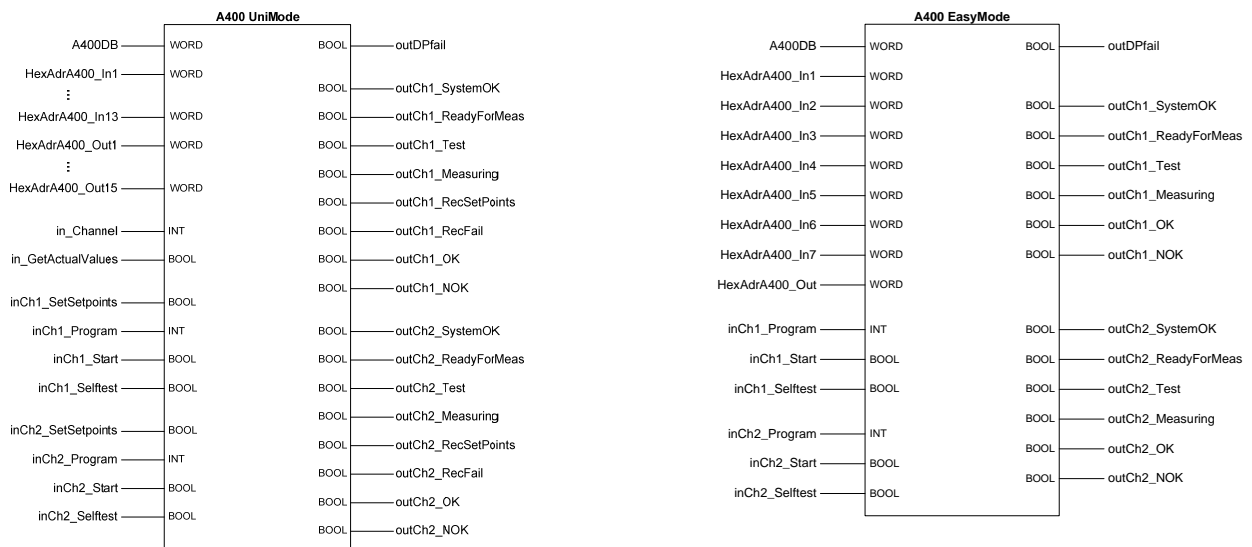


## Instruction Manual function blocks

# control of A400

with Simatic S7 *PROFIBUS*  
universal-mode and easy-mode

Version of date: 01.02.2006 / MW  
Valid from: FB-Version 1.0  
Item no.: 25130



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**BA-Nr. 1553 V0101**  
**S7-actuation of A400**



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For detailed information about function and parameter entry please refer to instruction manual A400!




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### Important note:

The authors have taken great care and used effective monitoring processes in compiling all the technical specifications and programs in this document. Nevertheless, errors may occur, therefore Staiger, Mohilo must point out that no warranty or any liability can be assumed for the consequences arising from incorrect information, accidental damage or consequential damage.

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## 1. General

Using the function and data modules as well as the basic structure variables the measuring- and evaluation electronics A400 can immediately be integrated in user-own PLC-programs. The function modules control independently the signal exchange between A400 and the user-PLC, whereby both the A400 UniMode and the Easy-Mode mode are supported by corresponding function modules.

The function modules are not write-protected and can like that be adjusted to unit-specific requirements and processes.

Since an absolute addressing is not effected within the function- and data modules, integration in all projects is possible. All the input and output signals and the transfer addresses, if required, are passed to the modules as parameters, provided that the structure of the data modules and structure variables (only for *PROFIBUS*) remain unchanged.

### Integration in a user program

The integration of the required modules takes place in the S7-development environment by copying and pasting from the example project to the target project (user program). The modules may be renamed.

### Multi instances

All the function modules are multi-instance capable allowing multiple call-ups – e.g. several presses in the system. For each instance an appropriate communication data module must be invoked.

### Instance data blocks

Equivalent to the S7 syntax an appropriate instance data module must be provided for each instance call.

### Program call

The function modules are normally called from the OB1 (organisation module) or from the functions (FCs). Conditional or absolute calls are permitted.

