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Output on an external device

SINUMERIK 828D, 840D sl

<http://support.automation.siemens.com/WW/view/en/90277867>

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1 Output on an external device

1.1 Overview

Production with CNC machine tools requires a large quantity of measurement data and parameters to guarantee the quality and verify the production in accordance with the legal requirements. This applies particularly to the medical technology and aircraft construction sectors. Both sectors are confronted with very high demands on quality and the accountability for the manufactured parts over decades.

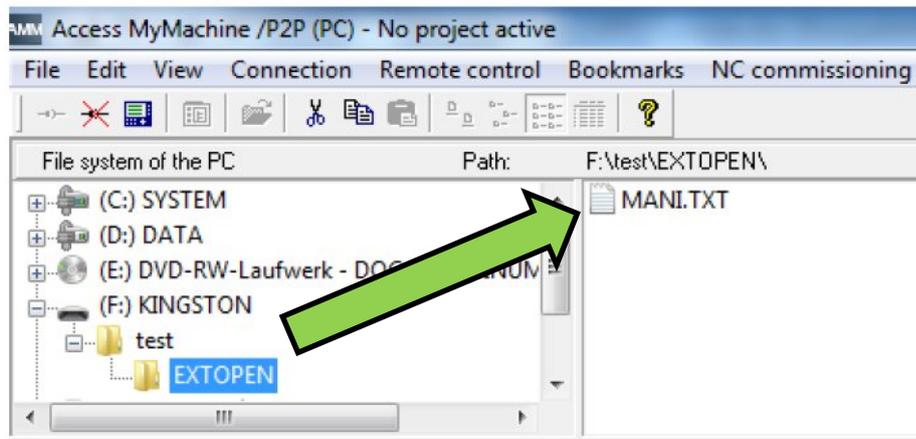
In order to prevent the loss of machining parameters during the production process, the "EXTOPEN, WRITE and EXTCLOSE" high-level language elements can be used to archive the machining parameters, for example, to safeguard the production. Archiving using a log file is possible in all machining channels of the NCK for all of the available output devices at the machine.

The example below should provide users with an application to output data at an external device using the "EXTOPEN, WRITE and EXTCLOSE" high-level language elements.

Overview of how to create a log file

The following diagram provides an overview of the principle of operation of the "WRITE" and "EXTOPEN/EXTCLOSE" high-level language elements.

Fig. 1-1 Reading out data from the EXTOPEN program



2 The commands (EXTOPEN/WRITE/EXTCLOSE)

Writing data from the part program to a predefined device outside the NCK using language commands is possible using the high-level language elements "WRITE". For example, in order that production of measurement data can be backed up or measurement data logged, the "WRITE" high-level language element must be used in conjunction with the "EXTOPEN" command. In this combination, "EXTOPEN" initiates that the external, predefined device is opened before the data or data sets are read out using "Write" and written to the target folder. After the data have been successfully output on the external device, the operation is terminated using "EXTCLOSE", when the end of the program is reached "M30" or for a "Channel reset". For instance, files on a local CompactFlash card are considered as external devices or files.

Note

Linking to external devices using the EXTOPEN, WRITE and EXTCLOSE high-level languages has proven to be very complicated. As a consequence, EXTCALL command represents an alternative to read out files.

2.1 Availability

This function is only available:

- in part programs.
- Parallel in all machining channels of the NCK for all available output devices.
When opening the device, an assignment takes place as to whether several (shared mode) or only one channel is assigned to the device.

2.2 Structure of programming command

Output to an external device/file is realized in 3 steps.

1. Open the external device/file
An external device/file is opened for the channel for writing using the EXTOPEN command.
2. Data are written
The WRITE command is used for writing
3. Closing the external device/file
The device/file is released again using the EXTCLOSE command or when the end the program (M30) is reached.

