

## APPLICATION USER MANUAL

TestBed V24-1



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## 2. About this document

This is the users manual for the Test Bed module.

### 2.1. Legend

The following symbols and formats will be used throughout the document.



#### **Important**

It gives you important information about the subject.  
Please read carefully!



#### **Hint**

It gives you a hint or provides additional information about a subject.



#### **Example**

Gives you an example of a specific subject.

## 3. Introduction

Testbed module is an interface between DewesoftX and testbed control systems. It can be used with the combustion engine analyser (CEA) module where engine cycles are used for storing and calculation conditions. Alternatively, it can also be used in time-mode where any channel or value can be sent from DewesoftX and measurement time is used for triggering and calculation interval.

The communication to the testbed server is implemented as a dedicated Test Bed module. You can choose between:

- IndiMaster 670 compatible,
- AK Protocol,
- Puma Open AK,
- D2T AK, and
- Tornado AK.

For all of these protocols the RS232 or TCP/IP connection is possible.

**TestBed** uses the Request/Response working principle and can be pre-set and used independently of DewesoftX. In this way it is controlled only by the master system that is requesting a certain data from the TestBed module, which gives the response then back to the master system. There are 2 modes that can be used:

- *Remote on (online)* - Dewesoft's TestBed is controlled by some other Testbed, where you do not need to touch Dewesoft anymore.
- *Remote off (offline)* - Dewesoft's TestBed is not controlled by any outside source. In this mode can be set and configured.

## 4. Installation and settings

In case you can't find the TestBed Plug-In inside Dewesoft X: *Settings -> Extensions -> TestBed Plugin*, please contact your local support to get the TestBed driver. Then copy the file called **"Testbed.dll"** in the **Addons** folder of your current DewesoftX installation. Addons is a sub-directory of your used DEWESoftX.exe. Depending on the installation this may be in:

- D:\DEWESoft\Bin\X2\Addons, or
- C:\Program Files\DEWESoft\Bin\X2\Addons

After this simple installation, please perform "Register plugins" and restart Dewesoft X.

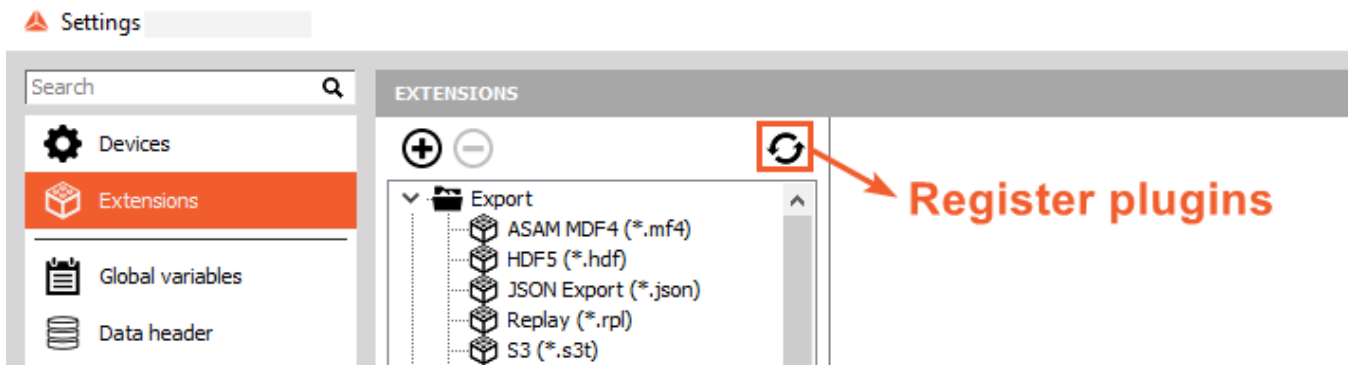


Image 1: Register plugins refresh button



### Important

If you don't have administrator rights on your PC, the registration of the Testbed.dll may not work. If so, please execute "DCOMReg.exe" from your DewesoftX.exe directory as administrator (right click and choose "Run as Administrator" from the Menu).

Now you are ready to choose between several Testbed types and two Protocol types: the TCP/IP or RS232 connection.

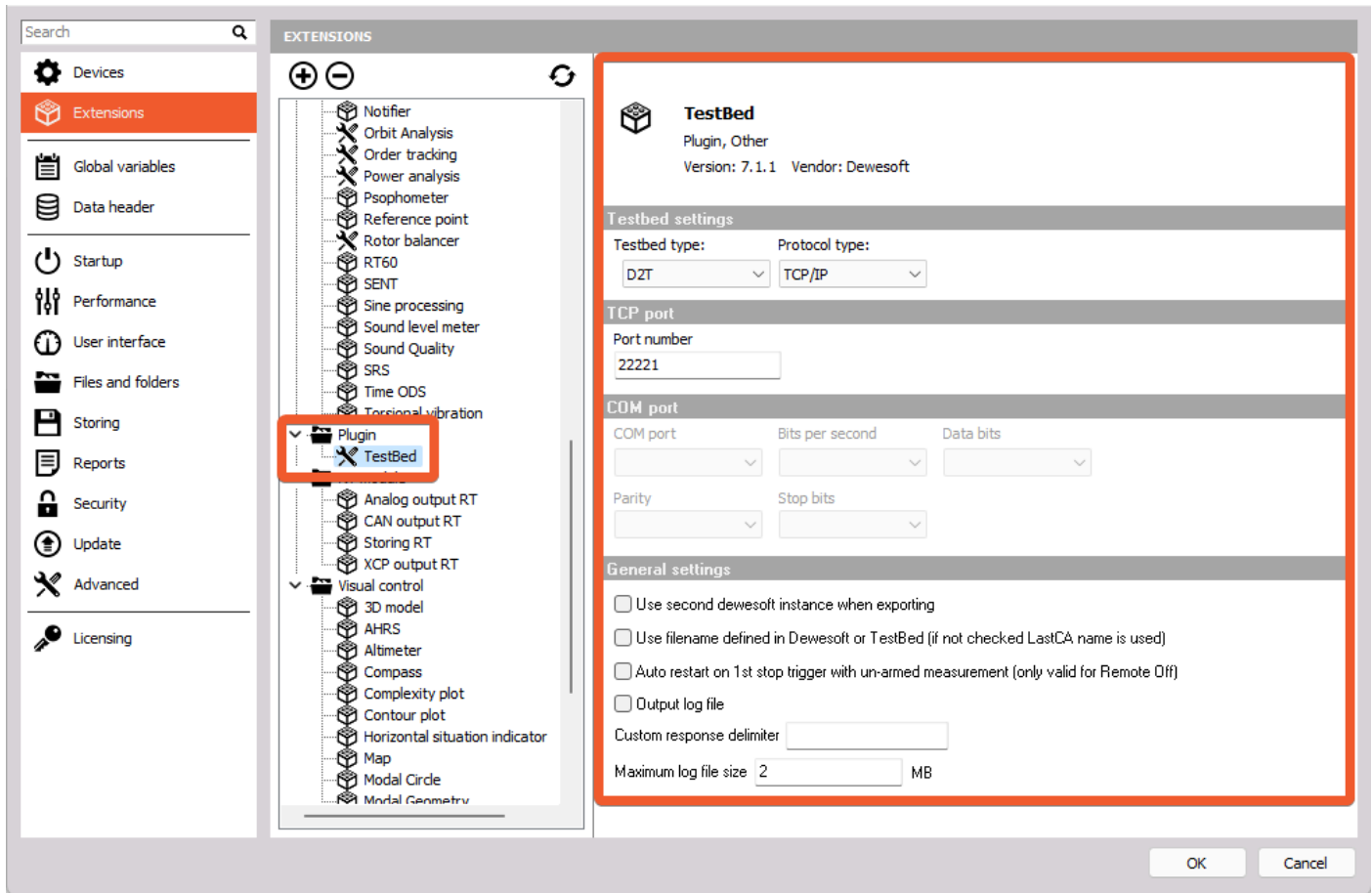


Image 2: TestBed settings

In addition to the communication port settings (eg. Baud Rate in case of RS232 or the Port No. in case of TCP/IP) additional settings are possible:

- Added user defined custom delimiter as a string for testbed responses and values.
- use DEWESoft filename (ignore fixed filename "Last"). If activated, the stored file name is defined by the setup or by the host PC. Otherwise, the stored file is always named with "LastCEA.dxd".
- allow to open a 2nd instance of Dewesoft for export. The TestBed PlugIn allows automatic export of the data files into different data formats. When enabling the second instance, Dewesoft CEA can be used in parallel during the data export.
- write a log file to the system-logs folder.

