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Engineering in Electronics

INFORMATION ON SAFE GATES
Vertical Doors

(report by MICROTRONICS Mr Bertan)

Impact force measurements for “sectional” closure doors

Introduction ...Since May 2005 all types of automatic/manual doors and gates have been required, in accordance with UNI EN 13241-1, to meet CE marking standards and the application of specific harmonised standards EN 12445 and EN 12453 has also become compulsory.

Qualified installer are therefore now required to carry out the installation, which must be completed to professional standards, using only CE marked components. In addition to this, the fitter must also provide: the door’s EC Declaration, CE marking and Technical File containing - in addition to the assembly diagrams - the Impact Force Test reports specified by the aforesaid standards (which must be performed using the relative gauge).

This Demonstrative Example deals with impact force measurements concerning a “sectional” closure in a garage door application..

Remark: You are advised to follow the "good use and safety at work" rules, and remember that the illustrations provided, together with the presence of the expert technician, should be considered a helpful, practical example to assist the fitter when using the gauge.

Overview - First of all, before performing any tests, all the details of the closure type under examination must be gathered together: location, dimensions, weight, safety devices fitted, etc., Then you can start setting up the gauge accordingly (see fig.**1**)

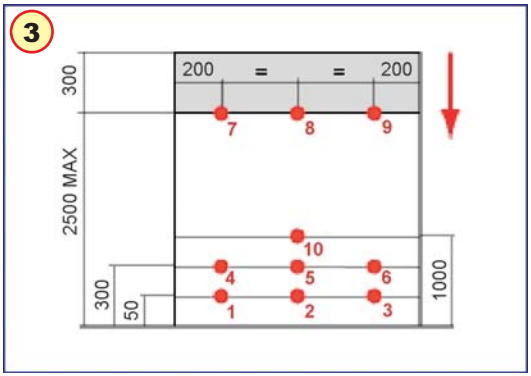
Safety - in this case the automatic door is located inside a building, and it is medium-sized, which makes our measuring task easier but does not exempt us from our testing duties.

The operator applied is a recent model with a 24 V DC power supply Volt and a “feed-back” control device, which guarantees fluid door movement and good sensitivity when it comes to stopping and reversing in the event of accidental impact.

These particular characteristics already reduce the actual area at risk; so much so, in fact, that the only place where a guard has been fitted is along the closing edge. This part of the door is equipped with a “passive” sensitive edge (basically a semi-rigid rubber profile which lessens the force of an accidental collision with objects or people, see fig. **2**)

Measuring - To perform the measurements the gauge was used together with the Blue Force software supplied.

The first operation completed was the creation of the software with a new sectional type door (vertical closure). This stage provides the user with information on how many measurements are required, where the gauge should be fitted, and the relative distance of the measuring point. (see fig. **3**)



There are thirty measurements necessary, three for each measuring point.

For each group of three tests, the mathematical average of the parameters measured must be calculated (Dynamic force, Dynamic time, Static force and Final force); the calculation is performed automatically by the software after the tests have been entered at the set points.

The first three measurements are taken at a height of 5 cm from the ground, in the centre of the door, followed by three measurements on the right-hand side, and then three on the left (see fig. **4**)

Remark: For the sake of brevity, the figures show one measuring point only.

A quick evaluation of the measurements can already be made after the first series of tests, by referring to the data stored and displayed on the gauge, before sending them to the software. (see fig. **5**)

Given the type of closure and the motor actually checked, we would not expect 'non-standard' values and in fact, at first glance we saw that the dynamic forcer values varied around 190-200 Newtons and the dynamic time oscillates around 0.15 and 0.30 seconds These results are well below the set limits of **400N** and **0,75s**.

The repeated good results of the first series of tests leads us (from experience) to make a positive evaluation of the measurement and therefore to conclude that door operation is correct.

Continuing with the tests at different distances, we need to fit the "linear" accessory, which was used to take the measurements at distances from the ground ranging from 30 to 50 cm (see fig. **6**)

With reference to the points specified by the software (see fig. **3**), the following measurements are taken in the same position but at different heights, i.e. in three tests at three points (right, centre and left) at a height of 30cm (see fig. **7**), followed by a single measurement taken in the centre at a height of 100 cm (see fig **8**).

