

## RF POWER TRIODE

| QUICK REFERENCE DATA |                |                                |                       |                              |                       |                       |                       |                       |                       |
|----------------------|----------------|--------------------------------|-----------------------|------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| $\lambda$<br>(m)     | Freq.<br>(MHz) | C telegr.                      |                       | C grounded<br>grid           |                       | B teleph.             |                       | C <sub>a</sub> mod.   |                       |
|                      |                | V <sub>a</sub><br>(V)          | W <sub>o</sub><br>(W) | V <sub>a</sub><br>(V)        | W <sub>o</sub><br>(W) | V <sub>a</sub><br>(V) | W <sub>o</sub><br>(W) | V <sub>a</sub><br>(V) | W <sub>o</sub><br>(W) |
| 2                    | 150            | 2500                           | 390                   |                              |                       | 2500                  | 65                    |                       |                       |
|                      |                | 2000                           | 295                   |                              |                       | 2000                  | 64                    | 2000                  | 205                   |
|                      |                | 1500                           | 210                   |                              |                       | 1500                  | 59                    | 1500                  | 154                   |
|                      |                | 1000                           | 126                   |                              |                       |                       |                       | 1000                  | 96                    |
| 3                    | 100            |                                |                       | 2500                         | 910                   |                       |                       |                       |                       |
|                      |                |                                |                       | 2000                         | 700                   |                       |                       |                       |                       |
|                      |                |                                |                       | 1500                         | 516                   |                       |                       |                       |                       |
|                      |                |                                |                       | 1000                         | 332                   |                       |                       |                       |                       |
| 6                    | 50             | C osc. industrial              |                       |                              |                       |                       |                       | B mod.<br>two tubes   |                       |
|                      |                | V <sub>a</sub> $\infty$<br>(V) | W <sub>o</sub><br>(W) | V <sub>a</sub> $\sim$<br>(V) | W <sub>o</sub><br>(W) |                       |                       | V <sub>a</sub><br>(V) | W <sub>o</sub><br>(W) |
|                      |                | 2000                           | 290                   | 2500                         | 170                   |                       |                       | 2500                  | 700                   |
|                      |                |                                |                       |                              |                       |                       |                       | 1000                  | 274                   |

**HEATING:** direct; filament thoriated tungsten

Filament voltage

V<sub>f</sub> = 6.3 V

Filament current

I<sub>f</sub> = 5.8 A

### CAPACITANCES

Anode to all other elements except grid

C<sub>a</sub> = 0.1 pF

Grid to all other elements except anode

C<sub>g</sub> = 4.9 pF

Anode to grid

C<sub>ag</sub> = 5.0 pF

### TYPICAL CHARACTERISTICS

Anode voltage

V<sub>a</sub> = 2500 V

Anode current

I<sub>a</sub> = 60 mA

Amplification factor

$\mu$  = 25

Mutual conductance

S = 2.8 mA/V

**TEMPERATURE LIMITS**

Absolute maximum rating system

Temperature of anode seal

= max. 220 °C

Bottom temperature

= max. 180 °C

It is recommended to direct a low-velocity air flow on bottom and top seal if the tube is used at or near the limiting values at frequencies above 50 MHz.

**MECHANICAL DATA**

Base giant 5 p

Socket 2422 512 01001

Anode connector 40624

Net mass 125 g

Dimensions in mm

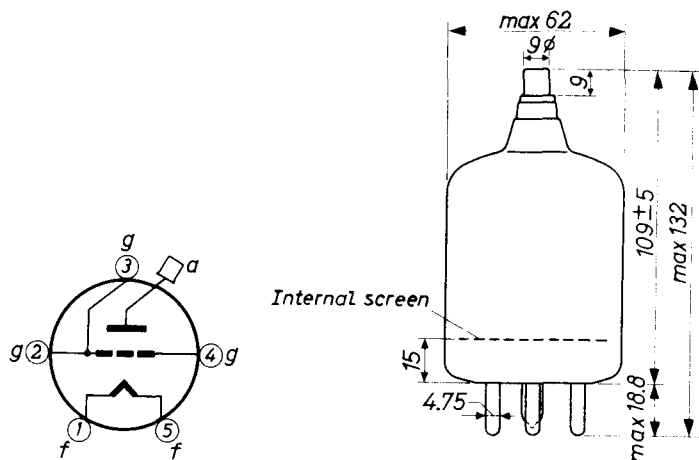


Fig. 1 Mechanical outline.

