INTERNATIONAL STANDARD

ISO
9959-2

Numerically controlled draughting machines — Draughting test for evaluation of performance —

Part 2:
Monochrome raster plotters

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Machines à dessiner à commande numérique — Essai de traçage pour l'évaluation des performances —

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Partie 2: Traceurs à quadrillages monochromes

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9959-2 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Subcommittee SC 9, *Media and equipment for drawing and related documentation.*

ISO 9959 consists of the following parts, under the general title *Numerically controlled draughting machines — Draughting test for evaluation of performance:*

— *Part 1: Vector plotters*

— *Part 2: Monochrome raster plotters*

Annex A of this part of ISO 9959 is for information only.

Numerically controlled draughting machines — Draughting test for evaluation of performance —

Part 2:
Monochrome raster plotters

1 Scope

This part of ISO 9959 specifies a draughting test for plotters based on raster image technology for evaluating the quality of the graphic output, independently of the machine type. It is applicable to monochrome raster plotters.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 9959. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 9959 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3098-1:—[1]), *Technical product documentation — Lettering — Part 1: Latin alphabet, numerals and marks.*

ISO 9179-1:1988, *Technical drawings — Numerically controlled draughting machines — Part 1: Vocabulary.*

3 Terms and definitions

For the purposes of this part of ISO 9959, the terms and definitions given in ISO 9179-1 and the following apply.

3.1 General physical terms and definitions

3.1.1
dot
smallest image element

3.1.2
dot density
number of dots per unit length or area

NOTE   It is expressed in dots per millimetre or square millimetre.

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1) To be published. (Revision of ISO 3098-1:1974)

3.1.3
dot size
size of the smallest element which can be drawn

NOTE   The shape may be circular, square or irregular.

3.1.4
dot overlap
overlapping percentage of a nominal dot with an adjacent dot

NOTE   Dot overlap may be different in the X, Y and off-axis directions of the machine.

3.1.5
image density
reflection or transmission density of the plotted image

3.1.6
transmission density
logarithmic measure of the amount of light transmitted through the image

3.1.7
reflection density
logarithmic measure of the amount of light reflected from the image

3.1.8
X axis
direction parallel to the motion of the media through the machine

3.1.9
Y axis
direction perpendicular to the motion of the media through the machine

3.1.10
grey scale
ability to image different levels of grey

3.1.11
resolution
ability to resolve fine closely spaced lines

3.1.12
addressable resolution
addressability
number of addressable dots per unit length in X and Y axes

3.1.13
image margins
distance from the maximum image to the edge of the medium along X and Y axes

3.1.14
fixing
adhesion of the image to the medium

3.1.15
light resistance
ability of a line written on specified testing paper to remain visible after exposure to specified light for a specified length of time

[ISO 12756:1998]

3.1.16
water resistance
ability of a line written on specified testing paper to remain visible after immersion in distilled or deionized water for a specified length of time

[ISO 12756:1998]

3.2 Terms and definitions concerning operation

3.2.1
imaging speed
plotting speed
rate of image generation along the X axis

NOTE   Definition different from that given in ISO 9179-1.

3.2.2
imaging time
time required to make a standard plot

3.2.3
warm-up time
time required for the machine to achieve thermal equilibrium or those conditions necessary to produce output

3.2.4
environmental operating condition
temperature and humidity ranges necessary for proper operation

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3.3 Terms and definitions concerning image quality evaluation

3.3.1
positional accuracy

ISO 9959-2:1999
https://standards.iteh.ai/catalog/standards/sist/65619c1a-a5f0-44ff-a214-
worst-case percentage error in the distance between two parallel lines, defined in both X and Y axes, over a length
45be71c151f9/iso-9959-2-1999
sufficient to eliminate effects due to resolution and cyclic errors

3.3.2
diameter variation
difference between the maximum and minimum diameters of a circle, sufficiently large to eliminate effects due to resolution and cyclic errors

3.3.3
linearity
constancy of scale over the entire plotting area

3.3.4
ability to image a 90° angle
deviation from 90° of intersecting lines intended to be perpendicular

3.3.5
skew
angle formed by the edges of the medium and the margins of the image in the X axis of the plotter

3.3.6
usable plot width
maximum plottable width

3.3.7
usable plot length
maximum plottable length

3.3.8
minimum line width
average width of the smallest line that can be imaged along X and Y axes of the plotter

3.3.9
banding
cyclic optical density variation in either X or Y direction of the plotter

3.3.10
uniformity
evenness of the image density within a given plot

3.3.11
line ends
shape and positional variance of the ends of the obtained line from the end points

NOTE   Line ends may be butt (square and terminating at the end point), square (square and terminating one-half line width beyond the end point), round (with a radius equal to one-half the line width).

