

# 1 Device: Device

**Users and Groups**

Users:

Groups

**Access Rights**

- View
- Modify
- Execute
- Add/remove children

**Symbol Rights**

**Information**

Name: CODESYS Control Win V3  
Vendor: CODESYS  
Categories: PLCs  
Type: 4096  
ID: 0000 0001  
Version: 3.5.20.40  
Order number: ???  
Description: CODESYS V3 Soft-PLC for Windows with non realtime capabilities (CODESYS Control Win V3)

## 1.1 PLC Logic: Plc Logic

### 1.1.1 Application: Application

#### 1.1.1.1 Folder: Days

##### 1.1.1.1.1 Interface: IPuzzle

- 1 INTERFACE IPuzzle
- 2

## 1.1.1.1.1.1 Interface method: Solve

```
1  METHOD Solve
2
```

## 1.1.1.2 Folder: Utility

### 1.1.1.2.1 POU: ArrayInsertSorted

```
1  FUNCTION ArrayInsertSorted : BOOL
2  VAR_INPUT
3      Element : DINT ;
4      AreaStart : DINT ;
5      AreaEnd : DINT ;
6  END_VAR
7
8  VAR_IN_OUT
9      TargetArray : ARRAY [ * ] OF DINT ;
10 END_VAR
11
12 VAR_OUTPUT
13     ErrorCode : STRING := 'OK' ;
14 END_VAR
15
16 VAR
17     i : DINT ;
18     arrayStart : DINT := LOWER_BOUND ( TargetArray , 1 ) ;
19     arrayEnd : DINT := UPPER_BOUND ( TargetArray , 1 ) ;
20 END_VAR
21
22
23 IF AreaStart < arrayStart OR AreaEnd > arrayEnd THEN
24     ErrorCode := 'Target area outside of array bounds.' ;
25     ArrayInsertSorted := FALSE ;
26     RETURN ;
27 END_IF
28
29 FOR i := AreaStart TO AreaEnd DO
30     // Insert before the first larger element
31     IF TargetArray [ i ] > Element THEN
32         ShiftArray (
33             Direction := ShiftDirection . RIGHT ,
34             ShiftAmount := 1 ,
35             Start := i ,
36             End := AreaEnd ,
37             TargetArray := TargetArray ) ;
38
39         TargetArray [ i ] := Element ;
40         ArrayInsertSorted := TRUE ;
41         RETURN ;
42     END_IF
43 END_FOR
44
45 // All elements are smaller, append at the end.
46 TargetArray [ AreaEnd + 1 ] := Element ;
47 ArrayInsertSorted := TRUE ;
48 RETURN ;
49
```

## 1.1.1.2.2 POU: LineReader

```

1  FUNCTION_BLOCK LineReader
2  VAR CONSTANT
3      MAX_LINES : __XWORD := 999 ;
4      MAX_LINE_LENGTH : INT := 255 ;
5  END_VAR
6  VAR_INPUT
7      FilePath : STRING ;
8  END_VAR
9  VAR_OUTPUT
10     Done : BOOL := FALSE ;
11     Error : BOOL := FALSE ;
12     ErrorCode : STRING := '' ;
13     ReadLines : ARRAY [ 0 .. MAX_LINES ] OF STRING ( MAX_LINE_LENGTH ) ;
14     LineCount : WORD := 0 ;
15 END_VAR
16 VAR
17     CurrentLine : STRING ( MAX_LINE_LENGTH ) := '' ;
18     FileHandle : SysFile . RTS_IEC_HANDLE ;
19     BytesRead : __XWORD := 0 ;
20     CharBuffer : STRING ( 1 ) ;
21     pResult : POINTER TO SysFile . RTS_IEC_RESULT ;
22     i : __XWORD := 0 ;
23     Initialized : BOOL := FALSE ;
24 END_VAR
25
1  IF Initialized = FALSE THEN
2      FOR i := 0 TO MAX_LINES DO
3          ReadLines [ i ] := 'NOT WRITTEN TO' ;
4      END_FOR
5      Initialized := TRUE ;
6  END_IF
7
8  FileHandle := SysFileOpen ( szFile := FilePath , am := SysFile . AM_READ , pResult := pResult ) ;
9
10 IF FileHandle = SysFile . RTS_INVALID_HANDLE THEN //File not found
11     ErrorCode := 'File not found, is it on the device?' ;
12     Error := TRUE ;
13     Done := TRUE ;
14 ELSE // File open
15     WHILE NOT Done DO
16         BytesRead := SysFileRead ( hFile := FileHandle , pbyBuffer := ADR ( CharBuffer ) , ulSize := 1 ,
17             pResult := pResult ) ;
18
19         IF BytesRead > 0 THEN
20             // A little bit of cheating, only read files with unix line endings
21             IF CharBuffer = '$N' THEN
22                 IF LineCount <= MAX_LINES THEN
23                     ReadLines [ LineCount ] := CurrentLine ;
24                     LineCount := LineCount + 1 ;
25                     CurrentLine := '' ;
26                 ELSE
27                     ErrorCode := 'Input file is larger than max line count.' ;
28                     Error := TRUE ;
29                     Done := TRUE ;
30                 END_IF
31             ELSE
32                 IF LEN ( CurrentLine ) <= MAX_LINE_LENGTH THEN
33                     CurrentLine := CONCAT ( CurrentLine , CharBuffer ) ;
34                 ELSE
35                     ErrorCode := 'Line exceeds max line length' ;
36                     Error := TRUE ;