For debug purpose, the complete communication is logged into a file (TestBed\_Log\_date time.txt)





### Important

When you change the protocol type or the COM port, please restart DewesoftX!

The type "AK Protocol" (R232 or TCP/IP) has limited functionality (e.g. no statistic values) and should not be used in new applications!

## 4.1. Extension TestBed settings

In the Settings -> Extension area, the following settings can be applied:

TestBed settings	Options
TestBed type	AK Protocol
	Puma Open
	D2T
	Tornado
Protocol Type	TCP/IP
	RS232

TCP port number	Options
TCP port	Type in the port number

COM port	Options
COM port	Select the COM port of the RS232 connection
Bits per second	Select bitrate from the dropdown menu
Data bits	Select number of data bits from the dropdown menu



Parity	None
	Odd
	Even
	Mark
	Space
Stop bits	Select the number of stop bits from dropdown menu

General settings	Options
Use second Dewesoft instance when exporting	When enabling the second instance, Dewesoft CEA can be used in parallel during the data export.
Use filename defined in Dewesoft or TestBed (if not checked LastCA name is used)	If activated, the stored file name is defined by the setup or by the host PC. Otherwise, the stored file is always named with "LastCEA.dxd".
Auto restart on 1st trigger with un-armed measurement (only valid for Remote off)	Will auto restart the measurement on the 1st trigger.
Output log file	It will write a log file to the system-logs folder, with the user defined size (Maximum log file size).

## 5. Defining the channel list and automatic export

In the next step we need to define the channel transfer list. Any DEWESoft® channel can be selected. The final step is to define the statistical calculation method for each channel. The statistic values are calculated over a definable number of cycles.



### Important

Transfer condition was added **after** Testbed v7.0.19!

More details can be found in [chapter 5.3](#).

With channels can be added and with already selected channels can be removed from the transfer channel list. Use and for moving the channels in a specific order.

The screenshot shows the TestBed plugin integration interface. At the top, there's a toolbar with icons for Arm, Save, Save as, Storing, Analog in, CAN, Math, CEA, TestBed, More..., and Remove. Below this, there are four main sections: Reference CA, Statistics, Transfer channels, and Transfer Condition.

**Reference CA:** Reference CA dropdown set to CEA 1.

**Statistics:** Statistics interval set to 20 Cycles. There's a checkbox for Transfer time and a Create trigger button.

**Transfer channels:** Maximum channel count to transfer set to 9.

**Transfer Condition:** A table with 5 columns: ID, Name, Channel, Condition, and Threshold.

ID	Name	Channel	Condition	Threshold
1	Transfer Condition +	Misfire_detection	More or equal	0,00
2	Transfer Condition -	Misfire_detection	Less or equal	0,00

Below these sections, there's a Channels tab with a search bar and buttons for Import and Export. The main table lists channels with columns: ID, Used, Channel, Statistic type, Value, Value on error, and Send Condition.

ID	Used	Channel	Statistic type	Value	Value on error	Send Condition
1	Used	PCyl1	Actual	AVG 4,45 (bar)	0,00	Transfer Condition +
2	Used	PCyl1_oavg	Actual	AVG 4,47 (bar)	1,00	Transfer Condition +
3	Used	Speed1	Actual	AVG 63,54 (rpm)	2,00	Transfer Condition +
4	Used	Rise1	Actual	AVG 0,01 (bar/deg)	3,00	Transfer Condition +
5	Used	APMax1	Actual	AVG 12,50 (deg)	0,00	Transfer Condition -
6	Used	PMax1	Actual	AVG 135,38 (bar)	1,00	Transfer Condition -
7	Used	dQ1	Actual	AVG 0,00 (kJ/m3/deg)	2,00	Transfer Condition -
8	Used	IMEPh1	Actual	AVG 16,43 (bar)	3,00	Transfer Condition -
9	Used	Misfire_detection	Actual	AVG -0,93 (-)	0,00	None

Image 3: TestBed plugin integration

Additionally, the data can also be automatically exported at the end of the measurement. This automatic export can even be performed without the TestBed (in REMOTE OFF mode).

In remote operation, additional options are available:

- Export can be performed in parallel by enabling a 2nd instance of Dewesoft.
  - Please refer to [chapter 4](#) Installation and settings for settings.
- The Dewesoft data file (raw data) can be automatically deleted after successful export.
- Please refer as well to chapter 8.3 Export angle domain data for further information about the export settings.

## 5.1. Channel setup TestBed Settings

In order to use TestBed, the Combustion Engine Analyzer (CEA) usually needs to be used as well. CEA is the reference module for the TestBed module. CEA is not needed only in cases where the Statistics interval is selected in 'Seconds' units.

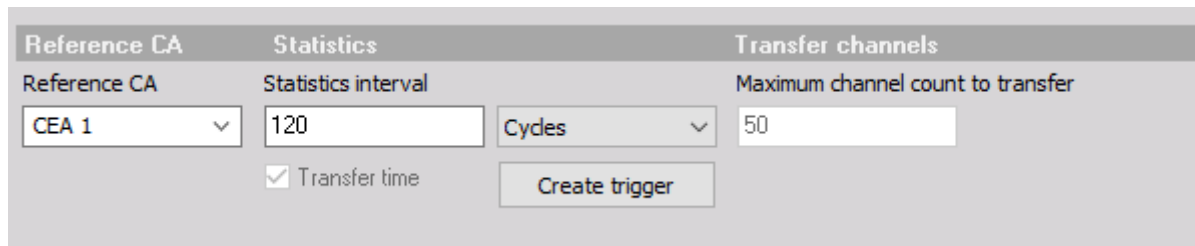


Image 4: TestBed Channel setup settings

- **Reference CA** - the CEA (CA) of interest should be selected. This can be selected only when the Statistics interval has the Cycles unit.
- **Statistics interval** - defines intervals used for statistical calculations measured in Cycles or in Seconds, which will then be applied for the calculation of the statistics defined for each channel in the channel transfer list.
  - **Cycles** - are used only for Combustion calculation, where number of cycles is important. As well the corresponding CEA module then needs to be selected.
  - **Seconds** - are used for any other TestBed cases, where number of cycles are not important and they do not use CEA (for example E-vehicles).
- **Transfer time** - the message response will include the time value as well. Time value will be then positioned first in the response message.
- **Create trigger** - in offline mode only, it is possible to create a trigger by clicking on the Create trigger button. Click on the button will create the trigger based on Statistics interval value and its unit - Cycles or Seconds inside the Storing tab. So in case of the upper image, it will create a storing trigger for 120 cycles. See image 5.
- **Maximum channel count to transfer** - limits the number of channels that can be transferred over the TestBed module.  
After TestBed v7.0.19 the maximum number of transfer channels is set to **1000**, earlier versions to **500**