### Data access

The output parameters of the function modules and the contents of the data modules can be called from other program parts in the usual S7-syntax, and are like that globally available.

The function modules assume no safety functions at all. No liability can be assumed for any damages. Depending on the application unit-specific adaptations might be necessary.



All the signals indicated in the following refer to input and output signals of the function modules, if not declared otherwise.

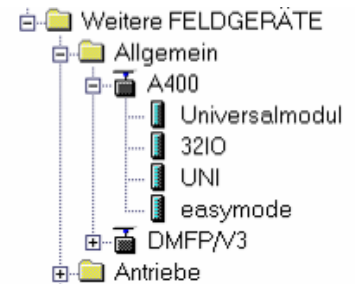




## 2. Function block

### 2.1. GSD-file

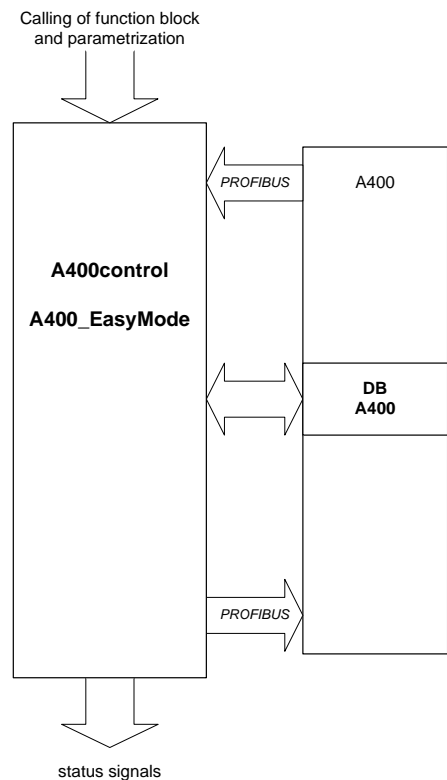
As basis for the function the actual GSD-file of the A400 must be installed in the system. After integration of the device file the communication module can be selected within the GSD file corresponding to the requested Profibus-transfer mode.



### 2.2. Program call

The function module is normally called from the OB1 or a function (FC), whereby the control parameters are being transmitted. The function block passes now all the relevant data via Profibus from the A400 to the PLC, modifies the control data corresponding to the parameters and transfers them back to the A400. The user program has now access on the output parameters of the function module and the stored data in the data module.

The Profibus addresses and the number of the data module must be transmitted as parameters.



Therefore the following program components must be copied into the user program:

|                     | A400-UniMode               |             | Easy-Mode                         |                  |
|---------------------|----------------------------|-------------|-----------------------------------|------------------|
| <b>FB</b>           | FB100                      | A400control | FB100                             | A400_EasyMode    |
| <b>DB</b>           | DB100                      | A400data    | DB103                             | A400_DB_EasyMode |
| <b>UDT</b>          | 401 bis 417                |             | 401, 403, 408, 409, 410, 431, 432 |                  |
| <b>SFC</b>          | SFC14, SFC15, SFC20, SFC21 |             | SFC14, SFC15, SFC20               |                  |
| <b>from Projekt</b> | Uni                        |             | EasyMode                          |                  |

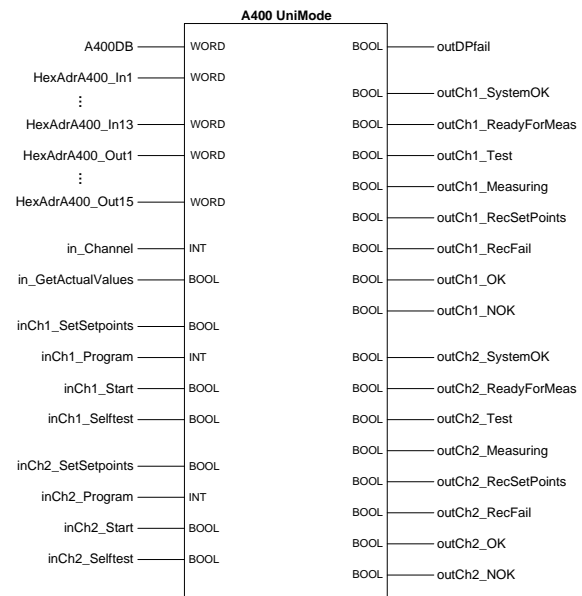


## 2.3. A400-UniMode

In the UniMode the complete functional range of the A400 is supported. Both the transfer of measured values of all windows of both channels to the PLC and the setpoint record default through the PLC to the A400 are affected autonomously or by control signal.

