SPECIFICATIONS

SR－09－001EN

SPEC No. EN4964－001C 1/6

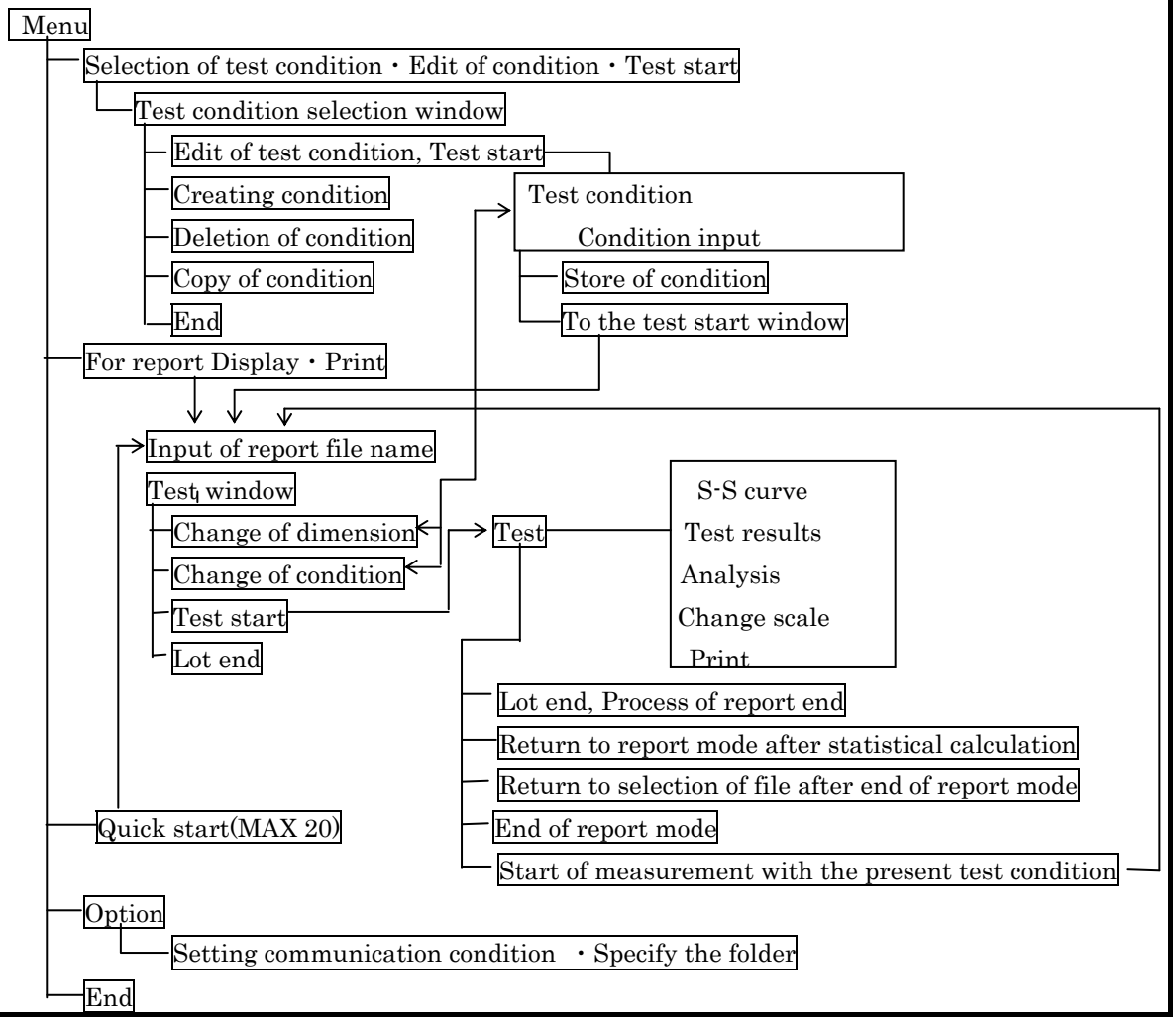
DATA PROCESSOR

1． General

Installed on MinebeaMitsumi's LTS-*NB type testing machine, this data processor performs various kinds of tests according to the test conditions set previously, show the test force-elongation diagrams during the test, and test results of the test force-elongation diagrams can be stored.
Input for test conditions can be available by using a mouse and keyboard.
Selected test conditions can perform various setting for the testing machine through the USB.
During the test, the various calculations capture the data of the test force and position (displacement).
During test (at the time of test end for each sample), analysis can be provide so you can proceed to the test without wasting the samples. In this case, re-calculation can be made (can be selectable) by re-acquired samples on the changed conditions, so you can proceed to the test without wasting the samples.
After the test is over, it's possible for the S-S curves to output into the Windows metafiles, you can make use of them into other application software.
Moreover, analysis can be available on the display of report data.

