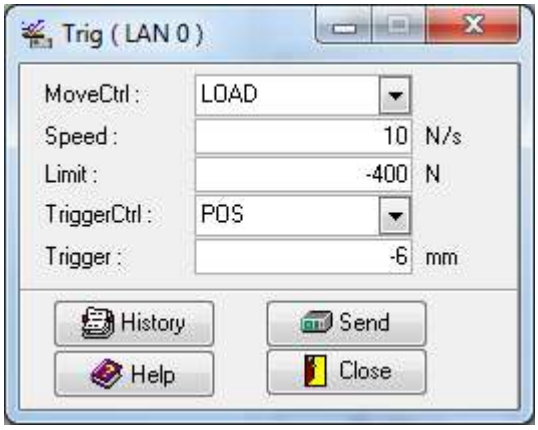
Machine is moving in load control with 20 N/s. At about 17 s, the DoPEXpCont command switches to position control, and continues with the current speed in position. After reaching the Limit position, the command is terminated.

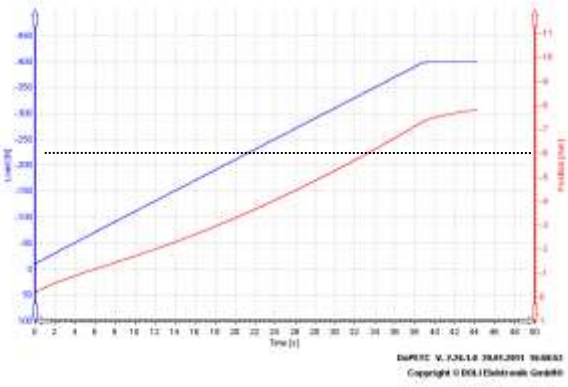
Function declaration	Description	Unit
extern unsigned DLLAPI DoPEXpCont(DoPE_HANDLE DoPEHdl, unsigned short MoveCtrl, double Limit unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Limit position Pointer to transaction number.	 Unit
.NET <Edc object>.Move.XpCont(DoPE.CTRL MoveCtrl, Double Limit, ref Int16 Tan)		

5.2.5 DoPETrig, DoPETrig_A

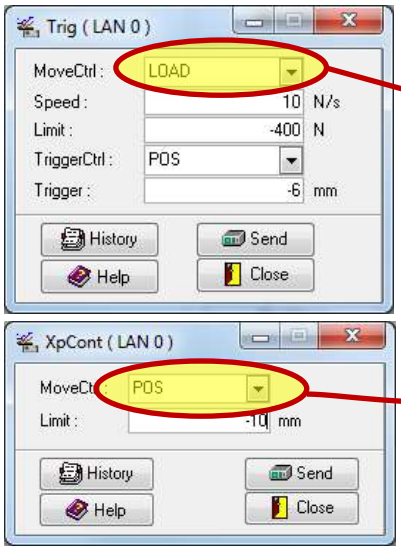
Move cross-head with the specified speed to the limit position. If the trigger position is reached a message will be transmitted and if used inside a combined moving sequence, the next command is activated.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





Move in load control with 10 N/s to -400N. A trigger message is generated at -6mm position. Upon this, the PC program may send another e.g. moving command.



The DoPETrig command can be used inside a combined moving command. Upon reaching -6mm, the next command will be automatically started. Here go with the current speed in position to -10mm.

Function declaration	Description	Unit
extern unsigned DLLAPI DoPETrig(DoPE_HANDLE DoPEHdl, unsigned short MoveCtrl, double Speed, double Limit, unsigned short TriggerCtrl, double Trigger, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Speed for movement Limit position in case Destination cannot be reached Control mode for trigger channel(CTRL_xxx) Trigger level Pointer to transaction number.	 Unit/s
.NET <Edc object>.Move.Trig(DoPE.CTRL MoveCtrl, Double Speed, Double Limit, DoPE.CTRL TriggerCtrl, Double Trigger, ref Int16 Tan)		
extern unsigned DLLAPI DoPETrig_A(DoPE_HANDLE DoPEHdl, unsigned short MoveCtrl, double Acc, double Speed, double Dec, double Limit,	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Acceleration Speed for movement Deceleration Limit position in case Destination cannot be reached	 Units/s² Unit/s Units/s²

unsigned short TriggerCtrl, double Trigger, unsigned short * lpusTAN);	Control mode for trigger channel(CTRL_xxx) Trigger level Pointer to transaction number.	
.NET <Edc object>.Move.Trig_A(DoPE.CTRL MoveCtrl, Double Acc, Double Speed, Double Dec, Double Limit, DoPE.CTRL TriggerCtrl, Double Trigger, ref Int16 Tan)		

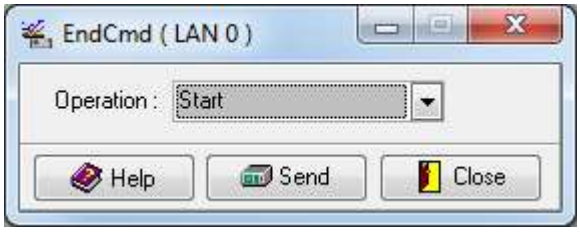
5.3 Combined movement commands

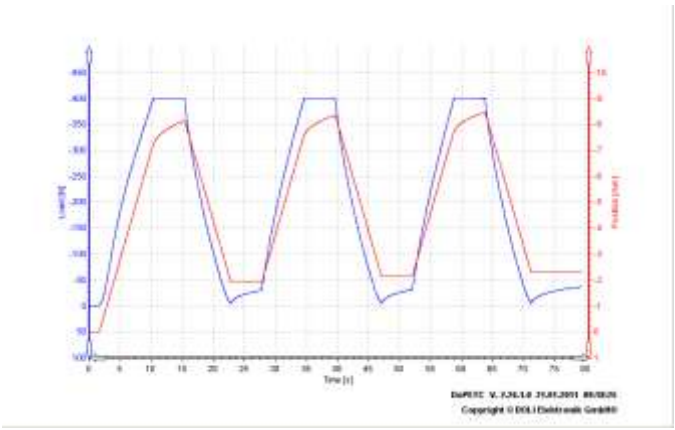
5.3.1 DoPEBlockHeader, DoPEBlockExecute

All simple moving commands can be used inside a combined movement command. The combined movement command starts with DoPEBlockHeader and ends with DoPEBlockExecute.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00


```
DoPEPosExt(CTRL_POS, 0.833, LIMIT_RELATIVE, 10,
           CTRL_LOAD, -400, DEST_POSITION);
DoPEHaltW(CTRL_LOAD, 5);
DoPEPosExt(CTRL_POS, 0.833, LIMIT_RELATIVE, 10,
           CTRL_LOAD, -5, DEST_APPROACH)
DoPEHaltW(CTRL_POS, 5);
```





Repeat following sequence 3 times:

1. Go in position control with 8.33 mm/s (50 mm/min) to -400N and switch to load control.
2. Keep load for 5 seconds.
3. Go in position control with 8.33 mm/s (50 mm/min) to -5N and halt in position control.
4. Keep position for 5 seconds.

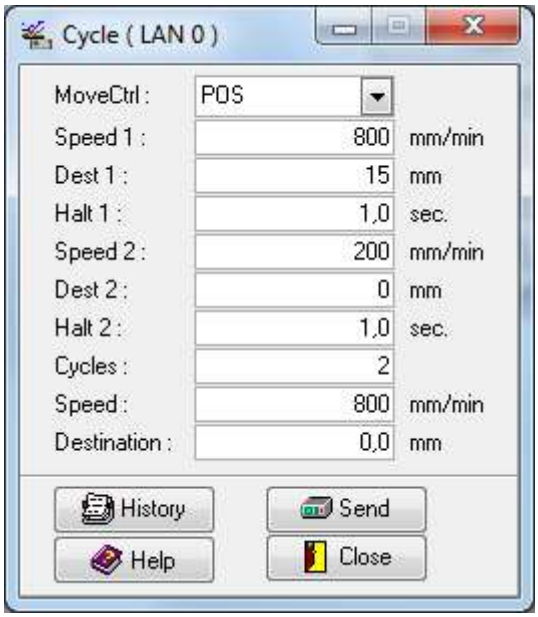
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPEBlockHeader (DoPE_HANDLE DoPEHdl, unsigned long Cycles, unsigned short ModeFlags);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Number of cycles to be done Flags. Both flags may be 'ored'. **CMD_DWND**: Supervise destination window. Next command is started after the current reaches its destination window. Otherwise the next command is started, after the command value reaches its destination **CMD_MESSAGE**: Report intermediate destinations. For each single command a message (OnTPos) is sent after it was finished. After the last command in the sequence is finished a message (OnPos) is always sent.	
.NET <Edc object>.Block. Header(Int32 Cycles, DoPE.CMD_MODE ModeFlags)		
extern unsignedDLLAPI DoPEBlockExecute(DoPE_HANDLE DoPEHdl, unsigned short Operation, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle CMD_START: Start the command sequence. CMD_DISCARD: Discard the command sequence. Pointer to transaction number.	
.NET <Edc object>.Block.Execute(DoPE.CMD_OPERATION Operation, ref Int16 Tan)		

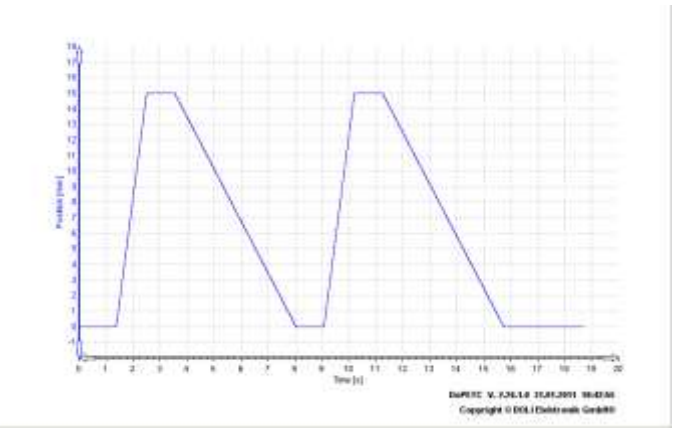
5.4 Complex moving commands

5.4.1 DoPECycle

Cycle movement using ramps.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





Go with 800mm/min to 15mm, Halt 15mm for 1 second, go with 200mm/min to 0mm and halt 0mm for 1 second.

Repeat this sequence two times.

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPECycle(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
double	Speed1	Speed to reach destination 1	Unit/s
double	Dest1	Destination 1	Unit
double	Halt1	Halt time at destination 1	s
double	Speed2	Speed to reach destination 2	Unit/s
double	Dest2	Destination 2	Unit
double	Halt2	Halt time at destination 2	s
unsigned long	Cycles	Number of cycles	
double	Speed	Speed to final destination	Unit/s
double	Destination	Final destination	Unit
unsigned short *	lpusTAN	Pointer to transaction number.	

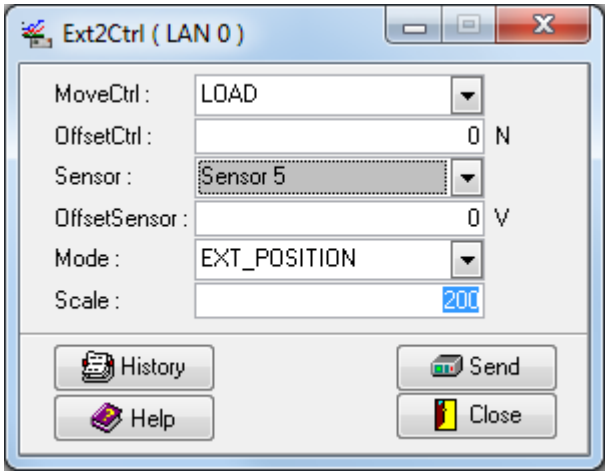
.NET <Edc object>.Move.Cycles(DoPE.CTRL MoveCtrl, Double Speed1, Double Dest1, Double Halt1, Double Speed2, Double Dest2, Double Halt2, Int32 Cycles, Double Speed, Double Destination, ref Int16 Tan)

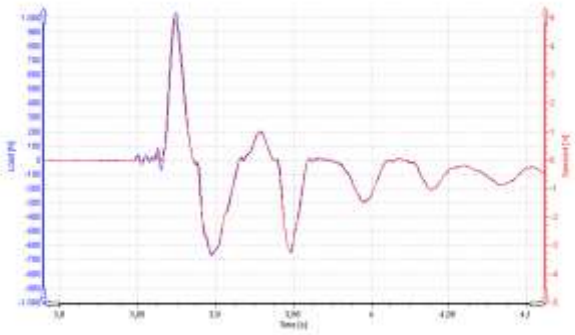
5.4.2 DoPEExt2Ctrl

Move cross-head according to an external command signal. You may supply a random function to an A/D converter and specify movement according to this random function. Scaling of the command- and sensor-system is done by offsets and scale. Following formula is used:

$$Output = (externalCommandValue - OffsetSensor) \bullet Scale + OffsetCtrl$$

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





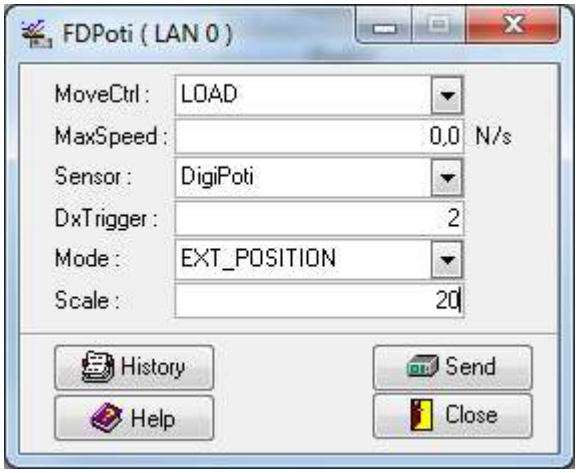
Follow external signal at Sensor4 in load control.
0V at Sensor4 will be 0N,
10V at Sensor4 will be 2000N.

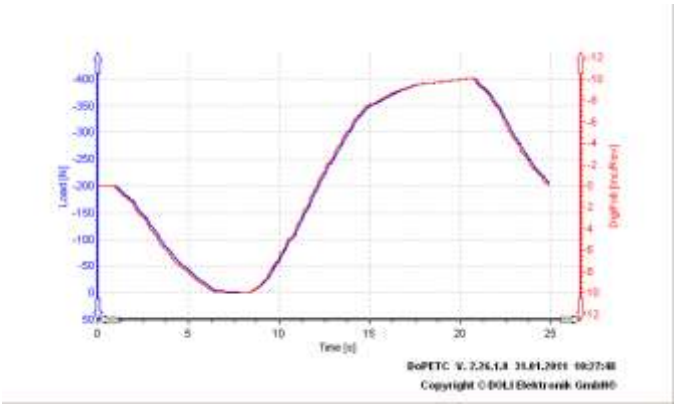
Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEExt2Ctrl (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
double	OffsetCtrl	Offset for position, load or extension	Unit
unsigned short	SensorNo	Sensor number for the external command signal	
double	OffsetSensor	Offset for external command signal	
unsigned short	Mode	various position or speed control modes (see next page)	
double	Scale	Scaling factor for external command signal Scale = 1 for POSITION mode: Nominal value of external command (e.g. 10V, or 1 round of a encoder) represents one unit of the control channel (e.g. 1mm, or 1N, or 1kN) Scale = 1 for SPEED mode: Nominal value of external command (e.g. 10V, or 1 round of a encoder) represents nominal speed of the control channel (e.g. 20mm/s, or 100kN/s) Scale = 1 for OPENLOOP mode: Nominal value of external command (e.g. 10V, or 1 round of a encoder) represents 100% output	
unsigned short *	lpusTAN)	Pointer to transaction number.	
.NET	<Edc object>.Move.Ext2Ctrl(DoPE.CTRL MoveCtrl, Double OffsetCtrl, DoPE.SENSOR SensorNo, Double OffsetSensor, DoPE.EXT Mode, Double Scale, ref Int16 Tan)		

5.4.3 DoPEFDPoti

Move cross-head according to an external command signal generated by a digital encoder (DigiPoti). This is a special version of the DoPEExt2Ctrl command. Offsets and limits are handled inside this function.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





Follow DigiPoti signal in load control.
One revolution of the DigiPoti will cause 20N in load.

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEFDPoti (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
double	MaxSpeed	Start speed for speed controlled modes	Unit/s
unsigned short	SensorNo	Sensor number for the external command input. Use sensor SENSOR_DP for Digital Encoder (DigiPoti) on EDC front panel.	
unsigned short	DxTrigger	Dead area of encoder. The Encoder has to change the specified number of digits before the command is active. For EDC front panel DigiPoti 2 or 3 is a good value.	
unsigned short	Mode	various position or speed control modes (see below)	
double	Scale	For EXT_POSITION Number of Units per revolution e.g. Scale = 1 -> 1 mm per revolution Scale = 10 -> 10 N per revolution. For EXT_SPEED_xx number of revolutions to nominal speed e.g. Scale = 2 -> after 2 revolutions to nominal speed.	
unsigned short *	lpusTAN	Pointer to transaction number.	

Various position or speed control modes:

The first four modes refer to measuring values. E.g. EXT_SPEED_POSITIVE moves to increasing measuring values.

EXT_POSITION	0	Position, moves to increasing and decreasing positions
EXT_SPEED_BIPOLAR	1	Speed bipolar (positive and negative speed)
EXT_SPEED_POSITIVE	2	Speed positive direction
EXT_SPEED_NEGATIVE	3	Speed negative direction

The next four modes refer to movement UP/DOWN. E.g. EXT_SPEED_UP moves Cross-head UP. The relation between measured values and movement Up/Down is defined in the set-up data.

EXT_POS_UP_DOWN	4	Position Up / Down
EXT_SPEED_UP_DOWN	5	Speed bipolar (Up and Down)
EXT_SPEED_UP	6	Speed UP
EXT_SPEED_DOWN	7	Speed DOWN
EXT_POS_OPENLOOP	8	Position mode for openloop configurations.

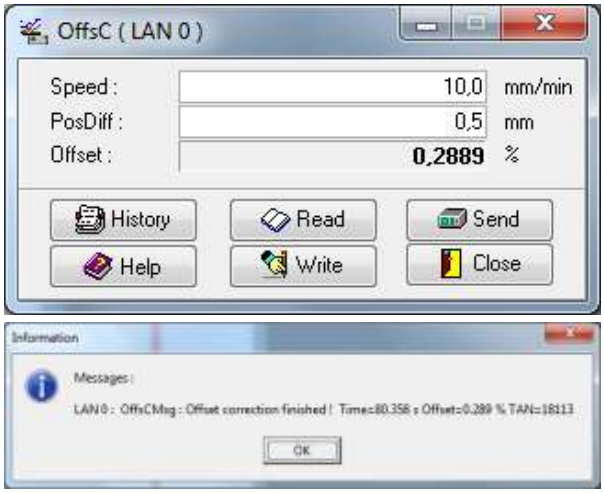
For use with DoPEFDPoti command we recommend only the following modes:
EXT_POS_UP_DOWN, EXT_SPEED_UP, EXT_SPEED_DOWN, EXT_POS_OPENLOOP

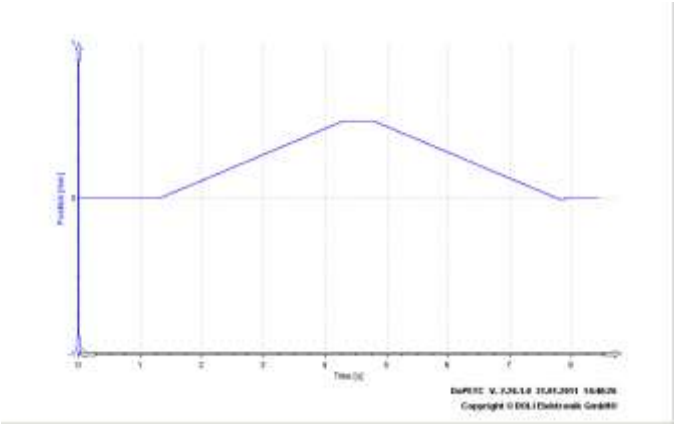
.NET <Edc object>.Move.FDPoti(DoPE.CTRL MoveCtrl, Double MaxSpeed, DoPE.SENSOR Sensor, Int16 DxTrigger, DoPE.EXT Mode, Double Scale, ref Int16 Tan)

5.4.4 DoPEOffsC

Special moving command to measure the offset of an external, analogue speed controller. This offset will be used for the speed output signal and compensates the offset of the external speed controller.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00





Move 0.5 mm up and down and calculate the offset.

The offset is transmitted to PC (see DoPEOnOffsCMsgHdlr)

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEOffsC (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
double	Speed	Speed	Unit/s
double	PosDiff	Distance to move cross-head	Unit
unsigned short *	lpusTAN	Pointer to transaction number.	

.NET <Edc object>.Move.OffsC(Double Speed, Double PosDiff, ref Int16 Tan)

5.5 PC Command

With the PC Command a digital command signal can be used to move the cross-head.
PC Command is not supported by EDCi10

5.5.1 DoPEPcCmd

Move cross-head according to a digital command signal.
Scaling of the command- and sensor-system is done by offsets and scale. Following formula is used:

$$Output = (Value - Offset) \bullet Scale + OffsetCtrl$$

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00
(not supported by EDCi10)

Function declaration	Description	Unit
extern unsigned DLLAPI DoPEPcCmd (DoPE_HANDLE DoPEHdl, unsigned short ExecutionMode, unsigned short MoveCtrl, unsigned short CmdMode, double SpeedToStart, double Offset, double Scale, double OffsetCtrl, double FadeInTime, double FadeOutTime, unsigned Cycles, unsigned Count, DoPEPcCmdData *Data, unsigned short * lpusTAN);	Function returns Error constant (DoPERR_xxxx) DoPE link handle (see description below) Control mode for movement (Position, Load, Extension) Interpolation mode between the values **DoPE_PC_CMD_MODE_POS:** Command data are position values for each control loop cycle. **DoPE_PC_CMD_MODE_POS_LINEAR:** Command data are time and position. A linear function is interpolated between the position values **DoPE_PC_CMD_MODE_POS_COSINUS:** Command data are time and position. A cosine function is interpolated between the position values Speed to StartPosition Offset for stimulation signal Scaling factor for stimulation signal Offset for move control channel Fade in time Fade out time Number of cycles (ignored in append mode) Number of PcCmdData items in Data array Pointer to PcCmdData array In DoPE_PC_CMD_MODE_POS mode the time values will be ignored Pointer to transaction number.	 Unit/s stimUnit Unit s s
typedef struct { double Time; double StimulationSignal; } DoPEPcCmdData;		 s stimUnit
.NET <Edc object>.Ilc.PcCmd(DoPE.PC_CMD_EXECUTE ExecutionMode, DoPE.CTRL MoveCtrl, DoPE.PC_CMD_MODE CmdMode, Double SpeedToStart, Double Offset, Double Scale, Double OffsetCtrl, Double FadeInTime, Double FadeOutTime, Int32 Cycles, Int32 Count, DoPE.PcCmdData[] Data, ref Int16 Tan)		

DoPEPcCmd can be used in two different ways. A single call can include all information to perform the movement command. In this case ExecutionMode DoPE_PC_CMD_EXECUTE_LAST must be used and all parameters are considered. Appending data to the running movement command isn't possible.

If the Data can't be stored on the EDC the command will be discarded and the return code is set to DoPERR_PARAMETER.

In the second case ExecutionMode is set to DoPE_PC_CMD_EXECUTE_APPEND in the first call. The movement command starts emedeatly after the transmission of the data. Now any number of calls can follow to append data to the running movement command (DoPE_PC_CMD_EXECUTE_APPEND). With the last call ExecutionMode must be set to DoPE_PC_CMD_EXECUTE_LAST. No more data can be appended.

In the append mode buffer overruns and underruns can occur. At a buffer overrun PC Command data is providet to fast and can't be buffered in the EDC. In this case the data block will be discarded and the return

code is set to DoPERR_PARAMETER.

At a buffer underrun PC Command data isn't provided fast enough. In this case the last point of the latest PC Command data block is used as stimulation signal until a new data block is available.

The number of buffer underruns can be retrieved with DoPERdPcCmdInfo.

Parameter	First call	Following calls	Last call
ExecutionMode	**EXECUTE_APPEND**	**EXECUTE_APPEND**	**EXECUTE_LAST**
MoveCtrl	**valid**	ignored	ignored
SpeedToStart	**valid**	ignored	ignored
CmdMode, Offset, Scale, OffsetCtrl, Count, Data	**valid**	**valid**	**valid**
FadeInTime	**valid**	ignored	ignored
FadeOutTime	ignored	ignored	**valid**
Cycles	ignored	ignored	**valid**
IpusTAN	**valid**	ignored	ignored

To interrupt, continue or terminate a running movement command the ExecutionModes DoPE_PC_CMD_EXECUTE_PAUSE, DoPE_PC_CMD_EXECUTE_CONTINUE and DoPE_PC_CMD_EXECUTE_TERMINATE can be used.

ExecutionMode	EXECUTE_PAUSE	EXECUTE_CONTINUE	EXECUTE_TERMINATE
MoveCtrl	ignored	ignored	ignored
SpeedToStart	ignored	ignored	ignored
CmdMode, Offset, Scale, OffsetCtrl, Count, Data	ignored	ignored	ignored
FadeInTime	ignored	**valid**	ignored
FadeOutTime	**valid**	ignored	**valid**
Cycles	ignored	ignored	**ignored**
IpusTAN	ignored	ignored	ignored

OffsetCtrl will be used as start/end point of the movement command if fade in/out will be used. Otherwise the first/last Data point will be used.

The Cycles count of the measuring data record is set to zero at the PcCmd call. Cycles count will be incremented with the execution of the first point of each PC Command data block.

For a detailed description of the SpeedToStart, Scale and Offset parameters and the fade times, please refer to the DoPEPcCmdFromFile dokumentation.

5.5.2 DoPEPcCmdFromFile

Move cross-head according to a digital command signal stored in a file.
DoPEPcCmdFromFile is similar to DoPEPcCmd except the stimulation data is passed thru a file and no data can be appended. So, all parameters will be considered.
Scaling of the command- and sensor-system is done by offsets and scale. Following formula is used:

$$Output = (Value - Offset) \bullet Scale + OffsetCtrl$$

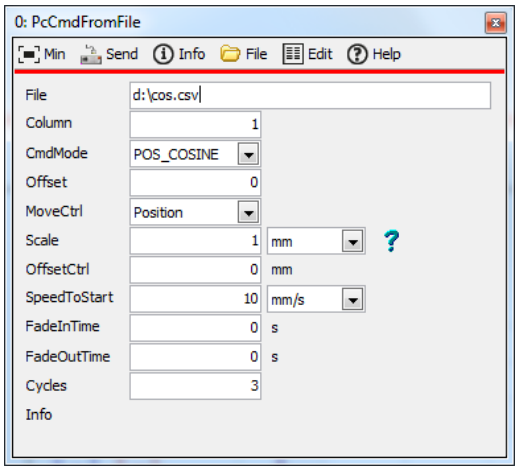
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00
(not supported by EDCi10)

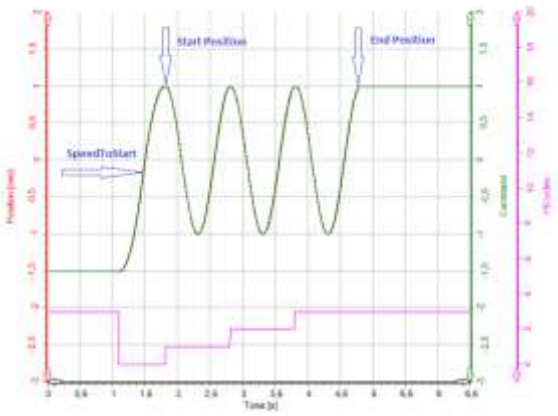
Function declaration	Description	Unit
extern unsigned DLLAPI DoPEPcCmdFromFile (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE DoPEHdl,	DoPE link handle	
unsigned short MoveCtrl,	Control mode for movement (Position, Load, Extension)	
unsigned short CmdMode,	Interpolation mode between the values **DoPE_PC_CMD_MODE_POS:** Command data are position values for each control loop cycle. **DoPE_PC_CMD_MODE_POS_LINEAR:** Command data are time and position. A linear function is interpolated between the position values **DoPE_PC_CMD_MODE_POS_COSINUS:** Command data are time and position. A cosine function is interpolated between the position values	
double SpeedToStart,	Speed to StartPosition	Unit/s
double Offset,	Offset for stimulation signal	stimUnit
double Scale,	Scaling factor for stimulation signal	
double OffsetCtrl,	Offset for move control channel	Unit
double FadeInTime,	Fade in time	s
double FadeOutTime,	Fade out time	s
unsigned Cycles,	Number of cycles	
unsigned Column,	Column number of Stimulation Signal In interpolation modes Time has always column number 0	
char *FileName,	Pointer to file name and path. Supported file types: csv "Comma Separated Values" text file: Value separator must be ';' Decimal point can be '.' or ',' Lines NOT starting with a number or a separator will be skipped bmv "DOLI Binary Measured Values" file: generated by DoPETestCenter version 2.27.1 (or above) In DoPE_PC_CMD_MODE_POS the time values will be ignored bmv2 "DOLI Binary Measured Values 2" file: generated by DoliInstallationCenter V10.13 (or above) In DoPE_PC_CMD_MODE_POS the time values will be ignored File access errors (e.g. wrong file extension) leads to an DoPERR_OPEN error	
unsigned short * lpusTAN);	Pointer to transaction number.	

.NET <Edc object>.Ilc.PcCmdFromFile(DoPE.CTRL MoveCtrl, DoPE.PC_CMD_MODE CmdMode, Double SpeedToStart, Double OffsetFile, Double Scale, Double OffsetCtrl, Double FadeInTime, Double FadeOutTime, Int32 Cycles, Int32 Column, String FileName, ref Int16 Tan)

To illustrate the various parameters we use a simple cos.csv file with cosinus interpolation and three cycles.

Time; Sec; 0; 0.5; 1.0;	Position mm 1 -1 1

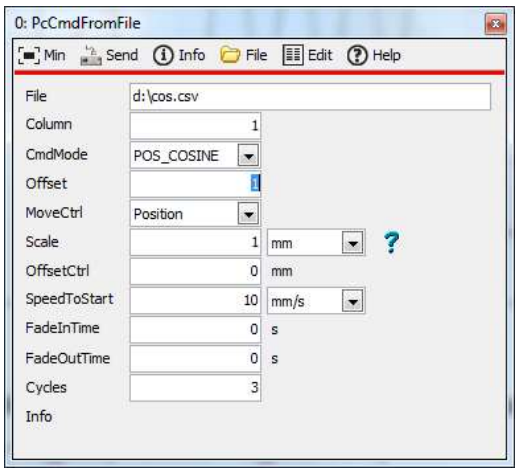
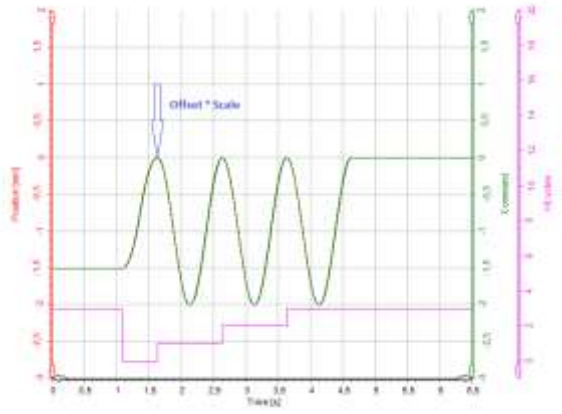




5.5.2.1 Scale and Offsets

Scaling of the command- and sensor-system is done by offsets and scale. Following formula is used:

$$Output = (Value - Offset) \bullet Scale + OffsetCtrl$$

<table>
<tr>
<td> 
</td>
<td> 
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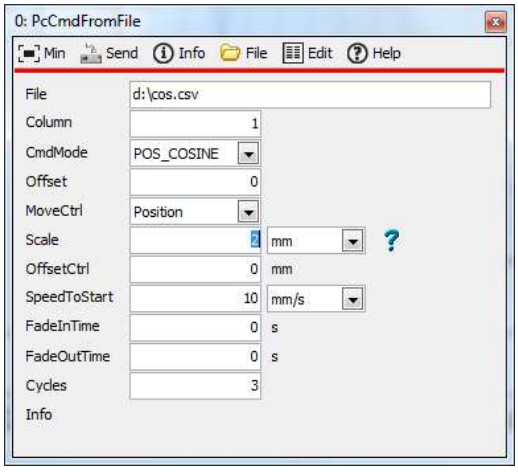
<td> 
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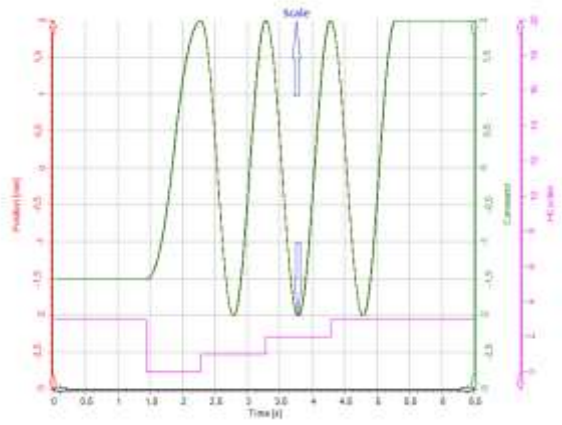
<td> 
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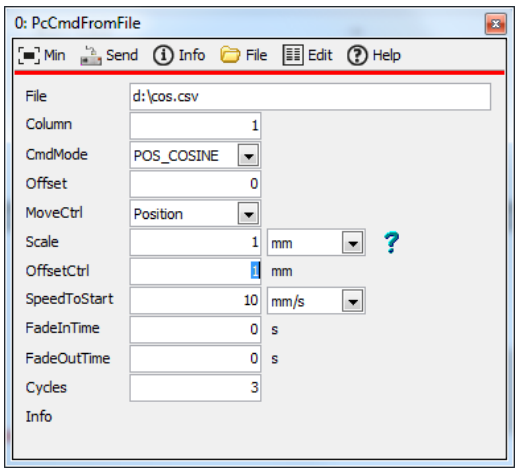
<td> 
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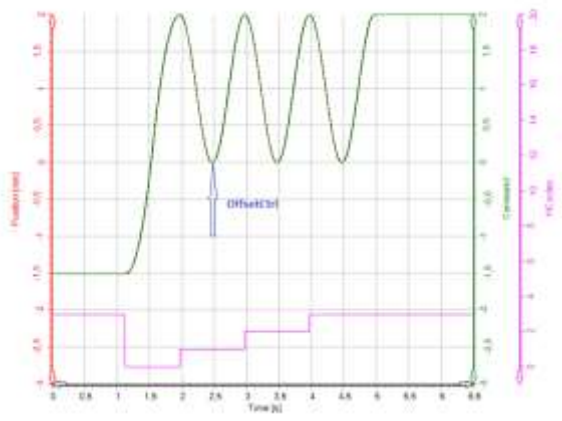
<td> 
</td>
</tr>
</table>

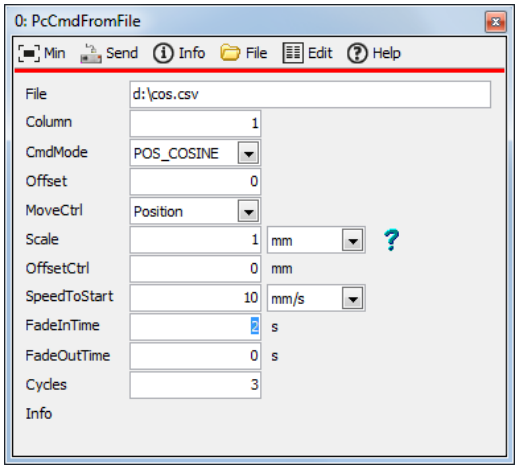
To convert e.g. temperature from Fahrenheit to Celsius according the formula °C = (°F-30)/2 Offset should be 30 and Scale 0.5.

