

applications & TOOLS

SIMATIC S7
Function Description

SIEMENS

Function for determining calendar day and week

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Preface

In this example we introduce fully functional and tested automation configurations based on Siemens Industry Sector standard products and individual function blocks or tools, for simple, fast and inexpensive implementation of automation tasks.

Apart from a list of all required hardware and software components and a description of the way they are connected to each other, the examples include the tested tools or function blocks. This ensures that the functionalities described here can be reset in a short period of time and thus also be used as a basis for individual expansions.

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Determining calendar day and week

Entry-ID: 31695931

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1 Task

What is the point?

In order to control annually repeated processes or time and date outputs via an HMI, it may be necessary to determine the day (e.g. 1...365) or the week (e.g. 1...52) from a specific date (year, month, day) in a control system. This task will be solved by using a function (FC).

1.1 Methods for calculating the week

The present FAQ will support the two most commonly used methods:

- Calculation according to DIN 1355 / ISO 8601 (mainly used in the EU)
- Calculation in the US and in many other countries

An FC will be provided for each method.

1.1.1 Calculation according to DIN 1355 / ISO 8601

According to the above standard, the week is calculated on the basis of the following rules:

- Every Monday, and on Monday only will a new week start.
- The first calendar week is that which includes at least 4 days of the new year.

From the above rules we can conclude that

- there are no incomplete weeks and that each week has 7 days without exception,
- each year has 52 or 53 weeks,
- a year has 53 weeks if the 1st January or the 31st December of that year is a Thursday,
- the last 3 days of a year can already belong to week 1 of the following year,
- the first 3 days of a year can still belong to the last week of the previous year.

1.1.2 Calculation in the US and in many other countries

- A new week always starts on Sunday.
- The first week always begins on 1st January, irrespective of the week day.

From the above rules we can conclude that

- the first and the last week of a year can have fewer than 7 days,

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- each year has 53 weeks
(exception: If the 31st December is a Sunday, and the 1st January of the same year was no Sunday, that Sunday will be the only day to belong to the 54th week (this is, however, a rare case: the last time in 2000 and the next time in 2028).

2 Solution

The two FCs created according to Chap. 1.1 were programmed in SCL. The source and the compiled STEP 7 code are not protected. The content of the delivered library is explained in Chap. 2.1. Chapter 2.2 describes how this block is integrated into your application program and how it is parameterized. Chapter 2.3 contains an SCL code description – for those among you who want to know more about the method used to calculate day and week.

Note

To apply the functions CWD_xx, you do not need the Engineering Tool S7-SCL, and nor do you have to study the SCL code description (Chap. 2.3).

2.1 Library

The FAQ contains the library “CIndr_Week_Day”. It contains the program folders...

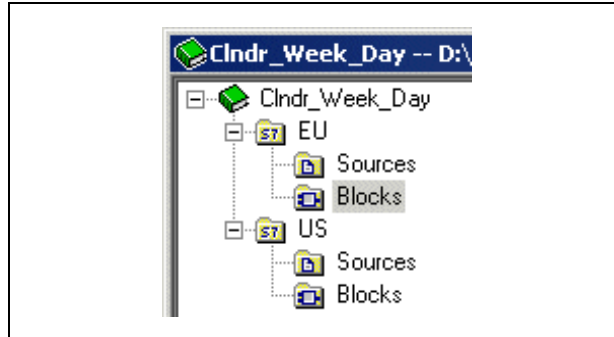
“EU”	for the calculation according to DIN 1355 / ISO 8601
“US”	for the calculation in the US and in many other countries

In this folder you will find:

“Sources”	with the SCL source “CIndr_Week_Day_xx” (xx = EU or US),
“Blocks”	with the STEP 7 code compiled from the SCL source as FC 45 (CWD_EU or CWD_US)
	...and the required subprograms...
	FC 3 (D_TOD_DT) ¹ (summarize DATE and TIME_OF_DAY to DT)
	FC 6 (DT_DATE) (extract DATE from DT),
	FC 7 (DT_DAY) (determine week day from DT),
	SFC 1 (READ_CLK) (read date and time out of the CPU clock).

¹ IEC function from the standard library

Figure 2-1: Library structure



2.2 Integration and parameterization

Extracting the file

Extract the file CWD.zip attached to the FAQ in SIMATIC Manager and open the library "Clnr_Week_Day".

Integrating the function

Copy all blocks from the corresponding block folder of the library into the block folder of your project. The function FC 45 (CWD_xx) can be integrated in both the cyclic part (e.g. OB 1) of your application program or in the acyclic part (e.g. OB 35).

Parameterization

The functions CWD_EU and CWD_US do not have different parameters.

Calendar day and week can be calculated until 31.12.2089. The function CWD_EU can process a past date back to 01.01.1991 and the function CWD_US back to 01.01.1990.

Figure 2-2: Block parameters

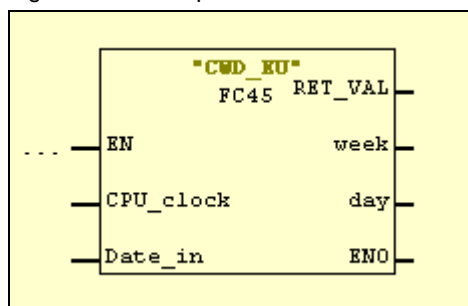


Table 2-1: Parameter description

Parameter	Declaration	Data type	Description
CPU_clock	INPUT	BOOL	If CPU_clock = FALSE, the output parameters "week" and "day" refer to FALSE ...to the IN-parameter "Date_in", TRUE ...to the CPU clock. (If "CPU_clock" = TRUE, "Date_in" will not be evaluated. But a valid address for the actual parameter "Date_in" must be entered nevertheless.)
Date_in	INPUT	DATE	Date for which "week" and "day" are to be calculated, provided that "CPU_clock" = FALSE. (DATE is a 16-bit fixed-point number without sign and indicates the number of days since 01.01.1990. Format: D#yyyy-mm-dd.
RET_VAL	OUTPUT	INT	The return value of the function contains an error code: 0000H: No error If „CPU_clock“ = FALSE: 8001H: "Date_in" not in allowed range If „CPU_clock“ = TRUE: Error code = error code of SFC 1 (READ_CLK).
week	OUTPUT	INT	Calendar week according to the function used CWD_EU or CWD_US.
day	OUTPUT	INT	Calendar day (identical for CWD_EU and CWD_US)

All parameters are defined in the memory areas I, Q, M, D, L.

2.3 Code description

A detailed code description and a flow chart of the function CWD_EU you will find in the download file of the code.

3 History

Version	Date	Change
V 1.0	02.02.2009	First edition