Mounting position vertical with base up or down

**COOLING**

Radiation/low-velocity air flow.

## RF CLASS C TELEGRAPHY

## LIMITING VALUES (Absolute limits)

| Frequency                                        | f        | up to  | 150  | MHz        |
|--------------------------------------------------|----------|--------|------|------------|
| Anode voltage                                    | $V_a$    | = max. | 3000 | V          |
| Anode current                                    | $I_a$    | = max. | 255  | mA         |
| Anode dissipation                                | $W_a$    | = max. | 150  | W          |
| Anode input power                                | $W_{ia}$ | = max. | 512  | W          |
| Negative grid voltage                            | $-V_g$   | = max. | 300  | V          |
| Grid current                                     | $I_g$    | = max. | 45   | mA         |
| Grid circuit resistance with fixed grid bias     | $R_g$    | = max. | 0.1  | M $\Omega$ |
| Grid circuit resistance with automatic grid bias | $R_g$    | = max. | 0.2  | M $\Omega$ |

## OPERATING CONDITIONS

| Frequency            | f        | = | 150  | 150  | 150  | 150  | MHz |
|----------------------|----------|---|------|------|------|------|-----|
| Anode voltage        | $V_a$    | = | 2500 | 2000 | 1500 | 1000 | V   |
| Grid voltage         | $V_g$    | = | -200 | -150 | -110 | -80  | V   |
| Anode current        | $I_a$    | = | 205  | 205  | 205  | 205  | mA  |
| Grid current         | $I_g$    | = | 40   | 40   | 40   | 40   | mA  |
| Peak grid AC voltage | $V_{gp}$ | = | 390  | 340  | 300  | 260  | V   |
| Grid input power     | $W_{ig}$ | = | 14   | 13   | 11   | 10   | W   |
| Anode input power    | $W_{ia}$ | = | 512  | 410  | 308  | 205  | W   |
| Anode dissipation    | $W_a$    | = | 122  | 115  | 98   | 79   | W   |
| Output power         | $W_o$    | = | 390  | 295  | 210  | 126  | W   |
| Efficiency           | $\eta$   | = | 76   | 72   | 68   | 61.5 | %   |

**RF CLASS B TELEPHONY**
**LIMITING VALUES** (Absolute limits)

| Frequency                                        | f        | up to  | 150  | MHz       |
|--------------------------------------------------|----------|--------|------|-----------|
| Anode voltage                                    | $V_a$    | = max. | 3000 | V         |
| Anode current                                    | $I_a$    | = max. | 170  | mA        |
| Anode dissipation                                | $W_a$    | = max. | 150  | W         |
| Anode input power                                | $W_{ia}$ | = max. | 200  | W         |
| Grid current                                     | $I_g$    | = max. | 55   | mA        |
| Grid circuit resistance with fixed grid bias     | $R_g$    | = max. | 0.1  | $M\Omega$ |
| Grid circuit resistance with automatic grid bias | $R_g$    | = max. | 0.2  | $M\Omega$ |

**OPERATING CONDITIONS**

|                      |          |   |      |      |      |     |
|----------------------|----------|---|------|------|------|-----|
| Frequency            | f        | = | 150  | 150  | 150  | MHz |
| Anode voltage        | $V_a$    | = | 2500 | 2000 | 1500 | V   |
| Grid voltage         | $V_g$    | = | -87  | -67  | -45  | V   |
| Anode current        | $I_a$    | = | 77   | 97   | 120  | mA  |
| Peak grid AC voltage | $V_{gp}$ | = | 100  | 100  | 100  | V   |
| Anode input power    | $W_{ia}$ | = | 193  | 194  | 180  | W   |
| Anode dissipation    | $W_a$    | = | 128  | 130  | 121  | W   |
| Output power         | $W_o$    | = | 65   | 64   | 59   | W   |
| Efficiency           | $\eta$   | = | 34   | 33   | 33   | %   |
| Modulation factor    | m        | = | 100  | 100  | 100  | %   |
| Grid current         | $I_g$    | = | 20   | 28   | 52   | mA  |
| Grid input power     | $W_{ig}$ | = | 3.6  | 5.1  | 9.4  | W   |

