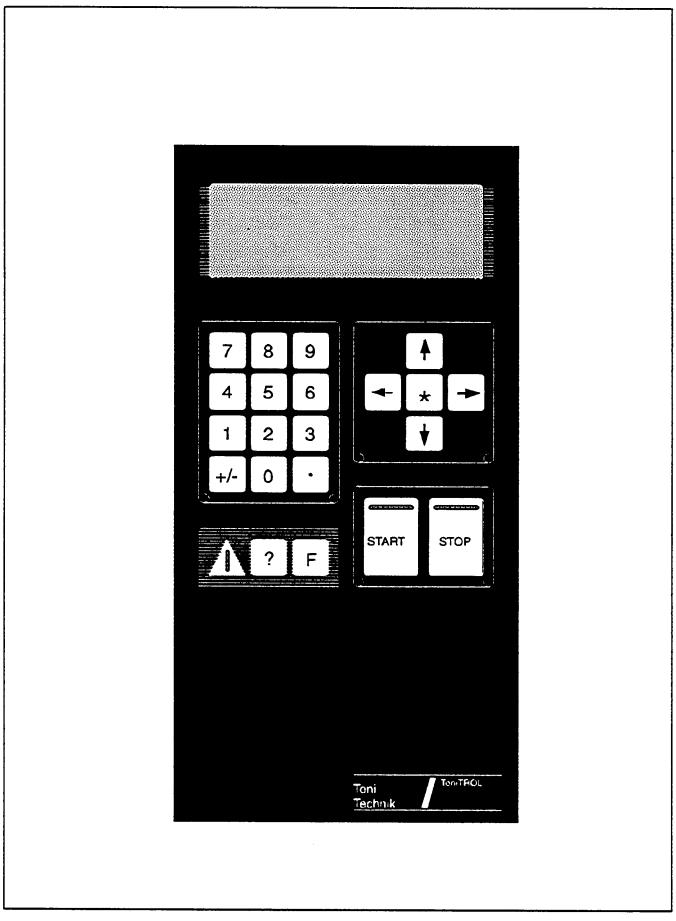
TONITROL

Part 1: User Level Execution Mode



CONTENTS

The Structure of the System Program

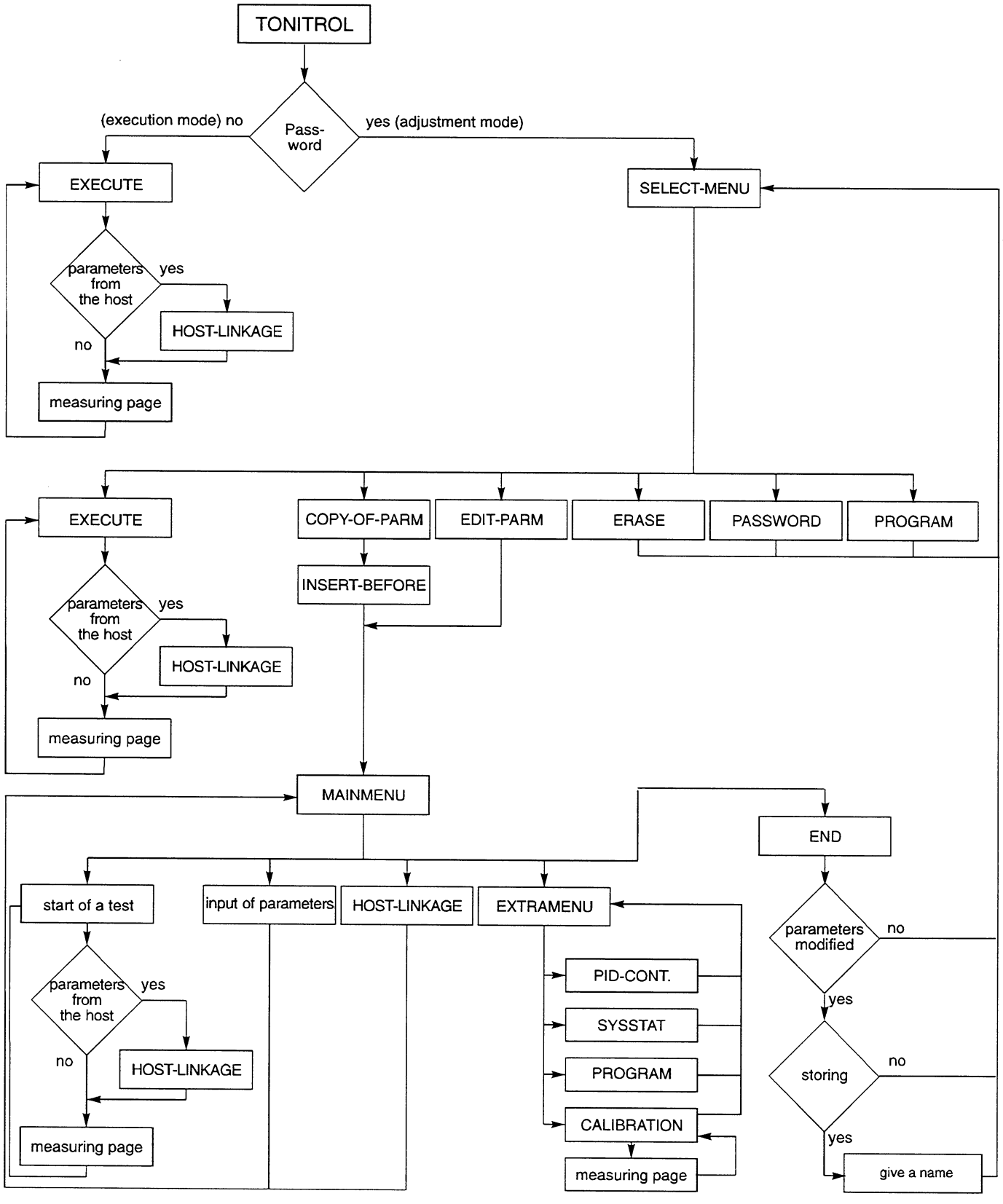


Fig. 47: The structure of the system program

1 INTRODUCTION

The TONITROL controls strength tests of building material at hydraulic test plants and records and evaluates the test results. The TONITROL can be combined with all load frames of Toni Technik; but, in principle, also with load frames of other manufacturers.

Using the TONITROL you are able to programme and automate the test procedures. The device is suitable for controlling of static compression, tensile or bending tests. It automatically controls breaking load tests in dependence on your settings. It is possible to connect up to three load frames to the TONITROL at the same time and control them alternating.

External computers can be connected to the TONITROL. You can use these to document or further process the course and results of tests.

In this manual the functions of the TONITROL are described. You can read here how to work with the TONITROL, but not how to use the load frames or peripheral devices. If you want to read about these, please look into the corresponding documentations.

This manual desrcibes all functions the TONITROL offers in principle. Only the communication between the TONITROL and a connected computer is subject of a separate manual. Please mind that the TONITROL is prepared for all described options, but, normally is not equipped with all of them. The number of functions you really can use depends on the options you ordered.

1.1 Hints for the Manual

In this manual we use the following types of writing:

- Key names are placed in brackets, for example [START].
- Everything you can see at the display is shown in italic letters: messages, menu items, input requests. Two examples: *MAINMENU* or *MORE TESTS*. Terms in italic brackets as *[mm]* are no key names, but part of a displayed message.

1.2 Security Remarks for Handling Hydraulic Test Machines

Caution!

If only two persons together should be able to set the test plant into operation the main switch can be locked by two padlocks. Each authorized person gets one key.

Be careful during the work with the test plant. Consider which forces are acting there: The smallest load frame of the TONIVERSAL series already works with a maximum load of 6 kN. This corresponds to the weight of a small car.

Only place materials in the load frame the machine is designed for! Other materials may damage the pressure areas of the machine.

Center the specimens exactly to the crosshairs on the pressure area.

During the test procedure you have to avoid the danger area between the columns of the load frame! If available use the protection facibilities of the load frame.

2 GENERAL PRODUCT DESCRIPTION

2.1 Application

As basic version the TONITROL is preferably used to perform programmed strength tests on building materials in accordance with standards (load controlled). Software moduls which subsequently can be implied extend the system for ambitious applications with complex test procedures.

2.2 Design

TONITROL is designed as a compact box, which is tiltable mounted in a device support; thus the optimum operating and reading position can be adjusted.

Front panel with four-line LCD display and foil protected keyboard for numeric inputs and function keys.

The system is laid-out for the connection of three load frames as standard. The TONITROL's hardware is prepared for all further extensions. The analogue control unit is monitored and digitally influenced by the processor system. The system program is nonerasable stored at an EPROM. Accumulator supported RAM memory for test parameters defined by the user.

For input and output functions four RS 232 interfaces and one Centronix interface are available.

2.3 Working Principle

2.3.1 Control System

Electronic control with servo valve. Determination of the set value via range generator. The measured value is led back via the transducer.

2.3.2 Operating Soncept

The operation of the system is done by dialog via numeric input keyboard and LCD display.

2.3.3 User Programs

Test procedures in accordance with standards or individual demands were programmed and saved.

After switching-on the machine a list of contents is offered. If a stored test procedure is called up the corresponding test parameters will automatically be allocated to the test.

99 storage locations are available.

2.3.4 Registration of Measured Values

The basic version is designed for three load signals. The additional connection of three path sensors and two deformation sensors is prepared as standard.

2.3.5 Display System

In the basic version the four-line display shows during the test load and pressure or bending stress in real values. With software extensions the display system can be programmed.

The maximum value is stored via fracture detection with programmable sensitivity.

2.3.6 Control Methods

PID control. The basic version is designed for load control only. Control loops for displacement and deformation control are prepared and can be activated with software options.

2.3.7 Test Evaluation

The test results can be transmitted via RS 232 interface to a PC and there evaluated (for this see program TONISOFT 3, model 0510.301).

2.4 Technical Data

Dimensions of the housing – width – depth – height	 mm mm mm	 160 285 315
Weight (net)	kg	11
Device support – width – depth – height	 mm mm mm	 163 250 variable

2.5 Advantages

- Programmable automatic test procedures
- Simple handling by dialog with the display
- Limitation to the essential operational elements
- Integrated software – especially for building material tests
- Storable user programs inclusive "list of contents"
- Connection of peripheric devices via standard interfaces
- Intelligent test evaluation with PC
- No floppy disk drives or harddisks; therefore unsensitive against dust
- Hardware universally prepared
- Extensible with software moduls
- Easy for servicing; all hardware elements can be changed without new calibration

3 SETTING THE TONITROL INTO OPERATION

Switch on the device together with the test plant using the yellow-red main switch.

You can switch off the TONITROL together with the test plant at any time. For this also use the yellow-red main switch.

After you switched on the TONITROL it performs a self-test.

Subsequently the lamp above the [STOP] key lights if the test plant is ready for operation.

After the self-test of the TONITROL you see at the display a page with the header *TONITROL*.

Caution!
Wait 20 to 30 minutes after system initializing before you start a test. After this period the measuring electronics has reached the working temperature. Wait this period every time you switched off the TONITROL for more than 10 minutes. Otherwise, the electronics will warm-up during the test procedure. This can influence measured values and measuring results.

3.1 System Initializing

The TONITROL is a processor controlled system. Every time you switch on the TONITROL the processor sets the system into a defined start behaviour via initializing. For example, it erases the last inputs, reads the set of parameters No 00 and loads the system program from a so-called EPROM into the working storage.

If the processor initialized the system the program page with the title *TONITROL* (fig. 1) will be shown.

```
***** TONITROL *****
Rel 3.02.00-13.01.95
950000 IDENT
0510-0000-1995
```

Fig. 1: The page TONITROL

Below the title you find information about the software you are working with and in line 3 and 4 customer-specific information about your machine configuration.

This information you should know when talking with Toni Technik about your test plant.

3.2 Structure of the Program Pages

The surface of the system program is designed like a book. You can read there or make entries. Therefore, in this manual we call the program screens "pages". If you turn from one program screen to another we correspondingly say "leaf through" or "turn to". Some pages have more than four lines. In figure 2 you can see how this is shown in this manual. If you turn to a page you see the marked display. Press the keys [↓] and [↑] to roll the text through the display.

```
***** MAINMENU *****
DIN 1048 Wuerfel 20
  START TEST
 *PARAMETER-INPUT

  HOST-LINKAGE
  EXTRA-FUNCTIONS
  END
```

Fig. 2: The main menu

Certain pages we call menus. These pages offer a list of menu items you can select.

An overview over the structure of the system program you will find in the appendix.

Pages and menus of the system program have the same structure. Look at the page *MAINMENU*.

In the header you see the title *MAINMENU*.

Below the header the main part of the communication with the TONITROL will take place. In the *MAINMENU* you will see in the first line the name of the selected test procedure: *DIN 1048 Wuerfel 20*. On other pages you can define test parameters or read test results.

3.3 The Keyboard

At the key area of the TONITROL's front panel you find the keys available for the communication with the TONITROL (see fig. 3). The keys are hidden behind a lettered foil.

The numeric keyboard serves for entering parameters.

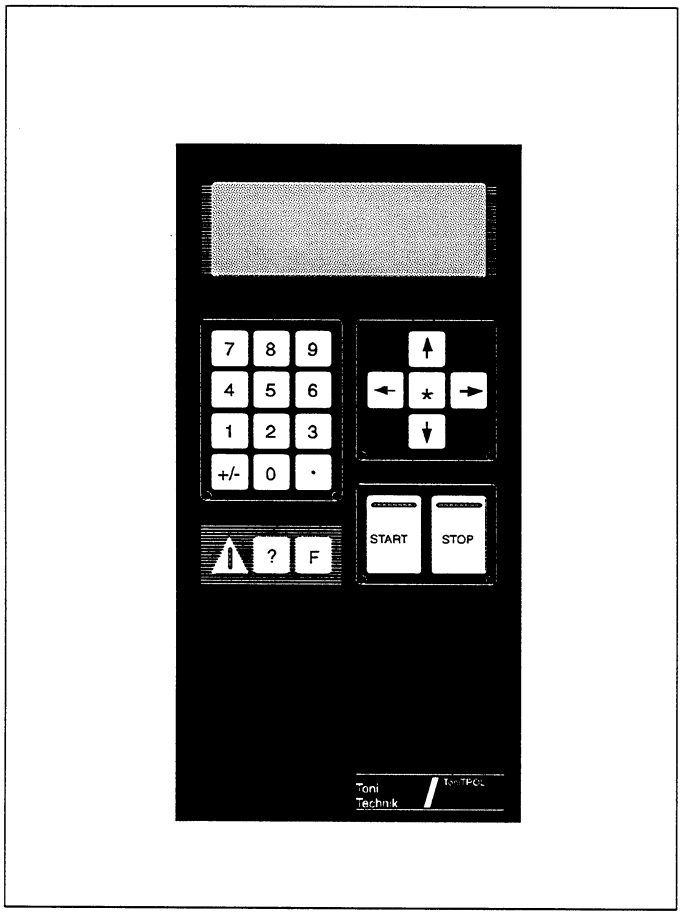


Fig. 3: The front panel

Use [*], [↑] or [↓] to select a menu item. The cursor (*) at the screen marks the actually selected menu item.

