TESTING Bluhm & Feuerherdt GmbH

Baustoffprüfgeräte

Operating Manual

Testing Machine Compression/Bending Machine for cement, mortar and gypsum specimens

TESTING Bluhm & Feuerherdt GmbH

Motzener Straße 26b

12277 Berlin

Germany

Telefon / phone: +49 30 7109645-0

Telefax / telefax +49 30 7109645-98

E-Mail info@testing.de

Internet: www.testing.de

Inhaltsverzeichnis

List of Figures

List of Tables

Revision table

Version	Author	Changes	Date
1.0	P. Sonnwald	First version	Dez 2020

The stated information in this manual only serve as product description. These statements do not discharge the user from making his own evaluation and audits. It has to be taken into account that our products are subject to the ageing processes and abrasion.

The **original manual** was created in the **German language**.

Customer Service

TESTING Bluhm & Feuerherdt GmbH
Motzener Straße 26b
12277 Berlin
Germany
Telefon / phone: +49 30 7109645-39
Telefax / telefax +49 30 7109645-98
E-Mail service@testing.de
Internet: www.testing.de

1 Introduction

The testing machine, testing machine combination or the complete testing machine system is manufactured according to the current state of the art and under consideration of the current machinery directive. The supplied EU Declaration of Conformity (for complete machines) or the Declaration of Incorporation (for incomplete machines) confirms this. Nevertheless, hazards for operators or other persons may occur during use, maintenance or other life phases of the test system. The operating instructions inform about existing residual risks. These have to be considered by the operator when preparing the risk assessment.

1.1 Warranty and liability

In principle, the **General Terms and Conditions** of TESTING Bluhm & Feuerherdt GmbH (hereinafter referred to as "TESTING") apply. The manufacturer guarantees that these operating instructions have been prepared in accordance with the technical and functional parameters of the delivered product. The manufacturer reserves the right to add supplementary information to this operating manual.
The manufacturer grants the warranty stated in the order confirmation.
Excluded from this warranty are wearing parts.
The manufacturer guarantees trouble-free operation only if the specifications in these operating instructions are observed and the product is used in accordance with its intended purpose. All liability and material defect claims against TESTING are void in the event of damage resulting from improper use and unauthorized interventions not provided in these operating instructions. (See section 2.2)
The manufacturer is not liable for damage resulting from misuse of the product or from disregard of the specifications and rules of conduct in these operating instructions.
The operator is obliged to take into account additional national and company regulations when operating the testing machine. These are for example:

- Rules for accident prevention and environmental protection
- Rules and regulations for work safety and the handling of work equipment
- Internal reporting and conduct regulations

Warranty claims against the manufacturer are excluded if the product is modified without the written consent of the manufacturer, either constructively or in its functional design. Contraventions can be prosecuted.

1.2 Basic information

This operating manual contains information for the entire life cycle of the product. It is intended for technical and operating personnel who work with the product. It must be read and used by these persons. If any ambiguities or discrepancies are found in the translation of the original operating instructions, the original operating instructions must be consulted for clarification and the manufacturer must be informed before the product is used. These operating instructions do not use gender-neutral wording due to the legibility and simple comprehensibility of the text.
The following documents are applicable to these operating instructions and represent the complete technical documentation of the test system:

1. Machine data sheets
2. Installation drawing
3. Operating instructions
4. Assembly drawing and parts list
5. Hydraulic circuit diagram and equipment list
6. Electrical circuit diagram and control
7. Transport instructions
8. Declaration of conformity
9. Certificates / calibration
10. Notes / other

1.2.1 Storage

The operating instructions must be kept in the immediate vicinity of the test system and must be protected from environmental influences or other harmful influences. The technical documentation is freely accessible to all persons working on and with the machine.

1.2.2 Warnings

The operating instructions contain warnings of possible hazards and their origin. All warnings must be observed. Appropriate protective measures must be observed. All persons working at or with the machine must be sensitized to the dangers so that they can be averted by appropriate actions.

Attention / Warning / Danger	
 	**Information on possible dangers and their origin** **Action to avoid the danger** **Application of appropriate protective measures**

General instructions for the operation, maintenance and other support of the testing machines are given as follows.

Note	
	**General notes for all life phases of the testing machine / support tips / and much more**

1.2.3 Pictograms

Pictograms are used in the operating instructions and as notes on the machine. The pictograms and corresponding explanations can be found in the following list.

Warning signs

Warning of a danger

Warning of electrical voltage

Warning of hot surface

Warning of hand injuries

Warning of danger of crushing

Warning of tipping hazard

Warning of falling objects

Warning of suspended loads

Gebotszeichen

Use protective clothing

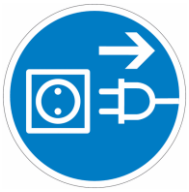
Wear safety shoes

Use hand protection

Use eye protection

Use hearing protection

Wear a safety helmet



Disconnect power plug

Disconnect system from power supply before maintenance or repair

Other characters

General note

Danger of environmentally hazardous substances

Note on required tools

2 Compression / bending frame for cement, mortar and gypsum

The frame 21.1401.01 consists of a torsion-resistant, four-column test frame, which is calibrated according to the accuracy class 1 in accordance with DIN EN 7500-1.
In the basic configuration, the frame is designed for force-controlled tests. Optionally, a displacement measuring system can be installed on the compression side. The solid steel frame is extremely torsion resistant. The columns are clamped without play. Four columns enclose the compression side. The plunger cylinder is made of solid steel. An inductive limit switch monitors the cylinder end position. The frame construction allows an easy insertion of standard specific test fixtures and the adaptation of different fixed test inserts for the execution of standard specific compression and bending strength tests.

2.1 Intended use

The test frame has been designed for the performance of tests to determine the compressive strength or flexural strength of cement, mortar and gypsum specimens, as well as lightweight and aerated concrete. Furthermore, CBR tests and aggregate tests can be displayed with the corresponding accessories.
The machine frame has been designed exclusively for tests with centric force application. An off-center application of force is not permitted.
In order to ensure that the force is applied centrically, the specimens must be placed centrally on the pressure plates or fixtures.
The maximum technical properties (see machine data sheets in the Technical Documentation Section 2) of the test frame must be observed.
The test frame is suitable for performing tests according to the following norms / standards (additional accessories required):

- EN 196, EN1015, EN13813, EN13892-3, EN12504-1 EN 993-5
- ISO 679, DIN 1164, DIN1048-1
- BS 3892, 4550, 4551,
- ASTM C109, ASTM C348,
- And many more

Attention	
	**Additional test accessories are required for carrying out different standard tests.** **Contact TESTING for advice** E-Mail: info@testing.de Phone: +49 30 7109645-0

2.2 Structure and function

The basic machine frame design is shown in Figure 1.

The force transducer is mounted on the upper crosshead. The ball calotte is screwed into the force transducer with the aid of an adapter. The spherical calotte is conically clamped in the adapter and can thus be replaced by further test inserts (upper bending cutters, CBR pressure punches, etc.). Different pressure pieces / test inserts can be attached to the ball calotte with the help of a centering ring.

A single-acting hydraulic cylinder is mounted on the lower crosshead. It is important that the cylinder is aligned centrically to the load cell. On the cylinder, there is a measuring point M16 x 2 for venting the cylinder during commissioning. A twisting of the piston rod is prevented by guiding the cylinder protection. Low-friction hydraulic rod seals ensure low cylinder friction. The operator is separated from the test chamber by a transparent polycarbonate protection. A specimen collection tray prevents the test system from becoming heavily soiled when the specimen breaks.

The exact dimensions and a list of the installed components including spare parts recommendations can be found in the technical documentation section 3.

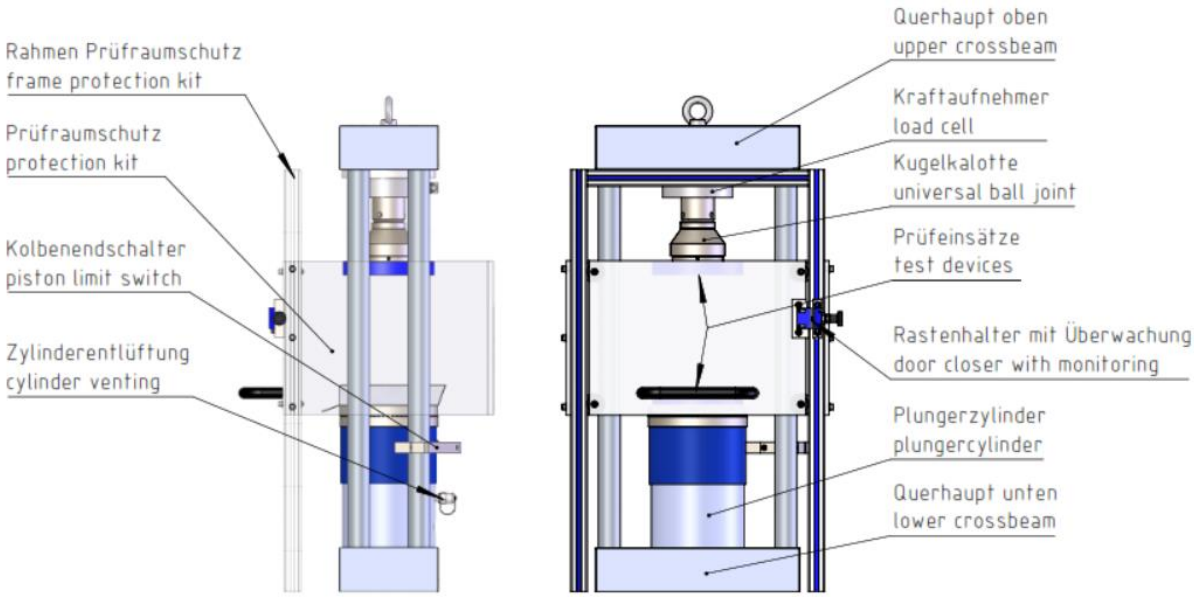


Fig. 1 Basic structure of the test frame

2.3 Technical data

The exact technical data of each test frame can be found in the Technical Documentation - Section 1.

