SPECIFICATIONS

SR－01－001

SPEC.No.EN4943－001D 1/7

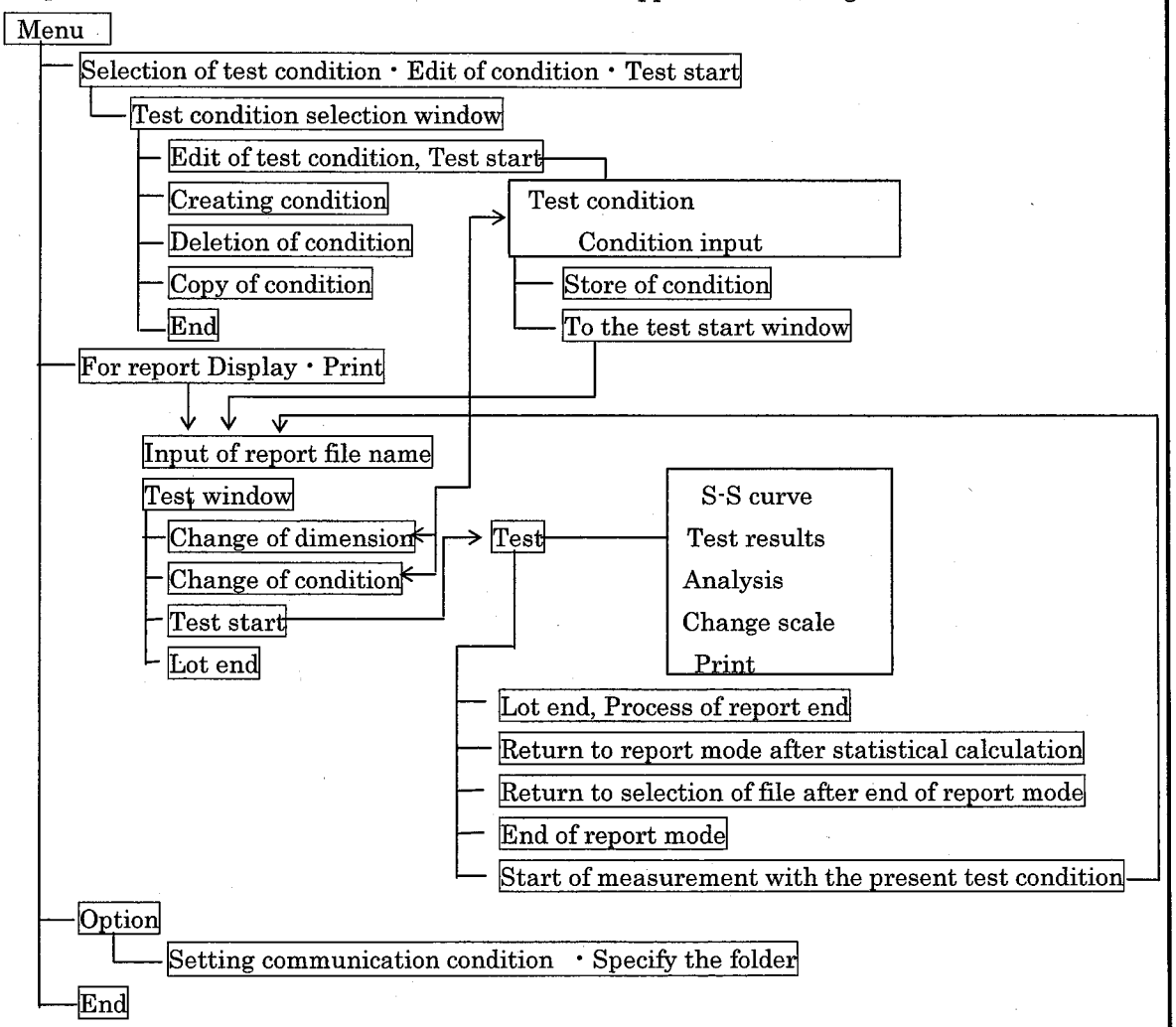
DATA PROCESSOR

1． General

Installed on Minebea's TG type and AL-B type universal testing machine, this Data Processor performs various kinds of tests according to the test conditions set previously, and provides the Test force-Elongation diagrams on the display during the test, and after finishing the test, the Test force-Elongation diagrams and test results can be stored.
Using a mouse and keyboard can input setting the selected test condition.
Selected test conditions can perform various setting for the universal testing machine through the RS-232C. Various kinds of calculations can be made by obtaining the Test force/Position data (displacement). During test (at the time of test end for each sample), analyses can be provided, in due course, test conditions ca be changed according to the results.
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, analyses can be available on the display of report data.