2.3 Syntax

The EXTOPEN, WRITE and EXTCLOSE commands are structured as following:

```

DEF INT <error>
DEF STRING[<n>] <output>
...
EXTOPEN (<error>,"<ExtG>",<processing mode>,<use mode>,<write mode>)
...
<output>="output data"
WRITE(<error>,"<ExtG>",<output>)
...
EXTCLOSE(<error>,"<ExtG>")
    
```

Table 2-1 Explanation of the EXTOPEN command

Command	Description
STRING	Character string of a defined length
EXTOPEN	Command to open an external device/file
<error>	Variable for returning the error value
<ExtG>	Symbolic identifier for the external device to be opened
<processing mode>	Processing mode for the write commands to this device
<use mode>	Use mode for this device (shared/exclusive)
<write mode>	
WRITE	Command for attaching a block or data to the end of a specified file.
<error>	Variable for returning the error value.
<file name>	The name of the file in the passive file system in which the specified block or specified data is to be added. (Additional explanations can be found in Section 3.1.1, File name).
<ExtG>:	The block or data to be added to the specified file.
<data/block>	The block or data that is to be added to the specified file.
EXTCLOSE	Command to close an external device/file that has been opened
<error>	Variable for returning the error value
<ExtG>	Symbolic identifier for the external device/file to be closed

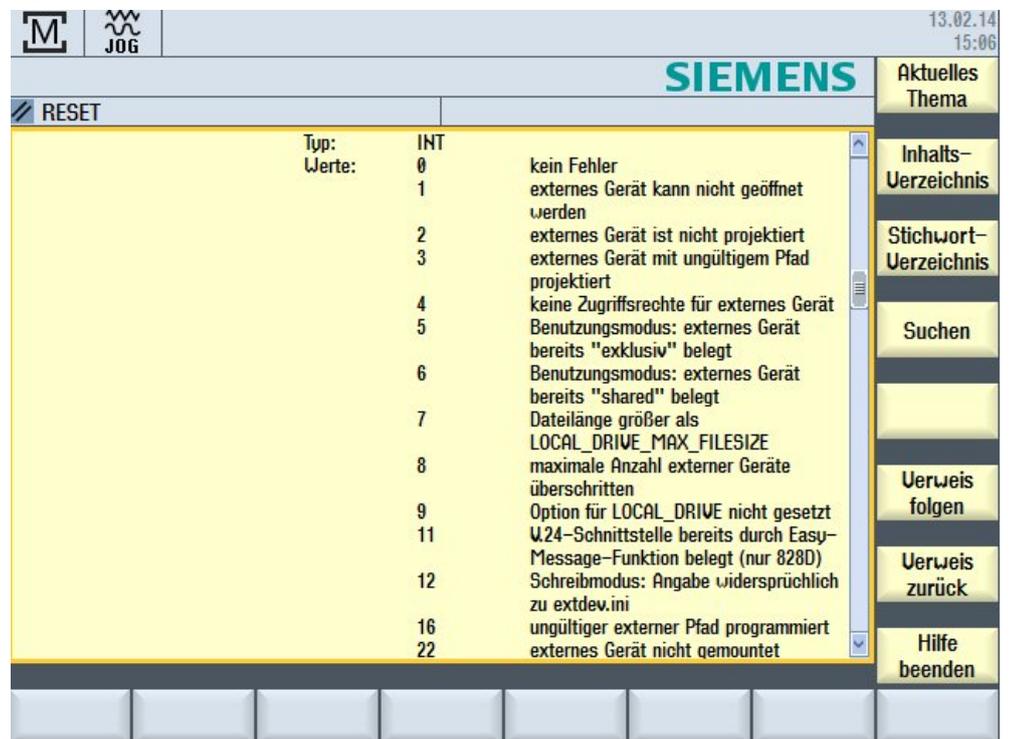
2.4 Notes to be taken into account for the commands used

2.4.1 EXTOPEN commands

The EXTOPEN command is used to open an external device. It comprises the following parameters:

- <error>
 - Variable for returning the error value. By using the error value, it can be evaluated in the program as to whether the operation was successful and processing is then appropriately continued.
 - Using the error value, the cause of an error can be located in the program. Values 0 to 22 provide the possible error causes (Fig. 2-1).

Fig. 2-1 Display of possible errors on the machine screen



- <ExtG>
 - Symbolic identifier for the external device/file to be opened
 - The symbolic identifier comprises the logical device name followed by a file path (Table 2-1).

