TECHNICAL REPORT

IEC TR 62112

First edition
2001-10

**Safety of hand-held motor-operated electric tools –
Particular requirements for drills –
Test procedure concerning dynamic forces
at sudden stalling**

*Sécurité des outils électroportatifs à moteur –
Règles particulières pour les perceuses –
Procédure d'essai des forces dynamiques
lors d'un calage soudain*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY OF HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – PARTICULAR REQUIREMENTS FOR DRILLS – TEST PROCEDURE CONCERNING DYNAMIC FORCES AT SUDDEN STALLING

FOREWORD

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IEC 62112, which is a technical report, has been prepared by subcommittee 61F: Safety of hand-held motor-operated electric tools, of IEC technical committee 61: Safety of household and similar electrical appliances.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
61F/282/CDV	61F/342/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

This document, which is purely informative, is not to be regarded as an International Standard.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

In IEC 60745-2-1, *Safety of hand-held motor-operated electric tools – Part 2: Particular requirements for drills*, the allowed degree of static stalling torque of a clutch at the locked driven spindle is given in clause 18.101 for different shaped tools. Because of a lack of knowledge about dynamic behaviour at sudden stalling, it was not possible there to define any limits or a test procedure.

A working group was therefore instituted to determine requirements and test specifications concerning dynamic forces in clutches, and a round-robin-test was initiated.

The work proceeded in three steps:

1. design of a test rig and installation of measuring devices: the influence of an operator on the torque at the handles was evaluated;
2. measurement of maximum torque that can be held at the handles at sudden stalling;
3. design of a loading device that simulates the hand-arm-system and of a test rig.

This technical report defines test procedures and limits for dynamic forces interfering in a sudden stalling. It presents a type-test concerning normal and correct use. It does not exclude the possibility that incorrect operation may lead to injuries when clutches are designed according to this proposal.

SAFETY OF HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – PARTICULAR REQUIREMENTS FOR DRILLS – TEST PROCEDURE CONCERNING DYNAMIC FORCES AT SUDDEN STALLING

1 Scope

This technical report deals with test specifications for the dynamic behaviour of drills and impact drills after sudden stalling of the rotating drillbit.

2 Definitions

2.1
stalling
sudden stoppage of the drillbit

2.2
stalling device
device (e.g. brake) which would cause the drillbit to stop suddenly

3 Test rig

The machine is positioned vertically down in a test rig, rotatable around its drill-spindle (see figures 1 and 2). The lower bearing is designed as a stalling device for the "drill". The stalling device (e.g. a brake) has to jam the drillbit within an angle of 30°.

An additional mass and a spring at the handle simulate the operator by acting with a torque against the angular displacement of the machine. This displacement is the measured quantity of the test, which must not exceed 65°. At this angle a maximum torque is acting according to an acceptable force at the handle.

The additional mass, as defined in table 1, is coupled to the handle of the tile machine and represents the hand-arm mass. It is to be fastened in the centre of the position where the hand normally holds the grip, i.e. on the radius *a* (single hand support) or a_2 (double-hand support). The spring is connected on a second radius r_z, simulating a certain hand force on radius *a or* a_2 respectively.

The torque produced by the spring is linear, within a tolerance of 5 % of the maximum torque rising with the angular displacement. At the beginning there is a preload of 5 N in order to keep the machine in 0° position against a stop before stalling the drillbit. The generated load moment at 65° displacement is shown in table 1.

For the position of the fastening point of the tile spring on the test rig, see figures 1 and 2. The fixing radius r_z is a function of *a* or a_2 respectively (see figure 3).

The characteristics of the springs are also determined in table 1.

The original additional handle can be exchanged by a special measuring handle, if necessary. The fixing means of the measuring handle, spring fixing points and upper bearing point (exceeding the original parts) are restricted with respect to the momentum of inertia to 15 % of the momentum of inertia of the whole machine including additional mass.

4 Operating conditions

The tool is switched on by means of an external switch while the tool switch is fixed in the ON position.

The mechanical gears are adjusted to the lowest speed. The electronic speed regulators are adjusted to their maximum speed value.

