# 무효전력계 (Varmeter)


## ■ 주요사양 ( Specification )

### ■ 1P 2W (단상 2선식)

| Type | Size (mm) | Scale Form | Input | | | Oper. Prin. | Accu. Class(%) | Burden | | Weight(g) | Dimension | Remarks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | V | A | Hz | | | Volt. | Curr. | | | Structure | Volt. | Curr. |
| SC – R1 | 80 × 80 | Square (각형) | 110V or 220V | 5A or 1A | 50/60 | | 1.5 | 0.5 | 0.5 | ≒ 680 | 280~281page 참조 | Ext.T/D | – | – |
| SB – R1 | 100 × 84 | | | | | | | | | ≒ 700 | | | | |
| SA – R1 | 120 × 100 | | | | | | | | | ≒ 750 | | | | |
| WB – R1 | 80 × 80 | Wide Angle (광각형) | | | | | | | | ≒ 800 | | | | |
| WA – R1 | 110 × 110 | | | | | | | | | ≒ 920 | | | | |
| WA – TR1 | | | | | | | | | | ≒ 740 | | Int.T/D | | |

※ 상기의 표준 전압 · 전류 이외의 제품은 고객의 요구에 따라 제작이 가능합니다.

### ■ 1P 3W (단상 3선식)

| Type | Size (mm) | Scale Form | Input | | | Oper. Prin. | Accu. Class(%) | Burden | | Weight(g) | Dimension | Remarks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | V | A | Hz | | | Volt. | Curr. | | | Structure | Volt. | Curr. |
| SC – R2 | 80 × 80 | Square (각형) | 110V | 5A or 1A | 50/60 | | 1.5 | 0.5 | 0.5 | ≒ 800 | 280~281page 참조 | Ext.T/D | – | – |
| SB – R2 | 100 × 84 | | | | | | | | | ≒ 800 | | | | |
| SA – R2 | 120 × 100 | | | | | | | | | ≒ 850 | | | | |
| WB – R2 | 80 × 80 | Wide Angle (광각형) | | | | | | | | ≒ 970 | | | | |
| WA – R2 | 110 × 110 | | | | | | | | | ≒ 1090 | | | | |
| WA – TR2 | | | | | | | | | | ≒ 800 | | Int.T/D | | |

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### ■ 3P 3W (3상 3선식)

| Type | Size (mm) | Scale Form | Input | | | Oper. Prin. | Accu. Class(%) | Burden | | Weight(g) | Dimension | Remarks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | V | A | Hz | | | Volt. | Curr. | | | Structure | Volt. | Curr. |
| SC – R3 | 80 × 80 | Square (각형) | 110V or 220V | 5A or 1A | 50/60 | | 1.5 | 0.5 | 0.5 | ≒ 850 | 280~281page 참조 | Ext.T/D | Un | Un |
| SB – R3 | 100 × 84 | | | | | | | | | ≒ 850 | | | | |
| SA – R3 | 120 × 100 | | | | | | | | | ≒ 900 | | | | |
| WB – R3 | 80 × 80 | Wide Angle (광각형) | | | | | | | | ≒ 970 | | | | |
| WA – R3 | 110 × 110 | | | | | | | | | ≒ 1090 | | | | |
| WA – TR3 | | | | | | | | | | ≒ 800 | | Int.T/D | | |

Un : Unbalance

※ 상기의 표준 전압 · 전류 이외의 제품은 고객의 요구에 따라 제작이 가능합니다.

## ■ 3P 4W (3상 4선식)

| Type | Size (mm) | Scale Form | Input | | | Oper. Prin. | Accu. Class(%) | Burden | | Weight(g) | Dimension | Remarks | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | V | A | Hz | | | Volt. | Curr. | | | Structure | Volt. | Curr. |
| SC – R4 | 80 × 80 | Square (각형) | 190/√3 or 380/√3 | 5A or 1A | 50 or 60 | | 1.5 | 0.5 | 0.5 | ≒ 850 | 280~281page 참조 | Ext.T/D | B | Un |
| SC – UR4 | | | | | | | | | | ≒ 900 | | | Un | |
| SB – R4 | 100 × 84 | | | | | | | | | ≒ 850 | | | B | |
| SB – UR4 | | | | | | | | | | ≒ 930 | | | Un | |
| SA – R4 | 120 × 100 | | | | | | | | | ≒ 900 | | | B | |
| SA – UR4 | | | | | | | | | | ≒ 900 | | | Un | |
| WB – R4 | 80 × 80 | Wide Angle (광각형) | | | | | | | | ≒ 970 | | | B | |
| WB – UR4 | | | | | | | | | | ≒ 1020 | | | Un | |
| WA – R4 | 110 × 110 | | | | | | | | | ≒ 1090 | | | B | |
| WA – UR4 | | | | | | | | | | ≒ 1170 | | | Un | |
| WA – TR4 | | | | | | | | | | ≒ 870 | | Int.T/D | B | |
| WA – UTR4 | | | | | | | | | | ≒ 890 | | | Un | |