2． Specifications

2－1 Specifications for software



2－2 Specifications for hardware

When you can supply by customer's side, the following performances should satisfy your Personal computer at least.

*** This software doesn't guarantee the operation with all PC.**

Personal computer

OS：Windows XP , Vista , 7,8,8.1,10 (English Version：32bit,64bit)

CPU：1 GHz or more (recommended)

Minimal operating memory：Windows XP： 512 MB or more (recommended)
Windows Vista,7,8,8.1,10：2.0 GB or more (recommended)

Hard disk：1 GB or more (recommended)

CD-ROM drive：Required at the time of installation.

USB port：Required when connecting USB cable.

Mouse, Keyboard：

Display：Color display with the resolution of 1280×1024 mm is recommended.

Color printer： Required during printing. (Even if not connected, test operation is provided.)

USB cable： The communication cable between the PC and Testing machine.

2－3 Test mode

Standard Single mode：Tension test, Compression test, Bending test（3 points・4 points）

2－4 Process items（Process items can be selectable at the time of output.）

Single Sample No. Automatic from 1 to 50

Elastic modulus Automatic setting：Automatic calculation from the relation of test force and displacement(elongation)

Manual setting：Calculates from setting the 2 points of test force or displacement(elongation)

＊Upper・lower yield point Sets the sensitivity on decreasing test force or increasing test force.

＊Yield strength point

＊Max. test force point

＊Test force point 6 points at max.

＊Test force displacement point 6 points at max. Setting can be made by displacement or elongation.

＊Break point Optional calculation formula

Energy

Optional calculate(16 items at max)

The above formula can be created optionally by using each analysis point, arithmetic operator(+,-,*,/,1/X,X^Y,X^2),optional value, π ,G and arithmetic /trigonometric function（Root,Sin,Cos,Tan,Exp,Log10,LogE）

＊ mark shows the calculation of each point of test force/displacement/stress and elongation.

Statistical process：One (1) lot of Average value/standard deviation(σ_{n-1})/maximum value/minimum value /3 times of standard deviation/maximum value- minimum value/median/average of JIS K6301/coefficient of variation/Σxi/Σxi2 and Number of data.

The item names can be changed optionally for each analysis point above.

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2－5 Data sampling（Data capture）

Capture the data by repeat transmitted and received of data.

Set the sampling cycle. : 50ms, Long term read 100ms, Long term read 250ms, Long term read 500ms, Long term read 1s,Long term read 2s, Long term read 2.5s, Long term read 5s, Long term read 10s

※ You can get up to the maximum 30000 data per one (sample) test.

2－6 Data analysis

・ Test results can be analyzed from the sampling data by the following methods. ・

・ Analysis can be made during testing and also displaying report as well.

(1) Initial point selection (elongation)

There are 3 kinds for obtaining Initial point Selection as follows, and selectable from measuring Conditions. Elongation of each analysis point can be obtained by the initial point as a standard.

Kinds of Initial point selection	Methods
Initial test force point	The point where the test force exceeds the initial test force to be set. (Can be researched from the max. point of direction.)
Regression Point	A point of intersection from the straight line of Elastic Modulus and the displacement axis. But when there is no specified measurement on the Elastic Modulus or the Elastic Modulus can't be measured, this point is considered as the point when the Initial test force point is passed..
Test start point	Initial Point Selection is considered as the Starting Point of Test.

Function of compensation for Deflection

Displacement	Compensates for the gage length and adds the deflection portion to the gage length.

(2) The max. point

The maximum test force point during one test. When the max. test force points exist so many, the maximum displacement point will be considered as the max. point.

(3) Break point

Break point should be decided wherever the first phenomenon is occurred among the 4 items as follows:

① When the Test stop signal is detected.

② When the Test force exceeds the Full scale set value.

③ When the Test force exceeds 7 % of Full scale and then the Test force becomes less than 5 %.

④ When detected with the Detectable Sensitivity.

(Compared to the Test force sampling point just before, prior to the sampling point when the decrease exceeds over the set value.)

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(4) Yield Strength Point

Having the same slope as the straight line to obtain the Elastic Modulus, the Yield Strength Point is decided to be the encountered point with the straight line that passes the Offset point equal to the strain specified from the regression point and S-S curve(Test force-Displacement curve). However, when the measurement on the Elastic Modulus is impossible or the encountered point exceeds the Break point, it is considered as impossible data to measure.