Values are transmitted in several data packages, which are requested / sent independently by the function module.

The mode is selected via GSD-file of the hardware configuration. The A400 does not have to be re-parameterised; the requested data transmission is recognized automatically.

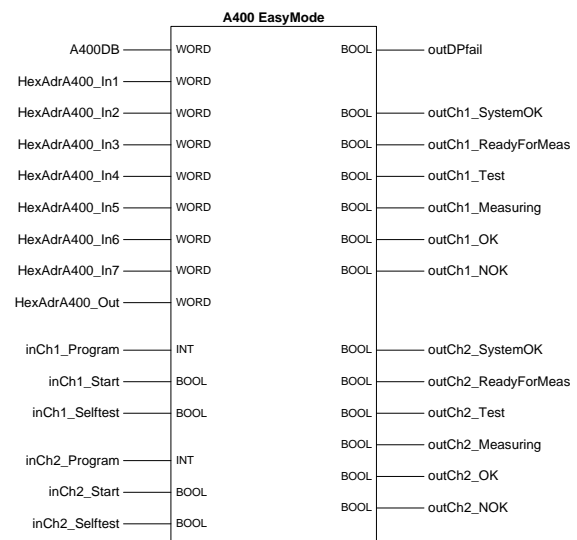


## 2.4. Easy-Mode

Here the mode with restricted functional range is supported. Only the parameters and measured values, which are applied mainly, are transmitted.

The transmission of setpoint records from the PLC to the A400 is not possible.

The mode is selected via GSD-file of the hardware-configuration. The A400 does not have to be parameterised again; the requested data transmission is recognized automatically.





### 3. FB-parameters

#### 3.1. Address parameter

| Parameter        | Format | Mode |    | Description  |
|------------------|--------|------|----|--|
|                  |        | Uni  | EM |  |
| A400DB           | INT    | X    | X  | Data module number in which the measured values are stored. The data module number is indicated as decimal integer value |
| HexAdrA400_In1   | WORD   | X    | X  | Hex-address DP-In-range 1 from hardware configuration  |
| HexAdrA400_In2   | WORD   | X    | X  | Hex-address DP-In-range 2 from hardware configuration  |
| HexAdrA400_In3   | WORD   | X    | X  | Hex-address DP-In-range 3 from hardware configuration  |
| HexAdrA400_In4   | WORD   | X    | X  | Hex-address DP-In-range 4 from hardware configuration  |
| HexAdrA400_In5   | WORD   | X    | X  | Hex-address DP-In-range 5 from hardware configuration  |
| HexAdrA400_In6   | WORD   | X    | X  | Hex-address DP-In-range 6 from hardware configuration  |
| HexAdrA400_In7   | WORD   | X    | X  | Hex-address DP-In-range 7 from hardware configuration  |
| HexAdrA400_In8   | WORD   | X    |    | Hex-address DP-In-range 8 from hardware configuration  |
| HexAdrA400_In9   | WORD   | X    |    | Hex-address DP-In-range 9 from hardware configuration  |
| HexAdrA400_In10  | WORD   | X    |    | Hex-address DP-In-range 10 from hardware configuration   |
| HexAdrA400_In11  | WORD   | X    |    | Hex-address DP-In-range 11 from hardware configuration   |
| HexAdrA400_In12  | WORD   | X    |    | Hex-address DP-In-range 12 from hardware configuration   |
| HexAdrA400_In13  | WORD   | X    |    | Hex-address DP-In-range 13 from hardware configuration   |
| HexAdrA400_Out1  | WORD   | X    | X  | Hex-address DP-Out-range 1 from hardware configuration   |
| HexAdrA400_Out2  | WORD   | X    |    | Hex-address DP-Out-range 2 from hardware configuration   |
| HexAdrA400_Out3  | WORD   | X    |    | Hex-address DP-Out-range 3 from hardware configuration   |
| HexAdrA400_Out4  | WORD   | X    |    | Hex-address DP-Out-range 4 from hardware configuration   |
| HexAdrA400_Out5  | WORD   | X    |    | Hex-address DP-Out-range 5 from hardware configuration   |
| HexAdrA400_Out6  | WORD   | X    |    | Hex-address DP-Out-range 6 from hardware configuration   |
| HexAdrA400_Out7  | WORD   | X    |    | Hex-address DP-Out-range 7 from hardware configuration   |
| HexAdrA400_Out8  | WORD   | X    |    | Hex-address DP-Out-range 8 from hardware configuration   |
| HexAdrA400_Out9  | WORD   | X    |    | Hex-address DP-Out-range 9 from hardware configuration   |
| HexAdrA400_Out10 | WORD   | X    |    | Hex-address DP-Out-range 10 from hardware configuration  |
| HexAdrA400_Out11 | WORD   | X    |    | Hex-address DP-Out-range 11 from hardware configuration  |
| HexAdrA400_Out12 | WORD   | X    |    | Hex-address DP-Out-range 12 from hardware configuration  |
| HexAdrA400_Out13 | WORD   | X    |    | Hex-address DP-Out-range 13 from hardware configuration  |
| HexAdrA400_Out14 | WORD   | X    |    | Hex-address DP-Out-range 14 from hardware configuration  |
| HexAdrA400_Out15 | WORD   | X    |    | Hex-address DP-Out-range 15 from hardware configuration  |