Note	
	**For further information, please contact the TESTING service team.** E-Mail: service@testing.de Phone: +49 30 7109645-39

2.4 Operation

The employer and the operator must observe all instructions described in chapter 2. Before use, the testing machine must be checked to ensure that it is free of objections. This must be done daily, before the test is started. The following points must be checked:

1. Check the testing machine externally for errors (visual inspection)
2. Check printing plates for cleanliness and flatness
   a. The printing plate must be cleaned after each test
3. check mobility of the ball calotte on compression testing machines

4. Switch machine on and check safety function:
   a. Actuate emergency stop switch → Machine switches off
   b. Check door position switch the cylinder cannot be moved when the safety door is open

Danger	
	**If there are faults on the testing machine, it must be shut down and TESTING must be informed!** E-Mail: service@testing.de Phone: +49 30 7109645-39
Note	
	**Auxiliary means / tools:** • Hair ruler • Brushes • Cleaning cloth

In general, it is not allowed to reach into the test room after the test has been started. Special attention must be paid to the correct execution of compression tests, since incorrect operation can cause the specimen to be ejected from the test chamber. The specimens or possible hardened intermediate pieces have to be placed in the middle of the compression plate. A centric application of force must be ensured.
(See figure 2)

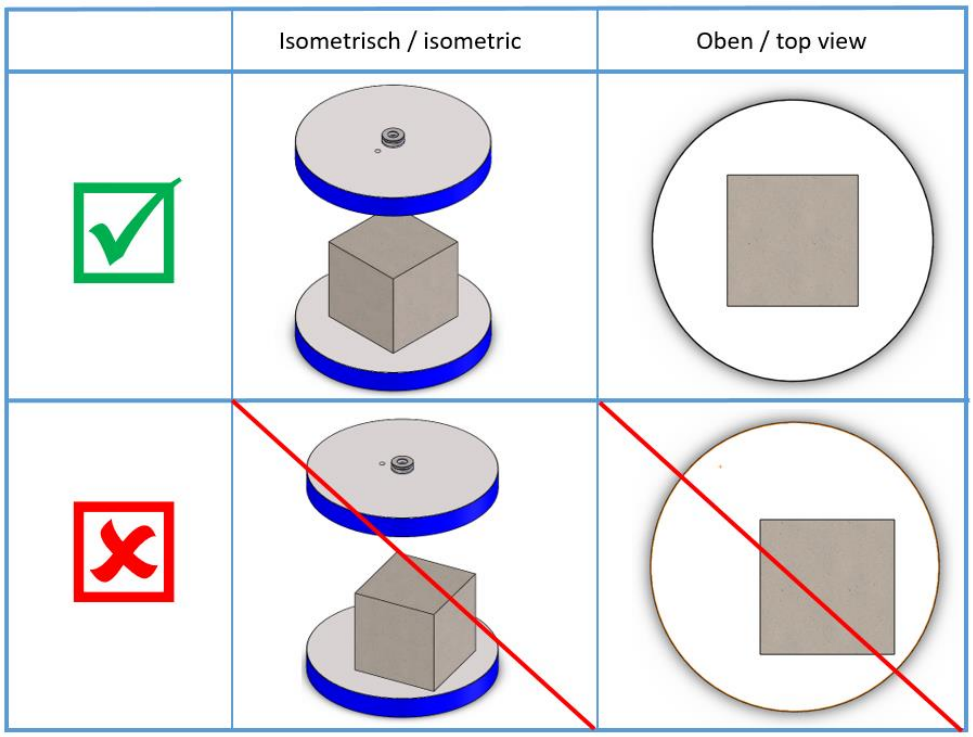


Fig. 2 Centric force applicaation

Danger
 **Do not reach into the test chamber after starting the test!**
Danger
 **Place specimens centrally on machine platens. Otherwise, the specimens may be ejected.**

Note
 **Clean the machine platens after each test procedure!**

The test frame can be used for a variety of standard specific tests. Often special test inserts are required for this purpose. Figure 3 shows how the different variants can be mounted in the test frame. Here one differentiates between the adaptation at the spherical calotte where the spherical bearing is maintained and the adaptation directly at the load cell, which is necessary for example for bending tests.

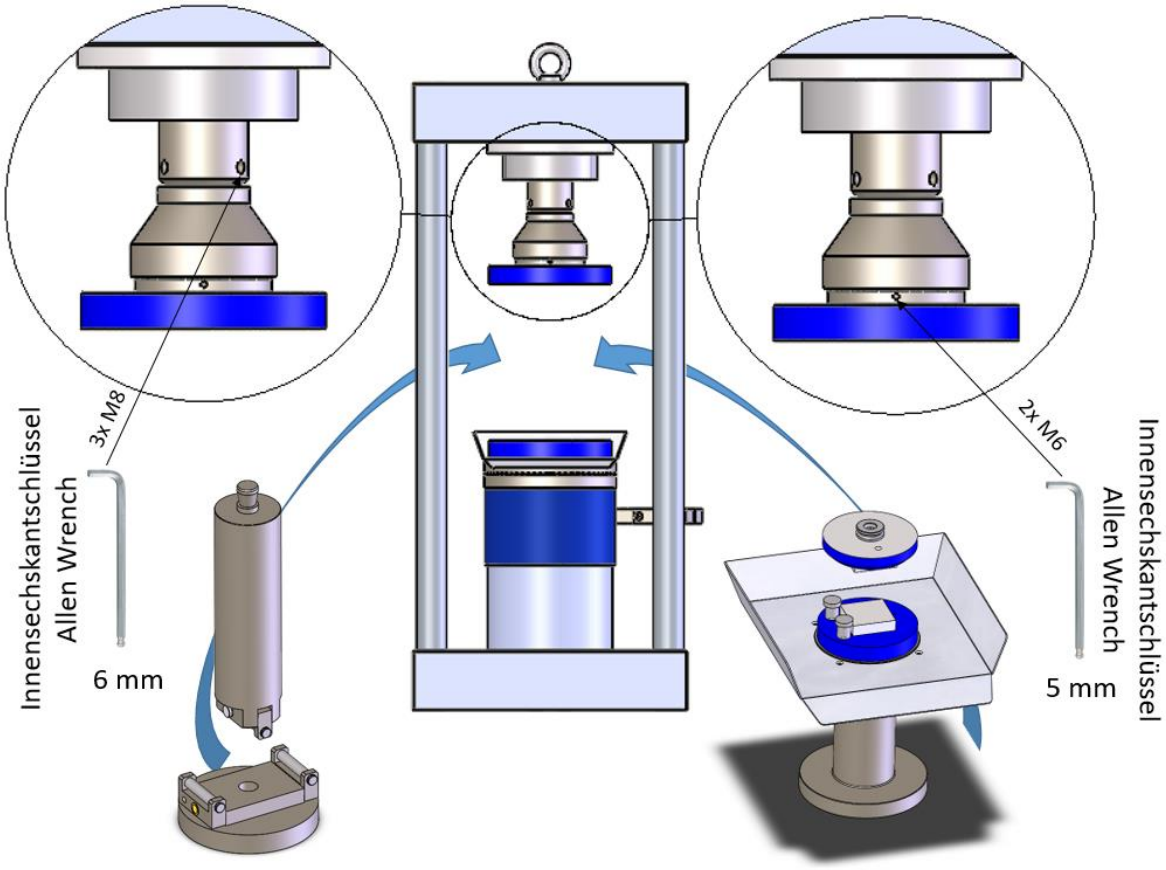


Fig. 3 Adaption of differen test devices

Note	
	**Screws / grub screws Tighten!**
	**Auxiliaries / Tools:** • Allen Wrench 5 mm • Allen Wrench 6 mm

3 Control Cabinet

3.1 Structure and function

The basic structure of the control cabinet is shown in Figure 4. For details regarding the electrical and hydraulic control, please refer to the technical documentation in sections 5 and 6. The individual arrangement of the main components of the control cabinet may vary depending on the layout, the test frames to be connected and the separate requirements for the test system.