## RF CLASS C ANODE MODULATION

## LIMITING VALUES (Absolute limits)

| Frequency                                        | f        | up to  | 150  | MHz        |
|--------------------------------------------------|----------|--------|------|------------|
| Anode voltage                                    | $V_a$    | = max. | 2400 | V          |
| Anode current                                    | $I_a$    | = max. | 170  | mA         |
| Anode dissipation                                | $W_a$    | = max. | 100  | W          |
| Anode input power                                | $W_{ia}$ | = max. | 340  | W          |
| Negative grid voltage                            | $-V_g$   | = max. | 300  | V          |
| Grid current                                     | $I_g$    | = max. | 45   | mA         |
| Grid circuit resistance with fixed grid bias     | $R_g$    | = max. | 0.1  | M $\Omega$ |
| Grid circuit resistance with automatic grid bias | $R_g$    | = max. | 0.2  | M $\Omega$ |

## OPERATING CONDITIONS

|                      |           |   |      |      |      |     |
|----------------------|-----------|---|------|------|------|-----|
| Frequency            | f         | = | 150  | 150  | 150  | MHz |
| Anode voltage        | $V_a$     | = | 2000 | 1500 | 1000 | V   |
| Grid voltage         | $V_g$     | = | -225 | -180 | -130 | V   |
| Anode current        | $I_a$     | = | 128  | 128  | 128  | mA  |
| Grid current         | $I_g$     | = | 40   | 40   | 40   | mA  |
| Peak grid AC voltage | $V_{gp}$  | = | 415  | 370  | 320  | V   |
| Grid input power     | $W_{ig}$  | = | 15   | 14   | 12   | W   |
| Anode input power    | $W_{ia}$  | = | 256  | 192  | 128  | W   |
| Anode dissipation    | $W_a$     | = | 51   | 38   | 32   | W   |
| Output power         | $W_o$     | = | 205  | 154  | 96   | W   |
| Efficiency           | $\eta$    | = | 80   | 80   | 75   | %   |
| Modulation factor    | m         | = | 100  | 100  | 100  | %   |
| Modulation power     | $W_{mod}$ | = | 128  | 96   | 64   | W   |

## RF CLASS C TELEGRAPHY, grounded grid

## LIMITING VALUES (Absolute limits)

| Frequency                                        | f        | up to  | 150  | MHz |
|--------------------------------------------------|----------|--------|------|-----|
| Anode voltage                                    | $V_a$    | = max. | 3000 | V   |
| Anode current                                    | $I_a$    | = max. | 205  | mA  |
| Anode dissipation                                | $W_a$    | = max. | 150  | W   |
| Anode input power                                | $W_{ia}$ | = max. | 512  | W   |
| Negative grid voltage                            | $-V_g$   | = max. | 300  | V   |
| Grid current                                     | $I_g$    | = max. | 45   | mA  |
| Grid circuit resistance with fixed grid bias     | $R_g$    | = max. | 0.1  | MΩ  |
| Grid circuit resistance with automatic grid bias | $R_g$    | = max. | 0.2  | MΩ  |

## OPERATING CONDITIONS, two tubes

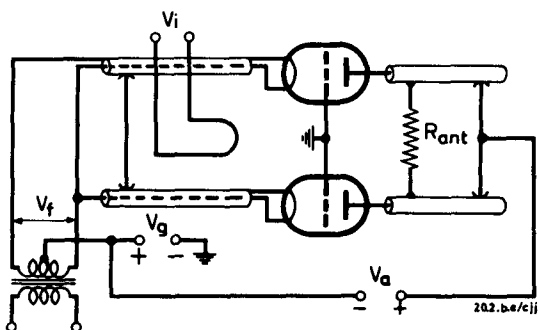


Fig. 2 Grounded grid configuration.

|                        |          |   |         |         |        |        |      |
|------------------------|----------|---|---------|---------|--------|--------|------|
| Frequency              | f        | = | 100     | 100     | 100    | 100    | MHz  |
| Anode voltage          | $V_a$    | = | 2500    | 2000    | 1500   | 1000   | V    |
| Grid voltage           | $V_g$    | = | -200    | -150    | -110   | -80    | V    |
| Anode current          | $I_a$    | = | 410     | 410     | 410    | 410    | mA   |
| Grid current           | $I_g$    | = | 80      | 80      | 80     | 80     | mA   |
| Peak grid A.C. voltage | $V_{gp}$ | = | 390     | 340     | 300    | 260    | V    |
| Grid input power       | $W_{ig}$ | = | 158     | 136     | 118    | 100    | W    |
| Anode input power      | $W_{ia}$ | = | 1025    | 820     | 615    | 410    | W    |
| Anode dissipation      | $W_a$    | = | 245     | 230     | 195    | 158    | W    |
| Output power           | $W_o$    | = | 780+130 | 590+110 | 420+96 | 252+80 | W 1) |
| Efficiency             | $\eta$   | = | 76      | 72      | 68     | 61.5   | % 2) |