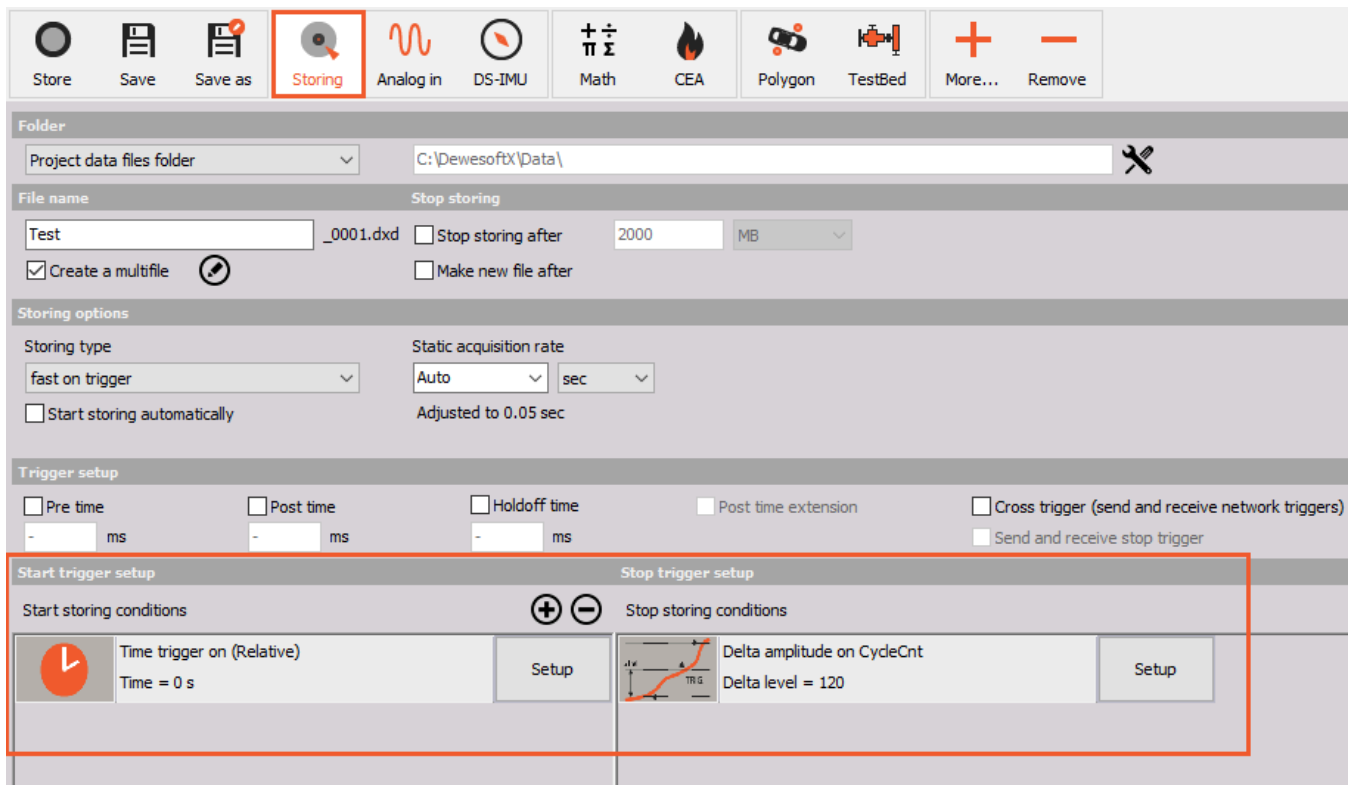


Image 5: Created trigger from the TestBed module

## 5.2. Channel Transfer list Tab

In the Channel transfer list any Dewesoft channel can be selected, which includes statistical calculations as well. Statistical values are calculated over a defined number of cycles. You can also select

Channels

Settings

Channels

Search

Q

+

−

^

v

Import

Export

ID	Used	Channel	Statistic type	Value	Value on error	Send Condition
1	Used	PCyl1	Actual	AVG5,92(bar)	0,00	None
2	Used	PCyl1_oavg	Actual	AVG4,47(bar)	0,00	None
3	Used	Speed1	Actual	AVG63,54(rpm)	0,00	None
4	Used	Rise1	Actual	AVG0,07(bar/deg)	0,00	None
5	Used	APMax1	Actual	AVG14,00(deg)	0,00	None
6	Used	PMax1	Actual	AVG133,10(bar)	0,00	None
7	Used	dQ1	Actual	AVG0,00(kJ/m3/deg)	0,00	None
8	Used	IMEPn1	Actual	AVG16,11(bar)	0,00	None
9	Used	Misfire_detection	Actual	AVG0,96(-)	0,00	None

Image 6: Channel transfer List

There are a few options of choosing the Statistic type for each channel separately:

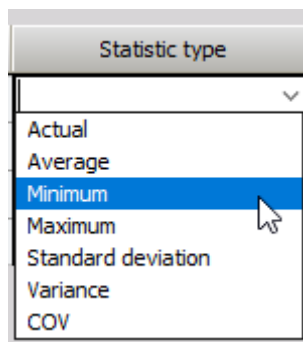


Image 7: Statistic type options

### 5.3. Transfer condition

**Transfer conditions** are used for defining conditions where a channel should or shouldn't be transferred. The defined conditions are cases where the Channel value **should not be transferred**. For example: In the case of the first Transfer condition, it will not send data if the value of Formula 1 is **more or equal** than the **threshold value** (in this case 0,00).

Transfer Conditions				
<div> <div>+</div> <div>-</div> </div>				
ID	Name	Channel	Condition	Threshold
1	Transfer Condition +	Formula 1	More or equal	0.00
2	Transfer Condition -	Formula 1	Less or equal	0.00

Image 8: Transfer condition panel

Transfer conditions take in a few inputs:

- **Name** - Optional condition name that is used for transfer condition in channel list.
- **Threshold** - Value which defines the limit.
- **Channel** - The channel that is referenced when determining whether to send or not.
- **Condition** - In which case to send data. We have the following options:

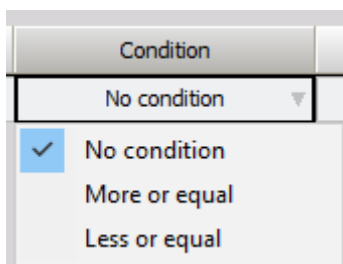


Image 9: Conditions

The defined Transfer conditions can then be **assigned to channels** in the transfer list. Which means that the value of the channel, which has a Transfer condition assigned will **not be transferred** if the condition is met. In which case the **Value on error** will be transferred.

	Value on error	Send Condition
(bar)	0,00	Transfer Condition +
(bar)	1,00	Transfer Condition +
(rpm)	2,00	Transfer Condition +
(bar/deg)	3,00	Transfer Condition +
(deg)	0,00	Transfer Condition -
(bar)	1,00	Transfer Condition -
(kJ/m3/deg)	2,00	Transfer Condition -
(bar)	3,00	Transfer Condition -
(-)	0,00	None

Image 10: Response diagram

## 5.4. Settings Tab

There are a number of settings that can be set under the Settings tab in the TestBed module.

Channels

Settings

General

☐ Run measurement in fullscreen
 ☐ Add channel statistic type to ANAM response

Storing options

☐ Stop storing when no new cycle appear within 10 seconds
 ☒ Stop storing after statistics interval is reached

Datafile settings

☐ Start multiframe index with 0001 or next highest if file with same name already exists (only valid if remote is on)
 ☐ Create new subfolder with datafile name for storing datafiles (only valid if remote is on)

Export

Export type

Data type

Export sampling type

<not assigned>

Degrees (by cycle)

☐ Cycle
 ☐ Once per cycle
 ☐ Averaged cycle

Export condition

TestBed command only

☐ Delete dxd-file after export (only valid if remote is on)
 Export is done on second instance of Dewesoft.

Image 11: Settings Tab settings

- **General**

- Allows to enable option Run measurement in fullscreen
- Option to automatically add a suffix for all channels that are not sent as actual values (Min, Max, Average,...)

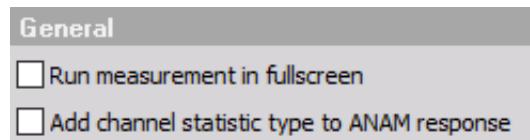


Image 12: General settings

- **Storing options**

- Allows to enable stop of storing, in case there is no new cycle within 10 seconds
- Option to continue storing after the defined statistics cycle period in the testbed plugin

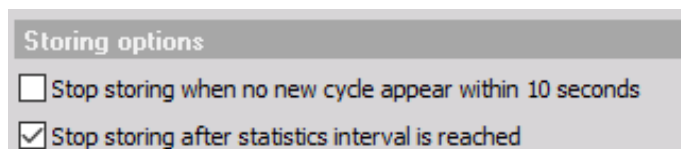


Image 13: Storing options settings

- **Datafile settings** - allows enabling of multi file indexing, and, or creating a subfolder with a datafile name. Both options are available only in remote mode.  
NOTE, that Multifile storing option has to be enabled under Storing settings then as well!