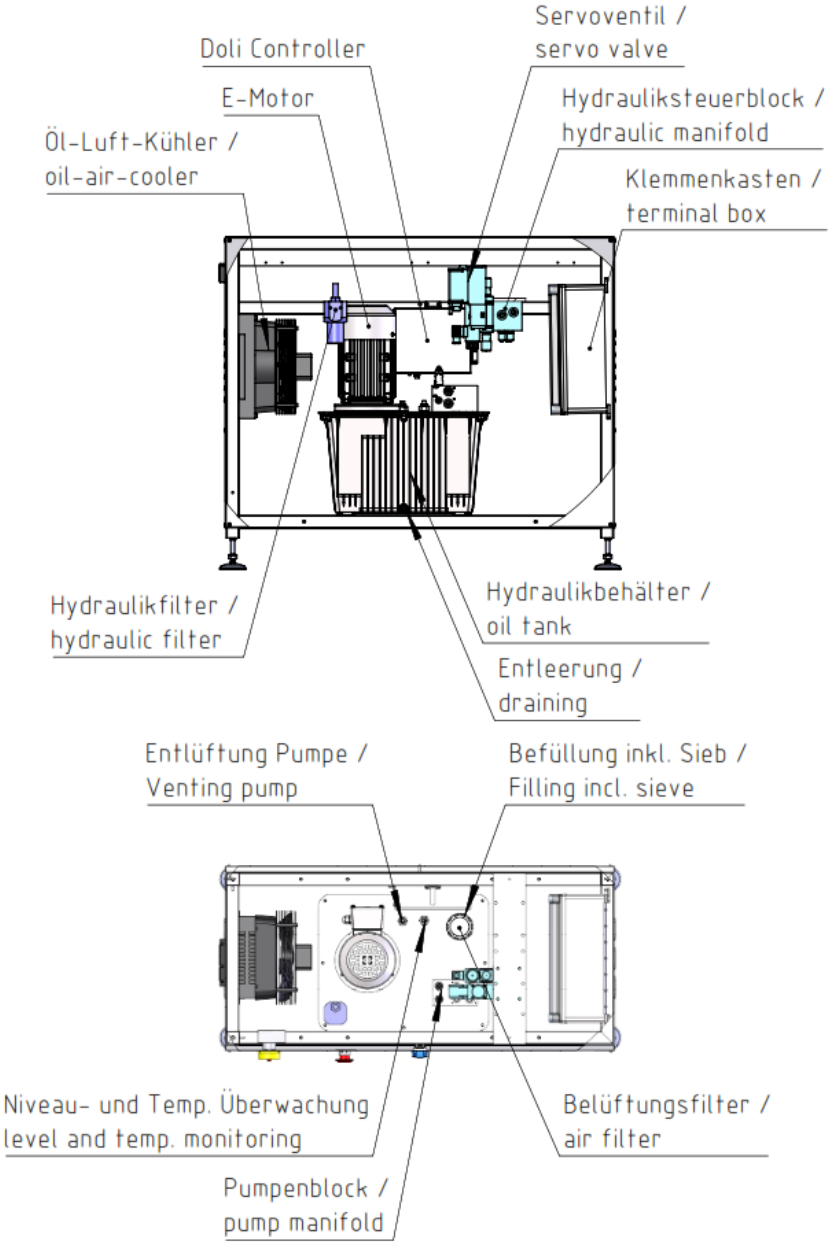
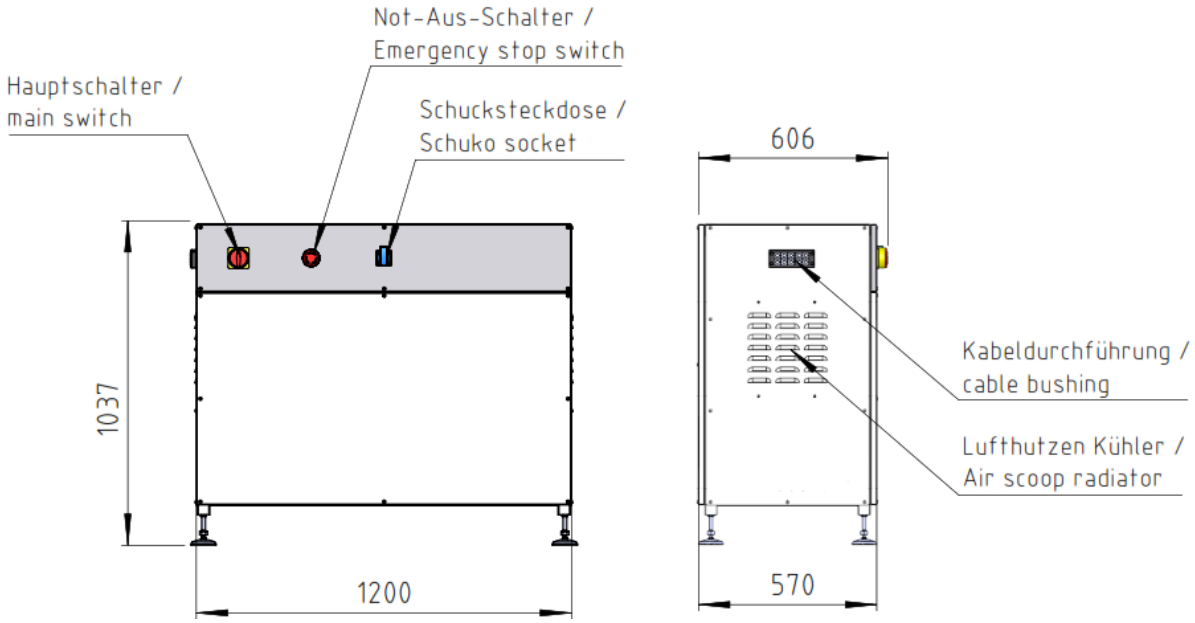


Fig. 4 Control Cabinet Layout

3.2 Technical data

The exact technical data of each test frame can be found in the Technical Documentation - Section 2.

Note	
	**For further information, please contact the TESTING service team.** E-Mail: service@testing.de Phone: +49 30 7109645-39



4 Measuring and control electronics

TESTING test systems are equipped with high-quality measurement and control electronics. Individual data sheets of the measuring sensors are attached to the technical documentation see section 10. A powerful DOLI controller of the latest series is used as the test controller, which was specially developed for data acquisition and control of materials testing machines.

Note	
	**The controller installed in your test system can be found in the control cabinet data sheet see Technical Documentation Section 2!**

