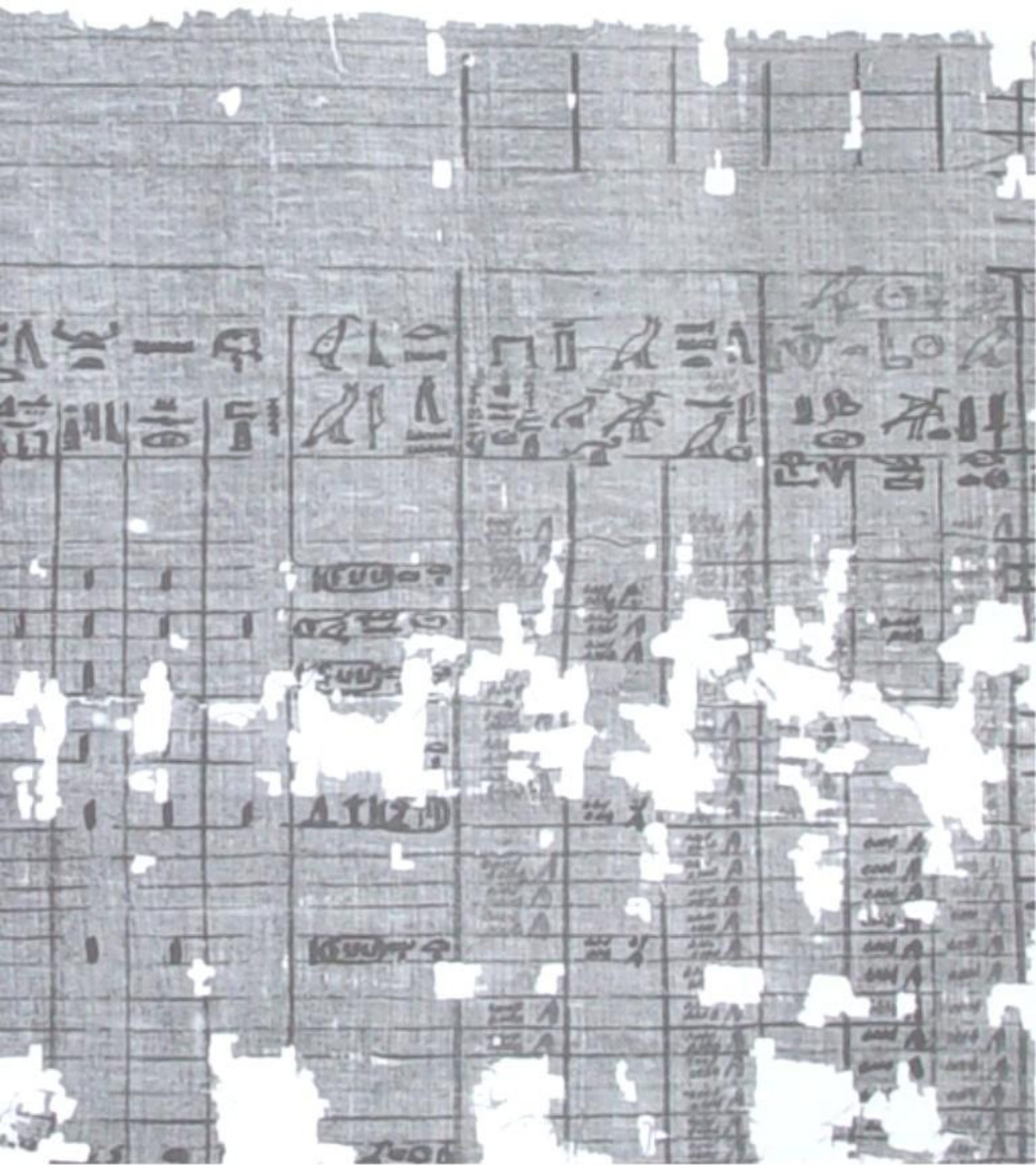




FRA RUNESTEN TIL MIKROCHIP

Data- og Lagermedier før og nu

Henning Isaksson
Dansk Datahistorisk Forening
Ballerup

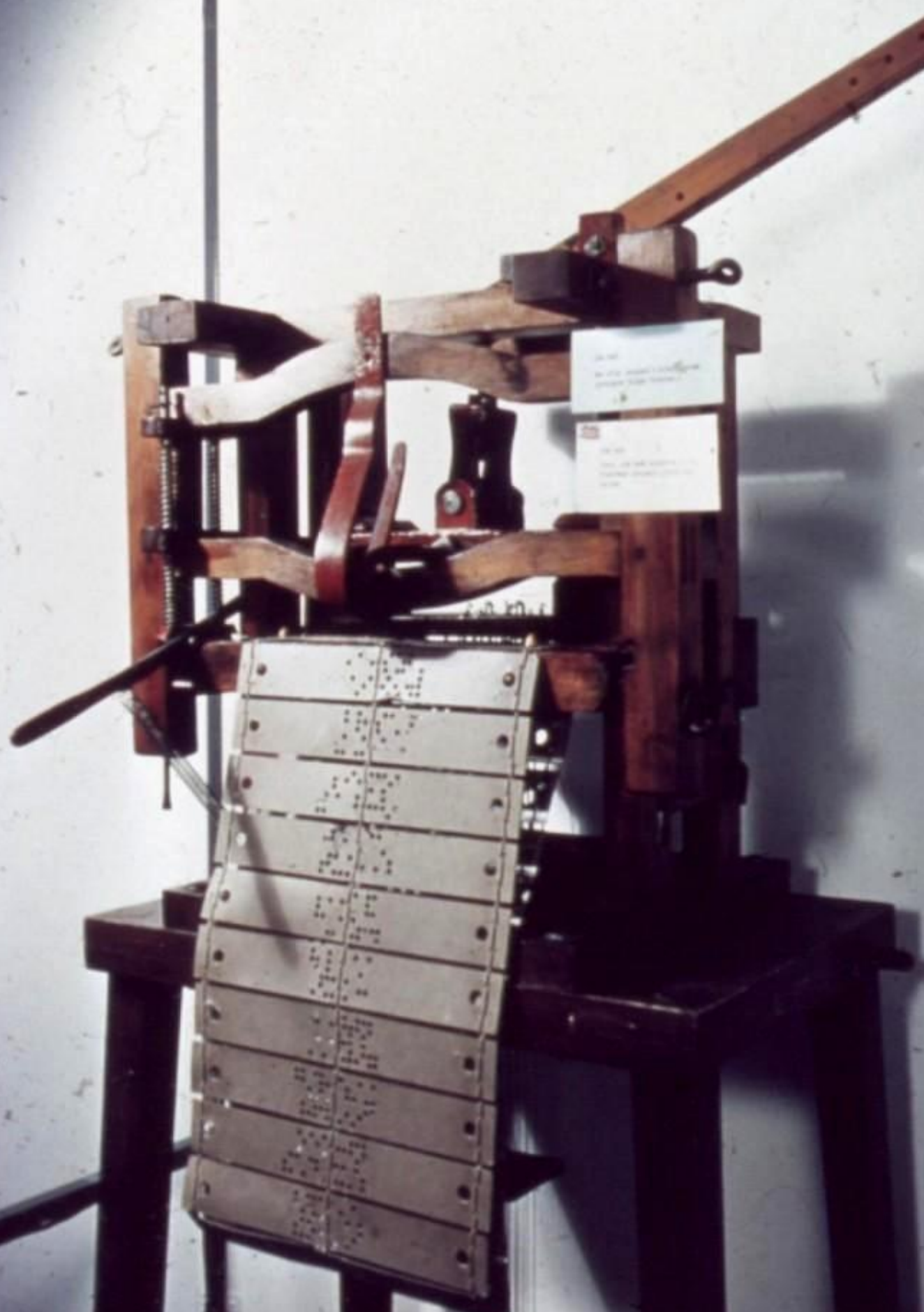


Papyrus fra 2500 fKr
med handelsregnskab

A large, weathered stone monument stands in a field, covered in ancient runic inscriptions. The stone is light-colored and shows signs of age and wear. The background features a field of tall grass and a clear blue sky.