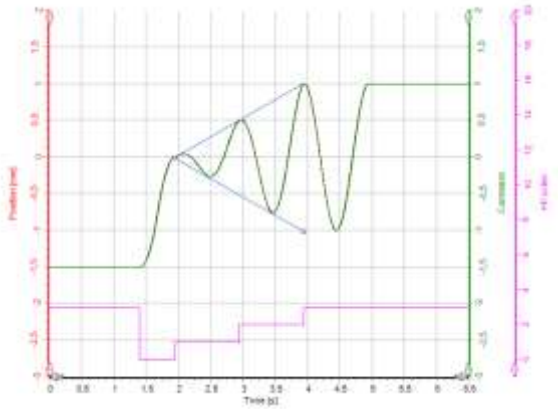
OffsetCtrl specifies the start/end position for fade in/out.

5.5.2.2 “Start/End Position”, SpeedToStart and Fade In/Out

If fade in/out time are zero the first point of the PcCmd data is used as the start/end position.
Otherwise OffsetCtrl is used as the start/end position.
During the Fade In time the following formula is used:

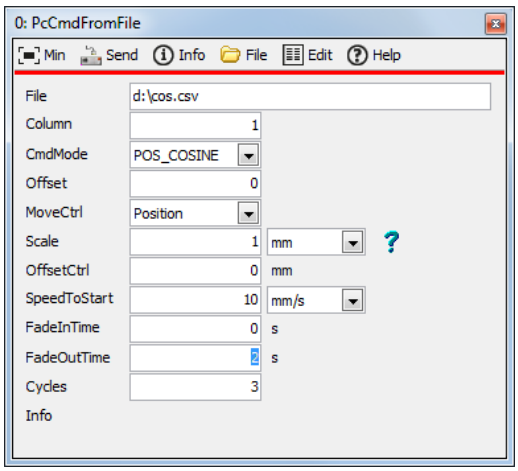
$$Output(t) = ((Value(t) - Offset) \bullet Scale + OffsetCtrl) \bullet (t - t0) \div FadeInTime$$

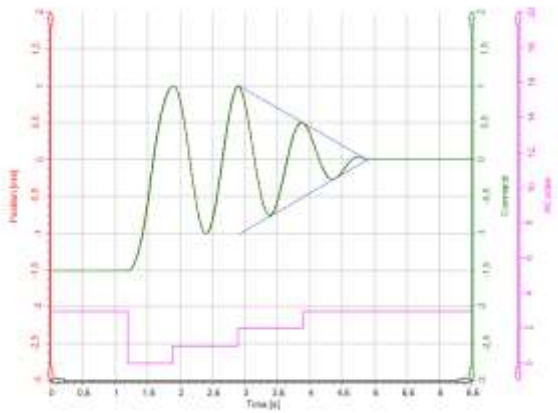




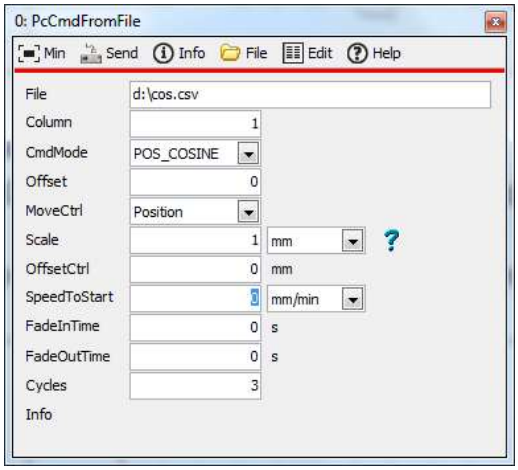
During the Fade Out time the following formula is used:

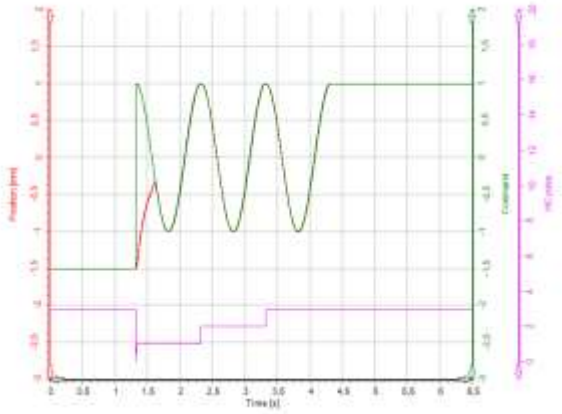
$$Output(t) = ((Value(t) - Offset) \bullet Scale + OffsetCtrl) \bullet (tend - t) \div FadeOutTime$$



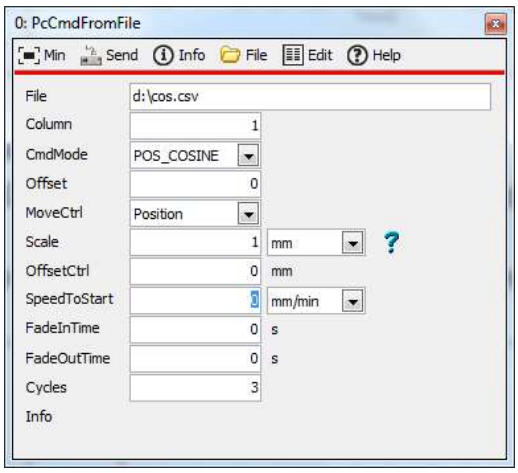


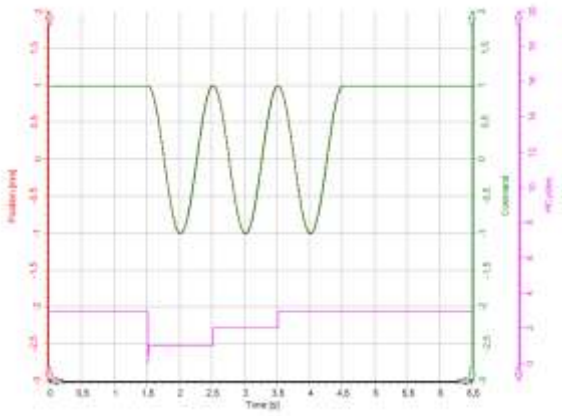
If SpeedToStart is set to zero the command of the closed loop controller 'jumps' to the start position within one closed loop controller cycle. This is a feature used for synchronized EDCs.



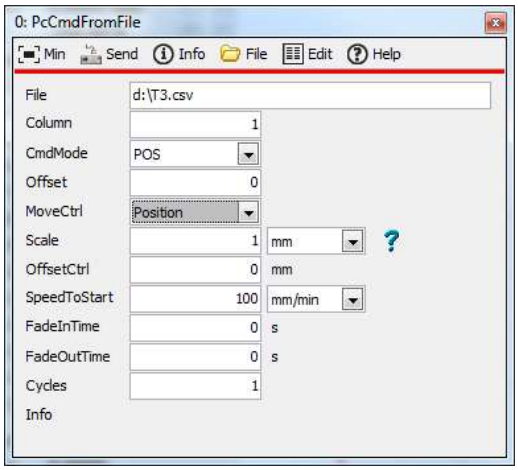


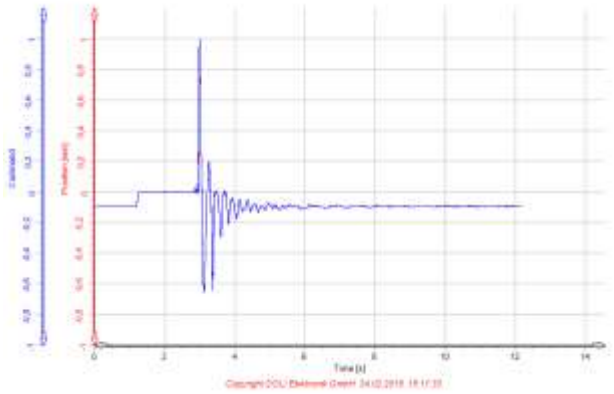
Obviously the start position should be set by a separate movement command.





5.5.2.3 Random Values



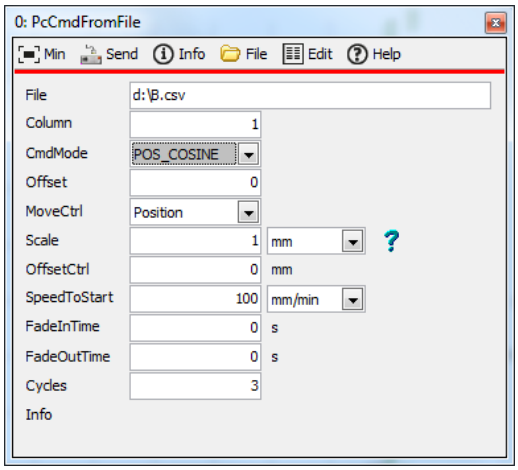


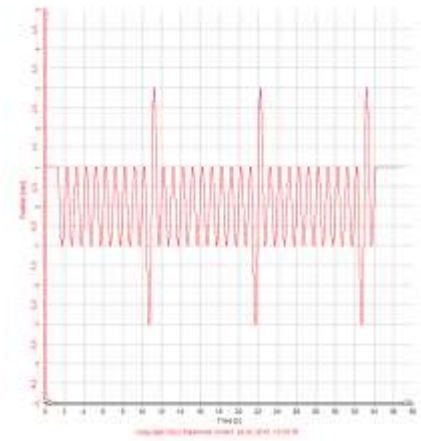
Follow digital command from PC in position control. Don't use inperpolation between the points in the file (ignore time column).
Use scale 0.001 to convert µm to mm.

Sample of a csv file:

Time;	Position
Sec;	µm
3.819;	-0,8092685
3.8192;	-0,6743904
3.8194;	-0,6069514
3.8196;	-0,5395123
3.8198;	-0,6069514
3.820;	-0,6743904
3.8202;	-0,6743904
3.8204;	-0,7418295
3.8206;	-0,8767075
3.8208;	-1,011586
3.821;	-1,146464
3.8212;	-1,281342
3.8214;	-1,146464
3.8216;	-1,011586
3.8218;	-0,8767075
3.822;	-0,8092685
…	…

5.5.2.4 Cosine with one Cycle big Amplitude

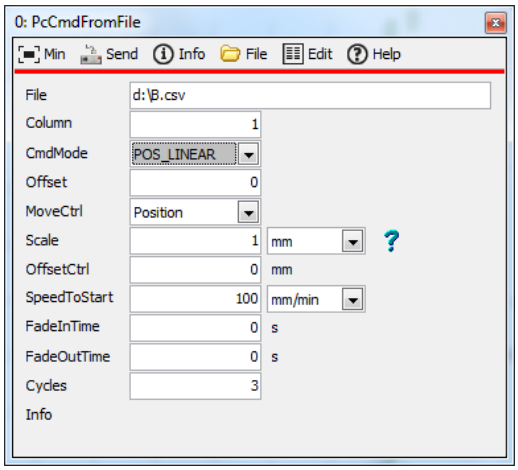


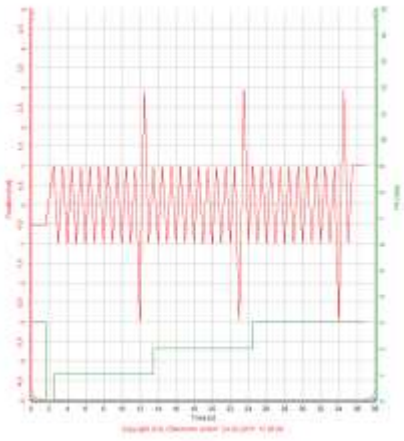


Follow digital command from PC in position control. Use a **cosine** interpolation between the points in the file.
Sample of a csv file:

Time;	Position
Sec;	mm
0;	1.0
0.5;	-1.0
1.0;	1.0
1.5;	-1.0
2.0;	1.0
2.5;	-1.0
3.0;	1.0
3.5;	-1.0
4.0;	1.0
4.5;	-1.0
5.0;	1.0
5.5;	-1.0
6.0;	1.0
6.5;	-1.0
7.0;	1.0
7.5;	-1.0
8.0;	1.0
8.5;	-1.0
9.0;	1.0
9.5;	**-3.0**
10.0;	**3.0**
10.5;	-1.0
11.0;	1.0

5.5.2.5 Triangle with one Cycle big Amplitude





Follow digital command from PC in position control. Use a **linear** interpolation between the points in the file.

At the beginning of the command, the HCycle counter is set to zero. At the beginning of each cycle, the counter is incremented.

Sample of a csv file:

Time;	Position
Sec;	mm
0;	1.0
0.5;	-1.0
1.0;	1.0
1.5;	-1.0
2.0;	1.0
2.5;	-1.0
3.0;	1.0
3.5;	-1.0
4.0;	1.0
4.5;	-1.0
5.0;	1.0
5.5;	-1.0
6.0;	1.0
6.5;	-1.0
7.0;	1.0
7.5;	-1.0
8.0;	1.0
8.5;	-1.0
9.0;	1.0
9.5;	**-3.0**
10.0;	**3.0**
10.5;	-1.0
11.0;	1.0

5.5.3 DoPERdPcCmdInfo

Read PC Command buffer and status information.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00 (not supported by EDCi10)		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPERdPcCmdInfo (DoPE_HANDLE DoPEHdl, DoPEPcCmdInfo *Info);	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer for DoPEPcCmdInfo structure.	
typedef struct { unsigned BufItemsFree unsigned BufItemsUsed; unsigned BufferUnderrun; double PosCtrlTime; unsigned Paused; } DoPEPcCmdInfo;	 number of available PcCmdData items number of used PcCmdData items number of buffer underruns Position controller cycle time PC Command execution paused	 s
.NET <Edc object>.Ilc.RdPcCmdInfo(ref DoPE.PcCmdInfo Info)		

5.5.4 DoPECalculatePcCmd

Calculate a digital command for each control loop cycle without execution. If the OutData buffer size isn't sufficient the function returns DoPERR_NOMEM.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00 (not supported by EDCi10)		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPECalculatePcCmd (DoPE_HANDLE DoPEHdl, unsigned short ExecutionMode, unsigned short CmdMode, double Offset, double Scale, double OffsetCtrl, double FadeInTime, double FadeOutTime, unsigned Cycles, unsigned InCount, DoPEPcCmdData *InData, double SpeedT, unsigned OutCountMax, unsigned *OutCount DoPEPcCmdData *OutData);	Function returns Error constant (DoPERR_xxxx) DoPE link handle (can be NULL for offline links) (see description at DoPEPcCmd, PAUSE, CONTINUE and TERMIATE mode have no effect) Interpolation mode between the values **DoPE_PC_CMD_MODE_POS:** Command data are position values for each control loop cycle. **DoPE_PC_CMD_MODE_POS_LINEAR:** Command data are time and position. A linear function is interpolated between the position values **DoPE_PC_CMD_MODE_POS_COSINUS:** Command data are time and position. A cosine function is interpolated between the position values Offset for stimulation signal Scaling factor for stimulation signal Offset for move control channel Fade in time Fade out time Number of cycles (ignored in append mode) Number of PcCmdData items in InData array Pointer to PcCmdData InData array In DoPE_PC_CMD_MODE_POS mode the time values will be ignored Speed controller time (can be 0 to use the Speed Controller Time of an online connection) Maximum number of PcCmdData items in OutData array (typically **(start time – end time) / SpeedT * Cycles + 1**, Can be more in append mode and due to numeric inaccuracy) Pointer to number of valid PcCmdData items in OutData array Pointer to PcCmdData OutData array	Unit/s stimUnit Unit s s
typedef struct { double Time; double Signal;		 s Unit

} DoPEPcCmdData;		
.NET <Edc object>.Ilc.CalculatePcCmd(DoPE.PC_CMD_EXECUTE ExecutionMode, DoPE.PC_CMD_MODE CmdMode, Double Offset, Double Scale, Double OffsetCtrl, Double FadeInTime, Double FadeOutTime, Int32 Cycles, Int32 InCount, DoPE.PcCmdData[] InData, Double SystemTime, Int32 OutCountMax, ref Int32 OutCount, ref DoPE.PcCmdData[] OutData)		

5.5.5 DoPECalculatePcCmdFromFile

Calculate a digital command stored in a file for each control loop cycle without execution.
The command creates a new csv output file. The size of this file is limited to 2 GB. If the limit is reached or temporarily allocated memory isn't sufficient the function returns DoPERR_NOMEM.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00
(not supported by EDCi10)

Function declaration	Description	Unit
extern unsigned DLLAPI DoPECalculatePcCmdFromFile (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE DoPEHdl,	DoPE link handle (can be NULL for offline links)	
unsigned short CmdMode,	Interpolation mode between the values **DoPE_PC_CMD_MODE_POS:** Command data are position values for each control loop cycle. **DoPE_PC_CMD_MODE_POS_LINEAR:** Command data are time and position. A linear function is interpolated between the position values **DoPE_PC_CMD_MODE_POS_COSINUS:** Command data are time and position. A cosine function is interpolated between the position values	
double Offset,	Offset for stimulation signal	
double Scale,	Scaling factor for stimulation signal	Unit/s
double OffsetCtrl,	Offset for move control channel	stimUnit
double FadeInTime,	Fade in time	
double FadeOutTime,	Fade out time	Unit
unsigned Cycles,	Number of cycles	s
unsigned Column,	Column number of Stimulation Signal In interpolation modes Time has always column number 0	s
char *InFileName,	Pointer to input file name and path. Supported file types: csv "Comma Separated Values" text file: Value separator must be ';' Decimal point can be '.' or ',' Lines NOT starting with a number or a separator will be skipped bmv "DOLI Binary Measured Values" file: generated by DoPETestCenter version 2.27.1 (or above) In DoPE_PC_CMD_MODE_POS the time values will be ignored bmv2 "DOLI Binary Measured Values 2" file: generated by DoliInstallationCenter V10.13 (or above) In DoPE_PC_CMD_MODE_POS the time values will be ignored File access errors (e.g. wrong file extension) leads to an DoPERR_OPEN error	
double SpeedT,	Speed controller time (can be 0 to use the current Speed Controller Time of an online connection)	
char *OutFileName);	Pointer to output file name and path. Each line contains the time and command value separated by '**;**' with '**.**' as decimal point. E.g: 0.0708;-9.62E-04	
.NET <Edc object>.Ilc.CalculatePcCmdFromFile(DoPE.PC_CMD_MODE CmdMode, Double OffsetFile, Double Scale, Double OffsetCtrl, Double FadeInTime, Double FadeOutTime, Int32 Cycles, Int32 Column, String InFileName, Double SystemTime, String OutFileName)		

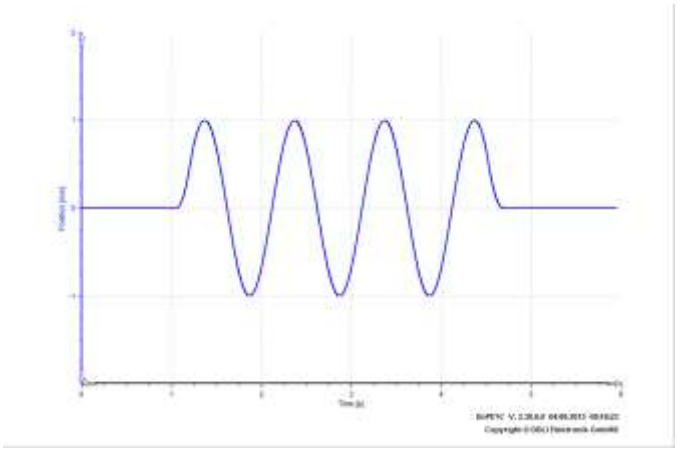
5.6 DoPEDynCycles

The DoPEDynCycles is a powerful command for mostly needed dynamic cycles:
Possible waveforms: **Cosine**, **Triangle**, **Rectangle**, **Saw tooth**, **inverted Saw tooth**, and **Pulse**.
Peak/Valley control may be activated for all these waveforms.
Linear or logarithmic sweeps for frequency, offset, or amplitude may be activated, even any combination e.g. frequency and amplitude sweep.
All waveforms may be superimposed with a cosine wave.
Different Bi-Modal modes like perform a test in e.g. position control and keep load peak/valley constant are also available.

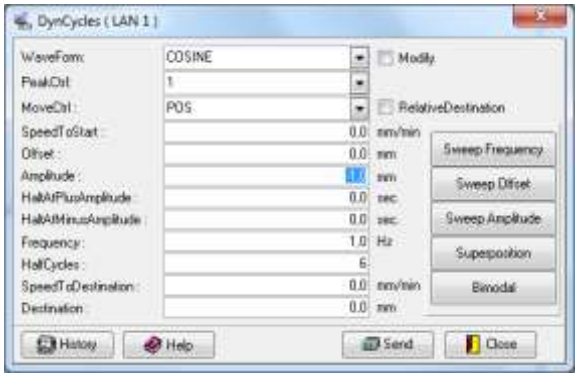
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00
(Modify, Sweeps, Superposition and Bimodal Modes are not supported by EDCi10)

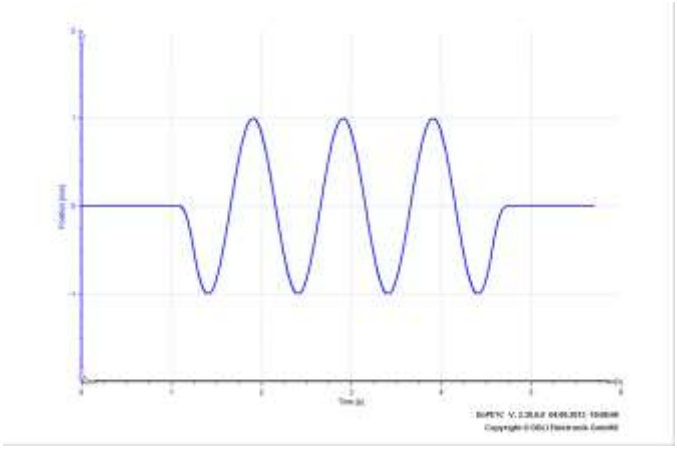
5.6.1 Basic Waveforms

5.6.1.1 Cosine

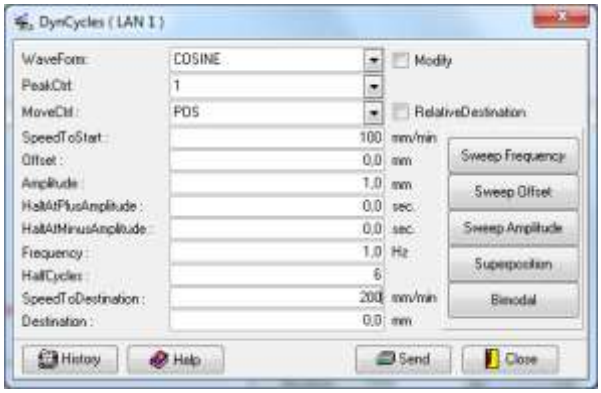


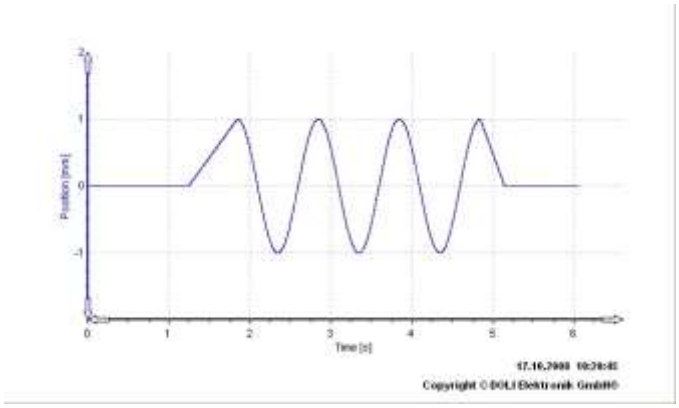
Cycle with a Cosine waveform at an offset of 0mm with amplitude of **+1mm** with 1Hz.
Do this for 6 half-cycles (3 cosine periods). SpeedToStart and SpeedToDestination are specified with 0mm/min.
In this case; the ramp to the starting point (1mm) and destination (0mm) is automatically calculated.





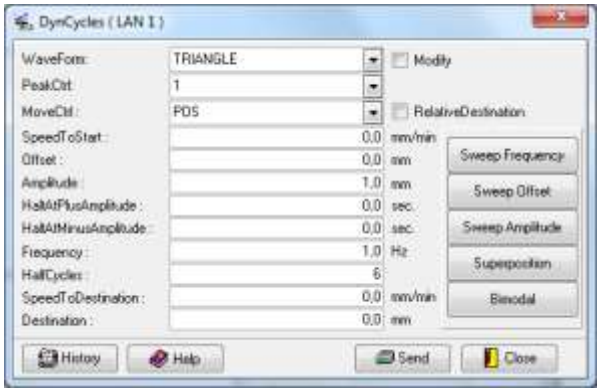
Same as above but with amplitude of **-1mm**.

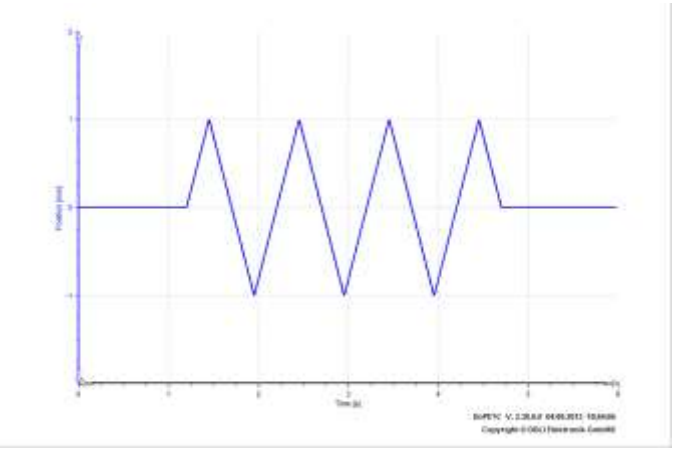




Same as above but SpeedToStart and SpeedToDestination specified.

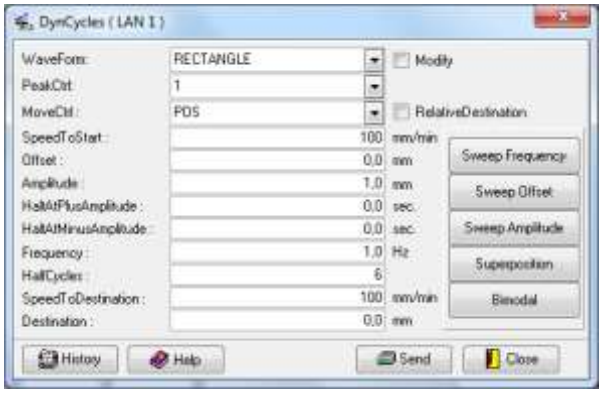
5.6.1.2 Triangle

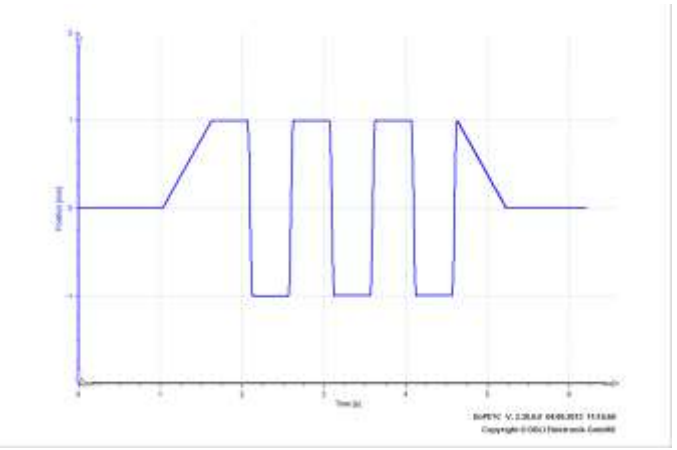




Same as above but with Triangle wafevorm.

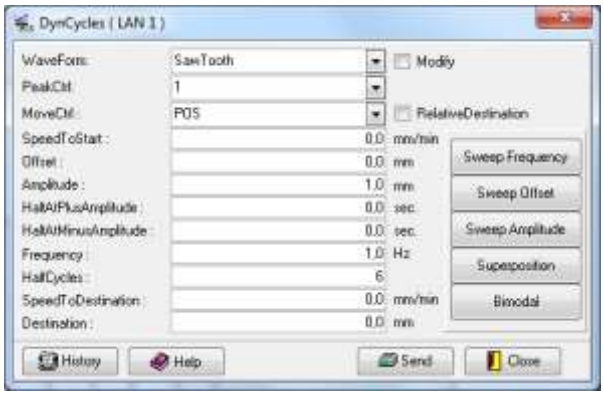
5.6.1.3 Rectangle

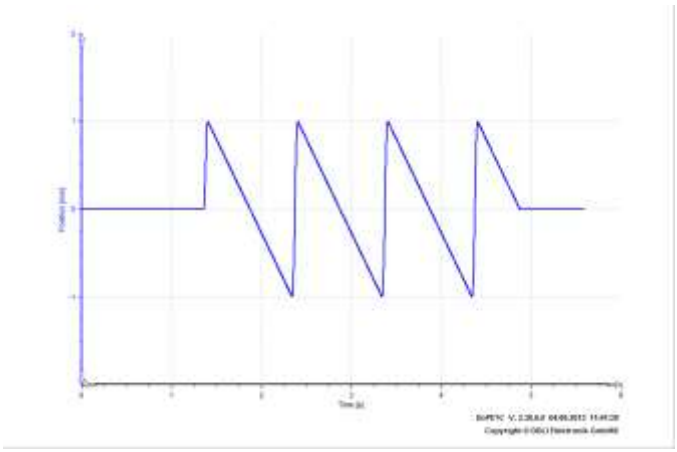




Same as above but with Rectangle wafevorm.

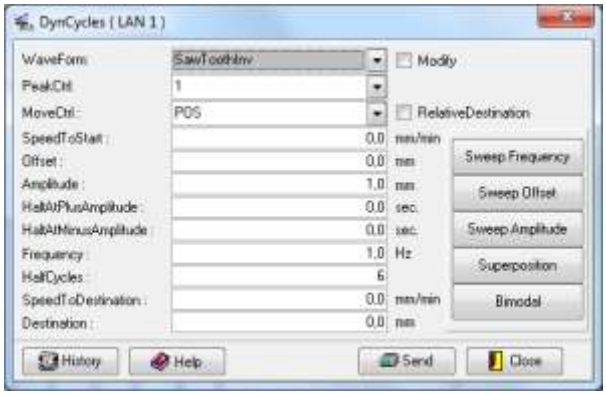
5.6.1.4 Sawtooth

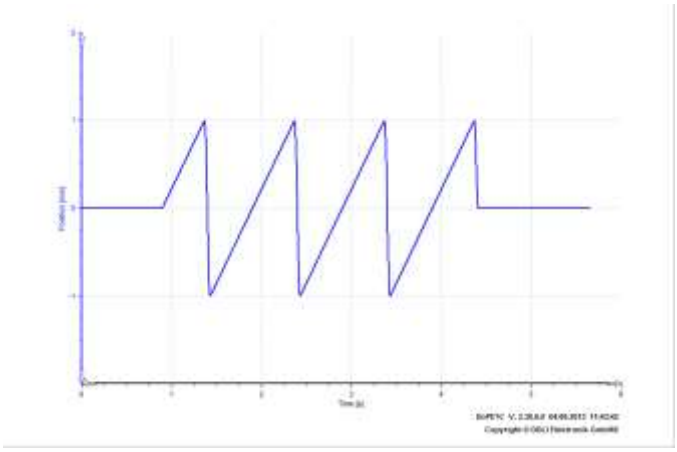




Same as above but with Sawtooth wafevorm.

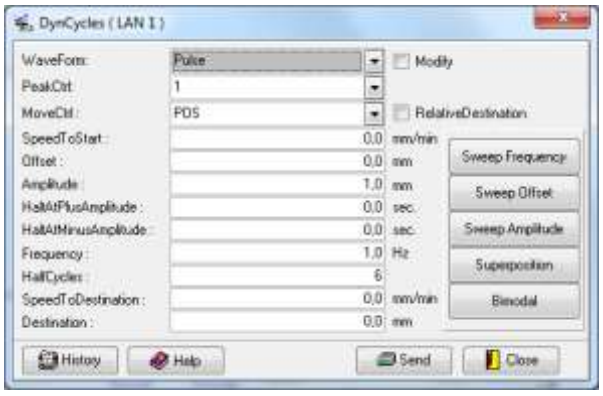
5.6.1.5 Sawtooth inverse

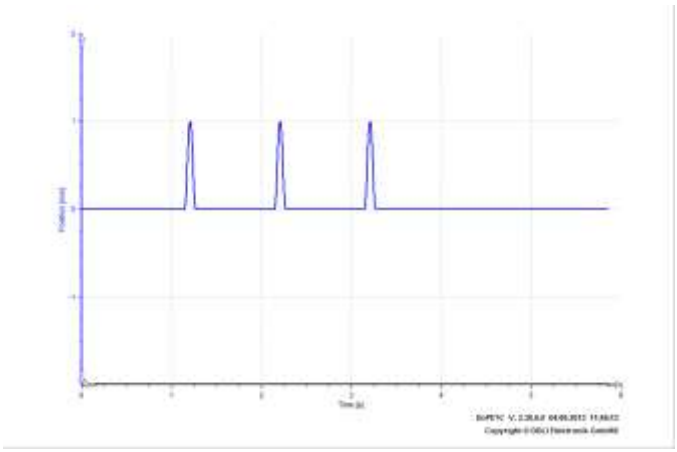




Same as above but with an inverted Sawtooth wafevorm.

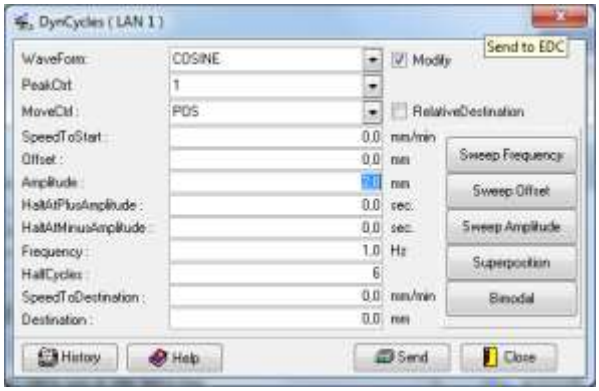
5.6.1.6 Pulse

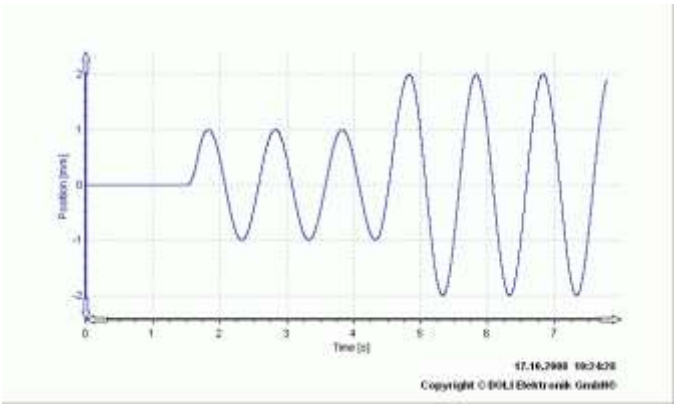




Same as above but with Pulse wafevorm.