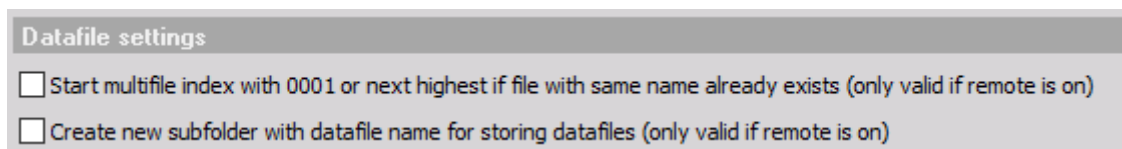


Image 14: Datafile settings

- **Export** - allows to choose:

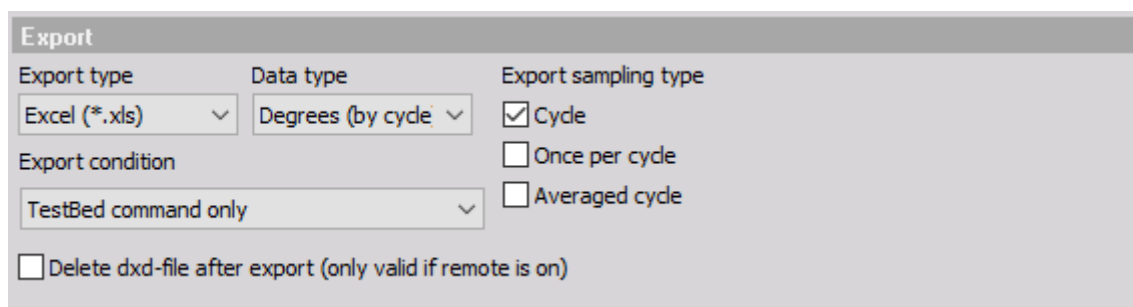


Image 15: Export settings



- **Export type and Data type**

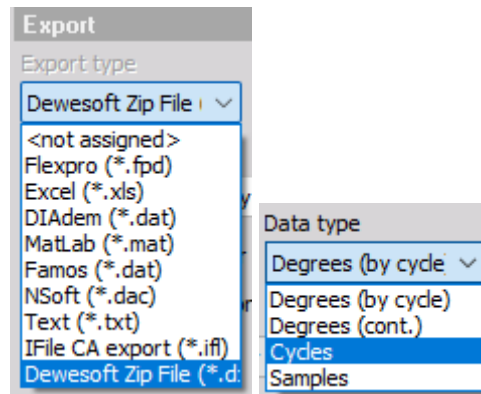


Image 16, 17: Export type and Data Type drop-down options

- For different Export types and Data types combinations, different options for Export sampling type selection can be chosen:
  - For example, with Flexpro export, all possible sampling types can be selected at once, but for Excel, only one sampling type can be selected. Also with IFile CA export it is allowed to select the following combinations:
    - Only each single option
    - Once per cycle and Cycle OR Once per cycle and Averaged cycle
    - Cycle OR Average cycle - selecting both is not possible

- **Export sampling rate:**

- Cycle,
- Once per cycle, or
- Averaged cycle.

- **Export condition:**

- TestBed command only
- TestBedCmd or StopStore (remote off only)

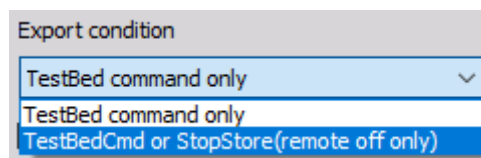


Image 18: Export condition selection

## 6. Basic AK protocol syntax

### 6.1. Request telegram

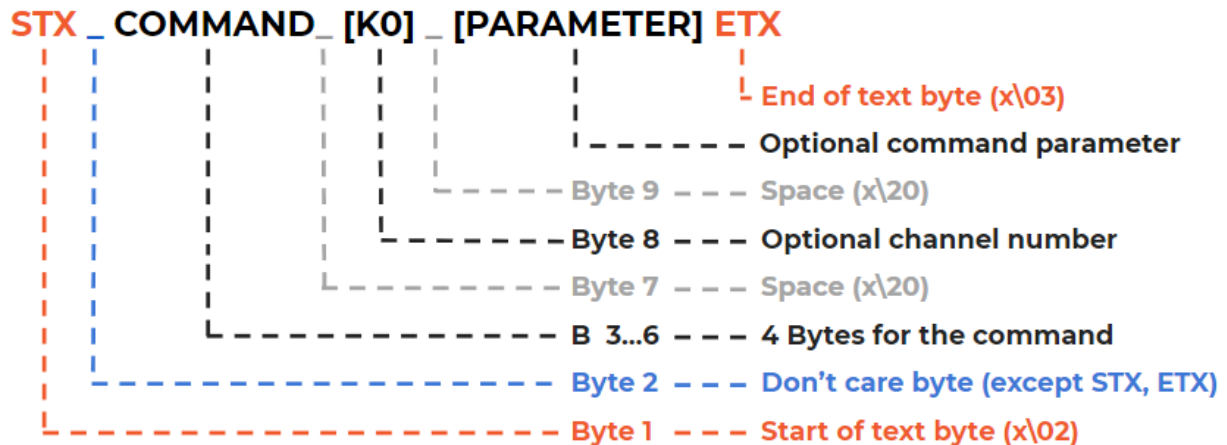


Image 19: Request telegram

Each request telegram begins with STX (Start of Text) in the first byte and indicates a new request. Previous requests will be ignored if not finished with ETX (End of Text) for last byte. If the complete telegram has less than the minimum of 10 bytes a "???" function code is sent with a response. If the request function code is unknown the response is also a "???" function code instead of an echo.

The "don't care" byte can be any ASCII character, usually an underscore '\_' or blank ' ' is used. The 4 function bytes represent the AK command followed by a blank, a fixed character "K" and the channel number. The channel number has variable length, but usually one byte. Dewesoft CEA does not need but accepts the channel number "K0". If data in variable length are included a blank is used to separate it from channel number.

In general, AK function codes are divided into three classes:

- Control commands (Sxxx)
- Read commands (Axxx)
- Configuration/Write commands (Exxx)

## 6.2. Response telegram

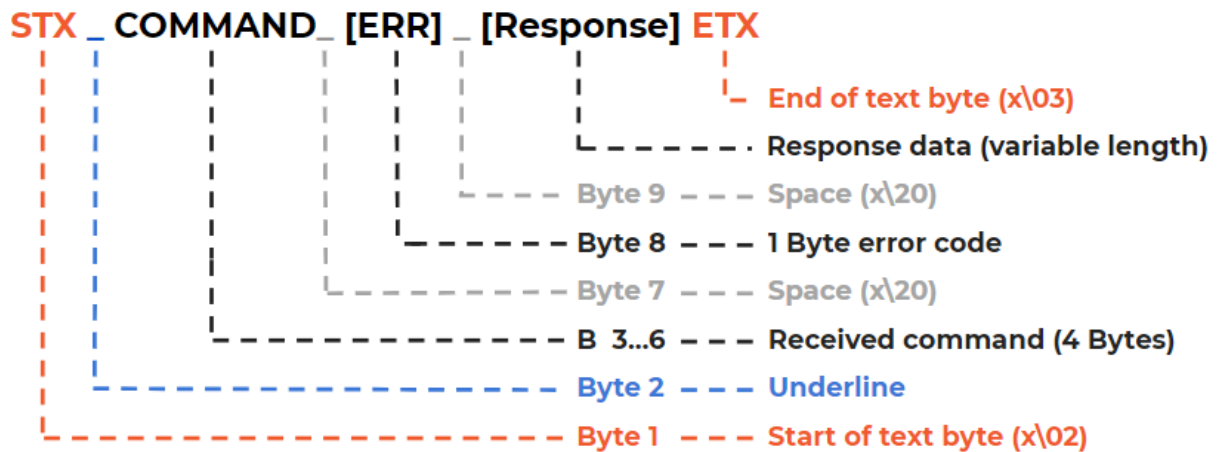


Image 20: Response diagram

Each response telegram begins with STX (Start of Text) in the first byte and with ETX (End of Text) for the last byte. The “don't care” byte can be any ASCII character, usually an underscore ( \_ ) or blank is used. The 4 function bytes are the echo of the request function bytes followed by a blank and the error status byte.