(5) Upper Yield point

When the Test force Sampling value is decreased with the equal value as set value for full scale of test force or the point that exceeds the maximum test force before starting to decrease, it's called as "Upper Yield point". If the phenomenon isn't occurred, it is considered as impossible data to measure.

(6)Lower Yield point

The Lower yield point is considered the minimum test force between the test force drops down after detecting the Upper yield point, and reaches to the same test force as the Upper yield point. When the phenomena isn't occurred, we consider that the data is impossible to measure.

(7) Test force point

Whichever the point of equal to the specified test force or the Displacement data at the point of first increasing sample point is called as the Test force point. However, when the test is completed with less than the specified test force, it is considered as impossible data to measure.

(8) Displacement point

Whichever equal to the specified Displacement or the Test force data at the point of first increasing sample point is called as the Displacement test force.
However, when the test is completed with less than the specified Displacement, it is considered as impossible data to measure. (Maximum 5 points can be specified.)

(9) Inclination of Elastic Modulus

The range from the specified Lower point of measuring Elastic Modulus to the Upper point is divided into 2, and from the 3 zones, that is, the Lower point to the Middle point, the Middle point to the Upper point and the Lower point to the Upper point, their inclinations can be obtained from the differences of Test force and Displacement, then the average of the three data obtained is called as the Elastic Modulus.
It the stored data is out of the measuring range, it is considered as impossible data to measure.

(10) How to obtain average S-S curve

Average S-S curve can be obtained when measurement on one lot is over.(End of the measurement on **n** number (pcs) within a lot) Average S-S curve is the average of calculated test force data from the Initial Test force Point at each test data to the minimum break elongation in the samples selected.

(11) Re-analysis

The data of re-analysis are possible for the following items.

①Elastic Modulus (Re-analyzed straight line of Elastic Modulus, and Yield Stress Point can be re-analyzed.

②Yield strength point

③The maximum point

④Break point

⑤Test force point, displacement point

⑥Upper Yield point

⑦Lower Yield point

Re-analyzed condition can reflect all of the sample data.

(12) Statistic processing items

In the single test, calculation on average･STD deviation(σ_{n-1}) ,Max. value and the min. value per one lot can be made.

(13)Random draw

Both in a lot or in another lot, random graphs from the selected sample data can be drawn.

(14) File output of data

The output to the following file can be provided by the setting with the test condition.

① Outputs the test data to the text file.

② Outputs the graph to the metafile of the Windows.

2－7 Calculation of formula

① Section area Plate ＝ Width×Thickness

Rod ＝ (Diameter^2×π) ／4

Pipe＝ ((Outside diameter^2－Inside diameter^2) ×π) ／4

② Geometrical Moment of Inertia Plate＝ (Width×Thickness^3) ／12

Rod ＝ (Outside diameter^4×π) ／64

Pipe＝ ((Outside diameter^4－Inside diameter^4) ×π) ／64

③ Modulus of section Plate ＝ (Width×Thickness^2) ／6

Rod ＝ (Diameter^3×π) ／32

Pipe＝ ((Outside diameter^4－Inside diameter^4) ×π) ／ (32×outside diameter)

④ Stress

Test kinds

Compression・Tension Test force／Sectional area

3 points bending (Down span×Test force) ／ (Modulus of section×4)

4 points bending (Down span－Up span) ×Test force) ／ (Modulus of section×4)

⑤Elongation

Test kinds

Compression・Tension （Displacement／Gage length）×１００

3 points bending （12×Displacement×Geometrical Moment of Inertia）／（Down span^2×Modulus of section）×100

4 points bending $\dfrac{\text{(Down span－Up span)}\times 12\times\text{Geometrical Moment of Inertia}\times\text{Displacement)}\times 100}{\text{(Down span}^3-3\times\text{Down span}\times\text{Up span}^2+2\times\text{Up span}^3)\times\text{Modulus of Section}}$

⑥The maximum test force The maximum test force

⑦Inclination of Calculation range

Method of least squares

$$y=\alpha+\beta x$$

$$\beta=\sum_{i=1}^{N}(x_i-\overline{x})(y_i-\overline{y})/\sum_{i=1}^{N}(x_i-x)^2$$

$$\alpha=\overline{y}-\beta\overline{x}$$

$$x=\frac{1}{N}\Sigma x_i \text{ 、 } y=\frac{1}{N}\Sigma y_i$$

⑧ Elastic modulus

Test kind

Compression・Tension Gage length／Sectional Area×β

3 point bending Down span^3／（４８×Geometrical Moment of Inertia）×β

4 point bending $\dfrac{\text{Down span}^3-3\times\text{Down span}\times\text{Up span}^2+2\times\text{Up span}^3\times\beta}{48\times\text{Geometrical Moment of Inertia}}$