Table 2-2

Logical device name	Description
"LOCAL_DRIVE"	Local CompactFlash card (pre-defined). The device name "LOCAL_DRIVE" must always be written in uppercase letters. A file path must be specified For example "LOCAL_DRIVE/my_dir/my_file.txt"
"CYC_DRIVE"	Reserved drive name for use in SIEMENS cycles (pre-defined). A file path must be specified for "CYC_DRIVE". Only uppercase letters are permissible for "CYC_DRIVE".
"/ dev / ext / 1", ... "/ dev / ext / 9"	Available network drives. It is necessary to configure in the extdev.ini file!
"/ dev / cyc / 1", "/ dev / cyc / 2"	Reserved drive names for use in SIEMENS cycles. It is necessary to configure in the extdev.ini file!
"/ dev / v24"	V.24 V interface. It is necessary to configure in the extdev.ini file!

- <processing mode>
 - Processing mode for the WRITE commands to this device/file

Table 2-3

Parameter	Description
"SYN"	Synchronous writing. Program execution is stopped until the write operation has been completed. Successfully completing the synchronous write operation can be checked by evaluating the error variables of the WRITE command.
"ASYN"	Asynchronous writing. Program execution is not interrupted by the WRITE command. In this mode, the error variable of the WRITE command does not provide any information and always has the value 0 (no error). In this particular mode, there is no certainty that the WRITE command was successful.

- <use mode>
 - Use mode for this device/file

Table 2-4

Parameter	Description
"SHARED"	Device/file is requested in the "SHARED" mode. Other channels can also use the device, i.e. also open in this mode.
"EXCL"	Device/file is exclusively used in the channel; no other channel can use the device.

- <write mode>
 - Processing mode for the WRITE commands to this device/file

Table 2-5

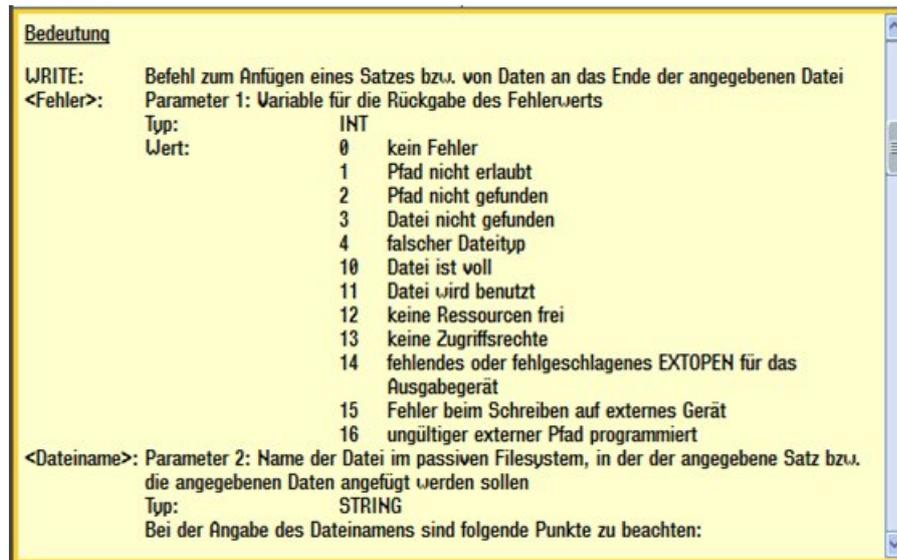
Parameter	Description
"APP"	Attach, the content of the file remains.
"OVR"	Overwrite, the content of the file is deleted and recreated through subsequent write calls.

2.4.2 WRITE command

The WRITE command is used to attach data at the end of the specified file:

- <error>
 - Variable for returning and error.
 - Variable for returning the error value. By using the error value, it can be evaluated in the program as to whether the operation was successful and processing is then appropriately continued.
 - Using the error value, the cause of an error can be located in the program. Values 0 to 16 provide the possible error causes (Fig. 2-2).

Fig. 2-2 Display of possible errors on the machine screen



- **<ExtG>**
 - A symbolic identifier must be specified for the external device to be opened when data is output to an external device. The identifier must be identical to the identifier specified in the EXTOPEN command.
- **<data/block>**
 - Data/block that is to be attached to the specified file.

2.4.3 **EXTCLOSE command**

- <error>
 - Command to close an external device/file.