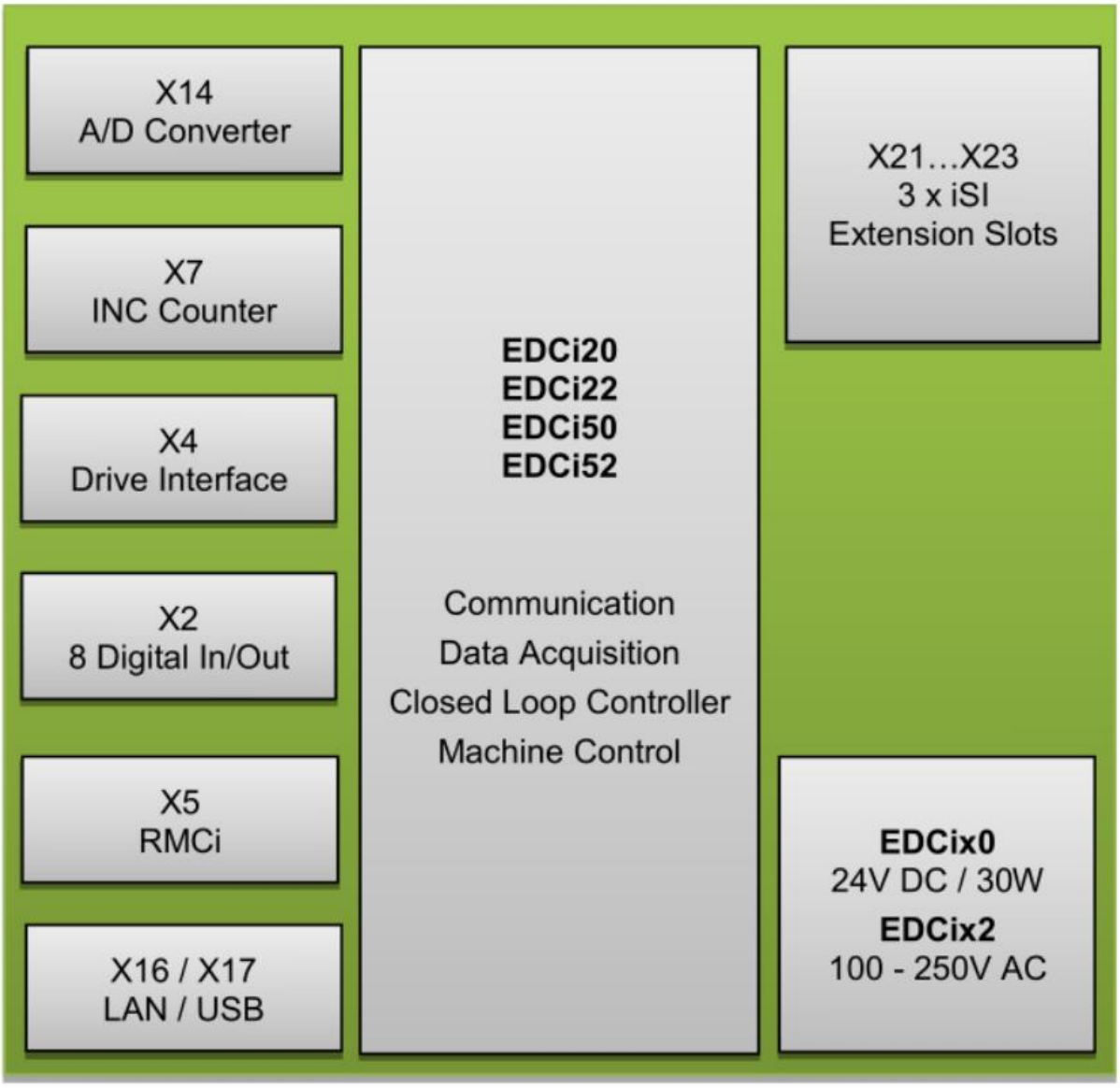
4.1 Controller overview

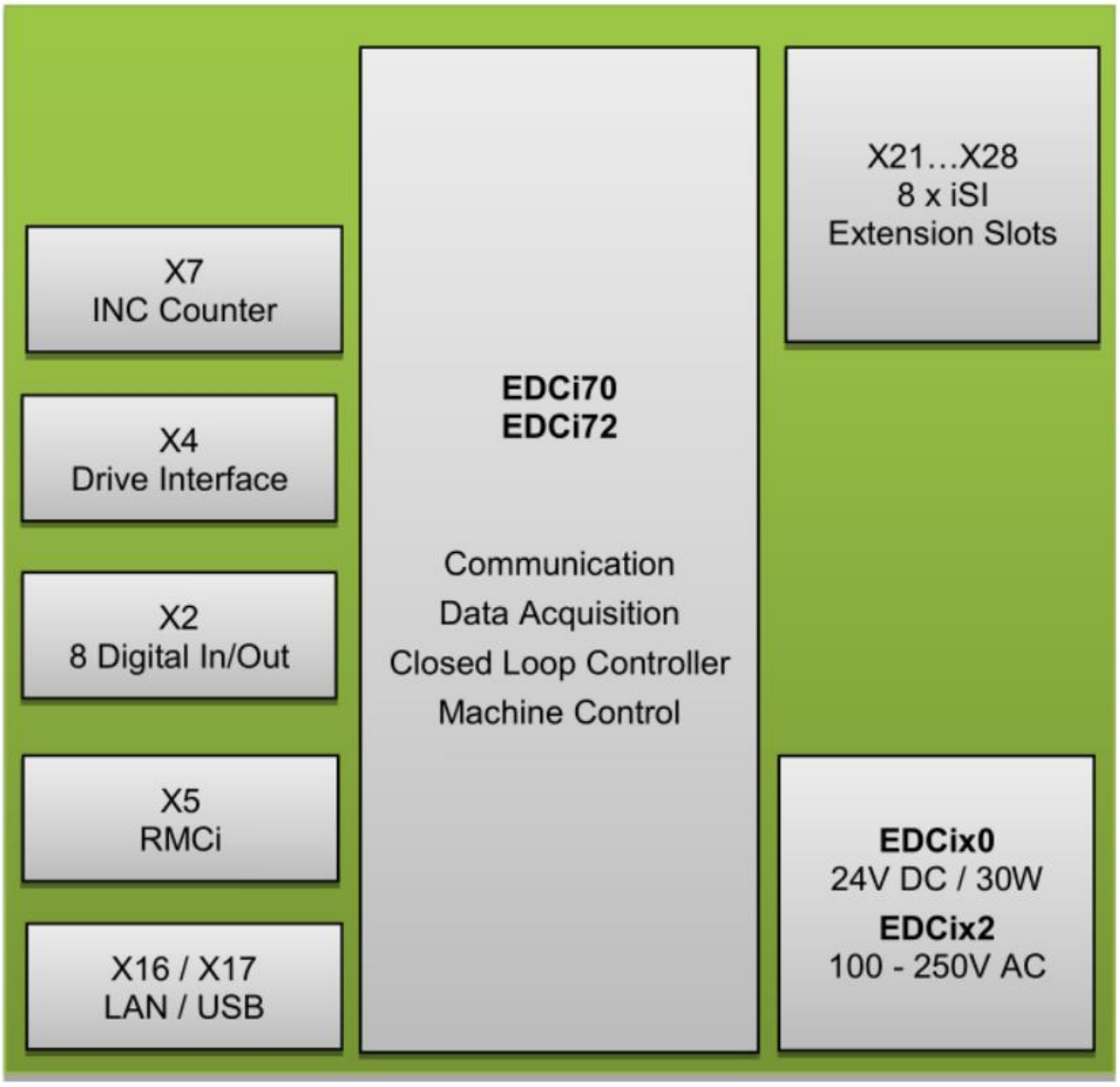
Depending on the configuration, one of the following controllers with the respective technical characteristics (see following Table Comparison of Technical Data EDCi) can be used on the test system. The basic functional structure of the DOLI EDCi controllers is shown as a block diagram in following Figures.

Funktion	EDCi10	EDCi20	EDCi50	EDCi70
Maximum control frequency	-	2.5 kHz	10 kHz	10 kHz
Minimum control frequency	-	1 kHz	1 kHz	1 kHz
Maximum test frequency	-	5 Hz	500 Hz	500 Hz
CPU Vortex DX86 800 Mhz	-	✓	✓	✓
PC interface USB 2.0	-	✓	✓	✓
PC interface LAN 10 / 100 MBit	-	✓	✓	✓
Load channel ± 10.000.000 steps	-	✓	✓	-
Incremental encoder:	-	✓	✓	✓
Digital inputs/outputs with 24 VDC level	-	8	8	8
iSI extension slots	-	3	3	8
Power supply 24 VDC, 1.5 A	-	✓	✓	✓
Supply voltage 100 – 240 VAC 50 – 60 Hz	-	✓	✓	✓
EDC synchronization	-	○	○	○
Drive interface:: - 10V command output with 15Bit resolution - Digitale Befehlsausgabe, A/B-Impulsfolge - E/A's und Relais für Sicherheitsfunktionen	-	○	○	○
External DriveBox: - 10V command output with 15Bit resolution	-	○	○	○

- Digital command output, A/B pulse train - I/O's and relays for safety functions - 16 digital inputs/outputs with 24V leve				
Internal servo valve amplifier up to 300 mA	-	○	○	○
Internal 160W DC power amplifier	-	○	○	○
Internal 320W DC power amplifier	-	○	○	○

✓ Inklusive ○ Optional - nicht möglich




X7
INC Counter
X4
Drive Interface
X2
8 Digital In/Out
X5
RMCi
X16 / X17
LAN / USB
EDCi70
EDCi72
Communication
Data Acquisition
Closed Loop Controller
Machine Control
X21…X28
8 x iSI
Extension Slots
EDCix0
24V DC / 30W
EDCix2
100 - 250V AC

4.2 Pin assignment

The pin assignment for the individual EDCi controllers is shown in following.

Funktion		EDCi10	EDCi20	EDCi50	EDCi70
X2	Universal digitale I/O	-	✓	✓	✓
X4	Drive Interface	-	✓	✓	✓
X5	RMC (Remote Control)	-	✓	✓	✓
X7	Input INC- or SSI-transducer	-	✓	✓	✓
X11	Synchronisation - IN	-	✓	✓	✓
X12	Synchronisation - Out	-	✓	✓	✓
X13	USB port	-	✓	✓	✓
X14	Force input	-	✓	✓	-
X16	LAN PC interface	-	✓	✓	✓
X17	USB PC interface	-	✓	✓	✓
X18	10V control output, Servo valve, internal amplifier	-	✓	✓	✓
X19	24v Power supply	-	✓	✓	✓
X21	iSI Expansion Slot	-	✓	✓	✓
X22	iSI Expansion Slot	-	✓	✓	✓
X23	iSI Expansion Slot	-	✓	✓	✓
X24	iSI Expansion Slot	-	-	-	✓
X25	iSI Expansion Slot	-	-	-	✓
X26	iSI Expansion Slot	-	-	-	✓
X27	iSI Expansion Slot	-	-	-	✓
X28	iSI Expansion Slot	-	-	-	✓
X40	External drive box	-	✓	✓	✓
X61	Up to four calculating sensors	-	✓	✓	✓
X62	Bis zu vier serielle Sensoren	-	✓	✓	✓
X63	RMC Digipoti	-	✓	✓	✓
Y1	RS232 Option for serial sensors	-	✓	✓	✓
	✓ possible		- not possible		

4.3 Remote Control RMCi Overview

The RMCi8 is a manual control unit connected to the EDC via a 3m long cable. It offers all necessary functions to operate the EDCi controller "Stand-Alone".

Furthermore, the manual control allows easy positioning of the test cylinder (setup mode) and simplifies the specimen insertion into clamping devices. The RMCi8 (see Fig. 5) has a magnetic foil on the rear side for attaching the hand control anywhere.

Display:	colourfull TFT Touch Display mit 480p x 272p and Status-LEDs
Connection:	3m cable, M12 – M12
Keys:	**16 Keys, Emergency stop button DigiPoti, Touch Display**
Digipoti:	Crosshead / cylinder positioning Scroll the display and Cursor positioning for data entry

Fig. 5 Remote Control RMCi8

Fig. 6 Remote Control RMCi1

4.3.1 RMCi Adress Select

Note	
	If you connect two or more RMCs of the same type (e.g. 2 x RMCi8) to the EDC, the addresses of these RMCs must be different. Follow the next steps to change the RMC address.

1. EDC switch off
2. Hold the LINK key  pressed and switch on the EDC
3. Now you see a headline with the current RMC address.
4. Press the LINK key several times to change the RMC address (0...3).
5. Switch off and on the EDC again.

4.3.2 RMCi Brightness Select

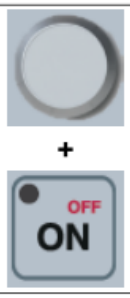
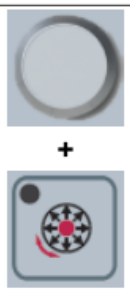
Note	
	**The life time of the yellow OLED of the RMCi6 and RMCi7 display is limited and depends on the brightness setting and the ambient temperature. Lower brightness values and lower ambient temperature lead to a longer life time. For systems running 24h a day or at higher temperatures we recommend setting the brightness to the lowest value at which the display is still readable**

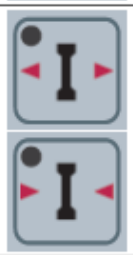
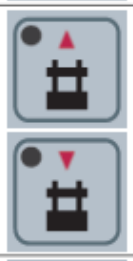
1. EDC switch off
2. Hold the LINK key  pressed and switch on the EDC
3. Now you see a headline with the current RMC address.
4. Press the DigiPoti key to toggle between RMCi address and brightness adjustment.
5. Press the LINK key several times to change the brightness (10%...100%)
6. Switch off and on the EDCi again

Starting from EdcApp 9149.004 we provide a screen saver that extends the display life time a lot. The screen saver sets the display to the lowest brightness (10%) if there is no key or DigiPoti input for more than one hour. Any keyboard or DigiPoti input stops the screen saver and the display returns to normal operation mode

4.3.3 RMCi Key Functions

Table 1 RMCi Key functions

Key	Comment	Function
	ON	Switch drive on. LED is flashing. After drive amplifier is on, LED is also on.
	OFF	Press Digipoti and ON key to switch drive off. LED is off.
	UP	Moves crosshead up. LED is on during movement in this direction.
	HALT	Halts movement of crosshead. In standalone mode the key stops the running test. Test results are shown.
	DOWN	Moves crosshead down. LED is on during movement in this direction.
	POS MODE	Change operational mode of Digipoti from speed to position control mode. Both direction LEDs are on.
	Turn	In speed control mode: increase / decrease speed. In position control mode: increase / decrease position.
	High / Low Pressure	Press Digipoti and POS MODE key to activate / deactivate high pressure. This function must be enabled and configured in the EDC setup. LED is on if high pressure is active.