B : Balance, Un : Unbalance

※ 상기의 표준 전압 · 전류 이외의 제품은 고객의 요구에 따라 제작이 가능합니다.

## ■ 주요특징 ( Overview )

본 계기는 무효전력을 측정하는 Transducer형 계기로 변환기(Transducer)를 계기 내부(Int.) 또는 외부(Ext.)에 부착하여 사용합니다.
동작전압의 범위는 정격전압의 ±15% 이내 입니다.
The types of operating principle of the meter is the transducer type, this meter measure reactive power.
var meter transducer is internal type and/or external type. Operating voltage range is ±15% of rated voltage.

정격을 초과하여 사용할 경우에는 AC 110V / 5A의 VT와 CT를 연결하여 사용하십시오.
Combine AC 110V VT and AC 5A CT in case of over rating value.

WA – TR □ type의 무효전력계는 Transducer box를 내장하고 있으며, □□ – R □ type의 무효전력계는 외부에 Transducer box를 연결하여 사용하십시오. 3상4선식 무효전력계의 정격전압은 상 전압으로 표시됩니다. ( /√3 V)
In case of the WA - TR □ type of var meters, transducer box is self-contained and the □ □ - R □ type of var meters are provided with on external transducer box. Rating voltage of 3P 4W is indicated the phase to earth voltage. ( / √3 V)

무효전력계의 최대눈금 계산 시는 전 부하용량의 1/2, 1/3, 1/4로 하는 것이 적합합니다. 단, 콘덴서 판넬의 무효전력 계측 시 무효전력계의 눈금은 전 부하용량(100%)으로 하여야 합니다.
The full scale of varmeter is generally 1/2, 1/3, or 1/4 of the load capacity. Only, scale of varmeter must mark full load capacity(100%) at measuring reactive power of condenser panel.

VT와 CT를 사용한 무효전력계의 교정 무효전력은

$$\text{교정 무효전력} = \frac{\text{최대눈금치}}{\text{VT비} \times \text{CT비}}$$

When using VT and CT calibrating vars will be as follows.

$$\text{Calibrating Vars} = \frac{\text{Full scale value}}{\text{VT Ratio} \times \text{CT Ratio}}$$

ex 1) 3P 3W

Full scale Varmeter : 600kVar
VT Ratio : 6600 / 110V
CT Ratio : 50 / 5A

$$\text{Calibration Vars} = \frac{600\text{kVar}}{(6600/110\text{V}) \times (50/5\text{A})} = 1.0\text{kVar}$$

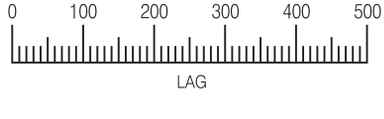
ex 2) 3P 4W

Full scale Varmeter : 2000kVar
VT Ratio : 22900/√3 / 190/√3 V
CT Ratio : 50 / 5A

$$\text{Calibration Vars} = \frac{2000\text{kVar}}{(22900/\sqrt{3}/190/\sqrt{3}\,\text{V}) \times (50/5\text{A})} = 1.666\text{kVar}$$

최대눈금 및 교정 무효전력은 Standard Full Scale vars Table을 참조하시기 바랍니다.
무효전력계를 역률계와 같이 사용할 시는 0점을 중앙에 두고 좌측에 LEAD, 우측에 LAG로 하는 것이 적합합니다.
Max. scale and calibration var refer to the Standard Full Scale vars Table.
The varmeter with" 0"point at center is recommended, if it is used instead of the power factor meter.