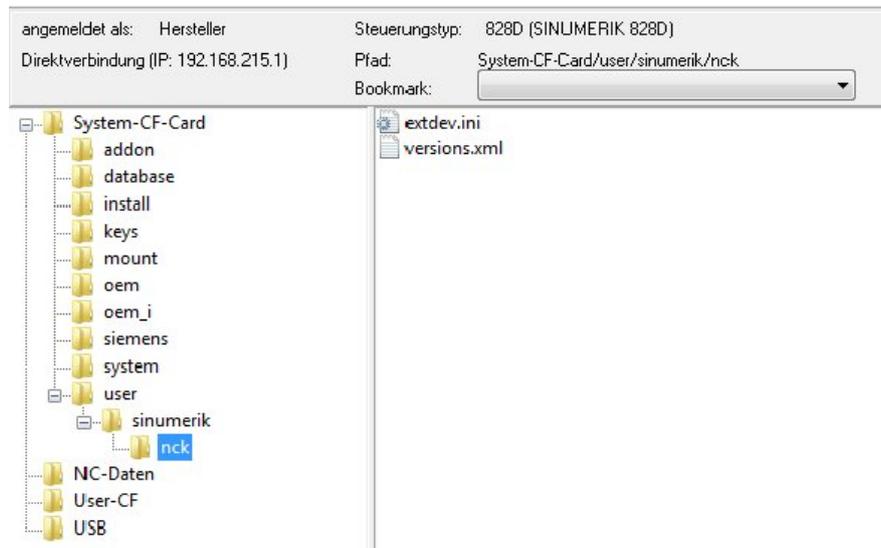
- <ExtG>
 - Symbolic identifier for the external device/file to be closed.
 - The identifier must be identical to the identifier specified in the EXTOPEN command.

3 Example

3.1 Access My Machine

The "Access My Machine" tool (AMM) is provided in the "Toolbox-DVD" provided. As a result of the restricted ability to edit on the control system, we recommend that the required files are externally processed. The AMM tool is opened, and in this case the extdev.ini file must be created in the CF card/user/sinumerik/nck folder (Fig. 3-1).

Fig. 3-1 View of AMM



The extdev.ini file can either be created in the card/oem/sinumerik/nck – or in the /card/user/sinumerik/nck directory of the NCU. If the extdev.ini files exist in both paths, then the user path is the preferred one. The file can be entered in the operating area **Startup** under **System data/ CF card**.

Note

The NCU must be booted with power off/on after the file has been created or modified.

3.1.1 Extdev.ini file

The content of the extdev.ini file is listed below:

```
;Template of configuration file /oem/sinumerik/nck/extdev.ini and
/user/sinumerik/nck/extdev.ini:

;Will apply for NC program commands EXTOPEN/WRITE/EXTCLOSE and
ISOOPEN/ISOPRINT/ISOCLOSE

[ExternalDevice]

/dev/ext/1 = //Auduser%SUNRISE@192.168.214.241/TEST/EXTOPEN/
```

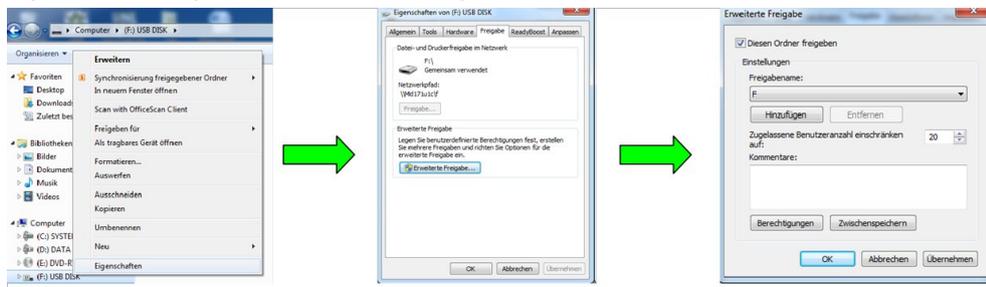
Table 3-1 Explanation of the content of the Extdev.ini file

