



# Standard Test Method for Determining the Drive Torque for Film and Fabric Ribbon Cartridges<sup>1</sup>

This standard is issued under the fixed designation F 1520; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method describes a procedure for determining the drive torque of typewriter and printer cartridges using a handheld torque gage. This test method is applicable to cartridges that contain film or fabric inked ribbons.

1.2 A related standard, Test Method F 1050, covers the procedure for determining tension and torque using a test fixture platform with a torque measurement motor.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

F 221 Terminology Relating to Carbon Paper and Inked Ribbon Products and Images Made Therefrom

F 1050 Test Method for Determining Winding Torque and Tension of Typewriter Ribbons

## 3. Terminology

### 3.1 Definitions:

3.1.1 *initial, breaking torque*—the moment of a force necessary to begin rotation of the drive elements in a ribbon cartridge.

## 4. Summary of Test Method

4.1 Fully assembled cartridges containing either film or fabric inked ribbons are held in the same orientation as in the printer. (Refer to Terminology F 221). The appropriate measuring gage is engaged in the hub of the drive wheel of the cartridge and turned at a constant speed one complete revolution (one revolution requiring approximately 2 s being equivalent to 30 to 40 r/min). The process is repeated five times.

## 5. Significance and Use

5.1 This test method can be used to evaluate the drive torque for cartridges from one or more lots intended for a common typewriter or printer. This test method may be used to indicate possible cartridge function problems in the end use equipment or as a means of manufacturing control or research.

## 6. Interferences

6.1 Before testing, cartridges should be thoroughly examined. Poor design or incorrect assembly can cause dragging of the ribbon during transport and affect the drive mechanism.

6.2 Drive torque measurements may vary widely as ribbon is exhausted or re-stuffed, depending on the type of cartridge.

6.3 Wide variations in environmental conditions (temperature and relative humidity) can affect cartridge torque. Comparisons should be made only between tests run under the same general environmental conditions.

6.4 Measurements can be distorted if the torque gage is turned with a sharp twist of the wrist. A slow, constant speed is required for accurate results.

## 7. Apparatus

7.1 *Torque Gage*<sup>3</sup>—Scaled in cN-cm, gf-cm or ozf. in. with a maximum reading needle. Gages scaled in the 0 to 600 cNg-cm range are suitable for most cartridge designs. Gages should be able to work vertically, as shown in Fig. 1.

7.2 *Bits*—Mount bits in the torque gage and interface with drive wheel hub.

## 8. Test Specimens

8.1 The test specimen shall be a complete ribbon cartridge that has not been disrupted since it was assembled.

8.2 The test specimen shall be identified as to source, type of ribbon, and date of manufacture.

## 9. Procedure

9.1 Position the maximum reading needle on the gage at zero so as to be readable in the drive direction.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee of F-5 on Business Imaging Products and is the direct responsibility of Subcommittee F05.02 on Inked Ribbons and Carbon Paper.

Current edition approved June 15, 1994. Published August 1994.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Several torque gages have been found to give satisfactory results. Both the TOHNICHI Manufacturing Co. and Waters Manufacturing Co., Wayland MA make applicable models.