1) Power transferred from driving stage included

2) Pure tube efficiency

**RF CLASS C OSCILLATOR** for high-frequency heating and diathermy generators, with anode voltage from single-phase full-wave rectifier without filter

**LIMITING VALUES** (Absolute limits)

| Frequency                                        | f        | up to  | 150  | MHz             |
|--------------------------------------------------|----------|--------|------|-----------------|
| Anode voltage                                    | $V_a$    | = max. | 2700 | V <sup>1)</sup> |
| Anode current                                    | $I_a$    | = max. | 180  | mA              |
| Anode dissipation                                | $W_a$    | = max. | 150  | W               |
| Anode input power                                | $W_{ia}$ | = max. | 512  | W               |
| Negative grid voltage                            | $-V_g$   | = max. | 300  | V               |
| Grid current                                     | $I_g$    | = max. | 40   | mA              |
| Grid circuit resistance with fixed grid bias     | $R_g$    | = max. | 0.1  | MΩ              |
| Grid circuit resistance with automatic grid bias | $R_g$    | = max. | 0.2  | MΩ              |

**OPERATING CONDITIONS**

|                   |          |   |      |                 |
|-------------------|----------|---|------|-----------------|
| Frequency         | f        | = | 50   | MHz             |
| Anode voltage     | $V_a$    | = | 2000 | V <sup>1)</sup> |
| Anode current     | $I_a$    | = | 170  | mA              |
| Grid current      | $I_g$    | = | 34   | mA              |
| Grid resistor     | $R_g$    | = | 3750 | Ω               |
| Anode input power | $W_{ia}$ | = | 420  | W               |
| Anode dissipation | $W_a$    | = | 120  | W               |
| Grid input power  | $W_{ig}$ | = | 10   | W               |
| Output power      | $W_o$    | = | 290  | W               |
| Efficiency        | $\eta$   | = | 69   | %               |

<sup>1)</sup> Mean value

**RF CLASS C OSCILLATOR** for industrial use with self-rectification. Phase shift of  $180^\circ$  between  $V_a$  and  $V_g$

**LIMITING VALUES** (Absolute limits)

| Frequency                                        | f        | up to  | 150  | MHz       |
|--------------------------------------------------|----------|--------|------|-----------|
| Anode voltage                                    | $V_a$    | = max. | 2825 | $V_{RMS}$ |
| Anode current                                    | $I_a$    | = max. | 110  | mA        |
| Anode dissipation                                | $W_a$    | = max. | 150  | W         |
| Anode input power                                | $W_{ia}$ | = max. | 340  | W         |
| Negative grid voltage                            | $-V_g$   | = max. | 300  | V         |
| Grid current                                     | $I_g$    | = max. | 35   | mA        |
| Grid circuit resistance with fixed grid bias     | $R_g$    | = max. | 0.1  | $M\Omega$ |
| Grid circuit resistance with automatic grid bias | $R_g$    | = max. | 0.2  | $M\Omega$ |

**OPERATING CONDITIONS**

|                   |          |   |      |           |
|-------------------|----------|---|------|-----------|
| Frequency         | f        | = | 50   | MHz       |
| Anode voltage     | $V_a$    | = | 2500 | $V_{RMS}$ |
| Anode current     | $I_a$    | = | 90   | mA        |
| Grid current      | $I_g$    | = | 20   | mA        |
| Grid resistor     | $R_g$    | = | 1700 | $\Omega$  |
| Grid voltage      | $V_g$    | = | 85   | $V_{RMS}$ |
| Anode input power | $W_{ia}$ | = | 255  | W         |
| Anode dissipation | $W_a$    | = | 85   | W         |
| Output power      | $W_o$    | = | 170  | W         |
| Efficiency        | $\eta$   | = | 67   | %         |