The 4 function bytes can be also "???? " in case of a basic error in request (see error handling). The error status number in the response telegram tells if internal errors in the responding device occurred. It is zero when no error appears, and it is 1 - 9 when one or more errors occurred. The error status number will be incremented by one with each change in error status of the device . The value 10 will wrap to 1. The error status number will be reset to zero when all errors on the device are removed.

If data in variable length are included a blank is used to separate it from error status or error code.

## 6.3. Error handling and response

If any of the following error conditions occurs, the error counter will be increased by 1:

- an unknown request,
- the analyser is busy,
- an error occurred in the command parameters.

When the error counter exceeds “9”, it will start at “1” again. Each command returns this error counter **[ErrCnt]**, even if the actual command was successful.

- Response at invalid command or communication error

**X\02\_???? [ErrCnt] x\03**

→ [ErrCnt] : The error counter will not be increased

- Response at valid command but not possible to execute, an additional error code is returned.

**SXT\_COMMAND [ErrCnt] [ErrCod] EXT**

- Command is the request command
- [ErrCnt] is the standard internal error counter (will be not increased)
- [ErrCod] is the additional error code with following definition:
  - ◆ DF: Data Error: Received values are outside the permissible range
  - ◆ OF: Offline: Device is in local mode
  - ◆ BS: Device is currently busy with another function execution
- *Example:* When the host tries to load a setup, but the Dewesoft CEA is not in the correct state (SMAN)

x\02\_SLSD 0 OFx\03

- Response at any other internal error

**STX\_COMMAND [ErrCnt]ETX**

- Command is the request command
- [ErrCnt] will be increased at any error by 1. If the error counter exceeds "9", it will start at "1" again. Each command returns this error counter [ErrCnt], even if the actual command was successful.
- *Example:* When the host tries to load a setup, which does not exist on Dewesoft CEA

x\02\_SLSD 1x\03

- Below you can find the *Error Code definition*:

- 0 = es\_None
- 1 = es\_NotRemote
- 2 = es\_UnknownCommand
- 3 = es\_NoDataForOutput
- 4 = es\_CanNotLoadSetup
- 5 = es\_StoreModeNotSet
- 6 = es\_StoreNameExists
- 7 = es\_StoreNameNotDefined
- 8 = es\_StoreNameSetNotAllowed
- 9 = es\_SetParamNotAllowed



**Hint**

Refer to command ASTF – read the last error code on page 63 to reset the error counter and get the last Error Code.

## 6.4. Command examples with response

Request:     x\02\_AKENx\03  
Response:    x\02\_AKEN 0 DEWESOFT\_CEAx\03

Request:     x\02\_ESPC K0 120x\03  
Response:    x\02\_ESPC 0 x\03

## 7. CONTROL COMMANDS (Sxxx)

Command - short description	AK	D2T	Tornado	Puma Open	Puma Open Comment
SRES – stop and load last setup					
SREM – activate remote control	✓	✓	✓	✓	
SMAN – deactivate remote control	✓	✓	✓	✓	
SMON – start measurement without storing	✗	✓	✓	✗	
SMES – start measurement with storing	✓	✓	✓	✓	
SMEC – start measurement with auto restart	✗	✓	✓	✗	
STBY – change to setup mode	✓	✓	✓	✓	
SLSD x – load setup file	✓	✓	✓	✓	
SSTP – stop measurement	✓	✓	✓	✓	
SSTO x – rename datafile	✗	✓	✓	✓	
SECD x y – export CEA data	✗	✓	✓	✓	Same function as 'EXPO'
STRG x – trigger command	✓	✓	✓	✓	
SPRT x – set pretime trigger	✓	✓	✓	✗	

### 7.1. SRES - stop and load last setup

Request: `x\02_SRES K0x\03`

Response: `x\02_SRES 0x\03`

Stops, load last setup and goes to setups screen of Dewesoft CEA:

- This command is working in MANUAL and REMOTE Mode.

- The internal error-counter is reset.

## 7.2. SREM - activate remote control

Request:     x\02\_SREM K0x\03  
Response:    x\02\_SREM 0x\03

Activates the remote connection to the Dewesoft CEA to the testbed.

## 7.3. SMAN - deactivate remote control

Request:     x\02\_SMANx\03  
Response:    x\02\_SMAN 0x\03

Deactivates the remote connection to the Dewesoft CEA and for manual operation.

- Tornado only sets the RemoteFlag to Off.
- All others also stop the measurements.

## 7.4. SMON - start measurement without storing

Request:     x\02\_SMON K0x\03  
Response:    x\02\_SMON 0x\03

Dewesoft CEA changes to measure mode without storing

## 7.5. SMES - start measurement with storing

Request:     x\02\_SMES K0x\03  
Response:    x\02\_SMES 0x\03

- Dewesoft CEA changes to measure mode, and stores the data
- If it was already in measure mode only storing is started
- At start storing all the statistic values and also the cycle count is reset and starts from 0
- After NoOfCycles are acquired, Dewesoft CEA stops automatically
- AK and Puma Open does store only, if the Store Flag was set with ESPS command
  - Therefore the response with ASTZ is either SMES STOREON or SMES STOREOFF



### Hint

The stop of measurement can be indicated either with:

- the commando ASTZ - read actual remote/run state (chapter 9.2.5.5),



- the actual cycle number has reached the NrOfCycles,
- the statistic values changes from default value (IE10 or 0) to a discrete value.

## 7.6. SMEC - start measurement with auto restart

Request: `x\02_SMEC K0x\03`  
Response: `x\02_SMEC 0x\03`

This commando is similar to SMES – start measurement with storing. But Dewesoft CEA will automatically restart the measurement without storing after NoOfCycles are reached. This gives the possibility to continue the monitoring of the testbed although the data file is already stored.

- With “\_AMES K0” the actual values can be transferred
- With “\_AMES K0 MEC” the results stored in the data file are transferred



### Hint

The operation state with SMEC is either storing (like SMES) or monitoring (SMON). Therefore the result with ASTZ is SMES or SMON (never SMEC).

## 7.7. STBY - change to setup mode

Request: `x\02_STBY K0x\03`  
Response: `x\02_STBY 0x\03`

Dewesoft CEA will change to setup mode.

## 7.8. SLSD x - load setup file

Request: `x\02_SLSD CEASetupFileNamex\03`  
Response: `x\02_SLSD 0x\03`

- The file name is followed after the SLSD command without any extension, and without path.
- Error code 0 indicates a successful load.
- After loading the setup, Dewesoft CEA is in STBY = Setupmode.

## 7.9. SSTP - stop measurement

Request: `x\02_SSTP K0x\03`  
Response: `x\02_SSTP 0x\03`

- Dewesoft CEA will stop the measurement either with or without storing.
- Dewesoft CEA will stay in the measurement mode.

- To restart either SMON(without storing) or SMES(with storing) can be used.