X address input available

EM Easy-Mode

The addressing of the input and output ranges is effected corresponding to the hardware configuration, whereby the start address of each range must be transmitted as hexadecimal value in the S7 format.



Example:

Address range decimal 256 – 271 → 256<sub>dez</sub>=100<sub>hex</sub> → address transfer W#16#100

| Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | A-Adresse | A-Adresse | Kommentar |
|------------|------------|-----------------------------|-----------|-----------|-----------|
| 1          | 191        | UNI                         | 256-271   | 256-271   |           |
| 2          | 191        | → UNI                       | 272-287   | 272-287   |           |
| 3          | 191        | → UNI                       | 288-303   | 288-303   |           |
| 4          | 191        | → UNI                       | 304-319   | 304-319   |           |
| 5          | 191        | → UNI                       | 320-335   | 320-335   |           |
| 6          | 191        | → UNI                       | 336-351   | 336-351   |           |
| 7          | 191        | → UNI                       | 352-367   | 352-367   |           |
| 8          | 191        | → UNI                       | 368-383   | 368-383   |           |
| 9          | 191        | → UNI                       | 384-399   | 384-399   |           |
| 10         | 191        | → UNI                       | 400-415   | 400-415   |           |
| 11         | 191        | → UNI                       | 416-431   | 416-431   |           |
| 12         | 191        | → UNI                       | 432-447   | 432-447   |           |
| 13         | 191        | → UNI                       | 448-463   | 448-463   |           |
| 14         | 191        | → UNI                       | 464-479   | 464-479   |           |
| 15         | 191        | → UNI                       | 480-495   | 480-495   |           |