	Close / Open Grips	These four keys operate hydraulic / pneumatic grips. This function must be enabled and configured in the EDC setup. LEDs are controlled by an external device.
	Close / Open Extensometer	These two keys operate automatic extensometer arms. This function must be enabled and configured in the EDC setup. LEDs are controlled by an external device.
	Move Fixed XHead	These two keys operate adjustment of a fixed crosshead. This function must be enabled and configured in the EDC setup. LEDs are on if crosshead is moving.
	START HALT CONTINUE	Start test (LED on). Halt running test (LED flashing). Continue test (LED on). Function depends on the standalone or PC application.
	RETURN	Return to start position. Function depends on the standalone or PC application.
	LINK	Link key. Function depends on the EDC general data setup parameter **RMC Active Mode.** If two or more RMC are connected, you can set the behavior of the active RMC. *MULTI* - All connected RMCs are active. All link LEDs are on. *SINGLE* - Only one active RMC is allowed. One link LED is on. - All other RMC keys are disabled (Estop is always active). - Press link key of the active RMC to switch to another RMC. - Now all RMC link LEDs are blinking. - Press the RMC link key of the new RMC.

	F1…F3	Function keys are only used in PC Control. Function depends on the PC application. Build in EDCi standalone tests don't use these keys.

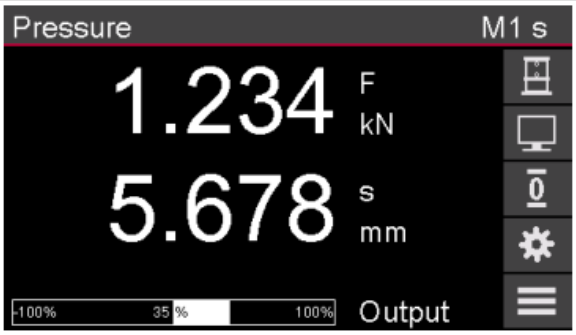
4.3.4 RMCi Key and Touch Functions

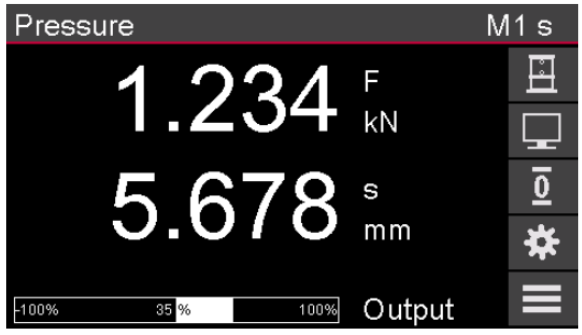
If you want to use the programs included into the EDCi, you need an RMCi1/RMCi8 with touch screen. With the RMCi1/RMCi8 you can set the test parameter and display the test results. An additionally connected RMCi6 or RMCi7 only displays force and displacement values.

Table 2 general handling in menus

Key	Comment	Function
	Touch	ENTER function in menus or selects a menu item.
	Swipe	Moves cursor up/down or selects a choice in parameter menus.
	Turn	Moves cursor up/down or selects a choice in parameter menus.
	Press	ENTER function in menus or selects a menu item.

Table 3 RMCi1 / RMCi8 main display and menus

Display	Function
	Main Display Buttons ◄ Machine menu. ◄ Display mode (for future use). ◄ Tare menu. ◄ Test settings. ◄ Main menu.



Main Display Readings

The headline shows the test name, machine number and current control sensor.

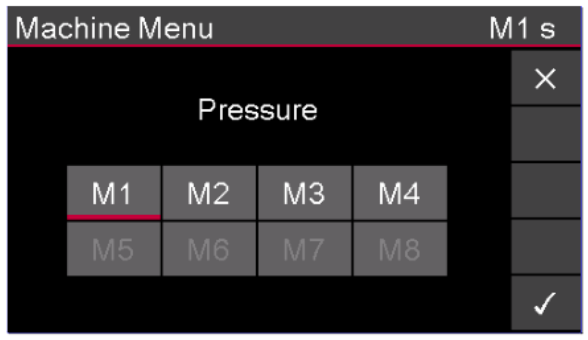
Depending on the selected test you see the sensor readings and additional info like the output.

Main Menu

◄ CANCEL: return to previous menu.

Select PC Control for USB/LAN communication.
Select a standalone test.
Edit user setup parameter.
Show EDC info menu.

◄ ENTER: confirm selection.



Machine Menu

◄ CANCEL: return to previous menu.

Select machine.

◄ ENTER: initialize selected machine.

Tare Menu

◄ CANCEL: return to previous menu.

Set/Reset sensor tare.

◄ ENTER: confirm new sensor tare.

Table 4 RMXi1 / RMCi8 PC control menu

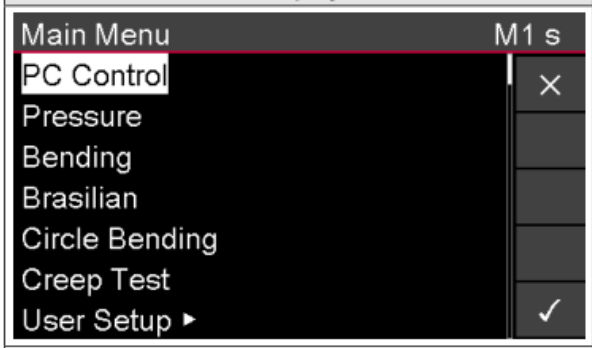
Display	Function
	Main Menu ◄ CANCEL: return to previous menu. Select PC Control for USB/LAN communication. ◄ ENTER: confirm selection.
	PC Control Offline ◄ PC Control settings. ◄ Main menu.
	PC Control Online ◄ Function keys for PC application.

Table 5 RMCi1 / RMCi8 test settings menu

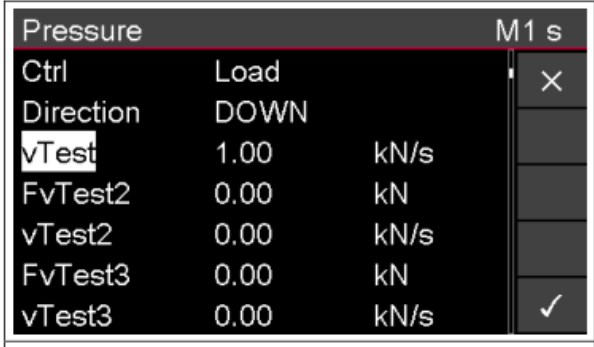
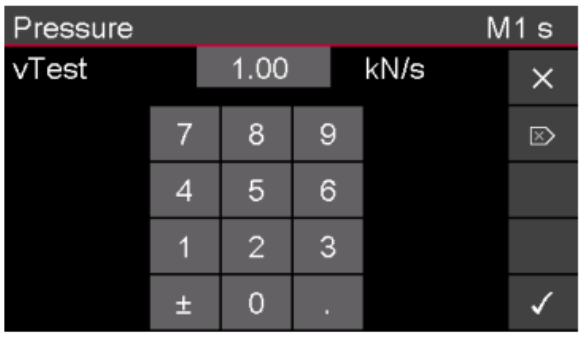
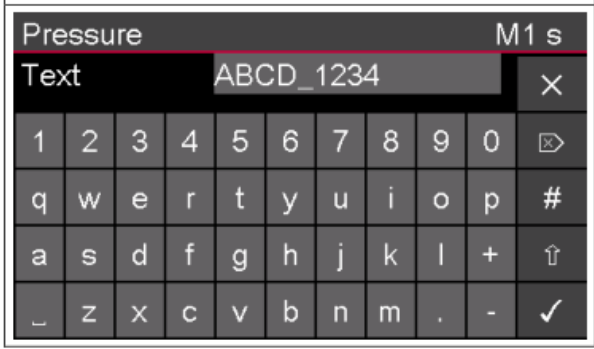
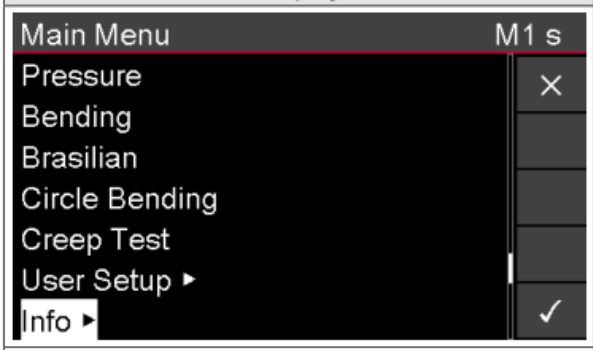
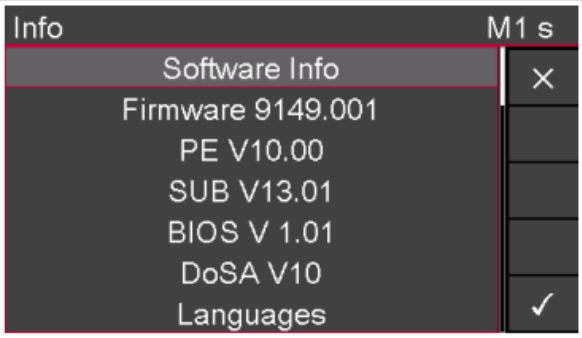
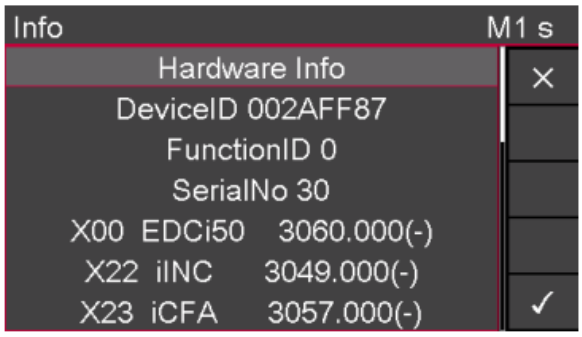
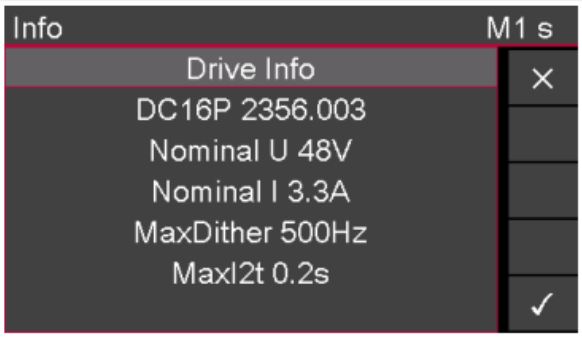
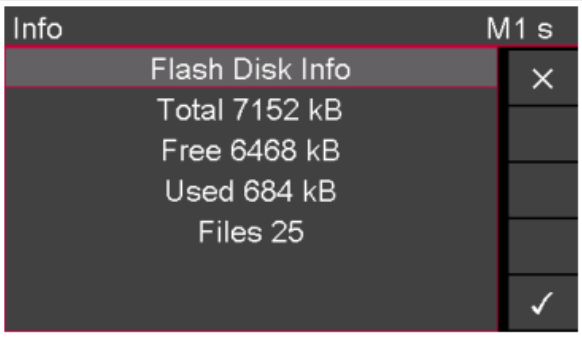
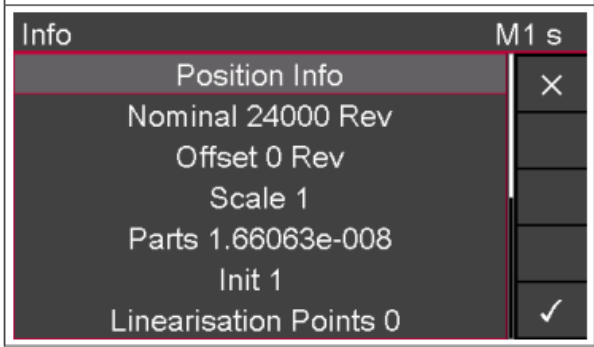
	Test Settings Menu ◄ CANCEL: return to previous menu. ◄ ENTER: edit parameter.
	Edit Value ◄ CANCEL: return to previous menu. ◄ DELETE: delete input. ◄ ENTER: confirm changed parameter.
	Edit Text ◄ CANCEL: return to previous menu. ◄ DELETE: delete input. ◄ SYMBOLS: show special symbols. ◄ SHIFT: change lower/capital characters. ◄ ENTER: confirm changed parameter.