It is recommended to operate the power tool without the striking action.

5 Test procedure

If the machine has reached a stable number of revolutions, the drillbit is jammed by activating the stalling device. Thereby the jamming of the drillbit must take place within an angle of 30°. The machine has passed the test successfully if the maximum angle of displacement is 65° or less, before switching off the machine.

Five successful consecutive tests in time intervals of 1 min are necessary to fulfil the requirements of this standard.

6 Test report

The minimal information required in a test report includes:

1. tool type;
2. manufacturer;
3. single-hand or double-hand machine;
4. number of successful tests.

A model test report is given in table 2.

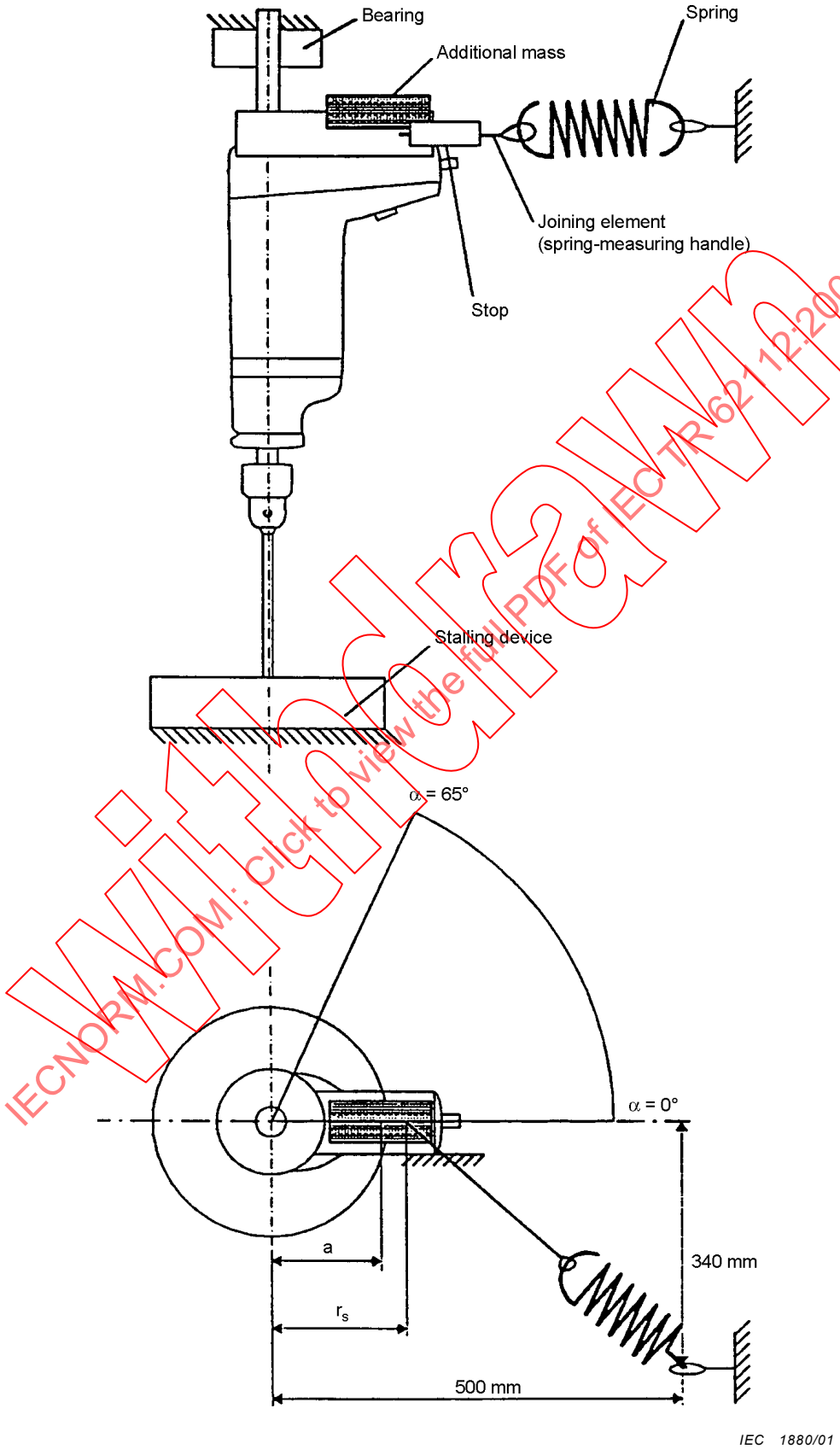

Figure 1 – Test rig for single-hand machines

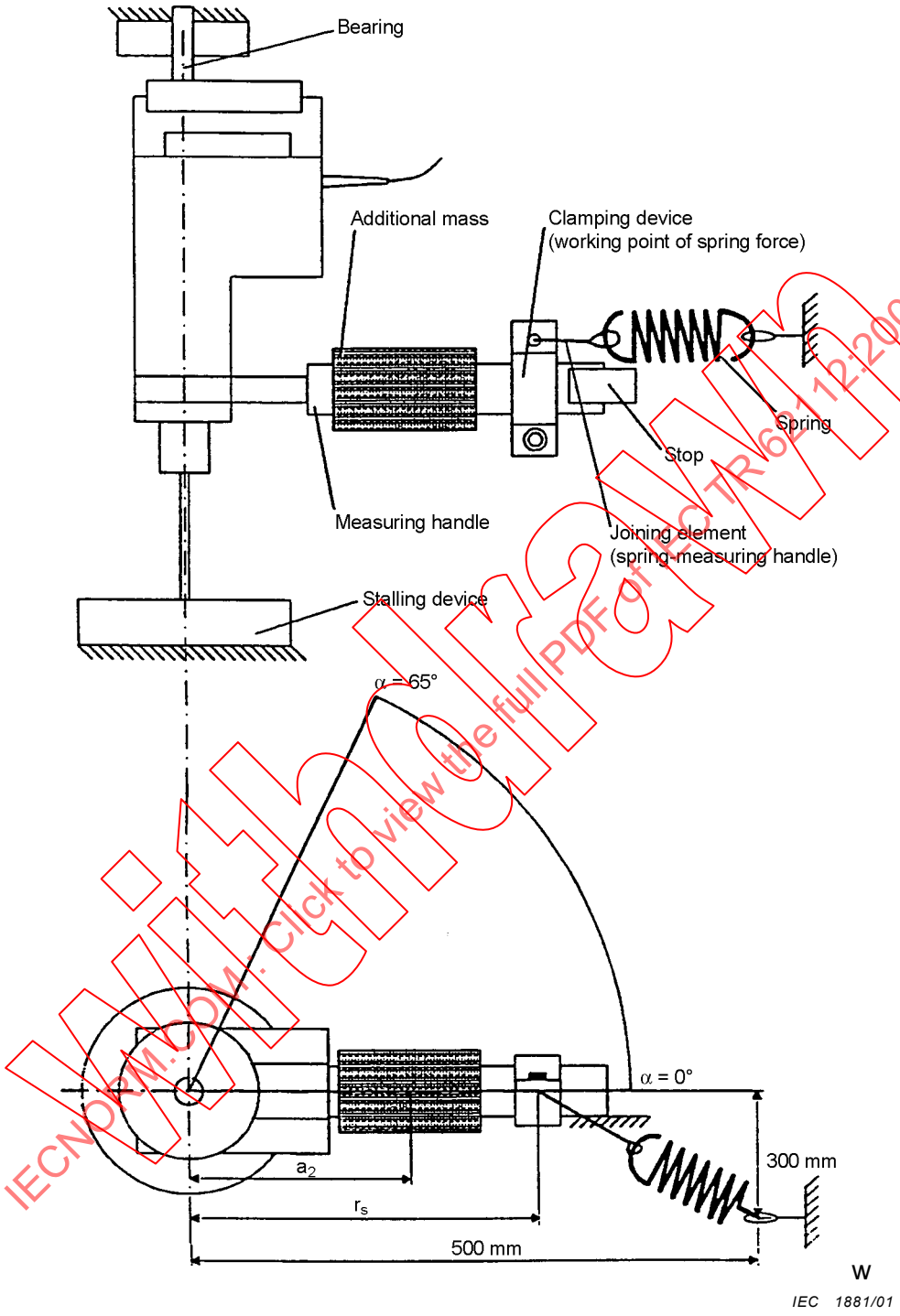

Figure 2 – Test rig for double-hand machines

Table 1 – Test parameter

Kind of machine	Single-hand	Double-hand
Additional mass	1 kg	2 kg
Spring rate c	0,5 N/mm	1,0 N/mm
Maximum length of unloaded spring, including fixing elements	490 mm	419 mm
Minimum linear range of spring	155 mm	219 mm
Spring preload	5 N	5 N
Load moment at 65° displacement	80 × a N·mm	200 × a_2 N·mm