| Steckplatz | DP-Kennung | Bestellnummer / Bezeichnung | E-Adresse | A-Adresse | Kommentar |
|------------|------------|-----------------------------|-----------|-----------|-----------|
| 1          | 2AX        | V3compatible                | 256-259   | 256-259   |           |
| 2          | 222        | → V3compatible              | 260-267   |           |           |
| 3          | 222        | → V3compatible              | 268-277   |           |           |
| 4          | 210        | → V3compatible              | 278-287   |           |           |
| 5          | 222        | → V3compatible              | 288-297   |           |           |
| 6          | 222        | → V3compatible              | 298-307   |           |           |
| 7          | 218        | → V3compatible              | 308-317   |           |           |
| 8          |            |                             |           |           |           |
| 9          |            |                             |           |           |           |
| 10         |            |                             |           |           |           |
| 11         |            |                             |           |           |           |
| 12         |            |                             |           |           |           |
| 13         |            |                             |           |           |           |
| 14         |            |                             |           |           |           |
| 15         |            |                             |           |           |           |

```

DB4
FB100
sending and receiving A400 datas
"A400control"

--EN
100 A400DB
W#16#100 HexAdrA400_In1
W#16#110 HexAdrA400_In2
W#16#120 HexAdrA400_In3
W#16#130 HexAdrA400_In4
W#16#140 HexAdrA400_In5
W#16#150 HexAdrA400_In6
W#16#160 HexAdrA400_In7
W#16#170 HexAdrA400_In8
W#16#180 HexAdrA400_In9
W#16#190 HexAdrA400_In10
W#16#1A0 HexAdrA400_In11
W#16#1B0 HexAdrA400_In12
W#16#1C0 HexAdrA400_In13
W#16#100 HexAdrA400_Out1
W#16#110 HexAdrA400_Out2
W#16#120 HexAdrA400_Out3
W#16#130 HexAdrA400_Out4
W#16#140 HexAdrA400_Out5
W#16#150 HexAdrA400_Out6
W#16#160 HexAdrA400_Out7
W#16#170 HexAdrA400_Out8
W#16#180 HexAdrA400_Out9
W#16#190 HexAdrA400_Out10
W#16#1A0 HexAdrA400_Out11
W#16#1B0 HexAdrA400_Out12
W#16#1C0 HexAdrA400_Out13
W#16#1CA HexAdrA400_Out14
W#16#1DA HexAdrA400_Out15

outDPfail
outCh1_SystemOK
outCh1_ReadyForMeas
outCh1_Test
outCh1_Measuring
outCh1_RecSetPoints
outCh1_RecFail
outCh1_OK
    
```



### 3.2. Input parameters

| Parameter          | Format | Mode |    | Description  |
|--------------------|--------|------|----|--|
|                    |        | Uni  | EM |  |
| in_Channel         | INT    | X    |    | Channel selection for Actual value transmission<br>FALSE -> channel 1 TRUE -> channel 2  |
| in_getActualValues | BOOL   | X    |    | Import X/Y actual values of the selected channel with rising edge at the parameter input, see diagram on page <b>Fehler! Textmarke nicht definiert.</b>      |
| inCh1_SetSetpoints | BOOL   | X    |    | Channel 1: Activating transmission of setpoint record with rising edge at the parameter input see diagram on page <b>Fehler! Textmarke nicht definiert.</b>  |
| inCh1_Program      | INT    | X    | X  | Channel 1: Program selection for evaluation of the next measurement  |
| inCh1_Start        | BOOL   | X    | X  | Channel 1: Activating the measurement<br>TRUE -> measuring process FALSE -> measurement end<br>see diagram on page <b>Fehler! Textmarke nicht definiert.</b> |
| inCh1_Selftest     | BOOL   | X    | X  | Channel 1: Activating the self test (test sequence)<br>TRUE -> self test FALSE -> self test stop<br>see diagram on page 10                                   |
| inCh2_SetSetpoints | BOOL   | X    |    | Channel 2: Activating transmission of setpoint record with rising edge at the parameter input see diagram on page <b>Fehler! Textmarke nicht definiert.</b>  |
| inCh2_Program      | INT    | X    | X  | Channel 2: Program selection for evaluation of the next measurement  |
| inCh2_Start        | BOOL   | X    | X  | Channel 2: Activating the measurement<br>TRUE -> measuring process FALSE -> measurement end<br>see diagram on page <b>Fehler! Textmarke nicht definiert.</b> |
| inCh2_Selftest     | BOOL   | X    | X  | Channel 2: Activating the self test (test sequence)<br>TRUE -> self test FALSE -> self test stop<br>see diagram on page 10                                   |