Every time you press [*] the cursor moves down one line. If you use [↑] or [↓] the cursor moves in the corresponding direction. Is the cursor placed at the last line of the menu and you press [↓] it moves back to the first line, is it placed at the first line and you press [↑] it moves to the last line.

With the keys [←] and [→] you can move the cursor within an input array.

The key [F] serves for special functions, i.e. to give identifiers for the tests.

The key [?] actually has a function in the adjustment mode only.

Use [START] to confirm or store the selections at the actual page and turn to the next one. Also you have to use it for starting a test. With [STOP] you interrupt procedures or turn to the previous page without storing the selections.

3.4 User Levels of the Tonitrol

The TONITROL offers two different user levels:

- The execution mode

  allows to select a test procedure from the list and perform it.

- The adjustment mode

  allows to create, modify, store or erase test procedures and to call up special functions

You will get access to the adjustment mode if you enter [*] and a password after switching on the machine.

Press any other key to start the execution mode.

4 TEST PERFORMANCE

Test performance is possible in the execution mode as well as in the adjustment mode.

You are not able to work in the execution mode, if not at least one test procedure is stored. Otherwise, the TONITROL will show you the page *MAINMENU* (see fig. 19) where you have to define a test procedure via *Parameter-Input* (see chapter 7.6).

4.1 Switching On

Switch on the TONITROL via the main switch. After the self-test the TONITROL shows the system page *TONITROL* (see fig. 1).

Press [START]. Now you see the menu *EXECUTE*.

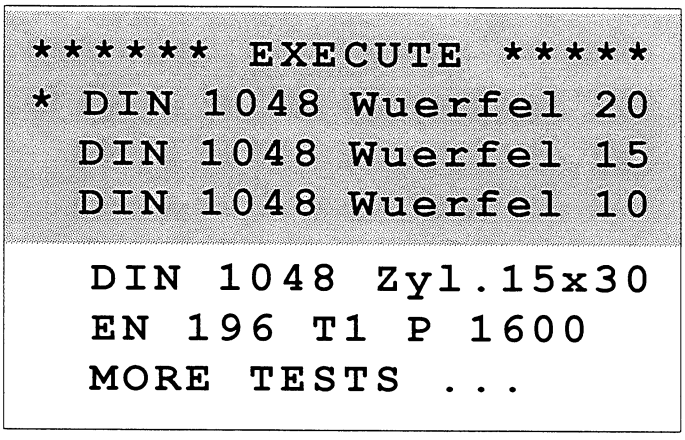


Fig. 4: The page EXECUTE

4.2 Selection

Here all stored test procedures are listed. Mark the desired test using [↑] or [↓] and press [START] to prepare the test performance.

If you do not see the desired test on this page select the item *MORE TESTS* in the last line and press [START] to turn to the next page. With [STOP] you can turn back again.

4.3 Performance

Normally all test parameters are stored in the TONITROL. If an external computer is connected you have the possibility to transmit several or all parameters from this computer. In this case you will first see the page *HOST-LINKAGE* (fig. 33) until the TONITROL received the parameters correctly. After this you can continue the work with the TONITROL.

With the TONITROL it is possible to define tests where certain parameters are entered by the operator prior to the test. If you selected such a test you will see these parameters with their presettings after pressing [START]. With the keys [↑] and [↓] to move from parameter, do your selection with the key [*] or enter the value via the numeric keys.

After all parameters are set correctly, press [START]. The page "specimens data" appears.

4.3.1 The Page "Specimen's Data"

On this page you see pre-defined dimensions (for cubes: length *l*, width *b* and height *h*; for cylinders: diameter *d* and height *h*), the weight and the identifier of the specimen. Use the numeric keyboard to modify these values. Move the cursor with the arrow keys to the corresponding place.

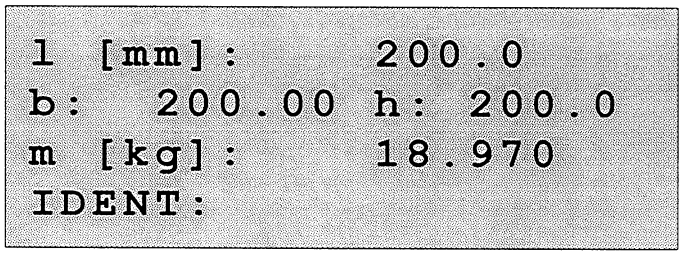


Fig. 5: The page "specimen's data"

For *IDENT* you also can enter letters. If available use the additional PC keyboard. Otherwise you can select letters if you hold down the key [F] and press [←] or [→]. Each pressing varies the character in increasing or decreasing order. All capital and small letters from A to Z and a number of special characters are available.

If an automatic measuring and weighing station is connected the TONITROL waits for transmission of the value when the cursor is placed in the corresponding array. After receiption of the value the cursor automatically moves to the next array.

After you checked and (if necessary) corrected the specimen's data, press [START] to turn to the measuring page.

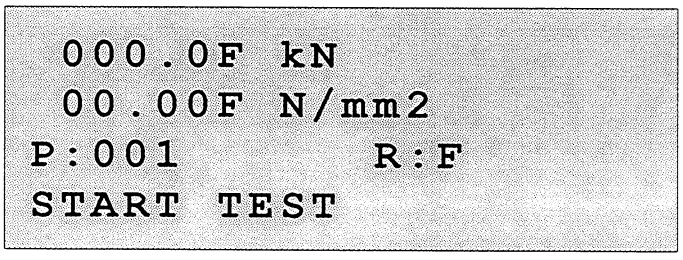


Fig. 6: The measuring page before start of test

4.3.2 The Measuring Page

On this page you see two displays for the measuring values.

If the displayedload differs from zero press [0] to counterbalance it.

In the third line you see the number of the specimen within the test series (*P: 001*) and the control variable (*R:F*). The following control variables are possible:

- *F* = load
- *S* = displacement
- *E* = elongation

Below this you read *START TEST*. This indicates that the test system is in start position.

4.3.3 Preparation of the Test

Before starting a test prepare the load frame. For details read the corresponding manual.

Clean the pressure plates and place the specimen in the test room.

Caution!
Center the specimen exactly on the crosshairs of the pressure area!

Now position the piston of the load frame. For the distance between specimen and pressure area mind: On the one hand, you should be able to place and replace the specimen without effort; on the other hand the distance the piston has to move until frictional connection should not be too large.

Move the piston with [↑] and [↓] up and down. Press [←] and [→] to move the piston in smaller steps. These keys serve for precise adjustment.

Caution!
Close the test room protection before starting the test.

4.3.3.1 Special Features for Tests of Young's Modulus

For these tests you have to mount an extensiometer before placing the specimen in the test room. Connect the plug of the extensiometer with the pre-amplifier and the plug of the pre-amplifier with the sockets E1/E2 at the rear front of the TONITROL (see fig. 42 in the appendix).

After placing the specimen loosen the stop lever at the extensiometer. Adjust the value *.0000* in the measuring array using the potentiometer at the pre-amplifier. Then arrest the potentiometer.

4.3.4 The Test

Press [START] to start the test.

Caution!
If you want to interrupt a procedure which is controlled by the TONITROL at once, use the yellow-red main switch. This switch serves as an emergency switch. The key [STOP] at the TONITROL's keyboard has no security function!

The lamps in the array [STOP] are extinguished, those in the array [START] light up. On the measuring page the fourth line is extinguished. Besides the control variable the phase of the test is indicated. The following phases can be indicated:

- *POSIT*
  Before or after a test the piston of the test machine is positioned and did not yet reach the desired adjustment.
- *F0*
  The machine calibrates the load measuring system to zero.
- *FC*
  The machine moves to friction connection. This means that the specimen is clamped in the test room.
- *RAMP*
  The machine increases or decreases the load.
- *STOP*
  The machine holds the load constant.
- *END*
  The test is finished.

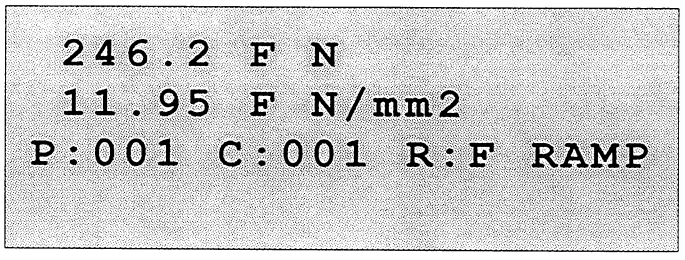


Fig. 7: The measuring page during the test

Subsequently the TONITROL drives the piston in the load frame to friction connection (*FC*). When the machine recognizes the friction connection, the indication changes to

RAMP. Now the piston will act to the specimen with the defined load.

If you perform a cyclic test you will also see the number of the actual cycle.

The program system documents in the digital displays continuously the value of the load the specimen is stressed with.

As long as *RAMP* is indicated the loading or deloading procedure can be interrupted by pressing the key [*]. Then the machine holds the load constant until the next pressing of [*].

4.3.4.1 Special Features for Tests of Young's Modulus

If the second cycle is finished the load F2 acts to the specimen for 30 seconds. At the end of this stop period the TONITROL indicates the actual values for load and elongation in the right displays. In the left displays it shows the development of these values during the further test process.

Now the TONITROL increases the load continuously up to the value F1 and holds this for 30 seconds. At the end of this stop period the system evaluates the actual load value and the value for elongation from the extensiometer and calculates the Young's modulus with the following equation:

$$\frac{FT1-FT2}{ET1-ET2}$$

Read the value at the measuring page and write it in your report.

In the footer you see the message *[START]-GO TO FRACT.*

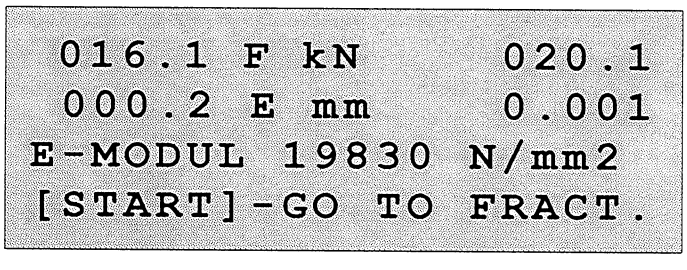


Fig. 8: The measuring page at the test of Young's modulus

Caution:
Now you have to remove the extensiometer! Otherwise, this device could be destroyed.

If you use an extensiometer with locking stay bars you can remove it in loaded behaviour. Subsequently continue the test with [START].

To remove another version of extensiometers you first have to deload the specimen. Therefore, press [STOP]. The TONITROL deloads the specimen and you can remove the extensiometer. In the footer you see the message *[START]-GO TO FRACT* again.

The further test procedure is the same for both types of extensiometers. Press [START]. The TONITROL increases the load in the load frame continuously until it recognizes the fracture of the specimen or reaches the maximum load value F3.

4.3.4.2 Special Features for Tests of Young's Modulus in compliance with ISO 6784 or Austrian Standard B3303

First the load will be increased up to the load value F1. Check after the stop period whether the single values differ more than ± 20 % from the common average. In this case terminate the test with [STOP]. Otherwise, the deloading procedure down to the load F2 will follow.

If the cycles are finished this load acts to the specimen for 60 seconds. At the end of the stop period the TONITROL indicates in the right displays the actual values of load and elongation. In the left displays it shows the development of these values during the further test procedure.

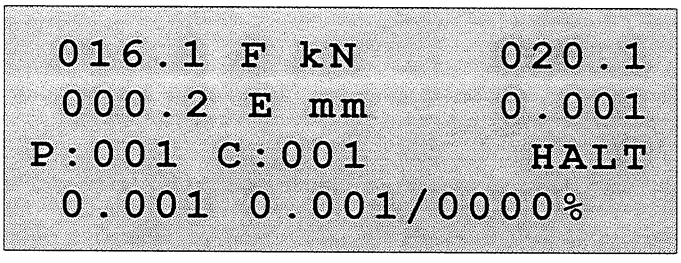


Fig. 9: The measuring page at the test of Young's modulus in compliance with ISO 6784 or Austrian Standard B3303

Now the TONITROL increases the load continuously to the value F1 and holds this for 60 seconds. The further test procedure is identically with section 4.3.4.1.

4.3.4.3 Special Features for the Test "Special"

With respect to the value of the piston path S[mm] mind the following: If the test frame reached the load F1 the TONITROL sets the indicated value for the piston path to "0". Subsequently the actual piston path will be indicated. When the load value F2 is reached, the values are taken from the left to the right displays. Thus, you read there the piston path between F1 and F2 and the load value F2.

4.3.4.4 Special Features for the Test "Steps"

During the stop period the message *[START]-NEXT STEP* appears. You can finish the stop period at any time pres-

sing [START]. In this case the next ramp will be started at once.

4.4 End of Test

If the system detects the fracture of the specimen the piston of the load frame moves down below the point of fracture detection. The lamps in the array [START] are extinguished, the lamps in the array [STOP] light up. In the last line of the screen you read the message *FRACTURE DETECTED*. The indications show the maximal value of load and strength. Write these values in your report. Mind that the values for the strength are calculated from the maximum load and the test area of the specimen.

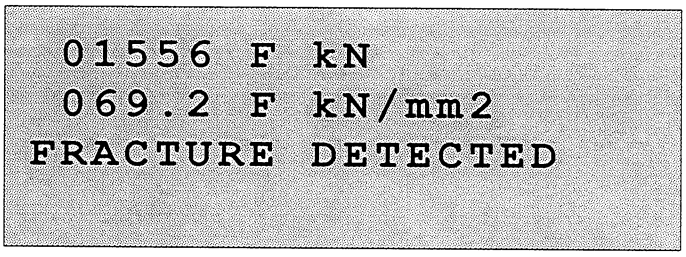


Fig. 10: The measuring page after fracture detection

Recognizes the TONITROL a fracture of specimen too early it switches off without stressing the specimen with the maximum load. You are able to cancel the test results by simultaneoulsy pressing the keys [F] and [1].

