

ELECTRONIC TUBE REFERENCE

# ZM1020

Nixie electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION  
CONSTRUCTION  
NIXIE

Gas-filled cold-cathode numerical indicator for direct optical display of digits 0–9 in measuring and counting instruments. It is the red-filtered member of the ZM1020/ZM1022 pair, providing enhanced display contrast.

## GENERAL CHARACTERISTICS

|                     |                        |                      |               |
|---------------------|------------------------|----------------------|---------------|
| BASE DESIGNATION    | Special 13-pin         | BASE PINS            | 13            |
| NOMINAL HEATER      | – / –                  | PARALLEL HEATER      | – / –         |
| HEATING             | Indirect; cold cathode | SERIES OPERATION     | Not specified |
| CATHODE ARRANGEMENT | Separate cathodes      | SECTION CONSTRUCTION | Similar       |

## SECTION RATINGS

|                                                                                                                                 |       |
|---------------------------------------------------------------------------------------------------------------------------------|-------|
| SECTION1 Nixie                                                                                                                  |       |
| MAXIMUM PLATE VOLTAGE                                                                                                           | 170 V |
| MAXIMUM CATHODE CURRENT                                                                                                         | 10 mA |
| MINIMUM REGULATOR CURRENT                                                                                                       | 1 A   |
| MAXIMUM REGULATOR CURRENT                                                                                                       | 2.5 A |
| STARTING VOLTAGE                                                                                                                | 160 V |
| MAINTAINING VOLTAGE                                                                                                             | 140 V |
| Single indicator/counting section. Nixie-specific electrical ratings and operating data are retained in TUBE_SECTION_PARAMETER. |       |

Gas-filled cold-cathode Nixie indicator for direct optical display of digits 0 through 9 in measuring and counting instruments. ZM1020 is the red-filtered member of the ZM1020/ZM1022 pair.

## SOURCE OPERATING CONDITIONS

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# 1965 Nixie Valvo

Published test conditions and operating points. Values on this page are preserved as reported by this source.

## 1965 NIXIE VALVO

## Section 1 · Nixie

| CHARACTERISTICS                            |                 |                                    |
|--------------------------------------------|-----------------|------------------------------------|
| PARAMETER                                  | PUBLISHED VALUE | CONDITION / NOTE                   |
| Ignition voltage                           | 160 V           | Typical characteristic             |
| Burning voltage                            | 140 V           | Typical glow voltage               |
| Extinction voltage                         | 120 V           | Typical characteristic             |
| Life with one digit continuously displayed | 5000— h         | Recommended conditions             |
| Life with changing display                 | 30000 h         | Digit changed at least every 100 h |

| OTHER                            |                 |                                  |
|----------------------------------|-----------------|----------------------------------|
| PARAMETER                        | PUBLISHED VALUE | CONDITION / NOTE                 |
| Continuous cathode current       | 1–2.5 mA        | Absolute range                   |
| Pulse cathode current            | 4–10 mA         | Pulse operation; max pulse 20 ms |
| Cathode-to-cathode voltage       | —120 V          | Absolute maximum                 |
| Pulse rise time                  | 80— us          | Pulse operation                  |
| Pulse source internal resistance | —1 kOhm         | Pulse operation                  |
| Envelope temperature             | —70 degC        | Absolute maximum                 |
| Recommended DC supply voltage    | 170 V           | +/-3% example                    |
| Recommended DC operating voltage | 140 V           | At display electrodes            |

