

# FM300BT

## MANUAL





## English version

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# 1 General

## 1.1 Scope of Application

The force meter FM300BT is used to measure the pinch force of power operated elevator doors and machinery protection systems.

The device evaluates the measured results with respect to the requirements of the following applicable standards and guidelines:

- EN 81-1
- EN 81-2
- EN 81-20:2014
- EN 81-50:2015
- EN 14120

Please find detailed information to the given standards on our website (refer chapter 5.4 "Contact").

## 1.2 Product Description

The pinch force measurement system consists of the following parts:

- 1 Sensor FM300 BT (1)
- 4 optional Spacers (2)
- 1 USB cable for data transmission and charging (3)
- 1 Quick guide (4)
- 1 Calibration certificate (5) (in the transportation case cover)
- 1 Transportation case
- 1 USB stick with software (6)



Figure 1: FM300BT Set

**Functions:**

- Button (7)
- LED (8)
- USB socket (9)

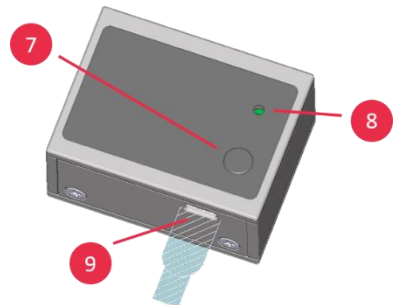


Figure 2: Device functions

### 1.3 Construction

The device consists of a static and a moveable part. Both parts are linked by a strain gauge sensor and a spring with a defined stiffness of 25 N/mm.

The housing of the device is made of aluminium. The force initiation area with a diameter of 58 mm is on the upper side. The distance between the force initiation area and the counterplot is 140 mm.

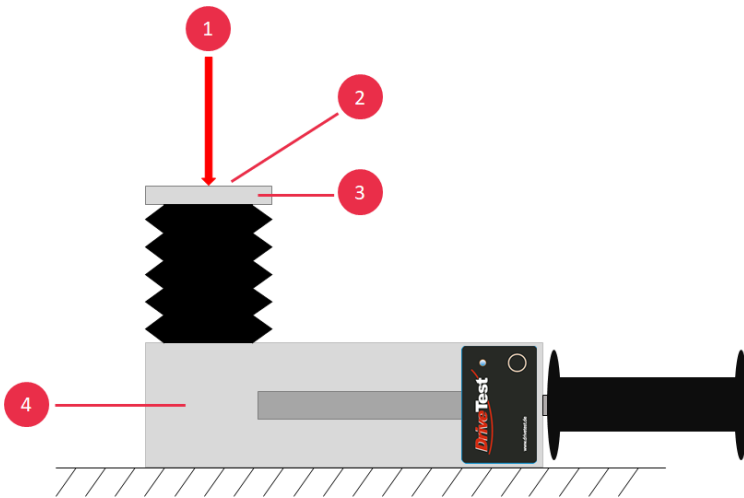


Figure 3: Device construction

The applied force (1) at the initiation area (2) on the moveable (3) part will be determined during measurement. The static part (4) has to be guided by the moveable part of the unit under test during measurement.

## 1.4 Optional Modules

### 1.4.1 Spacers

A set of spacers is optionally available. The spacers are mounted on the static part the device at the bottom side. There are no tools required to mount the spacers.



*Figure 4: Spacers 1, 2, 3 and 4 for the FM300BT*



The spacer set includes the following parts:

- Spacer 1: 20 mm
- Spacer 2: 50 mm
- Spacer 3: 100 mm
- Spacer 4: 200 mm

With these spacers the following apertures can be measured:

| Total aperture | S1 | S2 | S3 | S4 |
|----------------|----|----|----|----|
| 140 mm         | ○  | ○  | ○  | ○  |
| 210 mm         | X  | X  | ○  | ○  |
| 310 mm         | X  | X  | X  | ○  |
| 410 mm         | X  | X  | ○  | X  |
| 510 mm         | X  | X  | X  | X  |

### 1.4.2 Software

The following Add-on modules for the given device are available:

- Software interface for .net
- Software interface for LabView

Please find currently available add-ons, optional modules and product descriptions on our website (refer chapter 5.4 "Contact").