5.6.2 Modify Parameter of an active test

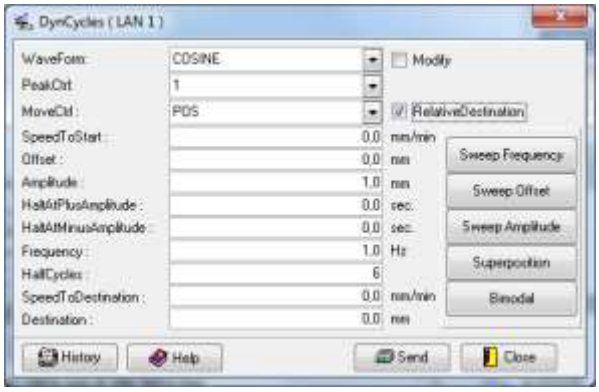


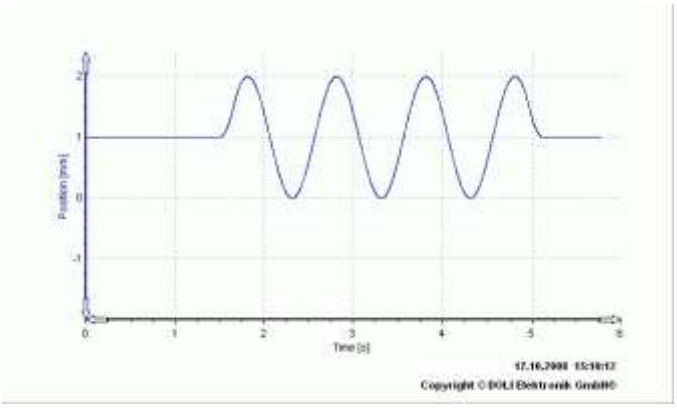


Modify amplitude of an active Cosine.
Cosine was started with 1mm amplitude. After some cycles, DynCycle command was sent again, with the Modify flag set, and amplitude of 2mm.
Besides amplitude, offset and frequency may also be modified.

The Modify Parameter is not supported by EDCi10

5.6.3 Relative Destinations





Cosine command with relative Destinations.
Cosine was started at a position of 1mm. This position will be added to the offset, and Destination.

5.6.4 Peak and Valley control

Peak (and Valley) Control can be activated for all Waveform by choosing any value for PeakCtrl (1, 2, 4, 8, 16).
PeakCtrl = 0 will deactivate peak conctol.
PeakCtrl = 1 will control the error at peak and valley points using the error of each cycle.
PeakCtrl = 2 will control the error every second peak and valley points, using the average error of two cycles.
PeakCtrl = 16 will control the error every 16 peak and valley points, using the average error of 16 cycles.
Below different samples of peak control:

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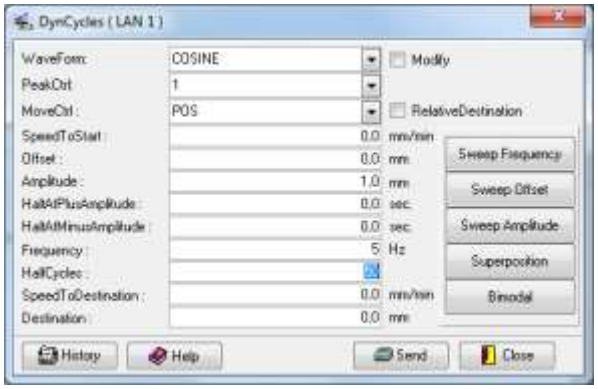
<td> 
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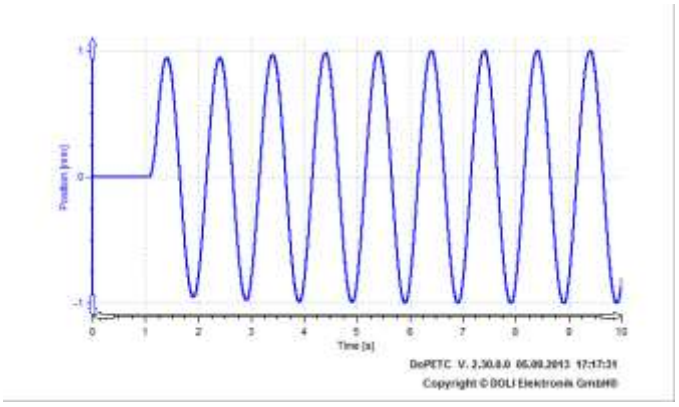
<td> 
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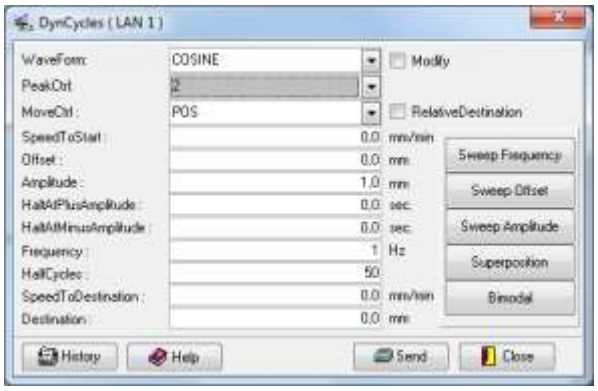
<td> 
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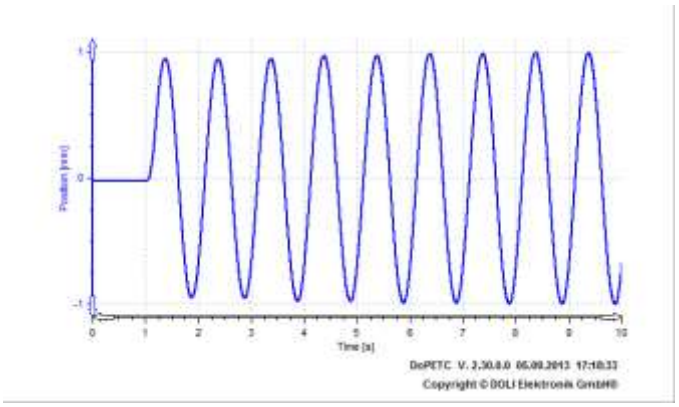
<td> 
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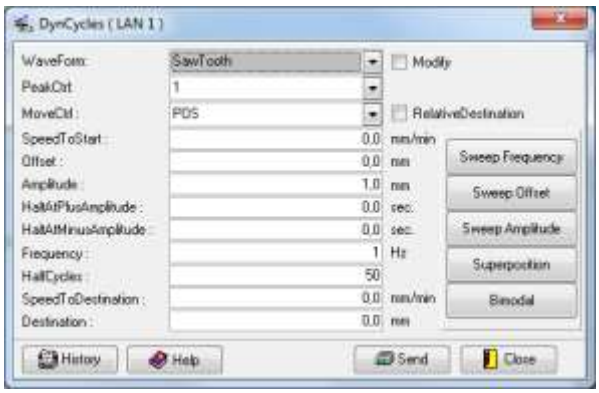
<td> 
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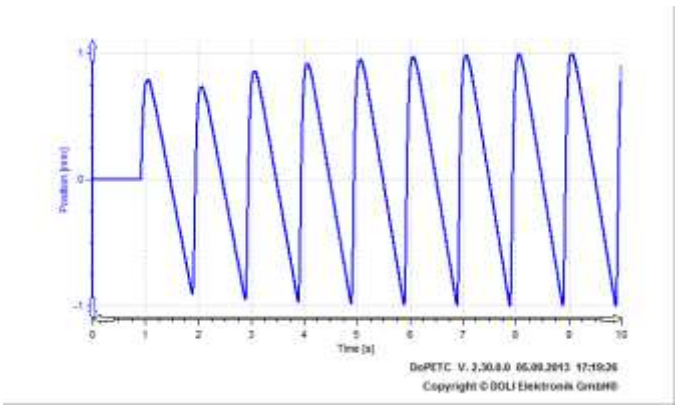
<td> 
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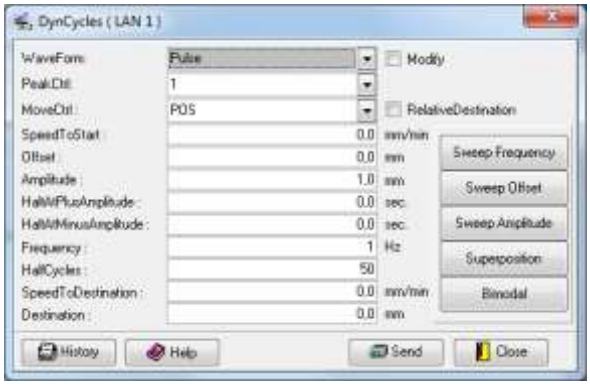
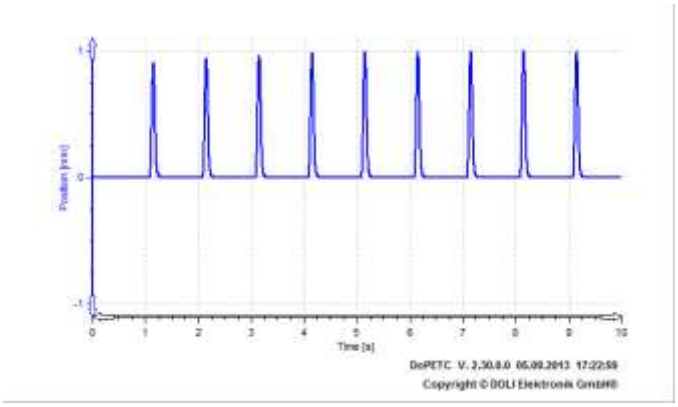
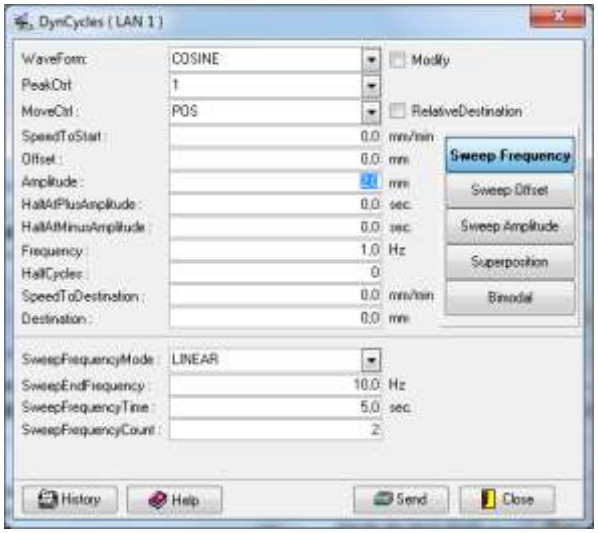
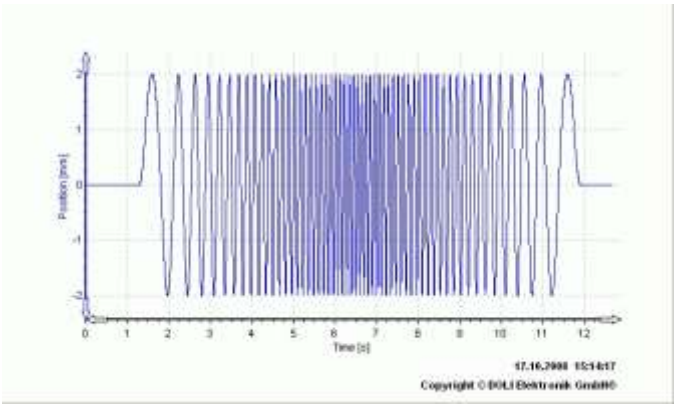

DynCycles (LAN 1)
WaveForm
Pulse
Modify
PeakCtrl
1
MoveCtrl
POS
RelativeDestination
SpeedToStart
0,0
mm/min
Offset
0,0
mm
Amplitude
1,0
mm
HalfWPlusAmplitude
0,0
sec
HalfWMinusAmplitude
0,0
sec
Frequency
1
Hz
HalfCycles
50
SpeedToDestination
0,0
mm/min
Destination
0,0
mm
Sweep Frequency
Sweep Offset
Sweep Amplitude
Superposition
Bimodal
History
Help
Send
Close


Time [s]
DoPETC V. 2.30.8.0 06.09.2013 17:22:59
Copyright © DOLI Elektronik GmbH

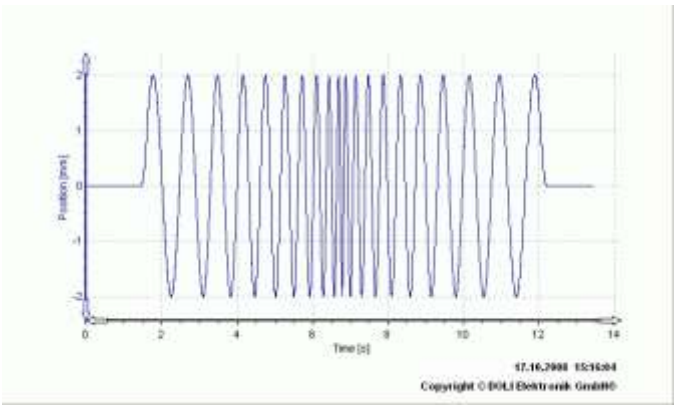
5.6.5 Sweeps

Sweeps are not supported by EDCi10

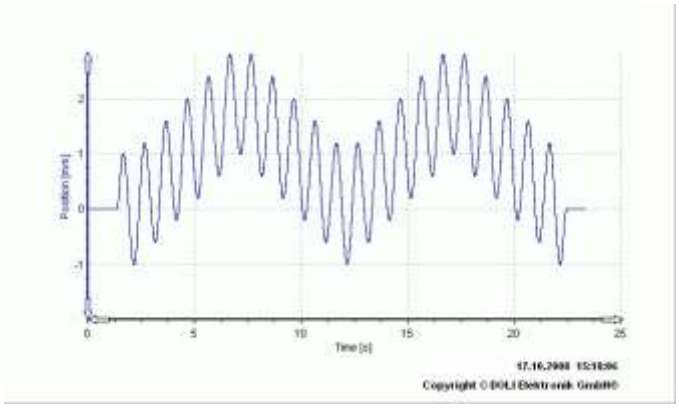




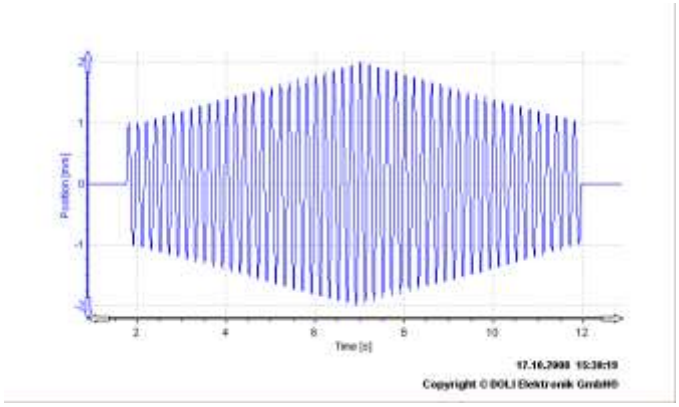
Cosine command with a linear frequency sweep.
Cosine starts with a frequency of 1Hz. The frequency will be continuously increased to 10Hz within 5 seconds. The parameter SweepFrequencyCount specifies how many sweeps should be done. In this case go up to 10Hz, and back to 1Hz.



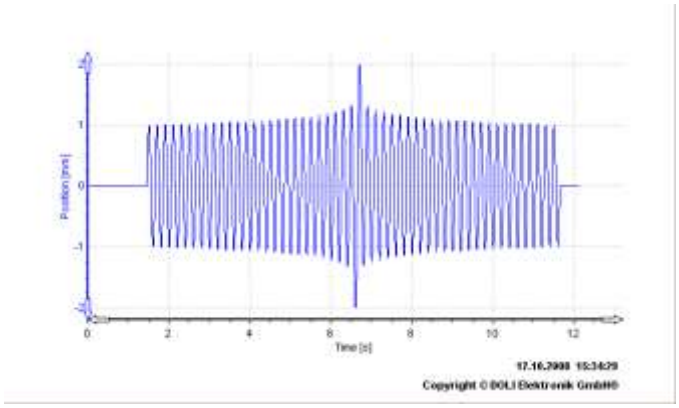
Cosine command with a logarithmic frequency sweep.
Cosine starts with a frequency of 1Hz. The frequency will be exponentially increased to 10Hz within 5 seconds. The parameter SweepFrequencyCount specifies how many sweeps should be done. In this case go up to 10Hz, and back to 1Hz.



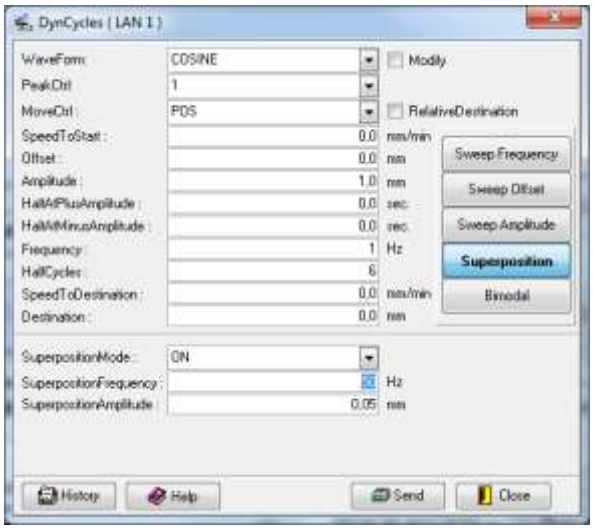
Cosine command with a linear offset sweep.
Cosine starts with an offset of 0mm. The offset is linearly increased to 2mm within 5 seconds. The parameter SweepOffsetCount specifies how many sweeps should be done.

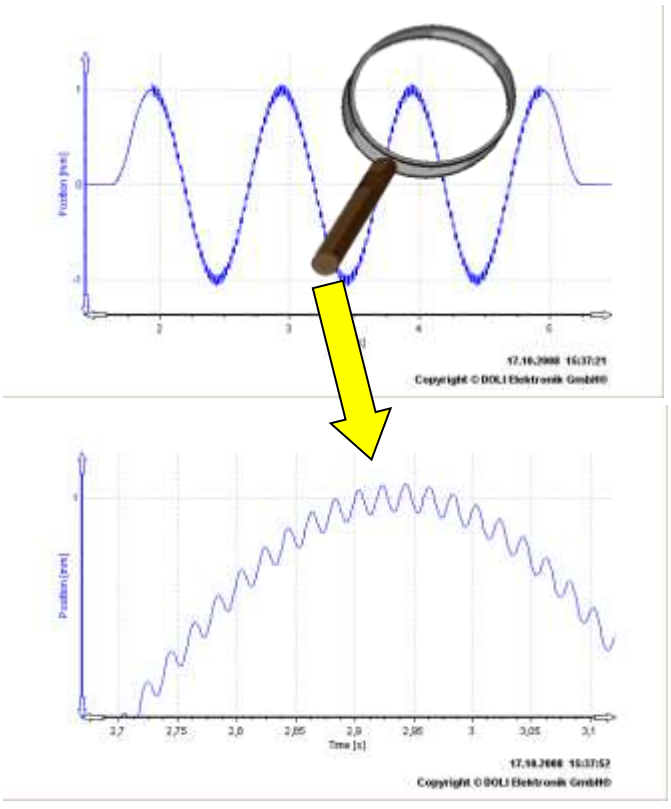


Cosine command with a linear amplitude sweep.
Cosine starts with amplitude of 1mm. The amplitude is linearly increased to 2mm within 5 seconds. The parameter SweepAmplitudeCount specifies how many sweeps should be done.



Cosine command with a logarithmic amplitude sweep.
Cosine starts with amplitude of 1mm. The amplitude is exponentially increased to 2mm within 5 seconds. The parameter SweepAmplitudeCount specifies how many sweeps should be done.





Cosine command superposition cosine.
The basic frequency of the Cosine is 1Hz. A cosine with a frequency of 50Hz and amplitude of 0.05mm is superimposed.

Please note; it is possible to have different sweeps at the same time. E.g. Frequency and amplitude sweep.

Rule for detecting end of cycling:

First priority has the parameter HalfCycles. If the Parameter HalfCycles is not zero, the command is finished after the number of half-cycles are finished, no matter if the sweep count has been reached.

If HalfCycles is set to zero, the command is finished after **all** sweeps are finished.

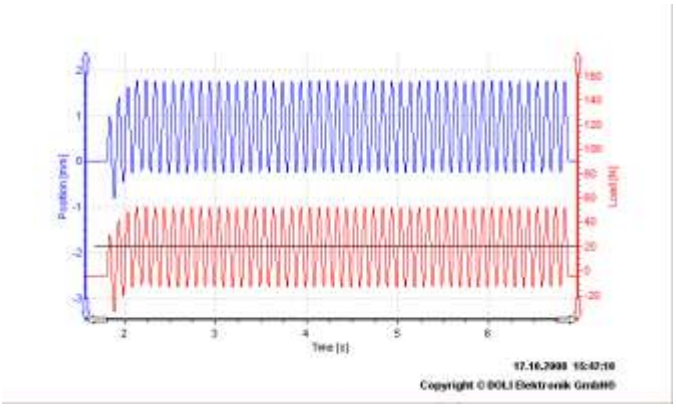
5.6.6 Bimodal commands

Bimodal commands are not supported by EDCi10

A bimodal command runs the test in e.g. position control, but keep a certain e.g. load. The load is controlled by changing the offset of e.g. position. The parameter BimodalScale defines the scaling between the two sensors. You may calculate this parameter by determining the ratio between move control sensor / bimodal control sensor.

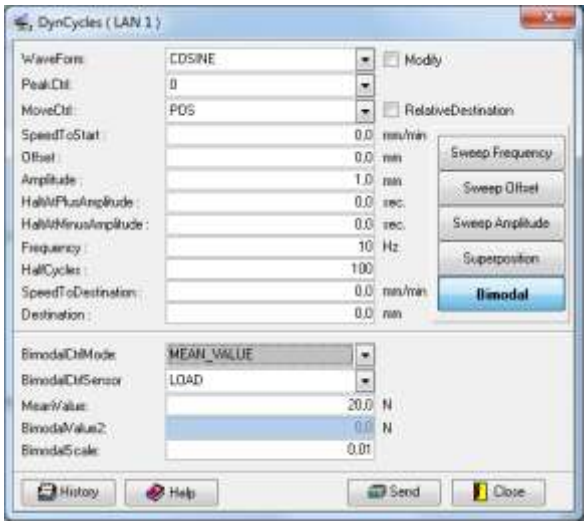
(For move control = Position, and bimodal control = Load, BimodalScale represents 1/stiffness of your specimen in mm/N.)

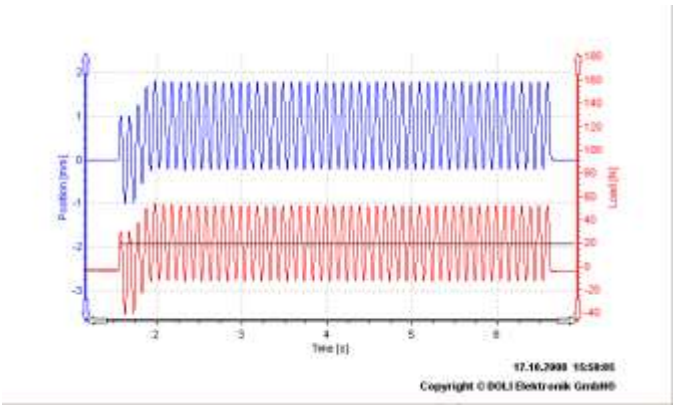
5.6.6.1 Control arithmetic mean value



Do cosine cycles in position control with amplitude of 1mm, and starting offset of 0mm.
Control the arithmetic mean value of load at 20N, by modifying the offset of position.

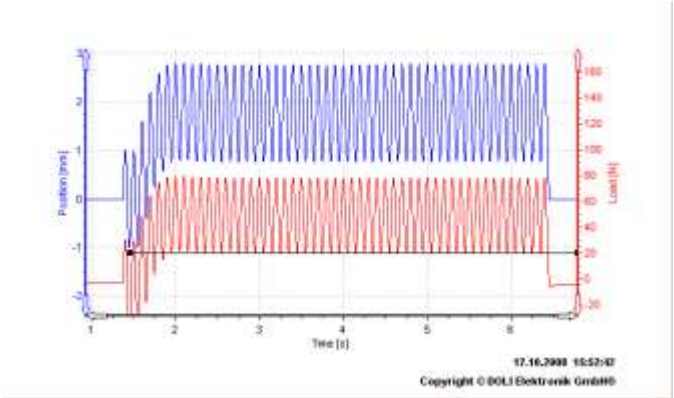
5.6.6.2 Control mean value





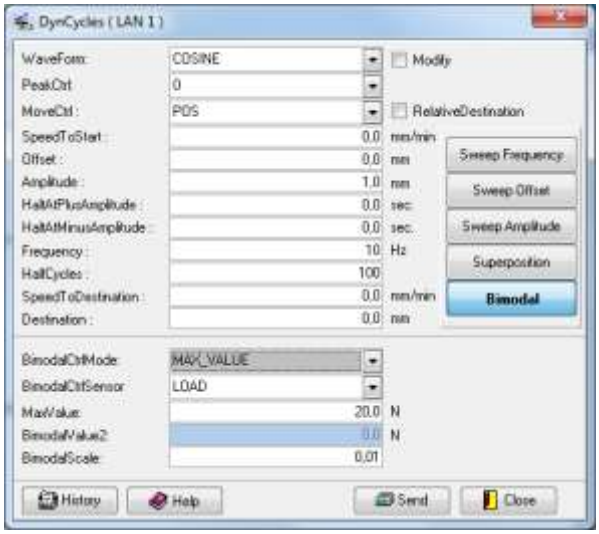
Do cosine cycles in position control with an amplitude of 1mm, and starting offset of 0mm.
Control the mean value of load at 20N, by modifying the offset of position.

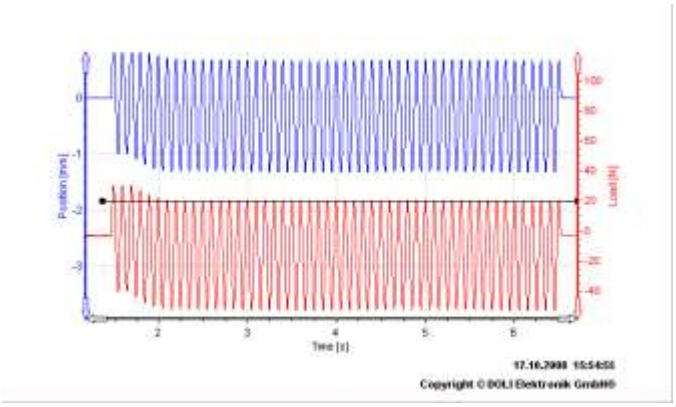
5.6.6.3 Control minimum value



Do cosine cycles in position control with amplitude of 1mm, and starting offset of 0mm.
Control the minimum value of load at 20N, by modifying the offset of position.

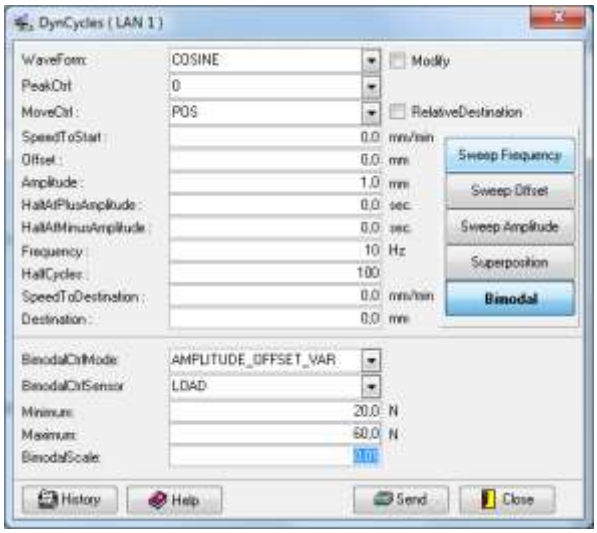
5.6.6.4 Control maximum value

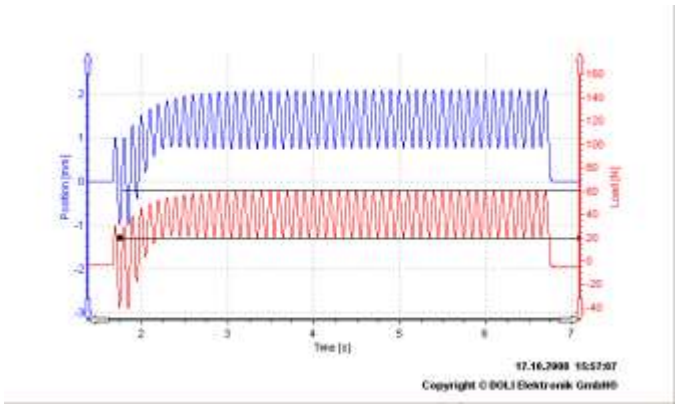




Do cosine cycles in position control with amplitude of 1mm, and starting offset of 0mm.
Control the maximum value of load at 20N, by modifying the offset of position.

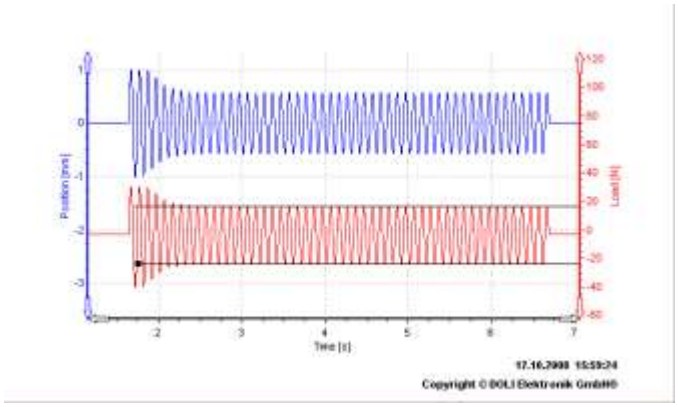
5.6.6.5 Control minimum AND maximum values,





Do cosine cycles in position control with amplitude of 1mm, and starting offset of 0mm.
Control the minimum and maximum value of the load at 20N, and 60N, by modifying the offset, and amplitude of position.

5.6.6.6 Control minimum AND maximum values



Do cosine cycles in position control with amplitude of 1mm, and starting offset of 0mm.
Control the amplitude of load at 20N, by modifying the amplitude of position.

5.6.7 Restrictions:

- Frequency Sweeps are only possible for Cosine waveforms
- Amplitude or Offset sweep should not change faster than 4 * 1/frequency
- Amplitude AND SweepEndAmplitude MUST have the same sign!
- Modify not permitted with active Amplitude or Offset Sweep
- Modify not permitted for different waveforms
- Modify not permitted for different control modes
- Modify not permitted for different signs of the Amplitude
- Modify not permitted with RelativeDestination
- Bimodal control sensor must be different to move control sensor
- BimodalValue1 must be smaller than BimodalValue2
- BimodalValue1 (Amplitude) must be positiv
- BimodalScale must be smaller than 32767 (EDC point scale)
- Amplitude and Offset Sweeps are not permitted for bi-modal modes: “DYN_BIMODAL_MIN_VALUE” or “DYN_BIMODAL_MAX_VALUE”.
- Amplitude and Offset Sweeps are not permitted for bi-modal modes: “DYN_BIMODAL_AMPLITUDE_OFFSET_VAR” or “DYN_BIMODAL_AMPLITUDE_OFFSET_CONST”
- Modify, Sweeps, Bimodal Control and Superposition are not supported by EDCi10

5.6.8 DoPEDynCycle function declaration:

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPEDynCycles (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	WaveForm	DYN_WAVEFORM_xxx (Cosine, Triangular,…)	
unsigned short	Modify	Modify Parameter of active cycles	
unsigned short	PeakCtrl	Peak control cycles 0, 1,2,4,8,16	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
unsigned short	RelativeDestination	false, Offset, and Destination absolute true, Offset, and Destination relative	
double	SpeedToStart	Speed to Offset + Amplitude	Unit/s
double	Offset	Offset	Unit
double	Amplitude	Amplitude	Unit
double	HaltAtPlusAmplitude	Halt Time at Offset + Amplitude	s
double	HaltAtMinusAmplitude	Halt Time at Offset – Amplitude	s
double	Frequency	Frequency	1/s
unsigned long	HalfCycles	Number of half cycles	
double	SpeedToDestination	Speed to final destination (0=automatic speed calculation)	Unit/s
double	Destination	Final destination	Unit
unsigned short	SweepFrequencyMode	DYN_SWEEP_xxx (Off, Linear, Logarithmic,…)	
double	SweepEndFrequency	End frequency for frequency sweep	1/s
double	SweepFrequencyTime	Time for frequency sweep	s
unsigned long	SweepFrequencyCount	Frequency sweep counter (0=infinitive)	
unsigned short	SweepOffsetMode	DYN_SWEEP_xxx (Off, Linear, Logarithmic,…)	
double	SweepEndOffset	Second offset for offset sweep	Unit
double	SweepOffsetTime	Time for offset sweep	s
unsigned long	SweepOffsetCount	Offset sweep counter (0=infinitive)	
unsigned short	SweepAmplitudeMode	DYN_SWEEP_xxx (Off, Linear, Logarithmic,…)	
double	SweepEndAmplitude	Second offset for offset sweep	Unit
double	SweepAmplitudeTime	Time for amplitude sweep	s
unsigned long	SweepAmplitudeCount	Amplitude sweep counter (0=infinitive)	Unit
unsigned short	SuperpositionMode	Superposition Mode (DYN_SUPERPOS_ON / _OFF)	
double	SuperpositionFrequency	Superposition Frequency	1/s
double	SuperpositionAmplitude	Superposition Amplitude	Unit
unsigned short	BimodalCtrlMode	Mode for bimodal control	
unsigned short	BimodalCtrlSensor	Sensor for bimodal control	
double	BimodalValue1	Value1 to keep constant	UnitBi
double	BimodalValue2	Value2 only for DYN_BIMODAL_AMPLITUDE_OFFSET_VAR	UnitBi

	double	BimodalScale	Scale	Unit/UnitBi
	unsigned short *	lpusTAN	Pointer to transaction number.	
.NET	<Edc object>.Move.DynCycles(DoPE.DYN_WAVEFORM WaveForm, bool Modify, DoPE.DYN_PEAKCTRL PeakCtrl, DoPE.CTRL MoveCtrl, bool RelativeDestination, Double SpeedToStart, Double Offset, Double Amplitude, Double HaltAtPlusAmplitude, Double HaltAtMinusAmplitude, Double Frequency, Int32 HalfCycles, Double SpeedToDestination, Double Destination, DoPE.DYN_SWEEP SweepFrequencyMode, Double SweepEndFrequency, Double SweepFrequencyTime, Int32 SweepFrequencyCount, DoPE.DYN_SWEEP SweepOffsetMode, Double SweepEndOffset, Double SweepOffsetTime, Int32 SweepOffsetCount, DoPE.DYN_SWEEP SweepAmplitudeMode, Double SweepEndAmplitude, Double SweepAmplitudeTime, Int32 SweepAmplitudeCount, DoPE.DYN_SUPERPOS SuperpositionMode, Double SuperpositionFrequency, Double SuperpositionAmplitude, DoPE.DYN_BIMODAL BimodalCtrlMode, DoPE.SENSOR BimodalCtrlSensor, Double BimodalValue1, Double BimodalValue2, Double BimodalScale, ref Int16 Tan)			

5.6.9 DoPESetPeakCtrl

Modify peak control of a running DynCycle command.
Refere to *5.6.4Peak and Valley control* for details.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		**Description**
extern unsigned DLLAPI	DoPESetPeakCtrl (	Function returns Error constant (DoPERR_xxxx)
DoPE_HANDLE	DoPEHdl,	DoPE link handle
unsigned short	PeakCtrl)	Peak control cycles 0, 1,2,4,8,16
.NET	<Edc object>.Move.PeakCtrl(Int16 Cycles)	

6 Synchronized data and movement

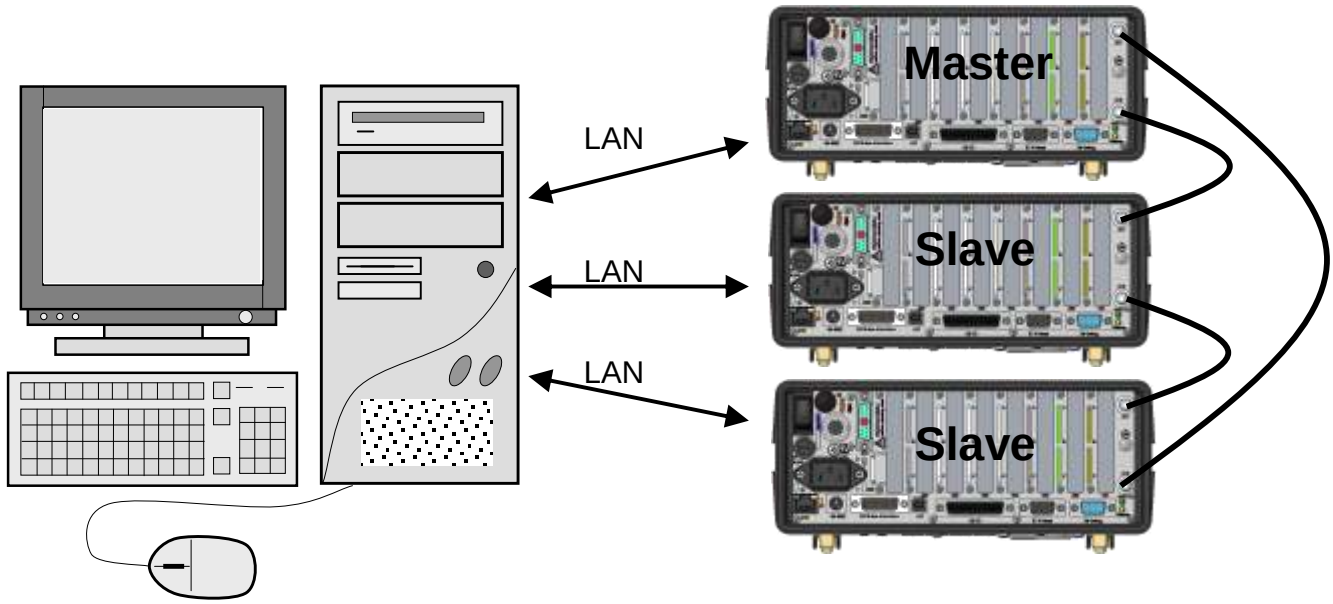
There are two commands (DoPESynchronizeSystemMode, DoPESynchronizeSystemStart) to control synchronized movement of two or more EDC systems. These commands are only useful if the synchronization option is installed, and the two or more EDC are correctly connected.