## AF CLASS B AMPLIFIER AND MODULATOR

## LIMITING VALUES (Absolute limits)

|                   |          |   |      |      |    |
|-------------------|----------|---|------|------|----|
| Anode voltage     | $V_a$    | = | max. | 3000 | V  |
| Anode current     | $I_a$    | = | max. | 210  | mA |
| Anode dissipation | $W_a$    | = | max. | 150  | W  |
| Anode input power | $W_{ia}$ | = | max. | 512  | W  |
| Grid current      | $I_g$    | = | max. | 45   | mA |

## OPERATING CONDITIONS, two tubes

|                           |              |   |               |               |            |
|---------------------------|--------------|---|---------------|---------------|------------|
| Anode voltage             | $V_a$        | = | 2500          | 1000          | V          |
| Grid voltage              | $V_g$        | = | -86           | -23           | V          |
| Load resistance           | $R_{aa\sim}$ | = | 18.2          | 5.0           | k $\Omega$ |
| Peak grid to grid voltage | $V_{ggp}$    | = | 0      412    | 0      295    | V          |
| Anode current             | $I_a$        | = | 2x30    2x178 | 2x30    2x210 | mA         |
| Grid current              | $I_g$        | = | 0      2x42   | 0      2x40   | mA         |
| Grid input power          | $W_{ig}$     | = | 0    2x7.8    | 0    2x5.4    | W          |
| Anode input power         | $W_{ia}$     | = | 2x75    2x445 | 2x30    2x210 | W          |
| Anode dissipation         | $W_a$        | = | 2x75    2x95  | 2x30    2x73  | W          |
| Output power              | $W_o$        | = | 0      700    | 0      274    | W          |
| Total harmonic distortion | $d_{tot}$    | = | -      5.0    | -      2.2    | %          |
| Efficiency                | $\eta$       | = | -      78.5   | -      65     | %          |