There is a possibility to define tests with manual fracture detection. In this case you have to enter the fracture of the specimen by pressing [STOP].

Caution!
If the fracture detection of the TONITROL is switched off or selected "manually" the danger exists that the pressure devices will be destroyed or the specimen is loaded until explosion. Pay highest attention to the processes in the test room.

If a limit value is reached for the control values load, displacement or elongation the TONITROL also finishes the test. You get the message *TEST FINISHED*. The load indications are set to "0". On the right you see the reached maximum values.

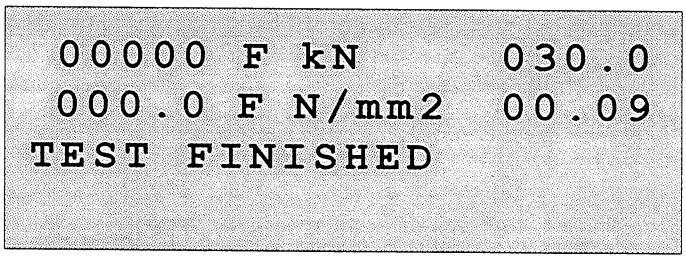


Fig. 11: The measuring page after specimen's fracture

If your TONITROL is not connected to an external computer or the function "record results" is switched off for this test you have to note down the test results or print a test report.

Replace the tested specimen by the next one. Clean the pressure plates in the test frame.

Press [START] to set the test plant into start position again.

If you want to test another type of specimen or switch off the machine press [STOP].

4.4 Termination of a Test

You can terminate a test at every time using the key [STOP].

In this case the message *TEST INTERRUPTED* is shown and you see the reached maximum values right from the displays for the measuring values.

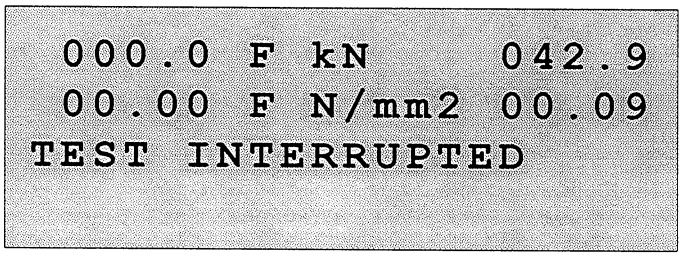


Fig. 12: The measuring page after termination of a test

With [STOP] you turn back to the page *EXECUTE*.

5 ERROR MESSAGES – HELP AT PROBLEMS

If you cannot solve problems with the TONITROL by yourself, please call Toni Technik or the service.

Before calling look at the diplays of the page *TONITROL* (see fig. 1). This information you should know when talking with Toni Technik about your test plant.

5.1 The System Program "Hangs" after End of Test

For the test or the series of tests you performed, the printing of a test report is destined.

Check whether a printer is connected (socket LPT1 at the rear side of the TONITROL) and whether it is switched on and filled with paper.

If no printer is available you have to re-start the TONITROL by switching off and on.

5.2 Error Message: memory full

You performed several tests which results were stored at the TONITROL.

Now the file TP.RES containing these results is too large for the TONITROL's memory. If you want to store the results, take care that this file will be called-up and erased by the PC. For this you can use the PC-program GETRES.

If you do not need the results furthermore, you are able to delete them in the adjustment mode (see chapter 7.3).

5.3 Error: Interr.missing

This indicates a hardware error in the TONITROL. Please, contact Toni Technik.

5.4 Error Message: STOP – MAX. STROKE

You moved the piston out too far. Refer to the corresponding manual of the load frame to solve the problem.

5.5 Error Message: STOP – OIL TEMP.

You did tests over a long period. The oil reached a critical temperature.

Switch off the machine and wait until the oil is cooled down.

5.6 Error Message: STOP – PUMPERROR

This error message is caused by your control unit. Refer to the corresponding manual to solve the problem.

5.7 Error Message: CROSSHEAD NOT FIXED

You performed a crosshead adjustment. Until now the crosshead is not clamped fixely again. Wait some minutes and try again.

5.8 The Specimen's Fracture is Detected Too Early

This can have the following reasons: 1. dirty pressure plates in the test frame, 2. not correctly prepared specimens, or 3. unfit values for fracture detection in the program.

If smallest parts between specimen and pressure plates break during a test it can happen that the TONITROL first indicates the fracture of these parts. To avoid this indication error clean the pressure plates thoroughly before each test.

When you prepare the specimens always remove all mould marks. The fracture of such fine raised parts will falsify the measuring results.

A too low value in the array *FRCONST* on the page *PARAMATER-2* will cause that the TONITROL indicates the specimen's fracture if the control value decreases a little. If the specimen is not really cracked this indication may result from minimal material displacements. Another possible reason are shocks in the area of the test room. To avoid such wrong indications enter a little higher value in the array *FRCONST*.

A fracture detection not typical for the specimen's material can be caused by oscillation of the control loop. For this read section 8.5.

To cancel an incorrect test result press the keys [F] and [1] simultaneously.

5.9 Nothing Happens after Switching On

The display remains dark and no self-test is performed.

1. Check whether the switch at the rear side of the TONITROL is switched on.

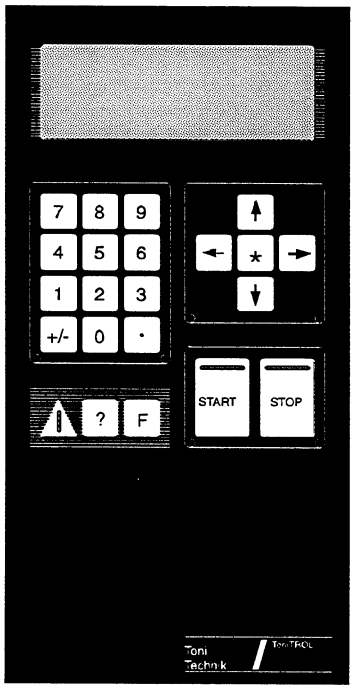
Caution!
Swith off the mains supply and pull out the mains plug before opening the TONITROL's housing or the contactor box!

2. Subsequently check the fuse for the voltage supply of the TONITROL's processor part. If necessary, replace it (see fig. 42, rear panel of the TONITROL).

3. Check whether LED D5 lights. If not, probably the 230 V-supply is missing. Ask your electrician to check the fuses in the contactor box.

TONITROL

Part 2: User Level Adjustment Mode



CONTENTS

APPENDIX

6 HINTS

This part of the manual is only prepared for personnel authorized to make adjustments and modifications of test parameters.

Caution!
The intensive knowledge of part 1 is a presumption for working with this part of the manual.

As you learned in part 1 at the user level "execution mode" the user has no possibility to check the adjustments of the parameters himself. On the other hand, it is necessary to know certain adjustments when working with the TONITROL. Therefore, the user needs clear and comprehensible names for the different test procedures. Above this, it will be helpful to document the stored test procedure, to i.e. have information about the used machine, the print of a test report, storing of measuring results etc.

In the appendix you will find an example for a form which you can use for those purposes. The bold marked information are urgently needed to work in the execution mode.

7 ADJUSTMENTS OF TESTS

To guarantee that only authorized operators are able to adjust test parameters this function is protected by a pass number.

If you want to work in the adjustment mode, swith off the TONITROL with the yellow-red main switch or the switch at the rear side of the TONITROL and switch on again.

After the self-test the device shows the system page *TONITROL* (see fig. 1).

Press [*]. The page *SETUP-MODE* appears.

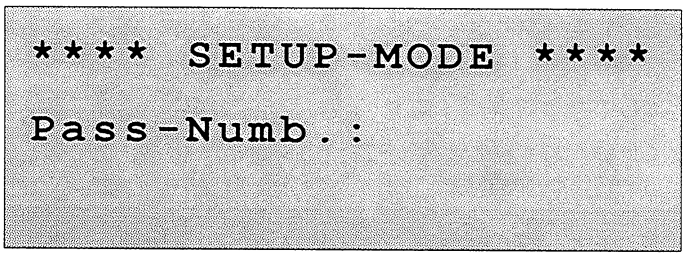


Fig. 13: The page SETUP-MODE

Enter the maximum 4 digits of the pass number and press [START]. Now you see the *SELECT-MENU*

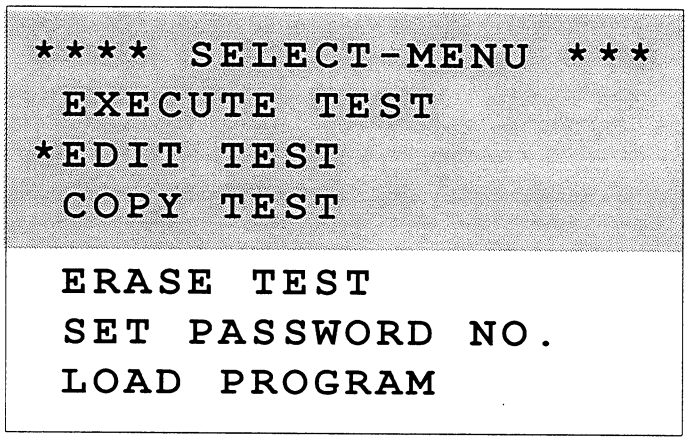


Fig. 14: The page SELECT-MENU

Use the keys [↑] and [↓] to mark the desired action and press [START].

7.1 Executing Tests

After you called up the menu item *EXECUTE TEST* the page *EXECUTE* will appear (see fig. 4). For performance of tests read sections 4.2 ff.

Press [STOP] to turn back to the *SELECT-MENU*.

7.2 Copying Tests

If you start this menu item the list of available test procedures will be shown (fig. 15).

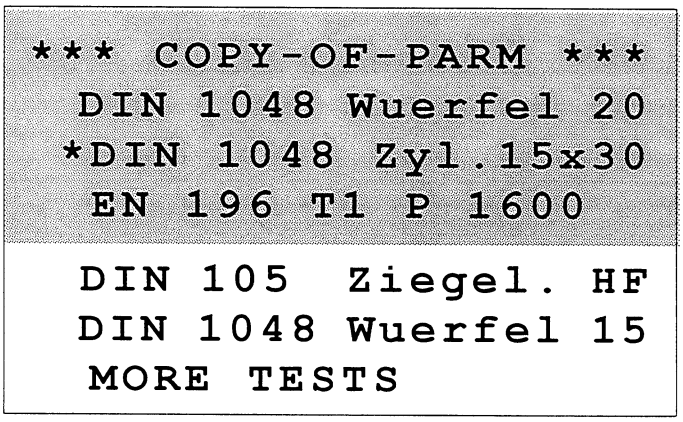


Bild 15: The page COPY-OF-PARM

Use the keys [↑] and [↓] to select the test you want to copy and press [START]. The page *INSERT-BEFORE* is shown (fig. 16).

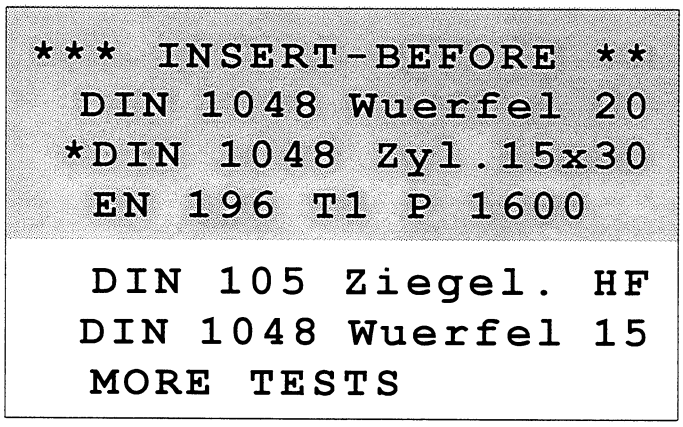


Fig. 16: The page INSERT-BEFORE

Move the cursor (*) to the place the copy should be inserted before and press [START]. Now the page *MAINMENU* (see fig. 19) is automatically called up. There you can modify the parameters. For this see the description in chapter 7.6.

If you changed the parameters you can exchange the "info" text of this test after terminating the program (see section 7.11)

7.3 Erasing Tests

After calling up the list of tests is shown.

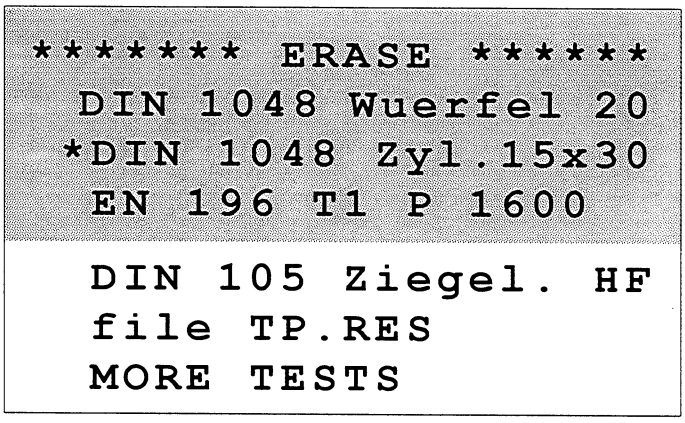


Fig. 17: The page ERASE

The line *file TP.RES* appears if you performed tests with saving their results. Here you are able to erase this file (i.e. if the TONITROL's memory is full, see section 5.2) without using an external computer.

Use the keys [↑] and [↓] to mark the desired test and press [START].

Caution:
The selected test will be erased without warning.

Press [STOP] to turn back to the *SELECT-MENU.*

7.4 Shifting Tests

The functions *COPY-OF-PARM* and *ERASE* can be used for varying the order of the tests on the page *EXECUTE.*

Copy the test you want to move and position it at the desired place. Call-up *PARAMETER-INPUT* and press [START] to turn through the pages. Call up *END* and confirm with [START] without changing the info text.

Do not forget to erase the original set of parameters to avoid confusion.

7.5 Editing/Adjusting Tests

Use this function to adjust or modify tests. After selection of this menu item and pressing [START] the page *EDIT-PARM* is shown (fig. 18).