Important: **Make sure that all synchronized EDC's use the same**
- System Time
- Data Transmission Rate

With DoPESynchronizeSystemMode you can synchronize time and movement, with DoPESynchronizeSystemStart you can start the synchronization.

There is also an event handler for synchronized measuring data samples available. The event is activated after DoPE receives samples with the same time from all synchronized EDCs.

The parameter SyncOption of DoPEGeneralData must be set correctly:
SYNC_OPTION_MASTER: for one Master EDC
SYNC_OPTION_SLAVE: for all other Slave EDCs



There might be undefined measured values if a sync cable is unplugged during operation. We recommend to supervise the CTRL_SYNCINPUT Bit of the Controller Status WORD 1 and take actions if the cabling is interrupted (e.g. switching off the drive and reinitializing the EDCs).

6.1 DoPESynchronizeSystemMode

DoPESynchronizeSystemMode command is used for synchronized movement
(see sample and state diagram below).

Minimum requirements: EDCi with EDCiApp 9149.008, DoPE 10.11

If Mode is SSM_SYNCMOVE, the next moving command like DoPEPos, DoPECosine or any other moving command will be delayed until synchronization condition is true. The systems will be synchronized by the DoPESynchronizeSystemStart command.

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPESynchronizeSystemMode(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	Mode	SSM_SYNCMOVE: If Time is ZERO, start movement after synchronize signal is active. If Time is not ZERO, wait Time after synchronize signal is active before starting the movement. SSM_SYSTEMTIME: Set EDC-system time to Time, after synchronize signal is active. SSM_DISCARD: Discard previous DoPESynchronizeSystemMode command.	
double	Time	Delay or system time to set with the next DoPESynchronizeSystemStart command.	s

.NET <Edc object>.Syn.SynchronizeSystemMode(DoPE.SSM Mode, Double Time)

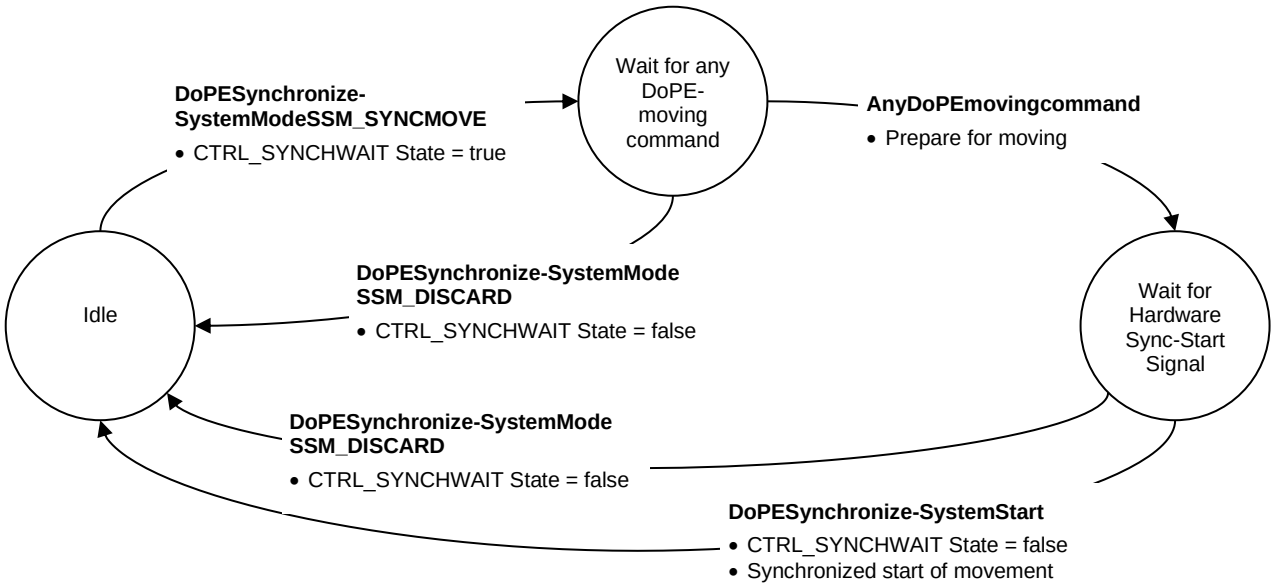
6.2 DoPESynchronizeSystemStart

This function can only be processed on the Master-EDC.
The digital synchronization signal will be activated, and with the next system clock, all involved EDC will start the previously defined actions, set by DoPESynchronizeSystemMode.

Minimum requirements: EDCi with EDCiApp 9149.008, DoPE 10.11

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPESynchronizeSystemStart (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle of Master EDC	

.NET <Edc object>.Syn.SynchronizeSystemStart()



Example1: Two axes should do synchronized sinusoidal cycles with no phase shift. EDC with DoPEHdl_1 is the master EDC.

```
/* Attention: The return code in this example is not checked!
   A real program must check the return code !!                    */
/* Move both EDC to the start position */
Error = DoPEPosSync (DoPEHdl_1, CTRL_CTRL, Speed1, Dest1);
Error = DoPEPosSync (DoPEHdl_2, CTRL_CTRL, Speed1, Dest1);


/* Wait until both EDC reached the start position */
/* (e.g. use the OnPosMsg handler to set flags)
While(!PosReached_1 || !PosReached_2)
    < check timeout >


/* Set system time for both EDC to zero after synchronization started */
Error = DoPESynchronizeSystemMode (DoPEHdl_1, SSM_SYSTEMTIME, 0, &lpusTAN_1);
Error = DoPESynchronizeSystemMode (DoPEHdl_2, SSM_SYSTEMTIME, 0, &lpusTAN_2);

/* Start cosine after synchronization without delay */
Error = DoPESynchronizeSystemMode (DoPEHdl_1, SSM_SYNCMOVE, 0, &lpusTAN_1);
Error = DoPECosineSync ( DoPEHdl_1, CTRL_POS, Speed1, Dest1, Dest2, Frequency, HalfCycles,
                         Speed, Destination, &lpusTAN_1);

/* Start cosine after synchronization without delay */
Error = DoPESynchronizeSystemMode (DoPEHdl_2, SSM_SYNCMOVE, 0, &lpusTAN_2);
Error = DoPECosineSync ( DoPEHdl_2, CTRL_POS, Speed1, Dest1, Dest2, Frequency, HalfCycles,
                         Speed, Destination, &lpusTAN_2);

/* Start synchronization at Master EDC */
Error = DoPESynchronizeSystemStart (DoPEHdl_1, &lpusTAN_1);
```

Example2: Two axes should do synchronized sinusoidal cycles with 90° phase shift. EDC with DoPEHdl_1 is the master EDC.

```
/* Attention: The return code in this example is not checked!
   A real program must check the return code !!                    */
/* Move both EDC to the start position */
Error = DoPEPosSync (DoPEHdl_1, CTRL_CTRL, Speed1, Dest1);
Error = DoPEPosSync (DoPEHdl_2, CTRL_CTRL, Speed1, Dest1);


/* Wait until both EDC reached the start position */
/* (e.g. use the OnPosMsg handler to set flags)
While(!PosReached_1 || !PosReached_2)
    < check timeout >


/* Set system time for both EDC to zero after synchronization started */
Error = DoPESynchronizeSystemMode (DoPEHdl_1, SSM_SYSTEMTIME, 0, &lpusTAN_1);
Error = DoPESynchronizeSystemMode (DoPEHdl_2, SSM_SYSTEMTIME, 0, &lpusTAN_2);

/* Start cosine after synchronization without delay */
Error = DoPESynchronizeSystemMode (DoPEHdl_1, SSM_SYNCMOVE, 0, &lpusTAN_1);
Error = DoPECosineSync ( DoPEHdl_1, CTRL_POS, Speed1, Dest1, Dest2, Frequency, HalfCycles,
                         Speed, Destination, &lpusTAN_1);

/* Start cosine after synchronization 90° phase shift */
Error = DoPESynchronizeSystemMode (DoPEHdl_2, SSM_SYNCMOVE, 1 / (Frequency * 4), &lpusTAN_2);
Error = DoPECosineSync ( DoPEHdl_2, CTRL_POS, Speed1, Dest1, Dest2, Frequency, HalfCycles,
                         Speed, Destination, &lpusTAN_2);

/* Start synchronization at Master EDC */
Error = DoPESynchronizeSystemStart (DoPEHdl_1, &lpusTAN_1);
```

6.3 DoPESynchronizeData

Activate sample synchronization for a list of DoPE handles. Passing an empty linklist (first item NULL) stops sample synchronization. Initializing, selecting a setup or closing one or more links stops sample synchronization, too.	
Minimum requirements: EDCi with EDCiApp 9149.008, DoPE 10.11	
Function declaration	**Description**
extern unsigned DLLAPI DoPESynchronizeData(DoPE_HANDLE DoPEHdl[] DoPE_HANDLE *pMaster)	Function returns Error constant (DoPERR_xxxx) DoPE link handle array (terminated by NULL). Pointer to storage for the master DoPE link handle.
.NET <EdcList object>.Syn.SynchronizeData(EdcList ListEdc, out Edc MasterEdc)	

6.4 DoPESetOnSynchronizeDataHdlr

Set the OnSynchronizeData handler.	
Minimum requirements: EDCi with EDCiApp 9149.008, DoPE 10.11	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnSynchronizeDataHdlr(DoPEOnSynchronizeDataHdlr Hdlr LPVOID lpParameter)	Function returns Error constant (DoPERR_xxxx) User function to be called with everyreceived synchronized sample. User specific pointer.
User function for the OnSynchronizeDataevent:	
unsigned CALLBACK OnSynchronizeData DoPE_HANDLE DoPEHdl DoPEOnSynchronizeData *Data LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to received data User specific pointer set with DoPESetOnSynchronizeDataHdlr
typedef struct { unsigned DoPError unsigned nData DoPELinkData *Sample double Occupied } DoPEOnSynchronizeData; typedef struct { DoPE_HANDLE DP DoPEData Data } DoPELinkData	 DoPERR_NOERROR event is ok. Number of measuring data records Array of measuring data records. Utilization [% of data buffer size] DoPE link handle Measuring data record
.NET <EdcList object>.Syn.DoPEOnSynchronizeDataHdlr += new DoPE.OnSynchronizeDataHdlr(Hdlr)	

6.5 DoPESetOnSynchronizeDataOverflowHdlr

Set the OnSynchronizeDataOverflow handler.	
Minimum requirements: EDCi with EDCiApp 9149.008, DoPE 10.11	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnSynchronizeDataOverflowHdlr(DoPEOnSynchronizeDataOverflowHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) User function to be called with every overflow of synchronized sample. User specific pointer.
User function for the OnSynchronizeDataOverflow event:	
unsigned CALLBACK OnSynchronizeDataOverflow LPVOID lpParameter	Function should return 0 (reserved for future versions) Userspecific pointer set with DoPESetOnSynchronizeDataOverflowHdlr
.NET <EdcList object>.Syn.DoPEOnSynchronizeDataOverflowHdlr += new DoPE.OnSynchronizeDataOverflowHdlr (Hdlr)	

7 Miscellaneous Control Commands

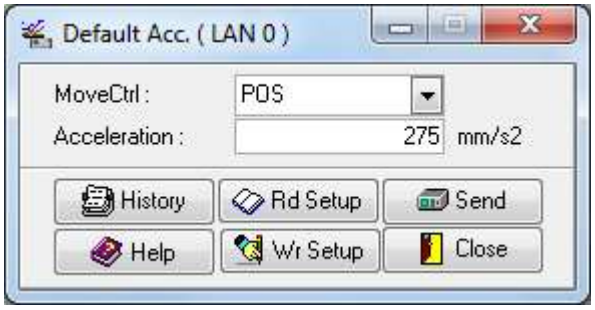
7.1 DoPEOn

Activate drive.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPEOn(DoPE_HANDLE DoPEHdl	Function returns Error constant (DoPERR_xxxx) DoPE link handle	
.NET <Edc object>.Move.On()		

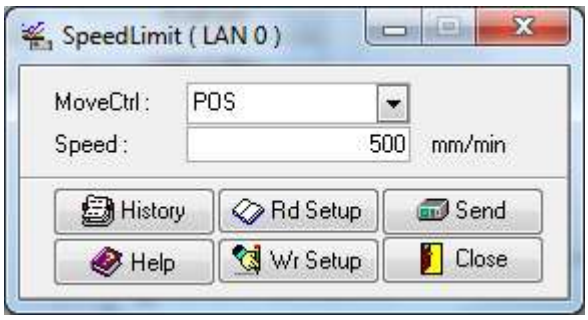
7.2 DoPEOff

Deactivate drive.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPEOff(DoPE_HANDLE DoPEHdl	Function returns Error constant (DoPERR_xxxx) DoPE link handle	
.NET <Edc object>.Move.Off()		

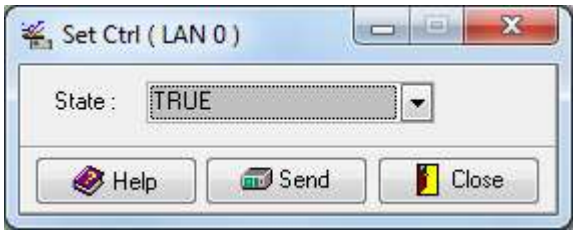
7.3 DoPEDefaultAcc

Set default acceleration (and deceleration) for all moving commands. After initialization default and nominal acceleration are identical.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPEDefaultAcc (DoPE_HANDLE DoPEHdl unsigned short MoveCtrl double Acc	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Default Acceleration	
.NET <Edc object>.Move.DefaultAcc(DoPE.CTRL MoveCtrl, Double Acc)		

7.4 DoPESpeedLimit

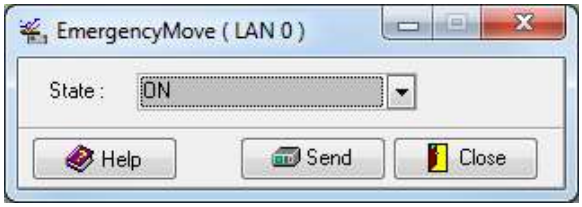
Set speed limit. The maximum speed for all moving commands will be limited to this SpeedLimit.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPESpeedLimit (DoPE_HANDLE DoPEHdl unsigned short MoveCtrl double Speed	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Maximum allowed speed (must be below nominal speed)	 Unit/s
.NET <Edc object>.Move.SpeedLimit(DoPE.CTRL MoveCtrl, Double Speed)		

7.5 DoPESetCtrl

Enable / disable closed loop control.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
	Use this command to switch off EDC-Closed Loop Control. After switching closed loop control off, PC must wait unlil all bits in ActiveCtrl are ZERO.
	This command activates closed loop control of EDC. Wait until the CTRL_READY bit in controller status word 1 is active before any moving command is used!

Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPESetCtrl (DoPE_HANDLE DoPEHdl unsigned Enable WORD *lpusTAN	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables =0 disables closed loop control Pointer to transaction number.	
.NET <Edc object>.Move.SetCtrl(bool Enable, ref Int16 Tan)		

7.6 DoPEEmergencyMove

Activate / deactivate emergency movement. Emergency movement is used to move crosshead if the hardware limit switch is active.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
		
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPEEmergencyMove (DoPE_HANDLE DoPEHdl Unsigned short State	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 on =0 off	
.NET <Edc object>.Move.EmergencyMove(bool Activate)		

7.7 DoPEEmergencyOff

Activate / deactivate EmergencyOff state.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
	The emergency off state may be activated or deactivated by software.	
Function declaration	**Description**	**Unit**
extern unsigned DLLAPI DoPEEmergencyOff (DoPE_HANDLE DoPEHdl Unsigned short State	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 Activate emergency off =0 Deactivate emergency off	
.NET <Edc object>.Move.EmergencyOff(bool Activate)		

7.8 DoPESetOpenLoopCommand

Set output value to valve.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

This command is only allowed in OpenLoop controller structure. It is used for hydraulic machines that operate without a position sensor. (typically concrete testing machines) With this command it is possible to move the piston up or down. The command value where the piston is floating (not moving up or down) must be determined during installation.

Function declaration		Description	Unit
extern unsigned DLLAPI	DoPESetOpenLoopCommand (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
double	Command	Output value to valve in %.	%

.NET <Edc object>.Output.SetOpenLoopCommand(Double Command)

8 Event Handler

8.1 Using DoPE Event handler

Whenever necessary, EDC will send a message, possibly with parameters to PC. There are many different reasons for such messages. E.g. if a positioning command has reached the destination, EDC will send a message to PC, reporting the destination has been reached.

To make it easy for the application program to get these messages, DoPE offers an event handler interface.For each event, the application program wants to process, an event handler must be installed. DoPE will call these event handlers, whenever the event occurs.

8.2 Overview of Events:

Event Name	Description	Related DoPE Command
OnLine	EDC goes On/Offline	-
OnDataBlock	New data record(s) with measures values	-
OnCommandError	Error event upon a command	Any command
OnPosMsg	A positioning command has reached the destination	Any positioning command like DoPEPos, DoPEBlockExecute
OnTPosMsg	Trigger position hit	DoPETrig, Positioning command with DoPEBlockHeader/Execute
OnLPosMsg	Limit position reached	DoPEPosExt, DoPEFDPoti when reaching softend
OnSftMsg	Softend reached	DoPESft, Any positioning command
OnOffsCMsg	Offset correction finished	DoPEOffsC
OnCheckMsg	A measuring channel supervision hit.	DoPESetCheck
OnRefSignalMsg	Reference signal message of a encoder	DoPESetRefSignalMode
OnSensorMsg	Message from a serial sensor	-
OnOverflow	Overflow of data records	-
OnRuntimeError	Any error condition, like emergency off active.	-
OnIoSHaltMsg	Upper / Lower S-Halt input triggered	-
OnKeyMsg	RMC-key state	-
OnSystemMsg	System message, like initialization errors	-
OnDebugMsg	Debug message (for remote support)	DoPEDebugMsgEnable DoPESendDebugCommand

8.3 DoPESetOnLineHdlr

The OnLine Handler supplies any change of the communication state between EDC, and PC.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnLineHdlr DoPE_HANDLE DoPEHdl DoPEOnLineHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after every line state change. User specific pointer.
User function for the OnLine event:	
unsigned CALLBACK OnLine DoPE_HANDLE DoPEHdl int LineState LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle DoPEOFFLINE (0) link is offline DoPEONLINE (1) link is online DoPERESTART (2) asynchronous restart of the link User specific pointer set with DoPESetOnLineHdlr
.NET <Edc object>.Eh.OnLineHdlr += new DoPE.OnLineHdlr(Hdlr)	

8.4 DoPESetOnDataBlockHdlr

The OnDataBlock event handler is called with each received measuring data record block from EDC. Per default DoPE collects 50 measuring data records in a block. This number can be changed with the DoPESetOnDataBlockSize function.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnDataBlockHdlr DoPE_HANDLE DoPEHdl DoPEOnDataBlockHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a new data record block is available. User specific pointer
User function for the OnDataBlock event:	
unsigned CALLBACK OnDataBlock DoPE_HANDLE DoPEHdl DoPEOnDataBlock *pData LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to measuring data record block User specific pointer set with DoPESetOnDataBlockHdlr
typedef struct { unsigned DoPError; unsigned nData DoPEOnData *pData double Occupied; } DoPEOnDataBlock;	 DoPERR_NOERROR event is ok, else at least one measuring data record reports an error. Number of measuring data records in the block Pointer to measuring data records Utilization in percent of the measuring data circular buffer inside DoPE.
typedef struct { unsigned DoPError DoPEData Data double Occupied; } DoPEOnData;	 DoPERR_NOERROR event is ok, Measuring data record Utilization in percent of the measuring data circular buffer inside DoPE
.NET <Edc object>.Eh.OnDataBlockHdlr += new DoPE.OnDataBlockHdlr(Hdlr)	

8.5 DoPESetOnDataBlockSize

Set the number of measuring data records to collect in an OnDataBlock block.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnDataBlockSize DoPE_HANDLE DoPEHdl unsigned nData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Number of samples to collect in a block
.NET <Edc object>.Eh.SetOnDataBlockSize(Int32 nData)	

8.6 DoPEGetOnDataBlockSize

Get the number of measuring data record to collect in an OnDataBlock block.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPEGetOnDataBlockSize DoPE_HANDLE DoPEHdl unsigned *nData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to storage for number of samples to collect in a block
.NET <Edc object>.Eh.GetOnDataBlockSize(ref Int32 nData)	

8.7 DoPESetOnCommandErrorHdlr

The OnCommandError event handler is called after parameter check of any DoPE command. DoPE commands like DoPEPos (not DoPEPosSync) report errors after being checked by EDC-firmware. After receiving the command error message from EDC, DoPE sends the OnCommandError event. (Only for non synchronized commands)	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPISetOnCommandErrorHdlr DoPE_HANDLE DoPEHdl DoPEOnCommandErrorHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called. User specific pointer.
User function for the OnCommandErrorevent:	
unsigned CALLBACK OnCommandError DoPE_HANDLE DoPEHdl DoPEOnCommandError *pError LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to command error structure User specific pointer set with DoPESetOnDataHdlr
typedef struct { unsigned short CommandNumber unsigned short ErrorNumber unsigned short usTAN } DoPEOnCommandError;	 EDC internal command number (for internal use). ErrorNumber specifies the error type (see DoPERR_CMD_xxx). Transaction number of the corresponding DoPE command.
.NET <Edc object>.Eh.OnCommandErrorHdlr += new DoPE.OnCommandErrorHdlr(Hdlr)	

8.8 DoPESetOnPosMsgHdlr

Whenever a moving command, like DoPEPos, is finished, EDC will send a message to PC. The moving command is finished after the command generator reached the final destination. DoPE will call the OnPosMsg event handler with a pointer to the DoPEOnPosMsg structure:

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnPosMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnPosMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called. User specific pointer.
User function for the OnPosMsg event:	
unsigned CALLBACK OnPosMsg DoPE_HANDLE DoPEHdl DoPEOnPosMsg * pPosMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to positioning message structure User specific pointer set with DoPESetOnPosMsgHdlr
typedef struct { unsigned DoPError unsigned short Reached double Time unsigned short Control double Position unsigned short DControl double Destination unsigned short usTAN } DoPEOnPosMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. 1 if current position is within the destination window, 0 if current position is outside destination window. EDC-System time when reaching destination. Control mode of the next parameter (Position) If Reached = 1 Destination of the corresponding moving command. If Reached = 0 Current position. Control mode of the next parameter (Destination) Here: DControl has always the same value as Control. Destination of the corresponding moving command. Transaction number of the corresponding moving command.
.NET <Edc object>.Eh.OnPosMsgHdlr += new DoPE.OnPosMsgHdlr(Hdlr)	

8.9 DoPESetOnTPosMsgHdlr

This event is sent if the trigger position of a DoPETrig command hits. DoPE will call the OnTPosMsg event handler with a pointer to the DoPEOnPosMsg structure:

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnTPosMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnTPosMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after the trigger position of DoPETrig command hits. User specific pointer.
User function for the OnTPosMsg event:	
unsigned CALLBACK OnTPosMsg DoPE_HANDLE DoPEHdl DoPEOnTPosMsg * pTPosMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to positioning message structure User specific pointer set with DoPESetOnTPosMsgHdlr
typedef struct { unsigned DoPError unsigned short Reached double Time unsigned short Control double Position unsigned short DControl double Destination unsigned short usTAN } DoPEOnPosMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. Always 1. EDC-System time when trigger hits. Control mode of the next parameter (Position) Limit position of DoPETrig com. Control mode of the next parameter (Destination). Trigger position of DoPETrig command. Transaction number of the corresponding DoPETrig command.
.NET <Edc object>.Eh.OnTPosMsgHdlr += new DoPE.OnTPosMsgHdlr(Hdlr)	

8.10 DoPESetOnLPosMsgHdlr

This event is sent if the limit position of a DoPEPosExt command hits, or a softend position exceeds during DoPEFDPoti command. DoPE will call the OnLPosMsg event handler with a pointer to the DoPEOnPosMsg structure:	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnLPosMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnLPosMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after the limit position of DoPEPosExt command hits. User specific pointer.
User function for the OnLPosMsg event:	
unsigned CALLBACK OnLPosMsg DoPE_HANDLE DoPEHdl DoPEOnLPosMsg * pLPosMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to positioning message structure User specific pointer set with DoPESetOnLPosMsgHdlr
typedef struct { unsigned DoPError unsigned short Reached double Time unsigned short Control double Position unsigned short DControl double Destination unsigned short usTAN } DoPEOnPosMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. Always 1. EDC-System time when limit hits. Control mode of the next parameter (Position) Limit position of DoPEPosExt com. Control mode of the next parameter (Destination). Destination position of DoPEPosExt command. Transaction number of the corresponding DoPEPosExt command.
.NET <Edc object>.Eh.OnLPosMsgHdlr += new DoPE.OnLPosMsgHdlr(Hdlr)	

8.11 DoPESetOnSftMsgHdlr

This event is sent if a softend position was exceeded.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnSftMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnSftMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a positioning command wasfinished. User specific pointer.
User function for the OnSftMsg event:	
unsigned CALLBACK OnSftMsg DoPE_HANDLE DoPEHdl DoPEOnSftMsg *pSftMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to positioning message structure User specific pointer set with DoPESetOnSftMsgHdlr
typedef struct { unsigned DoPError unsigned short Upper double Time unsigned short Control double Position unsigned short usTAN } DoPEOnSftMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. 1 = upper softend. 0 = lower softend. EDC-System time when softend was exceeded. Control mode of the softend that was exceeded. Position, where the softend was detected. Transaction number of the last positioning command.
.NET <Edc object>.Eh.OnSftMsgHdlr += new DoPE.OnSftMsgHdlr(Hdlr)	

8.12 DoPESetOnOffsCMsgHdlr

Handler for offset correction messages	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnOffsCMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnOffsCMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after an offset correction, activated withDoPEOffsC command was finished. User specific pointer.
User function for the OnOffsCMsg event:	
unsigned CALLBACK OnOffsCMsg DoPE_HANDLE DoPEHdl DoPEOnOffsCMsg *pOffsCMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to positioning message structure User specific pointer set with DoPESetOnOffsCMsgHdlr
typedef struct { unsigned DoPError double Time unsigned short Offset unsigned short usTAN } DoPEOnOffsCMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. EDC-System time when offset correction was finished. Measured offset of the output channel. Transaction number of the corresponding DoPEOffsC command.
.NET <Edc object>.Eh.OnOffsCMsgHdlr += new DoPE.OnOffsCMsgHdlr(Hdlr)	

8.13 DoPESetOnCheckMsgHdlr

Handler for channel supervision messages	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnCheckMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnCheckMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a channel supervision condition hits. User specific pointer.
User function for the OnCheckMsg event:	
unsigned CALLBACK OnCheckMsg DoPE_HANDLE DoPEHdl DoPEOnCheckMsg *pCheckMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to check message structure User specific pointer set with DoPESetOnCheckMsgHdlr
typedef struct { unsigned DoPError unsigned short Action double Time unsigned short CheckId Double Position unsigned short SensorNo unsigned short usTAN } DoPEOnCheckMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. 1 = the action of DoPESetCheck command was started. 0 = the action of DoPESetCheck command was NOT started. (due to an error condition like active softend) EDC-System time. ID of measuring channel check. Position of the supervised sensor. Supervised sensor. Transaction number of the corresponding DoPESetCheck command.
.NET <Edc object>.Eh.OnCheckMsgHdlr += new DoPE.OnCheckMsgHdlr(Hdlr)	

8.14 DoPESetOnRefSignalMsgHdlr

Handler for reference signal messages	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPIDoPESetOnRefSignalMsgHdlr DoPE_HANDLE DoPEHdl DoPESetOnRefSignalMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a reference signal occurred. User specific pointer.
User function for the OnRefSignalMsg event:	
unsigned CALLBACK OnRefSignalMsg DoPE_HANDLE DoPEHdl DoPEOnRefSignalMsg * pRefSignalMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to reference signal message structure. User specific pointer set with DoPESetOnRefSignalMsgHdlr
typedef struct { unsigned DoPError double Time unsigned short SensorNo Double Position unsigned short usTAN } DoPEOnRefSignalMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. EDC-System time. Sensor where the reference signal occurred. Position at reference signal. Transaction number of the corresponding DoPESetRefSignalMode command.
.NET <Edc object>.Eh.OnRefSignalMsgHdlr += new DoPE.OnRefSignalMsgHdlr(Hdlr)	

8.15 DoPESetOnSensorMsgHdlr

Handler for serial sensormessages	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPIDoPESetOnSensorMsgHdlr DoPE_HANDLE DoPEHdl DoPESetOnSensorMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a message from a serial sensor wasreceived. User specific pointer.
User function for the OnSensorMsg event:	
unsigned CALLBACK OnSensorMsg DoPE_HANDLE DoPEHdl DoPEOnSensorMsg * pOnSensorMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to serial sensor message structure. User specific pointer set with DoPESetOnSensorMsgHdlr
typedef struct { unsigned DoPError double Time unsigned short SensorNo unsigned short Length unsigned char Data[SENSOR_MSG_LEN+1] unsigned short usTAN } DoPEOnSensorMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. EDC-System time. Sensor number. Number of bytes in Data. Message from the sensor. Transaction number is unused, always ZERO.
.NET <Edc object>.Eh.OnSensorMsgHdlr += new DoPE.OnSensorMsgHdlr(Hdlr)	

8.16 DoPESetOnIoSHaltMsgHdlr

Handler for IO-SHalt messages.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnIoSHaltMsgHdlr DoPE_HANDLE DoPEHdl DoPESetOnIoSHaltMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a SHalt input has triggered. User specific pointer.
User function for the OnIoSHaltMsg event:	
unsigned CALLBACK OnIoSHaltMsg DoPE_HANDLE DoPEHdl DoPEOnIoSHaltMsg * pOnIoSHaltMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to IO-SHalt message structure. User specific pointer set with DoPESetOnIoSHaltMsgHdlr
typedef struct { unsigned DoPError unsigned short Upper double Time unsigned short Control double Position unsigned short usTAN } DoPEOnIoSHaltMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. 1: Upper SHalt input triggered. 0: Lower SHalt input triggered. EDC-System time. Control mode of Position. Position at SHalt input trigger. Transaction number.
.NET <Edc object>.Eh.OnIoSHaltMsgHdlr += new DoPE.OnIoSHaltMsgHdlr(Hdlr)	

8.17 DoPESetOnKeyMsgHdlr

Handler for keymessages. For each activated or deactivated key this message is sent.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnKeyMsgHdlr DoPE_HANDLE DoPEHdl DoPESetOnKeyMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a change of any (RMC) key was detected. User specific pointer.
User function for the OnKeyMsg event:	
unsigned CALLBACK OnKeyMsg DoPE_HANDLE DoPEHdl DoPEOnKeyMsg * pOnKeyMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to key message structure. User specific pointer set with DoPESetOnKeyMsgHdlr
typedef struct { unsigned DoPError double Time unsigned __int64 Keys unsigned __int64 NewKeys unsigned __int64 GoneKeys unsigned short OemKeys unsigned short NewOemKeys unsigned short GoneOemKeys unsigned short usTAN } DoPEOnKeyMsg;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. EDC-System time. Current key state. All new keys. All gone keys. Current OEM key state (for future use). New OEM keys (for future use). Gone OEM keys (for future use). Transaction number.
.NET <Edc object>.Eh.OnKeyMsgHdlr += new DoPE.OnKeyMsgHdlr(Hdlr)	

8.18 DoPESetOnRuntimeErrorHdlr

Handler for runtime errormessages.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPIDoPESetOnRuntimeErrorHdlr DoPE_HANDLE DoPEHdl DoPEOnRuntimeErrorHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after a runtime error occurred. User specific pointer.
User function for the OnOnRuntimeError event:	
unsigned CALLBACK OnRuntimeError DoPE_HANDLE DoPEHdl pOnRuntimeError * pOnRuntimeError LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to runtime error structure. User specific pointer set with DoPESetOnRuntimeErrorHdlr
typedef struct { unsigned DoPError unsigned short ErrorNumber double Time unsigned short Device unsigned short Bits unsigned short usTAN } DoPEOnRuntimeError;	 DoPERR_NOERROR event is ok. Else error occurred during event generation, e.g. data conversion error. Number of run time error. System time the error occurred. Device Number responsible for the error. Responsible bits of the device. Transaction number. **Note: Device and Bits are only information for DOLI service personal.**
.NET <Edc object>.Eh.OnRuntimeErrorHdlr += new DoPE.OnRuntimeErrorHdlr(Hdlr)	

8.18.1 List of Runtime errors

Error number	Error constant	Description
104	RTE_EMOVE_END	Error at end of emergency movement still active
105	RTE_CTRL_DEVIATION	Controller deviation error (Control channel see device)
201	RTE_DRIVE_OFF	Drive off or emergency off
202	RTE_E_MOVE_RQ	emergency off, emergency drive required
203	RTE_UPPER_LIMIT_SWITCH	Upper hard-limit switch active
204	RTE_LOWER_LIMIT_SWITCH	Lower hard-limit switch active
205	RTE_STOP	Drive not ready
206	RTE_DF_KEY	Drive free withdrawn by key
207	RTE_SHALT	Signal S-HALT activated
301	RTE_UPPER_LIMIT	Upper range limit exceeded
302	RTE_LOWER_LIMIT	Lower range limit exceeded

8.19 DoPESetOnOverflowHdlr

Handler for overflow messages. An overflow may occur, if data records or messages from EDC are not processed by the application program for a longer time. The application program can adjust the number of data records, and messages when opening the link to EDC with DoPE open functions.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPIDoPESetOnOverflowHdlr DoPE_HANDLE DoPEHdl DoPEOnOverflowHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called after overflow detection. User specific pointer.
User function for the OnOverflow event:	
unsigned CALLBACK OnOverflow DoPE_HANDLE DoPEHdl int Overflowtype LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle 0=measuring data records lost else =message lost. User specific pointer set with DoPESetOnOverflowHdlr
.NET <Edc object>.Eh.OnOverflowHdlr += new DoPE.OnOverflowHdlr(Hdlr)	

8.20 DoPESetOnSystemMsgHdlr

Handler for system messages.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnSystemMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnSystemMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called for system messages. User specific pointer.
User function for the OnSystemMsg event:	
unsigned CALLBACK OnSystemMsg DoPE_HANDLE DoPEHdl DoPEOnSystemMsg *SystemMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to received system message User specific pointer set with DoPESetOnSystemMsgHdlr
typedef struct { unsigned DoPError unsigned short MsgNumber double Time wchar_t Text[SYSTEM_MSG_TEXT_LEN] } DoPEOnSystemMsg;	 DoPERR_NOERROR event is ok. Number of system message System time the message was sent. Message text
.NET <Edc object>.Eh.OnSystemMsgHdlr += new DoPE.OnSystemMsgHdlr(Hdlr)	

8.21 DoPESetOnDebugMsgHdlr

Handler for debug messages.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetOnDebugMsgHdlr DoPE_HANDLE DoPEHdl DoPEOnDebugMsgHdlr Hdlr LPVOID lpParameter	Function returns Error constant (DoPERR_xxxx) DoPE link handle User function to be called for debug messages. User specific pointer.
User function for the OnDebugMsg event:	
unsigned CALLBACK OnDebugMsg DoPE_HANDLE DoPEHdl DoPEOnDebugMsg *DebugMsg LPVOID lpParameter	Function should return 0 (reserved for future versions) DoPE link handle Pointer to received debug message User specific pointer set with DoPESetOnDebugMsgHdlr
typedef struct { unsigned DoPError unsigned short MsgType double Time wchar_t Text[DEBUG_MSG_TEXT_LEN] } DoPEOnDebugMsg;	 DoPERR_NOERROR event is ok. Type of debug message System time the message was sent. Message text
Constants for MsgType DEBUG_MSG DEBUG_MSG_DATA	 General debug message Measured values debug message (typically sent every 500ms)
.NET <Edc object>.Eh.OnDebugMsgHdlr += new DoPE.OnDebugMsgHdlr(Hdlr)	

8.22 DoPEThreadPollHdlr

In case, the application program uses an extra thread for communication with DoPE, the DoPEThreadPollHdlr must be called periodically.