No.	Parameter	Description
1.	;/dev/ext/1	Definition of the first device
2.	;/Auduser	Login name
3.	;%SUNRISE	Password
4.	@192.168.214.241	IP address of the PCU
5.	;/TEST	Path must be available and released
6.	;/EXTOPEN	A subpath must be available and released

3.1.2 Releasing the folder through Windows

The external device must be released as otherwise the data will not be able to be externally read out. This is realized as follows:

Fig. 3-1 Releasing an external device using Windows

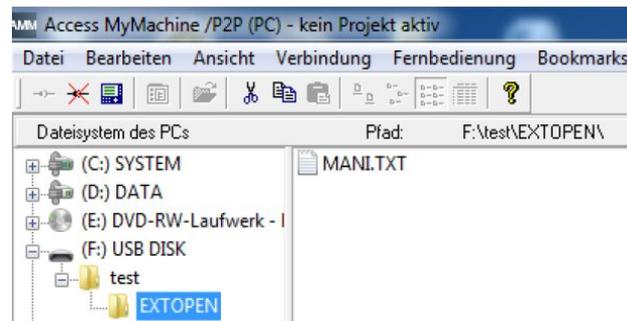


The properties of the external device are selected by pressing the right-hand mouse key in the Windows menu. The external device is released by setting a checkmark under "Share folder" (Fig.3-1).

3.1.3 Creating the EXTOPEN file

After "Selection" and processing the execution program (EXTOPEN.MPF) by pressing the "CYCLE START" button, the designated "hello" text is written to the "MANI.TXT" file

Fig. 3-2 Folder structure of the external device that is used



The content of the EXTOPEN.MPF file is listed below:

```
#####
;Example (remove leading semicolon for activation):/dev/ext/1 =
//Auduser%SUNRISE@192.168.214.241/TEST/EXTOPEN/
#####

N10 DEF INT RESULT
N20 DEF BOOL EXTDEVICE
N30 DEF STRING[200] OUTPUT
N40 DEF INT PHASE
N50 EXTOPEN(RESULT,"/dev/ext/1/test/EXTOPEN/MANI.TXT","SYN","SHARED")
MSG ("Result=" << Result)
M0
N60 IF RESULT > 0
N70 MSG("Error for EXTOPEN:" << RESULT)
N80 ELSE
N90 EXTDEVICE=TRUE
N100 ENDIF

N200 PHASE=4
N210 IF EXTDEVICE
N220 AUSGABE=SPRINT("end phase: %D",PHASE) ;*text
M00

N230 WRITE(RESULT,"/dev/ext/1/test/EXTOPEN/MANI.TXT","Hallo")
MSG("=" <<RESULT)
M00
N240 ENDIF
N250 M30
```

3.2 Using PCU or TCU

PCU is an industrial PC, on which the operating system (Windows), the Sinumerik basis software, Sinumerik 828D/840D sl Operate software, ShopMill/ShopTurn, archives, user files, etc. are located.

The TCU (Thin Client Unit) only serves as the man-machine interface, and has no means of saving data or providing diagnostic functions.

In order to ensure which version of the SINUMERIK control is used, the user himself must define whether it involves a TCU or PCU. The most reliable option to define this is to read out the control version in directory **Diagnostics**.

When using a PCU, while reading out an external device, configuration via the extdev.ini file must be realized. This is not applicable when using a TCU. The most important notes for reading out an external device are listed below.

3.2.1 Local drive

The local CompactFlash card corresponds to the memory, which is referred to from the HMI. The symbolic identifier was defined as LOCAL_DRIVE. Sinumerik 840D sl uses the local drive; however, Sinumerik 828D uses the user CompactFlash card. Both designations essentially refer to the local memory.

Configuration in extdev.ini is not required when using LOCAL_DRIVE. The two devices are always available as soon as the corresponding option (840D sl) is set or the user CompactFlash Card is available (828D). The symbolic identifier functions on the TCU and PCU without any problems.

In order that the symbolic identifier functions, program EXTOPEN.MPF from the actual example must be adapted as follows at the N50 and N230 positions.

```
EXTOPEN(RESULT,"LOCAL_DRIVE/test/MANI.TXT","SYN","SHARED")
WRITE(RESULT,"LOCAL_DRIVE/test/MANI.TXT","Hallo")
```

Preconditions

When reading out the file on LOCAL_DRIVE the following preconditions must be satisfied:

- 828D
 - For SINUMERIK 828D, a user CompactFlash Card must be available, an option is not required here.
- 840D sl
 - For output to the LOCAL_DRIVE device, for SINUMERIK 840D sl option "Additional HMI user memory on the CF card of the NCU" is required (Fig. 3-3).