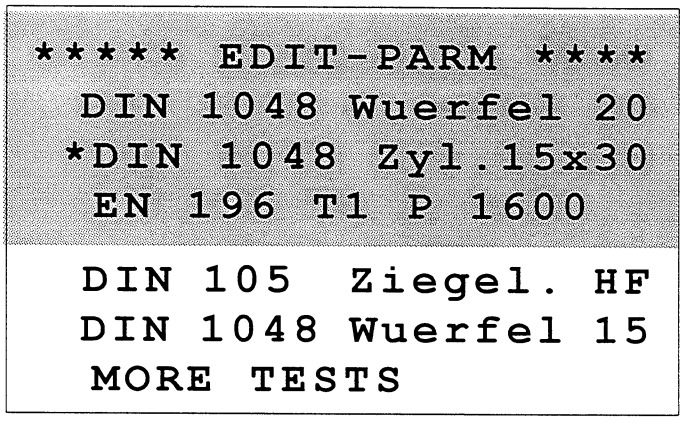


Fig. 18: The page EDIT-PARM

Use the keys [↑] and [↓] to select a test and confirm with [START]. Now automatically the page *MAINMENU* will be called up (fig. 19).

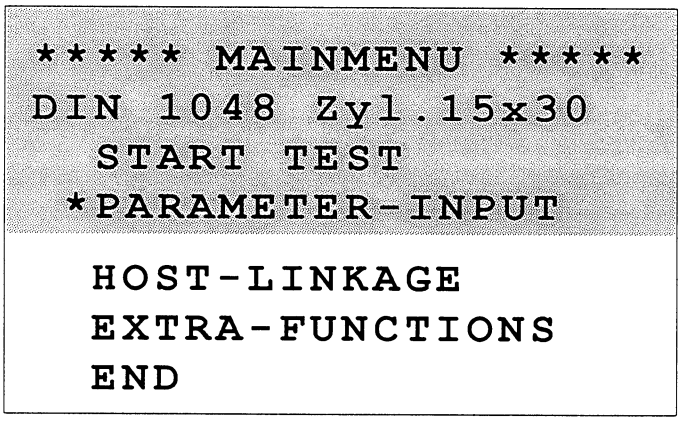


Fig. 19: The main menu

Below the header you see the name of the selected test. Select *PARAMETER-INPUT.*

7.6 Input of Parameters

Select the menu item *PARAMETER-INPUT* and press [START] to turn to the page *PARAMETER* (fig. 20).

Move the cursor using the keys [↓] and [↑]. The array the cursor is actually placed, is blinking. The selection within an array is done with the keys [*] or [←] and [→]. Via these keys you take all available elements into the array one after the other. Numeric values were entered via the numeric keyboard.

For some tests it is to modify single parameters in the execution mode (i.e. upper loads at the test of Young's modulus). To allow this setting press [?] when the cursor is on the corresponding parameter. Before test performance, this parameter will appear at the monitor before start of test procedure with the value you enter. It can be modified by the operator. During editing you will hear a beep if you select such a parameter. Press [?] again to make the parameter constant again. All parametes on the pages

PARAMETER, *PARAMETER-1*, *PARAMETER-2*, *PRTPARM*, *PRTPARM1* and *PRTPARM2* can be made accessable for the operator.

```
**** PARAMETER *****
SIMULATION:  OFF
AUTOZERO:    F/E
PRINTER:     OFF
ELONG.CHAN:  E1/E2
SENSOR I:    0.000  mm
REF.LENGTH:  002.0  mm
SENSOR II:   0.000  mm
REF.LENGTH:  001.0  mm
REC.RESULT:  OFF
MEASUREROW:  A. START
RATE:        00.040 s
REC.RESULT:  OFF
READINGS:    -F------
HOST-PARAM:  NO
```

Fig. 20: The page PARAMETER

At the page *PARAMETER* you can do the following adjustments:

- *SIMULATION: ON / OFF*

  If you select *ON* you can observe the test procedure in the displays of the measuring page without having a real test frame in operation.

- *AUTOZERO: F / E / F/E / ---*

  If you select *F* the TONITROL automatically performs a nullification of the load measuring system at the begin of a test. This procedure guarantees a high measurement quality, also the warming up phase of the TONITROL was not considered (see also chapter 3).

  Use the parameter *E* to set the elongation channels to zero at friction connection.

  If you select *F/E* a nullification of the load measuring system as well as the elongation channels will be done.

  With --- you switch off the automatism. You can perform a manually nullification if you press [0] before starting the test.

  The automatic nullification of the load (F) takes 2 to 3 seconds per test. This procedure will delay the test procedure correspondingly. Therefore, it can be meaningful to switch off the automatism when testing many specimens. But, in this case, the laboratory assistant should orderly check the zero point and perform a nullification if necessary.

- *PRINTER: RAWDATA / PROTOC. / OFF*

  With *RAWDATA* you print the results of each test in one line. Hereby no evaluations (as i.e. average) are possible.

  With the selection *PROTOC.* you get a printed test report.

  If you select *RAWDATA* or *PROTOC.* in this array you are not able to work with the TONITROL after the end of a test until the printer has finished the report. Is no printer connected or the printer is not switched on, the system program waits after the end of the test until you switch on the printer. If no printer is available, you have to switch off and on the TONITROL.

- *ELONG.CHAN: E1 / E2 / E1/E2 / Em / ---*

  You will see this array only if your test plant is prepared for at least one extensiometer.

  Is the machine prepared for one extensiometer the value of this array is *E1* and cannot be changed. If two extensiometers are provided you can select between *E1, E2, E1/E2* and *Em*.

  If you select *E1* the extensiometer has to be connected to socket E1. Is it connected to socket E2 you have to select *E2*.

  For tests of Young's modulus in compliance with ISO 6784 or Austrian Standard B3303 both extensiometers have to be connected and you have to select *Em*. In this case the average of both elongation channels will be shown. Additionally, you will see the both single values and their difference to the average in the last line of the measuring page.

  Select the parameter *E1/E2* if you connect two external measuring channels. For the grouping of the connection cables see the appendix.

  With --- you switch off the elongation channels.

- *ELONG.LEN:*

  You will see this array only if you selected *E1*, *E1/E2* or *Em* for *ELONG.CHAN*. Enter here the length in mm where the connected extensiometer has an output voltage of 10 V.

- *SENSOR II:*

You will see this array only if you selected *E2* or *E1/E2* for ELONG.CHAN. Enter here the length in mm where the conntected extensiometer has an output voltage of 10 v:

- *REF.LENGTH:*

  This array exists for each sensor.

  Values for the elongation of a specimen are only useful in relation to the measuring length of the extensiometer.

  If you enter the value 0 the dimensional unit for E during the test preparation and performance is mm. If you enter a value > 0 the TONITROL will show the elongation values in %. These values define the proportion between the elongation and the measuring length of the extensiometer.

- *REC.RESULT: OFF / HOST / STORE*

  You will see this array only if your TONITROL is equipped for communication with an external computer.

  If *OFF* is selected the TONITROL will not store the test results. You have to note down or print them.

  If you select *STORE* the TONITROL creates the file TP.RES where it records continuously all test results. This file can be read from an external computer for further processing. It has to be explicitely erased. Otherwise after some time the RAM memory is full and the error message *memory full* will be shown.

  For the selection *HOST* it is necessary that the TONITROL is connected to an external computer. After each test series the TONITROL automatically will send the file TP.RES to this computer. After successful transmission it will erase the file in the own memory.

- *MEASURE ROW: OFF / A.START / ALWAYS / ACT.TEST*

  You will see the array *MEASUREROW* only if the TONITROL is equipped for communication with an external computer.

  With *OFF* no data will be sent to the computer.

  If you select *A.START* the TONITROL will send the measured values to the external computer from start of test until the end. This means: The TONITROL sends the measured values for load (F) and elongation (E) of the specimen as well as the displacement of the load frame's piston (S) in regularly intervals as they were displayed at the measuring page.

  With *ALWAYS* the TONITROL will send all measured values – also after the test is finished – antil you quitt with [START] or [STOP]. Thus the recording considers the subsequent positioning of the piston, the automatic nullification and friction connection.

  ALWAYS is created for machine inspections.

  For test documentation you should work with *A.START* to limit the number of data.

  If you select *ACT.TEST* the data transmission will start with friction connection.

- *RATE:*

  If you have selected *A.START*, *ALWAYS* or *ACT.TEST* the system needs the transmission rate for the communication between the TONITROL and the external computer. Enter a value between 0.05 and 99.995 seconds. For example, the value 0.2 means that the TONITROL will send the measured values to the computer all 0.2 seconds.

  If you leave this array with the keys [↓] or [↑] the system rounds the input in the last digit to 0 or 5.

  For details read the separate manual "computer interconnection.

- *READINGS: -F----- / TFSE1E2X*

  This array appears only if the parameter *MEASUREROW* is switched on. Here you define which variables should be transmitted via computer interconnection.

  The variable *F* will always be transmitted. Additionally, you are able to select one or more of the following variables: the time (*T*), the distance (*S*) the elongation with on or two connected extensiometers (*E*, *E1E2*) and the repetitive error (*X*).

  The variables have a fix position within the parameter. You switch them on or off with the key [*]. Use the keys [↑] or [↓] to move the cursor within this parameter.

- *PUMPDELAY*

  If your test plant is equipped with bypass hydraulics you will not see this array. In this case the period for pump delay is automatically defined by the control unit.

  Otherwise you have to define a period for pump delay. After finishing a test or positioning process the hydraulics will remain switched on for this period.

  Normally this value should be 5 seconds.

- *HOST-PARAM: NO / YES*

  You will see this array only if an external computer is connectes. If you select *YES* the TONITROL will wait after start of test until the computer sends some or all parameters. During this time you will see the page

HOST-LINKAGE (fig. 36). After receiption the TONITROL will start the test automatically.

If you select *NO* the TONITROL will start the test without waiting for data transmission.

If you adjusted all parameters correctly press [START] to store them. Subsequently you will see the page *PARAMETER-1*.

7.6.1 Parameters on the Page PARAMETER-1

```
**** PARAMETER-1 ***
MACHINE:      I
TEST TYPE:    COMPRESS
CONTROL:      F=LOAD

INPUTS:       F [N]
DISPLAY 1:    F [N]
DISPLAY 2:    S [mm]
TESTSEQU.:    RAMP
SHAPE:        PRISM
MEASURE h:    MANUAL
```

Fig. 21: The page PARAMETER-1

On this page you can set the following parameters:

- *MACHINE: I / II / III*

  Select the test machine at which the test shall be performed.

- *TEST TYPE: COMPRESS / TENSION / BENDING / SPLITTEN*

  Here the system program offers the test types the machine selected in the array *MACHINE* is designed for.

- *CONTROL: F=LOAD / S=DISPL / E=ELONG.*

  Via the control variable you define the speed of the test procedure and the maximum value, the load frame's piston is allowed to reach. You can select load (F), displacement (S) or elongation (E). For measured values of the control variable elongation the load frame has to be equipped with an extensiometer.

- *INPUTS: F [N] / F [kPa] / F[kN/m2]*
- *LOADCONT.: OFF / ON*

  This array depends on your selection in the array *CONTROL*. If you selected *F=LOAD* this array is named *INPUTS*. Here you define the dimensional unit for the control variable F.

  If you adjusted displacement or elongation for control variable you are not able to select a dimensional unit. For displacement the dimensional unit always is mm, for elongation it is mm or % depending on the adjustment in the array *ELONG.LEN.* at the page *PARAMETER*.

  In these cases the array is named *LOADCONT.* Here you can switch on or off the automatism for a friction connection. At load controlled tests this automatism cannot be switched off.

- *DISPLAY 1: F [N] / F [kPa] / F[kN/m2] / S [mm] / E1 [mm] / E2 [mm] / E1 [%] / E2 [%] / Xw [V] / (S' [mm])*

- *DISPLAY 2: F [N] / F [kPa] / F[kN/m2] / S [mm] / E1 [mm] / E2 [mm] / E1 [%] / E2 [%] / Xw [V] / (S' [mm])*

  In these arrays you define the measuring variables and dimension units for the displays at the measuring page. If the machine cannot be controlled with certain control variables the system program will not make available the corresponding parameters.

  You can select load F, displacement S, elongation *E1 / E2*, the corrected value for displacement S' (as option only) or the deviation X_w.

  The corrected value for displacement S' considers the machine's deformation to get an approximate value for the specimen's deformation for relatively "weak" specimens. This value only is available as an optional extension of the TONITROL.

  The deviation X_w is used by the manufacturer and the service to check the TONITROL. The user cannot operate with this measuring variable.

- *TESTSEQU: RAMP / CYCLIC / SPECIAL / E-MODUL / EMOD-ISO / STEPS / programs*

  Here you define the test sequence. Depending on the equipment of the TONITROL the following variants are available: ramp test, cyclic test, special test, test of Young's modulus, tests of Young's modulus in compliance with ISP 6784 or Austrian Standard B3303 and stepwise tests. If you have customer-specifically programmed test sequences they will also be listed here.

  Details about the test sequences you will find in the description of the page *PARAMETER-2*

- *SHAPE: PRISM / CYLINDER / PRISM 16 / PRISM 25 / NO SPEC.*

  Here you define the shape of the specimen.

  Prisms are all specimens with a tetragonal area. *PRISM 16* is a specimen with a test area of 16 cm^2 (40 mm x 40 mm). The test area of *PRISM 25* is 25 cm^2 (40 mm x 62,5 mm).

  *CYLINDER*s are specimens with a circular area.

  Select *FREEFORM* if you want to test a specimen with any other shape.

  NO SPEC. is only available if the TONITROL has no strength values to evaluate or display (kN/m^2 or kPa). If such a dimensional unit is adjusted for display 1 or 2 the system do not offer *NO SPEC.*

- *MEASURE h: MANUAL / ADJUST / AUTOM.*

  If the dimensions of the specimen are fix (*PRISM 16, PRISM 25*) or no defining of the shape is selected (*NO SPEC.*) the system program suppresses this array. But, for prisms or cylinders the TONITROL needs the value of the specimen's height. In the area *MEASURE h* you define how the TONITROL reads this value.

  If *MANUAL* is selected you have to enter the specimen's dimensions at the page *PARAMETER-2* via the keyboard.

  If you select *ADJUST* the TONITROL will evaluate at the next friction connection the position of the piston from the entered height of the specimen and the absolute piston path. On the bases of this value the TONITROL calculates the specimen's height automatically via friction connection in the further tests. The value for the array *MEASURE h* will be set automatically to *AUTOM.* for further tests.