## 1.5 Technical Specifications

| Description  | Value   |
|--|---|
| <b>Mechanics:</b>  |   |
| Spring stiffness   | 25 N/mm                                       |
| Accuracy of spring stiffness<br>(lined force initiation) | - 10 % to +10 %                               |
| Gap width  | 140 mm  |
| Force initiation area                                    | 58 mm diameter                                |
| Overload protection                                      | yes   |
| Weight   | approx. 1200 g                                |
| Dimensions   | 280 x 140 x 82 mm                             |
| <b>Force Measuring:</b>                                  |   |
| Range  | 0 - 750 N                                     |
| Resolution   | 1 N   |
| Accuracy<br>(greater value applies)                      | ± 3 N or<br>± 3 % of measured value           |
| Sampling frequency/ rate                                 | 500 Hz/ 2 ms                                  |
| <b>Power supply:</b>                                     |   |
| USB (5 V DC)   | max. 500 mA                                   |
| Lithium Polymer Battery                                  | 350 mAh                                       |
| Operating time at full load<br>(continuous measurement)  | more than 10 hours                            |
| <b>Environment:</b>                                      |   |
| Operation temperature range                              | -10 to +40 °C                                 |
| Storage temperature range                                | -40 to +50 °C                                 |
| Humidity   | max. 90% relative Humidity,<br>non-condensing |

## 2 Safety Instructions

### 2.1 Target Group

The initial start-up and the operation of the device is restricted to professional personnel. This professional must have read and understood the content of this manual.

Opening or disassembling of the device is restricted to Drive Test personnel due to safety and warranty reasons.

### 2.2 Transportation

We highly recommend to use the transportation case included in the set to carry, ship or deliver the device.

The device contains a Lithium-Polymer battery cell. These are classified as dangerous goods in transportation. As this is a build-in battery cell, please follow guidelines UN3481 and respect your local law.



Figure 5: Shipping label

Consider the package labelling requirements therefore by putting a label outside on the package looking like shown in Figure 5: Shipping label. The size should be min. 120mm x 110mm, on small boxes (where it does not fit on one side) it can be 105mm x 74mm. It has to be printed in colour.

Please find further information on our website (refer chapter 5.4 "Contact").

## 2.3 Operation

### 2.3.1 Battery

The device has a build-in Lithium-Polymer battery cell. This cell needs to be charged once every 6 months to prevent total discharging which leads to a cell defect.

The Lithium-Polymer battery cell has a defined operating temperature of 0 to 45 ° C during charging and -10 to +60 ° C during discharging (refer chapter 1.5 "Technical Specifications").

Please find the battery cell's safety notice on the website of our battery supplier [www.dynamis-batterien.de](http://www.dynamis-batterien.de).

### 2.3.2 Risks

Please use the device with care. Improper handling may cause injuries because of the following hazards:

- ⚠ There is a hazard of pinching extremities when putting them into the measurement area (between the movable and the static part) of the sensor during compression. Avoid the described area during compression of the sensor at any case.
  
- ⚠ There is a hazard of injuries when the device is dropped from great heights.
  
- ⚠ Do not open the device on your own. Improper opening or disassembling of the device may cause defects or short circuits which can lead to severe burn injuries or electrical accidents.

## 2.4 Storing

Please always store the device in a dry environment under the specified temperature (refer chapter 1.5 "Technical Specifications"). The battery should not be empty before storing and if stored for a longer period it has to be charged once in 6 months.

# 3 Preliminary

In this chapter preliminary steps for the device operation will be illustrated.

## 3.1 Battery

The battery cell which is built in the device has to be checked for proper charging state before use. For detailed information about charging please read the corresponding chapter 4.6 "Charging".

## 3.2 Assembly of Spacers

The spacers enable the user to realize different measuring gaps.

The assembling is done via a threaded hole on the static part at the under surface of the measuring device.

The base device can measure at a gap width of 140 mm. When attaching the first and the second spacer, the device is capable of measuring gap width of 210 mm. Using spacers 1, 2 and 3 gives a gap width of 310 mm. By attaching the spacers 1, 2 and 4 a gap width of 410 mm is the result. Using all of the four spacers, a gap width of 510 mm can be realized (refer chapter 1.4.1 "Spacers").

# 4 Operation

In the following the steps during the operation of the device will be described.