Runesten fra år 800
Indskrift: 750 tegn

Fra o. 1800



Hulkkortstyret væv

Data- og Lagermedier

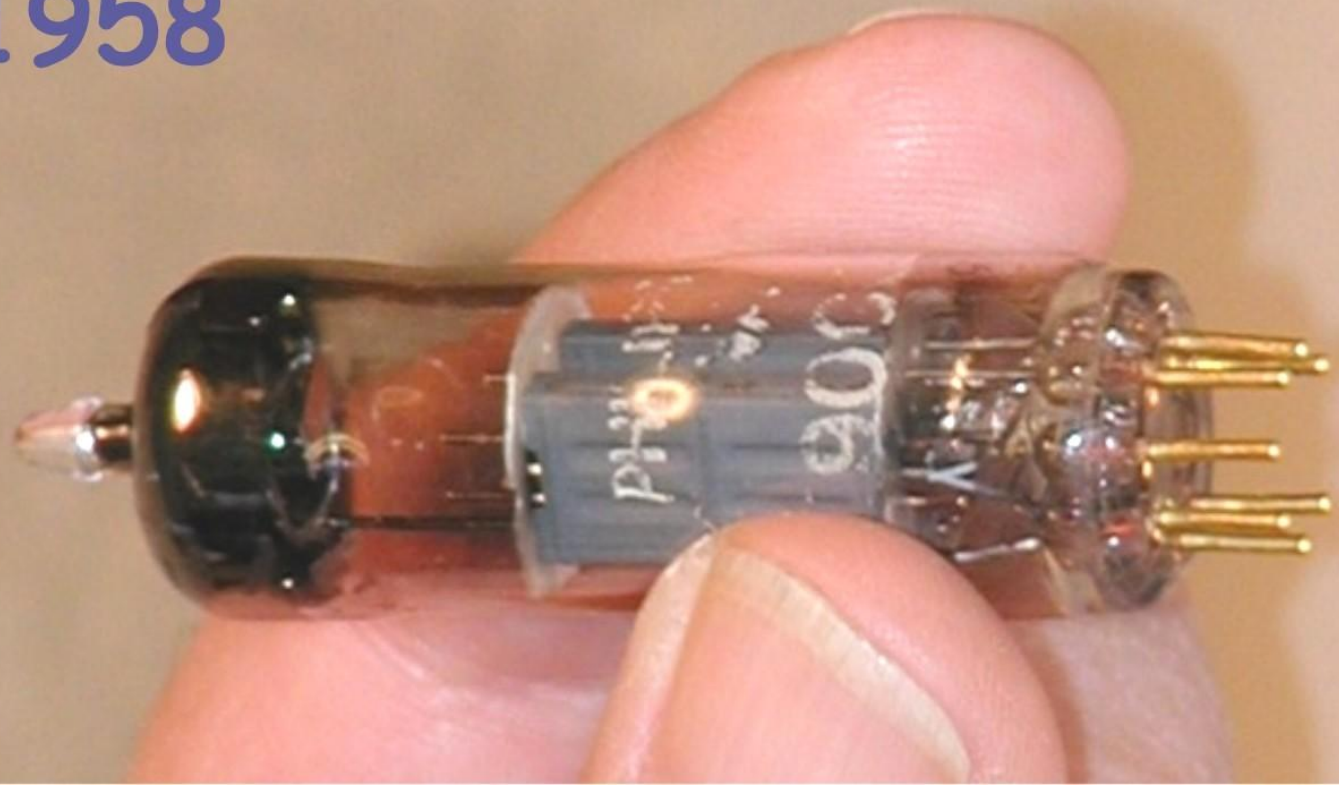
| | |
|----------------------|------------------------|
| Hulstrimmel | 1857 - ca. 1975 |
| Hulkort | 1890 - ca. 1975 |
| Magnettromle | 1949 - ca. 1980 |
| Ferritkerner | 1955 - ca. 1975 |
| Magnetbånd | 1952 - ca. 1985> |
| Magnetplade/harddisk | 1957 -----> |
| Diskette/floppydisk | 1971 -----> |
| Mikrochip/IC | 1975 -----> |
| CD/DVD | 1990 -----> |

2 kabinetter med 2500 elektronrør !

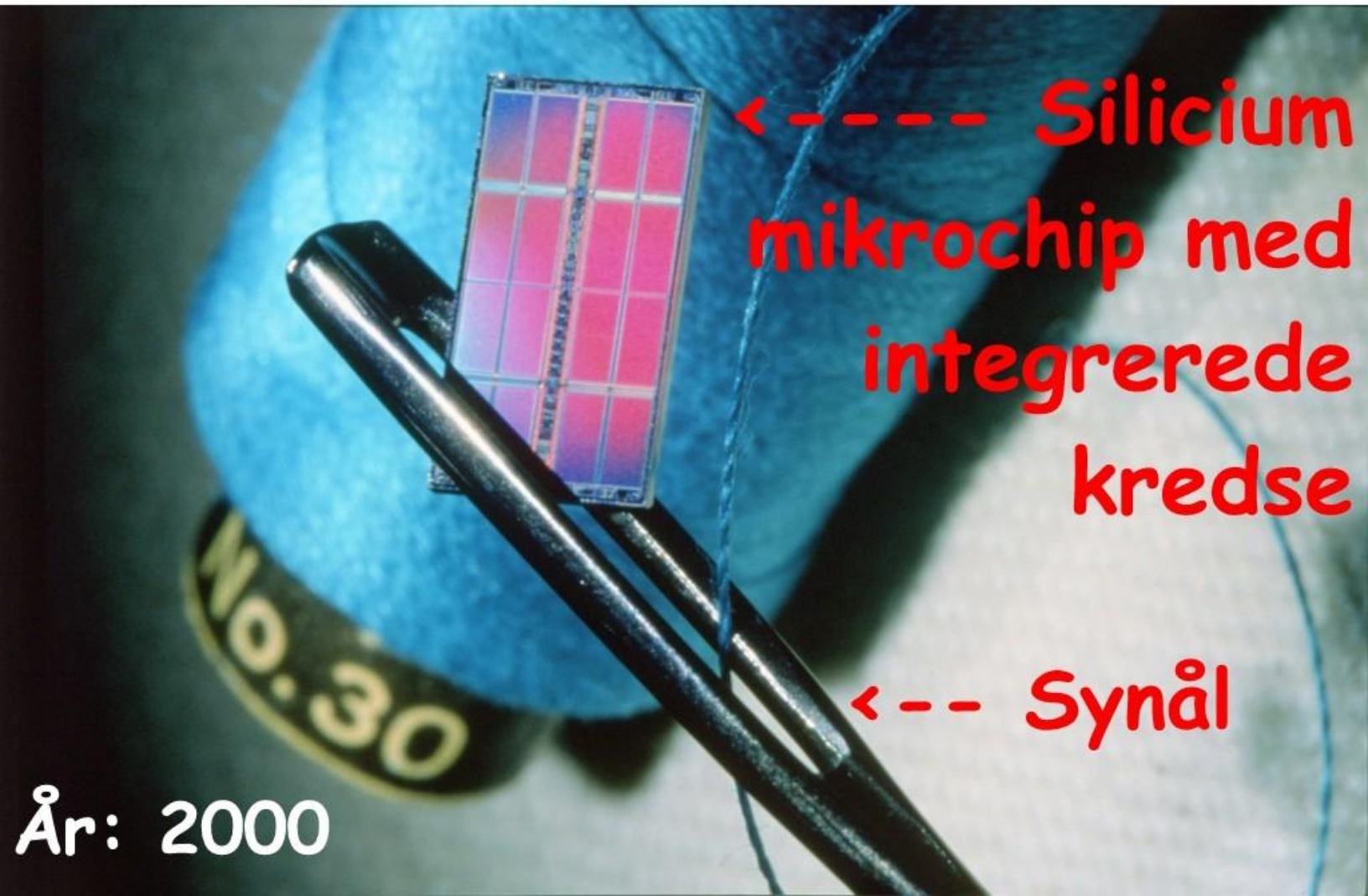
Første danske computer
DASK, Regnecentralen 1958



