

1.1. Reference Data of Type F1

Reference data are computer data files which represent the total profile in suitable recording medium, a 1,44 MB FD or CD in this case. These data are used to test software by using them as input data into the software.

1.2. Softgauge file format

1.2.1. General

The softgauge file format used in this case is a subset of the softgauge file format specified in ISO 5436-2:2000.

The file extension of this file protocol is `.smd`. The file protocol for the softgauge is divided into four separate sections or records. Each record is composed of lines of information and within each line there are various "fields" in which the information is coded. The file format is in **seven bit ASCII character code**.

Each line is terminated by a carriage return, (`<cr>`), and line feed, (`<lf>`). This is MSDOS typically.

Each record is terminated by an end of record, (`<ASCII 3>`), with a carriage return, (`<cr>`), and line feed, (`<lf>`). The last record is also further terminated by an end of file, (`<ASCII 26>`). For each field the separator is at least one white space.

1.2.2. Record 1 header

The first record contains a fixed header including the following information:

The revision of the softgauge file format.

The file identifier.

The GPS feature type, number and name of the stored feature - axis information.

The number of data points in the profile.

The scaling of the data points.

The resolution of the data points.

The first line of record 1 contains 2 fields:

The_revision_number, and;

File_identifier.

Table 1 contains valid options for these fields.

field name	valid options	type	comments
revision	'ISO 5436 – 2000'	string ASCII	
file identifier	<filename without extender and path>	string ASCII	must be unique

The second line of record 1 contains 3 fields:

Feature_type, and;

Feature_number, and;

Feature_name.

Table 2 contains valid options for these fields.

field name	valid options	type	comments
feature type	'PRF'	string ASCII	only profile data are allowed
feature number	0	unsigned integer	reserved for future use
feature name	'PTB_2d_k' or 'PTB_2d_p'	string ASCII	'PTB_2d_k' is used for cartesian data, 'PTB_2d_p' is used for polar data

Each of the remaining lines of record 1 contains at least 6 fields:

Axis_name, and;
 Axis_type, and;
 Number_of_points, and;
 Units, and;
 Scale_factor, and;
 Axis_data_type.

A seventh field, containing the incremental value is added if the axis type is incremental. Each axis in the softgauge has a line allocated to it. Thus for a profile there will be 2 remaining lines one for the X-axis and one for the Z-axis. Table 3 contains valid options for these fields.

field name	valid options	type	comments
axis name	'CX' 'CZ' 'PR' 'PA'	string ASCII	Cartesian X axis Cartesian Z axis polar Radius polar Angle
axis type	'A' 'I' 'R'	unsigned char	absolute data incremental data relative data
number of points	n	unsigned long integer	number of data points
units	'm' 'mm' 'um' 'nm'	string ASCII	metres millimetres micrometres nanometres
scale factor	normally 1.0e0	double	scale to indicated units (scientific notation)
axis data type	'I' 'L' 'F' 'D'	unsigned char	integer long integer float double
incremental value (axis type I only)		double	value of the increment

Example of record 1:

```
ISO 5436 - 2000<0>RN505<0><cr><lf>
PRF<0> 0 PTB_2d_k<0><cr><lf>
CX<0> A 11200 um<0> 1.0e0 D<cr><lf>
CZ<0> A 11200 nm<0> 1.0e0 D<cr><lf>
<3><cr><lf>
```

1.2.3. Record 2 other Information

The second record may contain some information, some other are mandatory. This information shall start with a keyword. The following list of examples is non-exhaustive and new keywords may be specified and used.

NOTE Information contained in record 2 is intended for information only. However the information may be read and used by computers but it shall be possible to use the data without information from record 2.

Table 4: Examples of keywords in record 2

keyword	type	comments	mandatory
DATE	string ASCII	date of measurement	YES
TIME	string ASCII	time of measurement	no
INSTRUMENT_ID	string ASCII	identification of measuring instrument (manufacturer and model)	no
LAST_CALIBRATION	string ASCII	date and time of last calibration	YES
PROBING_SYSTEM	see table 5	details of the probe used for the measurement	YES
COMMENT	string ASCII (must be delimited by '/' and '*'; C-comment style)		no
OFFSET_mm	double	offset of the start of the measurement in mm from the origin	no
SPEED	double	traverse speed in mm/s	YES
PROFILE_FILTER	see table 6		YES
PARAMETER_VALUE	see table 7		no