표준 LAG 눈금 예)




LEAD, LAG 눈금 예)

## ■ Varmeter 표준 최대 눈금표 ( Standard Full Scale Vars Table (standard : 1/2var) )

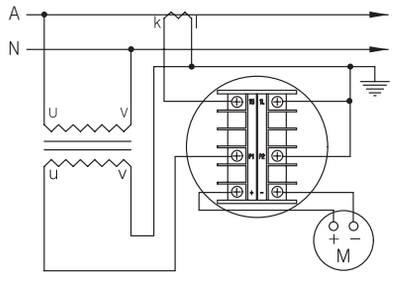
(Unit : kVar)

| Phase × Wire | 1×2 | 1×3 | 3×3 | | | | | | | | 3×4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| V.T ratio | 110 | 110 | 220 | 380/110 | 440/110 | 3300/110 | 6600/110 | 22000/110 | 22900/110 | 154kV/110 | 208/√3 | 380/√3 / 190/√3 | 380/√3 | 11400/√3 / 190/√3 | 22900/√3 / 190/√3 |
| Calibrating C.T ratio Vars | 0.3kVar | 0.5kVar | 1.0kVar | 0.579kVar | 0.5kVar | 0.5kVar | 0.5kVar | 0.5kVar | 0.480kVar | 0.5kVar | 1.0kVar | 1.0kVar | 2.0kVar | 0.833kVar | 0.833kVar |
| 5/5 | 0.3 | 0.5 | 1 | 2 | 2 | 15 | 30 | 100 | 100 | 700 | 1 | 2 | 2 | 50 | 100 |
| 10/5 | 0.6 | 1 | 2 | 4 | 4 | 30 | 60 | 200 | 200 | 1400 | 2 | 4 | 4 | 100 | 200 |
| 15/5 | 0.9 | 1.5 | 3 | 6 | 6 | 45 | 90 | 300 | 300 | 2100 | 3 | 6 | 6 | 150 | 300 |
| 20/5 | 1.2 | 2 | 4 | 8 | 8 | 60 | 120 | 400 | 400 | 2800 | 4 | 8 | 8 | 200 | 400 |
| 25/5 | 1.5 | 2.5 | 5 | 10 | 10 | 75 | 150 | 500 | 500 | 3500 | 5 | 10 | 10 | 250 | 500 |
| 30/5 | 1.8 | 3 | 6 | 12 | 12 | 90 | 180 | 600 | 600 | 4200 | 6 | 12 | 12 | 300 | 600 |
| 40/5 | 2.4 | 4 | 8 | 16 | 16 | 120 | 240 | 800 | 800 | 5600 | 8 | 16 | 16 | 400 | 800 |
| 50/5 | 3.0 | 5 | 10 | 20 | 20 | 150 | 300 | 1000 | 1000 | 7000 | 10 | 20 | 20 | 500 | 1000 |
| 60/5 | 3.6 | 6 | 12 | 24 | 24 | 180 | 360 | 1200 | 1200 | 8400 | 12 | 24 | 24 | 600 | 1200 |
| 75/5 | 4.5 | 7.5 | 15 | 30 | 30 | 225 | 450 | 1500 | 1500 | 10.5Mvar | 15 | 30 | 30 | 750 | 1500 |
| 80/5 | 4.8 | 8 | 16 | 32 | 32 | 240 | 480 | 1600 | 1600 | 11.2 | 16 | 32 | 32 | 800 | 1600 |
| 100/5 | 6.0 | 10 | 20 | 40 | 40 | 300 | 600 | 2000 | 2000 | 14.0 | 20 | 40 | 40 | 1000 | 2000 |
| 120/5 | 7.2 | 12 | 24 | 48 | 48 | 360 | 720 | 2400 | 2400 | 16.8 | 24 | 48 | 48 | 1200 | 2400 |