Elektronrør fra DASK 1958



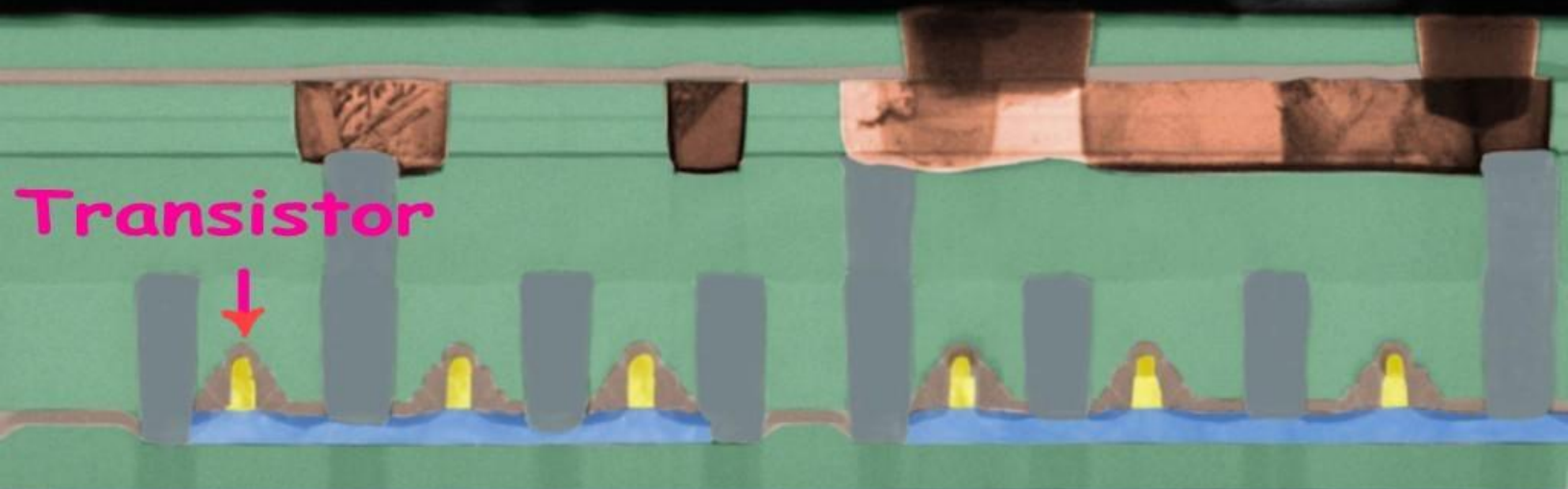
Mikrochip: Lagermoduler



← - - - - Silicium
mikrochip med
integrerede
kredse

← - - Synål

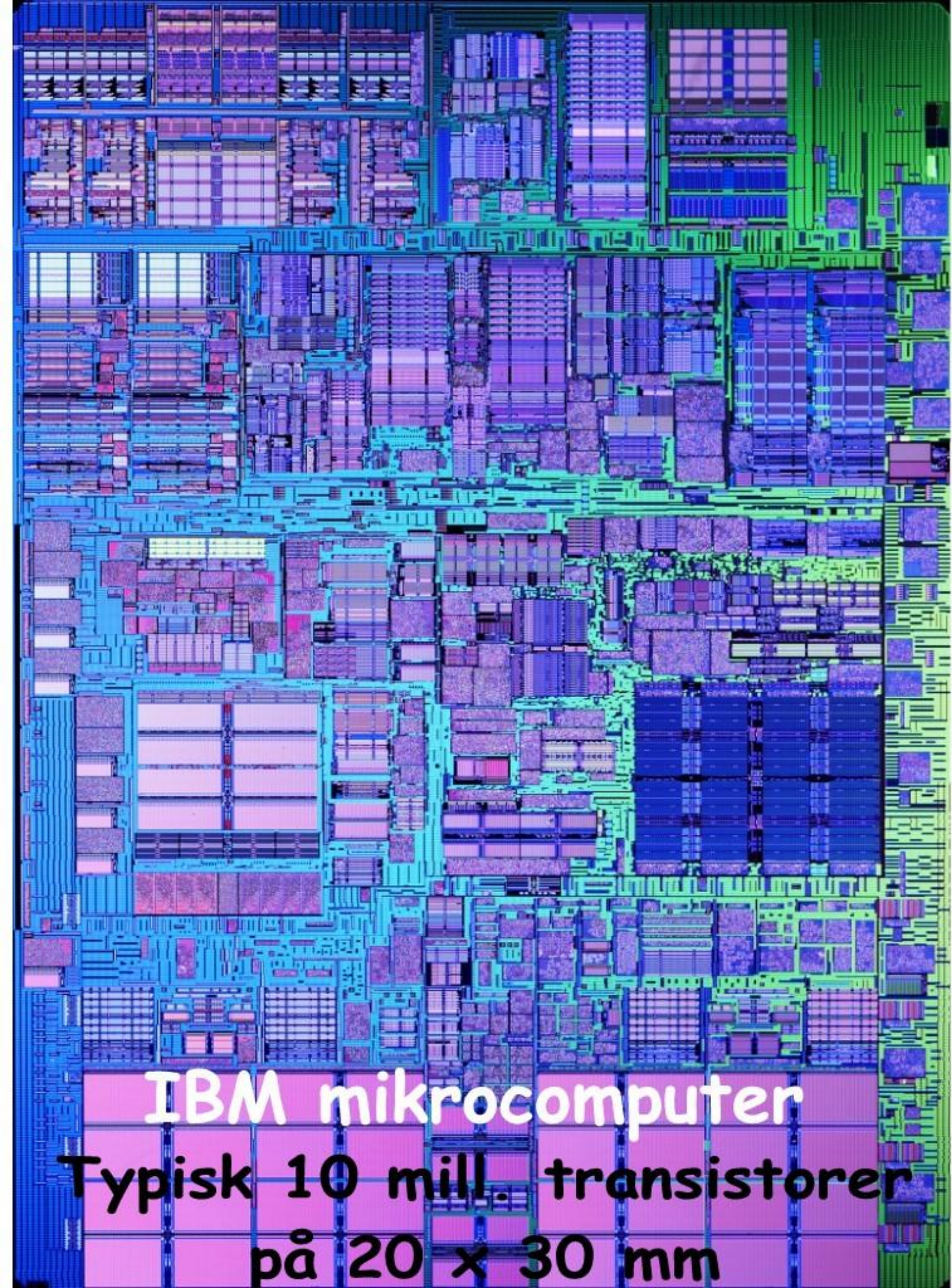
År: 2000



Snit i mikrochip med
ledninger og komponenter

0.5 μm

<-----> = 1/1000 mm



IBM mikrocomputer

Typisk 10 mill. transistorer