Table 6 RMCi1 / RMCi8 info menu

Display	Function
	Main Menu ◄ CANCEL: return to previous menu. ◄ ENTER: show info sub menu.
	Info Menu ◄ CANCEL: return to previous menu. ◄ ENTER: show info.
	Software Info ◄ CANCEL: return to previous menu. ◄ ENTER: confirm.
	Hardware Info ◄ CANCEL: return to previous menu. ◄ ENTER: confirm.

	Drive Info ◄ CANCEL: return to previous menu. ◄ ENTER: confirm.
	Flash Disk Info ◄ CANCEL: return to previous menu. ◄ ENTER: confirm.
	Sensor Info ◄ CANCEL: return to previous menu. ◄ ENTER: confirm.

4.4 General Operation

The operation of the test system described below refers to "stand-alone" operation without the corresponding test software and PC.

Note	
	**For maximum benefit and flexibility of the test system, TESTING recommends using the test software Test&Motion**

4.4.1 Switch On the EDC

Switch-on the EDC. The system check runs automatically.

Note	
	**The correct contents of the sensor EEPROMs and the EDC setup are preconditions for the accurate running of the system check. If an initialisation error occurs, the EDC will show the error number and a short description on the display**

The active machine number and the current closed loop control mode are always displayed at the upper right display corner.

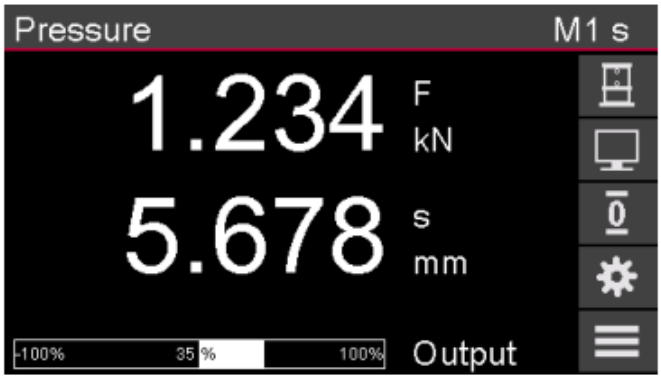


Fig. 7 EDC Display: main readings

4.4.2 Select Machine

Press the  key to select the right machine, if the EDC controls more than one machine or has different machine settings in the setup. Press the OK button to initialize the selected machine.

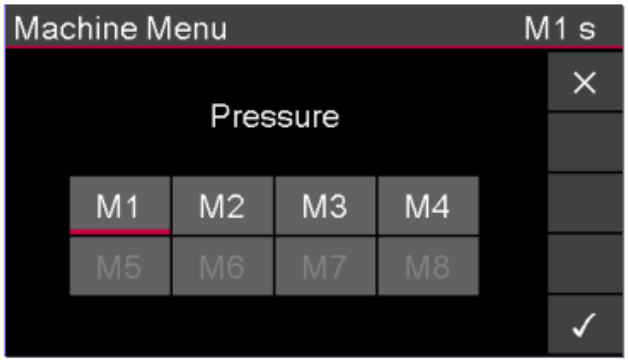


Fig. 8 EDC Display: main readings

4.4.3 Tare Sensors

Press the  key to tare a sensor. Press the OK button to confirm the new tare.

Fig. 9 EDC Display: Tara Menu

4.4.4 Switch On the Drive

Press the ON key in order to switch on the drive. The illuminated ON LED signalises the condition Drive On.

Note	
	**If there is a fault, it is shown in the display (e.g. "Emergency stop button pressed") and the drive cannot be switched on. The ON LED does not light up.**

If the drive was started successfully, the EDC software shows the last test, in which the machine has been shut off. The testing parameters are still available, but not the testing results or the statistics of the testing series before the disconnection. Now, the machine is in the positioning mode, explained in chapter 5.4.2.

4.4.5 Positioning

To move the crosshead or the hydraulic piston with the direction keys, three conditions must be fulfilled:

1. The display must show the readings.
2. The drive must have been switched on (ON LED is on).
3. There must not be a test running (TEST LED is off).

Press the  key to choose between two Digipoti modes, speed control or position control. You can set the sensitivity of the Digipoti with a parameter in the EDC setup.

4.4.5.1 Digipoti in Speed Control

The Digipoti controls the speed of the crosshead. You can adjust the driving direction with the direction keys. A LED in the direction key shows the chosen direction.

Attention!	
	**If the Digipoti start speed 'RMC Speed Slow' was set to a non-zero value in the EDC setup, the machine starts moving immediately with this speed. If the start speed is set to zero, the machine will start moving only after the Digipoti has been turned.**

To change the direction of the machine, press the appropriate direction key and after that turn the Digipoti. You can stop the machine by pressing the **STOP** key. If the push mode is activated in the EDC setup, the crosshead moves while you press the direction key. If you release the key, the machine stops immediately.

4.4.5.2 Digipoti in Position Control

The Digipoti controls the position of the crosshead. The **UP** and **DOWN** LEDs are on. Turning the Digipoti right or left moves the crosshead up or down. You can stop the machine by pressing the **STOP** key. This mode can be useful when clamping samples.

Note	
	**This mode can be very useful for clamping samples**

4.4.6 Main Menu

Press the  key to enter the main menu. Here you can select the build in standalone tests, PC Control, user setup and some other information. Press the OK button to select your choice.

4.4.6.1 User Setup

In this menu you can set the following parameters:

Table 7 User Setup Parameter

Parameter	Choice	Unit	Remark
SPos		mm	Crosshead position.
SMax SMin		mm mm	Position soft ends.
FUnit	mN, N, kN		Minimum displayed load unit.
Bypass		s	The bypass valve is opened for this time at the return move after test end. If a crosshead travel transducer is available, the defined time will be ignored and the bypass valve is closed, when reaching the return position.
Bypass	closed opened		The bypass valve is closed. The bypass valve is opened manually, as long as the Digipoti key is pressed.
Language	English German User1 User2		Select the EDC display language. User1 and User2 language can be load from the PC with the DOLI Installation Center.
Date	dd.mm.yyyy		The date for the EDC real time clock can be set.
Time	hh:mm:ss		The time for the EDC real time clock can be set
Protocol Setup			Select protocol setup menu (see chapter 3.6.1.1)

PC-Interface (DoSA)

This menu shows you how to adjust the protocol interface. If the receiver is set to **PC**, you can set the communication parameters for the **DoSA** Interface. With **DoSA** you can control the build-in EDC creep test from your PC application. You can get the measured values and results of the tests.

Table 8 Protocol setting PC interface

Parameter	Choice	Unit	Remark
Receiver	Disabled PC		Protocol off Activate **DoSA** protocol to PC
Time		s	Time base for the transfer of readings to the PC
Decimal	Point Comma		Decimal sign
Results	No/Yes		Send results to PC
Data	No/Yes		Send measured data results to PC
Buffer	No/Yes		Buffers measured data in the EDC, while the PC is offline.