If you adjusted all parameters correctly press [START] to store them and turn to the page *PARAMETER-2*. If you want to make corrections on the page *PARAMETER* you have to press [STOP].

7.6.2 Parameters on the Page PARAMETER-2

How the page *PARAMETER-2* looks depends on the adjustments on the page *PARAMETER-1*.

Enter the dimensions and the mass of the specimen in the first three lines.

If the specimen's shape corresponds to a standard (*PRISM 16*, *PRISM 25*) or no specification should be made, the system programm suppresses these input arrays.

For a not defined prismatic specimen you can enter the length *l*, the width *b*, the height *h* and the mass *m*. For cylinders enter the values for the diameter *d*, the height *h* and the mass *m*. For other shapes of specimen you have to enter the area *A*, the height *h* and the mass *m*.

```
**** PARAMETER-2 ***
l [mm]:   160.0
b: 040.0 h: 040.0
m [kg]    00.000
IDENT:
SUPP.DIST: 0001 [mm]
LOAD APPL: 1/2
COUNT:     001
RANGE F:  AUTO
dF/dt:     010.0 N/s
Fmax:      09999 N
FRACTDET:LOAD [%]
FRCONST:  00.150
MAX.F:     0999 N
MAX.S:     102.7 mm
```

Fig. 22: The page PARAMETER-2 for bending tests on prisms with ramp procedure

If you selected *ADJUST* or *AUTOM.* in the array *MEASURE h* at the page *PARAMETER-1* the TONITROL will evaluate the specimen's height automatically. In this case you cannot place the cursor in the array *h*.

If you are working with a measuring and weighing station enter rough values in these arrays. The TONITROL will use these values for a rough calculation of certain settings where the material's tension plays a role. Before starting a test it automatically takes the exact values from the station.

Set the following parameters:

- *IDENT:*

  In this array you can enter a name for the specimen. You should use this possibility if you will print a test report or process the test results with an external computer. By pressing the key [F] and one arrow key simultaneously you are able to enter alphanumeric characters in this array (see also 7.10).

- *SUPP.DIST:*

  You will see this line only if you define a bending test. Enter the distance between the bending supports.

- *LOAD APPL: 1/2 / 1/3*

  This line also will be available for bending tests only. With *1/2* and *1/3* you can adjust whether you load the specimen in the center point or in the third points.

- *COUNT*

  Enter the number of specimens a test series consists of. This parameter especially is important if you want to print a test report or work with an external computer.

- *RANGE F: AUTO / 100% / 010%*

  In this array you adjust the measuring range for the displays at the measuring page.

  If you select *AUTO* the TONITROL first will use 10 % as measuring range. If this range is exeeded without fracture of the specimen it automatically switches to 100 %. The displays offer 5 digits for the values. As long as the load value is within 10 % of the whole measuring range of the load frame the accuracy of the display is increased by one digit after the decimal point. If the value of the test load exeeds 10 % of the whole measuring range the system automatically decreases the accuracy of the display.

  With *100%* you select the maximum measuring and test range of the load frame.

  With *010%* you select the first 10 % of the whole measuring and test range of the connected load frame. Use this selection when the fracture of the specimen will take place in this range. You reach a higher accuracy of the display as with 100 %. But, the TONITROL will finish the test if 10 % of the maximal test load are reached.

  It is recommended to perform the tests with the adjustment *AUTO*.

The further lines depend on the test sequence you adjusted on the page *PARAMETER-1* at *TESTSEQU*. The graphics on the following pages will illustrate the described test procedure.

But, the last four parameters on this page are identically for all tests again:

- *FRACTDET: OFF / TIME[s] / LOAD[%] / MANUAL / C.DEV.[%]*

  Undependent from your selection for fracture detection the following is valid:

  - The TONITROL always finishes a test if the adjusted limit value of the control variable is reached. For cyclic tests this is the value F3 (S3, E3).
  - The TONITROL terminates a test always if one of the adjusted safety values *MAX.F* or *MAX.S* (see below) is reached.

Caution!
The adjustments *OFF* or *MANUAL* switch off the TONITROL's automatic fracture detection. In this case the danger exists that the pressure devices will be destroyed or the specimen is loaded until explosion. Pay highest attention to the processes in the test room.

If you adjust to *OFF* for this parameter the TONITROL will terminate the test when you press [STOP].

With the selection *TIME* the TONITROL detects the specimen's fracture if the load falls below a maximum value for a certain time.

With the selection *LOAD* the TONITROL detects the specimen's fracture if the load value is decreased to the relation entered at *FRCONST*.

If you adjusted *MANUAL* you have to enter the specimen's fracture by pressing [STOP].

The criterium *C.DEV* is especially suitable for a quick fracture detection to avoid an explosion-like fracture of the specimen.

- *FRCONST:*

  You will see this line only if you selected *TIME*, *LOAD*, or *C.DEV* for *FRACTDET*.

  As a first step you should use values for the automatic detection Toni Technik evaluated as advatageous for the most applications:

  - for *LOAD* and *C.DEV* a value between 0.12 and 0.25 %
  - for *TIME* 0.5 seconds.

  For all measuring variables is valid: Higher values lead to a lower sensitivity of fracture detection. With lower values you will reach the opposite.

Caution:
If the values for the automatic fracture detection are not sufficiently sensitive (too high values) the danger exists that the specimen will burst.

If the values for the automatic fracture detection are too sensitive (too low values) the TONITROL may detect a fracture too early. Then it will switch off without loading the specimen maximally.

- *MAX.F:*

  If the TONITROL measures this value in the load frame it finishes the test. You should especially use this safety value if you use tools for the test in the test room.

- *MAX.S:*

  If the TONITROL measures this value in the load frame it finishes the test. You should especially use this safety value if you use tools for the test in the test room.

In the following chapters the different test sequences and the special parameters will described.

If you adjusted all parameters correctly press [START] to give them to the TONITROL's processor. Simultaneously you will turn back to the page *MAINMENU*.

7.6.2.1 Ramps (see also fig. 22)

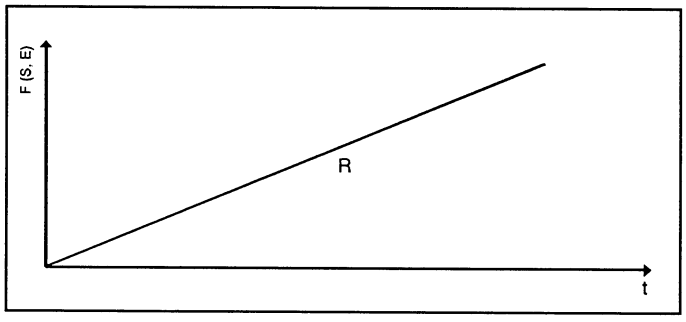


Fig. 23: Test sequence RAMP

- *dF/dt – dS/dt – dE/dt*

  At this test the TONITROL increases the selected control variable F, S or E with the constant speed R until the end of test. This speed is defined by *dF/dt*, *dS/dt* or *dE/dt*.

- *Fmax – Smax – Emax*

  Here you define the limit value at which the TONITROL automatically will finish the test if the specimen did not break before.

7.6.2.2 Cycles

- *dF/dt 1 – dS/dt 1 – dE/dt 1*
- *dF/dt 2 – dS/dt 2 – dE/dt 2*
- *dF/dt 3 – dS/dt 3 – dE/dt 3*

  These values define the speeds R1, R2 and R3 (see graphics) for the loading and deloading phases of the test.

```
**** PARAMETER-2 ***
l [mm]:   040.0
b: 040.0 h: 040.0
m [kg]    00.000

IDENT:
COUNT:    001
RANGE F:  AUTO
dF/dt 1:  010.0 N/s
F1:       01000 N
TCONST1:  00010 s
CYCLES:   003
dF/dt 2:  008.0 N/s
F2:       00200 N
TCONST2:  00015 s
dF/dt 3:  010.0 N/s
F3:       00200 N
TCONST3:  00100 s
FRACTDET:LOAD [%]
FRCONST:  00.150
MAX.F:    09999 N
MAX.S:    102.7 mm
```

Fig. 24: The page PARAMETER-2 for cyclic tests, tests of Young's modulus or special tests on prisms

- *F1 – S1 – E1*
- *F2 – S2 – E2*
- *F3 – S3 – E3*

  These values correspond to the limit values L1, L2 and L3 in the graphics.

- *TCONST1*
- *TCONST2*
- *TCONST3*

  These values determine the stop periods T1, T2 and T3.

- *CYCLES*

  Here you define the number of cycles.

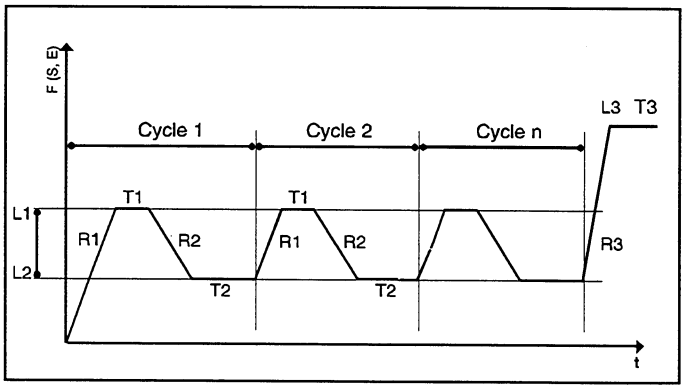


Fig. 25: Cyclic test sequence, variant 1

During a defined number (n) of cycles the TONITROL increases or decreases the value of the control variable (F, S or E) between the limit values L1 and L2 with the speeds R1 and R2. Subsequently it increases the load with the constant speed R3 until the specimen breaks or the maximum value L3 is reached.

During the times T1, T2 and T3 the TONITROL holds the corresponding limit value constant.

With the stop periods T1 and T2 set to zero the cycle has the following shape:

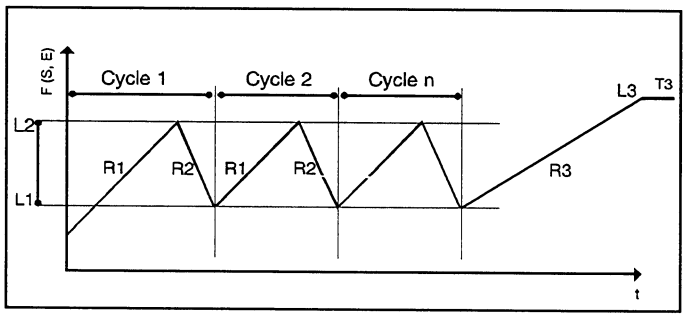


Fig. 26: Cyclic test sequence, variant 2

Is the limit value L2 higher than L1 and the rest period T2 is set to zero a test sequence results consisting of a combination of different ramps:

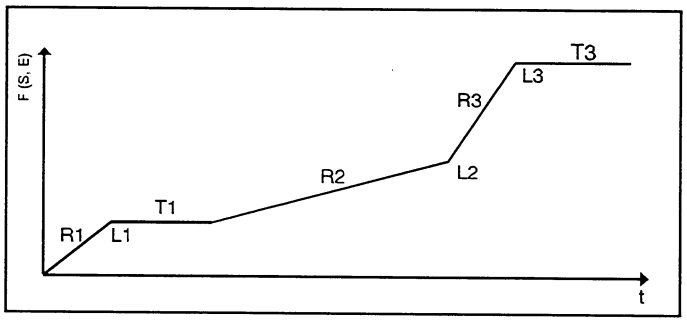


Fig. 27: Cyclic test sequence, variant 3

7.6.2.3 Young's Modulus (see also fig. 24)

For the test of the Young's modulus the load frame should be equipped with an extensiometer. If your TONITROL has the corresponding extension, you are able to test "weak" specimens with a deformation essentially greater than that of the load frame without an extensiometer using the measuring variable S'.

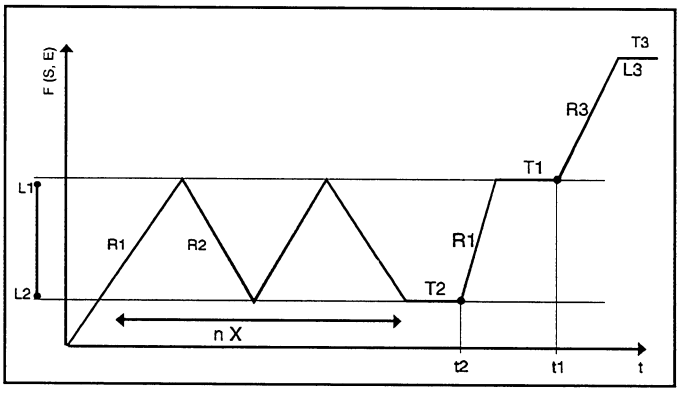


Fig. 28: Test sequence – Young's modulus

After starting the test the TONITROL will first load and deload the specimen in a number of cycles (n) between the limit values L1 and L2 with the speeds R1 and R2. Subsequently, the load L2 acts to the specimen for the period T2. After the period T2 the TONITROL reads the values from the extensiometer (t2). Then the load is again increased with the speed R1 from L2 to L1 and held constant for the period T1. After T1 the TONITROL reads the value from the extensiometer for the second time (t1). Subsequently, it calculates and indicates the Young's modulus.

If desired, the TONITROL finally increases the load with the speed R3 up to specimen's fracture or the maximum value L3. Details for the test performance you find in part 1 of this manual, chapter 4.3.3.1.

7.6.2.4 Young's Modulus in compliance with ISO 6784 or Austrian Standard B3303

For testing the Young's modulus in compliance with ISO 6784 or Austrian Standard B3303 you need an extensiometer corresponding to the standards.

In a defined number of cycles (n) the TONITROL increases and decreases the value of the control variable between the limit values L1 and L2. Between loading and deloading the control variable is held constant at the value L1 for the period T1 and at the value L2 for the period T2.

After the period T2 in the last cycle the TONITROL reads the values from the extensiometer (t2). Subsequently the value of the control variable is increased with the speed R1 from L2 to L1 and held there for the period T1. After the period T1 the TONITROL reads the value from the extensiometer the second time (t1) and calculates and displays the Young's modulus.

If desired, the TONITROL finally increases the value of the control variable with the speed R3 up to the specimens fracture or the limit value L3. At L3 the TONITROL holds the load constant for the period T3.