| 150/5 | 9.0 | 15 | 30 | 60 | 60 | 450 | 900 | 3000 | 3000 | 21.0 | 30 | 60 | 60 | 1500 | 3000 |
| 200/5 | 12.0 | 20 | 40 | 80 | 80 | 600 | 1200 | 4000 | 4000 | 28.0 | 40 | 80 | 80 | 2000 | 4000 |
| 250/5 | 15.0 | 25 | 50 | 100 | 100 | 750 | 1500 | 5000 | 5000 | 35.0 | 50 | 100 | 100 | 2500 | 5000 |
| 300/5 | 18.0 | 30 | 60 | 120 | 120 | 900 | 1800 | 6000 | 6000 | 42.0 | 60 | 120 | 120 | 3000 | 6000 |
| 400/5 | 24.0 | 40 | 80 | 160 | 160 | 1200 | 2400 | 8000 | 8000 | 56.0 | 80 | 160 | 160 | 4000 | 8000 |
| 500/5 | 30.0 | 50 | 100 | 200 | 200 | 1500 | 3000 | 10Mvar | 10Mvar | 70.0 | 100 | 200 | 200 | 5000 | 10Mvar |
| 600/5 | 36.0 | 60 | 120 | 240 | 240 | `1800 | 3600 | 12 | 12 | 84.0 | 120 | 240 | 240 | 6000 | 12 |
| 750/5 | 45.0 | 75 | 150 | 300 | 300 | 2250 | 4500 | 15 | 15 | 105 | 150 | 300 | 300 | 7500 | 15 |
| 800/5 | 48.0 | 80 | 160 | 320 | 320 | 2400 | 4800 | 16 | 16 | 112 | 160 | 320 | 320 | 8000 | 16 |
| 1000/5 | 60.0 | 100 | 200 | 400 | 400 | 3000 | 6000 | 20 | 20 | 140 | 200 | 400 | 400 | 10Mvar | 20 |
| 1200/5 | 72.0 | 120 | 240 | 480 | 480 | 3600 | 7200 | 24 | 24 | 168 | 240 | 480 | 480 | 12 | 24 |
| 1500/5 | 90.0 | 150 | 300 | 600 | 600 | 4500 | 9000 | 30 | 30 | 210 | 300 | 600 | 600 | 15 | 30 |
| 2000/5 | 120.0 | 200 | 400 | 800 | 800 | 6000 | 12Mvar | 40 | 40 | 280 | 400 | 800 | 800 | 20 | 40 |
| 2500/5 | 150.0 | 250 | 500 | 1000 | 1000 | 7500 | 15 | 50 | 50 | 350 | 500 | 1000 | 1000 | 25 | 50 |
| OPTION : Full Scale Calibrating Vars | | | | | | | | | | | | | | | |
| 1/4 Calibrating Var | 0.15 | 0.25 | 0.5 | 0.290 | 0.25 | 0.25 | 0.25 | 0.25 | 0.24 | 0.25 | 0.5 | 0.5 | 1.0 | 0.416 | 0.416 |
| 1/3 Calibrating Var | 0.2 | 0.333 | 0.667 | 0.386 | 0.667 | 0.667 | 0.667 | 0.667 | 0.32 | 0.667 | 0.667 | 0.667 | 1.333 | 0.555 | 0.555 |
| 1 Calibrating Var | 0.6 | 1.0 | 2.0 | 1.158 | 1.0 | 1.0 | 1.0 | 1.0 | 0.961 | 1.0 | 2.0 | 2.0 | 4.0 | 1.666 | 1.666 |