1. The application program must install a tread message queue for the thread, using the windows API-function MsgWaitForMultipleObjectsEx.
2. Open communication with a DoPE open function.
3. Install all event handlers you want to process.
4. Use MsgWaitForMultipleObjectsEx function, and wait for tread messages.
5. Call DoPEThreadPollHdlr function if MsgWaitForMultipleObjectsEx stops waiting due to the QS_POSTMESSAGE wait mask. (See Microsoft MSDN for details)

Here a “C” sample program:

```
UINT Thread( LPVOID pParam)
{
  DoPE_HANDLE DoPEHdl = NULL;
  unsigned DoPEErr;
  // create a message queue for the thread
  MsgWaitForMultipleObjectsEx(
        0,              //DWORD nCount,          // number of handles in the handle array
        NULL,           //LPHANDLE pHandles,     // pointer to the object-handle array
        0,              //DWORD dwMilliseconds,  // time-out interval in milliseconds
        QS_POSTMESSAGE,//DWORD dwWakeMask       // type of input events to wait for
        MWMO_INPUTAVAILABLE //DWORD dwFlags     // wait flags
        );
  DoPEErr = DoPEErr = DoPEOpenFunctionID( ... &DoPEHdl ); // open the communication link
  if( DoPEErr != DoPERR_NOERROR)
    //add errorhandling here
  DoPEErr = DoPESelMachine ( DoPEHdl, 1, UserScale  );
  if(DoPEErr != DoPERR_NOERROR)
    //add errorhandling here
  // install the on data handler
  DoPEErr = DoPESetOnDataBlockHdlr ( DoPEHdl, OnData, NULL);
    if(DoPEErr != DoPERR_NOERROR)
    //add errorhandling here
  for ( BOOL Terminate = FALSE; !Terminate; ) // thread loop
  {
    DWORD n;
    #define nCOUNT 0
    switch(n=MsgWaitForMultipleObjectsEx(
        nCOUNT,         //DWORD nCount,          // number of handles in the handle array
        NULL,           //LPHANDLE pHandles,     // pointer to the object-handle array
        1000,           //DWORD dwMilliseconds,  // time-out interval in milliseconds
        QS_POSTMESSAGE,//DWORD dwWakeMask       // type of input events to wait for
        MWMO_INPUTAVAILABLE //DWORD dwFlags     // wait flags
        ))
    {
    case WAIT_TIMEOUT:
      break;
    case WAIT_OBJECT_0 + nCOUNT:
      // New input of the type specified in the dwWakeMask parameter
      // is available in the thread's input queue.
      DoPEErr=DoPEThreadPollHdlr ( DoPEHdl );
      if(DoPEErr!=DoPERR_NOERROR)
      {
        //add errorhandling here
        Terminate = TRUE;
      }
      // process thread messages with PeekMessage ( &Msg, NULL, WM_USER, WM_USER, PM_REMOVE ))
      break;
    }
  }
  return 0;
}
```

9 Configuration

9.1 DoPEwRdVersion

Read version strings.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPIDoPEwRdVersion DoPE_HANDLE DoPEHdl DoPEwVersion *Version	Function returns Error constant (DoPERR_xxxx) DoPE link handle Version strings.
typedef struct { wchar_t PeInterface[6]; wchar_t Application [13]; wchar_t Subsy[6]; wchar_t SubsyCustVer[6]; wchar_t SubsyCustName[9]; wchar_t Bios[6]; wchar_t HwCtrl[7]; wchar_t PeInterfacePC[6]; wchar_t DpxVer[6]; wchar_t SerialNumber[17]; } DoPEwVersion;	 PE interface EDC VERSION "xx.xx" EDC appl. version "xxxxxxxx.xxx" Subsystem version "xx.xx" Subsystem customer version "xx.xx" Subsystem customer name "xxxxxxxx" EDC BIOS version "xx.xx" EDC controller hardware no "xxxx.x" PE interface PC Version "xx.xx" DPX version "xx.xx" EDC serial number"xxxxxxxxxxxxxxx" Strings are zero terminated '\0'
.NET <Edc object>.Info.RdVersion(ref DoPE.VersionInfo VersionInfo)	

9.2 DoPEwRdLanguageInfo

Read language info.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPIDoPEwRdLanguageInfo DoPE_HANDLE DoPEHdl DoPEwLanguageInfo *Info	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to storage for the language info.
typedef struct { wchar_t Name0[LANGINFO_NAME_LEN]; wchar_t Name1[LANGINFO_NAME_LEN]; wchar_t Name2[LANGINFO_NAME_LEN]; wchar_t Name3[LANGINFO_NAME_LEN]; }DoPEwLanguageInfo;	 Language name 0 (e.g. "English") Language name 1 (e.g. "German") Language name 2 (e.g. "Spanish") Language name 3 (e.g. "French")
.NET <Edc object>.Info.RdLanguageInfo(ref DoPE.LanguageInfo LanguageInfo)	

9.3 Data Acquisition commands

9.3.1 DoPESetDataTransmissionRate

Set time base for data transmission. The default refresh time is defined in the set-up data. You may change it according to your needs.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE double unsigned sort *	DoPESetDataTransmissionRate (DoPEHdl Refresh lpusTAN	Function returns Error constant (DoPERR_xxxx) DoPE link handle Refresh time Pointer to transaction number (not for Sync. version).	 s
.NET <Edc object>.Data.SetDataTransmissionRate(Double Refresh)			

9.3.2 DoPESetTime

Set time counter to a desired value.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned sort double unsigned sort *	DoPESetTime (DoPEHdl Mode Time lpusTAN	Function returns Error constant (DoPERR_xxxx) DoPE link handle **SETTIME_MODE_IMMEDIATE**: set time without a delay **SETTIME_MODE_MOVE**: set time at the beginning of the next movement command **SETTIME_MODE_CYCLE**: set time at the beginning of the first cycle of the next cyclic command New value for Time in Pointer to transaction number (not for Sync. version).	 s
.NET <Edc object>.Data.SetTime(DoPE.SETTIME_MODE Mode, Double Time)			

9.3.3 DoPETransmitData

Activate / Deactivate transmission of data. If deactivated NO measuring data will be transmitted to the PC!			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short double unsigned sort *	DoPETransmitData (DoPEHdl Enable Time lpusTAN	Function returns Error constant (DoPERR_xxxx) DoPE link handle TRUE = Activate transmission FALSE = Deactivate transmission Pointer to transaction number (not for Sync. version).	
.NET <Edc object>.Data.TransmitData(bool Enable)			

9.3.4 DoPEFilterTime

Set filter time for a measuring channel. Normally filter time of analogue measuring channels is set to 20 ms. If this time is increased to a higher value e.g. 100 ms, resolution is increased and noise is decreased. For example you have a 100 kN load cell and you display 1 N as the smallest value. You reach this resolution at about 20 ms. Now you increase the time to 100 ms and you still display only 1 N steps, your signal noise will be reduced. You may use this effect for a stable load display while no test is running. Set filter time always to 250 ms while no test is running and just before starting a test reduce it to e.g. 20 ms.
Note: The filter time is independent from the refresh time (DoPESetDataTransmissionRate). It is possible to set the refresh time to 20 ms and the filter time to 100ms.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		**Description**	
extern unsigned DLLAPI	DoPEFiltertime (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	SensorNo	Sensor Number	
double	Time	Filter time for measuring channels in sec. The maximum time is 1sec. The minimum time is the speed control loop cycle time. (see machine set-up data)	s
unsigned sort *	lpusTAN	Pointer to transaction number (not for Sync. version).	
.NET	<Edc object>.Data.FilterTime(DoPE.SENSOR SensorNo, Double Time)		

9.4 Channel supervision

9.4.1 DoPESetCheck

Activate measuring channel supervision.
As support for special condition movement sequences, up to ten measurement channel supervisions are provided, all may be simultaneously active. Each supervision consists of the condition to supervise and the associated action. Supervisions are applicable to all configured measuring channels also for calculated channels if configured. All possible conditions and actions are listed below.
The condition of all active supervisions will be checked every 20 ms.
If a supervision condition hits, the associated action will be executed, an appropriate message transmitted, the current supervision and all other supervisions (which are not marked with the CHK_NOCLEAR bit) are deactivated.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPESetCheck (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	CheckId	ID of this check, use the CheckId constants (CHK_ID0 ... CHK_ID9)	
unsigned short	SensorNo	Sensor to be supervised	
double	Limit	Limit to be supervised	Unit
unsigned short	Mode	Mode, how the limit is detected. (see below)	
unsigned short	Action	This action will be activated if the check hits. (see below)	
unsigned short	Ctrl	Control mode for selected action(CTRL_xxx)	
double	Acc	Acceleration	Unit/s²
double	Speed	Maximum speed	Unit/s
double	Dec	Deceleration	Unit/s²
double	Destination	Final destination	Unit
unsigned short *	lpusTAN)	Pointer to transaction number.	

Possible modes:

CHK_BELOW	Action if	$Value < Limit$
CHK_ABOVE	Action if	$Value > Limit$
CHK_PERCENT_MAX	Action if	$\max.value - actual.value > \frac{\max.value * Limit}{100}$
CHK_PERCENT_MIN	Action if	$actual.value - \min.value > \frac{\min.value * Limit}{100}$
CHK_ABS_MAX	Action if	$\max.value - actualvalue > Limit$
CHK_ABS_MIN	Action if	$actualvalue - \min.value > Limit$

Possible actions:

ACTION_HALT	HALT with default deceleration
ACTION_HALT_A	HALT with specified deceleration
ACTION_POS	Go to a position with default deceleration
ACTION_POS_A	Go to a position with specified deceleration
ACTION_XPCONT	Change control mode, go on with current speed
ACTION_STOP	Switch off closed loop control. (Use this action for machines without position sensor)
ACTION_NOACTION	No action, only message to host
ACTION_SETOL	Set command output (only in open loop structure)
ACTION_SHALT	Immediate Halt in X-head position control
ACTION_UP	Move Up with specified speed
ACTION_DOWN	Move Down with specified speed
ACTION_DRIVE_OFF	Switch drive OFF

.NET <Edc object>.Check.SetCheck(DoPE.CHK_ID CheckId, DoPE.SENSOR SensorNo, Double Limit, DoPE.CHK_MODE Mode, DoPE.ACTION Action, DoPE.CTRL Ctrl, Double Acc, Double Speed, Double Dec, Double Destination, ref Int16 Tan)

9.4.2 DoPEClrCheck

Deactivate a measuring channel supervision			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short	DoPEClrCheck (DoPEHdl CheckId)	Function returns Error constant (DoPERR_xxxx) DoPE link handle ID of this check, use the CheckId constants (CHK_ID0 ... CHK_ID9)	
.NET <Edc object>.Check.ClrCheck(DoPE.CHK_ID CheckId)			

9.4.3 DoPESetCheckLimit

Activate limit supervision for a measuring channel. If the measured value is outside UprLimitSet or LwrLimitSet a digital output will be set. This function may be used to prevent opening of clamps under load **(see DoPEIOGrip configuration)**. The allocation of the digital output depends on the device selected in EDC-Set-up. **Attention:** The values for UprLimitSet, UprLimitReset, LwrLimitReset and LwrLimitSet are calculated with the current Tare and BasicTare. If BasicTare is changed, while limit check is still active, these values are recalculated with the new BasicTare. A new Tare does not affect these values!			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short double double double double	DoPESetCheckLimit (DoPEHdl SensorNo UprLimitSet UprLimitReset LwrLimitReset LwrLimitSet)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Defines the sensor to be supervised. For all values above, the digital output will be set. For all values below, the digital output will be reset. For all values above, the digital output will be reset For all values below, the digital output will be set.	
.NET <Edc object>.Check.SetCheckLimit(DoPE.SENSOR SensorNo, Double UprLimitSet, Double UprLimitReset, Double LwrLimitReset, Double LwrLimitSet)			

9.4.4 DoPEClrCheckLimit

Deactivate check limit function. The digital output will be set inactive.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE	DoPEClrCheckLimit (DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle	
.NET <Edc object>.Check.ClrCheckLimit()			

9.4.5 DoPESetCheckLimitIO

Set / reset measuring channel supervision IO.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short	DoPESetCheckLimitIO (DoPEHdl Value)	Function returns Error constant (DoPERR_xxxx) DoPE link handle 0 = reset, 1 = Set	
.NET <Edc object>.Check.			

9.5 Controller Parameter

All controller parameter can be modified at any time!

9.5.1 DoPEPosPID

Set parameter for closed loop position controller			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short double double double	DoPEPosPID (DoPEHdl MoveCtrl P I D)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Proportional gain of the position controller Integration time constant Derivative time constant	
Attention: **Normally there is a speed control loop with an integration part. In such cases set I here to ZERO. Otherwise we have a control loop with two integration parts and this will never be stable!**			
.NET <Edc object>.Ctrl.PosPID(DoPE.CTRL MoveCtrl, Double PosP, Double PosI, Double PosD)			

9.5.2 DoPERdPosPID

Get parameter for closed loop position controller			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short unsigned double double double	DoPEPosPID (DoPEHdl MoveCtrl HighPressure *P *I *D)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) !=0 get parameter for high pressure 0 get parameter for low pressure Pointer to Proportional gain of the position controller Pointer to Integration time constant Pointer to Derivative time constant	
.NET <Edc object>.Ctrl.RdPosPID(DoPE.CTRL MoveCtrl, bool HighPressure, ref Double PosP, ref Double PosI, ref Double PosD)			

9.5.3 DoPEWrPosPID

Set parameter for closed loop position controller			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short unsigned double double double	DoPEPosPID (DoPEHdl MoveCtrl HighPressure P I D)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) !=0 set parameter for high pressure 0 set parameter for low pressure Proportional gain of the position controller Integration time constant Derivative time constant	
Attention: **Normally there is a speed control loop with an integration part. In such cases set I here to ZERO. Otherwise we have a control loop with two integration parts and this will never be stable!**			
.NET <Edc object>.Ctrl.WrPosPID(DoPE.CTRL MoveCtrl, bool HighPressure, Double PosP, Double PosI, Double PosD)			

9.5.4 DoPESpeedPID

Set parameter for closed loop speed controller.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short double double double	DoPESpeedPID (DoPEHdl MoveCtrl P I D)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Proportional gain of the speed controller Integration time constant Derivative time constant	
.NET <Edc object>.Ctrl.SpeedPID(DoPE.CTRL MoveCtrl, Double SpeedP, Double SpeedI, Double SpeedD)			

9.5.5 DoPERdSpeedPID

Get parameter for closed loop speed controller			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short unsigned double double double	DoPEPosPID (DoPEHdl MoveCtrl HighPressure *P *I *D	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) !=0 get parameter for high pressure 0 get parameter for low pressure Pointer to Proportional gain of the speed controller Pointer to Integration time constant Pointer to Derivative time constant	
.NET <Edc object>.Ctrl.RdSpeedPID(DoPE.CTRL MoveCtrl, bool HighPressure, ref Double SpeedP, ref Double SpeedI, ref Double SpeedD)			

9.5.6 DoPEWrSpeedPID

Set parameter for closed loop speed controller			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short unsigned double double double	DoPEPosPID (DoPEHdl MoveCtrl HighPressure P I D)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) !=0 set parameter for high pressure 0 set parameter for low pressure Proportional gain of the speed controller Integration time constant Derivative time constant	
Attention: Normally there is a speed control loop with an integration part. In such cases set I here to ZERO. Otherwise we have a control loop with two integration parts and this will never be stable!			
.NET <Edc object>.Ctrl.WrSpeedPID(DoPE.CTRL MoveCtrl, bool HighPressure, Double SpeedP, Double SpeedI, Double SpeedD)			

9.5.7 DoPEFeedForward

Set feed forward parameter.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPEFeedForward (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
double	SpeedFFP	FeedForward for Speed in % of current speed	
double	PosDelay)	Delay for Position command	0.1ms
.NET	<Edc object>.Ctrl.FeedForward(DoPE.CTRL MoveCtrl, Double SpeedFFP, Double PosDelay)		

9.5.8 DoPERdFeedForward

Getfeed forward parameter			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPEPosPID (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
unsigned	HighPressure	!=0 get parameter for high pressure	
		0 get parameter for low pressure	
double	*SpeedFFP	Pointer to FeedForward for Speed in % of current speed	
double	*PosDelay	Pointer to Delay for Position command	
.NET	<Edc object>.Ctrl.RdFeedForward(DoPE.CTRL MoveCtrl, bool HighPressure, ref Double SpeedFFP, ref Double PosDelay)		

9.5.9 DoPEWrFeedForward

Set feed forward parameter			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPEPosPID (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
unsigned	HighPressure	!=0 set parameter for high pressure	
		0 set parameter for low pressure	
double	SpeedFFP	FeedForward for Speed in % of current speed	
double	PosDelay)	Delay for Position command	
Attention: Normally there is a speed control loop with an integration part. In such cases set I here to ZERO. Otherwise we have a control loop with two integration parts and this will never be stable!			
.NET	<Edc object>.Ctrl.WrFeedForward(DoPE.CTRL MoveCtrl, bool HighPressure, Double SpeedFFP, Double PosDelay)		

9.5.10 DoPEOptimizeFeedForward

Optimize feed forward parameter.
For optimization you specify e.g. a cosine cycle and the optimization function will find SpeedFFP and PosDelay values.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPEOptimizeFeedForward(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
unsigned short	Mode	Waveform: OPTIMIZE_COSINE, OPTIMIZE_TRIANGLE, or OPTIMIZE_RECTANGLE	
double	Offset	Offset	Unit
double	Amplitude	Amplitude	Unit
double	Frequency)	Frequency	Hz
.NET	<Edc object>.Ctrl.OptimizeFeedForward(DoPE.CTRL MoveCtrl, DoPE.OPTIMIZE Mode, Double Offset, Double Amplitude, Double Frequency, ref Int16 Tan)		

9.5.11 DoPECurrentPID

Set parameter for the external current closed loop controller.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

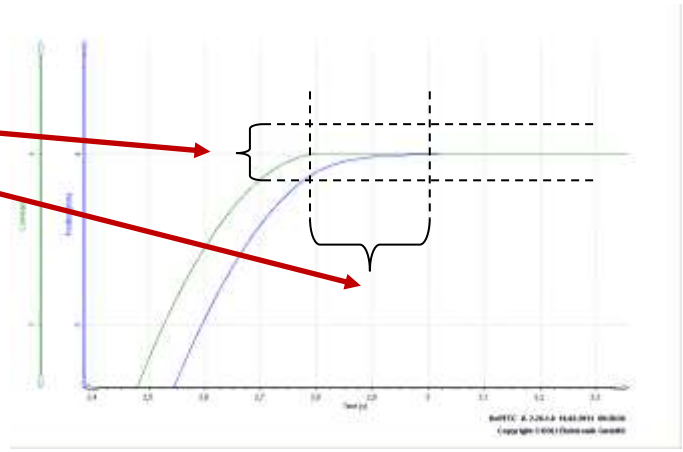
Function declaration		Description	
extern unsigned DLLAPI	DoPECurrentPID (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
unsigned long	P	Proportional gain of the current controller	
unsigned short	I	Integration time constant	
unsigned short	D)	Derivative time constant	
.NET	<Edc object>.Output.CurrentPID(DoPE.OUT Output, Int32 P, Int16 I, Int16 D)		

9.5.12 DoPEDestWnd

Definitions for destination window.
The closed loop controller supervises the controlled channel. After the command value reaches the final destination, the controlled channel has to reach this position within the specified destination window.
If the actual value reaches the destination window within the specified time a DoPEOnPosMsg event is sent to the application program. The Reached parameter of the event is set to 1.
If it does not reach it, the event is sent with the Reached set to 0.
By default, the destination limit is set to:

For absolute sensors	WndSize = 0.2% of the nominal sensor range.
For incremental position sensors	WndSize = 0.05 mm
For incremental extension sensors	WndSize = 0.005 mm
For all sensors	WndTime = 0.5 s.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00



Function declaration		Description	
extern unsigned DLLAPI	DoPEDestWnd (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
double	WndSize	Size of destination window	Unit
double	WndTime)	Time for destination window	s

.NET <Edc object>.Ctrl.DestWnd(DoPE.CTRL MoveCtrl, Double WndSize, Double WndTime)

9.5.13 DoPESft

Definitions of limits supervised by software (softend).
If Reaction is defined as REACT_ACTION all moving commands will limit destinations to this softends.
In contrast to the range limits of the measurement channels, softends are working limits that can be changed at any time.
By default, all softends are set to the range limits and REACT_STATUS.
The state of the softend's is maintained in CtrlState2 (see default measuring dada record).
Attention: The values for UpperSft and LowerSft are calculated with the current Tare and BasicTare.
If BasicTare is changed, these values are recalculated with the new BasicTare.
A new Tare does not affect these vales!

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description		
extern unsigned DLLAPI	DoPESft(	Function returns Error constant (DoPERR_xxxx)		
DoPE_HANDLE	DoPEHdl	DoPE link handle		
unsigned short	MoveCtrl	Control mode (CTRL_xxx)		
double	UpperSft	Upper soft limit		Unit
double	LowerSft	Lower soft limit		Unit
unsigned short	Reaction)	REACT_STATUS	No reaction if softend is reached, only status bits are set	
		REACT_ACTION	Halt in X-head position control if softend is reached	

.NET <Edc object>.Ctrl.Sft(DoPE.CTRL MoveCtrl, Double UpperSft, Double LowerSft, DoPE.REACT Reaction)

9.5.14 DoPECtrlSpeedTimeBase

Define maximum time base for speed calculation.
When changing control mode, the current speed of the new control channel is used as the start speed after control mode was changed. Normally this speed is determined by differentiation by two following position values. In case of a small resolution of the transducer for the new control mode, the speed values are very small and thus also inaccurate. Using this command the time base can be increased and thus a higher accuracy for speed calculation can be archived. Use this command only if speed is not changing too fast otherwise with a big time base the calculated speed is incorrect. This time base exclusively works for the determination of the start speed when control mode is changed. It has no effect for speed calculation for the digital speed controller.

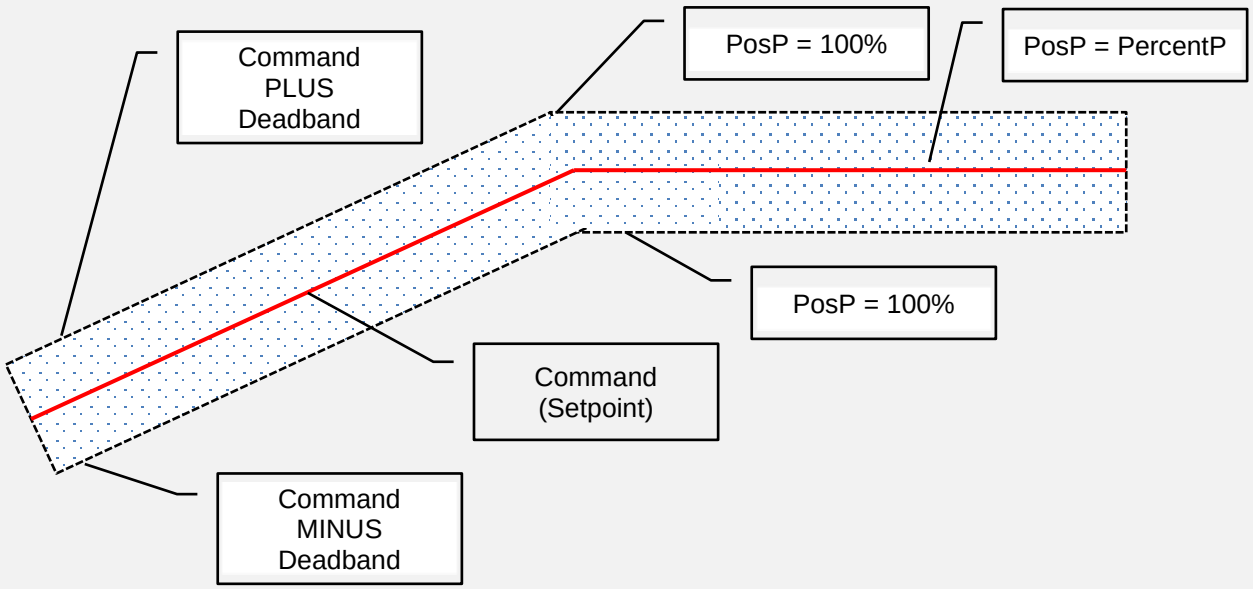
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description		
extern unsigned DLLAPI	DoPECtrlSpeedTimeBase(	Function returns Error constant (DoPERR_xxxx)		
DoPE_HANDLE	DoPEHdl	DoPE link handle		
double	Time	Time base in for speed calculation		
)		Note:	for EdcApp versions up to 9140.015: internally only 1, 2, 4, 8, 16, 32, 64, 128 x position controller time base will be used!	s

.NET <Edc object>.Ctrl.CtrlSpeedTimeBase(Double Time)

9.5.15 DoPEDeadbandCtrl

Set parameter for error deadband controller.
A deadband can be used to reduce, or eliminate a limit cycle due to friction.
Inside an area “setpoint plus Deadband and setpoint minus Deadband” the gain of position controller is continuously reduced from PosP = 100% to a minimum value (PercentP of PosP = 100%).
Note: a well adjusted feed forward is needed for a good function of Deadband control!



Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPEDeadbandCtrl (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	MoveCtrl	Control mode (CTRL_xxx)	
double	Deadband	Width of error deadband around setpoint	
unsigned short	PercentP)	Smallest P inside deadband PercentP range is 0..100% 100% disables error deadband controller 0% sets the PosP to the smallest value (1)	[%PosP]

.NET <Edc object>.Ctrl.DeadbandCtrl(DoPE.CTRL MoveCtrl, Double Deadband, Int16 PercentP)

9.5.16 DoPERdCtrlParameter

Read closed loop controller parameter			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned short DoPECtrlParameter	DoPERdCtrlParameter (DoPEHdl MoveCtrl *CtrlParameter)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Pointer for DoPECtrlParameter structure	
typedef struct Controller parameter			
{**// Controller parameter**			
double	PosP	Pos. contr. P: gain	[No]
double	PosI	Pos. contr. I: time constant	[No]
double	PosD	Pos. contr. D: time constant	[No]
double	SpeedP	Speed contr. P: gain	[No]
double	SpeedI	Speed contr. I: time constant	[No]
double	SpeedD	Speed contr. D: time constant	[No]
double	SpeedFFP	Speed feed forward	[No]
double	PosDelay	Delay for Command	[No]
double	Acceleration	default acceleration	[Unit/s²]
double	Speed	speed limit	[Unit/s]
double	Deviation	Max. deviation of controller	[Unit]
unsigned short	DevReaction	Reaction if deviation exceeded	[No]
double	DestinationWnd	Size of 1/2 destination window	[Unit]
double	DestinationTime	Time until controlled channel must reach destination window	s
double	UpperSoftEnd	Upper softend	[Unit]
double	LowerSoftEnd	Lower softend	[Unit]
unsigned short	SoftEndReaktion	Reaction if softend is reached	[No]
// numerical limitations for acceleration and speed parameters			
double	MinAcceleration	minimum acceleration	[Unit/s²]
double	MaxAcceleration	maximum acceleration	[Unit/s²]
double	MinDeceleration	minimum deceleration	[Unit/s²]
double	MaxDeceleration	maximum deceleration	[Unit/s²]
double	MinSpeed	minimum speed	[Unit/s]
double	MaxSpeed	maximum speed	[Unit/s]
// error dead band controller parameter			
double	Deadband	Error deadband around setpoint	[Unit]
unsigned short	PercentP	Smallest P inside deadband	[%PosP]
// dither parameter			
double	DitherFrequency	Dither frequency	[Hz]

double DitherAmplitude	Dither amplitude	[%]
} DoPECtrlParameter		
.NET <Edc object>.Ctrl.RdCtrlParameter(DoPE.CTRL MoveCtrl, ref DoPE.CtrlParameter CtrlParameter)		

9.5.17 DoPESetNominalAccSpeed

Set nominal values for the position generator.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPESetNominalAccSpeed (DoPE_HANDLE DoPEHdl Unsigned short MoveCtrl double Acc double Speed)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Control mode (CTRL_xxx) Acceleration Nominal speed	
.NET <Edc object>.Ctrl.SetNominalAccSpeed(DoPE.CTRL MoveCtrl, Double Acc, Double Speed)		

9.6 Tare functions

DoPE offers two different tare functions, Tare and BasicTare.

The **BasicTare** functions should be used for set-up the machine configuration like changing grips. The Basic-Tare value is stored in the machine set-up inside EDC. After switching mains power off / on, the Basic-Tare value is still valid.

The **DoPETare, DoPETareSetValue and DoPETareSetDisplay** functions can be used at any time. The tare value will be lost after reset.

9.6.1 DoPE(Basic)TareSetValue

Set (basic) tare of the measuring channel. Note: DoPEBasicTaresetValue clears the ordinary tare value		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEBasicTareSetValue (DoPE_HANDLE DoPEHdl unsigned short SensorNo double Value)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number Value will be subtracted This is useful to compensate the weight of grips.	 Unit
extern unsigned DLLAPI DoPETareSetValue (DoPE_HANDLE DoPEHdl unsigned short SensorNo double Value)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number Value will be subtracted This is useful to compensate the weight of grips.	 Unit
.NET <Edc object>.Tare.BasicTareSetValue(DoPE.SENSOR SensorNo, Double Value) <Edc object>.Tare.TareSetValue(DoPE.SENSOR SensorNo, Double Value)		

9.6.2 DoPE(Basic)TareSetDisplay

Set (basic) tare of the measuring channel.
Note: DoPEBasicTaresetDisplay clears the ordinary tare value

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description	
extern unsigned DLLAPI DoPEBasicTareSetDisplay (DoPE_HANDLE DoPEHdl unsigned short SensorNo double Value)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number Value represents the desired measuring value. This is useful to set crosshead position for systems with encoder.	Unit
extern unsigned DLLAPI DoPETareSetDisplay (DoPE_HANDLE DoPEHdl unsigned short SensorNo double Value)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number Value represents the desired measuring value. This is useful to set crosshead position for systems with encoder.	Unit
.NET <Edc object>.Tare.BasicTareSetDisplay(DoPE.SENSOR SensorNo, Double Value) <Edc object>.Tare.TareSetDisplay(DoPE.SENSOR SensorNo, Double Value)		

9.6.3 DoPE(Basic)Tare

Enable / disable (basic) tare of the measuring channel.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description	
extern unsigned DLLAPI DoPEBasicTare (DoPE_HANDLE DoPEHdl unsigned short SensorNo unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number != 0: activates basic tare, like DoPEBasicTareSetDisplay(…, 0) == 0: clears basic tare, like DoPE(Basic)TareSetValue(…, 0)	Unit
extern unsigned DLLAPI DoPETare (DoPE_HANDLE DoPEHdl unsigned short SensorNo unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number != 0: activates tare, like DoPETareSetDisplay(…, 0) == 0: clears tare, like DoPETareSetValue(…, 0)	Unit
.NET <Edc object>.Tare.BasicTare(DoPE.SENSOR SensorNo, bool Enable) <Edc object>.Tare.Tare(DoPE.SENSOR SensorNo, bool Enable		

9.6.4 DoPE(Basic)TareGetValue

Read (basic) tare value of the measuring channel.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description	
extern unsigned DLLAPI DoPEGetBasicTareValue (DoPE_HANDLE DoPEHdl unsigned short SensorNo double * Value	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number Pointer for basic tare value	Unit
extern unsigned DLLAPI DoPEGet(Basic)TareValue (DoPE_HANDLE DoPEHdl unsigned short SensorNo double * Value	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number Pointer for tare value	Unit
.NET <Edc object>.Tare.BasicTareGetValue(DoPE.SENSOR SensorNo, ref Double Value) <Edc object>.Tare.TareGetValue(DoPE.SENSOR SensorNo, ref Double Value)		

9.7 Reference signal handling of incremental sensors

Incremental sensors like encoder or linear gauges may use the build in reference to set the counter-value. Encoders have one reference pulse per revolution. Linear gauges have either one pulse at a certain position, or so called distance coded references.

Currently, DoPE supports the reference pulse to set the counter to a certain value.

ATTENTION:

- These functions are not supported by EDC5/25/100.
- The following hardware interfaces support this function:
  4INC(channel A and C), 2INC (channel A), X7 on EDC220/222/580 or newer.

9.7.1 DoPESetRefSignalMode

After the reference pulse occurred, the counter value is stored in a Hardware register.
This command defines what to do with this value:

1. Ignore it, don't send any message. (REFSIG_NON)
2. Send a message after every occurrence of the reference pulse. (REFSIG_ON)
3. Send a message after the next occurrence of the reference pulse. (REFSIG_ONCE)

With the message (DoPERefSignalMsg) you get the exact position of the reference pulse.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPESetRefSignalMode (DoPE_HANDLE DoPEHdl unsigned short SensorNo unsigned short Mode unsigned short * lpusTAN)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor Number Mode reference signal messages will be reported: REFSIG_NON: never REFSIG_ON: always REFSIG_ONCE: only once Pointer to transaction number.
typedef struct DoPERefSignalMsg/ { unsigned short MsgId; double Time; unsigned short SensorNo; double Position; } DoPERefSignalM;	 ID of message System time for the message Control mode of position Position
.NET <Edc object>.Tare.SetRefSignalMode(DoPE.SENSOR SensorNo, DoPE.REFSIG_MODE Mode, ref Int16 Tan)	

9.7.2 DoPESetRefSignalTare

Set the measuring channel to the tare value at the next occurrence of the reference signal.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPESetRefSignalTare (DoPE_HANDLE DoPEHdl unsigned short SensorNo unsigned short Mode double Tare unsigned short * lpusTAN)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor Number REFSIG_TARE: set the measuring channel to the tare value REFSIG_NON: don't affect the measuring channel Tare value for the measuring channel. This tare value will be stored in EDC's non volatileBasicTarememory.This function clears the current basic tare and ordinary tare valueat the next occurrence of the reference signal. Pointer to transaction number.
.NET <Edc object>.Tare.SetRefSignalTare(DoPE.SENSOR SensorNo, DoPE.REFSIG_TARE Mode, Double Value, ref Int16 Tan)	

9.8 Calculated measuring channels

9.8.1 DoPEConfPeakValue

Configure peak values to the measuring data record.

The peak values are detected by the EDC. They may be transmitted to PC instead of an unused measuring channel. With this command a peak value of a measuring channel may be configured to a measuring channel in the data record. The peak value detection is available for cyclic commands only. The peak values are refreshed ater each cycle. These calculated channels are not allowed as the command channel in DoPEExts2 or DoPEFDPoti command!