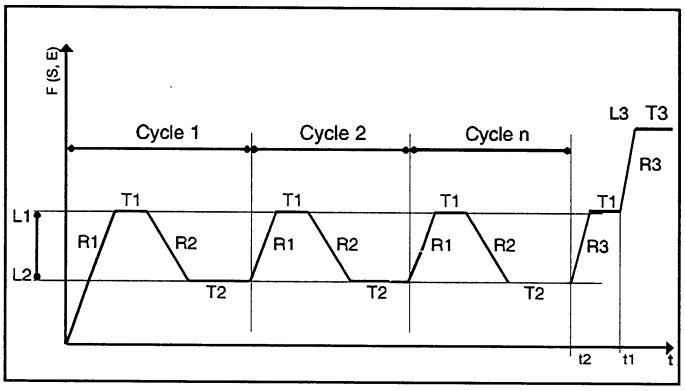


Fig. 29: Test sequence – Young's modulus in compliance with ISO 6784 or Austrian Standard B3303

7.6.2.5 SPECIAL (see also fig. 24)

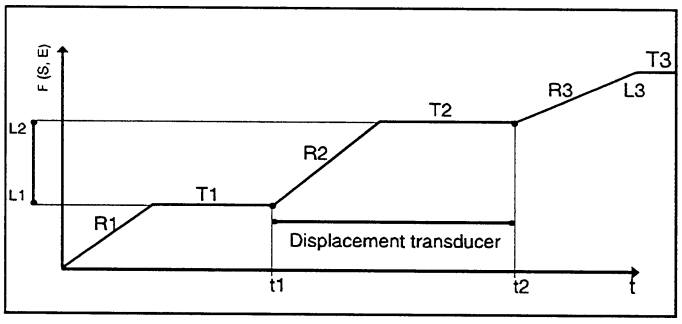


Fig. 30: The test sequence SPECIAL

For the test "SPECIAL" the TONITROL increases the load with the speed R1 up to the limit value L1 and holds it there for the period T1. Subsequently, the load is increased with the speed R2 up to the limit value L2 and hold for the period T2. During this phase the TONITROL measures the piston path via the displacement transducer. Finally, the TONITROL increases the load up to specimen's fracture or the limit value L3.

7.6.2.5 STEPS

- *Fmax – Smax – Emax:*
- *Fmin – Smin – Emin:*

  Maximal respectively minimal load.

The TONITROL increases the value of the control variable to the limit value L1 with the speed R1. Is this load reached, the difference between minimal and maximal load (L2-L1) is divided through the number of steps. Consider that L1 and L2 also are steps.

```
**** PARAMETER-2 ***
l [mm]:   040.0
b: 040.0 h: 040.0
m [kg]    00.000

IDENT:
COUNT:    001
RANGE F:  AUTO
dF/dt 1:  010.0 N/s
Fmax:     01000 N
TCONST1:  00010 s
STEPS:    010
dF/dt 2:  001.0 N/s
Fmin:     00100 N
FRACTDET:LOAD [%]
FRCONST:  00.150
MAX.F:    09999 N
MAX.S:    102.7 mm
```

Fig. 31: The page PARAMETER-2 for test sequences in steps

R2 serves as brake speed with enables an exact moving to the steps. The target window where R2 acts is fixly adjusted in the program and cannot be modified.

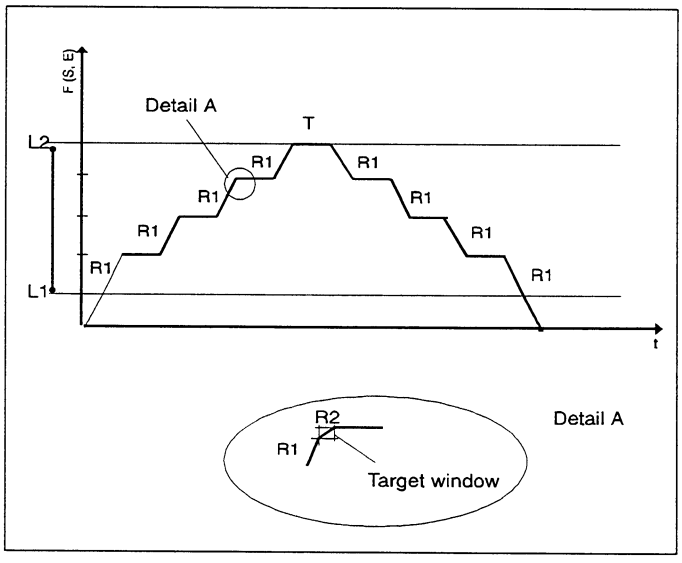


Fig. 32: Test sequence in steps

7.7 Parameters for Report Printing

7.7.1 Parameters at the Page PRTPRAM

If you selected *RAWDATA* or *PROTOC.* for *PRINTER* at the page *PARAMETER* you will see the page *PRTPARM* after leaving the page *PARAMETER-2* Here you define how many digits the printed values will have after the decimal point.

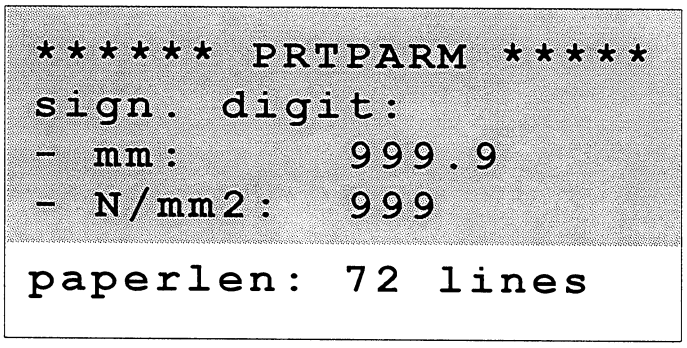


Fig. 33: The page PRTPARM

- *mm: 999 / 999.9*

  The printing program will consider the selection in this array as follows:

selection	digits behind the decimal point		
	l/b/h	raw density	area
999	0	2	0
999.9	1	3	1

- N/mm2: 999 / 999.9 / 99.99 / 9.9/999 / ..99/9.9 / NO

  If you select *NO* the value will be printed with the maximal accuracy (depending of the widht of the column).

- *paperlen:*

  Enter the paperlength for your printer.

7.7.2 Parameters on the Page PRTPARM1

You will see this page only if you selected *PROTOC.* for *PRINTER* at the page *PARAMETER.*

Your inputs at *report No:*, *tester:*, *strength cl:*, *prod.day:* and *test.age:* will be printed in the report. Use the keys [F] and [→] or [←] to generate characters (see 7.11).

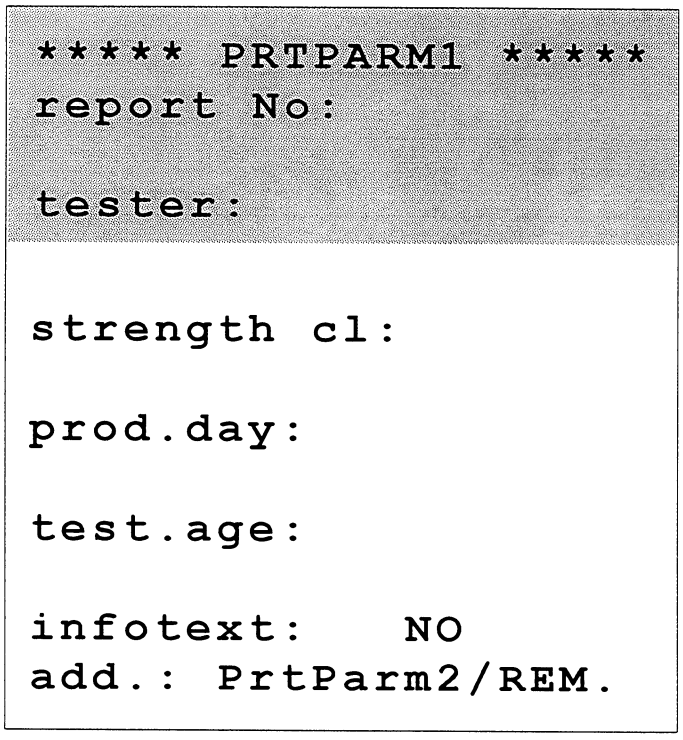


Fig. 34: The page PRTPARM1

- *infotext: YES / NO*

  Select *YES* if you want to print the infotext listed at the page *EXECUTE* in the report.

- *add.: PrtParm2 / REMARKS / PrtParm2/REM. / ----*

  If you select *PrtParm2* you will come to the page *PRTPARM2* (see 7.7.3) after leaving the page *PRTPARM1*. There you can define correction factors.

  With *REMARKS* you are able to comment the test when it is finished.

  PrtParm2/REM. offers you both possibilities.

7.7.3 Parameters at the Page PRTPARM2

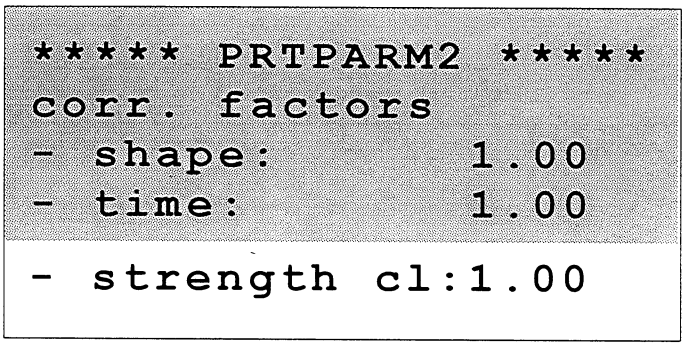


Fig. 35: The page PRTPARM2

With the correction factors *shape*, *time* and *strength cl* the TONITROL calculates automatically corrected test results for the printed report. If the value of one correction factor $\neq 1.00$, the printing programm adds one line with the values of all correction factors below the header of the certificate.

7.8 Start of Test

Use the menu item *START TEST* to perform a test. For details see section 4.3.

If you selected *ON* for *SIMULATION* at the page *PARAMETER* you are able to check the test procedure without really working with a machine.

7.9 Host Linkage

If the TONITROL is equipped with the option "computer interconnection" you will find the menu item *HOST-LINKAGE* in the *MAINMENU*. This function serves for extern control, check, recording and evaluation of tests.

With the computer interconnection you have several possibilities for communication between the TONITROL and an external computer (read also the manual "computer interconnection).

1. The TONITROL sends the actual values during the test.
2. The TONITROL sends the results and test adjustments after the test.
3. The host asks the TONITROL for single or all set of parameters, files and test adjustments.
4. The host sends single or all set of parameters, files and test adjustments to the TONITROL.
5. The host erases set of parameters or files in the TONITROL.

Via computer interconnection it is possible to make a safety copy of all files of the TONITROL at an external computer. If the data at the TONITROL were lost, the files can be replaced via computer interconnection without problems.

After calling up the function *HOST-LINKAGE* the page *HOST-LINKAGE* will appear.

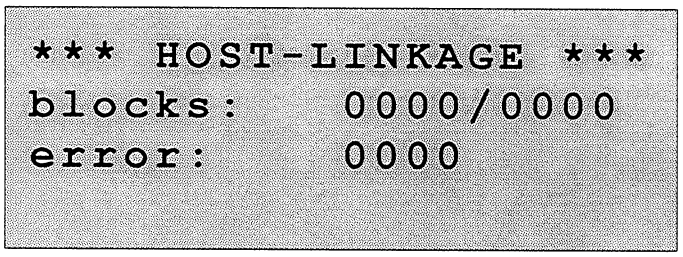


Fig. 36: The page HOST-LINKAGE

You see the number of sent/received blocks and the number of detected errors. This page is mainly prepared for the system programmer.

For details about using the function *HOST-LINKAGE* see the separate manual for computer interconnection.

7.10 Extra Functions

After calling up the menu item *EXTRA-FUNCTIONS* you will see the page *EXTRAMENU*.

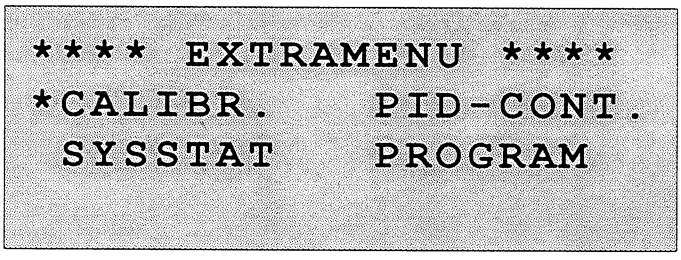


Fig. 37: The page EXTRAMENU

The function *CALIBR.* serves for calibrating the TONITROL. Before an official calibration you should order a service for preparing the device for the check.

The function *PID-CONT.* serves for adjusting the PID portions of the control loop.

Use the function *SYSSTAT* to check the system of the TONITROL.

With the menu item *PROGRAM* you start additional programs.

7.10.1 Calibration

After calling up the menu item *CALIBR.* you see the page *CALIBRATION.*

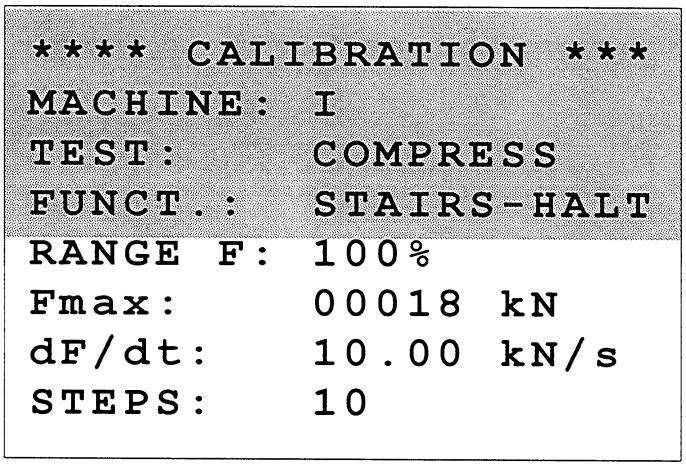


Fig. 38: The page CALIBRATION

You define the exact calibration procedure with several parameters. For the single steps read the following sections.

Use the keys [↓] and [↑] to move the cursor from array to array. The selection within the arrays is done with the keys [*] or [←] and [→]. Pressing these keys you get one after the other all elements available in the array. Numeric values were entered via the numeric keyboard.

In the array *MACHINE* you select with *I*, *II* or *III* the test machine you want to use for calibration. If only one machine is connected to the TONITROL you cannot place the cursor in this array. In this case the system program automatically enters the connected machine.