2． Specifications

2－1 Specifications for software **"Wizard method has applied for creating test conditions."**



2－2 Specifications for hardware

The following performances shall be required for your Personal Computer at least..

Personal computer CPU clock frequency : 1 GHz or more

Memory : Windows 2000: Main RAM 256 MB or more,

Windows Xp: Main RAM 512 MB or more

Hard disk : 6.4G or more

CD-ROM : 20 ratio

FDD : 3.5" drive(3 modes)×1

Attached RS-232C port(If not, prepare USB-RSAQ2 (By I/O DATA.)

Display 17" color display possible to show the size of 1024×768 mm

Basic software Japanese (or English) Windows2000,NT,XP (Microsoft) WORD/EXCEL attached. Inform us beforehand, when English Windows is required.

Communication function on the Test machine TG-232C(attached cable)

Printer Resolution : Equal to super 1 200dpi paper : A4～post card size

Others Rack for PC,5口OA tap, mouse pad, printer cable

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 100)

Elastic modulus

(Spring constant) Automatic setting : Automatic calculation from the relation of test force and displacement(elongation)

(3 points at max.) 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. Setting can be made by test force or stress.

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

＊Break point Energy

Optional calculation formula (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) .

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.

Each analysis point in above, its item name can be changed optionally.

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

2－5 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.)

(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 doesn't occurre, 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.

2－6 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)

⑤ Elongation

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

⑥ The maximum test force The maximum test force

⑦ Inclination of Calculation range

Method of least squares

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

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

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

$$x = \frac{1}{N} \Sigma x_i \quad , \quad y = \frac{1}{N} \Sigma y_i$$

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

2 － 7 Optional control program

Since you can describe the contents of Mode, Control and Data processing in every step optionally, optional control and analysis test can be provided

As fore the number of step, up to 100 lines can be made.

(1) Applicable mode

Single, Cycle, Creep, Relaxation and Automatic load

(2) Applicable Control and Processing

	Single	Repeat	Creep	Relaxation	Auto load
・Test speed	○	○	○	○	○
・Upper direction	○	○	○	○	○
・Lower direction	○	○	○	○	○
・Zero return	○	○	○	○	○
・Stop	○	○	○	○	○
・Proportional control factor	×	×	×	×	○
・Integral control factor	×	×	×	×	○
・Auto load for upper limit speed	×	×	×	×	○
・Auto load control time	×	×	×	×	○
・Creep control width	×	×	○	×	×
・Break detection	○	○	○	○	○
・Break sensitivity	○	○	○	○	○
・>=、MAX value	○	○	○	○	○
・<=、MIN value	○	○	×	×	×
・Repeatability start	○	○	○	○	○
・Repeatability end	○	○	○	○	○
・Waiting for key input	○	○	○	○	○
・Time	○	○	○	○	○
・Taking data	○	○	○	○	○
・Analysis process star	○	○	○	○	○
・Analysis process end	○	○	○	○	○
・Raw data clear	○	○	○	○	○
・End of taking raw data	○	○	○	○	○
・Sampling	○	○	○	○	○
・Start of drawing SS data	○	○	○	○	○
・End of drawing SS data	○	○	○	○	○

2 － 8 Zero detection function

At the time of compression test for spring and sponge and so on, the data of height from the Standard surface can be calculated. The standard surface will be the base, but you don't have to contact the base surface and the compression board of load cell, since we have prepared for the Jig for standard height (options).
The jig has the buffer spring in it, so you can set the jig in high speed.