4.4.7 TEST Settings

Press the  key to enter the current test settings menu. Each test has its own settings menu, in which the variable test parameters are to be set. Press the OK button to edit the parameters, press CANCEL to leave the menu.

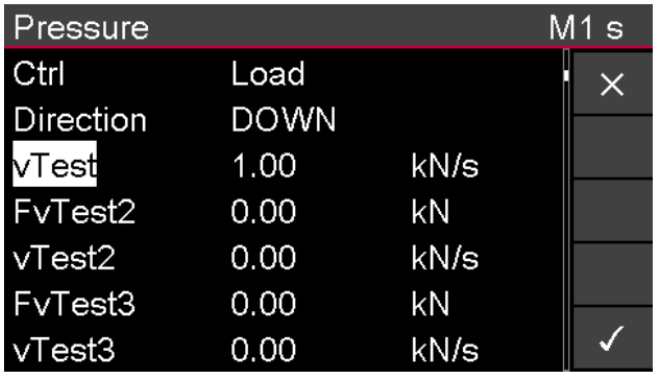


Fig. 10 EDC Display – test settings

4.4.8 PC Control

In main menu you can switch from EDC standalone to PC Control mode. This is the default mode, if no RMCi1/RMCi8 is connected to the EDC.

All standalone tests are disabled and a PC application can control the EDC. No process hardware is needed by the PC, because the electronics of the EDC is used. All commands can be transferred directly from the PC to the EDC and vice versa, the measured values will directly go to the PC.

In order to use this operation mode, you have to connect the USB or LAN interface of the PC with the X17 USB or the X16 LAN connector of the EDC. For LAN communication, you have to use a '**crossover LAN cable'**, if you do not use a LAN switch between your PC and the EDC. You have to install a USB or LAN driver provided by TESTING.

Note	
	**For more information about the drivers, install the DOLI Installation Center and read the document: C:\Programme\Doli\CommuncationDrivers\CommuncationDrivers.pdf**

Use the  Button to choose the following settings for the PC Control.

Table 9 Settings PC Control

Parameter	Choice	Unit	Remark
Connector	AUTO X17 USB X16 LAN		Automatically detect the active interface (USB or LAN) Use only USB Use only LAN

As soon as the communication is online, the function keys F1, F2 and F3 will appear. All keys are transmitted to the PC. As a result, all reactions are determined by the PC program. The PC can control the whole EDC display including the function key texts.

To leave PC Control you must exit your PC application or switch off and on the EDC. If the PC does not communicate with the EDC, you can go back to the main menu and select any other test.

If the PC turns OFFLINE, the EDC will switch to the EMERGENCY STOP state. If the PC goes ONLINE again, the EDC will turn to normal state and you are able to switch on the drive amplifier again by pressing the ON key.

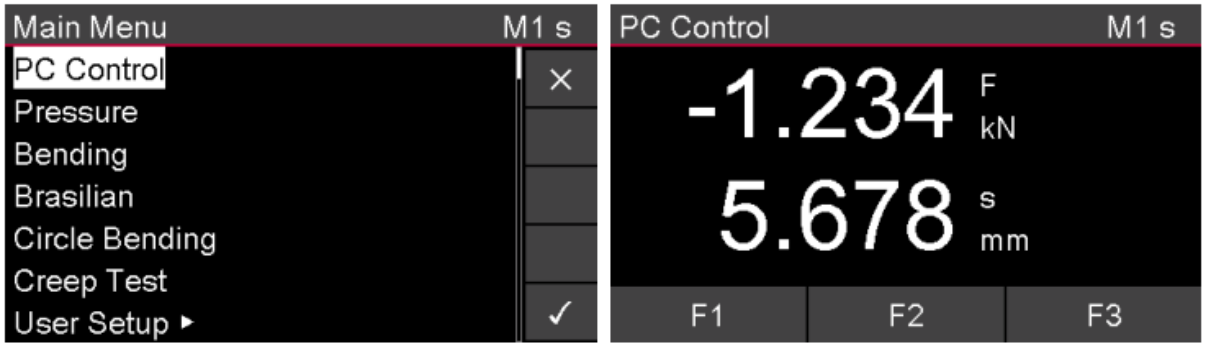


Fig. 11 EDC Display: PC-Control

4.5 Tests

Note	
	**The following chapters describe all different standalone tests, which are available on the EDC. Depending on the EDCs licence file, some tests may not be active**

4.5.1 General test control

The test control, the handling of the test results and the structure of the printouts are equal for all tests and described in this chapter. Possible variations and the specific test parameters are described in the different tests.

4.5.2 Test mode „Control“ and „No Control“

Generally, all tests can be carried out in the mode „Control“ as well as in the mode „NO Control“. You can adjust the desired mode in the EDC machine setup with the parameter Testmode (see documentation “DOLI Installation Manual”). The difference between the test modes is as follows:

Table 10 Test mode „Control“ and „No Control“

Test mode	Characteristic
Control	The machine respectively the test run is controlled by the EDC. It is possible to react to critical errors (e.g. with Emergency Stop). Additionally, the EDC records the measuring data and calculates them.
No Control	The EDC records the measuring data and does the calculations only. There is no possibility to control the machine. The movement keys have no effect. The **START** key starts the calculations only. The test has to be started at the machine control panel. If the load limit is exceeded, the digital output signal for the brake is set (low active).

4.5.3 Test Start

In the headline you see the selected test, below you can see the measuring values which are normally load and position.

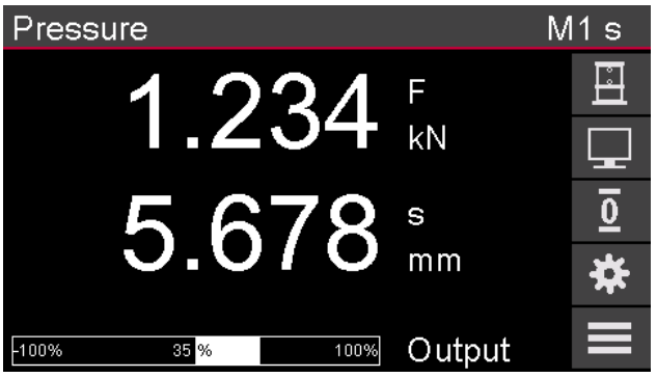


Fig. 12 EDC test display

Use the  button to enter the test settings menu.

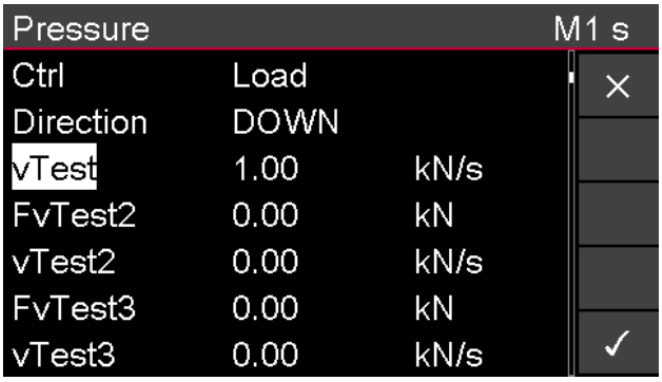


Fig. 13 EDC test settings

If you want to start a new testing series, enter the series menu here before starting the test. After leaving the series menu, a new testing series is started. If there are any statistic results from previous testing series, they will be finished.

Fig. 14 EDC test series

Table 11 Function keys for test start

Key	Comment	Function
	START	Start test.
	STOP	Halts movement of crosshead. Stops the running test. Test results are shown.
	RETURN	Return to LE start position.

4.5.4 Test result

The test results appear at the regular test end or if the  key is pressed.

Fig. 15 EDC test results

Table 12 Function keys for test result

Key	Comment	Function
	CANCEL	Discard the test results. The results are not saved and the statistics is not updated.
	OK	Accept the test results. The results are saved and the statistics is updated.

After your choice the measuring values are shown again and you can start the next test with the  key.

4.5.5 Building material tests

You have four different building material tests at your disposal:

- Pressure test (DIN 1048 part 5)
- Bending tensile strength test (DIN 1048 part 5)
- Brasilian test (DIN 1048 part 5)
- Circle bending test (DIN4032)

The load and crosshead travel position (if available) can be seen in the display for measured values. shows the diagram of these tests.

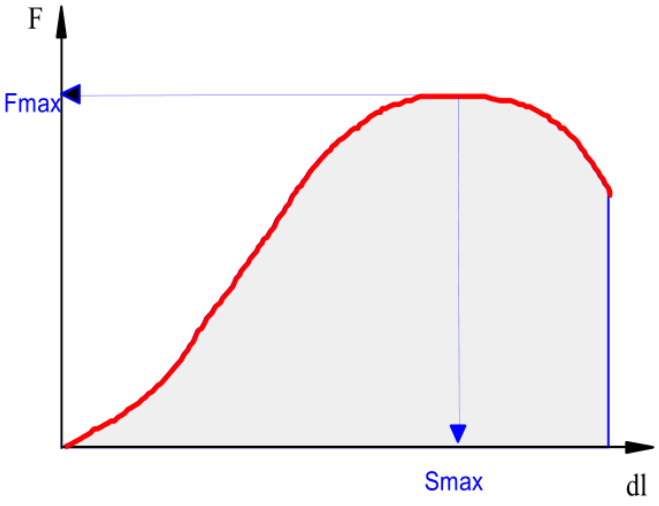


Fig. 16 Graph of the Building material tests

4.5.5.1 Test mode „Control“

In all four tests, the specimen will be loaded up to break with a constant speed of increase of tension or position (only with crosshead travel transducer). The respective resistance (ß) can be calculated out of the arising maximum load (Fmax). The test results (Fmax, Smax, ß) will be put out on the display. Smax is only calculated, if a cross head travel transducer is connected to the EDC.