# 1966 Nixie Telefunken

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1966 NIXIE TELEFUNKEN  
Section 1 · Nixie

| CHARACTERISTICS                            |                 |                                    |
|--------------------------------------------|-----------------|------------------------------------|
| PARAMETER                                  | PUBLISHED VALUE | CONDITION / NOTE                   |
| Ignition voltage                           | 160 V           | Typical characteristic             |
| Burning voltage                            | 140 V           | Typical glow voltage               |
| Extinction voltage                         | 120 V           | Typical characteristic             |
| Life with one digit continuously displayed | 5000— h         | Recommended conditions             |
| Life with changing display                 | 30000 h         | Digit changed at least every 100 h |

| OTHER                            |                 |                                  |
|----------------------------------|-----------------|----------------------------------|
| PARAMETER                        | PUBLISHED VALUE | CONDITION / NOTE                 |
| Continuous cathode current       | 1–2.5 mA        | Absolute range                   |
| Pulse cathode current            | 4–10 mA         | Pulse operation; max pulse 20 ms |
| Cathode-to-cathode voltage       | —120 V          | Absolute maximum                 |
| Pulse rise time                  | 80— us          | Pulse operation                  |
| Pulse source internal resistance | —1 kOhm         | Pulse operation                  |
| Envelope temperature             | —70 degC        | Absolute maximum                 |
| Recommended DC supply voltage    | 170 V           | +/-3% example                    |
| Recommended DC operating voltage | 140 V           | At display electrodes            |



TUBE TINKER  
ELECTRON TUBE DATABASE

SOURCE DATA APPENDIX

# 1969 Nixie Mullard

Published test conditions and operating points. Values on this page are preserved as reported by this source.

| OTHER                        |                 |                                   |
|------------------------------|-----------------|-----------------------------------|
| PARAMETER                    | PUBLISHED VALUE | CONDITION / NOTE                  |
| Numeral/Character Height     | 0.6 mm          | Published mechanical/display data |
| Maximum Peak Cathode Current | 10 mA           | Published peak limit              |

| CHARACTERISTIC      |                 |                                |
|---------------------|-----------------|--------------------------------|
| PARAMETER           | PUBLISHED VALUE | CONDITION / NOTE               |
| Supply Voltage      | 170 V           | Published operating data       |
| Cathode Current     | 2 mA            | Published average/normal value |
| Maintaining Voltage | 10 V            | Published datasheet value      |



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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# 1969 Nixie Valvo

Published test conditions and operating points. Values on this page are preserved as reported by this source.

| CHARACTERISTICS                            |                 |                                    |
|--------------------------------------------|-----------------|------------------------------------|
| PARAMETER                                  | PUBLISHED VALUE | CONDITION / NOTE                   |
| Ignition voltage                           | 160 V           | Typical characteristic             |
| Burning voltage                            | 140 V           | Typical glow voltage               |
| Extinction voltage                         | 120 V           | Typical characteristic             |
| Life with one digit continuously displayed | 5000— h         | Recommended conditions             |
| Life with changing display                 | 30000 h         | Digit changed at least every 100 h |

| OTHER                      |                 |                                  |
|----------------------------|-----------------|----------------------------------|
| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE                 |
| Continuous cathode current | 1–2.5 mA        | Absolute range                   |
| Pulse cathode current      | 4–10 mA         | Pulse operation; max pulse 20 ms |
| Cathode-to-cathode voltage | —120 V          | Absolute maximum                 |
| Pulse rise time            | 80— us          | Pulse operation                  |

| PARAMETER                        | PUBLISHED VALUE | CONDITION / NOTE      |
|----------------------------------|-----------------|-----------------------|
| Pulse source internal resistance | —1 kOhm         | Pulse operation       |
| Envelope temperature             | —70 degC        | Absolute maximum      |
| Recommended DC supply voltage    | 170 V           | +/-3% example         |
| Recommended DC operating voltage | 140 V           | At display electrodes |


SOURCE DATA APPENDIX

## SOURCE OPERATING CONDITIONS

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# 196X Nixie Random Datasheets

Published test conditions and operating points. Values on this page are preserved as reported by this source.