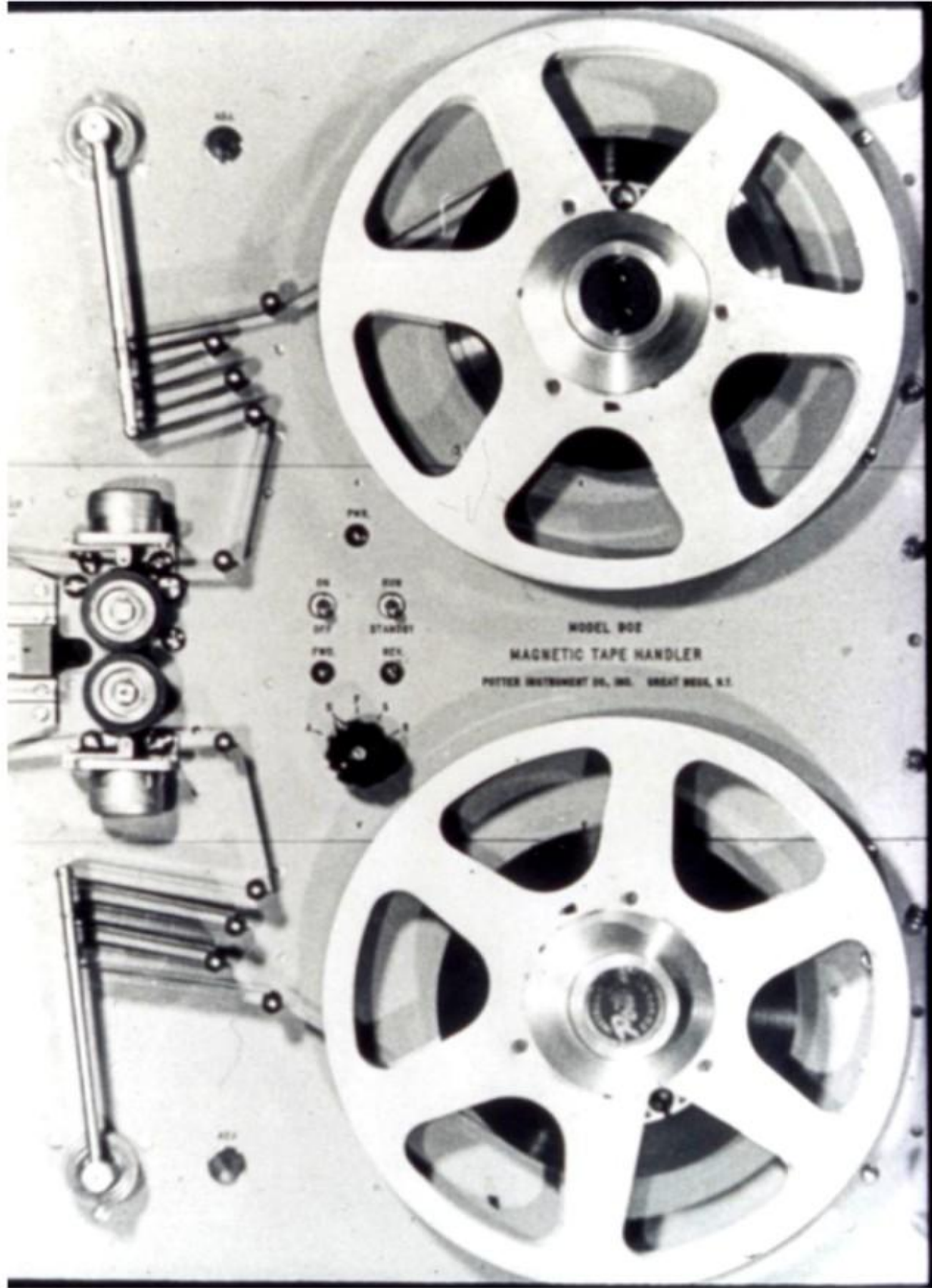
på 20 x 30 mm



15 cm



Dask
trådnings
panel

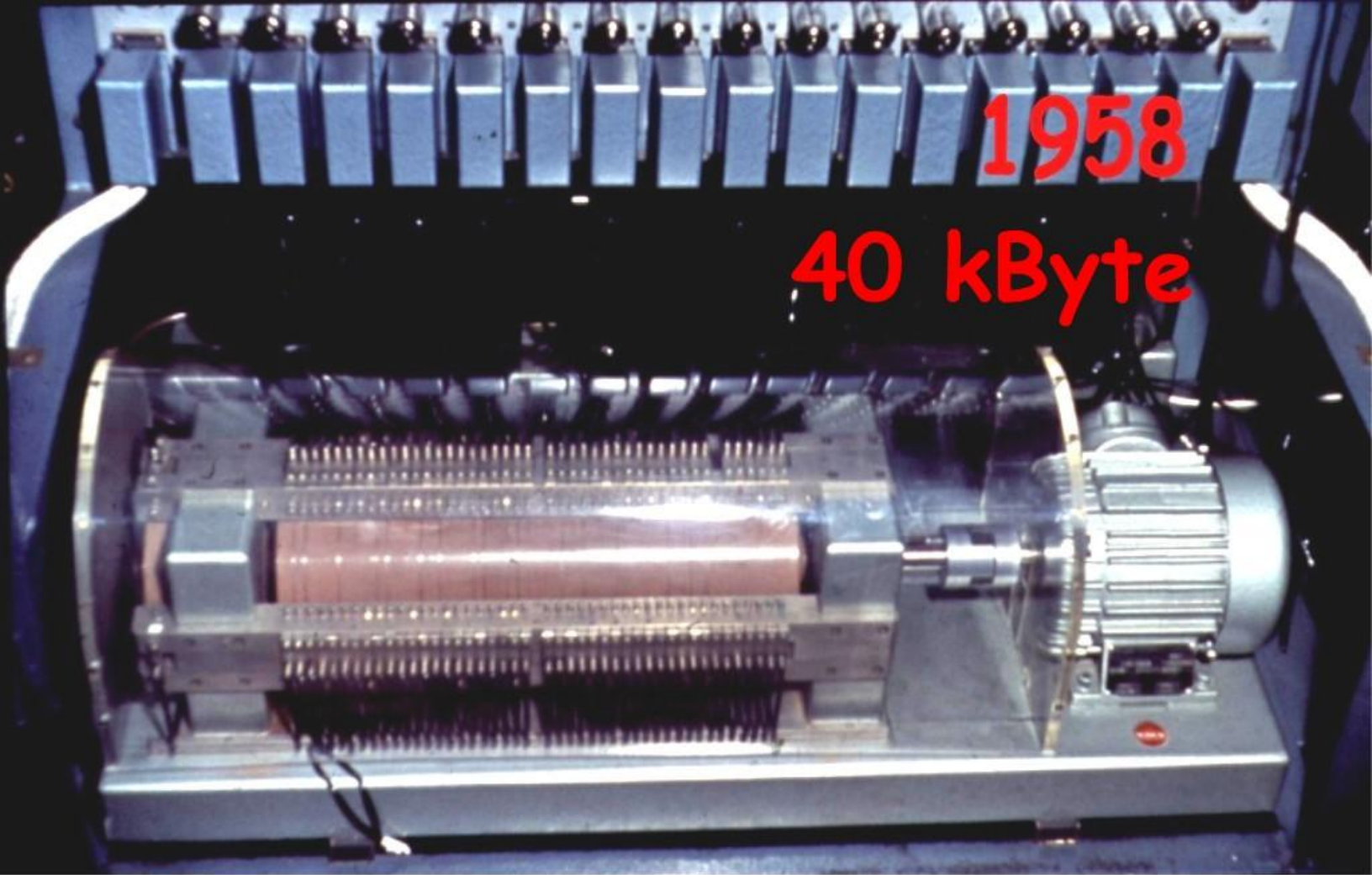


Magnetbånd til Dask 2MB



IBM
System
705

Databehandling med magnetbånd, 1957



1958

40 kByte

Magnettromle til DASK

Ferritlager: 4096 kerner=

512

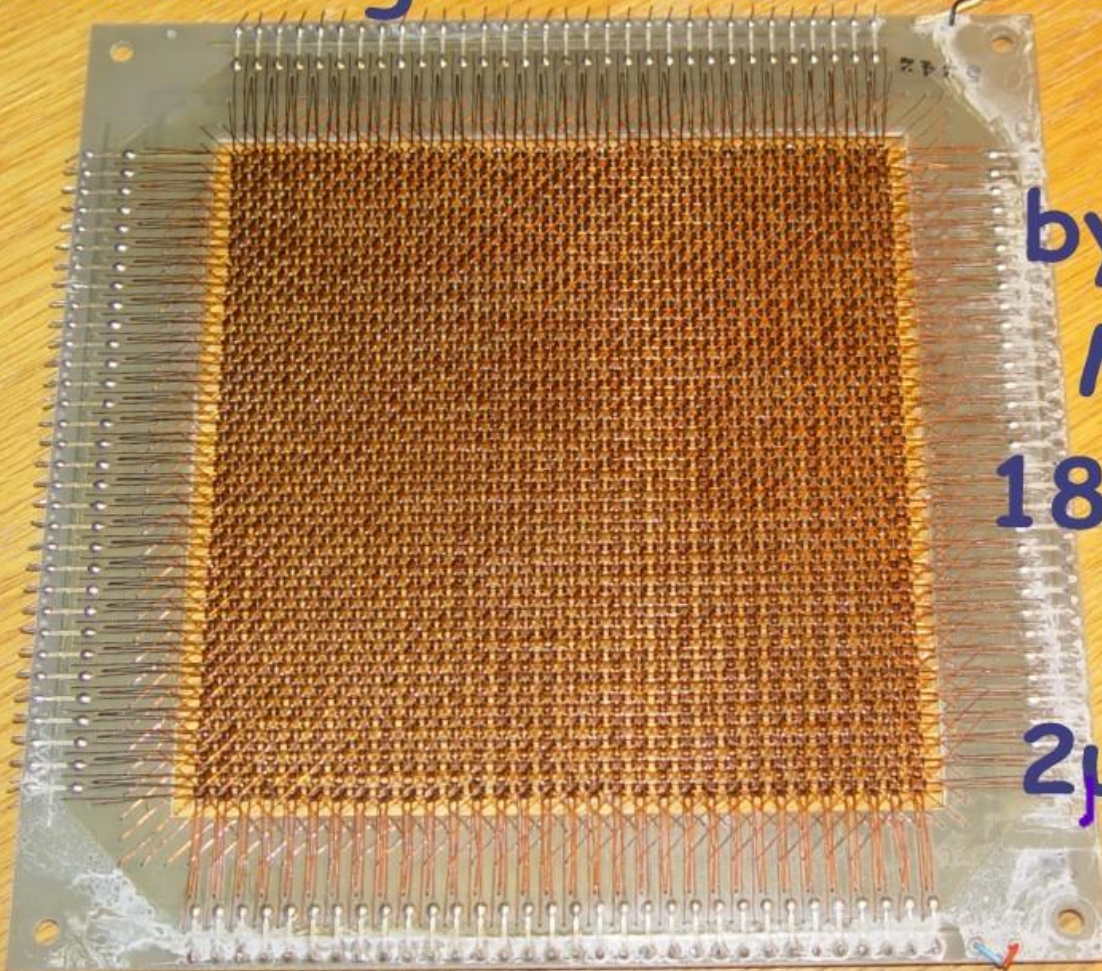
bytes

Mål:

18x18

cm

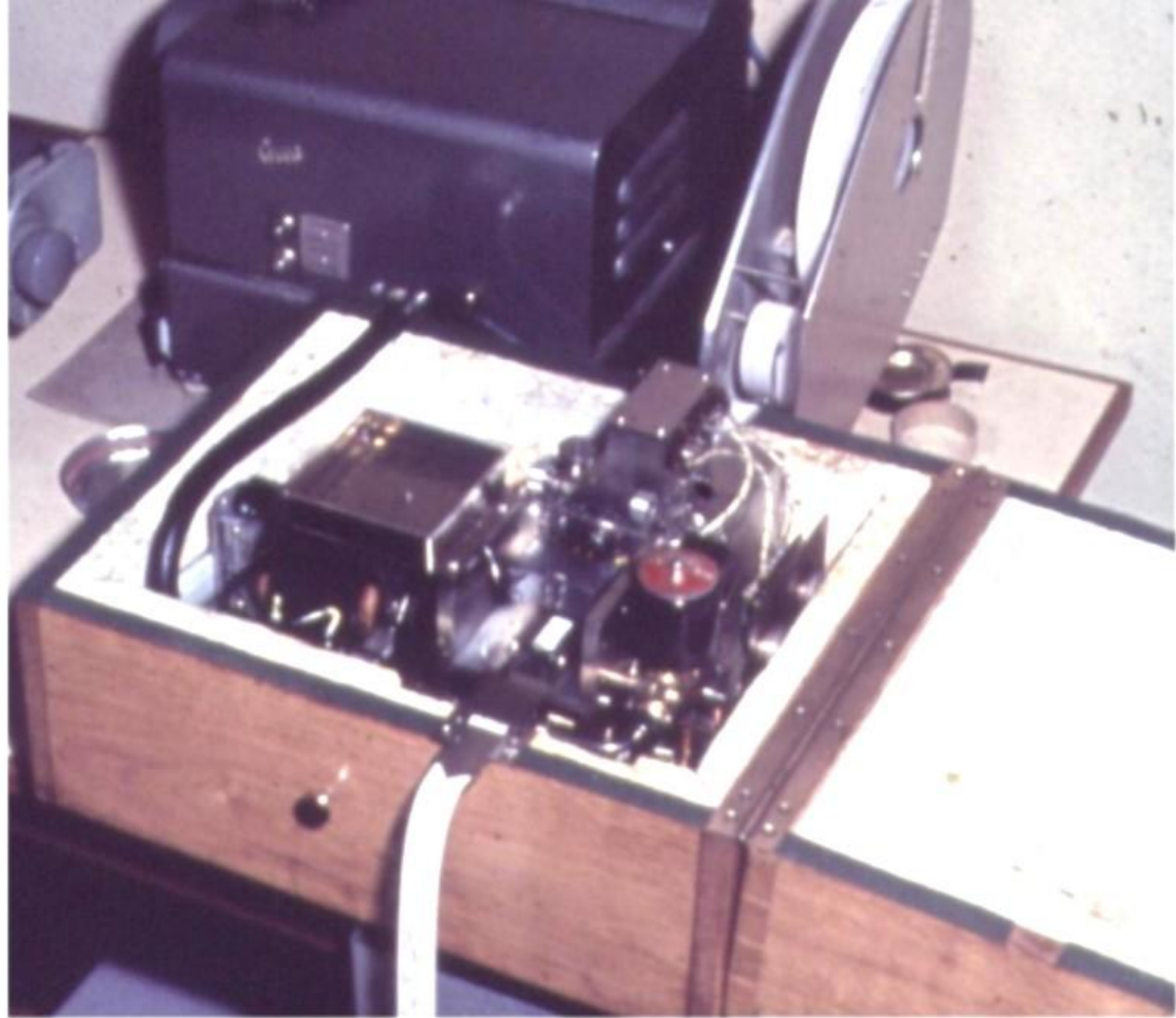
2 μ sek





Ferritlager: eneste brugbare
RAM-lager
i perioden 1955 - 1970

Ringkerner: Diameter ca. 2 mm



DASK strimmelperforator 140 t/s



Strimmel checkes manuelt af Dask bruger

Aage Melbye har fået bits mellem fingrene. Han kontrollerer at grunddata til valget i 1960 er korrekt indkodet på 5-kanal strimlen til Dask. Over kontrolbordet ses en soroban bag en glasrude, der bærer indskriften: Ved maskinefejl knus ruden og regn videre.