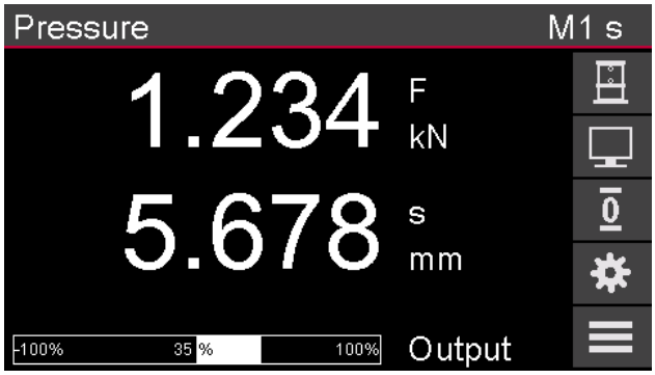


Fig. 17 EDC Display: Building material test with mode “Control”

- Display with crosshead travel transducer: The display shows the load and position. The beam shows the command output.
- Display without crosshead travel transducer: The display shows the load. The beam shows the command output.

4.5.5.2 Test mode „No Control“

In all four tests, the EDC measures the load. The respective resistance (ß) can be calculated out of the arising maximum load (Fmax). The test results (Fmax, Smax, ß) will be put out on the display numerically. Smax is calculated, if a cross head travel transducer is connected to the EDC, only.

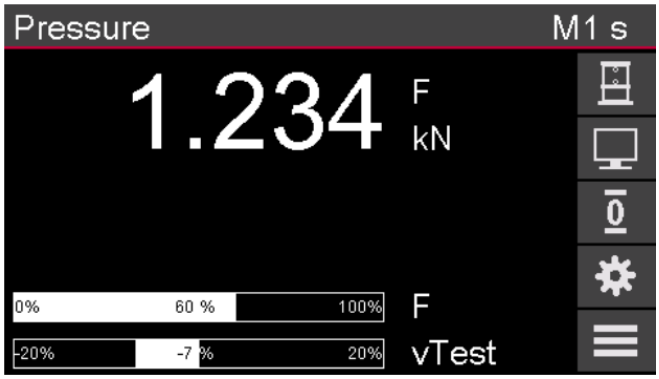


Fig. 18 EDC Display: Building material test with mode “No Control”

- Display without crosshead travel transducer: The display shows the load. The upper beam shows the load in comparison to the nominal load of the machine (F100% in setup). The lower beam shows vTest, the real speed of tension increase in comparison to the theoretical speed, set in the test settings.
- Display with crosshead travel transducer: The display shows the load and position. The lower beam shows vTest, the real speed of tension increase in comparison to the theoretical speed, set in the test settings.

4.5.5.3 Compression test

The pressure resistance is calculated via the following formula:

For cuboids:

$$\theta = \frac{Load_{max}}{Width \times Depth} \times Scale$$

For cylinders:

$$\theta = \frac{Load_{max}}{Radius^2 \times \pi} \times Scale$$

Table 13 Test parameter Compression test

Parameter	Choice	Unit	Comment
Test	Load Position		Control mode: Load control Control mode: Position control (only with XHead sensor)
Direction	UP DOWN		Test direction
vTest1		MPa/s, N/mm²s N/s, kN/s, mm/min	First test speed
FvTest2		N, kN	Load trigger level to switch to second test speed vTest2.
vTest2		MPa/s, N/mm²s N/s, kN/s, mm/min	Second test speed, when load level FvTest2 triggers. To switch off the trigger level FvTest2, set vTest2 = 0.
FvTest3		N, kN	Load trigger level to switch to third test speed vTest3.
vTest3		MPa/s, N/mm²s N/s, kN/s, mm/min	Third test speed, when load level FvTest3 triggers. To switch off the trigger level FvTest3, set vTest3 = 0.

Preload		N, kN	Preload (only required, if there is no closed load loop when test starts)
vPreload		mm/min, %	Preload speed. [mm/min] only with cross head travel transducer. [%] are percent of the maximum command, when there is no crosshead travel transducer.
Shape	Cube Cylinder		Specimen shape is a cube Specimen shape is a cylinder
Specimen			Menu for specimen parameters
Area	 No Input Input		When test starts: do not input specimen parameters input specimen parameters
Break		 % N dF,kN dF N, kN N/s, kN/s	Break recognition via: - relative load decay of Fmax in [%] (70% = 300N with Fmax = 1000N) - absolute load decay of Fmax in [N, kN] - underflow of a minimum load in [N, kN] - load decay per second in [N/s, kN/s]
vReturn		mm/min	Speed for return run
Return	Yes No		Activate return run Deactivate return run
 Prß PrFm PrSm PrA PrScale	Yes No		Activate result parameter Deactivate result parameter - Pressure resistance - Maximum load - Position at Fmax (only with XHead sensor) - Specimen area - Scale

4.5.5.4 Bending tensile strenght test

The bending tensile strength is calculated via the following formula:

For single loading:

$$\theta = \frac{Load_{max} \times Span \times 1.5}{Width \times Height^2}$$

For double loading:

$$\theta = \frac{Load_{max} \times Span}{Width \times Height^2}$$

Table 14 Test parameter Bending tensile test

Parameter	Choice	Unit	Comment
Test	Load Position		Control mode: Load control Control mode: Position control (only with XHead sensor)
Direction	UP DOWN		Test direction
vTest1		MPa/s, N/mm²s N/s, kN/s, mm/min	First test speed
FvTest2		N, kN	Load trigger level to switch to second test speed vTest2.
vTest2		MPa/s, N/mm²s N/s, kN/s, mm/min	Second test speed, when load level FvTest2 triggers. To switch off the trigger level FvTest2, set vTest2 = 0.
FvTest3		N, kN	Load trigger level to switch to third test speed vTest3.
vTest3		MPa/s, N/mm²s N/s, kN/s, mm/min	Third test speed, when load level FvTest3 triggers. To switch off the trigger level FvTest3, set vTest3 = 0.
Span		mm	Span of specimen
Charge	Double Single		Charge
Preload		N, kN	Preload (only required, if there is no closed load loop when test starts)
vPreload		 mm/min %	Preload speed. [mm/min] only with XHead sensor [%] command, if no XHead sensor active.
Specimen			Menu for specimen parameters
Area		 No Input Input	When test starts: do not input specimen parameters input specimen parameters
Break		 % N dF,kN dF N, kN N/s, kN/s	Break recognition via: - relative load decay of Fmax in [%] (70% = 300N with Fmax = 1000N) - absolute load decay of Fmax in [N, kN] - underflow of a minimum load in [N, kN] - load decay per second in [N/s, kN/s]
vReturn		mm/min	Speed for return run
Return	Yes No		Activate return run Deactivate return run
  Prß PrFm PrSm PrA	Yes No		Activate result parameter Deactivate result parameter - Bending tensile strength - Maximum load - Position at Fmax (only with XHead sensor) - Specimen area

4.5.5.5 Brasilian test

The resistance is calculated via the following formula:

For cuboids:

$$\theta = \frac{Load_{max} \times 2}{Width \times Height \times \pi}$$

For cylinders:

$$\theta = \frac{Load_{max} \times 2}{Diameter \times Length \times \pi}$$

Table 15 Test parameter brasilian test

Parameter	Choice	Unit	Comment
Test	Load Position		Control mode: Load control Control mode: Position control (only with XHead sensor)
Direction	UP DOWN		Test direction
vTest1		MPa/s, N/mm²s N/s, kN/s, mm/min	First test speed
FvTest2		N, kN	Load trigger level to switch to second test speed vTest2.
vTest2		MPa/s, N/mm²s N/s, kN/s, mm/min	Second test speed, when load level FvTest2 triggers. To switch off the trigger level FvTest2, set vTest2 = 0.
FvTest3		N, kN	Load trigger level to switch to third test speed vTest3.
vTest3		MPa/s, N/mm²s N/s, kN/s, mm/min	Third test speed, when load level FvTest3 triggers. To switch off the trigger level FvTest3, set vTest3 = 0.
Length		mm	Length of specimen (only for cylinders)
Preload		N, kN	Preload (only required, if there is no closed load loop when test starts)
vPreload		mm/min %	Preload speed. [mm/min] only with XHead sensor [%] command, when there is no XHead sensor
Shape		Cube Cylinder	Specimen shape is a cube Specimen shape is a cylinder
Specimen			Menu for specimen parameters (see chapter 4.2.7)
Area		No Input Input	When test starts: do not input specimen parameters input specimen parameters

Break		% N dF,kN dF N, kN N/s, kN/s	Break recognition via: - relative load decay of Fmax in [%] (70% = 300N with Fmax = 1000N) - absolute load decay of Fmax in [N, kN] - underflow of a minimum load in [N, kN] - load decay per second in [N/s, kN/s]
vReturn		mm/min	Speed for return run
Return	Yes No		Activate return run Deactivate return run
  Prß PrFm PrSm PrA	Yes No		Activate result parameter Deactivate result parameter - Resistance - Maximum load - Position at Fmax (only with XHead sensor) - Specimen area

4.5.5.6 Specimen parameters

Depending on the current test and the shape of the specimen, you can set one or more of the following specimen parameters:

Table 16 Specimen parameters for building material tests

Parameter	Choice	Unit	Comment
Width		mm	Width of the specimen (only for cubes) Pressure test Bending test Brasilian test
Height		mm	Height of the specimen (for cubes only) Bending test Brasilian test
Depth		mm	Depth of the specimen (for cubes, only) Pressure test
⌀		mm	Diameter of the specimen (for cylinders, only) Pressure test Brasilian test Circle bending test
Thick		mm	Thickness of the specimen (for cylinders, only) Circle bending test
Scale			Scale Pressure test