X signal input (function) available

EM Easy-Mode

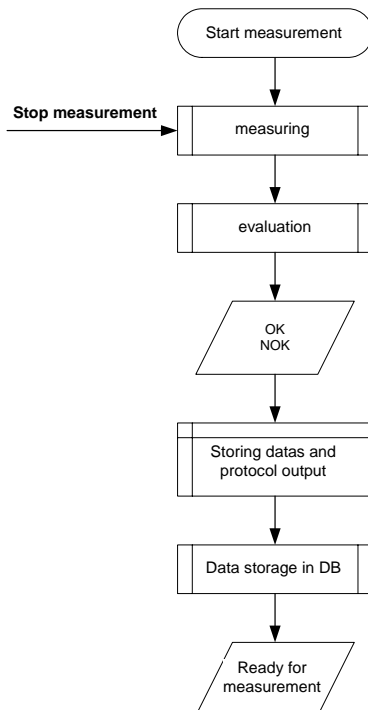


### 3.3. Output parameters

| Parameter           | Format | Mode |    | Description  |
|---------------------|--------|------|----|--|
|                     |        | Uni  | EM |  |
| outDPfail           | BOOL   | X    | X  | DP-communication error<br>Check addressing   |
| outCh1_SystemOK     | BOOL   | X    | X  | Channel 1: system ready  |
| outCh1_ReadyForMeas | BOOL   | X    | X  | Channel 1: ready for measurement<br>Step enabling condition for PLC sequence                         |
| outCh1_Test         | BOOL   | X    | X  | Channel 1: Test sequence active<br>see diagram page 10   |
| outCh1_Measuring    | BOOL   | X    | X  | Channel 1: Measurement active<br>see diagram page Fehler! Textmarke nicht definiert.                 |
| outCh1_RecSetPoints | BOOL   | X    |    | Channel 1 setpoint record transmission active<br>see diagram page Fehler! Textmarke nicht definiert. |
| outCh1_RecFail      | BOOL   | X    |    | Channel 1: Last setpoint record transmission was incorrect, Data in the measuring channel invalid    |
| outCh1_OK           | BOOL   | X    | X  | Channel 1: Last measurement OK / within tolerance  |
| outCh1_NOK          | BOOL   | X    | X  | Channel 1: Last measurement NOK / not within tolerance   |
| outCh2_SystemOK     | BOOL   | X    | X  | Channel 1: system ready  |
| outCh2_ReadyForMeas | BOOL   | X    | X  | Channel 1: ready for measurement<br>Step enabling condition for PLC sequence                         |
| outCh2_Test         | BOOL   | X    | X  | Channel 1: Test sequence active<br>see diagram page 10   |
| outCh2_Measuring    | BOOL   | X    | X  | Channel 1: Measurement active<br>see diagram page Fehler! Textmarke nicht definiert.                 |
| outCh2_RecSetPoints | BOOL   | X    |    | Channel 1 setpoint record transmission active<br>see diagram page Fehler! Textmarke nicht definiert. |
| outCh2_RecFail      | BOOL   | X    |    | Channel 1: Last setpoint record transmission was incorrect, Data in the measuring channel invalid    |
| outCh2_OK           | BOOL   | X    | X  | Channel 1: Last measurement OK / within tolerance  |
| outCh2_NOK          | BOOL   | X    | X  | Channel 1: Last measurement NOK / not within tolerance   |

X signal output (function) available

EM Easy-Mode



The status outputs "outChX\_OK" / "outChX\_NOK" are updated subsequent to the measurement immediately after the evaluation.

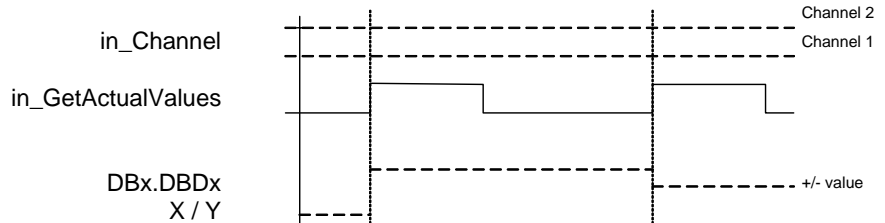
The ready-for-measurement signal "outChX\_ReadyForMeas" however, is only placed when the intern data storage and protocol output are finished, and the measured values were stored in the data module via Profibus.