## 7.10. SSTO x - rename Datafile

Request: `x\02_SSTO [DataFileName]x\03`

Response: `x\02_SSTO 0x\03`

- This commando is only valid if “use Dewesoft filename (ignore fixed filename “Last”) is not used
  - Please refer to [chapter 4](#) Installation and settings for defining this setting
- In this mode, Dewesoft CEA is automatically storing each file with the default name (LastCEA.dxd)
- This command only renames this data file and have to be performed after each measurement
- **[DataFileName]** must be without extension and without path (default Data directory is used)
- It is not possible to get the data back, if this command is not performed
- Error code 0 indicates the successful renaming of the data file

## 7.11. SECD x y - export CEA data

Request: `x\02_SECD SourceFileName TargetFileName x\03`

Response: `x\02_SECD 0x\03`

- SourceFileName and TargetFileName must be without extension and path (default Data directory is used).
- If no parameter is defined, then automatically the last stored data file is exported with the same file name.
- If the SourceFileName is not defined, then automatically the last stored data file is exported.
- The TargetFileName gets automatically the extension from the selected export type.
- If the TargetFileName already exists, it will be overwritten
- Deleting the raw file after export is an optional definition and should be used with care.
  - Raw file is only deleted after a successful export.
  - Deleting the raw file is only supported in remote operation.
- We have two main options how the export is performed:
  - As default, Dewesoft exports after the measurement the data (sequential).
  - In parallel by starting a second instance of Dewesoft.
  - Please refer to [4 Installation and settings](#) on page 9 for the setup.
- In case of sequential exporting:
  - At the end of the Export, the Response is sent.

- Error code 0 indicates the successful export of the data file (else error code 7 or 12).
- During exporting, Dewesoft CEA doesn't accept any commando from the Host.
- Host must wait with new commands until getting the response.
- In case of parallel export (on 2nd instance):
  - The response for the export is immediately sent and the export starts in parallel on the 2nd instance.
  - If the second instance of Dewesoft CEA is still occupied from previous export it will queue it and perform all queued requests.
  - Export at the second instance is supported in remote operation.

## 7.12. STRG x y - Trigger command

Request: `x\02_STRG x\03`  
 Response: `x\02_STRG 0x\03`

- Command to trigger a measurement or other function in Dewesoft. When STRG command is received, the "TestBedTrig" channel will briefly go from 0 to 1 and back to 0.

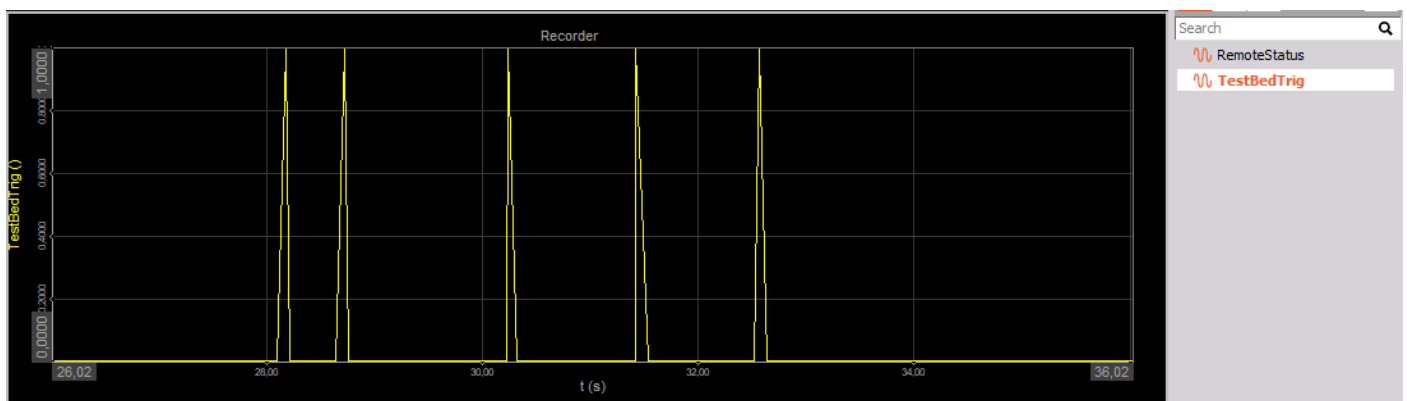


Image 21: Triggers in DewesoftX called from TestBed

## 7.13. SPRT x - set trigger pre time

Request: `x\02_SPRT K0 [pre time]x\03`  
 Response: `x\02_SPRT 0 [pre time]x\03`

- Set the value of trigger pre time. This command only works if pre time is enabled and Dewesoft is in channel setup.

## 8. READ COMMANDS (Axxx)

Command - short description	AK	D2T	Tornado	Puma Open	Puma Open Comment
AIDN - read identification	✓	✓	✓	✓	
AKEN - read identification	✓	✓	✓	✓	
AVER - read actual version number	✓	✓	✓	✓	
ASTA – read statistic type of transfer list	✓	✓	✓	✓	
ASTZ - read actual remote/run state	✓	✓	✓	✓	
ASTF – read last error code	✓	✓	✓	✓	
ANAM – read channel names of transfer list	✓	✓	✓	✓	
AUNT – read units of transfer list	✓	✓	✓	✓	
AMES – read channel data of transfer list	✓	✓	✓	✓	Several optional parameters
ALST – read immediate statistic result of transfer list	✗	✓	✓	✓	Same function as “AMES ACT”
AACT – read actual value of transfer list	✓	✓	✓	✓	Same function as “AMES MIN”
AMIN – read actual value of transfer list	✗	✓	✓	✓	Same function as “AMES MIN”
AMAX – read actual value of transfer list	✗	✓	✓	✓	Same function as “AMES MAX”
AAVE – read actual value of transfer list	✗	✓	✓	✓	Same function as “AMES AVE”
ASTD – read actual value of transfer list	✗	✓	✓	✓	Same function as “AMES STD”
AVAR – read actual value of transfer list	✗	✓	✓	✓	Same function as “AMES VAR”
ACOV – read actual value of transfer list	✗	✓	✓	✓	Same function as “AMES COV”

ARES – read actual value of transfer list	✗	✓	✓	✓	Same as “AMES RES or AMEC”
AMEC – read actual value of transfer list	✗	✓	✓	✓	Same as “AMES MEC or ARES”
ACYC – read actual cycle number	✗	✓	✓	✓	
ACFG – read actual protocol definition	✓	✓	✓	✓	
APRT – read actual pretime trigger	✗	✓	✓	✓	
ASTN – read loaded setup name	✓	✓	✓	✓	

## 8.1. AIDN - read identification

Request: `x\02_AIDN K0x\03`  
 Response: `x\02_AIDN 0 DEWESOFT_CEA\03`

Is used to check if the right device is connected to the interface.

## 8.2. AKEN - read identification

Request: `x\02_AKEN K0x\03`  
 Response: `x\02_AKEN 0 DEWESOFT_CEA\03`

Is used to check if the right device is connected to the interface.

## 8.3. AVER - read actual version number

Request: `x\02_AVER K0x\03`  
 Response: `x\02_AVER 0 X3 SP11 (build 299)\03`

Is used to check the actual software version of Dewesoft CEA.

## 8.4. ASTA - read statistic type of transfer list

Request: `x\02_ASTA K0x\03`  
 Response: `x\02_ASTA 0 AVE Actual Actual AVEx\03`

Read the actual statistic types of the transfer list, the types are separated with a blank character.

- Keywords for the statistics types:
  - Actual - actual value
  - AVE - average value
  - MAX - maximum value
  - MIN - minimum value
  - STD - standard deviation
  - Var - variance
  - COV - coefficient of variation

## 8.5. ASTZ - read actual remote/run state

Request: `x\02_ASTZ K0x\03`

Response: `x\02_ASTZ 0 [RemoteState] [RunState]\03`

Returns the actual states of the Dewesoft CEA unit.

