Interfacing Multi Counters 7KT1350/7KT1351/HH7KT1352 to PROFIBUS

General

The models 7KT1350 , 7KT1351 and HH7KT1352 can be connected to PROFIBUS. The data exchange is accomplished according to the DP standard profile (DPV0).
The instrument can be integrated in the communication system as a DP standard slave and configured with gsd file and master specific tools.

Setting the instrument

The profibus address of the instrument must be set acceding the relevant password protected menu on the instrument itself (PROFIBUS MENU). Valid addresses are 1 to 125.
The baudrate doesn't require any adjustment on the instrument: it is selected via the master station. (max. 12 Mbit/s).

Integration via the GSD file

The configuration of the device parameters is performed via a configuration tool which is part of each DP master. If a SIMATC S7 is applied as master, this is the HW Config of the SIMATIC STEP7 package. If it is not a SIMATIC S7, the configuration procedure can be performed depending on the master.
If the GSD file containing the device master data of the Multi counter has not yet been installed, this file must first be integrated into the configuration tool. For this purpose, you can, e.g., copy the GSD file to the subdirectory in which all GSD files of the configuration tool are stored and update the device library via the corresponding menu item. All parameters which have to be sent by the master during start-up of the slave are stored within the GSD file.

Selection of a basic type

After integrating the gsd file in the Master, the module type must be defined, selecting among the basic types 1 to 4 and 1c to 4c (c stands for "consistent data blocks"). The selection procedure depends on the master. The basic type determines the size of the data exchanged cyclically between the master and the slave:

Type 1 or 1c	3 measured values	(4 Status Bytes + 3 Float measures) = 16 Bytes Input
Type 2 or 2c	6 measured values	(4 Status Bytes + 6 Float measures) = 28 Bytes Input
Type 3 or 3c	12 measured values	(4 Status Bytes + 12 Float measures) = 52 Bytes Input
Type 4 or 4c	32 measured values	(4 Status Bytes + 32 Float measures) = 132 Bytes Input

Each quantity is formatted as a "floating point", according to IEEE standards. The 4 bytes are sent to the master in "Little Endian". So the byte called "byte1" in ieee std 754 is the last in data stream, the byte called byte4 in ieee std 754 is the first in data stream.

Notation: Floating-Point (4 Byte)
Range of values: see IEEE Std 754 Short Real Number (32 Bits).
Coding: see IEEE Std 754 Short Real Number (32 Bits).

The selection must be done taking in account that a great amount of data decreases the performance of the bus. Large data types should be used only if it is necessary.

Choosing basic type 4 or 4c requires that the DP master allows the parameterization of
an I/O-address range of 132 Bytes for DP slaves.

Selection of quantities to be exchanged cyclically

After selecting how many quantities will be exchanged, a further parameterization must be performed, in order to select which quantities will be exchanged, unless you accept the default settings. The procedure depends on the master. In some master configuration tools it can be done clicking on "Parameter Data",=>"Module"
Three parameters for each quantity must be specified:

1. quantity specification
Note: the index in the right column is used for diagnostics (cfr the chapter Status Bytes)

"Voltage"	0
"Current"	1
"Power"	2
"VA Power"	3
"VAR Power"	4
"Power factor"	5
"Frequency"	6
"Temperature"	7
"Active Energy import"	8
"Active Energy export"	9
"Energy Inductive Reactive"	10
"Energy Capacitive Reactive"	11
"Energy VA"	12

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2. phase specification
Note: the index in the right column is used for diagnostics (cfr the chapter Status Bytes)

Phase	Diagnose
"L1"	0
"L2"	1
"L3"	2
"L12"	3
"L23"	4
"L31"	5
"Sum"	6
" -"	7

3.rate specification (tariff)
Note: the index in the right column is used for diagnostics (cfr the chapter Status Bytes)

Tarif	Diagnose
" 1"	0
" 2"	1
" -"	2

Some combinations of the parameters mentioned above are not valid. For instance “Voltage”, "L23", “-“ is valid, but “Voltage”, "L23", “2“ is meaningless, because the tariff (1 or 2) is inherent to Energy. Refer to the following table for setting valid parameters.

QUANTITY	VALID PHASE PARAMETERS	VALID RATE PARAMETERS
“Voltage”	“L1”, ”L2”, ”L3”, ”L12”, ”L23”, ”L31”	“-“
Current	“L1”, “L2”, “L3”, “Sum”	“-“
Power, VA Power, Power factor	“L1”, “L2”, “L3”, “Sum”	“-“
VAR Power	“Sum”	“-“
Frequency, Temperature	“-“	“-“
"Active Energy import", "Active Energy export", "Energy Inductive Reactive", "Energy Capacitive Reactive", "Energy VA"	“-“	" 1", " 2"

Eventual errors in parameters setting can be detected by means of status bytes, as described below.
The default setting is a valid setting, and it allows to transfer the following quantities.