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEConfPeakValue (DoPE_HANDLE DoPEHdl unsigned short SensorNo unsigned short DataAddress unsigned short Mode)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Sensor number to be supervised Position of Min/Max value in the measuring data record One of the DoPE_PEAK_VALUE_... modes (see below)

Possible modes:

DoPE_PEAK_VALUE_OFF	disable the Min/Max detection the measuring data record at position DataAddress is restored to the sensor specified in the setup
DoPE_PEAK_VALUE_MIN	enable Min value detection for the sensor SensorNo and report the results in the measuring data record at position DataAddress
DoPE_PEAK_VALUE_MAX	enable Max value detection for the sensor SensorNo and report the results in the measuring data record at position DataAddress

.NET <Edc object>.Cmc.ConfPeakValue(DoPE.SENSOR SensorNo, DoPE.SENSOR DataAddress, DoPE.PEAK_VALUE Mode)

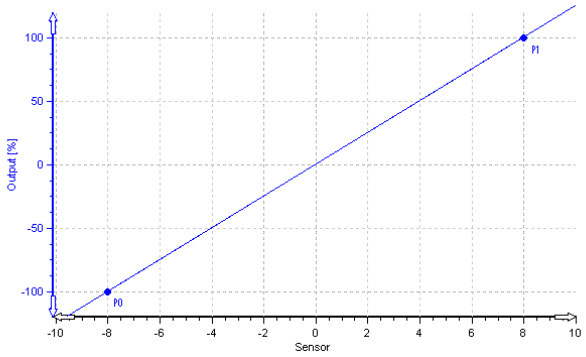
9.8.2 DoPEMc2Output

Output of a measured value to an analogue output channel. Any measured channel may be scaled and via a DAC converted to an analogue signal.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPEMc2Output (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	Mode	Mode flags (see below)	
unsigned short	SensorNo	Sensor number	
unsigned short	Output	Number of analogue output channel	
double	SensorPoints[3]	Sensor points table	Unit
double	OutputPoints[3])	Output points table	%
.NET <Edc object>.Output. Mc2Output(DoPE.MC2OUT_MODE Mode, DoPE.SENSOR SensorNo, DoPE.OUT Output, Double[] SensorPoint, Double[] OutputPoint)			

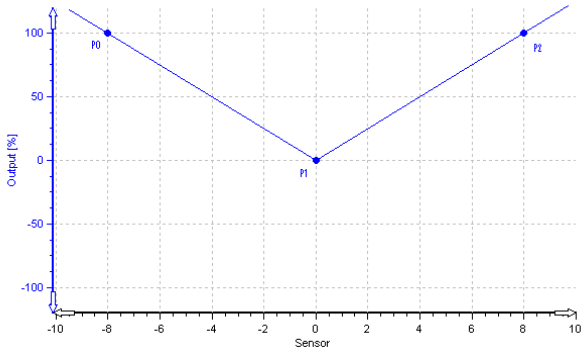
Definition of Mode:

MC2OUT_MODE_OFF Stop output to this analogue output channel.

MC2OUT_MODE_2POINTS Output definition by 2 points.



MC2OUT_MODE_3POINTS Output definition by 3 points.



9.9 Sensor Correction

9.9.1 DoPESetSensorCorrection

Set sensor correction table.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration			Description
extern unsigned DLLAPI	DoPESetSensorCorrection(		Function returns Error constant (DoPERR_xxxx)
DoPE_HANDLE	DoPEHdl		DoPE link handle
Unsigned short	CalculatedSensor		Sensor number of the corresponding Calculated Measuring Channel (with formula F_SensorCorrection)
DoPESensorCorrection	*CorrTable)		Pointer to sensor correction table.

```
SENSOR_CORR_MAX     32                          /* maximum number of sensor correction points */

typedef struct
{
  DoPE_HANDLE      DoPEHdl;
  unsigned         CorrNo;                       /* Number of valid entries */
  double           S1Correction [SENSOR_CORR_MAX]; /* Correction values for S1 */
  double           S2Value [SENSOR_CORR_MAX];      /* S2 values (must be in ascending order) */
} DoPESensorCorrection;
```

.NET <Edc object>.Corr.SetSensorCorrection(DoPE.SENSOR CalculatedSensor, ref DoPE.SensorCorrectionTable SensorCorrectionTable)

9.9.2 DoPESetStiffnessCorrection

Set stiffness correction table.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration			Description
extern unsigned DLLAPI	DoPESetStiffnessCorrection(		Function returns Error constant (DoPERR_xxxx)
DoPE_HANDLE	DoPEHdl		DoPE link handle
DoPEStiffnessCorrection	*CorrTable)		Pointer to stiffness correction table.

```
STIFF_CORR_MAX     32                           /* maximum number of stiffness correction points */

typedef struct
{
  DoPE_HANDLE      DoPEHdl;
  unsigned         CorrNo;                      /* Number of valid entries */
  double           Load[STIFF_CORR_MAX];        /* Load value */
  double           Deformation[STIFF_CORR_MAX]; /* Machine deformation at load value */
} DoPEStiffnessCorrection;
```

.NET <Edc object>.Corr.SetStiffnessCorrection(ref DoPE.StiffnessCorrectionTable StiffnessCorrectionTable)

9.10 Serial Sensors

9.10.1 DoPEWrSensorMsg

Write a message to a sensor.The message is not interpreted by DoPE!
Maximum message length is 80 Bytes.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration			Description
extern unsigned DLLAPI	DoPEWrSensorMsg(		Function returns Error constant (DoPERR_xxxx)
DoPE_HANDLE	DoPEHdl		DoPE link handle
unsigned short	SensorNo		Sensor Number
void	* Buffer		Pointer to message to transmit
unsigned	Length)		Message length in Byte's.

.NET <Edc object>.Sersen.WrSensorMsg(DoPE.SENSOR SensorNo, String Buffer)

9.10.2 DoPESerialSensorDef

Definition for serial sensor.
A message for a serial sensor will be transmitted after:

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPESerialSensorDef (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	SensorNo	Sensor Number	
double	Timeout	Timeout, 0 = no timeout	s
unsigned short	MaxLength	Transmit after Number of bytes received (must be <= SERSEN_TRANSFER)	
char	EndChar1	First Endcharacter	
char	EndChar2	Second Endcharacter	
WORD	EndCharMode)	Mode for detection end character (see below)	
SERSEN_ENDCHAR_NO		No Endcharacter active, message will be transmitted after timeout, or MaxLength	
SERSEN_ENDCHAR_1		Detect only EndChar1	
SERSEN_ENDCHAR_1_OR_2		Detect EndChar1 or EndChar1	
SERSEN_ENDCHAR_1_AND_2		Detect Sequence EndChar1 + EndChar2	
SERSEN_ENDCHAR_1_PLUS1		Detect EndChar1 plus one Character	
.NET	<Edc object>.Sersen.SerialSensorDef(DoPE.SENSOR SensorNo, Double Timeout, Int16 MaxLength, Byte EndChar1, Byte EndChar2, DoPE.SERSEN_ENDCHAR EndCharMode)		

9.10.3 DoPESetSerialSensor

Set value (e.g. Temperature) for serial channel.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPESetSerialSensor (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	SensorNo	Sensor Number	
unsigned short	Mode	SERSEN_SET_COMMAND: Set Command value SERSEN_SET_FEEDBACK: Set Feedback value	
double	Value	Value to set	
double	Speed)	Speed for ramp	Unit/s
.NET	<Edc object>.Sersen.SetSerialSensor(DoPE.SENSOR SensorNo, DoPE.SERSEN_SET_VALUE Mode, Double Value, Double Speed)		

9.10.4 DoPESetSerialSensorTransparent

Set serial channel to transparent mode or the previously selected protocol.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description
extern unsigned DLLAPI	DoPESetSerialSensorTransparent (	Function returns Error constant (DoPERR_xxxx)
DoPE_HANDLE	DoPEHdl	DoPE link handle
unsigned short	SensorNo	Sensor Number
unsigned short	Mode)	SERSEN_SET_PROTOCOL:Set sensor to the protocol (Set-up) SERSEN_SET_TRANSPARENT: Set sensor to transparent mode
.NET	<Edc object>.Sersen. SetSerialSensorTransparent(DoPE.SENSOR SensorNo, DoPE.SERSEN_SET_PROTOCOL Mode)	

9.11 Debug Messages

For service purposes it is sometimes necessary to record the debug output of the EDC and send it to the DOLI support team. To facilitate this, the OnDebugMsg Event Handler were implemented.

9.11.1 DoPEDebugMsgEnable

Enable or disable debug messages. **Attention: Unfortunately, the debug messages influence the runtime behavior of the application and should be turned off by default and turned on only in e.g. a remote support session**	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPEDebugMsgEnable(DoPE_HANDLE DoPEHdl unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables =0 disables debug messages.
.NET <Edc object>.Debug.DebugMsgEnable(bool Enable)	

9.11.2 DoPESendDebugCommand

Send a command to the debug interface. The “?” command prints a list of the available commands to the debug interface.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPEDebugMsgEnable(DoPE_HANDLE DoPEHdl char *Text)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to zero terminated text to transmit.
.NET <Edc object>.Debug.SendDebugCommand(String Text)	

10 Input / Output-Commands

10.1 Analogue output

10.1.1 DoPESetOutput

Set an analogue output channel. The output channel must be assigned in EDC set-up.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPESetOutput (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	Output	Number of analogue output channel	
double	Value)	New value of output channelin % of max. value	%
.NET	<Edc object>.Output.SetOutput(DoPE.OUT Output, Double Value)		

10.1.2 DoPESetOutChannelOffset

Set an analogue output channel offset.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPESetOutChannelOffset(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	Output	Number of analogue output channel	
double	Offset)	New Offset value of output channelin % of max. value	%
.NET	<Edc object>.Output.SetOutChannelOffset(DoPE.OUT Output, Double Offset)		

10.1.3 DoPESetDither

Set an analogue output channel dither. Some DOLI output amplifier like D03I, D16I, D32I have a digital dither generator function. The dither amplitude and frequency can be set by this command.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI	DoPESetDither (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	Output	Number of analogue output channel	
double	Frequency	Dither frequency in Hz	Hz
double	Amplitude)	Dither amplitude in % of nominal output current	%
.NET	<Edc object>.Ctrl.SetDither(DoPE.CTRL MoveCtrl, Double Frequency, Double Amplitude)		

10.1.4 DoPEOfflineActionOutput

Definition of an action for an initialized analogue output channel after EDC has detected offline. With this command, the PC-Software can specify the state of any analogue output channel, after the communication between PC and EDC was disturbed or interrupted(OFFLINE). EDC-Software checks automatically communication with PC, and if PC does not answer for a period of 2 Seconds, EDC regards PC to be offline. This may happen if the line between PC and EDC was disconnected, or PC-Program has crashed.If PC-Program terminates regularly by using DoPECloseLink command, EDC will reinitialize, and DoPEOfflineActionBitOutput command has no effect.
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI DoPE_HANDLE unsigned short unsigned short double	DoPEOfflineActionOutput (DoPEHdl Output Mode Value)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Number of analogue output channel. If closed loop control, Output channel 0 cannot be selected! DO_NOTHING: Don't modify this digital output USE_INIT_VALUE: Use Initial value from set-up USE_VALUE: Use defined value Output value used in USE_VALUE mode in % of max. value	

.NET <Edc object>.Output.OfflineActionOutput(DoPE.OUT Output, DoPE.OFFLINE_ACTION Mode, Double Value)

10.2 Bit I/O-Commands

These commands can be uses to read or write digital I/O's.

Reading digital inputs is normally not necessary, since all configured inputs are automatically read and transferred in the measuring data record.

General digital bit outputs are set with the command DoPESetBit. You have to assign the outputs you use in EDC set-up. Please refer to the document "Driver of Hardware-Modules of the EDC-Family" for definition of output devices and bits.

For dedicated output bits, DoPE supplies dedicated functions like DoPEBeep to activate/deactivate the beep at an EDC.

For Digital input/output bits that are not often used, DoPE provides functions to read or write these devices without having initialized it (not assigned in EDC set-up).

10.2.1 DoPESetBit

Set, Reset, Flash Bits. This command is used to set any output bit on a digital output device. The devices are specified in the set-up data.
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI DoPE_HANDLE unsigned short unsigned short unsigned short unsigned short	DoPESetBit (DoPEHdl BitOutputNo SetB ResB FlashB)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Number of bit output device These bits will be set These bits will be set These bits 'flash'	

The three data words will be processed in the following sequence (important with conflicting data):

1. Flashing bits.
2. Resetting of the bits.
3. Setting of the bits.

.NET <Edc object>.Io.SetBit(DoPE.BOUT BitOutput, Int16 SetB, Int16 ResB, Int16 FlashB)

10.2.2 DoPECalOut

Activate / deactivate calibration output on EDC. The calibration contact may be used to trigger a reference measuring system during load calibration (see also DoPEIOMisc).		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPECalOut (DoPE_HANDLE DoPEHdl unsigned short Cal)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 activate Calibration output 0 deactivate Calibration output	
.NET <Edc object>.Io.CalOut(bool cal)		

10.2.3 DoPEBeep

Activate / deactivate beep on EDC.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEBeep (DoPE_HANDLE DoPEHdl unsigned short Beep)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 activate Beep 0 deactivate Beep Pointer to transaction number (not for Sync. version).	
.NET <Edc object>.Io.Beep(bool beep)		

10.2.4 DoPEBypass

Activate/Deactivate bypass output bits at EDC.		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEBypass (DoPE_HANDLE DoPEHdl unsigned short Bypass)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 activates bypass output 0 deactivates bypass output	
.NET <Edc object>.Io.Bypass(bool bypass)		

10.2.5 DoPERdBitInput

Read a digital input device.
Note: This command will also work on not initialized I/O-devices.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPERdBitInput (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
WORD	Connector	Connector number, for the I/O device Use connector constants from header file like “CON_X2”	
WORD	*Value	Data pointer to store result	
WORD	* lpusTAN)	Pointer to transaction number (not for Sync. version).	

.NET <Edc object>.Io.RdBitInput(DoPE.CONNECTOR Connector, ref Int16 Value)

10.2.6 DoPEWrBitOutput

Write to a digital output device.
Note: This command will also work on not initialized I/O-devices.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPEWrBitOutput(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
WORD	Connector	Connector number, for the I/O device Use connector constants from header file like “CON_X2”	
WORD	Value)	Data to be written to the output device.	

.NET <Edc object>.Io.WrBitOutput(DoPE.CONNECTOR Connector, Int16 Value)

10.2.7 DoPEOfflineActionBitOutput

Definition of an action for an initialized digital output device after EDC has detected offline.
With this command, the PC-Software can specify the state of any digital output, after the communication between PC and EDC was disturbed or interrupted(OFFLINE).
EDC-Software checks automatically communication with PC, and if PC does not answer for a period of 2 Seconds, EDC regards PC to be offline. This may happen if the line between PC and EDC was disconnected, or PC-Program has crashed.
If PC-Program terminates regularly by using DoPECloseLink command, EDC will reinitialize, and DoPEOfflineActionBitOutput command has no effect.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPEOfflineActionBitOutput (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	BitOutputNo	Number of bit output device	
unsigned short	Mode	DO_NOTHING: Don't modify this digital output USE_INIT_VALUE: Use Initial value from set-up after offline USE_VALUE: Use defined value after offline	
WORD	Value)	Use defined value after offline.	

.NET <Edc object>.Io. OfflineActionBitOutput(DoPE.BOUT BitOutput, DoPE.OFFFLINE_ACTION Mode, Int16 Value)

10.3 IOSignals

Following functions are supported:

- Control of grips
- Control of extensometer
- Fixed XHead adjustment
- High/Low pressure selection

All of these functions must be configured in the EDC set-up. The control functions may be activated via keys on RMC, or via commands from PC.

Each control function uses digital I/O with certain functions. The I/O bits for one function must be configured as a whole block to any I/O device. The first bit of a block may be assigned to any bit of the I/O device.

The number of reserved In- and Output bits for each block are identical, even if not all are currently used. The Miscellaneous Input- and Output-bits may be defined separately.

Note: For more detailed information please refer to EDC Installation Manual.

10.3.1 DoPEIOGripEnable

Enable or disable grip IO handling.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGripEnable (DoPE_HANDLE DoPEHdl Unsigned Enable WORD * lpusTAN)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables 0 disables grip IO handling Pointer to transaction number (not for Sync. version).	
.NET <Edc object>.IoSignal.IOGripEnable(bool Enable)		

10.3.2 DoPEIOGripSet

Perform a grip action.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGripSet (DoPE_HANDLE DoPEHdl unsigned Grip unsigned Action)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Grip to use(use IO_GRIP_ defines) Action to perform (use IO_GRIP_ACTION_ defines)	
Constants for Grip IO_GRIP_UPPER IO_GRIP_LOWER IO_GRIP_BOTH **Constants for Action** IO_GRIP_ACTION_OPEN IO_GRIP_ACTION_CLOSE IO_GRIP_ACTION_HIGH_PRESSURE1 IO_GRIP_ACTION_HIGH_PRESSURE2		
.NET <Edc object>.IoSignal.IOGripSet(DoPE.IO_GRIP Grip, DoPE.IO_GRIP_ACTION Action)		

10.3.3 DoPEIOExtEnable

Enable or disable extensometer IO handling.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOExtEnable (DoPE_HANDLE DoPEHdl unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables 0 disables extensometer IO handling	
.NET <Edc object>.IoSignal.IOExtEnable(bool Enable)		

10.3.4 DoPEIOExtSet

Perform an extensometer action.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOExtSet(DoPE_HANDLE DoPEHdl unsigned Ext unsigned Action)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Grip to use(use IO_EXT_ defines) Action to perform(use IO_EXT_ACTION_ defines)	
IO_EXT_UPPER IO_EXT_LOWER IO_EXT_BOTH IO_EXT_ACTION_OPEN IO_EXT_ACTION_CLOSE		
.NET <Edc object>.IoSignal.IOExtSet(DoPE.IO_EXT Ext, DoPE.IO_EXT_ACTION Action)		

10.3.5 DoPEIOFixedXHeadEnable

Enable or disable fixed cross head IO handling.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOFixedXHeadEnable (DoPE_HANDLE DoPEHdl unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables 0 disables fixed cross head IO handling	
.NET <Edc object>.IoSignal.IOFixedXHeadEnable(bool Enable)		

10.3.6 DoPEIOFixedXHeadSet

Move fixed cross head.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOFixedXHeadSet (DoPE_HANDLE DoPEHdl unsigned Direction)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Direction of movement (use MOVE_HALT, MOVE_UP, MOVE_DOWN defines)	
.NET <Edc object>.IoSignal.IOFixedXHeadSet(DoPE.MOVE Direction)		

10.3.7 DoPEIOHighPressureEnable

Enable or disable high pressure IO handling.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOHighPressureEnable (DoPE_HANDLE DoPEHdl unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables 0 disables high pressure IO handling	
.NET <Edc object>.IoSignal.IOHighPressureEnable(bool Enable)		

10.3.8 DoPEIOHighPressureSet

Set high or low pressure.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOHighPressureSet (DoPE_HANDLE DoPEHdl unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 selects high pressure 0 selects low pressure	
.NET <Edc object>.IoSignal.IOHighPressureSet(bool HighPressure)		

10.3.9 DoPEIOGuardSetLimitedMode

Activate or deactivate limited mode.		
Minimum requirements: EDCi with EDCiApp 9149.015, DoPE 10.16		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGuardSetLimitedMode (DoPE_HANDLE DoPEHdl unsigned LimitedMode)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 activates 0 deactivates limited mode	
.NET <Edc object>.IoSignal.GuardSetLimitedMode (bool LimitedMode)		

10.3.10 DoPEIOGuardSetUnlockRequest

Activate or deactivate guard unlock request.		
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGuardSetUnlockRequest (DoPE_HANDLE DoPEHdl unsigned UnlockRequest)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 activates 0 deactivates guard unlock request	
.NET <Edc object>.IoSignal.GuardSetUnlockRequest (bool UnlockRequest)		

10.3.11 DoPEIOGuardSetRangeLimit

Set upper/lower range limit and overrun tolerance.			
Minimum requirements: EDCi with EDCiApp 9149.015, DoPE 10.16			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE double double double	DoPEIOGuardSetRangeLimit (DoPEHdl UpperRangeLimit LowerRangeLimit RangeLimitTolerance)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Upper range limit Lower range limit Range limit overrun tolerance	
.NET <Edc object>.IoSignal.GuardSetRangeLimit (…)			

10.3.12 DoPEIOGuardGetRangeLimit

Get upper/lower range limit and overrun tolerance.			
Minimum requirements: EDCi with EDCiApp 9149.015, DoPE 10.16			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE double double double	DoPEIOGuardGetRangeLimit (DoPEHdl *UpperRangeLimit *LowerRangeLimit *RangeLimitTolerance)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer for Upper range limit Pointer for Lower range limit Pointer for Range limit overrun tolerance	
.NET <Edc object>.IoSignal.GuardGetRangeLimit (…)			

10.3.13 DoPEIOGuardSetMuteGuard

Mutes the guard monitoring. If activated, the guard is not monitored.			
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned	DoPEIOGuardSetMuteGuard (DoPEHdl MuteGuard)	Function returns Error constant (DoPERR_xxxx) DoPE link handle IO_GUARD_MUTE_OFF 0 Muting off IO_GUARD_MUTE_SINGLE 1 Muting active for one opening IO_GUARD_MUTE_CONTINUOUS 2 Muting active continuously	
.NET <Edc object>.IoSignal.GuardSetMuteGuard (int32 MuteGuard)			

10.3.14 DoPEIOGuardGetMuteGuard

Get the state of the guard closed muting.			
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE unsigned	DoPEIOGuardGetMuteGuard (DoPEHdl *MuteGuard)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer for the state of the guard muting	
.NET <Edc object>.IoSignal.GuardGetMuteGuard (ref int32 MuteGuard)			

10.3.15 DoPEIOGuardSetMuteSpeedLimit

Mutes the speed limit monitoring. If “Low Pressure Action Enable” is enabled it will also be muted. (Only if the “SpeedLimitEnable” is enabled in the machine setup)		
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGuardSetMuteSpeedLimit(DoPE_HANDLE DoPEHdl unsigned MuteSpeedLimit)	Function returns Error constant (DoPERR_xxxx) DoPE link handle IO_GUARD_MUTE_OFF 0 Muting off IO_GUARD_MUTE_SINGLE 1 Muting active for one opening IO_GUARD_MUTE_CONTINUOUS 2 Muting active continuously	
.NET <Edc object>.IoSignal.GuardSetMuteSpeedLimit (int32 MuteSpeedLimit)		

10.3.16 DoPEIOGuardGetMuteSpeedLimit

Get the state of the speed limit monitoring muting.		
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGuardGetMuteSpeedLimit (DoPE_HANDLE DoPEHdl unsigned *MuteSpeedLimit)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer for the state of the speed limit muting	
.NET <Edc object>.IoSignal.GuardGetMuteSpeedLimit (ref int32 MuteSpeedLimit)		

10.3.17 DoPEIOGuardSetMuteRangeLimit

Mutes the range limit monitoring. If “Low Pressure Action Enable” is enabled it will also be muted. (Only if the “RangeLimitEnable” is enabled in the machine setup)		
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGuardSetMuteRangeLimit (DoPE_HANDLE DoPEHdl unsigned MuteRangeLimit)	Function returns Error constant (DoPERR_xxxx) DoPE link handle IO_GUARD_MUTE_OFF 0 Muting off IO_GUARD_MUTE_SINGLE 1 Muting active for one opening IO_GUARD_MUTE_CONTINUOUS 2 Muting active continuously	
.NET <Edc object>.IoSignal.GuardSetMuteRangeLimit (int32 MuteRangeLimit)		

10.3.18 DoPEIOGuardGetMuteRangeLimit

Get the state of the range limit monitoring muting.		
Minimum requirements: EDCi with EDCiApp 9149.019, DoPE 10.18		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEIOGuardGetMuteRangeLimit (DoPE_HANDLE DoPEHdl unsigned *MuteRangeLimit)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer for the state of the range limit muting	
.NET <Edc object>.IoSignal.GuardGetMuteRangeLimit (ref int32 MuteRangeLimit)		

10.4 Display Commands

DoPE offers functions to write data to the EDC display. The display is subdivided into:

1. Headline section
2. Function key section
3. Value section for two values

Following functions can be used to write data to the display.

Note: The display should not be updated faster than 3 times per second!

10.4.1 DoPEDspClear

Clear LCD-display at EDC front panel.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEDspClear (DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle	
.NET <Edc object>.Display.Clear()		

10.4.2 DoPEwDspHeadLine

Display HeadLine on LCD-display at EDC front panel.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEwDspHeadLine (DoPE_HANDLE DoPEHdl wchar_t * HeadLine)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Wide character string	
DSP_FKEYSLINE_LEN (22) Number of characters in Value field (including terminating zero '\0')		
.NET <Edc object>.Display.HeadLine(String HeadLine)		

10.4.3 DoPEwDspFKeys

Display Function-Keys on LCD-display at EDC front panel.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEwDspFKeys(DoPE_HANDLE DoPEHdl wchar_t * FKeys)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Wide Character string	
DSP_FKEYSLINE_LEN (22) Number of characters in Value field (including terminating zero '\0')		
.NET <Edc object>.Display.FKeys(String FKeys)		

10.4.4 DoPEwDspMValue

Display values with dimension on LCD-display at EDC front panel.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEwDspMValue (DoPE_HANDLE DoPEHdl wchar_t * Value1 wchar_t * Value2 wchar_t * Dim1 wchar_t * Dim2 WORD * lpusTAN)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Wide character string for first value Wide character string for second value Wide character string for first dimension Wide character string for second dimension Pointer to transaction number (not for Sync. version).	
DSP_VALUE_LEN (10) Number of characters in Value field (including terminating zero '\0') DSP_DIM_LEN (7) Number of characters in Dim field (including terminating zero '\0') On the RMCi1/8 values can be displayed as “2 characters sensor name + 7 digits” or “8 digits” without sensor name.		
.NET <Edc object>.Display.MValue(String Value1, String Value2, String Dim1, String Dim2)		

11 EDC keyboard interface

DoPE offers some function to handlekeys and LED's of EDC keyboards (Front-Panel and RMC).

11.1 DoPERdNumberOfKeyboards

Read the number of connected keyboards.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPERdNumberOfKeyboards (DoPE_HANDLE DoPEHdl unsigned *pNumber	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to storage for the number of keyboards	
.NET <Edc object>.Key.RdNumberOfKeyboards(ref Int32 Number)		

11.2 DoPESetKeyShiftState

Set the keyboard shift state.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPESetKeyShiftState (DoPE_HANDLE DoPEHdl unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle 0=disable shift state, else enable shift state	
.NET <Edc object>.Key.SetKeyShiftState(bool Enable)		

11.3 DoPERdKeyShiftState

Read the keyboard shift state.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPERdKeyShiftState (DoPE_HANDLE DoPEHdl unsigned *pEnabled	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to storage for keyboard shift state	
.NET <Edc object>.Key.RdKeyShiftState(ref bool Enabled)		

11.4 DoPESetLed

Switch On/Off LED's at the EDC keyboard.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPESetLed (DoPE_HANDLE DoPEHdl unsigned __int64 LedOn unsigned __int64 LedOff unsigned __int64 LedFlash WORD OemLedOn WORD OemLedOff WORD OemLedFlash)	Function returns Error constant (DoPERR_xxxx) DoPE link handle These LED's will be set These LED's will be reset These LED's 'flash' These LED's will be set These LED's will be reset These LED's 'flash' Pointer to transaction number (not for Sync. version).	
The parameters will be processed in the followingsequence (important with conflicting data): 1. Flashing LED's. (lowest) 2. Resetting of the LED's. 3. Setting of the LED's. (highest)		
.NET <Edc object>.Key.SetLed(Int64 LedOn, Int64 LedOff, Int64 LedFlash, Int16 OemLedOn, Int16 OemLedOff, Int16 OemLedFlash)		

11.5 DoPELedMask

Set the LED matrix bit for a given LED code.Each LED is represented by a bit in the LED matrix. This function convertsa LED code to the matrix bit and sets the bit in the LED or OEM LED matrix.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPELedMask (DoPE_HANDLE DoPEHdl __int32 LedCode unsigned State unsigned __int64 *pLedMask WORD *pOemLedMask	Function returns Error constant (DoPERR_xxxx) DoPE link handle LED code to convert 0=clear bit, else set bit Pointer to the LED matrix Pointer to the OEM-LED matrix (NULL pointers are accepted)
.NET <Edc object>.Key.LedMask(DoPE.LED LedCode, Int32 State, ref Int64 LedMask, ref Int16 OemLedMask)	

11.6 DoPECurrentKeys

Read the current keys.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern unsigned DLLAPI DoPECurrentKeys(DoPE_HANDLE DoPEHdl unsigned __int64 *pKeys WORD *pOemKeys	Function returns Error constant (DoPERR_xxxx) DoPE link handle current key matrix current OEM-key matrix
.NET <Edc object>.Key.CurrentKeys(ref Int64 Keys, ref Int16 OemKeys)	

11.7 DoPEKeyPressed

Check if the key with the given key code is pressed.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern intDLLAPI DoPEKeyPressed (DoPE_HANDLE DoPEHdl __int32 KeyCode unsigned __int64 Keys unsigned short OemKeys	Function returns 0 if key is not pressed, else key is pressed DoPE link handle Key code to check Key matrix OEM-Key matrix
.NET <Edc object>.Key.KeyPressed(DoPE.KEY KeyCode, Int64 Keys, Int16 OemKeys)	

11.8 DoPEKeyGet

Get the key code of a pressed key.Each pressed key is represented by a set bit in the key matrix. This functionconverts a bit from the key matrix to its key code and resets the bit inthe key matrix.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00	
Function declaration	**Description**
extern intDLLAPI DoPEKeyGet (DoPE_HANDLE DoPEHdl unsigned __int64 *pKeys unsigned short *OemKeys	The key code of a pressed key or DoPE_KEY_NONE DoPE link handle Pointer to the key matrix Pointer to the OEM-Key matrix
.NET <Edc object>.Key.KeyGet(ref Int64 Keys, ref Int16 OemKeys)	

11.9 Definition of keys

Key constant	Key code	Description
DOLI keys		
DoPE_KEY_NONE	-1	invalid (no key pressed)
DoPE_KEY_HALT	0x00	'HALT'
DoPE_KEY_UP	0x01	'UP'
DoPE_KEY_DOWN	0x02	'DOWN'
DoPE_KEY_DPOTI	0x03	'DigiPoti pressed'
DoPE_KEY_F1	0x04	'F1' function key
DoPE_KEY_F2	0x05	'F2' function key
DoPE_KEY_F3	0x06	'F3' function key
DoPE_KEY_ON	0x07	'ON'
DoPE_KEY_TEST	0x08	'TEST'
DoPE_KEY_UPR_GRIP_OPEN	0x09	'Upper Grip Open'
DoPE_KEY_UPR_GRIP_CLOSE	0x0A	'Upper Grip Close'
DoPE_KEY_LWR_GRIP_OPEN	0x0B	'Lower Grip Open'
DoPE_KEY_LWR_GRIP_CLOSE	0x0C	'Lower Grip Close'
DoPE_KEY_EXTMETER_OPEN	0x0D	'Extensometer Open'
DoPE_KEY_EXTMETER_CLOSE	0x0E	'Extensometer Close'
DoPE_KEY_FIXED_XHEAD_UP	0x0F	'fixed X-Head Up'
DoPE_KEY_FIXED_XHEAD_DOWN	0x10	'fixed X-Head Down'
DoPE_KEY_DPOTI_CONTROL	0x11	'DigiPoti Speed-Position Mode'
DoPE_KEY_BF1	0x12	'blind F1' function key (no LCD)
DoPE_KEY_BF2	0x13	'blind F2' function key (no LCD)
DoPE_KEY_BF3	0x14	'blind F3' function key (no LCD)
DoPE_KEY_HIGH_PRESSURE	0x15	'Activate High Pressure'
DoPE_KEY_LOW_PRESSURE	0x16	'Activate Low Pressure'
DoPE_KEY_OFF	0x17	'OFF'
DoPE_KEY_UP_FAST	0x18	'Move UP fast'
DoPE_KEY_DOWN_FAST	0x19	'Move DOWN fast'
DoPE_KEY_TEST_STOP	0x1A	'Test stop'
DoPE_KEY_TEST_RETURN	0x1B	'Test return'
DoPE_KEY_TEST_HALT_CONTINUE	0x1C	'Test halt / continue'
DoPE_KEY_reserved1D	0x1D	
DoPE_KEY_reserved1E	0x1E	
DoPE_KEY_reserved1F	0x1F	
DoPE_KEY_reserved20	0x20	
DoPE_KEY_CTRL_SENSOR3	0x21	
DoPE_KEY_CTRL_SENSOR4	0x22	
DoPE_KEY_CTRL_SENSOR5	0x23	
DoPE_KEY_CTRL_SENSOR6	0x24	
DoPE_KEY_CTRL_SENSOR7	0x25	
DoPE_KEY_CTRL_SENSOR8	0x26	
DoPE_KEY_CTRL_SENSOR9	0x27	
DoPE_KEY_CTRL_SENSOR10	0x28	
DoPE_KEY_CTRL_SENSOR11	0x29	
DoPE_KEY_CTRL_SENSOR12	0x2A	
DoPE_KEY_CTRL_SENSOR13	0x2B	
DoPE_KEY_CTRL_SENSOR14	0x2C	
DoPE_KEY_CTRL_SENSOR15	0x2D	
DoPE_KEY_DP	0x2E	'.' period (decimal point)
DoPE_KEY_SIGN	0x2F	'±' sign
DoPE_KEY_0	0x30	'0'
DoPE_KEY_1	0x31	'1'
DoPE_KEY_2	0x32	'2'
DoPE_KEY_3	0x33	'3'

DoPE_KEY_4	0x34	'4'
DoPE_KEY_5	0x35	'5'
DoPE_KEY_6	0x36	'6'
DoPE_KEY_7	0x37	'7'
DoPE_KEY_8	0x38	'8'
DoPE_KEY_9	0x39	'9'
DoPE_KEY_CTRL_POS	0x3A	Position Control
DoPE_KEY_CTRL_LOAD	0x3B	Load Control
DoPE_KEY_CTRL_EXTENSION	0x3C	Extension Control
DoPE_KEY_reserved3D	0x3D	
DoPE_KEY_LINK	0x3E	Link
DoPE_KEY_CONNECT	0x3F	
OEM keys		
DoPE_KEY_OEM0	0x40	
DoPE_KEY_OEM1	0x41	
DoPE_KEY_OEM2	0x42	
DoPE_KEY_OEM3	0x43	
DoPE_KEY_OEM4	0x44	
DoPE_KEY_OEM5	0x45	
DoPE_KEY_OEM6	0x46	
DoPE_KEY_OEM7	0x47	
DoPE_KEY_OEM8	0x48	
DoPE_KEY_OEM9	0x49	
DoPE_KEY_OEMA	0x4A	
DoPE_KEY_OEMB	0x4B	
DoPE_KEY_OEMC	0x4C	
DoPE_KEY_OEMD	0x4D	
DoPE_KEY_OEME	0x4E	
DoPE_KEY_OEMF	0x4F	

11.10Keyboard Lock Commands

The RMCi features a Link Key to allow an exclusive access if more than one RMCi is connected to the EDCi. DoPE offers a function to disable RMCi keyboard input and let the PC gain exclusive access.