3.3.12
line join
appearance of connected line ends when line segments meet at an acute angle

NOTE   A line join may be bevelled, rounded, triangular or mitred.

3.3.13
waves
periodic perturbation affecting line straightness (e.g. measurement of deviation and frequency)

3.3.14
staircasing
jaggy
stepped appearance of a line or curve composed of discrete line segments

3.3.15
jitter
cyclic misregistration of dots along X and Y axes

3.3.16
feathering
diffusion of ink outside the intended dot area, giving a woolly and feathered appearance to the image

3.3.17
smear
imaged line where one side of the line is sharply defined and the other side of the line is not sharp and is diffuse

3.3.18
flare
defect resulting in a larger distorted shape of a dot

3.3.19
smudging
blurring of lines over some areas of the image

3.3.20
inadvertent marking
unintentional spots or lines on the drawing

3.3.21
ghosting
unforeseen appearance of spurious images

3.3.22
media background
difference in coloured space between processed and unprocessed unimaged areas

3.3.23
dropout
missing dot or sequence of dots

3.3.24
white spot
inadvertent white or transparent area in a black-field image

3.3.25
legibility
ability of a character to be properly recognized

3.3.26
contrast
difference in reflection or transmission density between plotted areas and unplotted areas

3.3.27
microvibration
high-frequency variation of line width along a line

3.3.28
grey-scale linearity
constancy of density differences between adjacent grey levels

3.3.29
registration
dimensional deviation of the actual location of the image from its intended location

3.3.30
skip
non-constant line spacing resulting in the appearance of a white band or bands

4 Drawing test

4.1 Principle of the test

Standard test patterns are imaged at a 1/1 scale and the image is stepped to fill the maximum output format of the raster device. Images are placed at the extreme edges of the imageable area to permit measurement of maximum usable plot width and usable plot length. The images are evenly placed across the width and length of the usable plot area. The manufacturer's recommendations for operation, media and environmental constraints should be consulted for optimum test results.

The evaluation of the test images permits comparison of the performance characteristics of different plotters.

4.2 Test information

4.2.1 The following information shall be included in the test pattern identification block:

— plotter manufacturer;

— plotter model and serial number;

— plotting technology (electrostatic, direct thermal, thermal transfer, ink jet, etc.);

— plotting media and supplies (paper, toner, ink, ink ribbon, film, etc.);

— imaging speed, in millimetres per second (mm/s);

— processor type and speed;

— contrast adjustment (if selectable);

— quality level (if selectable, several levels to be indicated: high, draft, etc.) and the resolution;

— atmospheric conditions [temperature, in degrees Celsius (°C); relative humidity, as a percentage (%)] (see ISO 554);

— date of the test;

— raster plotter test pattern (1 or 2); and

— identification number.

4.2.2 The process time consists of the following:

— warm-up time (start-up time);

— CPU (Central Processing Unit) time to generate a plot file;

— time to transfer the file to the controller;

— time to rasterize the plot, if applicable;

— imaging time;

— drying time, if applicable.

Not all of the above times apply to all of the imaging technologies, and some of the times may overlap.

4.3 Test pattern description

4.3.1 General

The draughting test is based on two patterns of A4 size, one dealing with line drawings (Test Pattern No. 1), the other dealing with filled areas and shades of grey (Test Pattern No. 2). Each pattern consists of several pattern elements, numbered from zone 1 to zone 23, which are described below.

4.3.2 Raster test pattern No. 1 (zone 1 to zone 16)

a) **Zone 1:** Outer frame

Straight lines drawn parallel to the edges. Each straight line shall be 10 mm from the edge of the plotting media. Nested squares, with 1 mm intervals, serve as registration marks on all four corners.

The following test criteria are used:

— usable plot width

— usable plot length

— skew

b) **Zone 2:** Graduation

Plot the graduation with an interval of 1 mm.

The following test criterion is used:

— accuracy

Note   See ISO 9960-1.

c) **Zone 3:** Lines at regular intervals (direction of shorter length)

Lines drawn perpendicular to the horizontal line of the outer frame, having a regular interval of approximately 0,5 mm consistent with an integer dot spacing. The lines shall be 10 mm in length.

The following test criteria are used:

— microvibration

— jitter

— smear

— dropout

— flare

d) **Zone 4:** Lines at regular intervals (direction of longer length)

Lines drawn perpendicular to the vertical line of the outer frame, having a regular interval of approximately 0,5 mm consistent with an integer dot spacing.

The following test criteria are used:

— microvibration

— jitter

— smear

— dropout

— flare

e) **Zone 5:** Inner frame

Pairs of lines drawn with a 0,5 mm interval.

The following test criteria are used:

— waves

— jitter

— dropout

— ability to image a 90° angle

— microvibration