## 4.1 Function Overview Android App

- (1) (Change) current screen
- (2) Open settings
- (3) Display current device state (in connected state)
- (4) Disconnect and turn off device
- (5) Remaining battery
- (6) Bluetooth connection quality
- (7) Test (guideline/directive) settings
- (8) (Change) instruction to the current measuring guideline
- (9) Measuring value
- (10) Start/ stop/ drop/ save measurement

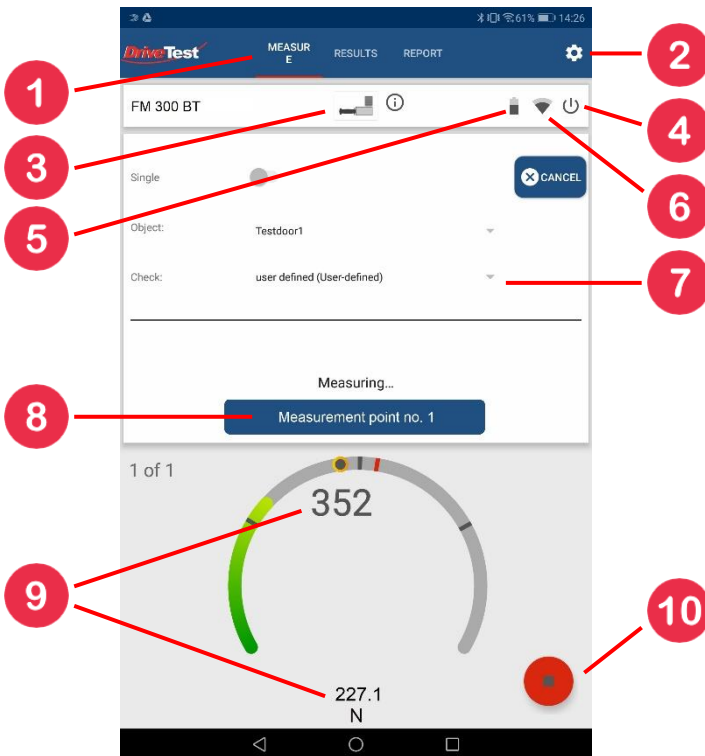


Figure 6: Overview Android App Force Meter

## 4.2 Turning On

Push the button on the device for approximately 1 second to turn it on (see "Functions").

During the start-up, the LED will be lightning in blue colour for a short period of time.

After the device has finished the start-up procedure, the LED will change from blue lightning to pulsing blue state. This state indicates that the device is ready to connect.



Figure 7: Device after turning it on

*Flashing blue*

➔ Ready to connect

*Permanently blue*

➔ Device is connected

## 4.3 Connecting

The device can whether be connected via Bluetooth (Android device) or via USB (PC).

It has to be turned on (see chapter 4.2 "Turning On") and the LED needs to be flashing in blue colour to establish a connection to the device.

### 4.3.1 Bluetooth connection

You will need the App Force Meter from Drive Test to connect your Android device to the measuring device. It can be downloaded in Google PlayStore™.



Figure 8: QR-Code for Google PlayStore™ download

Start the App Force Meter on your Android device and hit the connect symbol to connect to the sensor (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden. "Fehler! Verweisquelle konnte nicht gefunden werden. App"**).

The LED on the measuring device will rapidly blink in blue colour during establishing the connection. If the connection was successfully established, the LED on the measuring device will change to permanently blue light and the Android App will show a symbol for "Connected".

### 4.3.2 USB connection

Connect the measuring device at the USB socket with the USB cable and connect the other side of the cable with your PC. The software PinchPilot from Drive Test has to be installed on your PC. The software is stored on the USB stick which is part of the set. Start the software PinchPilot and open the measurement window via "Sensor" → "Measurement" or "Ctrl + M" for measuring.

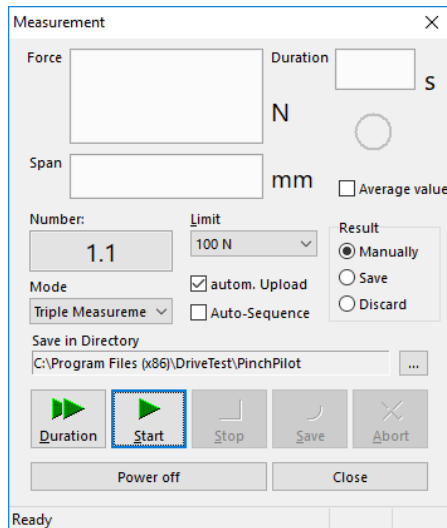


Figure 9: Measurement window in software PinchPilot

The LED will show a permanently blue light after connecting to the device.



## 4.4 Measuring

The measuring device has to be turned on and connected via Bluetooth or USB to perform a measurement.

### 4.4.1 Device positioning

The instrument is to be used such that the static part is connected to the stop of the closing system and the movable part faces towards the moving edge. In case of two moving edges, choose one of the edges for the static part and follow the movement of this edge manually. The force initiation area and the moving edge should be in parallel to each other.