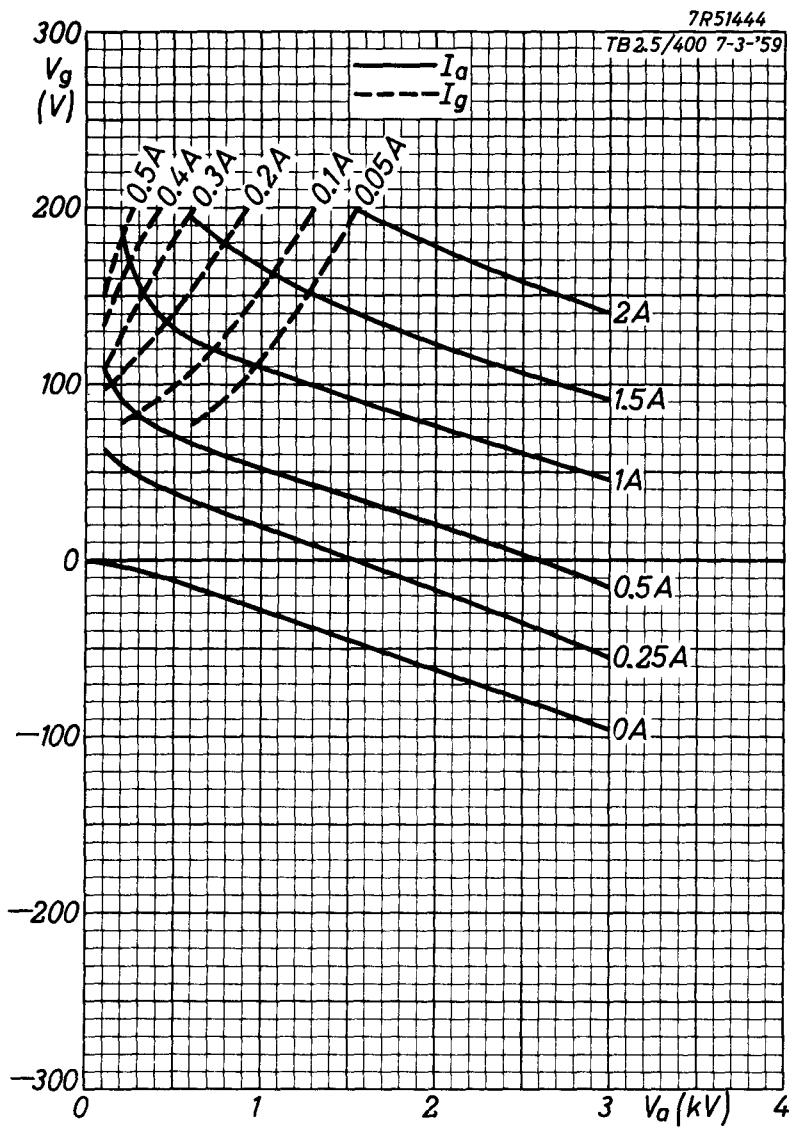
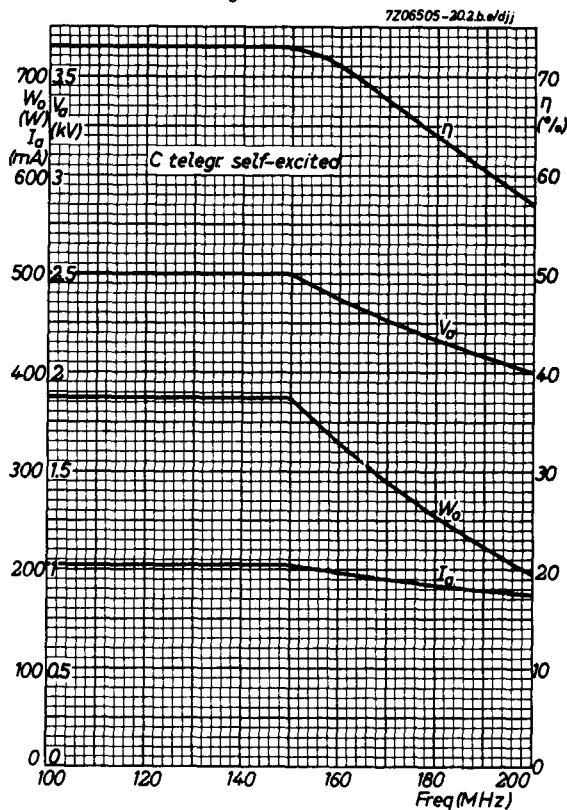
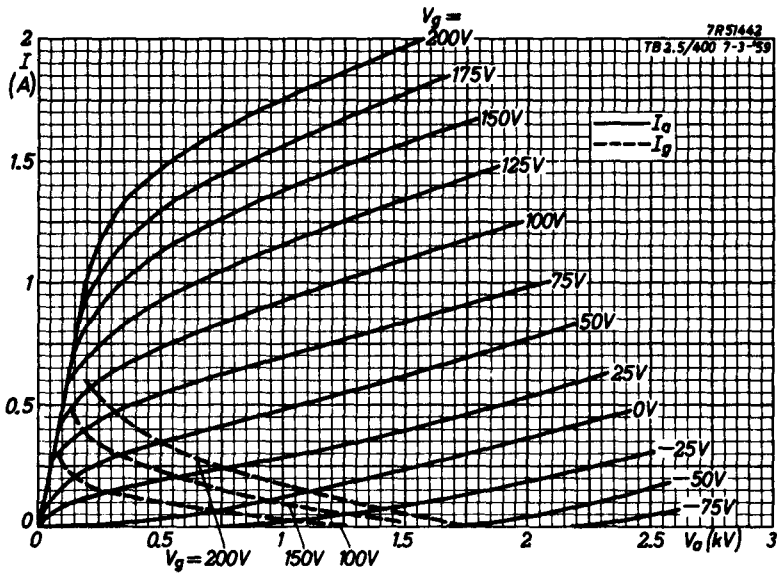


Fig. 3 Constant current characteristics.



# PHILIPS

## Data handbook



**Electronic  
components  
and materials**

**TB2.5/400**

| <b>page</b> | <b>sheet</b> | <b>date</b> |
|-------------|--------------|-------------|
| 1           | 37           | 1988.02     |
| 2           | 38           | 1988.02     |
| 3           | 39           | 1988.02     |
| 4           | 40           | 1988.02     |
| 5           | 41           | 1988.02     |
| 6           | 42           | 1988.02     |
| 7           | 43           | 1988.02     |
| 8           | 44           | 1988.02     |
| 9           | 45           | 1988.02     |
| 10          | 46           | 1988.02     |
| 11          | 47           | 1988.02     |
| 12          | FP           | 2000.09.14  |