11.10.1 DoPESetKeyboardLockState

Set the lock state of all keyboards.	
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.01	
Function declaration	**Description**
extern unsigned DLLAPI DoPESetKeyboardLockState (DoPE_HANDLE DoPEHdl, unsigned Enable)	Function returns Error constant (DoPERR_xxxx) DoPE link handle true: set all keyboards to the Locked state - all keys are disabled - the Link LED is off false: In DoPEGeneralData RmcActiveMode Single Mode - set all keyboards to the Idle state - only the Link key is enabled - the Link LED is blinking In DoPEGeneralData RmcActiveMode Multi Mode - set all keyboards to the Linked state - all keys are enabled - the Link LED is on
.NET <Edc object>.Key.SetKeyboardLockState(bool Enable)	

11.10.2 DoPEGetKeyboardLockState

Set the lock state of all keyboards.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.01		
Function declaration	**Description**	
extern unsigned DLLAPI DoPESetKeyboardLockState (DoPE_HANDLE DoPEHdl unsigned * pState)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to storage for keybords state	
DoPE_KEYBOARD_IDLE all keyboard are in the Idle state - only the Link key is enabled - the Link LED is blinking DoPE_KEYBOARD_LINKED at least one keyboard is in the Linked state - all keys are enabled - the Link LED is on DoPE_KEYBOARD_LOCKED all keyboards were set to the Locked state by DoPESetKeyboardLockState - all keys are locked - the Link LED is off		
.NET <Edc object>.Key.GetKeyboardLockState(ref DoPE.KEYBOARD_STATE State)		

11.11Definition of LED's

LED constant	LED refers to key
DOLI LED's	
DoPE_LED_HALT	DoPE_KEY_HALT
DoPE_LED_UP	DoPE_KEY_UP
DoPE_LED_DOWN	DoPE_KEY_DOWN
DoPE_LED_DPOTI	DoPE_KEY_DPOTI
DoPE_LED_F1	DoPE_KEY_F1
DoPE_LED_F2	DoPE_KEY_F2
DoPE_LED_F3	DoPE_KEY_F3
DoPE_LED_ON	DoPE_KEY_ON
DoPE_LED_TEST	DoPE_KEY_TEST
DoPE_LED_UPR_GRIP_OPEN	DoPE_KEY_UPR_GRIP_OPEN
DoPE_LED_UPR_GRIP_CLOSE	DoPE_KEY_UPR_GRIP_CLOSE
DoPE_LED_LWR_GRIP_OPEN	DoPE_KEY_LWR_GRIP_OPEN
DoPE_LED_LWR_GRIP_CLOSE	DoPE_KEY_LWR_GRIP_CLOSE
DoPE_LED_EXTMETER_OPEN	DoPE_KEY_EXTMETER_OPEN
DoPE_LED_EXTMETER_CLOSE	DoPE_KEY_EXTMETER_CLOSE
DoPE_LED_FIXED_XHEAD_UP	DoPE_KEY_FIXED_XHEAD_UP
DoPE_LED_FIXED_XHEAD_DOWN	DoPE_KEY_FIXED_XHEAD_DOWN
DoPE_LED_DPOTI_CONTROL	DoPE_KEY_DPOTI_CONTROL
DoPE_LED_BF1	DoPE_KEY_BF1
DoPE_LED_BF2	DoPE_KEY_BF2
DoPE_LED_BF3	DoPE_KEY_BF3
DoPE_LED_HIGH_PRESSURE	DoPE_KEY_HIGH_PRESSURE
DoPE_LED_LOW_PRESSURE	DoPE_KEY_LOW_PRESSURE
DoPE_LED_OFF	DoPE_KEY_OFF
DoPE_LED_UP_FAST	DoPE_KEY_UP_FAST
DoPE_LED_DOWN_FAST	DoPE_KEY_DOWN_FAST
DoPE_LED_TEST_STOP	DoPE_KEY_TEST_STOP
DoPE_LED_TEST_RETURN	DoPE_KEY_TEST_RETURN
DoPE_LED_TEST_HALT_CONTINUE	DoPE_KEY_TEST_HALT_CONTINUE
DoPE_LED_reserved1D	DoPE_KEY_reserved1D
DoPE_LED_reserved1E	DoPE_KEY_reserved1E
DoPE_LED_reserved1F	DoPE_KEY_reserved1F
DoPE_LED_reserved20	DoPE_KEY_reserved20
DoPE_LED_CTRL_SENSOR3	DoPE_KEY_reserved21
DoPE_LED_CTRL_SENSOR4	DoPE_KEY_reserved22
DoPE_LED_CTRL_SENSOR5	DoPE_KEY_reserved23
DoPE_LED_CTRL_SENSOR6	DoPE_KEY_reserved24
DoPE_LED_CTRL_SENSOR7	DoPE_KEY_reserved25
DoPE_LED_CTRL_SENSOR8	DoPE_KEY_reserved26
DoPE_LED_CTRL_SENSOR9	DoPE_KEY_reserved27
DoPE_LED_CTRL_SENSOR10	DoPE_KEY_reserved28
DoPE_LED_CTRL_SENSOR11	DoPE_KEY_reserved29
DoPE_LED_CTRL_SENSOR12	DoPE_KEY_reserved2A
DoPE_LED_CTRL_SENSOR13	DoPE_KEY_reserved2B
DoPE_LED_CTRL_SENSOR14	DoPE_KEY_reserved2C
DoPE_LED_CTRL_SENSOR15	DoPE_KEY_reserved2D
DoPE_LED_DP	DoPE_KEY_DP
DoPE_LED_SIGN	DoPE_KEY_SIGN
DoPE_LED_0	DoPE_KEY_0
DoPE_LED_1	DoPE_KEY_1
DoPE_LED_2	DoPE_KEY_2
DoPE_LED_3	DoPE_KEY_3
DoPE_LED_4	DoPE_KEY_4

DoPE_LED_5	DoPE_KEY_5
DoPE_LED_6	DoPE_KEY_6
DoPE_LED_7	DoPE_KEY_7
DoPE_LED_8	DoPE_KEY_8
DoPE_LED_9	DoPE_KEY_9
DoPE_LED_CTRL_POS	DoPE_KEY_reserved3A
DoPE_LED_CTRL_LOAD	DoPE_KEY_reserved3B
DoPE_LED_CTRL_EXTENSION	DoPE_KEY_reserved3C
DoPE_LED_reserved3D	DoPE_KEY_reserved3D
DoPE_LED_LINK	DoPE_KEY_LINK
DoPE_LED_CONNECT	DoPE_KEY_CONNECT
OEM- LED's	
DoPE_LED_OEM0	DoPE_KEY_OEM0
DoPE_LED_OEM1	DoPE_KEY_OEM1
DoPE_LED_OEM2	DoPE_KEY_OEM2
DoPE_LED_OEM3	DoPE_KEY_OEM3
DoPE_LED_OEM4	DoPE_KEY_OEM4
DoPE_LED_OEM5	DoPE_KEY_OEM5
DoPE_LED_OEM6	DoPE_KEY_OEM6
DoPE_LED_OEM7	DoPE_KEY_OEM7
DoPE_LED_OEM8	DoPE_KEY_OEM8
DoPE_LED_OEM9	DoPE_KEY_OEM9
DoPE_LED_OEMA	DoPE_KEY_OEMA
DoPE_LED_OEMB	DoPE_KEY_OEMB
DoPE_LED_OEMC	DoPE_KEY_OEMC
DoPE_LED_OEMD	DoPE_KEY_OEMD
DoPE_LED_OEME	DoPE_KEY_OEME
DoPE_LED_OEMF	DoPE_KEY_OEMF

12 SetupCommands

You can read or write machine set-up data.

Set-up data from machine number one onwards are stored inside the EDC flash disk.

Machine number zero is the working set-up. All data written to machine zero are not stored, but can be used to initialize EDC.

12.1 DoPERdGeneralData

Read general data of the machine.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPERdGeneralData (DoPE_HANDLE DoPEHdl DoPEGeneralData * GeneralData)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer for DoPEGeneralData structure

.NET <Edc object>.Setup.RdGeneralData(ref DoPE.GeneralData GeneralData)

12.2 DoPEWrGeneralData

Write general data of the machine.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEWrGeneralData (DoPE_HANDLE DoPEHdl DoPEGeneralData * GeneralData WORD * lpusTAN)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to DoPEGeneralData structure Pointer to transaction number (not for Sync. version).

DoPEGeneralData structure:

```
typedef struct                      /* General data                          */
{                                   /* ------------------------------------ */
  WORD   MachineNo;                 /* Number of active machines      [No]*/
  WORD   MachineNoIo;               /* Machine select IO's config.    [No]*/
                                    /* (see MACHINE_NO_IO_... definitions)*/
  WORD   Supervisor;                /* Supervisor mode                [No]*/ //EDC120-
  WORD   SuperPassword;             /* Supervisor Password(0=inactive)[No]*/
  WORD   UserPassword;              /* User       Password(0=inactive)[No]*/
  WORD   Logo;                      /* DOLI Logo (0 = inactive)       [No]*/
  DWORD  nRmc;                      /* Required number of RMC's       [No]*/ //EDC220+
  DWORD  Language;                  /* Language                       [No]*/ //EDC220+
  DWORD  FunctionID;                /* User defined function ID       [No]*/ //EDC220+
  WORD   SyncOption;                /* Sync option (SYNC_OPTION_xxx)  [No]*/ //EDC220+
  WORD   MachineNoIoBitConnector;   /* BitIn/BitOut connector         [No]*/ //EDC220+
  WORD   MachineNoIoBitNo;          /* First bit of block          [0..15]*/ //EDC220+
} DoPEGeneralData;
```

.NET <Edc object>.Setup.WrGeneralData(ref DoPE.GeneralData GeneralData)

12.3 DoPERdMachine

Read the total machine structure.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPERdMachine (DoPE_HANDLE DoPEHdl unsigned short MachineNo DoPEMachine *Machine	Function returns Error constant (DoPERR_xxxx) DoPE link handle Machine Number Pointer to machine data structure

.NET <Edc object>.Setup.RdMachine(DoPE.MACHINE_NUMBER MachineNo, ref DoPE.Machine Machine)

12.4 DoPEWrMachine

Write the total machine structure.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEWrMachine (DoPE_HANDLE DoPEHdl unsigned short MachineNo DoPEMachine * Machine	Function returns Error constant (DoPERR_xxxx) DoPE link handle Machine Number Pointer to machine data structure

DoPEMachine structure:

```
typedef struct                          /* EDC Setup Data                      */
{                                       /* ----------------------------------- */
  DoPEMachineDef  MDef;                 /* Machine definition data             */
  DoPESenDef      SDef[MAX_MC];         /* Sensor definition data              */
  DoPECtrlSenDef  CSDef[MAX_CTRL];      /* Control-Sensor definition           */
  DoPECtrlSenDef  CSDefHigh[MAX_CTRL]; /* Control-Sensor def. (high pressure)*/
  DoPEOutChaDef   ODef[MAX_OC];         /* Analogue output definition data     */
  DoPEBitDef      BDef[MAX_BIT];        /* Digital bit input/output definition*/
  DoPEIOSignals   IOSignals;            /* IO signal definition                */
  DoPEMainMenu    MainMenu[MAX_MAIN_MENU]; /* EDC main menu definition         */
} DoPEMachine;
```

.NET <Edc object>.Setup.WrMachine(DoPE.MACHINE_NUMBER MachineNo, DoPE.Machine Machine)

12.5 DoPEMachineScale

Sets the machine user scale.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEMachineScale (DoPE_HANDLE DoPEHdl unsigned short MachineNo UserScale US)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Machine Number User scale for all machine sensor data e.g. use this to convert the SI unit meter into mm by setting the UserScale to 1000 for the position sensor Default values 1.0 will be used if US is NULL.

.NET <Edc object>.Setup.MachineScale(DoPE.MACHINE_NUMBER MachineNo, DoPE.UserScale US)

12.6 DoPERdMachineNumber

Read currently selected machine number.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPERdMachineNumber (DoPE_HANDLE DoPEHdl unsigned short * MachineNo)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Pointer to store machine number

.NET <Edc object>.Setup.RdMachineNumber(ref DoPE.MACHINE_NUMBER MachineNo)

12.7 DoPESelMachine

Select a machine and initialize.
Machine number 1 to 8 are stored inside the EDC flash disk. Machine number 0 is the working set.
If machine 1 to 8 is selected, machine data and basic tare values are copied from the flash disk to the working set 0.If machine 0 is selected, set-up data in the working set 0 are not altered. Basic tare values cannot be stored permanently inside EDC. Thus if machine 0 was written completely by PC, this data are used to initialize the system.TheDoPESelMachine function calls DoPEInitialize to do system initialization.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description	
extern unsigned DLLAPI DoPESelMachine (DoPE_HANDLE DoPEHdl unsigned short MachineNo UserScale US)	Function returns Error constant (DoPERR_xxxx) DoPE link handle Machine No. User scale for all measuring channels. The measured data will be multiplied with the value in US. E.g. use this to convert the SI unit meter into mm by setting the UserScale to 1000 for the position channel.If US = NULL, user scale will be set to 1.0	

.NET <Edc object>.Setup.SelMachine(DoPE.MACHINE_NUMBER MachineNo, DoPE.UserScale US)

12.8 DoPEInitialize

Initialize System with selected machine data. This command must be called after a change of machine data was made without selecting a new machine.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEInitialize (DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle TAN's are used to identify initialization errors sent in addition to the synchronized return code. (This will be implemented in future EDC versions.In Version 2.11 we have synchronized return codes but onlyone error code sent on the PE_INITIALIZE command.)

.NET <Edc object>.Setup.Initialize()

12.9 DoPEInitializeResetXHead

Initialize System with selected machine data and reset the crosshead position.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEInitializeResetXHead (DoPE_HANDLE DoPEHdl)	Function returns Error constant (DoPERR_xxxx) DoPE link handle

.NET <Edc object>.Setup. InitializeResetXHead()

12.10 DoPERdSensorInfo

Read summary sensor information's.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPERdSensorInfo (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
unsigned short	SensorNo	Sensor Number.	
DoPESumSenInfo	*Info	Pointer for SumSenInfo structure.	

DoPESumSenInfo structure:

```
typedef struct                          /* Summary Sensor Information         */
{                                       /* ---------------------------------- */
  WORD   Connector;                     /* Connector number of sensor     [No]*/
  double NominalValue;                  /* Nominal value of sensor      [Unit]*/
  WORD   Unit;                          /* Unit of sensor UNIT_xxx        [No]*/
  double Offset;                        /* Offset of sensor             [Unit]*/
  double UpperLimit;                    /* Upper range limit of sensor  [Unit]*/
  double LowerLimit;                    /* Lower range limit of sensor  [Unit]*/
  WORD   SensorState;                   /* Sensor state SEN_STATE_xxx     [No]*/
  WORD   McType;                        /* Measuring channel type         [No]*/
  double UpperSoftLimit;                /* Upper soft limit             [Unit]*/
  double LowerSoftLimit;                /* Lower soft limit             [Unit]*/
  WORD   SoftLimitReaction;             /* reaction if soft limit         [No]*/
  double BasicTare;                     /* Basic   tare                 [Unit]*/
  double Tare;                          /* Tare                         [Unit]*/
  double UserScale;                     /* User scale                     [No]*/
  double McFilterTime;                  /* Measuring channel filter time   [s]*/
  double CtrlFilterTime;                /* Closed loop control filter time [s]*/
  double HwDelayTime;                   /* Hardware delaytime              [s]*/
  double McDelayTime;                   /* Measuring channel delaytime     [s]*/
  double McDelayTimeCorr;               /* Delaytime correction            [s]*/
 } DoPESumSenInfo;
```

.NET <Edc object>.Setup.RdSensorInfo(DoPE.SENSOR SensorNo, ref DoPE.SumSenInfo Info)

12.11DoPERdSensorUserData

Read sensor user data (128 Byte). The application program may use this 128 bytes EEPROM data to store information about the sensor. The EEPROM is located inside the sensor plug!

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPERdSensorUserData (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
WORD	Connector	Connector number of sensor	
BYTE	*SenUsrData	Pointer for sensor user data	
unsigned	Length	User data buffer length in BYTE's	

.NET <Edc object>. Sensor.RdSensorUserData(DoPE.CONNECTOR Connector, ref Byte[] SenUsrData)

12.12DoPEWrSensorUserData

Write sensor user data (128 Byte).

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPEWrSensorUserData (	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
WORD	Connector	Connector number of sensor	
BYTE	*SenUsrData	Pointer for sensor user data	
unsigned	Length)	User data buffer length in BYTE's.	

.NET <Edc object>. Sensor.WrSensorUserData(DoPE.CONNECTOR Connector, Byte[] SenUsrData)

12.13DoPEwRdModuleInfo

Read module info.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description
extern unsigned DLLAPI	DoPEwRdModuleInfo (	Function returns Error constant (DoPERR_xxxx)
DoPE_HANDLE	DoPEHdl	DoPE link handle
unsigned	ModulNo	Module number (0 ... MAX_MODULE-1)
DoPEwModuleInfo	*Info	Pointer to storage for the module info

```
typedef struct                          /* Definition of module info          */
{                                       /* ---------------------------------- */
  DWORD  ID;                            /* Module hardware ID              [No]*/
  DWORD  Revision;                      /* Module hardware revision        [No]*/
  DWORD  DeviceID;                      /* Device ID                       [No]*/
  DWORD  FunctionID;                    /* Function ID (from MachineDef)   [No]*/
  DWORD  SerNr;                         /* Serial number                   [No]*/
  DWORD  Status;                        /* Module status                   [No]*/
  wchar_tName[MODINFO_NAME_LEN];        /* Module name (e.g. "2INC 1742.000(-)") */
} DoPEModuleInfo;
```

.NET <Edc object>.Info.RdModuleInfo(Int32 ModulNo, ref DoPE.ModuleInfo ModuleInfo)

12.14DoPEwRdDriveInfo

Read drive info.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration		Description	
extern unsigned DLLAPI	DoPEwRdDriveInfo(	Function returns Error constant (DoPERR_xxxx)	
DoPE_HANDLE	DoPEHdl	DoPE link handle	
WORD	Connector	Module number (0 ... MAX_MODULE-1)	
DoPEwDriveInfo	*Info	Pointer to storage for the drive info	

```
typedef struct                          /* Definition of drive info           */
{                                       /* ---------------------------------- */
  DWORD  ID;                            /* Drive hardware ID              [No]*/
  DWORD  Revision;                      /* Drive hardware revision        [No]*/
  DWORD  SerNr;                         /* Serial number                  [No]*/
  double NominalCurrent;                /* Nominal current                 [A]*/
  double MinCurrent;                    /* Minimum current                 [A]*/
  double MaxCurrent;                    /* Maximum current                 [A]*/
  double MaxCurrentTime;                /* Maximum current time (I²t)      [s]*/
  int    NominalVoltageCount;           /* Number of nominal voltages     [No]*/
  double NominalVoltage[MAX_NOMV];      /* Nominal voltage                 [V]*/
  double MaxPower;                      /* Maximum power                   [W]*/
  double FeedbackPower;                 /* Average feedback power          [W]*/
  double MinDither;                     /* Minimum dither frequency       [Hz]*/
  double MaxDither;                     /* Maximum dither frequency       [Hz]*/
  double CurrentControllerCycle;        /* Current controller cycle time   [s]*/
                                        /* (0 = analogue or not adjustable)   */
wchar_tName[DRIVEINFO_NAME_LEN];        /* Drive name (e.g. "DC2500 1860.000(-)") */
} DoPEwDriveInfo;
```

.NET <Edc object>.Info.RdDriveInfo(DoPE.CONNECTOR Connector, ref DoPE.DriveInfo DriveInfo)

13 Sensor EEPROM Handling

Following functions support read and write of sensor-EEPROM data.

ATTENTION: **Use these functions very carefully.**
DoPE cannot check the total integrity of the data!
UserScale has no effect on the Sensor EEPROM data!

These functions work on initialized and not initialized sensors. The sensors are selected by the connector number.

The data inside the sensor EEPROM are divided into two sections.

The first section (DoPESensorHeaderData) is identical for all sensors.

The second section depends of the sensor class.

If you want to change data inside the sensor EEPROM, please follow the procedure described below:

1. Use DoPERdSensorConKey function and check if a sensor is connected.
2. Use DoPERdSensorHeaderData function to read header data.
   Analyze the sensor class!
3. For DoPESensorHeaderData.Class = SEN_ANALOGUE useDoPERdSensorAnalogueData,
   for DoPESensorHeaderData.Class =SEN_INC useDoPERdSensorIncData,
   for DoPESensorHeaderData.Class =SEN_ABS useDoPERdSensorAbsData
   to read the sensor class specific data.
4. Modify data.
   Only the **bold type**parameter in the sensor data structures is allowed to be changed!
5. Use DoPERdSensorConKey in a loop (not faster than 100 ms) and wait until the KeyPressed parameter is 1.
6. Use the appropriate write function to store the data into the sensor EEPROM.

It is not absolutely necessary to use the function DoPERdSensorConKey before writing data into the sensor EEPROM. **If you don't use it, be aware that calibration data may be changed, without breaking the seal at the sensor plug!**

13.1 DoPERdSensorConKey

Read sensor plug connected and key state.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPE_HANDLE WORD WORD WORD	DoPERdSensorConKey (DoPEHdl Connector *Connected * KeyPressed	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to the sensor plug connected state (0=not connected, 1=connected) Pointer to the sensor plug key state (0=not pressed, 1=pressed	
.NET <Edc object>.Sensor. RdSensorConKey(DoPE.CONNECTOR Connector, ref bool Connected, ref bool KeyPressed)			

13.2 DoPERdSensorHeaderData

Read sensor EEPROM data header.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPERdSensorHeaderData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorHeaderData *SenHdrData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to sensor data header structure	
.NET <Edc object>.Sensor.RdSensorHeaderData(DoPE.CONNECTOR Connector, ref DoPE.SensorHeaderData SenHdrData)		

13.3 DoPEWrSensorHeaderData

Write sensor EEPROM data header.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEWrSensorHeaderData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorHeaderData *SenHdrData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to sensor data header structure	

DoPESensorHeaderData structure:

```
typedef struct                          /* Sensor EEPROM header data          */
{                                       /* ---------------------------------- */
  WORD    PartNo;                       /* Part indent number             [No]*/
  BYTE    Version;                      /* Part revision                  [No]*/
  DWORD   SerNo;                        /* Part serial number             [No]*/
  WORD    Class;                        /* Sensor class                   [No]*/
  BYTE    DatVersion;                   /* Version of data                [No]*/
} DoPESensorHeaderData;
                                           Write protected

                                        /* Sensor classes                     */
                                        /* ---------------------------------- */
#define SEN_UNDEF            0          /* unknown sensor class               */
#define SEN_ANALOGUE         1          /* analogue sensor                    */
#define SEN_INC              2          /* incremental sensor                 */
#define SEN_ABS              3          /* absolute value sensor              */

                                        /* Analogue sensor types              */
                                        /* ---------------------------------- */
#define SIG_STRAINGAUGE      0          /* Strain gauge                       */
#define SIG_LVDT             1          /* LVDT                               */
#define SIG_DC               2          /* DC                                 */

                                        /* Incremental sensor types           */
                                        /* ---------------------------------- */
#define SIG_TTL              0          /* TTL Signal                         */
#define SIG_LINE             1          /* RS422 (line driver)                */
#define SIG_SINE11uA         2          /* Sine 11µA                          */
#define SIG_SINE1V           3          /* Sine 1V                            */

                                        /* Absolute value sensor types        */
                                        /* ---------------------------------- */
#define SIG_UNDEF            0          /* undefined                          */
#define SIG_TR_LT_S          1          /* TR LT-S Sensor                     */

                                        /* Transducer types                   */
                                        /* ---------------------------------- */
#define TRANSDUCER_LINEAR    0          /* Linear transducer                  */
```

```
#define TRANSDUCER_ROTARY  1          /* Rotary transducer                  */

                                      /* Reference mark types               */
                                      /* ---------------------------------- */
#define REFMARK_NON        0          /* Transducer has no reference mark   */
#define REFMARK_ONE        1          /* Transducer has one reference mark  */
#define REFMARK_DISTCODE   2          /* Transducer has distance coded      */
```

.NET <Edc object>.Sensor.WrSensorHeaderData(DoPE.CONNECTOR Connector, ref DoPE.SensorHeaderData SenHdrData)

13.4 DoPERdSensorAnalogueData

Read analogue sensor data.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPERdSensorAnalogueData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorAnalogueData *SenAnalogueData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to analogue sensor data structure

.NET <Edc object>.Sensor. RdSensorAnalogueData(DoPE.CONNECTOR Connector, ref DoPE.SensorAnalogueData SensorAnalogueData)

13.5 DoPEWrSensorAnalogueData

Write analogue sensor data.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEWrSensorAnalogueData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorAnalogueData *SenAnalogueData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to analogue sensor data structure

DoPESensorAnalogueData structure:

```
typedef struct                        /* Analogue sensor EEPROM data        */
{                                     /* ---------------------------------- */
  float  MaxExcitation;               /* Maximum excitation voltage      [V]*/
  WORD   MinImpedance;                /* Impedance                    [Ohm]*/
  float  NominalValue;                /* Nominal value of the sensor  [Unit]*/
  WORD   Unit;                        /* Unit of sensor UNIT_xxx        [No]*/
  float  Offset;                      /* Sensor offset                [Unit]*/
  WORD   NegLimit;                    /* Range limit - min.              [%]*/
  WORD   PosLimit;                    /* Range limit - max.              [%]*/
  float  Reference;                   /* Nominal value of the reference  [*]*/
  double CorrReference;               /* Corr. value of the reference   [No]*/
  WORD   Sensortype;                  /* Sensor type                        */
  double NominalSensitive;            /* Sensitivity at Nominal value    [*]*/
  WORD   Sign;                        /* Invert sign of channel        [1/0]*/
  int    Day;                         /* Date of last change             [No]*/
  int    Month;                       /* Date of last change             [No]*/
  int    Year;                        /* Date of last change             [No]*/
  WORD   LinPoint;                    /* Number of linearization steps   [No]*/
  struct LinVal
  {
    double MeasValue;                 /* Measured value               [Unit]*/
    double RefValue;                  /* Reference                    [Unit]*/
  } LinV[SEN_LIN_DATA_MAX];           /* Linearization table                */
} DoPESensorAnalogueData;
                                         Write protected
```

.NET <Edc object>.Sensor.WrSensorAnalogueData(DoPE.CONNECTOR Connector, DoPE.SensorAnalogueData SensorAnalogueData)

13.6 DoPERdSensorIncData

Read incremental sensor data.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPERdSensorIncData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorIncData *SenIncData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to incremental sensor data structure	
.NET <Edc object>.Sensor.RdSensorIncData(DoPE.CONNECTOR Connector, ref DoPE.SensorIncData SenIncData)		

13.7 DoPEWrSensorIncData

Write incremental sensor data.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEWrSensorIncData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorIncData *SenIncData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to incremental sensor data structure	

DoPESensorIncData structure:

```
typedef struct                          /* Incremental sensor EEPROM data     */
{                                       /* ---------------------------------- */
  float  Voltage1;                      /* Supply voltage 1                [V]*/
  float  Voltage2;                      /* Supply voltage 2                [V]*/
  float  Voltage3;                      /* Supply voltage 3                [V]*/
  float  Current1;                      /* Current for supply voltage 1    [A]*/
  float  Current2;                      /* Current for supply voltage 2    [A]*/
  float  Current3;                      /* Current for supply voltage 3    [A]*/
  WORD   InputSignal;                   /* Signal type at input  SIG_xxx  [No]*/
  WORD   OutputSignal;                  /* Signal type at output SIG_xxx  [No]*/
  WORD   InterpolationFactor;           /* Factor for interpolation       [No]*/
  float  MaxInputFreq;                  /* Maximum input frequency        [Hz]*/
  float  MaxOutputFreq;                 /* Maximum output frequency       [Hz]*/
  WORD   TransducerType;                /* Transducer type TRANSDUCER_xxx [No]*/
  WORD   Unit;                          /* Unit of sensor UNIT_xxx        [No]*/
  double SignalPeriod;                  /* Signal period                [Unit]*/
  double CorrFactor;                    /* Correction factor              [No]*/
  double MeasuringRange;                /* Measuring range              [Unit]*/
  WORD   SignalType;                    /* Transducer signal type  SIG_xxx[No]*/
  WORD   ReferenceMark;                 /* Reference mark type REFMARK_xxx[No]*/
  double FirstDistance;                 /* First distance of the reference[Unit]*/
  double NominalDistance;               /* Nominal distance of the reference[Unit]*/
  double Delta;                         /* Dislocation of the mean reference[Unit]*/
  float  LimitFrequency;                /* Limit frequency of the transducer[Hz]*/
  WORD   Sign;                          /* Invert sign of channel        [1/0]*/
  BYTE   NegLimit;                      /* Range limit - min.              [%]*/
  BYTE   PosLimit;                      /* Range limit - max.              [%]*/
  int    Day;                           /* Date of last change            [No]*/
  int    Month;                         /* Date of last change            [No]*/
  int    Year;                          /* Date of last change            [No]*/
 } DoPESensorIncData;
                                          Write protected
```

.NET <Edc object>.Sensor.WrSensorIncData(DoPE.CONNECTOR Connector, DoPE.SensorIncData SenIncData)

13.8 DoPERdSensorAbsData

Read absolute sensor data.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPERdSensorAbsData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorAbsData *SenAbsData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to absolute sensor data structure	
.NET <Edc object>.Sensor.RdSensorAbsData(DoPE.CONNECTOR Connector, ref DoPE.SensorAbsData SenAbsData)		

13.9 DoPEWrSensorAbsData

Write absolute sensor data.		
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00		
Function declaration	**Description**	
extern unsigned DLLAPI DoPEWrSensorAbsData (DoPE_HANDLE DoPEHdl WORD Connector DoPESensorAbsData *SenAbsData	Function returns Error constant (DoPERR_xxxx) DoPE link handle Connector number of sensor Pointer to absolute sensor data structure	

DoPESensorAbsData structure:

```
typedef struct                          /* Absolute value EEPROM header data  */
{                                       /* ---------------------------------- */
  float  Voltage1;                      /* Supply voltage 1                [V]*/
  float  Voltage2;                      /* Supply voltage 2                [V]*/
  float  Voltage3;                      /* Supply voltage 3                [V]*/
  float  Current1;                      /* Current for supply voltage 1    [A]*/
  float  Current2;                      /* Current for supply voltage 2    [A]*/
  float  Current3;                      /* Current for supply voltage 3    [A]*/
  WORD   InputSignal;                   /* Signal type at input  SIG_xxx  [No]*/
  WORD   OutputSignal;                  /* Signal type at output SIG_xxx  [No]*/
  float  MaxInputFreq;                  /* Maximum input frequency        [Hz]*/
  float  MaxOutputFreq;                 /* Maximum output frequency       [Hz]*/

  BYTE   DelayTime;                     /* Sensors signal delay time   [ms/10]*/
  WORD   Unit;                          /* Unit of sensor UNIT_xxx        [No]*/
  double SignalPeriod;                  /* Signal period                [Unit]*/
  float  Offset;                        /* Sensor offset                [Unit]*/
  double CorrFactor;                    /* Correction factor              [No]*/
  double NominalValue;                  /* Nominal value of the sensor  [Unit]*/
  WORD   SignalType;                    /* Tansducer sgnal type  SIG_xxx  [No]*/
                                        /* or SIG_SSI_GENERIC + code + number */
                                        /* of data bits                       */
  float  LimitFrequency;                /* Limit frequency of the transducer[Hz]*/
  WORD   Sign;                          /* Invert sign of channel        [1/0]*/
  BYTE   NegLimit;                      /* Range limit - min.              [%]*/
  BYTE   PosLimit;                      /* Range limit - max.              [%]*/
  int    Day;                           /* Date of last change            [No]*/
  int    Month;                         /* Date of last change            [No]*/
  int    Year;                          /* Date of last change            [No]*/
} DoPESensorAbsData;
                                           Write protected
```

.NET <Edc object>.Sensor.WrSensorAbsData(DoPE.CONNECTOR Connector, DoPE.SensorAbsData SenAbsData)

13.10DoPESetSsiGenericSignalType

Build the signal type of a SSI absolute sensor by it's generic data.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPESetSsiGenericSignalType(BYTE *SignalType unsigned Code unsigned Bits		Function returns Error constant (DoPERR_xxxx) Pointer to signal type variable Code of the sensor (0:binary, !=0:gray code) Number of databits of the sensor	
.NET <Edc object>.Sensor.SetSsiGenericSignalType(ref Byte SignalType, DoPE.SSI_CODE Code, Int32 Bits)			

13.11DoPESsiGenericSignalTypeInfo

Get the generic data of a SSI absolute sensor by it's signal type.			
Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00			
Function declaration		**Description**	
extern unsigned DLLAPI DoPESsiGenericSignalTypeInfo(BYTE SignalType unsigned * Code unsigned * Bits		Function returns Error constant (DoPERR_xxxx) Signal type of the SSI sensor Pointer to storage for code of the sensor (code = 0:binary, !=0:gray code) Pointer to storage for number of databits of the sensor	
.NET <Edc object>.Sensor.SsiGenericSignalTypeInfo(Byte SignalType, ref DoPE.SSI_CODE Code, ref Int32 Bits)			

14 Reestablishing a Connection

For long-term experiments, it may be useful to close an open link without interrupting a running movement command. At a later time the connection can be resumed. For this DoPE provides two funtions. One enables the so called ReInitialize Mode and retreves the current state of the connection in the ReInitialize Data. The other one recovers the state of the connetion with this data.

14.1 DoPEReInitializeEnable

Activates the ReInitialize Mode and provides ReInitialize Data. This data will be passed to the DoPEReInitialize function to restore the communication link to the current state.
DoPESelSetup and the DoPEinitialize functions set the the ReInitialize Mode to the disabled state.

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEReInitializeEnable (DoPE_HANDLE DoPEHdl unsigned Enable DoPEReInitializeData* ReInitData)	Function returns Error constant (DoPERR_xxxx) DoPE link handle !=0 enables, =0 disables the ReInitialize mode pointer to storage for ReInitialize data

```
#define DoPEREINITIALIZEDATA_LEN 0x8000

typedef
  BYTE DoPEReInitializeData [DoPEREINITIALIEDATA_LEN];  /* ReInitialize data array [No]*/
```

.NET <Edc object>.Setup.ReInitializeEnable(bool Enable, ref byte[] ReInitData)

14.2 DoPEReInitialize

Recover a previously disconnected communication link.

Attention: DoPEReInitialize checks that:
- the EDC is still in ReInitialize Mode.
- the DoPEAPIVERSION of the current DoPE session matches the one used when the ReInitData were retreaved.
- the DeviceID didn't change.
- the ReInitData contains valid data (CRC check).