In the array *TEST* you select the type of test you want to use for calibration. *COMPRESS* (compression) and *TENSION* are available.

You can use four different calibration functions for calibrating the TONITROL. Define the desired one in the array *FUNCT.* Select between:

- *STAIRS-HALT*
- *STAIRS-CONT* (continuously)
- *PILGR.-HALT*
- *PILGR.-CONT* (continuously)

At calibration with *STAIRS* the TONITROL increases the load in the load frame continuously over a selectable number of steps up to a maximum value. Subsequently it decreases the load over the same steps to the start value.

With *PILGR.* (pilgrim-step) the TONITROL also increases the load in the test frame over a selectable number of steps to a maximum value and subsequently decreases it to the start value. But, before the controller will change the load from one step to the next it change it to the previous one.

The name pilgrim step describes the essential characteristic of this type: two steps forewards – one backwards.

Each step is a check point for the calibration. The manner the TONITROL considers these check points you select with the variants *HALT* and *CONT* (continuously). *HALT* means: the controller holds the load value at each step until you confirm with [START]. *CONT* means: the check points were slowly passed.

In the array *RANGE F* you adjust the measuring range for calibration. With *100 %* you select the maximum measuring and test range of the connected load frame, with *10 %* the first ten percent of this range.

With *Fmax* you define the maximum load for calibration.

In the array *dF/dt* you enter the maximum speed for increasing and decreasing the load. Experiences showed that a speed is advantageous with which the value *Fmax* is reached within 50 to 60 seconds. Maximum values of more than 1000 kN should be reached within 200 seconds.

In the array *STEPS* you set the number of check points for calibration. *Fmax* is a check point and counts as one step. Normally, you adjust 10 steps for the whole load range. If you perform a strain calibration to 2000 kN adjust 10 steps and *Fmax* 2000 kN. Pass through check points you do not need with [START].

With [STOP] you turn back to the page *EXTRAMENU.*

With [START] you send your adjustments at the page *CALIBRATION* to the processor and turn to the measuring page.

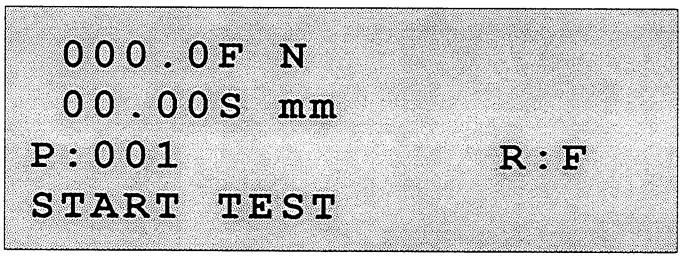


Fig. 39: The measuring page before start of calibration

Before starting the calibration place the load measuring cell in the load frame and align it.

Caution!
Center the load measuring cell at the pressure area exactly at the crosshairs or align it centrically to the upper pressure plate! Otherwise you risk falsified calibration results or that the load measuring cell will be catapulted out from the load frame.

Caution!
If you use load measuring cells with ball joints align the upper pressure plate plane-parallel to the lower! Otherwise you can get falsified calibration results.

Now position the piston of the load frame. For the distance between load measuring cell and pressure area consider: On the one hand you should be able to place the measuring device between the pressure areas without effort. On the other hand the distance the piston has to move until friction connection should not be too large.

With the keys [↓] and [↑] you will move the piston approximately 1 mm up or down. With the keys [←] and [→] you will move the piston 1/20 mm. [↓] and [↑] are used for coarse positioning, [←] and [→] are used for fine positioning.

If you want to terminate the calibration press [STOP]. Subsequently you will see the message *TEST FINISHED* in the third line of the measuring page. Set the test plant with [START] in start position again – the piston remains in its position – or press [STOP] to turn to the page *EXTRAMENU*.

Caution!
If you want to continue with calibration first press the key [0] to perform a nullification.

You should read the value zero at the display. Otherwise the calibration results will be correspondingly falsified. If necessary repeat the nullification.

To start the calibration press [START].

Caution!
If you want to interrupt a procedure controlled by the TONITROL at once use the yellow-red main switch! This switch serves as emergency line switch. [STOP] at the TONITROL's keyboard has no security function!

The lamps in the array [STOP] are extinguished, in the array [START] the lamps light. The TONITROL moves the piston in the load frame to friction connection. Now the piston acts to the load measuring cell. Before reaching a load step the controller automatically reduces the speed *dF/dt* by a pre-set factor. The load values of the single steps result from the parameters at the page *CALIBRATION*.

- If you perform the calibration with the function *STAIRS-HALT* the TONITROL increases the load until it reaches one of the defined steps. At each step the program asks with the message *[START]-NEXT STEP* in the last line to continue the calibration. The load value of the step is displayed. If *Fmax* is reached you will read in the last line: *[START]-STAIRS BACK*. If you press [START] the system will decrease the load to the start value stepwise following the same principle. If you press [STOP] the system smoothly deloads the load measuring cell.

  If the TONITROL does not reach a load step exactly, repeat the loading from the previous step. For this press [↓] or [↑] and subsequently [START].

- If you perform the calibration with the function *STAIRS-CONT* the TONITROL increases the load to one of the steps, displays the message *[START]-NEXT STEP* for a short time and continues the calibration automatically. If the value *Fmax* is reached you will read *[START]-STAIRS BACK*. If you press [START] the system reduces the load stepwise. Press [STOP] to deload the measuring cell smoothly.

- If you perform the calibration with the function *PILGR.-HALT* the TONITROL increases the load until the first step is reached. The load value is displayed. The program asks with the message *[START]-NEXT STEP* to continue the calibration. If you confirm the TONITROL decreases the load to the start value, stops and asks with the message *[START]-NEXT STEP* to continue. Is the first step reached again and continuing confirmed with [START] the TONITROL increases the load until the second step is reached. After [START] is pressed again it decreases the load to the first step. In this manner the TONITROL increases the load to the maximum value *Fmax* and subsequently decreases it to the start value.

- If you perform the calibration with the function *PILGR.-CONT* it is the same procedure as with *PILGR.-HALT*, but the process will not be interrupted at the single steps. The TONITROL increases the load until the first step is reached, shows the message *[START]-NEXT STEP* for a short time, and automatically continues the calibration. The load values of the steps were displayed.

Use [STOP] if you want to terminate the calibration at any time. The load frame will deload the load measuring cell at once. The piston moves to start position. In the last line of the measuring page the message *TEST INTERRUPTED* is shown. The system shows the measured value at which the test was determined.

If the calibration is finished the message *TEST FINISHED* appears and the lamps in the array [START] are extinguished and those in the array [STOP] light.

With [START] you can prepare a new measuring row.

Pressing [STOP] you turn first back to the page *CALIBRATION*, then to the page *EXTRAMENU* and finally to the *MAINMENU*. Now you can switch off the test plant with the main switch.

7.10.2 Adjustment

If deviations result at calibration you have to re-adjust the measuring amplifier, mounted at the load frame. This is done via a potentiometer at the amplifier board. A re-adjustment in the TONITROL is not necessary.

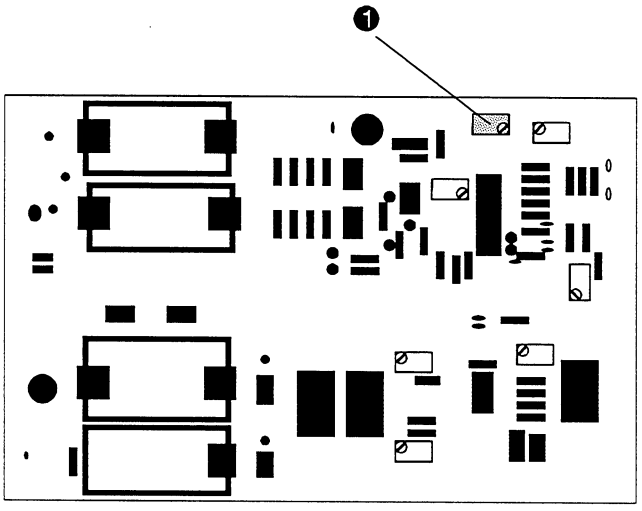


Fig. 40: Die Karte im Meßverstärker

Adjust the TONITROL with the screw of the potentiometer ❶.

Finally protect the screw with sealing wax.

7.10.3 PID Controller

After calling up the function *PID-CONT* you will see the page *PID-1*.

```
******* PID-1 ******
machine:   I
standard: YES
```

Fig. 41: The page PID-1

PID is an abbreviation for "Proportional Integral Differential" and describes the layout of the TONITROL.

For the PID portions Toni Technik adjusted the values most advantageous for the whole load range of the connected load frame. If you extend your TONITROL by special functions of programms or perform special tests at extreme materials it may be necessary to modify these values. Let do the adjustment by the service or an expert.

If you modified the adjustments and want to use the values of the manufacturer again, do the following:

Select the corresponding number in the array *machine*.

Select *YES* in the array *standard*. Press [START]. The processor will adjust the PID-values suggested by the manufacturer. Press [START] again to turn back to the page *EXTRAMENUE*.

Caution:
Too high control parameters can lead to an uncontrolled oscillation of the machine.

7.10.4 System Status

After calling up the function *SYSSTAT* the page *SYSTEMSTATUS* will be shown.

```
*** SYSTEMSTATUS ***
302.00 01032 +00003
Rel 3.02.00-13.01.95
Mem 642B/6900/1AD5h
```

Fig. 42: The page SYSTEMSTATUS

Use the function *SYSSTAT* to inform Toni Technik or the service about your TONITROL.

Call it up with [START]. On the page *SYSTEMSTATUS* you will find three lines.

Inform your communication partner about these values.

Press [START] to turn back to the page *EXTRAMENU*.

7.10.5 Load Program

This menu item is available on the page *EXTRAMENU* as well as on the page *SELECT-MENU* (see fig. 14). Use this function to load additional programs.

```
*** LOAD-PROGRAM ***
PROGRAM:    TPEDIT
```

Fig. 43: The page LOAD-PROGRAM

Actually, the following programs are available:

- *TPEDIT*

  This program serves for creating new test procedures if the option "individual programming" is available.

7.11 Terminating the Program

With the menu item *END* you will turn back to the page *EDIT-PARM*. If you modified any parameter – you called up the menu item *PARAMETER-INPUT* – the page *STORE-PARAMETER* will appear.

```
** STORE-PARAMETER *
  SET:  01
Info:
DIN 1048 Wuerfel 20
```

Fig. 44: The page STORE-PARAMETER

At *SET* you see the intern number of the set of parameters (important for computer interconnection).

The text you see below *Info:* will also appear in the lists for executing, editing, erasing or copying of tests.

If you want to modify the text move the cursor with [↓] to this line and with [→] or [←] to the character you want to change. Now hold the key [F] down and press simultaneously the key [→] or [←]. With each pressing the character will be changed. All small and capital letters from A-Z and a number of special characters are available. In the appendix you will find a list of available characters and their order.

If you press simultaneously the keys [F] and [↑] the character will appear which is 13 positions before the actual character, with the key [↓] this one appears which is 13 position behind.

If you leave the array *Info:* empty the TONITROL will store the set of parameters with the name *Parameter TPnn.PRM*.

But, it is recommended to give all sets of parameters expressive names.

7.12 Defining a Password Number

To protect the set of parameters from unauthorized modifications the adjustment mode is locked by a password. This number you have to enter after you presses [*] at the page *TONITROL*. To define a new password select the menu item *SET PASSWORD NO.* at the page *SELECT-MENU*. The page *PASSWORD* appears.

```
***** PASSWORD *****
set password no.
Input 1:
Input 2:
```

Fig. 45: The page PASSWORD

Enter a four-digit number for *Input 1*. Then move the cursor to *Input 2* and repeat the same number and press [START] to store the new password.

8 WHAT TO DO ...

In this chapter we describe different malfunctions and give hints to you what you can do yourself. But, let the specialists of your company do the work. Follow the proposals in the order we make them.

Some possible malfunctions we already described in part 1 of the manual, chapter 5. Please read there if you do not find anything about your problem in the following.

If your efforts are not successful, note down the problems in detail and call Toni Technik. As more precisely you describe the problem as higher is the chance we can solve the problem at the telephone.

Before calling look at the diplays of the page *TONITROL* (see fig. 1). This information you should know when talking with Toni Technik about your test plant.

Always consider the safety remarks.

If you have a special task in the frame of routine maintenance, please inform the service early. Thus, you enable the technician to get the needed spare parts.

8.1 ... if the Fan Does Not Work

Pay attention to the characteristic noise of the fan when switching on the TONITROL. Do not perform any test if the fan does not work. If the TONITROL is not cooled sufficiently the heat accumulation in the device can influence the control and measuring process and finally destroy the components in the TONITROL.

Inform the service.

8.2 ... If the Message *directory full* is displayed

You created too many sets of parameters. Erase sets of parameters you will no more need before storing a new one.

8.3 ... If the Piston Does Not Move Correctly

Malfunctions of the piston control appear in different manners:

- It is not possible to move the piston with the arrow keys in both directions.
- The piston does not move after start of test or nly moves downwards.
- The piston does not return to its start position after fracture of the specimen or possibly destroys the specimen.

Caution:
In these cases inform the service.

8.4 ... If the Pump Does Not Work

If you want to start a test yu will hear no pump noise. Additionally, the LEDs D16 and D21 (see fig. 42, connection panel of the TONITROL) do not light.

Check the connectors IO1 and IO2 and the fuses in the contactor box.

8.5 ... If the Control Loop Oscillates

If the control loop oscillates, the fracture detection will be untypical for the specimen's material or the device will boom unnormally.

This will happen if the servo valve of the load frame is worn-out or the portions of the control loop are wrongly adjusted.

In any case inform the service and Toni Technik.

8.6 ... If the Specimen is Destroyed after Fracture Detection

Adjust for *FRACTDET* on the page *PARAMETER-2* another parameter than *OFF*.

8.7 ... If the Specimen "Explodes"

Adjust the parameter *LOAD* in the array *FRACTDET* and *00.175 %* for *FRCONST*.

8.8 ... if the Message "memory full" is displayed

You performed several tests which results were stored at the TONITROL.

Now the file TP.RES containing these results is too large for the TONITROL's memory. If you want to store the

results, take care that this file will be called-up and erased by the PC. For this you can use the PC-program GETRES.