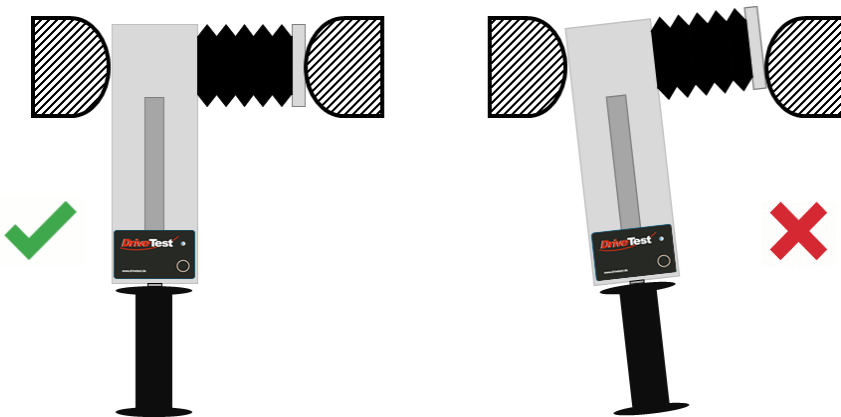


Figure 10: Parallel device positioning

### Lined force Initiation:

The force should be initiated on a line in an angle of  $90^\circ$  to the symmetrical axis of the device. The unit under test should hit the centre of the initiation disc.

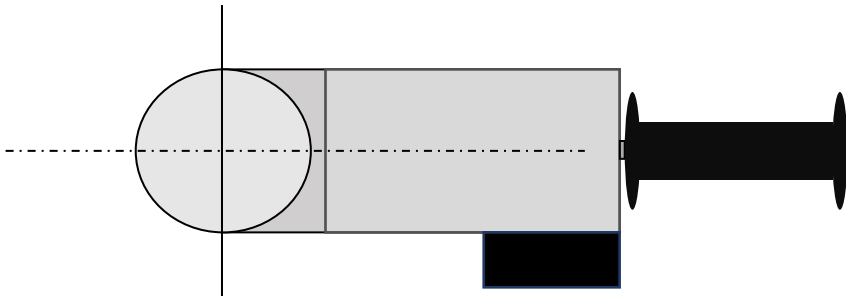


Figure 11: Best force application area

- Axis of symmetry
- Force initiation

### Closing systems with one moveable door:

Place one of the force initiation areas on the static part of the door without giving pressure to the sensor. The opposite force initiation area is facing the moveable part of the closing system.

### Closing systems with two moveable doors:

We recommend 2 methods to measure closing systems with two moveable parts:

- a) Method 1: Place the device at the position between the two moveable parts where they will meet in fully closed position.
- b) Method 2: Place the static part of the device on one of the two moveable doors without giving pressure to the sensor. Guide the device along the distance of the moving door until the force initiation area hits the opposite door. **Hint:** If the sensor is exposed to pressure during guidance and the trigger value is reached then the device will start measuring.

#### 4.4.2 Mounting spacers

There is the possibility to mount spacers to the measuring device to adapt to several different door apertures which are required to measure according to

specific norms. This point is related to the applied norm and is therefore optional (refer chapter 1.4.1 "Spacers" and chapter 3.2 "Assembly of Spacers").

#### 4.4.3 Start measuring

The measurement is started by a short button press. Alternatively, it can be started through the software (either PC or Android device). During the measurement the LED shows a yellow light and the measured values are displayed in the software.



*Permanently yellow*

→ Device is measuring

Figure 12: Device during measurement

The device will perform a taring action after initiating the measurement. This will take about 0.5 seconds. If there is a force applied to the measuring device during this period, then the following values will be decreased by this value.

The measurement will be stopped automatically if the measuring values will be below the defined force value for a certain time period. If the measurement should be stopped earlier then it can be done manually by pushing the stop button either on the measuring device or in the software.

The LED will show a permanently blue light after stopping the measurement.

## 4.5 Turning Off

Pushing the button on the measuring device for a time period longer than 3 seconds will turn the device off. Alternatively, the device can be turned off by the Android App (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** "Fehler! Verweisquelle konnte nicht gefunden werden. App").

## 4.6 Charging

The LED on the measuring device will give feedback about the remaining battery in certain cases. If the LED is showing a permanently red LED after turning it on then the device has to be charged.

The remaining battery in percentage will be displayed if you push the battery icon in the Android App (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden. "Fehler! Verweisquelle konnte nicht gefunden werden. App"**).

Connect the measuring device via the USB socket with the USB cable. Then connect the other plug with a USB power charger or PC/ Laptop.