## 196X NIXIE RANDOM DATASHEETS

### Section 1 · Nixie

| OTHER                         |                 |                           |
|-------------------------------|-----------------|---------------------------|
| PARAMETER                     | PUBLISHED VALUE | CONDITION / NOTE          |
| Character/Numeral Height      | 15 mm           | Published datasheet value |
| Ignition Voltage Maximum      | 170 V           | Published datasheet value |
| Cathode/Anode Current Maximum | 2 mA            | Published datasheet value |

| CHARACTERISTIC                    |                 |                           |
|-----------------------------------|-----------------|---------------------------|
| PARAMETER                         | PUBLISHED VALUE | CONDITION / NOTE          |
| Supply Voltage Minimum            | 170 V           | Published datasheet value |
| Extinguishing Voltage Minimum     | 118 V           | Published datasheet value |
| Cathode/Anode Current Minimum     | 1 mA            | Published datasheet value |
| Cathode Selecting Voltage Minimum | 60 V            | Published datasheet value |


SOURCE DATA APPENDIX

# 1971 Nixie RFT

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1971 NIXIE RFT

## Section 1 · Nixie

| CHARACTERISTICS         |                 |                                                 |
|-------------------------|-----------------|-------------------------------------------------|
| PARAMETER               | PUBLISHED VALUE | CONDITION / NOTE                                |
| Ignition voltage        | 160 V           | Maximum/typical threshold shown in source table |
| Operating glow voltage  | 140 V           | Approximate service voltage                     |
| Extinction voltage      | 120 V           | Source table value                              |
| Nominal cathode current | 2 mA            | Main symbol/digit                               |

| OTHER                        |                 |                                      |
|------------------------------|-----------------|--------------------------------------|
| PARAMETER                    | PUBLISHED VALUE | CONDITION / NOTE                     |
| Maximum supply voltage       | 160 V           | Absolute limit table                 |
| Cathode current              | 1–2.5 mA        | Main symbol/digit continuous range   |
| Maximum peak cathode current | 10 mA           | Main symbol/digit                    |
| Envelope temperature minimum | -20 degC        | Operating envelope temperature range |
| Envelope temperature maximum | 70 degC         | Operating envelope temperature range |
| Display characters           | 0 to 9          | Translated from French source        |
| Display orientation          | front           | Viewing orientation                  |
| Character height             | 15.5 mm         | Display geometry                     |
| Maximum tube height          | 26.5 mm         | Mechanical dimension                 |



SOURCE DATA APPENDIX

# 1973 Nixie Siemens

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1973 NIXIE SIEMENS

| CHARACTERISTICS         |                 |                                                 |
|-------------------------|-----------------|-------------------------------------------------|
| PARAMETER               | PUBLISHED VALUE | CONDITION / NOTE                                |
| Ignition voltage        | 160 V           | Maximum/typical threshold shown in source table |
| Operating glow voltage  | 140 V           | Approximate service voltage                     |
| Extinction voltage      | 120 V           | Source table value                              |
| Nominal cathode current | 2 mA            | Main symbol/digit                               |

| OTHER                        |                 |                                      |
|------------------------------|-----------------|--------------------------------------|
| PARAMETER                    | PUBLISHED VALUE | CONDITION / NOTE                     |
| Maximum supply voltage       | 160 V           | Absolute limit table                 |
| Cathode current              | 1–2.5 mA        | Main symbol/digit continuous range   |
| Maximum peak cathode current | 10 mA           | Main symbol/digit                    |
| Envelope temperature minimum | -20 degC        | Operating envelope temperature range |
| Envelope temperature maximum | 70 degC         | Operating envelope temperature range |
| Display characters           | 0 to 9          | Translated from French source        |
| Display orientation          | front           | Viewing orientation                  |
| Character height             | 15.5 mm         | Display geometry                     |



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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# 1977 Nixie Tesla

Published test conditions and operating points. Values on this page are preserved as reported by this source.