Table 5: Fields of PROBING_SYSTEM option of record 2

	PROBING_SYSTEM	
probe identification	string ASCII	identification of probe type
probing_system_type	'contacting' 'non_contacting'	probing system which needs material contact probing system which does not need material contact
tip radius value	double	radius value
units	'm' 'mm' 'um' 'nm'	metres millimetres micrometres nanometres
tip angle	double	angle of the spherical portion of the probe in degrees

Table 6: Fields of FILTER option of record 2

	FILTER	
filter type	'gauss' 'dft' 'fft' '2rc' 'spline' 'motiv'	Type of implementation of ISO 11562:1996 2RC-filter spline-filter motif filter according to ISO 12085:
λ s cutoff value	'Ls' <32>double	Value of λ s in μ m in scientific notation

λc cutoff value	'Lc' <32>double	Value of λc in mm in scientific notation
motif_A	'MA' <32>float	value of A according to ISO 12085
motif_B	'MB' <32>float	value of B according to ISO 12085

Table 7: Fields of PARAMETER_VALUE option of record 2

	PARAMETER_VALUE	
parameter name	string ASCII	Example 'Wq'
parameter value	double	value of the parameter
units	'm' 'mm' 'um' 'nm'	metres millimetres micrometres nanometres
uncertainty	double	uncertainty calculated according to GUM

Example of record 2:

```
DATE 21 November 2000<0><cr><lf>
TIME 11:57 AM <0><cr><lf>
CREATED_BY PTB<0><cr><lf>
INSTRUMENT_ID TEST Type A<0><cr><lf>
INSTRUMENT_SERIAL AAA0001 <0><cr><lf>
LAST_CALIBRATION 1 April 2000 <0><cr><lf>
PROBING_SYSTEM FTK50<0>contacting 2.0 um<0> 90.0<cr><lf>
COMMENT /* This is a comment */<0><cr><lf>
OFFSET<0>1.0 <cr><lf>
SPEED<0>0.5 <cr><lf>
PROFILE_FILTER FFT Ls<32>0.25e+1 Lc<32>0.8e+0<cr><lf>
<3><cr><lf>
```

1.2.4. Record 3 data

The third record contains the data. Each axis, defined in record 1, that is not an incremental axis will require data.

The data in record 3 is written in blocks in the order that the axes are defined in record 1. Each line of record 3 relates to a single data value. It contains 1 field:

Data_value.

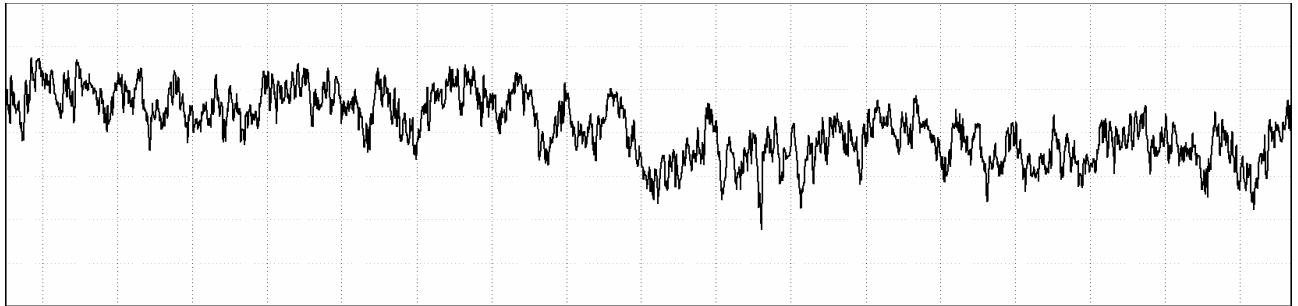
Multiplication of the data value by the scale factor contained in record 1 gives the value in the units specified in record 1.

NOTE The data in record 3 are raw data and have not been adjusted after a calibration.

Example of record 3:

```
0.5<cr><lf>
118.370000<cr><lf>
1.0<cr><lf>
158.865000<cr><lf>
1.5<cr><lf>
171.325000<cr><lf>
.
.
5598.5<cr><lf>
-732.025000<cr><lf>
5599.0<cr><lf>
-747.600000<cr><lf>
5599.5<cr><lf>
-718.007500<cr><lf>
<3><cr><lf>
```

profile unfiltered:



1.2.5. Record 4 checksum

This record contains a checksum for the data contained in records 1, 2 and 3. Checksums are used to maintain data integrity.

The checksum is obtained by summing all the individual bytes (including <cr>, <lf> end of records etc.) values over records 1, 2 and 3 to an unsigned long integer, Modulo 65535.

Example of record 4:

```
23243<cr><lf>
```

```
<3><cr><lf>
```

```
<26>
```