Fig. 3-3 Setting the license of the additional memory on the CF card of the NCU

Option	gesetzt	lizenziert
Technology function AN84 (reserved) 6FC5800-0AN84-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
Technology function AN85 (reserved) 6FC5800-0AN85-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
Technology function AN86 (reserved) 6FC5800-0AN86-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
Technology function AN87 (reserved) 6FC5800-0AN87-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
Technology function AN88 (reserved) 6FC5800-0AN88-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
Bedienen ohne SINUMERIK OP 6FC5800-0AP00-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
SINUMERIK HMI Kopierlizenz OA 6FC5800-0AP02-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
SINUMERIK HMI Kopierlizenz CE 6FC5800-0AP03-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
programSYNC 6FC5800-0AP05-0YB0	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CCG-Compiler (Nockenschleifen) 6FC5800-0AP10-0YB0	<input type="checkbox"/>	<input type="checkbox"/>
zusätzl. HMI-An.speicher auf CF-Card d.NCU 6FC5800-0AP12-0YB0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3.2.2 USB devices

- For Sinumerik 828D, a USB device at the front panel can be defined as target. The USB device can only be addressed from the part program using a symbolic device identifier `"/dev/ext/x"`. This functions as described above in Chapter 3.1.
- For Sinumerik 840D sl, only statically connected USB interfaces of a TCU can be configured as USB devices. The configuration is realized via **SERVER:/PATH**, whereby **SERVER** stands for the TCU name and **/PATH** designates the USB interface. The USB interfaces of a TCU are addressed using "dev0-0", "dev0-1", "dev1-0". The following examples apply:
 - `/dev/ext/8 = "TCU:/dev0-0, /01/,A"`
 - `/dev/ext/8 = "TCU:/dev0-0, /01/,mydir.dir/"`
 - `/dev/ext/8 = "TCU:/dev0-0, /myfirstpartition/Mydir.dir/myfile.txt,O"`

4 Notes

4.1 Programming commands

4.1.1 EXTOPEN command

- The storage location is the static NC memory. In the case of SINUMERIK 840D sl this is the CompactFlash Card. Compared to the SINUMERIK 840D, this increases the runtime of the WRITE command by approx. 75 ms.
- If a file with the same name exists on the hard disk, it is overwritten after the file is closed (in the NC). The name can be changed in the NC in the "Services" operating area using the "Properties" softkey.

4.1.2 WRITE command

The following points should be noted when specifying the file name:

- The specified file name must not contain any blanks or control characters (characters with ASCII code ≤ 32), otherwise the "WRITE" high-level element outputs error code 1 "Path not allowed".
- The file name can be specified with path data and file identifier:
 - Path data must be absolute, i.e. start with "/". If a path is not specified, the file is saved to the current directory.
 - If the file name does not contain a domain identifier ("_N_"), it is added accordingly. If the fourth from last character of the file name is an underscore "_", the next three characters are interpreted as the file identifier. In order to be able to use the same file name for all file commands, e.g. via a STRING type variable, only the _SPF and _MPF file identifiers must be used. If no _SPF and _MPF identifiers are used. If there is no "_MPF" or "_SPF" identifier, the file name is automatically augmented with _MPF.
- The file name length can be up to 32 bytes, the path length up to 128 bytes.

4.1.3 EXTCLOSE command

The <ERROR> variable in the syntax code of the "WRITE" high-level language element does not generate an NCK alarm. The variable is used for the evaluation in the program for a specific reaction.

The following file identifiers are permitted:

- "_MPF"
- "_SPF"
- "_CYC"

The following characters are permitted in file names:

- 1 to 0
- A to Z
- Underscore “_”

The decimal point and other "special characters" are not permitted in file names. Values from 1 to 16 to read out possible errors are listed in the following.

5 Contact person

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6 History

Table 6-1

Version	Date	Revision
V1.0	07/2014	First Edition