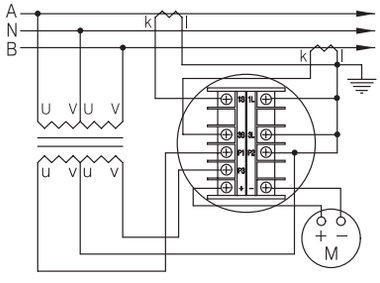
※ CT의 2차 전류가 1A일 경우에는 상기 Calibrating Vars값의 1/5값입니다.

## ■ 외부결선 ( External Connection )

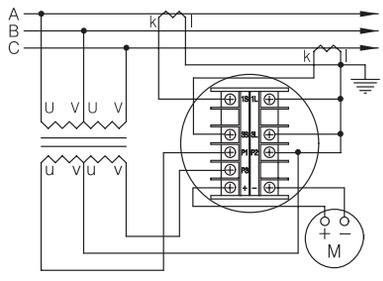
### ▣ Ext. T/D Type



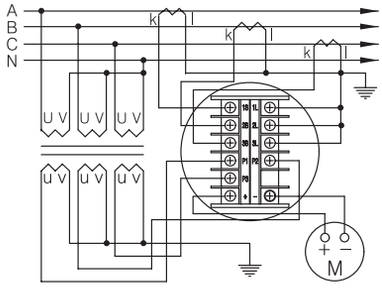

1P 2W



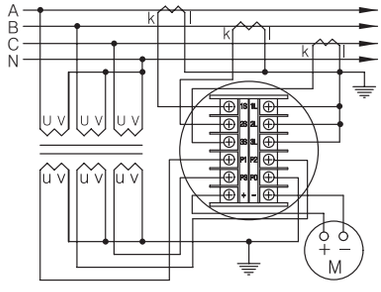

1P 3W



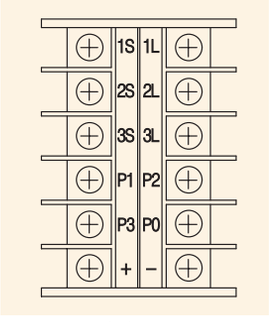

3P 3W




3P 4W Balance

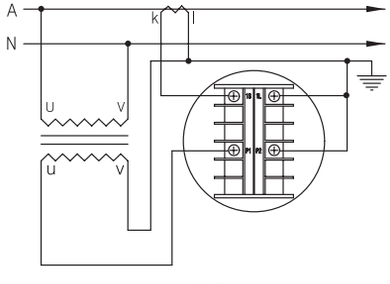



3P 4W Unbalance

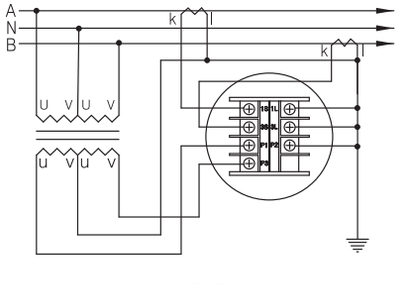



단자구조도

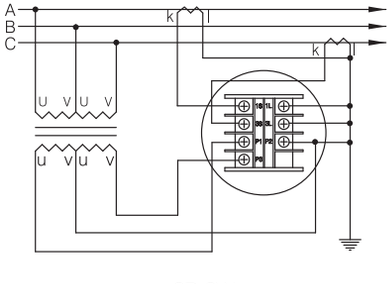