## 4. Signal sequences

### 4.1. Importing actual values

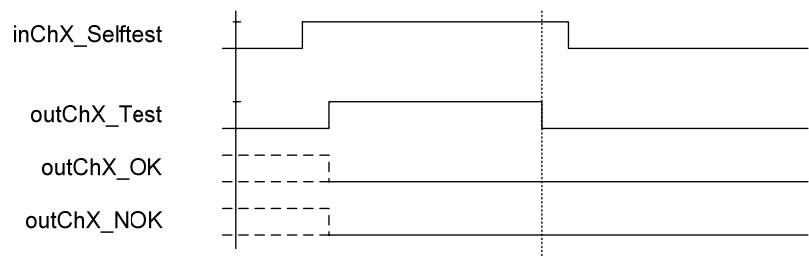
If the selected measuring channel is not in the measuring mode, the current X- and Y-actual values can be requested. The values correspond to the displays in the service menu.



The decimal positions and axis units must be considered and are stored in the data module as well.

### 4.2. Test sequence

However, it has to be observed, that both X-sensor and Y-sensor are in rest position, e.g. no force acts on the force sensor.

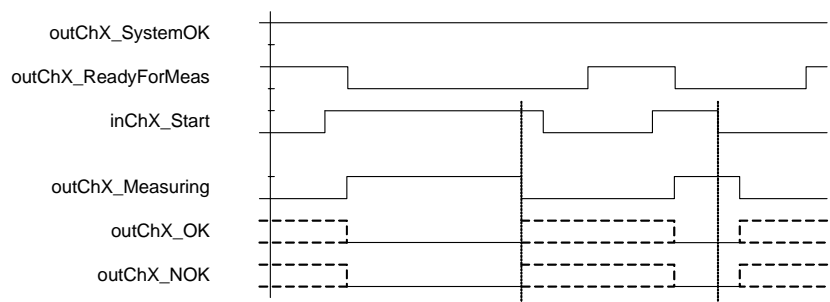


After the test sequence the status signal „*outChX\_SystemOK*” is updated.

### 4.3. Measurement

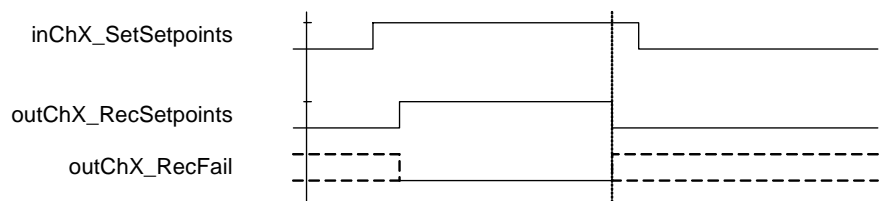
The measurement is activated with the static signal "*inChX\_Start*" and ended with FALSE defined at the parameter input.

With rising edge at the output "*outChX\_ReadyForMeas*" (ready for measurement) the measured values are available in the data module.



### 4.4. Transmission of setpoint records

In the A400-UniMode setpoint record information can be transmitted from the PLC to the A400. Therefore, from the PLC the data module range must be parameterised, and then the transmission activated.





## 5. DB-data structure

A change of the data structure of data modules results in failures  
A detailed data description can be obtained directly from the data module comment.