Minimum requirements: EDCi with EDCiApp 9149.001, DoPE 10.00

Function declaration	Description
extern unsigned DLLAPI DoPEReInitialize (DoPE_HANDLE DoPEHdl DoPEReInitializeData *ReInitData)	Function returns Error constant (DoPERR_xxxx) DoPE link handle pointer to ReInitialize data

.NET <Edc object>.Setup.ReInitialize(ref byte[] ReInitData)

Here a "C" sample program:

First session of the PC Program:

```
// open the communication link
DoPEErr = DoPEErr = DoPEOpenFunctionID( ... &DoPEHdl );
if( DoPEErr != DoPERR_NOERROR)
  //add errorhandling here
    return 0;

// select a setup
DoPEErr = DoPESelSetup ( DoPEHdl, 1, UserScale, NULL, NULL );
if(DoPEErr != DoPERR_NOERROR)
  //add errorhandling here

// add event handler and other application stuff
```

```
…

// switch drive on
DoPEErr = DoPEOn ( DoPEHdl );
if(DoPEErr != DoPERR_NOERROR)
  //add errorhandling here

// start a long term test
DoPEErr = DoPEDynCycle ( DoPEHdl, … HalfCycles = 10000000, … );
if(DoPEErr != DoPERR_NOERROR)
  //add errorhandling here

// enable the Reinitialize Mode and keep the ReInitialize Data
DoPEReInitializeData ReInitData;
DoPEErr = DoPEReInitializeMode ( DoPEHdl, true, &ReInitData );
if(DoPEErr != DoPERR_NOERROR)
  //add errorhandling here

…save ReInitDat to Disk…


// Close the communication link
DoPEErr = DoPECloseLink ( &DoPEHdl );
if(DoPEErr != DoPERR_NOERROR)
  //add errorhandling here
```

Recovery session of the PC Program:

```
// open the communication link
DoPEErr = DoPEErr = DoPEOpenFunctionID( ... &DoPEHdl );
if( DoPEErr != DoPERR_NOERROR)
  //add errorhandling here
    return 0;

// recover communication link with previously stored ReInitData
…load ReInitData from disk
DoPEErr = DoPEReInitialize ( DoPEHdl, &ReInitData );
if(DoPEErr != DoPERR_NOERROR)
  //add errorhandling here


// add event handler and other application stuff
…
```

15 Default measuring data record

double	Position	X-Head position
double	Load	Load
double	Extension	Extension
double	Sensor3	Sensor 3 measuring channel
double	Sensor4	Sensor 4 measuring channel
double	Sensor5	Sensor 5 measuring channel
double	Sensor6	Sensor 6 measuring channel
double	Sensor7	Sensor 7 measuring channel
double	Sensor8	Sensor 8 measuring channel
double	Sensor9	Sensor 9 measuring channel
double	Sensor10	Sensor 10 measuring channel
double	Sensor11	Sensor 11 measuring channel
double	Sensor12	Sensor 12 measuring channel
double	Sensor13	Sensor 13 measuring channel
double	Sensor14	Sensor 14 measuring channel
double	Sensor15	Sensor 15 measuring channel
double	Command	Command
double	Feedback	Feedback
double	Output	Output
double	Time	Time from subsystem
unsigned long	Cycles	Cycle counter for cyclic commands
unsigned long	BlockCycles	Cycle counter for block commands
unsigned long	BlockLine	Current block command line
double	CmdFrequency	Frequency for cycling commands
unsigned short	BitIn0	Digital input device 0
unsigned short	BitIn1	Digital input device 1
unsigned short	BitIn2	Digital input device 2
unsigned short	BitIn3	Digital input device 3
unsigned short	BitIn4	Digital input device 4
unsigned short	BitIn5	Digital input device 5
unsigned short	BitIn6	Digital input device 6
unsigned short	BitIn7	Digital input device 7
unsigned short	BitIn8	Digital input device 8
unsigned short	BitIn9	Digital input device 9
unsigned short	BitOut0	Digital output device 0
unsigned short	BitOut1	Digital output device 1
unsigned short	BitOut2	Digital output device 2
unsigned short	BitOut3	Digital output device 3
unsigned short	BitOut4	Digital output device 4
unsigned short	BitOut5	Digital output device 5
unsigned short	BitOut6	Digital output device 6
unsigned short	BitOut7	Digital output device 7
unsigned short	BitOut8	Digital output device 8
unsigned short	BitOut9	Digital output device 9
unsigned short	BitOutErrorHigh	Digital output error high (24V)
unsigned short	BitOutErrorLow	Digital output error low (0V)
unsigned short	InSignals	Logical input signals definition (see below)
unsigned short	OutSignals	Logical output signals definition (see below)15.2
unsigned short	CtrlState1	Controller status WORD 1 definition (see below)
unsigned short	CtrlState2	Controller status WORD 2 definition (see below)
unsigned short	UpperLimits	Upper range limits exceeded (Bit0=Position…Bit15=Sensor15)
unsigned short	LowerLimits	Lower range limits exceeded (Bit0=Position…Bit15=Sensor15)
unsigned short	ActiveCtrl	Active control channel (Bit0=Position…Bit15=Sensor15)
unsigned short	UpperSft	Upper soft limit active (Bit0=Position…Bit15=Sensor15)

unsigned short	LowerSft	Lower soft limit active	(Bit0=Position…Bit15=Sensor15)
unsigned short	SensorConnected	Sensor plug connected state	(Bit0=Position…Bit15=Sensor15)
unsigned short	SensorKeyPressed	Sensor plug key state	(Bit0=Position…Bit15=Sensor15)
unsigned short	DrvIntfStateIn1	Drive interface state input 1	(see below)
unsigned short	DrvIntfStateIn2	Drive interface state input 2	(see below)
unsigned short	DrvIntfStateOut	Drive interface state output	(see below)
unsigned short	SafetyState	Safety state	(reserved)
unsigned long	ModuleError	Error bits for installed modules (Bit0=Mainboard, Bit1=X21, Bit2=X22…)	

15.1 Logical input signals

The logical input signals are safety relevant digital inputs. They are configured during initialization and one logical input signal may map to more than one digital input. The state of the logical input signals is maintained in the measuring data record (InSignals).

Bit number	Constant	Description
0	IN_SIG_DRIVE_OFF (IN_SIG_ESTOP)	Drive off or emergency off If this signal is active, the machine control remains in the emergency stop state. Possible sources are limit switches, range limit active, emergency stop button or similar safety equipment.
1	IN_SIG_E_MOVE_RQ (IN_SIG_ESTOP_DRIVING_FREE)	Emergency off, emergency movement required This signal also forces the machine control into the emergency stop state, but can be masked during a driving free movement.
2	IN_SIG_UPPER_LIMIT_SWITCH	Upper hard-limit switch active This signal force the machine control into the emergency stop state and can be masked during a driving free movement.
3	IN_SIG_LOWER_LIMIT_SWITCH	Lower hard-limit switch active This signal force the machine control into the emergency stop state and can be masked during a driving free movement.
4	IN_SIG_NO_CTRL (IN_SIG_DRIVE_NOT_READY)	Drive not ready (stop) This signal reports the state of the connected drive unit. If set, the drive is not ready.
5	IN_SIG_DF_KEY (Iinternal use)	Drive free withdrawn by key
6	IN_SIG_SHALT	Signal S-HALT activated The signal is especially suitable for the connection of a HALT key, the cross-head can be halted with independently of the actual operating state.
7	IN_SIG_REFERENZ (IN_SIG_REFSWITCH_X_HEAD)	X-head reference switch This signal reports the state a reference switch at the X-Head.
8	(IN_SIG_ENABLE_LIMIT_POS)	unused
9	(IN_SIG_ENABLE_LIMIT_SPEED)	unused
10	(IN_SIG_ENABLE_LIMIT_LOAD)	unused
11	IN_SIG_IO_SHALT_UPPER	IO-Signal SHaltUpper
12	IN_SIG_IO_SHALT_LOWER	IO-Signal SHaltLower
13	IN_SIG_CPU_EMERGENCY_OFF	Internal emergency off
14	IN_SIG_ESTOP_UP_DOWN	Upper/Lower limit switch

Former signal names of EDC220/580 in brackets

15.2 Logical output signals

The logical output signals are digital outputs to control the drive and associated devices. They are configured during initialization. The state of the logical output signals is maintained in the measuring data record (OutSignals).

Bit number	Constant	Description
0	O_SIG_DRIVE_ON (O_SIG_SOFTWARE_READY)	Drive ON output Being in the **inactive** state, this output signal should force the drive into its defined emergency stop state. If the signal is **active**, the drive should change after an arbitrary period of time into the 'operational' state. 'Operational' means that the drive can react upon the output signal 'Drive Free' (see below) without delay.
1	O_SIG_DRIVE_FREE (O_SIG_DRIVE_ENABLE)	Drive enable output With this signal, the external drive may be enabled and disabled.
2	O_SIG_BRAKE (O_SIG_BRAKE_RELEASE)	Brake output The signal 'Brake Release' is linked with the signal 'Drive Free' because of their fault levels, but will be operated with a time shift due to their corresponding change of states. The time shift should enable systems with mechanical brakes to achieve a controlled transition between braking and position control.
3	O_SIG_E_MOVE	Emergency movement output The signal 'Emergency Movement' is only active, as long as the Subsystem executes an emergency movement. It can be used to deactivate the function of the machine limit switches on the drive system.
4	O_SIG_BYPASS	Bypass output
5	O_SIG_LIMIT (O_SIG_MC_LIMIT)	Load limit for grip reached This signal is used by the measuring channel supervision activated by DoPESetCheckLimit command.
7	O_SIG_ON_RELAY	ON Relay output
9	O_SIG_INTERNAL_DRIVE_ENABLE	Internal Drive enable /disable
10	O_SIG_READY_TO_MOVE	Controller is ready for positioning .commands
11	O_SIG_EDC_READY	EDC ready
12	O_SIG_DRIVE_OFF	EDC drive off
13	(O_SIG_OUT_LIMIT_POS)	unused
14	(O_SIG_OUT_LIMIT_SPEED)	unused
15	(O_SIG_OUT_LIMIT_LOAD)	unused

Former signal names of EDC220/580 in brackets

15.3 Controller Status WORD 1

Status word 1 of the closed loop controller (CtrlState1)		
Bit number	**Constant**	**Description**
4	CTRL_HALT	Command generator halts (controlled halt in S/F/E).
5	CTRL_DOWN	Movement DOWN
6	CTRL_UP	Movement UP
7	CTRL_MOVE	X-Head moves (not halted) This bit is always set when the cross-head is not securely halted. The bit is not set with a switched off machine and with S controlled holding of a position. In all other cases the bit is set.
8	CTRL_READY	Moving command will be accepted
9	CTRL_FREE	Waiting for free signal. The EDC waits for the drive enable through the Host software or from the user.
10	CTRL_INIT_E	Emergency movement has to be activated
11	CTRL_SFTSET	Change of softends allowed
12	CTRL_SYNCINPUT	Sync input: 1 = ok, 0 = not connected
13	CTRL_SYNCHWAIT	Synch State: 1 = wait for Start
14	CTRL_SLAVE	Synch State: 0 = Master 1 = Slave
15	CTRL_E_ACTIVE	Emergency movement active

15.4 Controller Status WORD 2

Status word 2 of the closed loop controller (CtrlState2)		
Bit number	**Constant**	**Description**
10	CTRL_CYCLES_ACTIVE	Cycle command active (cosine, rectangle, triangle, cycles, dyn_cycles)
11	CTRL_HIGH_PRESSURE	High pressure active
12	CTRL_CALIBRATION	Calibration of analogue channels is currently active.
15	CTRL_ERROR	Deviation position controller

15.5 Drive Interface input signals 1

Bit number	Constant	Description
0	DrvIntfErr	1 = Drive Interface Error
1	UpStop	1 = Default; 0 = Upper limit switch triggered
2	DownStop	1 = Default; 0 = Lower limit switch triggered
3	CtrlEnable	Hardware controller enable input; 1= enabled; 0 = disabled
4	MoveEnable	Hardware movement enable input; 1= enabled; 0 = disabled If disabled machine stops in position control (SHALT)
5	ManRst	State of the Manual Reset Button
6	EstopExt	1 = Default; 0 = External emergency stop triggered
7	LEDR	1 = Drive ON LED is on
8	DrvIntfOutpErrGND	1 = Drive interface/box output driver error (shortcut, overcurrent at drive IO's)
9	EstopRMC	1 = Default; 0 = RMC emergency stop triggered
10	EDMErr	1 = External device monitoring error
11	DrvIntfWatchdogErr	1 = Default; 0 = Watchdog error
12	IntCtrlEnableR	1 = Internal drive amplifier ready
13	CMDon	1 = Enable relay for external contactors on; 0 = Enable relay off
14	DrvIntfComEr	1 = Drive interface communication error DIC
15	DrvBoxOutpErrGND	1 = Drive box output driver error (shortcut, overcurrent at standard IO's)

15.6 Drive Interface input signals 2

Bit number	Constant	Description
0	EstopUpDown	1 = Default; 0 = Emergency stop or limit switch triggered
1	ManRstAct	Manual Reset Configuration 1 = Activated; the drive on command is possible after a Manual Reset pulse, only 0 = Disable; the drive on command is always possible
2	DrvIntfOutpErr	1 = Drive interface/box output monitoring error (drive IO's)
3	DrvBoxOutpErr	1 = Drive box output monitoring error (standard IO's)
4	SupEstopErr	1 = Emergency stop supply error (shortcut, overcurrent, …)
5	EstopRMCErr	1 = RMC emergency stop error (shortcut, contact error, cross connection, …)
6	EstopExtErr	1 = External emergency stop error (shortcut, contact error, cross connection, …)
7	EstopUpDownErr	1 = External emergency stop or limit switch error (shortcut, contact error, cross connection, …)
8	EDConErr	1 = Overrun relay error
9	CMDonErr	1 = ON-Relay error 1=Fehler im externen Sicherheitskreis / Relais-/Schütz-Ansteuerungskreis
10	EstopAppR	1 = Default; 0 = Application emergency stop triggered

11	BrakeOpenR	1 = release brake; 0 = close brake
12	BypassR	1 = activate bypass valve; 0 = close bypass valve
13	ManRstReqDrvInt	1 = Manual Reset Required from Drive Interface
14	EDCrdyR	1 = EDC ready, Closed Loop Control possible
15	CMDrdyR	1 = Contoller active

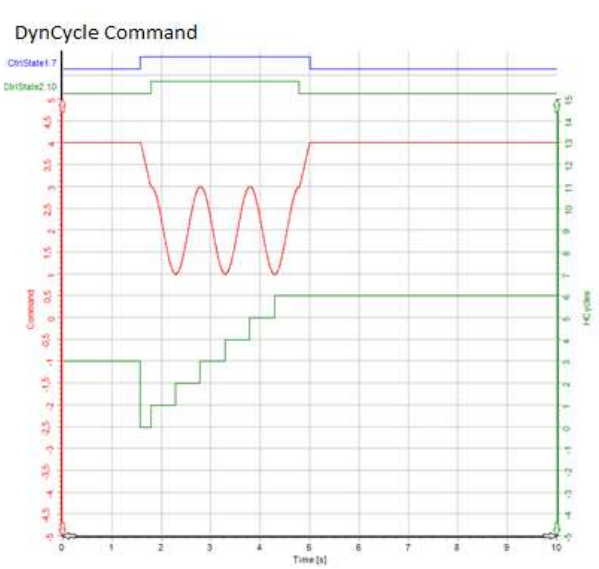
15.7 Drive Interface output signals

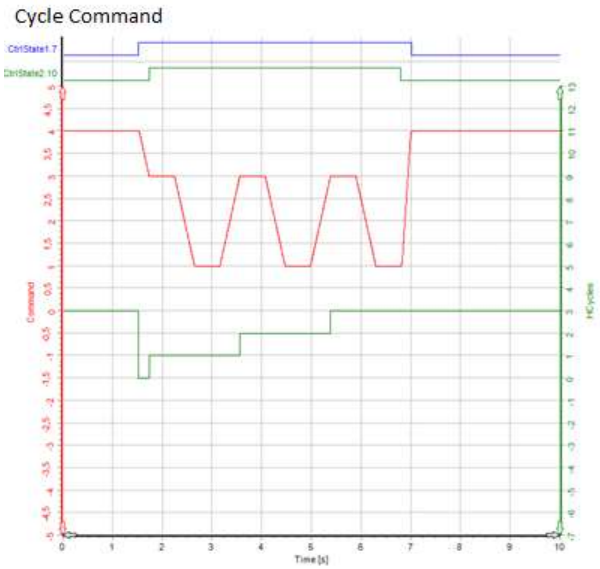
Bit number	**Constant**	**Description**
0	EstopApp	1 = Default; 0 = Application emergency stop
1	AVF	1 = Enable drive amplifier
2	BrakeOpen	1 = release brake
3		
4	ClrUpDnStop	1 = Limit switch Up/Down overrun (bypass Up/Down limit switch)
5	DrvIntfOn	1 = start drive on sequence (initiated by RMC or DoPE)
6	DrvIntfOff	1 = turn off drive
7	AVF_INT	1 = Enable internal drive amplifier
8	CtrlBlocked	1 = Controller not ready
9	DrvIntfReset	1 = Reset drive interface/box (clear error)
10	Bypass	1= activate bypass valve
11	EDCrdy	1 = EDC ready (no errors active)
12	IntCtrlEnable	1 = Internal control enable signal

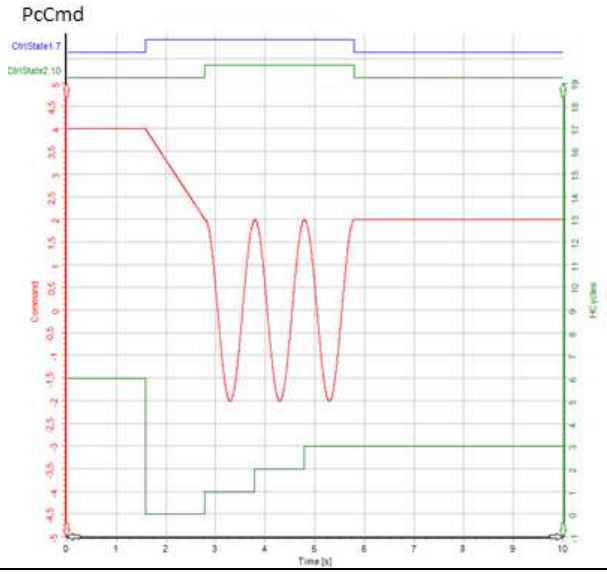
15.8 Detecting cycles

Cycle handling

- Bit7 of CtrlState1 signals ‘movement command is active’
- Bit10 of CtrlState2 signals ‘cycles active’
- Cycles count resets to zero at the beginning of the movement command (rising edge of CtrlState1.7)
- Cycles count increases at the **start of each (half)cycle**
- ‘cycles active’ resets to low at the end of the last cycle







16 DoPE System message

Number	Message constant	Description
0	SYSTEM_MSG_NOERROR	No error
General runtime errors		
10000	SYSTEM_MSG_UNKNOWN	Unknown runtime error
10001	SYSTEM_MSG_POWERAMP_ERROR	Power amplifier error
10003	SYSTEM_MSG_DRIVE_NOTREADY	Drive not ready
10004	SYSTEM_MSG_DRIVE_RELEASE	Drive release withdrawn
10005	SYSTEM_MSG_UPPER_SENLIMIT	Upper sensor limit exceeded
10006	SYSTEM_MSG_LOWER_SENLIMIT	Lower sensor limit exceeded
10007	SYSTEM_MSG_LIMITSWITCH	Upper or lower hard-limit switch
10008	SYSTEM_MSG_DEVIATION	Controller deviation error
10009	SYSTEM_MSG_NODIGIPOTI	No DigiPoti configurated
10010	SYSTEM_MSG_NORMC	No remote control plugged
10011	SYSTEM_MSG_EMERGENCY_OFF	Emergency switch activated
10012	SYSTEM_MSG_NOMEMORY	not enough memory
10013	SYSTEM_MSG_NO_LICENSE	No licence found
10014	SYSTEM_MSG_HARDWARE_VERSION	Wrong hardware version
System EEPROM errors (flash disk)		
10100	SYSTEM_MSG_SYSEEP_CRC	data CRC error
10101	SYSTEM_MSG_SYSEEP_NOBLOCK	block not found
10102	SYSTEM_MSG_SYSEEP_BLOCKLENGTH	wrong block length
10103	SYSTEM_MSG_SYSEEP_NOMEMORY	not enough EEPROM memory
10104	SYSTEM_MSG_SYSEEP_BIOSNOFUNC	BIOS: function not found
10105	SYSTEM_MSG_SYSEEP_BIOSNODEVICE	BIOS: device error
10106	SYSTEM_MSG_SYSEEP_BIOSPARA	BIOS: parameter error
10107	SYSTEM_MSG_SYSEEP_BIOSREAD	BIOS: read error
10108	SYSTEM_MSG_SYSEEP_BIOSWRITE	BIOS: write error
10109	SYSTEM_MSG_SYSEEP_BIOSREENT	BIOS: reentrance error
10110	SYSTEM_MSG_SYSEEP_USB_DISK_MISSING	USB disk not pluged
10111	SYSTEM_MSG_SYSEEP_USB_DISK_FULL	USB disk full
General initialization errors		
10200	SYSTEM_MSG_INIT_ENDDEV	Error at initialization level 1
10201	SYSTEM_MSG_INIT_ENDINI	Error at initialization level 2
10202	SYSTEM_MSG_INIT_SYSTIME	Wrong system time
10204	SYSTEM_MSG_INIT_DATA_TRANSMISSION_RATE	Wrong data transmission rate
10207	SYSTEM_MSG_INIT_MAINBOARD	EDC main board initialization error
10208	SYSTEM_MSG_INIT_MODULE_ERROR	Module error
10209	SYSTEM_MSG_INIT_CTRL	Error closed loop controller
10210	SYSTEM_MSG_INIT_SYSTIME_USB	System time with USB not possible
10211	SYSTEM_MSG_INIT_SYSTIME_SENSORS	Too many sensors for this system time
10212	SYSTEM_MSG_INIT_iSAFETY	iSAFETY message
Sensor initialization errors		
10300	SYSTEM_MSG_SEN_EEP_NOTFOUND	Sensor EEPROM not found
10301	SYSTEM_MSG_SEN_EEP_BCC	Sensor EEPROM data BCC error
10302	SYSTEM_MSG_SEN_EEP_CLASS	Unknown sensor EEPROM class
10303	SYSTEM_MSG_SEN_NOTFOUND	Sensor not found
10304	SYSTEM_MSG_SEN_INITBYTE	Initialization word error
10305	SYSTEM_MSG_SEN_INIT	Sensor initialization error
10306	SYSTEM_MSG_SEN_PARA	Wrong sensor parameter
10307	SYSTEM_MSG_SEN_CORR	Wrong sensor correction value
10308	SYSTEM_MSG_SEN_MCINTEGR	Wrong integration time for measured channel values
10309	SYSTEM_MSG_SEN_CTRLINTEGR	Wrong integration time for closed loop control

10310	SYSTEM_MSG_SEN_LIMIT	Wrong sensor limits
10311	SYSTEM_MSG_SEN_NOMINALACC	Wrong nominal acceleration
10312	SYSTEM_MSG_SEN_NOMINALSPEED	Wrong nominal speed
10313	SYSTEM_MSG_SEN_POS_CTRL	Wrong parameter for position closed loop control
10314	SYSTEM_MSG_SEN_SPEED_CTRL	Wrong parameter for speed closed loop control
10315	SYSTEM_MSG_SEN_BIOS	Wrong BIOS Version
10316	SYSTEM_MSG_SEN_OFFSET	Wrong sensor offset
10317	SYSTEM_MSG_SEN_SCALE	Wrong sensor scale
10318	SYSTEM_MSG_SEN_DITHER_FREQ	Wrong dither frequency
10319	SYSTEM_MSG_SEN_DITHER_AMPL	Wrong dither amplitude
10320	SYSTEM_MSG_SEN_DITHER_INIT	dither initialization error
Output channel initialization errors		
10400	SYSTEM_MSG_OC_EEP_NOTFOUND	Output channel EEPROM not found
10401	SYSTEM_MSG_OC_EEP_BCC	Output channel EEPROM data BCC error
10402	SYSTEM_MSG_OC_EEP_CLASS	Unknown Output channel EEPROM class
10403	SYSTEM_MSG_OC_INIT	Output channel initialization error
10404	SYSTEM_MSG_OC_VOLTAGE	Wrong voltage for DDAxx
10405	SYSTEM_MSG_OC_CURRENT	Wrong current for DDAxx
10406	SYSTEM_MSG_OC_POWER	Wrong power for DDAxx
10407	SYSTEM_MSG_OC_PARA	Wrong output channel parameter
10408	SYSTEM_MSG_OC_MAX_CURR_TIME	Wrong max current time for I²T
10412	SYSTEM_MSG_OC_CURRENT_CTRL	Wrong parameter for current closed loop control
10413	SYSTEM_MSG_OC_MC2OUTPUT	Mc2Output initialization error
10414	SYSTEM_MSG_OC_MC2OUTPUT	Mc2Output mode not 143mplemented
Bit input/output initialization errors		
10500	SYSTEM_MSG_BIN_INIT	Bit input initialization error
10600	SYSTEM_MSG_BOUT_INIT	Bit output initialization error
10601	SYSTEM_MSG_BOUT_ERROR_HIGH	Bit output error high (24V)
10602	SYSTEM_MSG_BOUT_ERROR_LOW	Bit output error low (0V)
IO-Signals initialization errors		
10710	SYSTEM_MSG_IO_GRIP_MODE	IOGrip: Mode not implemented
10711	SYSTEM_MSG_IO_GRIP_BIN	IOGrip: Bit input error
10713	SYSTEM_MSG_IO_GRIP_OC	IOGrip: Output channel error
10714	SYSTEM_MSG_IO_GRIP_LIMIT	IOGrip: Limit error
10730	SYSTEM_MSG_IO_EXT_MODE	IOExtensometer: Mode not implemented
10731	SYSTEM_MSG_IO_EXT_BIN	IOExtensometer: Bit input error
10740	SYSTEM_MSG_IO_FIXED_XHEAD_MODE	IOFixedXHead: Mode not implemented
10741	SYSTEM_MSG_IO_FIXED_XHEAD_BIN	IOFixedXHead: Bit input error
10750	SYSTEM_MSG_IO_HIGH_PRESSURE_MODE	IOHighPressure: Mode not implemented
10751	SYSTEM_MSG_IO_HIGH_PRESSURE_BIN	IOHighPressure: Bit input error
10753	SYSTEM_MSG_IO_HIGH_PRESSURE_OC	IOHighPressure: Output channel error
10780	SYSTEM_MSG_IO_MISC_MODE	IOMisc: Mode not implemented
10781	SYSTEM_MSG_IO_MISC_BIN	IOMisc: Bit input error
10790	SYSTEM_MSG_IO_MISC_TEMPERATURE1	IOMisc: temperature1 (warning)
10791	SYSTEM_MSG_IO_MISC_TEMPERATURE2	IOMisc: temperature2 (emergency off)
10792	SYSTEM_MSG_IO_MISC_OIL_LEVEL	IOMisc: oil level(emergency off)
10793	SYSTEM_MSG_IO_MISC_OIL_FILTER	IOMisc: oil filter (warning)
10794	SYSTEM_MSG_IO_MISC_POWER_FAIL	IOMisc: power fail (emergency off)
10820	SYSTEM_MSG_IO_LIMIT_POS_MODE	IOLimitPos: Mode not implemented
10821	SYSTEM_MSG_IO_LIMIT_POS_BIT	IOLimitPos: Bit device error
10830	SYSTEM_MSG_IO_LIMIT_SPEED_MODE	IOLimitSpeed: Mode not implemented
10831	SYSTEM_MSG_IO_LIMIT_SPEED_BIT	IOLimitSpeed: Bit device error
10840	SYSTEM_MSG_IO_LIMIT_LOAD_MODE	IOLimitLoad: Mode not implemented
10841	SYSTEM_MSG_IO_LIMIT_LOAD_BIT	IOLimitLoad: Bit device error
10850	SYSTEM_MSG_IO_SHALT_MODE	IOSHalt: Mode not implemented
10851	SYSTEM_MSG_IO_SHALT_BIN	IOSHalt: Bit input error
10860	SYSTEM_MSG_IO_GUARD_MODE	IOGuard: Mode not implemented

10861	SYSTEM_MSG_IO_GUARD_BIT	IOGuard: Bit device error
10862	SYSTEM_MSG_IO_GUARD_INIT	IOGuard: initialization error
10900	SYSTEM_MSG_LANGUAGE_READ	Language file: read error
10901	SYSTEM_MSG_LANGUAGE_VERSION	Language file: wrong version
10902	SYSTEM_MSG_LANGUAGE_SYNTAX	Language file: syntax errors
11000	SYSTEM_MSG_SYNC_ERROR_PARAM	Sync error: wrong parameter
11001	SYSTEM_MSG_SYNC_ERROR_VERSION	Sync error: wrong hardware version
11002	SYSTEM_MSG_SYNC_ERROR_NO_MASTER	Sync error: no master present

17 DoPE Error constants

Error number	Error constant	Description
0	DoPERR_NOERROR	No error
1	DoPERR_NOFLOAT	No float in WIN16 callback
2	DoPERR_SYNC	Synchronization to callback failed
3	DoPERR_TIMEOUT	Timeout at await answer
4	DoPERR_NOFNC	Function not implemented
5	DoPERR_VERSION	No compatible Version EDC-DoPE
6	DoPERR_INIT	Initialization Error Subsystem
7	DoPERR_PARAMETER	Invalid parameter
9	DoPERR_RTE_UNHANDLED	Unhandled runtime error
Command errors		
1001	DoPERR_CMD_PARCORR	Error in parameter (corrected)
1003	DoPERR_CMD_PAR	Error in parameter. not correctable
1004	DoPERR_CMD_XMOVE	X-Head is not halted
1005	DoPERR_CMD_INITSEQ	Sequence in init not observed
1006	DoPERR_CMD_NOTINIT	Controller part not initialized
1007	DoPERR_CMD_DIR	Movement direction not possible
1008	DoPERR_CMD_TMP	Required resource not available
1009	DoPERR_CMD_RUNTIME	Run time error active
1010	DoPERR_CMD_INTERN	Internal error in subsystem
1011	DoPERR_CMD_MEM	Insufficient memory
1012	DoPERR_CMD_CST	Wrong controller Structure
1013	DoPERR_CMD_NIM	Command not implemented
2001	DoPERR_CMD_MSGNO	Unknown message number
2003	DoPERR_CMD_VERSION	Wrong PE interface version
2004	DoPERR_CMD_OPEN	Set-up not opened
2005	DoPERR_CMD_MEMORY	Not enough memory
Machine normalization errors		
0x4001	DoPERR_PARMS	Parameter Error
0x4002	DoPERR_ZERODIV	Division by ZERO
0x4003	DoPERR_OVFLOW	Overflow
0x4004	DoPERR_NIN	Not Initialized
Low level communication errors		
0x8001	DoPERR_NODATA	No receiver data available
0x8002	DoPERR_NOBUFFER	No transmitter buffer available
0x8003	DoPERR_OFFLINE	Connection is offline
0x8004	DoPERR_HANDLE	Invalid DoPE handle
0x8005	DoPERR_MSGSIZE	Message to long
0x8007	DoPERR_NOMEM	Not enough heap memory
0x8008	DoPERR_BADPORT	Invalid device ID
0x800A	DoPERR_OPEN	Device already in use
0x800B	DoPERR_HARDWARE	Device not present
0x800C	DoPERR_NOTOPEN	Connection not open
0x800D	DoPERR_PORTLIMIT	Unused
0x800E	DoPERR_NOTIMER	No timer for timeout check
0x800F	DoPERR_NODRIVER	No driver available
0x8010	DoPERR_NOTHREAD	Win32: Thread creation failed
0x8011	DoPERR_BADOS	Not supported operating system
0x8012	DoPERR_THUNK	Win32: Thread creation failed
-1	DoPERR_INTERNAL	Internal driver error

18 For Experts

18.1 Realtime version of DoPE Event Handler

For each event, there are two versions of event handlers:

- The “normal” event handler (e.g. DoPESetOnDataHdlr),
- And a real time version (e.g. DoPESetOnData**Rt**Hdlr).

The difference of these two versions is the time priority; the event handler has to be called.

For the normal priority, DoPE uses the Windows message queue, while the real time handler is called by DoPE at a high priority level.

A realtime handler must not call any functions that read data from EDC like DoPERdSetup.

Application programmer using the real time event handler must be aware of the restrictions for functions at a high priority level.

In most cases, the normal version of event handler is sufficient.

19 .NET Wrapper

The DoPE10Net dynamic link library contains a .NET wrapper for the DoPE10 API.

The usage of the wrapper is demonstrated in the C# and Visual Basic :NET demo. Use these demos together with the Starter-Manual-C#-DoPE.NET.pdf and Starter-Manual-VB-DoPE.NET.pdf to write your own application.

The DoPE10Net wrapper is implemented in the Doli.DoPE namespace.

19.1 Establish Communication

The DoPENet wrapper provides the Edc class, which is a representation of a connection to the DOLI EDCi.

To open a connection you can use the following code:

```
private Edc MyEdc;
MyEdc = new Edc(DoPE.OpenBy.DeviceId, 0);
```

or

```
MyEdc = new Edc(DoPE.OpenBy.FunctionIdDeviceId, 0);
```

This is equivalent to the classic API function DoPEOpenDeviceID and DoPEFunctionID.

The EdcList class represents a list of Edc objects and can be used as a replacement for

```
private EdcList MyEdcList;
edcList = new EdcList(32);
```

This is equivalent to the classic API function DoPEOpenAll with InfoTableMaxEntries set to 32.

Disposing an Edc object closes the corresponding connection.

Disposing an EdcList object closes all connections, represented by the Edc objects in the list.

This cleanup will be performed automatically by shutting down the application.

19.2 Event Handler

Event handlers can be hooked to an Edc object.

For the OnDataBlock handler you can use the following code:

```
MyEdc.Eh.OnDataBlockHdlr += new DoPE.OnDataBlockHdlr(OnDataBlock);
```

This is equivalent to the classic API function DoPESetOnDataBlockHdlr function.

To remove the event handler you can use

```
MyEdc.Eh.OnDataBlockHdlr -= OnDataBlock;
```

This cleanup will be performed automatically by shutting down the communication.

19.3 How to use this documentation

The DoPE10 API contains about 200 functions. In DoPENet they are divided into several groups for a better overview. E.g. the classic API function DoPEPos is part of the Move group. To find the corresponding .NET API function, replace DoPE by the Edc object, find the right group and add the rest of the function name. In our case we end up with

```
MyEdc.Move.Pos
```

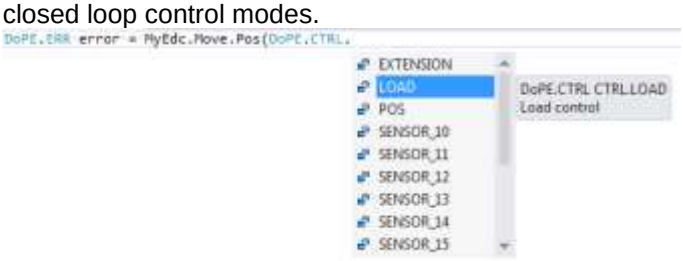
This is the list of all available groups.

Block	Block Command handling
Check	check functions
Cmc	calculated measuring channels and peak value handling
Corr	sensor correction handling
Ctrl	Closed Loop Controller handling
Data	data acquisition
Debug	debug message handling
Display	display handling
Eh	event handler interface
Info	info handling
Ilc	ILC handling
Io	Input/Output handling
IoSignal	IO signals handling
Key	keyboard handling
Move	setup and movement command handling
Output	Output Channel handling
Rmc	RMC handling
Sensor	sensor EEPROM handling
SerSen	serial sensor handling
Setup	setup handling
Shield	Shield handling
Syn	synchronized data acquisition
Tare	tare, basic tare and reference signal handling

19.4 IntelliSense

The Microsoft online help system IntelliSense can be used with DoPENet. Simply type your Edc's object name followed by a period and IntelliSense lists all groups and other information. Selecting the Move group gives you a list of the available function, together with an overview of the argument list and a brief description of the function. Here's an example of the Pos function:

Same can be done with the Enums and Structs of the Doli.DoPE namespace. Start with DoPE followed by a period and the Enum or Struct name, to get a list of their members. Here's an example for the constants for closed loop control modes.



Versions

Version	Changes	Date	Name
10.00	First EDCi API Version	12.09.2016	HEG
10.01	New Keyboard Lock functions.	19.07.2017	HEG
10.02	DoPEOpen… error code documentation	19.07.2017	HEG
10.03	Obsolete Calculated Measuring Channel functions removed	21.08.2017	HEG
10.06	Obsolete Shield functions removed	01.02.2018	HEG
10.10	New name DoPE10.dll Linux support DoPEREINITIALIZEDAT_LEN corrected (must be 0x8000)	03.07.2018	HEG
10.11	New DoPEShieldLock function	11.01.2019	HEG
10.12	DoPEwDspMValue limitations for RMCi1	05.02.2019	HEG
10.13	System Message 10112 removed New System Message 10210…10212, 10601, 10602 New RMCi8 DoPEDestWnd description updated Brief .NET wrapper documentation	05.06.2019	HEG
10.14	EDCi10 support / limitations .NET format of DoPE functions	09.12.2019	HEG
10.15	New System Message 11000…11002 System Message 10203 removed	03.06.2020	HEG
10.16	New DoPIOGuard Commands New Manual Reset status bits New System Message 10013…14 New System Message 10860…62	25.11.2020	HEG
10.17	New “.bmv2” file format for DoPEPcCmdFromFile	21.06.2021	GRS
10.18	New DoPIOGuard muting commands	15.10.2021	GRS