### ▣ Int. T/D Type



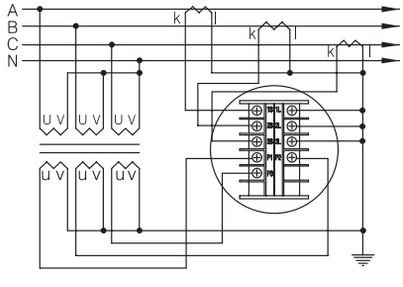

1P 2W



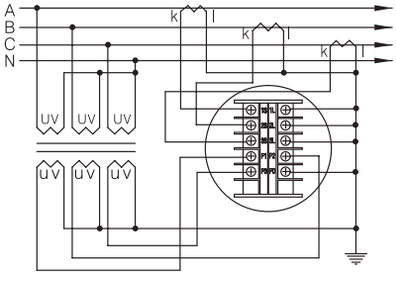

1P 3W



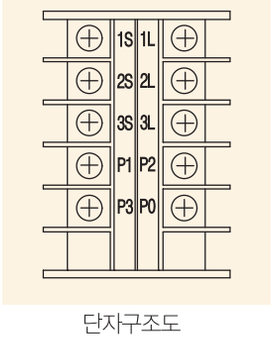

3P 3W




3P 4W Balance




3P 4W Unbalance

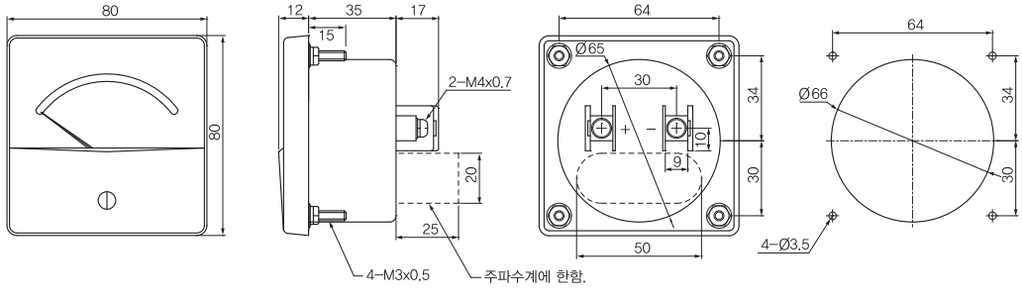



단자구조도

## ■ 외형치수 ( Dimension )

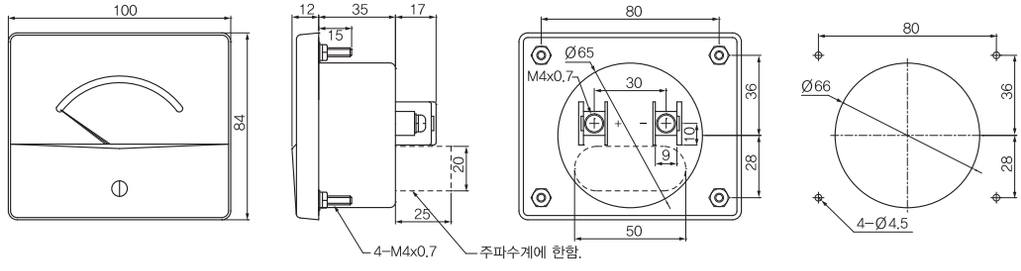
### ▣ SC Type

Unit : mm



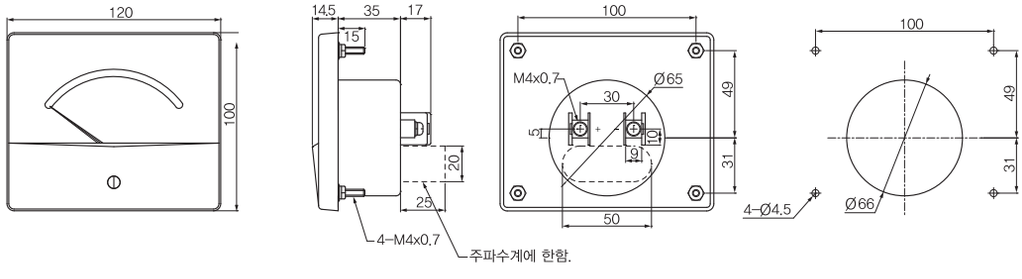

주) 점선부분은 주파수계에 한함

### ▣ SB Type



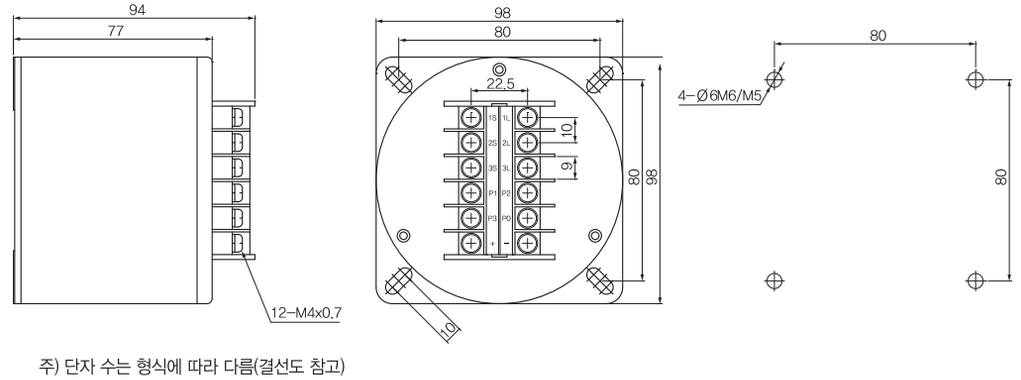