Hulkort hullemaskine



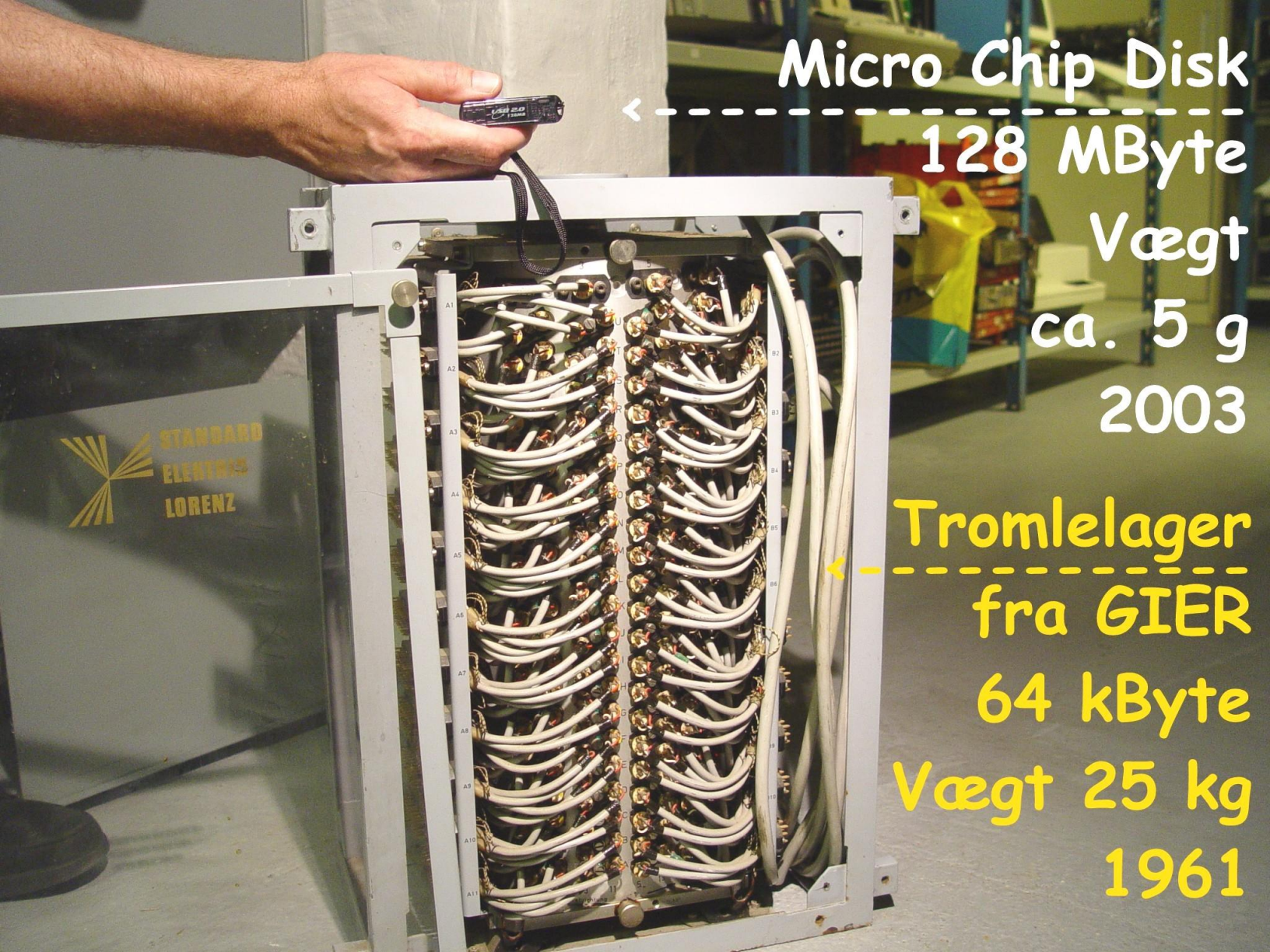
Transistormaskinen GIER, 1961



Transistorkredse fra Gier 1961



Ferritlager til Gier: 2 mm ringkerne
Cyklustid: 2 mikrosek



STANDARD
ELETRONIS
LORENZ

Micro Chip Disk



128 MByte

Vægt

ca. 5 g

2003

Tromlelager



fra GIER

64 kByte

Vægt 25 kg

1961



o. 1970

Pladelager - udskiftelig disk: ca. 10 Mbyte

Moderne harddisk 10 x 15 cm, fx 10 GBYTE



Papirstrimmel som datamedie

1837 Morsetelegraf: 10 ord/min

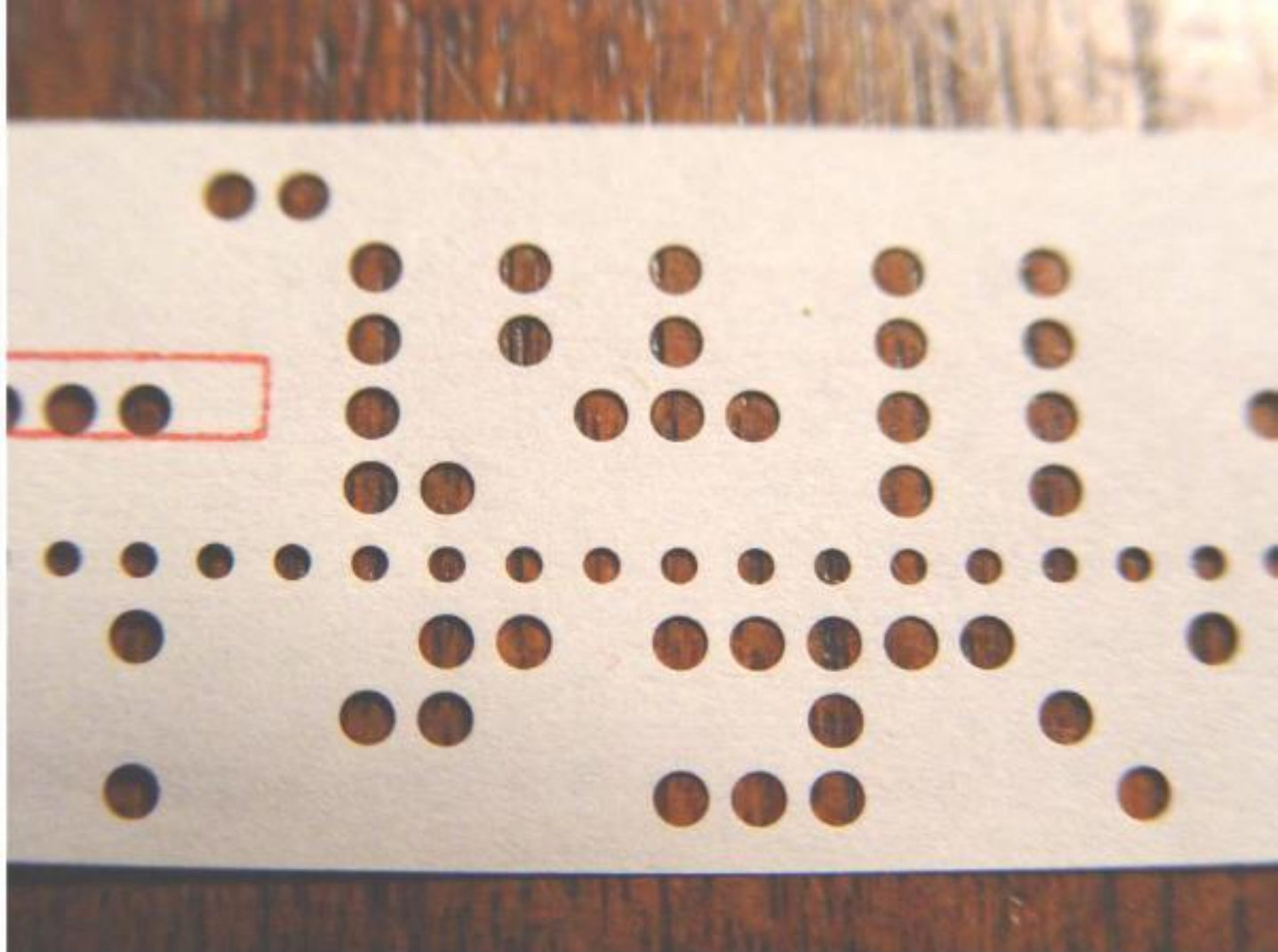
1857 Hulstrimmeltelegraf: 100 ord/min

1902 Fjernskriver/Teletype: 10 t/sek

1955 EDB perforator/læser: 150 t/sek

1963 RC2000 læser: 2000 t/sek

Hulstrimmel blev anvendt til 1970-erne



8-huls papirstrimmel

| DECIMAL VALUE | UNICODED SERVICE | | | | | | | | PUNCHED TAPE SYMBOL | NOTES |
|---------------|------------------|----|----|----|----|----|----|----|---------------------|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| 0 | SP | SP | SP | SP | SP | SP | SP | SP | SP | General Control Characters |
| 1 | SP | SP | SP | SP | SP | SP | SP | SP | SP | SP Same effect as the line printer control character |
| 2 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Line Feed |
| 3 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Upper Case |
| 4 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Carriage Return. The paper is advanced to the beginning of the line printer |
| 5 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Tabulation. The effect of this code on the printer is different from that on the typewriter |
| 6 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Special Punching Functions |
| 7 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Parity Function |
| 8 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Print Address Function |
| 9 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Can only be punched to a combination with other characters |
| 10 | SP | SP | SP | SP | SP | SP | SP | SP | SP | QIER ALGOL Control Characters |
| 11 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Can Code Punched as 0 |
| 12 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Clear Code Punched using ADR + 0 |
| 13 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Sum Code Punched using ADR + A |
| 14 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Print Code Punched as 0 |
| 15 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Print Code Punched as 0 |
| 16 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Print Code Punched as 0 |
| 17 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Line Printer Control Characters |
| 18 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Carriage Return. A line printer control character |
| 19 | SP | SP | SP | SP | SP | SP | SP | SP | SP | The CR character may be substituted for the following values to punch a carriage return instead of single-line spacing, or to punch a carriage return instead of the normal control spacing |