The LED is slowly flashing in red colour when the device is charging. The LED turns to permanently green when the battery is fully charged.



Figure 13: LED battery state

*Flashing red*

→ Device is charging

*Permanently red*

→ Please charge device



*Permanently green*

→ Device fully charged

*Figure 14: LED battery state (fully charged)*

Depending on the current battery charging state it will take up to 4 hours to fully charge the device.

## 4.7 Errors

If an error occurs then the LED will flash rapidly in red colour. After 5 seconds the device will automatically turn off.

Please contact us in the event of an error. Please follow the instructions described in chapter 5.4 "Contact".

# 5 Service

## 5.1 Calibration

Drive Test devices are very precise instruments, but can be damaged by inappropriate treatment like dropping etc.

To ensure proper function, we recommend an annual calibration (interval of one year). The calibration date and state appear on the report (calibration certificate).

Beside our default factory calibration, we also offer calibrations by an EN 17025 accredited laboratory. Please contact us on demand.

## 5.2 Maintenance

Our devices do not need any special maintenance or servicing. Please take care that the device is not exposed to excessive shock or load and is protected against moisture and soiling. Most of the parts are made of Aluminium or stainless steel. Clean the device with damp cloth if it gets polluted. If higher

forces than specified (refer chapter 1.5 "Technical Specifications") are applied to the device then there is a high risk of damaging it.

### 5.3 Warranty

The manufacturer grants the buyer a two years warranty. Beginning of the warranty time is the delivery date (date of delivery note).

Defect or non-functioning parts are either repaired or exchanged. Excluded from the warranty are damages due to improper treatment, wear and tear parts and injuries by non-authorized personal.

Place of repair is Munich (Germany). For all justified claims the cost of repair (working time and exchange parts) will be paid by Drive Test.

The liability of Drive Test is limited to the repair of the delivered equipment. Further liability is excluded.

## 5.4 Contact

On our website you will find product descriptions to this and other products. Additionally, you will find video manuals and detailed FAQ to our products.

**Website:** [www.drivetest.de](http://www.drivetest.de)

You can also reach us via e-mail or phone:

**Tel.:** +49 89 7434094-0

**Fax:** +49 89 7434094-9

**E-mail:** [support@drivetest.de](mailto:support@drivetest.de)

Please fill out and attach the return receipt, which you will find on our website under "Service" before sending the device back to us. You will also find other important notices regarding the transportation of our devices.

Please send your device for complaints, warranty, maintenance or calibration to:

**Drive Test GmbH**  
**Adi-Maislinger-Str. 9**  
**81373 Munich**  
**Germany**

## 6 Shutdown

### 6.1 Disposal

It is not allowed to dispose Lithium-Polymer battery cells or equipment with a build-in battery cell in domestic waste, and also electronic devices in general require a special handling for disposal.

You can send the device back to us for disposal. If you do so, please contact us in advance of your shipping (refer chapter 5.4 "Contact"). You are free to follow your local rules for local disposal or contact the battery's supplier on his website [www.dynamis-batterien.de](http://www.dynamis-batterien.de) for a local agent which is able to help you with the disposal.

## 7 Appendix

### 7.1 EC certificate of conformity

The manufacturer or of his representative is

*Drive Test GmbH  
Adi-Maislinger-Str. 9  
81373 München  
Deutschland*

hereby certify that the device **FM300BT** meets the intend of the applicable directives:

- 2014/35/EU Electrical equipment (low voltage)
- 2014/30/EU EMC
- 2011/65/EU RoHS



Thomas Berger, CEO

Munich, 23.07.2019



## 7.2 Glossary

The following glossary should serve as disambiguation and description of terms used in this manual.

| Term             | Meaning/ usage   |
|------------------|--|
| Accuracy         | Degree to which the result of measurement conforms to the correct value  |
| Gap width        | Also referred to as: opening width   |
| Guideline        | Referred to a set of parameters and limit values that define the execution of measurements and the way the results are tested; basis of guidelines are standards |
| Limits           | Maximum permitted quantity   |
| Pinch force      | $F_E$ , mean value of effective forces, measured sequentially at the same measuring point (also referred to as: closing force/ clamping force)                   |
| Spacers          | Distance piece for realising different gap width   |
| Spring stiffness | Necessary force to compress/ pull a spring a certain amount; here Newton per mm (also referred to as: deflection rate for a spring)                              |
| Standard         | General term for a directive for measuring and evaluating the pinch force, these can be laws, European standards etc.  |

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