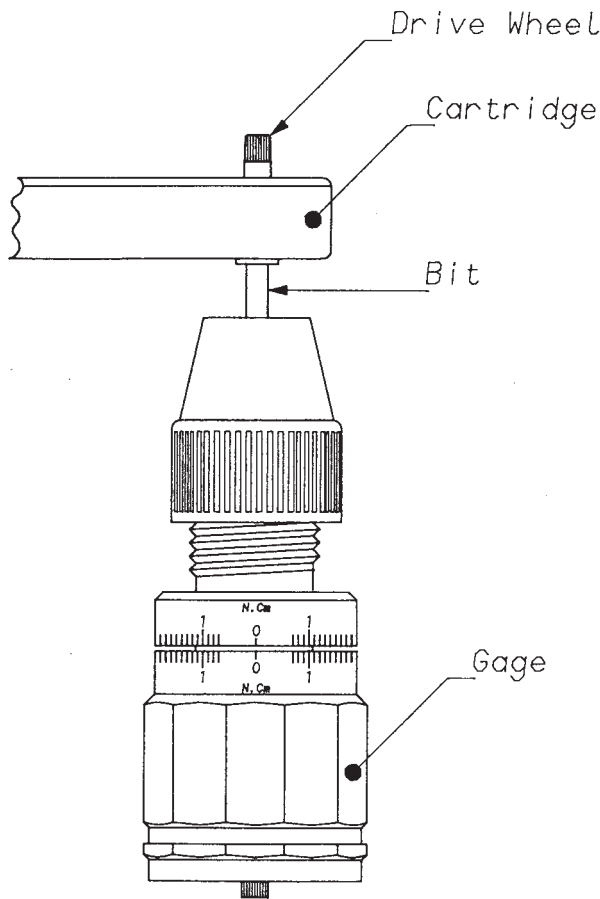


FIG. 1 Gage/Cartridge Position

9.2 Hold the cartridge flat and parallel to the floor, or as it would sit in the printer. If needed, the cartridge can be held by a holding device that simulates the position in the printer. The holding device must not compress the cartridge and cause test results to be altered.

9.3 Position the gage with the bit in the hub of the drive wheel on bottom of cartridge. Do not exert upward force while turning the gage, as it will affect the reading.

9.4 Turn the gage in the direction of the printer drive. It should be turned at a constant speed one complete revolution (one revolution requiring approximately 2 s being equivalent to 30 to 40 r/min).

9.5 Remove the torque gage and read the maximum needle.

9.6 Repeat 8.1 to 8.5 five times.

9.7 In characterizing torque levels of cartridges, it may be prudent to repeat the above procedure at the beginning, middle, and end of the ribbon's recommended character life.

## 10. Report

10.1 Report the test specimen identification as outlined in 8.2.

TABLE 1 Ribbon Drive Torque—Precision Statistics

Material	$\bar{x}$	$s_r$	$s_R$	$r$	R
A (film)	98.8	7.122	19.700	19.94	55.16
B (fabric)	191.4	13.152	15.964	36.83	44.70

10.2 Record the five readings and the average.

10.3 Record sets of readings at the beginning, middle, and end of life if following 9.7.

## 11. Precision and Bias

11.1 *Precision*—An interlaboratory study using this test method was conducted in 1991 and 1992 by three laboratories using two materials (fabric ribbon cartridges and film ribbon cartridges). Practice E 691 was followed for the design and analysis of data, with the exception that fewer materials and laboratories were involved. Each laboratory measured the drive torque of ten test specimens for the fabric cartridge and eight test specimens for the film cartridge. Each of the test results compared was the average of five test determinations. Details of testing and analysis can be found in a research report.<sup>4</sup> The precision information given in Table 1 is in the units of measurement N-cm. Precision terms are used as directed in Practice E 177.

11.1.1 *Repeatability*— Given an average of five measurements from the same operator, with one gage and under the same conditions, results can be expected to differ by less than the amount shown, as follows:

Measurement Range	95 % Limit
80 to 150 cNcm	±20
160 to 235 cNcm	±37

11.1.2 *Reproducibility*— Given an average of five measurements under the same conditions in different laboratories, results can be expected to differ by less than the amount shown, as follows:

Measurement Range	95 % Limit
80 to 150 cNcm	±55
160 to 235 cNcm	±45

NOTE 1—The between-laboratory variability was greater on the film ribbon cartridge with the lower measurement range, in contrast to the within-laboratory variability. Repeated shipments affect the dynamic parameters of film cartridges more than fabric. Differences in winding tension through life in the same film sample have also been found to cause variations.

11.2 *Bias*—Bias cannot be determined since there are no accepted reference materials.

## 12. Keywords

12.1 copy materials; film ribbons; inked ribbons; torque

<sup>4</sup> Supporting data have been filed at ASTM Headquarters. Request RR: F05 – 1007.

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or [service@astm.org](mailto:service@astm.org) (e-mail); or through the ASTM website ([www.astm.org](http://www.astm.org)).*