| 20 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 1 -> back 0 |
| 21 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 2 -> back 1 |
| 22 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 3 -> back 2 |
| 23 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 4 -> back 3 |
| 24 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 5 -> back 4 |
| 25 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 6 -> back 5 |
| 26 | SP | SP | SP | SP | SP | SP | SP | SP | SP | The modification + 16 causes the carriage to move and line feeding. (The letter A is used as a request to divide line feeding) |
| 27 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Line Printer Control Characters |
| 28 | SP | SP | SP | SP | SP | SP | SP | SP | SP | PA function and if necessary, the ADR appropriate value between 0 and 99 |
| 29 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Tabulation. The carriage is moved to the next tab character following the TAB character in printing position to be used |
| 30 | SP | SP | SP | SP | SP | SP | SP | SP | SP | On-Line Typewriter Control Characters |
| 31 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Red Ribbon. Punched using ADR + C |
| 32 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Black Ribbon. Punched using ADR + B |
| 33 | SP | SP | SP | SP | SP | SP | SP | SP | SP | TAB. Tabulation. The carriage is moved to the next tab |
| 34 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Off-Line Typewriter Control Characters |
| 35 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Punch On |
| 36 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Punch Off |
| 37 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Tap Feed. Can also be punched using ADR + C |
| 38 | SP | SP | SP | SP | SP | SP | SP | SP | SP | STOP. The off-line typewriter stops |
| 39 | SP | SP | SP | SP | SP | SP | SP | SP | SP | TAB. Tabulation. The carriage is moved to next tab stop |
| 40 | SP | SP | SP | SP | SP | SP | SP | SP | SP | Miscellaneous |
| 41 | SP | SP | SP | SP | SP | SP | SP | SP | SP | A Available on the on-line typewriter and the line printer. Punched using ADR + 1 |
| 42 | SP | SP | SP | SP | SP | SP | SP | SP | SP | U Available on the line printer only. Punched using ADR + 2 (same as SDR) |
| 43 | SP | SP | SP | SP | SP | SP | SP | SP | SP | 5C & Available on the line printer only. Punched using ADR + 3 |
| 44 | SP | SP | SP | SP | SP | SP | SP | SP | SP | — or Does not advance the carriage on the typewriter, but occupies one printer position on the line printer |
| 45 | SP | SP | SP | SP | SP | SP | SP | SP | SP | All values between 0 and 127, in any combination of holes in all eight tracks, can be punched with the on-line punch and read by the QIER Computer. The above-mentioned conventions for punching apply solely to the off-line typewriter, and this edition of the Table of Codes is revised in accordance with the conventions applicable to the Anelox Line Printer, Series S. |