- **[RemoteState]:**
  - SREM - Dewesoft CEA is in remote mode
  - SMAN - Dewesoft CEA is in manual mode
- **[RunState]:**
  - STOP - CEA is in measure mode and stopped, no update on display
    - Note: Tornado answers with "SSTP" instead of "STOP"
  - STBY - Standby = CEA is in Setup Screen
  - SMES - Measure Mode with storing
    - When PumaOpen or standard AK is used, additionally STOREON or STOREOFF is sent.
  - SMON - Measure Mode without storing
  - SANA - CEA is in analyse mode
  - SHWS - CEA is in Hardware setup screen
  - SUKN - CEA is in an unknown state

Example for response: `x\02_ASTZ 0 SREM SMESx\03`

## 8.6. ASTF - read last error code

Request: `x\02_ASTF K0x\03`

Response: `x\02_ASTF 0 [ErrCnt] [ErrCod]x\03`

- **[ErrCnt]** - The internal error-counter (increased by '1' at each error)
- **[ErrCod]** - Error code list:
  - 0 = es\_None
  - 1 = es\_NotRemote
  - 2 = es\_UnknownCommand
  - 3 = es\_NoDataForOutput
  - 4 = es\_CanNotLoadSetup
  - 5 = es\_StoreModeNotSet
  - 6 = es\_StoreNameExists
  - 7 = es\_StoreNameNotDefined
  - 8 = es\_StoreNameSetNotAllowed
  - 9 = es\_SetParamNotAllowed
- This command resets the [ErrCnt] and the [ErrCod]. A second request will always return "0 0".
- Additionally also command SRES – stop and load last setup (58) resets the [ErrCnt] and the [ErrCod].

Example for response: `x\02_ASTF 2 4x\03`

## 8.7. ANAM - read channel names of transfer list

Request: `x\02_ANAM K0x\03`

Response: `x\02_ANAM 0 APMax1 Pmax1 EngAve/150 APMax2x\03`

Read the actual channel names of the transfer list, the channel names are separated with a blank character.

ID	Used	Channel	Statistic type	Value
1	Used	APMax1	Average	18.00 (deg)
2	Used	PMax1	Actual	25.48 (bar)
3	Used	PMa <b>x</b> _eavg	Actual	24.81 (bar)
4	Used	APMax2	Average	18.00 (deg)

Image 22: Actual channel names of the transfer list

## 8.8. AUNT - read units of transfer list

Request: `x\02_AUNT K0x\03`

Response: `x\02_AUNT 0 deg bar deg degx\03`



Read the actual channel units of the transfer list, the units are separated with a blank character.

## 8.9. AMES - read channel data of transfer list

Request: `x\02_AMES K0 [Type]x\03`

Response: `x\02_AMES 0 [ActCycleCnt] value1 value2 value3 value4 ... value'n' x\03`

- Without optional parameter **[Type]**, the statistic result type is defined in the transfer list.
  - **[Type]** forces the result to the defined statistic value:
    - LST: statistic like defined in transfer list, but results are calculated immediately after start.
    - ACT: always actual value of transfer list
    - MIN: always minimum result of transfer list
    - MAX: always maximum result of transfer list
    - AVE: always average result of transfer list
    - STD: always standard deviation result of transfer list
    - VAR: always variance result of transfer list
    - COV: always coefficient of variance result of transfer list
    - RES or MEC: always value after last store of transfer list
  - Standard AK protocol does not support **[Type]**. Always actual values are transferred.
- Except standard AK protocol, each response starts with the actual cycle count **[ActCycleCnt]**
  - If the channel CycleCount is missing in DEWESoft, then "-2" and **[DummyVal]** is transferred (except **[Type]** = ACT).
  - If CycleCount value has no data yet, "-1" is transferred for CycleCount and LastKnown values for transfer list (except **[Type]** = ACT). This might happen, if the engine is not running or AMES is called directly after SMES or SMON.
- The values are separated with the space character `x\20`
- The length of the answer is depending the protocol type:
  - Standard AK protocol has variable length (depending on channel number defined in transfer list)
  - Length for D2T and Tornado can be defined in settings: Please refer to [4 Installation and settings](#)
  - PumaOpen has fixed transfer length of 50
  - Not defined channels or statistic results
  - Actual values are filled with **[DummyVal]**, until the first cycle is measured

- “\_AMES” without **[Type]**: statistical values are filled with **[DummyVal]**, until wanted NoOfCycle is reached
- “\_AMES” with **[Type]**: statistical values are transferred based on **[ActCycleCnt]**
  - If CycleCnt is 0, then **[DummyVal]** is transferred
  - If CycleCnt is 1, then actual value is transferred
  - If CycleCnt > 1, then statistic results over available CycleCnt is transferred (max.= wanted NoOfCycle)
- **[DummyVal]** is depending on the protocol type
  - Standard AK protocol has no dummy values: Transfer list length is depending on defined channel number.
  - The dummy value Tornado is “#”
  - The dummy value for PumaOpen or D2T is “1E10”
  - If a channel in the transfer list is not defined, then **[DummyVal]** is transferred!
- If storing is activated with SMES – start measurement with storing, Dewesoft CEA stops acquisition after wanted NoOfCycles are reached. If you request data after the Dewesoft CEA has stopped, then the last values are returned.
- If storing is activated with SMEC – start measurement with auto restart, “\_AMES MEC” will response the values related to the stored data file.



#### Hint

The stop of measurement can be indicated either with:

- the commando ASTZ - read actual remote/run state (CEA manual)
- the actual cycle number has reached the NrOfCycles
- the statistic values changes from default value (1E10 or #) to a discrete value

## 8.10. ALST - read immediate statistic result of transfer list

Request: `x\02_ALST K0x\03`

Response: `x\02_ALST 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 LST x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.11. AACT - read actual value of transfer list

Request: `x\02_AACT K0x\03`

Response: `x\02_AACT 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 ACT x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.



**Hint**

Even if no CycleCount value is defined, this command will always response the actual values for the defined transfer list. This allows to transmit any DEWESoft channel over the AK protocol (eg. D2T) even without the Combustion analyser option.

## 8.12. AMIN - read actual value of transfer list

Request: `x\02_AMIN K0x\03`

Response: `x\02_AMIN 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 MIN x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.13. AMAX - read actual value of transfer list

Request: `x\02_AMAX Kx\03`

Response: `x\02_AMAX 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 MAX x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.14. AAVE - read actual value of transfer list

Request: `x\02_AAVE K0x\03`

Response: `x\02_AAVE 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 AVE x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.15. ASTD - read actual value of transfer list

Request: `x\02_ASTD K0x\03`

Response: `x\02_ASTD 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 STD x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.16. AVAR - read actual value of transfer list

Request: `x\02_AVAR K0x\03`

Response: `x\02_AVAR 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 VAR x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.17. ACOV - read actual value of transfer list

Request: `x\02_ACOV K0x\03`

Response: `x\02_ACOV 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 ACT K0x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.18. ARES - read actual value of transfer list

Request: `x\02_ARES K0x\03`

Response: `x\02_ARES 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 RESx\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.19. AMEC - read actual value of transfer list

Request: `x\02_AMEC K0x\03`

Response: `x\02_AMEC 0 ActCycleCnt value1 value2 value3 value4 value'n' x\03`

This command is equal to `x\02_AMES K0 MEC x\03`. For further information please refer to [8.9 AMES](#) – read channel data of transfer list.

## 8.20. ACYC - read actual cycle number

Request: `x\02_ACYC K0x\03`

Response: `x\02_ACYC 0 35x\03`

Read the actual cycle number, in this case 35 cycles have been acquired.

## 8.21. ACFG - read actual protocol definition

Request: `x\02_ACFG K0x\03`

Response: `x\02_ACYC 0 [Config]x\03`

Example response for D2T setting with TCP/IP protocol:

x\02\_ACFG 0 Protocol(D2T-AK-TCP/IP) Interface(PC-Name,22221) TransferMaxCh(10)x\03

## 8.22. APRT - read trigger pretime

Request: x\02\_APRT K0x\03  
Response: x\02\_ACYC 0 **100**x\03

Read the trigger pre time, in this case it is 100ms.

## 8.23. ASTN - read setup name and full path

Request: x\02\_ASTN K0x\03  
Response: x\02\_ASTN 0 **C:\Program Files\DewesoftX\Dewesoft\Setups\Setup.dxs**x\03

Read the setup name, with the full path to it.