	QUANTITY	Type 1 or 1c	Type 2 or 2c	Type 3 or 3c	Type 4 or 4c
1	Voltage L1	x	x	x	x
2	Voltage L2	x	x	x	x
3	Voltage L3	x	x	x	x
4	Current L1		x	x	x
5	Current L2		x	x	x
6	Current L3		x	x	x
7	Voltage L1-L2			x	x
8	Voltage L2-L3			x	x
9	Voltage L3-L1			x	x
10	Power Factor L1			x	x
11	Power Factor L2			x	x
12	Power Factor L3			x	x
13	Active power L1				x
14	Active power L2				x
15	Active power L3				x
16	Active power sum				x
17	Apparent power L1				x
18	Apparent power L2				x
19	Apparent power L3				x
20	Frequency				x
21	Power factor sum				x
22	Reaktive power sum				x
23	Active energy rate 1 import				x
24	Active energy rate 1 export				x
25	Active energy rate 2 import				x
26	Active energy rate 2 export				x
27	Reaktive energy rate 1 ind				x
28	Reaktive energy rate 1 cap				x
29	Reaktive energy rate 2 ind				x
30	Reaktive energy rate 2 cap				x
31	Apparent energy rate 1				x
32	Apparent energy rate 2				x

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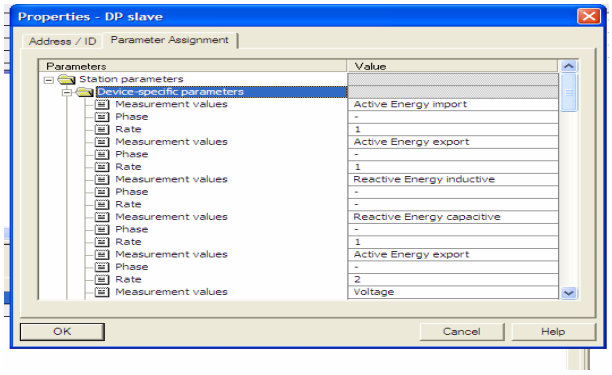
Eventual errors in parameters setting can be detected by means of status bytes, as described below.
The default setting is a valid setting, and it allows to transfer the following quantities:

Status Bytes

The data exchanged using any of the basic types starts with 4 status bytes:

- StatusByte0, StatusByte1, StatusByte2

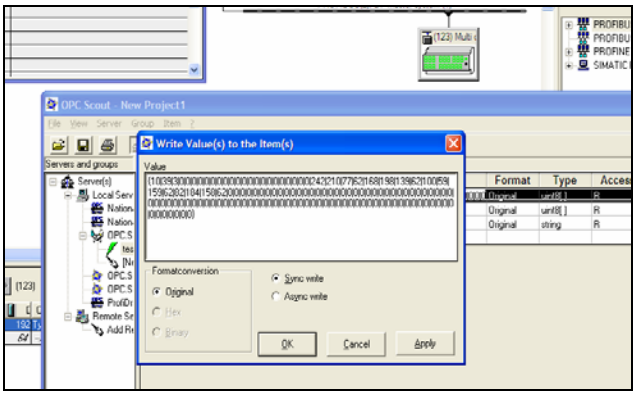
Diagnostics of wrong parameters setting.
StatusByte0 = HEX FF (255) => OK
StatusByte0 < HEX FF (255) => parameters error. In this case the value of StatusByte0, 1, 2 contain information about the wrong parameters: byte0 contains the current value of the parameter “quantity specification”, the leftmost 4 bits of Status Byte1 contain information about the current value of the parameter rate specification, and the remaining 4 bits of Status Byte1 contain information about the current value of the parameter phase specification, according to the indexes mentioned in the tables above. StatusByte2 contains the ordinal position of the wrong block of parameters.
An example of a wrong setting and the associated diagnostics follows:



the picture above shows a wrong configuration. The error is in the block
“Reactive Energy Inductive, - , - “

The data stream below shows:
-statusByte0 = 10 => in the wrong block the quantity specification is 10 ("Energy Inductive Reactive")
-statusByte1 = 39 = 27Hex => in the wrong block the rate specification is 2 (-), the phase specification is 7 (-). Cfr the tables above.

-statusByte2 = 3 => the error is in third block. If more than one block of settings is wrong only the first is reported.



- StatusByte3

Reports eventual alarms on measured quantities, according to the following table:

OVERVOLTAGE L1	HEX 01
OVERVOLTAGE L2	HEX 02
OVERVOLTAGE L3	HEX 04
OVERCURRENT L1	HEX 10
OVERCURRENT L2	HEX 20
OVERCURRENT L3	HEX 40
PHASE SEQUENCE ERROR	HEX 80

Overview on Input Data:

When the status of communication is “Data Exchange” the input data (data from slave to master) starts with 4 status bytes, and follows with the measures. The number of bytes depends on the selected basic type. Each measured quantity is sent to the master as a float according to ieee std 754.
For instance, using basic type1 (4 Status Bytes + (3 Float measures)*4Bytes) = 16 Bytes, the frame will be as follows:

stat0	stat1	stat2	stat3	meas1	Meas1	Meas1	Meas1
meas2	meas2	meas2	meas2	meas3	meas3	meas3	meas3