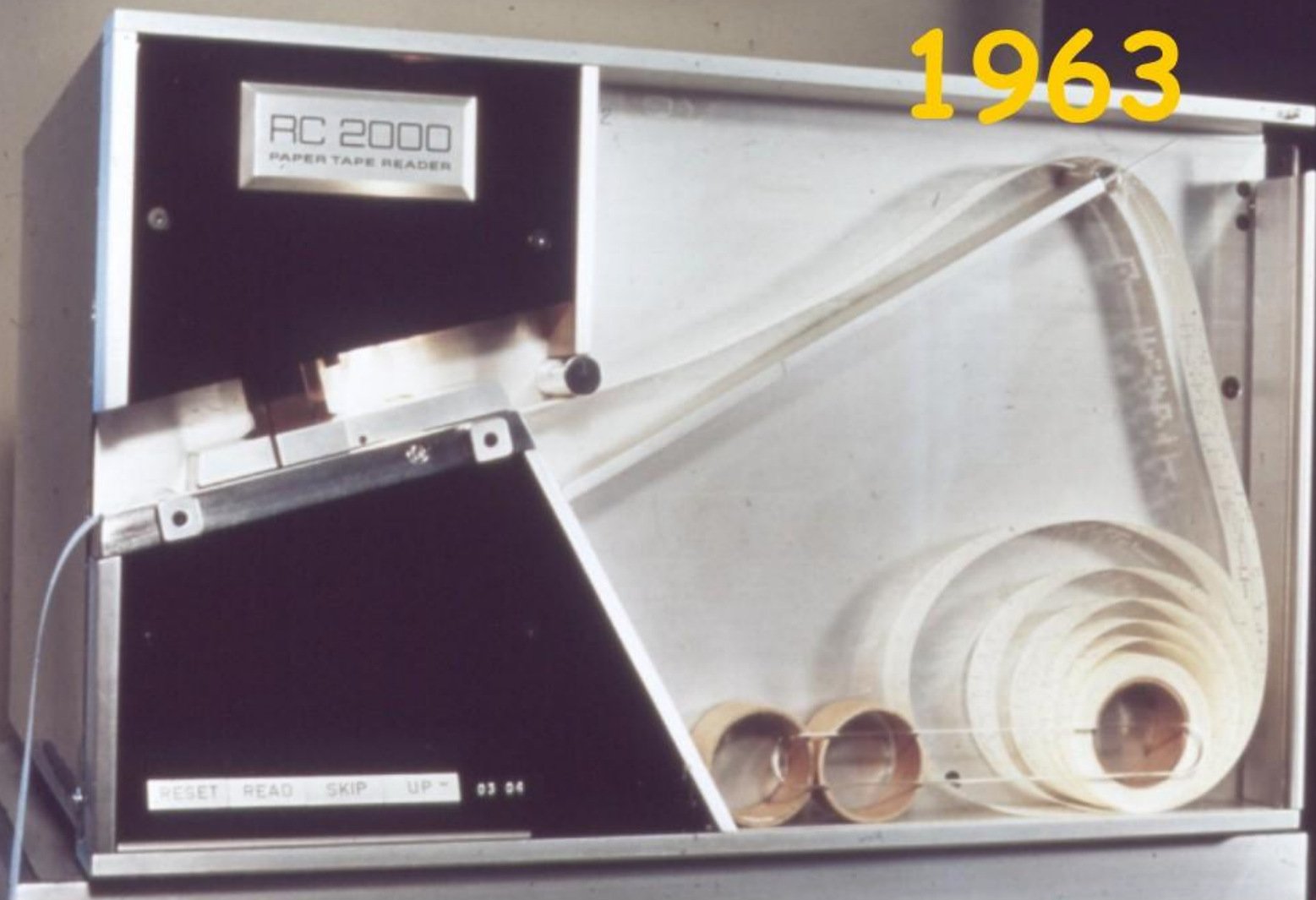
300 m/rulle

Papirhulstrimmel med kodetabel

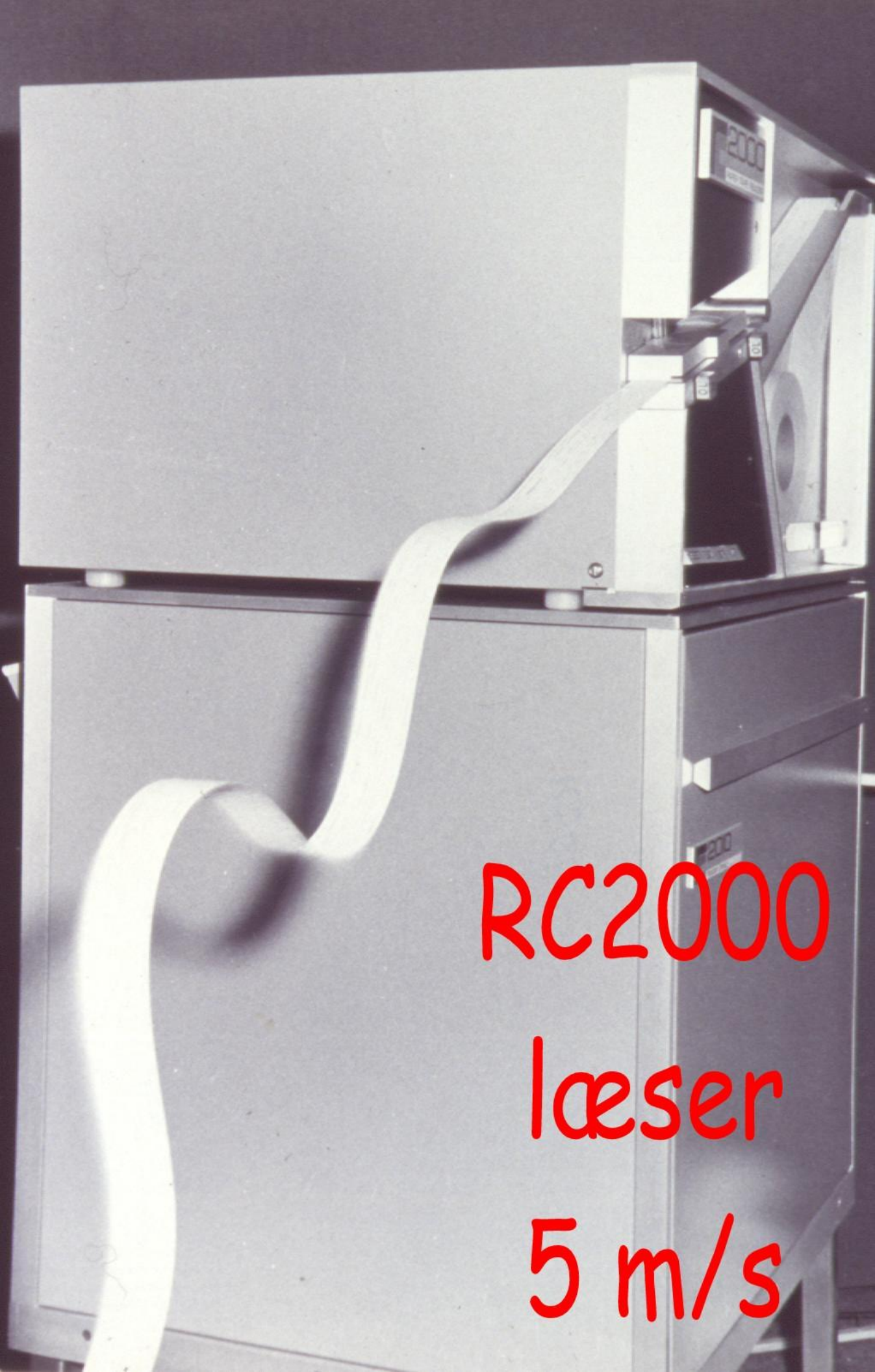
Hulstrimmel- hjælpemidler o. 1965



1963



RC2000 strimmellæser



RC2000

læser

5 m/s