If you do not need the results furthermore, you are able to delete them in the adjustment mode (see chapter 7.3).

Appendix

Documentation of Parameters

Test:			**Date:**	
☐ **Auto zero position**		☐ **Print test report**		
Send measuring row to external computer:		☐ after start	☐ continuous	☐ current test
Length of deformation transducer:		mm		
Elongation channel		☐ I	☐ II	☐ I+II
Pump delay	s			
Transmission rate:	s	**Save values:**	☐ external computer	☐ internal memory
Machine:		☐ I	☐ II	☐ III
Type of test:	☐ compression	☐ tensile	☐ bending	☐ splitting
Control variable:		☐ load	☐ displacement	☐ elongation
Inputs:		Friction connection:	☐ off	☐ on
Displays:	1.:		2.:	
Test procedure:	☐ ramp	☐ cyclic	☐ special	☐ steps
	☐ Young's modulus	☐ Young's mod. ISO	☐ program	
Shape of specimen:	☐ prism	☐ cylinder	☐ prism16	☐ prism25
Measurement:		☐ manual	☐ automatic	☐ adjusted
Program:		**Fix position:**		☐ adjusted
Support distance:	mm	**Load feeding:**	☐ 1/2	☐ 1/3
Number of specimens:		Measuring range:	☐ automatic	☐ %
Speeds:		1:	2:	3:
Load limits:		1:	2:	3:
Stop periods:		1:	2:	3:
No of cycles/steps:				
Fracture detection:	☐ load	☐ time	☐ deviation	☐ manual
Fracture detection at:	%			
Maximum load:	N	Maximum distance:	mm	
Remarks				

The Connection Panel

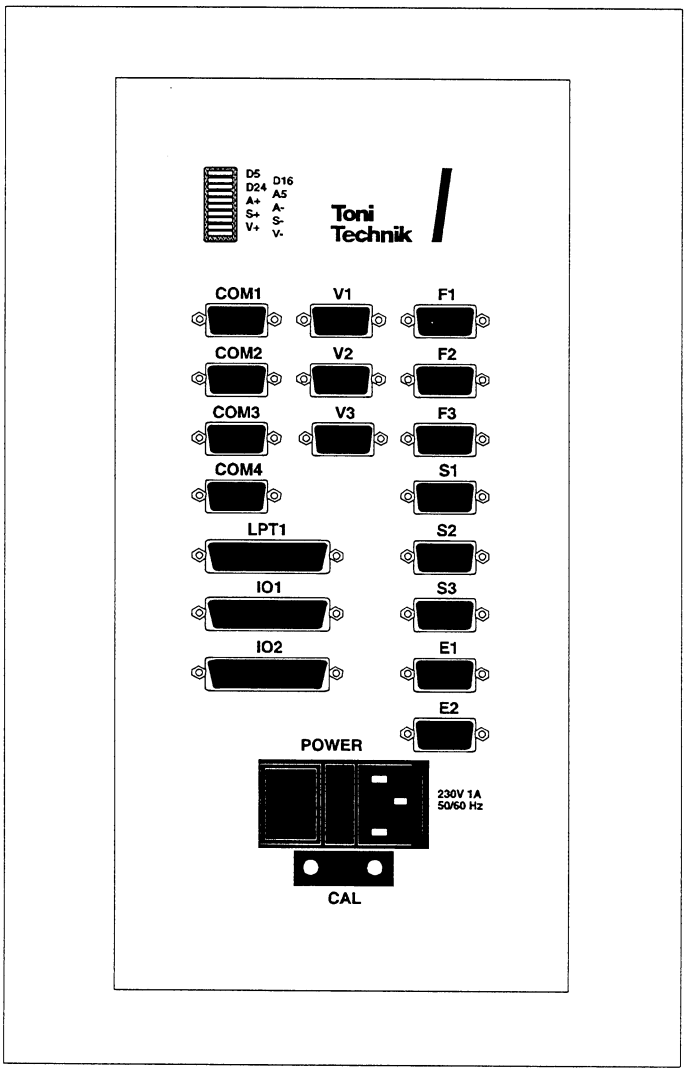


Fig. 46: Rear front of the TONITROL

Sockets

COM1 - COM4:	serial interfaces
LPT1:	printer connection
IO1/IO2:	connection for contactor box
V1 - V3:	connection for servo valve
F1 - F3:	connection for load sensors
S1 - S3:	connection for piston path sensors
E1/E2:	connection for extensiometer
CAL:	relay point for calibration
POWER:	mains supply, fuse, main switch

LED Indications

D5:	+ 5V digital
D16:	+ 16 V digital
D24:	+ 24 V digital
A+:	+ analog
A–:	– analog
S+:	+ servo voltage
S–:	– servo voltage
V+:	+ valve voltage
V–:	– valve voltage

Caution:
Only qualified personnel is allowed to handle this device. The knowledge of this User Manual is obligatory. Knowledge of the user manuals for the test machines is presumed.

This Manual presumes that the operator already has experience with handling servohydraulic test plants. This basic knowledge is not given here.

Caution:
Consider the savety remarks concerning the handling of hydraulic test plants in chapter 1.2

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We made strong efforts to the correctness of this Manual. But, we cannot overtake any guarantee for the validity of the instructions in the case of technical modification.

This Manual is valid from the TONITROL release 3.05.02.

Grouping of Interfaces and Connection Cables

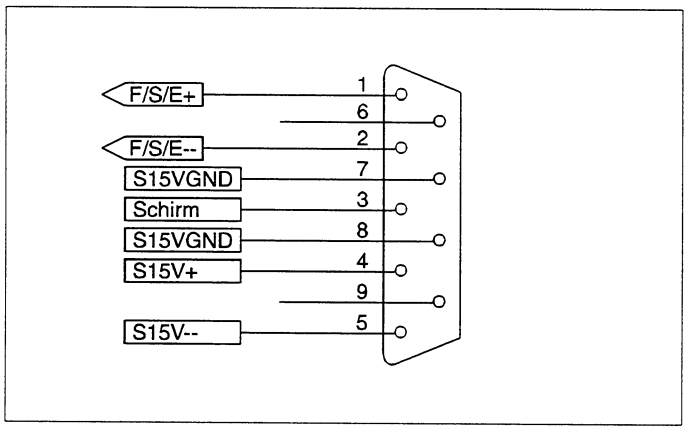

Fig. 48: Grouping of the sockets F1-3, S1-3 and E1/2 (9 channel Sub-D socket)

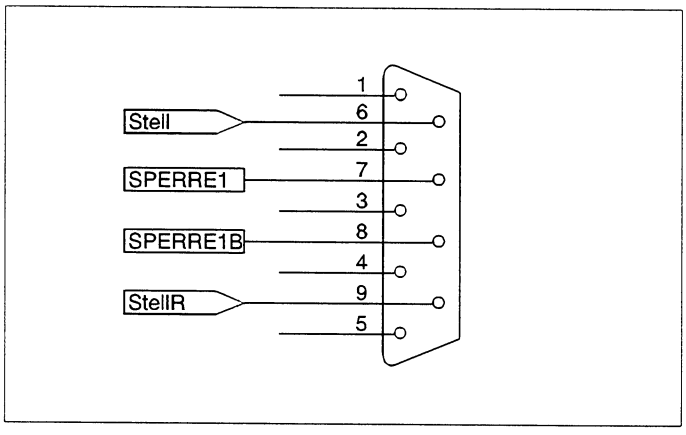

Fig. 49: Grouping of the sockets V1-3 (9 channel Sub-D socket)

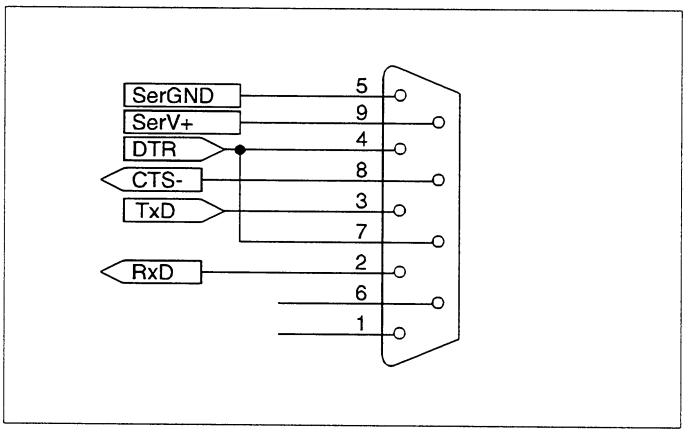

Fig. 50: Grouping of the interfaces COM1-4 (9 channel Sub-D plug)

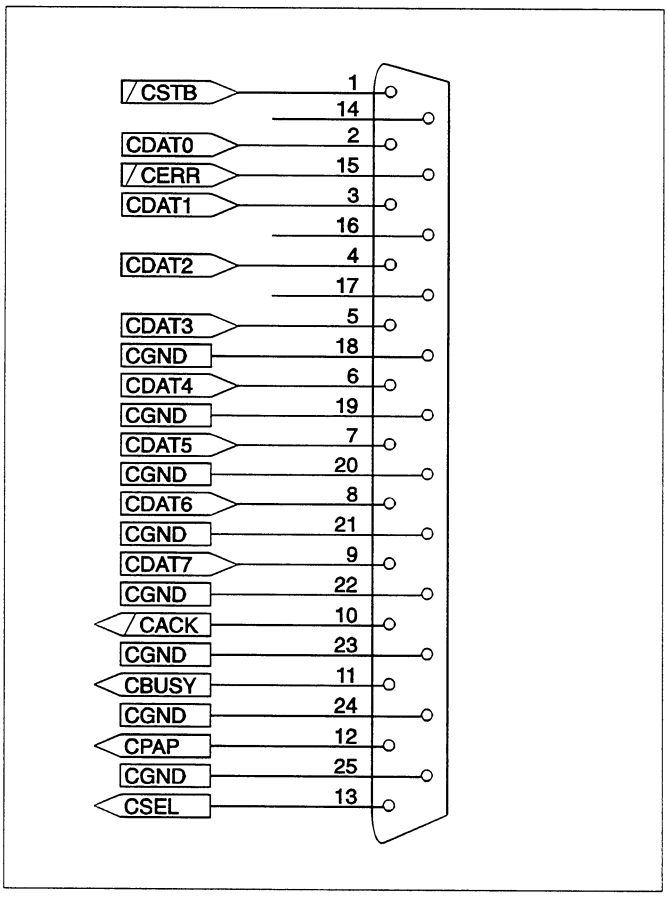

Fig. 51: Grouping of the interface LPT1 (25 channel Sub-D socket)

CTS	Clear to Send
DTR	Data Terminal Ready
FG	Frame Ground
RxD	Received Data
RTS	Request to Send
SG	Signal Ground
TxD	Transmitted Data

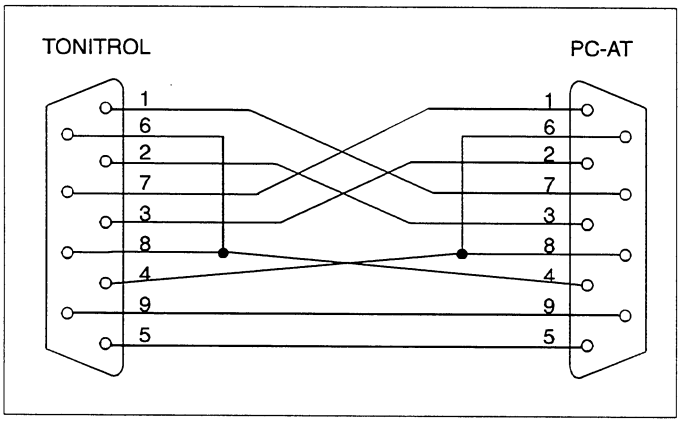

Fig. 52: Grouping of the connection cable for host linkage with a PC-AT (9 channel Sub-D sockets)

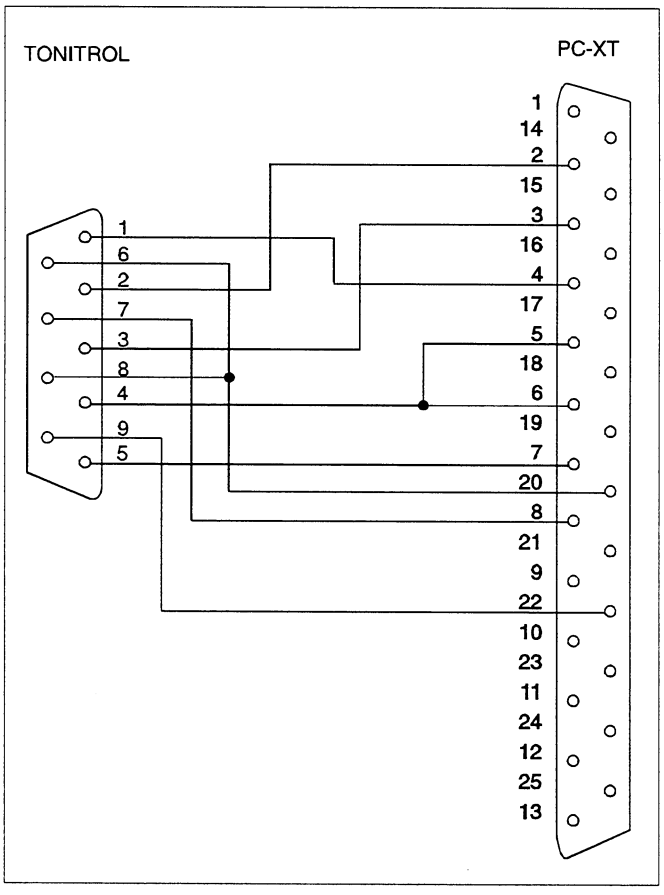

Fig. 53: Grouping of the conntection cable for host linkage with a PC-XT (25channel Sub-D socket/ 9channel Sub-D socket)

List of Available Characters

The following characters are available for entering info text or identifiers. You create the characters in their order pressing simultaneously the key [F] and [→] or [←]. With [↓] and [↑] you go forwards or backwards 13 positions.

1	2	3	4	5	6	7	8	9	10	11	12	13
	!	"	#	$	%	&	'	(	)	*	+	-
.	/	:	<	=	>	?	@	1	2	3	4	5
6	7	8	9	A	B	C	D	E	F	G	H	I
J	K	L	M	N	O	P	Q	R	S	T	U	V
W	X	Y	Z	a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r	s	t	u	v
w	x	y	z									