```

```

37         Done := TRUE ;
38     END_IF
39 END_IF
40 ELSE
41     Done := TRUE ;
42     EXIT ;
43 END_IF
44 END_WHILE ;
45 END_IF
46
47 SysFileClose ( FileHandle ) ;
48

```

### 1.1.1.2.3 POU: LineToNumbers

```

1  FUNCTION LineToNumbers : INT
2  VAR_INPUT
3      line          : STRING ;
4      separator     : STRING ;
5  END_VAR
6  VAR_IN_OUT
7      numberBuffer  : ARRAY [ * ] OF DINT ;
8  END_VAR
9  VAR_OUTPUT
10     numberCount   : INT          := 0 ;
11 END_VAR
12 VAR
13     separatorLength : INT          := LEN ( separator ) ;
14     bufferStart     : DINT          := LOWER_BOUND ( numberBuffer , 1 ) ;
15     bufferEnd       : DINT          := UPPER_BOUND ( numberBuffer , 1 ) ;
16     bufferIndex     : INT           := 0 ;
17     endReached      : BOOL          := FALSE ;
18     separatorIndex  : INT           := 0 ;
19     tmp             : STRING        := '' ;
20     startRight      : INT           := 0 ;
21     emergencyBreak  : INT           := 0 ;
22 END_VAR
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```

```

28     END_WHILE
29
30     LineToNumbers := numberCount ;
31

```

### 1.1.1.2.4 POU: ShiftArray

```

1  FUNCTION ShiftArray : BOOL
2  VAR_INPUT
3      Direction    : ShiftDirection ;
4      ShiftAmount  : DINT ;
5      Start        : DINT ;
6      End          : DINT ;
7  END_VAR
8  VAR_IN_OUT
9      TargetArray  : ARRAY [ * ] OF DINT ;
10 END_VAR
11 VAR_OUTPUT
12     ErrorCode    : STRING := 'OK' ;
13 END_VAR
14 VAR
15     i : DINT ;
16     arrayStart : DINT := LOWER_BOUND ( TargetArray , 1 ) ;
17     arrayEnd   : DINT := UPPER_BOUND ( TargetArray , 1 ) ;
18     target     : DINT ;
19 END_VAR
20

```

---

```

1  IF Start < arrayStart OR End > arrayEnd THEN
2      ErrorCode := 'Shift start/end outside of array bounds' ;
3      ShiftArray := FALSE ;
4      RETURN ;
5  END_IF
6
7  // Shift logic: Always start at the outer bound to prevent overriding values.
8  IF Direction = ShiftDirection . RIGHT THEN
9      FOR i := End TO Start BY -1 DO
10         target := i + ShiftAmount ;
11         IF target <= arrayEnd AND target >= arrayStart THEN
12             TargetArray [ target ] := TargetArray [ i ] ;
13         END_IF
14     END_FOR
15 END_IF
16
17 IF Direction = ShiftDirection . LEFT THEN
18     FOR i := Start TO End BY +1 DO
19         target := i - ShiftAmount ;
20         IF target <= arrayEnd AND target >= arrayStart THEN
21             TargetArray [ target ] := TargetArray [ i ] ;
22         END_IF
23     END_FOR
24 END_IF
25
26 ShiftArray := TRUE ;
27 RETURN ;
28

```

### 1.1.1.2.5 POU: SIGN

```
1  FUNCTION SIGN : INT
2  VAR_INPUT
3      number : DINT ;
4  END_VAR
5
6
7  IF number > 0 THEN
8      SIGN := 1 ;
9  ELSIF number < 0 THEN
10     SIGN := -1 ;
11 ELSE
12     SIGN := 0 ;
13 END_IF
```

---

### 1.1.1.3 POU: PLC\_PRG

```
1  PROGRAM PLC_PRG
2  VAR_OUTPUT
3      Decoration : BOOL := TRUE ;
4  END_VAR
5  VAR
6      day1 : Day1 ;
7      day2 : Day2 ;
8      puzzles : ARRAY [ 0 .. 1 ] OF IPuzzle := [ day1 , day2 ] ;
9      puzzleEnabled : ARRAY [ 0 .. 1 ] OF BOOL ;
10     i : DINT := 0 ;
11 END_VAR
12
```

---

```
1  // File not found? Put the input on the device with:
2  // Double click Device-> Files-> into the PlcLogic/inputs folder
3  FOR i := 0 TO UPPER_BOUND (puzzles , 1) DO
4      IF puzzleEnabled [ i ] = TRUE THEN
5          puzzles [ i ] . Solve ( ) ;
6      END_IF
7  END_FOR
8
```