### 5.1. A400-UniMode

| Address |        | description   | channel | User access |       |
|---------|--------|---|---------|-------------|-------|
| From    | To     |   |         | READ        | WRITE |
| 0.0     | 5.7    | Communication data, only for intern use                             | -       | -           | -     |
| 6.0     | 7.7    | Digital output bits<br>corresponding to the hardware outputs        | 1       | X           |       |
| 8.0     | 9.7    | Status word- detailed condition                                     | 1       | X           |       |
| 10.0    | 11.7   | Error word – detailed error note                                    | 1       | X           |       |
| 12.0    | 35.7   | Measuring information (time, date, evaluation method,<br>order,...) | 1       | X           |       |
| 36.0    | 227.7  | Measured values measuring windows 1-8 forward                       | 1       | X           |       |
| 228.0   | 419.7  | Measured values measuring windows 1-8 backward                      | 1       | X           |       |
| 420.0   | 423.7  | Unit X-axis   | 1       | X           |       |
| 424.0   | 427.7  | Unit Y-axis   | 1       | X           |       |
| 428.0   | 428.7  | Number of decimal positions X-axis                                  | 1       | X           |       |
| 429.0   | 429.7  | Number of decimal positions Y-axis                                  | 1       | X           |       |
| 430.0   | 433.7  | Actual value X-axis after transmission                              | 1       | X           |       |
| 434.0   | 437.7  | Actual value Y-axis after transmission                              | 1       | X           |       |
| 438.0   | 439.7  | Digital output bits<br>corresponding to the hardware outputs        | 2       | X           |       |
| 440.0   | 441.7  | Status word – detailed condition                                    | 2       | X           |       |
| 442.0   | 443.7  | Error word – detailed error note                                    | 2       | X           |       |
| 444.0   | 467.7  | Measuring information (time, date, measuring method,<br>order...)   | 2       | X           |       |
| 468.0   | 659.7  | Measured values measuring windows 1-8 forward                       | 2       | X           |       |
| 660.0   | 851.7  | Measured values measuring windows 1-8 backward                      | 2       | X           |       |
| 852.0   | 855.7  | Unit X-axis   | 2       | X           |       |
| 856.0   | 859.7  | Unit Y-axis   | 2       | X           |       |
| 860.0   | 860.7  | Number of decimal positions X-axis                                  | 2       | X           |       |
| 861.1   | 861.7  | Number of decimal positions Y-axis                                  | 2       | X           |       |
| 862.0   | 865.7  | Actual value X-axis after transmission                              | 2       | X           |       |
| 866.0   | 869.7  | Actual value Y-axis after transmission                              | 2       | X           |       |
| 870.0   | 873.7  | Communication data, only for intern use                             | -       | -           | -     |
| 874.0   | 875.7  | Digital input signals, described by the FB                          | 1       | X           |       |
| 876.0   | 876.7  | Target program for transmission of setpoint records                 | 1       |             | X     |
| 877.0   | 939.7  | Setpoint record default parameter                                   | 1       |             | X     |
| 940.0   | 1163.7 | Setpoint record default tolerance window                            | 1       |             | X     |
| 1164.0  | 1165.7 | Digital input signals described by the FB                           | 2       | X           |       |
| 1166.0  | 1166.7 | Target program for transmission of setpoint records                 | 2       |             | X     |
| 1167.0  | 1229.7 | Setpoint record default parameter                                   | 2       |             | X     |
| 1230.0  | 1453.7 | Setpoint record default tolerance window                            | 2       |             | X     |
| 1454.0  | 1929.7 | Temporary data range for intern use                                 | -       | -           | -     |



## 5.2. Easy-Mode

| Address |       | description  | channel | User access |       |
|---------|-------|--|---------|-------------|-------|
| From    | To    |  |         | From        | WRITE |
| 0.0     | 1.7   | Digital output bits corresponding to the hardware outputs          | 1       | X           |       |
| 2.0     | 3.7   | Digital output bits corresponding to the hardware outputs          | 2       | X           |       |
| 4.0     | 27.7  | Measurement information (time, date, evaluation method, order,...) | 1       | X           |       |
| 28.0    | 29.7  | Status word – detailed condition                                   | 1       | X           |       |
| 30.0    | 31.7  | Error word – detailed error note                                   | 1       | X           |       |
| 32.0    | 32.7  | Number of decimal positions X-axis                                 | 1       | X           |       |
| 33.0    | 33.7  | Number of decimal positions Y-axis                                 | 1       | X           |       |
| 34.0    | 89.7  | Measured values measuring windows 1-4                              | 1       | X           |       |
| 90.0    | 113.7 | Measurement information (time, date, evaluation method, order...)  | 1       | X           |       |
| 114.0   | 115.7 | Status word – detailed condition                                   | 1       | X           |       |
| 116.0   | 117.7 | Error word – detailed error note                                   | 1       | X           |       |
| 118.0   | 118.7 | Number of decimal positions X-axis                                 | 1       | X           |       |
| 119.0   | 119.7 | Number of decimal positions Y-axis                                 | 1       | X           |       |
| 120.0   | 175.7 | Measured values measuring windows 1-4                              | 1       | X           |       |
| 176.0   | 177.7 | Digital input signals, described by the FB                         | 1       | X           |       |
| 178.0   | 179.7 | Digital input signals, described by the FB                         | 2       | X           |       |