# 9. CONFIGURATION AND WRITE COMMAND (Exxx)

Command - short description	AK	D2T	Tornado	Puma Open	Puma Open Comment
ESPD x – set the file name	✓	✓	✓	✓	
ESPS x – set the store mode	✓	✗	✗	✓	
ESPC x – set number of cycles	✗	✓	✓	✓	
ECMD – write comment to CA Export	✗	✓	✓	✓	
EXPO x y – Export CA data	✗	✓	✓	✓	
EDBG – only response to this command	✓	✓	✓	✓	
EPCV - Set polytropic number	✗	✓	✓	✓	
ECDV – Cylinder deactivation	✗	✓	✓	✓	

## 9.1. ESPD x - set the file name

Request: `x\02_ESPD [DataFileName]x\03`

Response: `x\02_ESPD 0x\03`

- This command is only valid if “use Dewesoft filename (ignore fixed filename “Last”) is checked!
  - Please refer to [chapter 4](#) Installation and settings for defining this setting
- This command overwrites the file name defined in the DEWESoft setup
- **[DataFileName]** must be without extension and without path (default Data directory is used)
- It is recommended to enable “Create a multifile” in Dewesoft CEA setup
  - Then automatically storing cycle gets its own data file name
  - Otherwise existing data files might be overwritten!!

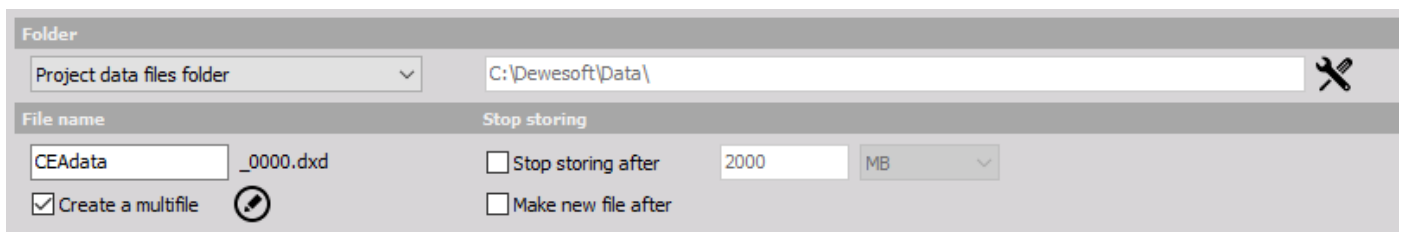


Image 23: Storing CEA data

## 9.2. ESPS x - set the store mode

Request: `x\02_ESPS [Store] x\03`

Response: `x\02_ESPS 0x\03`

- This commando defines the storing condition for Standard AK and PumaOpen protocol.
- If **[Store]** is set to “1”, then data will be stored with the command SMES – start measurement with storing
- If **[Store]** is set to “0”, then data will not be stored.

## 9.3. ESPC x - set number of cycles

Request: `x\02_ESPC 80x\03`

Response: `x\02_ESPC 0x\03`

- The cycle number is used for statistic calculation and stops storing after this number of cycles (eg. 80)

- This command overwrites the Statistic over xxx cycles value from the CEA setup file

## 9.4. ECMD - write comment to CEA Export

Request:     x\02\_ECMD **MyComment** x\03  
Response:    x\02\_ECMD 0x\03

This command adds a comment to the exported file.

- MyComment must be defined before the start of the measurement.
- With each stop of acquisition "MyComment" is cleared.
- Maximum length of MyComment: 80 characters

## 9.5. EXPO x y - Export CEA data

Request:     x\02\_ESPS **SourceFileName TargetFileName** x\03  
Response     x\02\_ESPS 0x\03

This command is equal to SECD x y – Export CEA data → please to 7.11 section for further information.

## 9.6. EDBG - only response to this command

Request:     x\02\_EDBGx\03  
Response:    x\02\_EDBG 0x\03

This command is used for checking the communication without interrupting the measurement.

## 9.7. EPCV x - set polytropic number

Request:     x\02\_EPCV **Value1 Value2**x\03  
Response:    x\02\_EPCV 0x\03

- Input for changing the polytropic number in the combustion engine analyser from the testbed

Two channels are created by the testbed plugin that output Value1 and Value2:

- Polytropic coefficient 1 → Value1
- Polytropic coefficient 2 → Value2



## 9.8. ECDV x - cylinder deactivation

Request:     x\02\_ESPC 1x\03  
Response:    x\02\_ESPC 0x\03

- Input for deactivating cylinders in the combustion engine analyser from the testbed

A channel is created by the testbed plugin that outputs the value that is sent directly.

- Cylinder deactivation → number that is sent as input for cylinder deactivation in the combustion engine analysis module

## 10. EXAMPLE COMMAND FLOW

Below the basic command flow is shown. To keep the overview simple, the error handling is skipped. The basic steps for the communication are:

- Initialisation and configuration
- Reading the configuration (from host)
- Reading data with following options:
  - without storing,
  - with storing, test bed defines the file name,
  - with storing, Dewesoft CEA defines the file name.
- De initialisation

### Step 1: Initialisation and configuration of the Dewesoft CEA

- [AIDN - read identification](#) to check if Dewesoft CEA is connected
- [SREM – activate remote control](#) to allow the control of the unit
- [SLSD x – load setup file](#) This must be predefined
- [ESPC x – set number of cycles](#) (optional)

### Step 2: Reading the configuration of the Dewesoft CEA

- [ANAM – read channel names of transfer list](#)
- [AUNT – read units of transfer list](#)
- Fehler: Referenz nicht gefunden

### Step 3a: Reading data without storing them on Dewesoft CEA

- [SMON – start measurement without storing](#)
- [AMES – read channel data of transfer list](#) repeat AMES command for getting actual data
- [SSTP – stop measurement](#) you can restart the measurement (SMON) or change to the setup at the end (STBY)

### Step 3b: Reading data with storing (test bed host defines the file name)

- [SMES – start measurement with storing](#) Measurement is stopped after reaching defined cycle number
- [AMES – read channel data of transfer list](#) reading data is possible during measurement and after stop
- [SSTO x – rename Datafile](#) test overwrites the default file name “LastCEA”
- [STBY – change to setup mode](#) or restart with SMES the next measurement

**Step 3c: Reading data with storing (Dewesoft CEA defines the file name)**

- [ESPD x – set the file name](#) optional overwrite the file name from the CEA setup file
- [SMES – start measurement with storing](#) Measurement is stopped after reaching defined cycle number
- [AMES – read channel data of transfer list](#) reading data is possible during measurement and after stop
- [STBY – change to setup mode](#) or restart with SMES the next measurement

**Step 4: De-initialisation**

- [SMAN – deactivate remote control](#)

## 11. Warranty information

### Notice

The information contained in this document is subject to change without notice.

### Note:

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The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit <https://dewesoft.com/support/distributors>.

### 11.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

### 11.2. Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

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Europe Tel.: +386 356 25 300

Web: <http://www.dewesoft.com>

Email: [Support@dewesoft.com](mailto:Support@dewesoft.com)

The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

### 11.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on <https://dewesoft.com/support/rma-service>.

### 11.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

## 11.5. Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

## 11.6. Copyright

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## 11.7. Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

## 12. Safety instructions

Your safety is our primary concern! Please be safe!

### 12.1. Safety symbols in the manual



#### **Warning**

Calls attention to a procedure, practice, or condition that could cause the body injury or death



#### **Caution**

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

### 12.2. General Safety Instructions



#### **Warning**

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

#### 12.2.1. Environmental Considerations

Information about the environmental impact of the product.

#### 12.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

#### 12.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site [www.dewesoft.com](http://www.dewesoft.com)

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

#### **12.2.4. General safety and hazard warnings for all Dewesoft systems**

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange

noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.

- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008



IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

## 13. Documentation version history

Version	Date	Notes
V20-2	24-12-2020	Updated content and template.
V21-1	22-02-2021	Template corrections.
V21-2	07-05-2021	STRG command added
V21-3	30-07-2021	EPCV, ECDV, storing and statistic names update
V23-1	15.09.2023	Added: <ul style="list-style-type: none"><li>- Dxz export type</li><li>- Max Ch. transfer count increased</li><li>- ASTN Command</li><li>- APRT Command</li><li>- SPRT Command</li><li>- Transfer condition</li></ul>
V24-1	15.01.2024	Added custom delimiter as a string for testbed responses and values