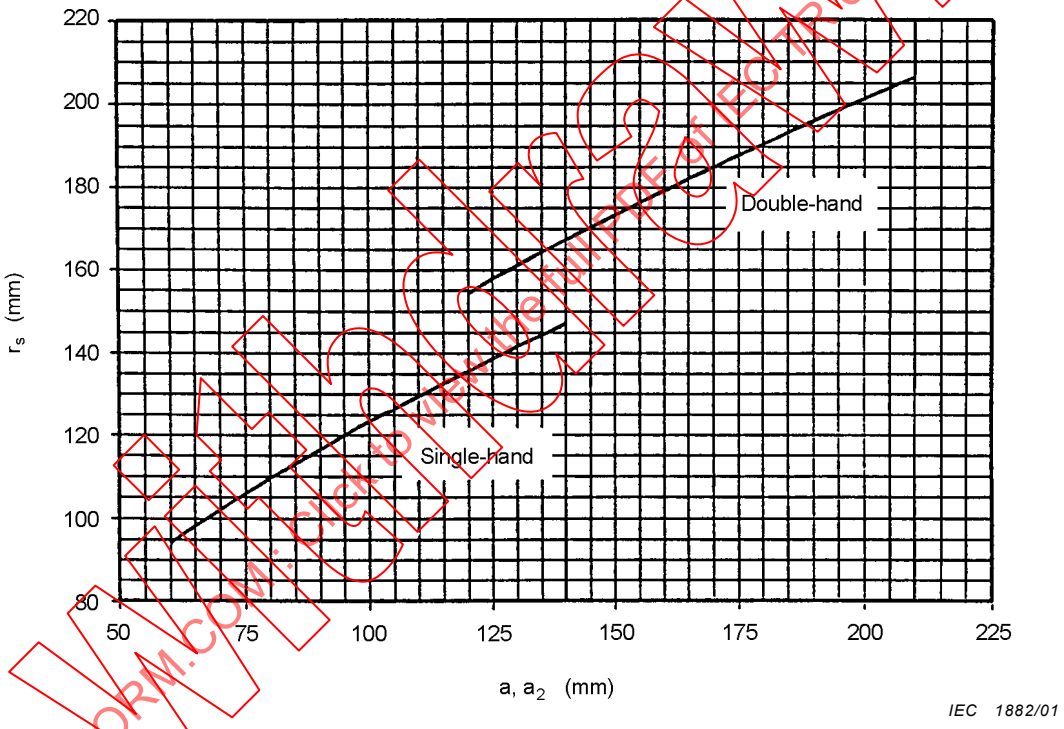

Figure 3 – Values of r_z for single- and double-hand machines

Table 2 – Model test report for drills and impact drills

General	
Tested by:	Reported by: .....
	.....
Date:	
Power tool tested	
Tool type:	Manufacturer: .....
Model No.:	Serial No.: .....
Mass, [kg]:	
Operating conditons	
Mechanical gear:	Electronic speed setting:
	.....
Single-hand test:	
	Double-hand test:
Additional mass:	
Radius:	
a:	
r_z:	a_2: .....
Results	
Number of successful tests ($\alpha \leq 65°$):	Number of failed tests ($\alpha > 65°$):
.....	.....
Maximum displacement: $\alpha \approx$	
.....	
Standard passed: yes	no