The so-called "angular" accessory requires special attention.

The accessory comprises an aluminium base (fig. **9**) with a small rubber "sole", which acts as a stop ledge, and a mechanical constraint which holds an extension pipe onto which the gauge is fitted (the gauge remains fixed to the end of the extension rod).

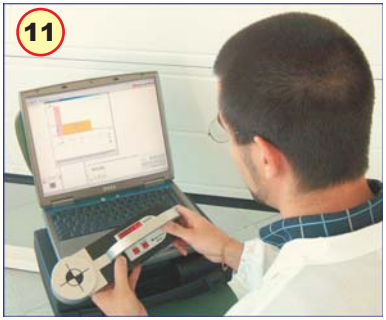
The "Angular" extension rod made taking measurements at heights over a metre much quicker and easier.

To finish, the last set of measurements is taken 30 cm from the upper edge, at the same three set points as before (see fig **10**).

The sectional door in question, as mentioned earlier, is a medium-sized model (width: 2.5 m and height: 2.0 m), which means we have no real difficulty setting up the gauge for the last set of measurements.

Positioning can become tricky with higher or non-standard doors, when the gauge has to be fixed firmly at heights ranging from 2.0 to 2.5 metres. In these cases the "angular" accessory comes in particularly handy (sometimes it is indispensable) as it allows the tests to be performed extremely accurately, rendering the complete gauge/accessory system convenient and easy to transport.

Conclusions - At the end of the measuring stage, the tests stored are transferred to a laptop for a final evaluation of the results (averages) and to print off a copy of the report certifying that the impact force measurements meet requirements. (see fig. **11**)

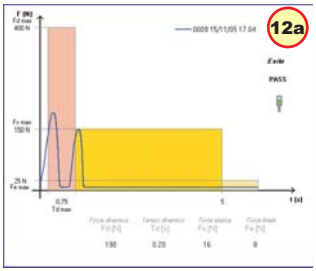


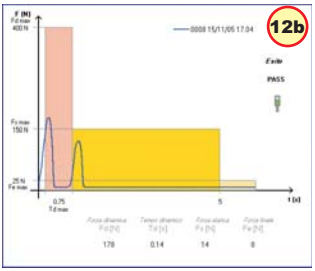
As mentioned earlier, there are no surprises on the evaluation graph as the automatic door falls well within the limits.

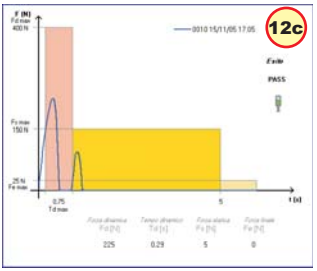
Nevertheless, there is a number of peculiarities that have emerged from the graphs which we would never have imagined from simply reading the instrument display.

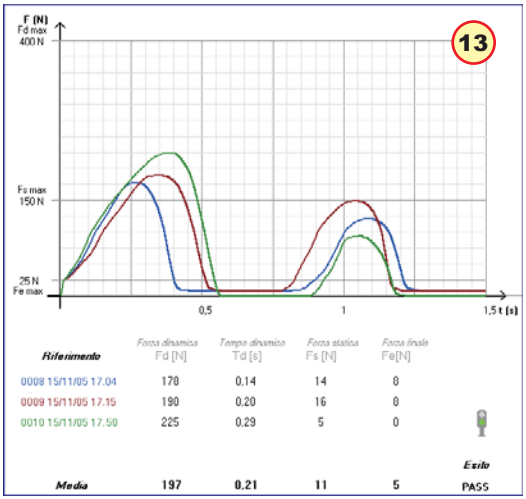
The graphs in figures **12 a, b and c** show the highest values of the thirty measurements taken.

Note the double "hump" in the measuring; this course is typical for sectional closure doors, which normally lower with a "braked fall" motion and, in the event of a collision with an obstacle, tend to oscillate slightly before reversing the travel.









A special software function allows the average of the displayed values to be calculated and the three overlaid graphs to be viewed in detail (fig. **13**).

The final test results (measurement averages) are shown below.

Dynamic force	197 N	(limit: 400 N)
Dynamic time	0.21 s	(limit: 0.75 s)
Static force	11 N	(limit: 150 N)
Final force	5 N	(limit: 25 N)

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