주) 점선부분은 주파수계에 한함

### ▣ SA Type



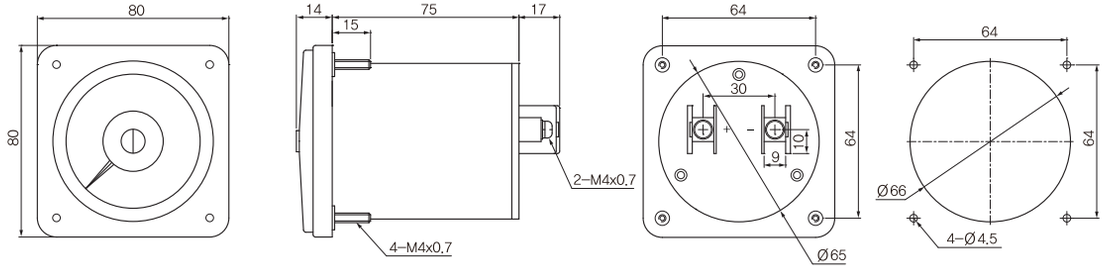

주) 점선부분은 주파수계에 한함

### ▣ EXTERNAL TRANSDUCER(For meter)

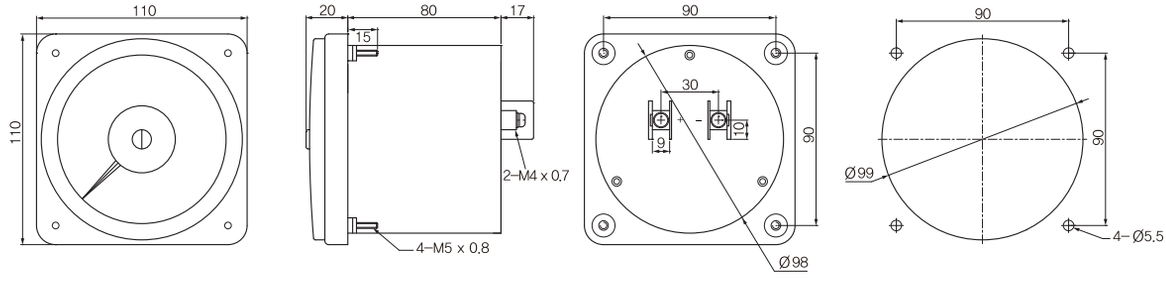



주) 단자 수는 형식에 따라 다름(결선도 참고)

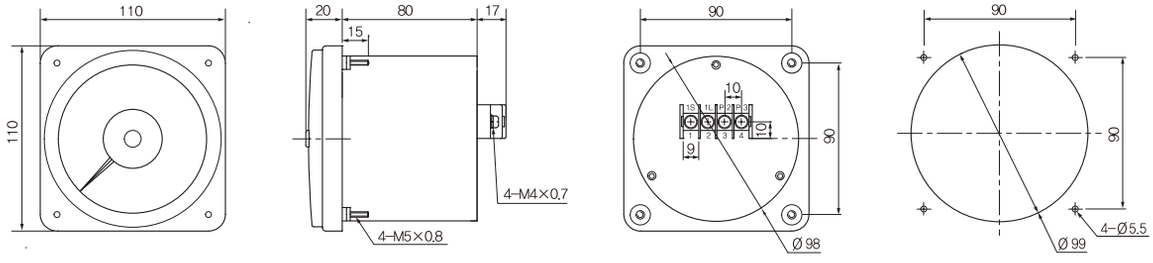
## ▣ WB Type(WB – A1, A2, V1, V2, H1)



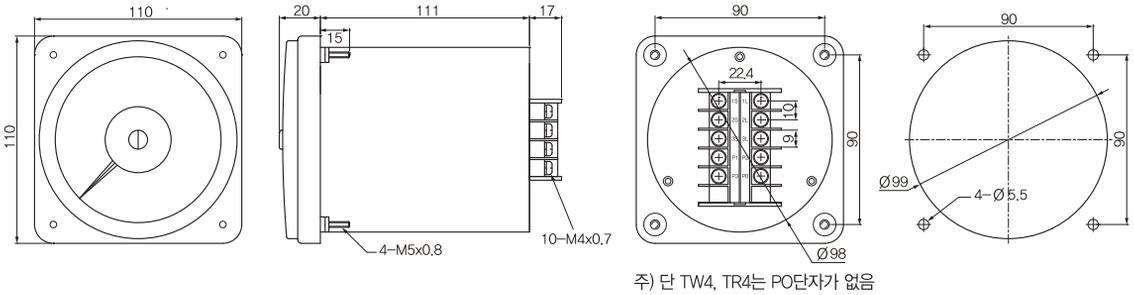

## ▣ WA Type




## ▣ WA – TP Type




## ▣ WA – TW4, TR4, UTW4, UTR4, UTP4, TP1, TW1 Type




주) 단 TW4, TR4는 PO단자가 없음

## ▣ WA – TW2, TR2, TP2, TW3, TR3, UTP3 Type