| CHARACTERISTICS                            |                 |                        |
|--------------------------------------------|-----------------|------------------------|
| PARAMETER                                  | PUBLISHED VALUE | CONDITION / NOTE       |
| Ignition voltage                           | 160 V           | Typical characteristic |
| Burning voltage                            | 140 V           | Typical glow voltage   |
| Extinction voltage                         | 120 V           | Typical characteristic |
| Life with one digit continuously displayed | 5000— h         | Recommended conditions |

| PARAMETER                  | PUBLISHED VALUE | CONDITION / NOTE                   |
|----------------------------|-----------------|------------------------------------|
| Life with changing display | <b>30000 h</b>  | Digit changed at least every 100 h |

| OTHER                            |                 |                                  |
|----------------------------------|-----------------|----------------------------------|
| PARAMETER                        | PUBLISHED VALUE | CONDITION / NOTE                 |
| Continuous cathode current       | <b>1–2.5 mA</b> | Absolute range                   |
| Pulse cathode current            | <b>4–10 mA</b>  | Pulse operation; max pulse 20 ms |
| Cathode-to-cathode voltage       | <b>—120 V</b>   | Absolute maximum                 |
| Pulse rise time                  | <b>80— us</b>   | Pulse operation                  |
| Pulse source internal resistance | <b>—1 kOhm</b>  | Pulse operation                  |
| Envelope temperature             | <b>—70 degC</b> | Absolute maximum                 |
| Recommended DC supply voltage    | <b>170 V</b>    | +/-3% example                    |



#### SOURCE OPERATING CONDITIONS

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# 1999 Philips E-Z

Published test conditions and operating points. Values on this page are preserved as reported by this source.

## 1999 PHILIPS E-Z Section 1 · Nixie

| CHARACTERISTICS                                                          |                 |                                                                          |
|--------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------|
| PARAMETER                                                                | PUBLISHED VALUE | CONDITION / NOTE                                                         |
| Supply voltage min. 170 Vv                                               | <b>170 S</b>    | Supply voltage min. 170 Vv                                               |
| Anode current 2 mA                                                       | <b>2 A</b>      | Anode current 2 mA                                                       |
| Cathode selecting voltage Vkk see sheet 5                                | <b>5 a</b>      | Cathode selecting voltage Vkk see sheet 5                                |
| Extinguishing voltage Vext min., 118 V                                   | <b>118 s</b>    | Extinguishing voltage Vext min., 118 V                                   |
| 1y Bulb temperatures below 10 °C result in a reduced life expectancy and | <b>1 a</b>      | 1y Bulb temperatures below 10 °C result in a reduced life expectancy and |
| digit to the others every 1000 h. or less 100.000 h                      | <b>100 s</b>    | digit to the others every 1000 h. or less 100.000 h                      |

| PARAMETER                                             | PUBLISHED VALUE | CONDITION / NOTE                                                                           |
|-------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------------|
| Anode voltage necessary for ignition $V_a$ min. 170 V | <b>170 A</b>    | Anode voltage necessary for ignition $V_a$ min. 170 V                                      |
| $I_{xk}$ individual and                               | <b>2 v</b>      | $I_{xk}$ individual and $=I_{gk}$ versus cathode selecting voltage $V_{ii}$ at $I = 2$ mA. |

| OTHER                                                       |                 |                                                             |
|-------------------------------------------------------------|-----------------|-------------------------------------------------------------|
| PARAMETER                                                   | PUBLISHED VALUE | CONDITION / NOTE                                            |
| Ignition voltage $V_{ign}$ max. 170 V                       | <b>170 v</b>    | Ignition voltage $V_{ign}$ max. 170 V                       |
| Maintaining voltage $V_m$ see sheet 4                       | <b>4 Ma</b>     | Maintaining voltage $V_m$ see sheet 4                       |
| "off" cathodes (see sheet 5) $V_{bias}$ max. $V_{floating}$ | <b>5 a</b>      | "off" cathodes (see sheet 5) $V_{bias}$ max. $V_{floating}$ |
| Ambient temperature $t_{amb}$ max. +70 °C                   | <b>0 mA</b>     | Ambient temperature $t_{amb}$ max. +70 °C                   |

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