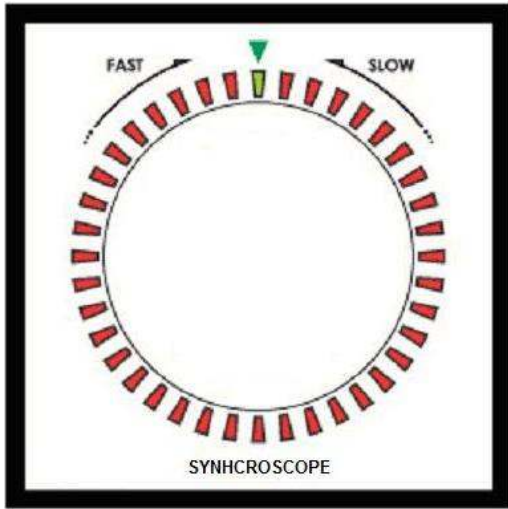


PDS-01A Synchroscope

- Phase angle indication on 40 LEDs



적용

이 제품은 마이크로프로세서기반의 싱크로스코프입니다. 2개의 교류전원 측, 발전기와 부스, 발전기와 발전기, 변압기와 변압기 등을 비교하여 위상차와 주파수 차이를 시각적으로 볼 수 있도록 합니다.

사용자가 수동으로 동기상태를 확인해야 할 필요가 있는 모든 영역에 설치해서 사용할 수 있으며, 발전기 병렬제어 판넬에 주로 사용됩니다.

계측

2개 입력신호의 주파수를 계측하고 위상각을 비교합니다.

기능

두 입력신호의 위상각차의 변화에 따라 LED가 지시됩니다.

위상각차이가 $\pm 4.5^\circ$ 이내이면 12시위치의 LED가 켜집니다.

40개의 고품질 LED가 원형으로 배치되어 있으며 각 LED의 간격은 위상각 9° 입니다.

이 LED들은 BUS와 GENERATOR 두 입력전압이 모두 제품 정격전압의 $\pm 70\%$ 이내이면서 두 주파수차이가 3Hz 이내인 조건에서만 켜집니다.

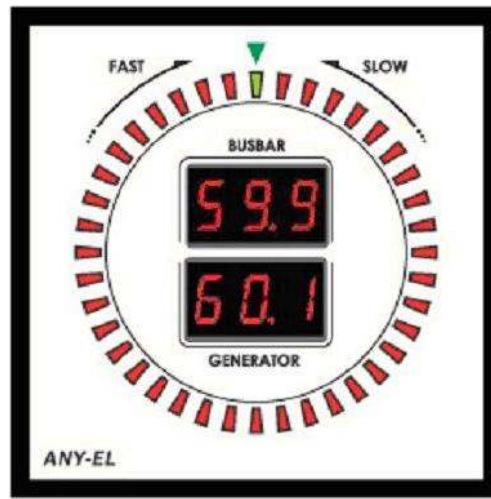
주파수지시용 Seven Segment가 내장된 제품은 다음과 같은 특성이 있습니다..

위쪽은 BUSBAR의 주파수를 보여주며, BUS측에 전원이 없거나 너무 낮으면 nnn라는 글씨가 나타납니다.

아래쪽은 GENERATOR의 주파수를 보여주며, GENERATOR측에 전원이 없거나 너무 낮으면 uuu라는 글씨를 보여줍니다.

이 seven segment 는 입력전압이 제품 정격전압의 $\pm 70\%$ 이내이면서 주파수차이가 3Hz이내인 조건에서만 켜집니다.

- Double digital frequency display



Application

The PDS is a microprocessor-based synchroscope. It provide illuminated indication of phase difference and frequency difference for two separate AC power sources , a generator to a common bus or a generator to a generator, a transformer to a transformer.

It can be used in any kind of installation where manual checking a synchro status is required, normally used as a reference to close a circuit breaker in generator synchro control panel.

Measuring

It measures frequency of two sources and compare the phase angle.

Function

Each LED is lighting as per phase angle variation.

The LED located at 12oclock is ligting if a phase angle is in $\pm 4.5^\circ$.

40 high quality LED are located as like circle shape and indicate phase angle with 9° resolution.

LED indication is available on the condition that both BUS and Generator voltage are within $\pm 70\%$ of rated voltage and the frequency difference is less than 3HZ.

Seven Segement built-in type for frequency indication Is like followings.

Upper one is to display the frequency of the common busbar. nnn is displayed if there is no voltage on terminal or the voltage is too low.

Lower one is to display the frequency of the generator. uuu is displayed if there is no voltage on terminal or the voltage is too low.

Seven segment indication is available on the condition that the input voltage is $\pm 70\%$ of rated voltage and the frequency difference is less than 5HZ.

PDS-01A Synchroscope

발전기 동기제어 적용

LED가 켜지는 진행방향이 시계방향이라면 발전기주파수가 부스주파수보다 더 높은 것이므로 발전기 엔진 속도를 낮출 필요가 있습니다.

시계반대방향이라면 엔진속도를 올릴 필요가 있습니다.

이상시 요령

Q. auto synchronizer와 함께 사용할 때, auto synchronizer의 차단기투입신호가 6시방향에서 발생한 경우

A. 단자 1-2 에 연결된 위상과 단자 3-4 에 연결된 위상이 서로 반대인 경우이므로 결선을 확인하십시오.

Q. auto synchronizer와 함께 사용할 때, auto synchronizer의 차단기투입신호가 4시 또는 8시방향에서 발생한 경우

A. 단자 1 의 위상이 단자 3 과 다르거나, 단자 2 의 위상이 단자 4 와 다른 경우이므로 결선을 확인하십시오..

결선

위쪽 BUSBAR메타에 지시된 입력을 단자 1 - 2에 연결하십시오.

아래쪽 발전기메타에 지시된 입력을 단자 3 - 4에 연결하십시오.

단자 1 과 3 은 같은 상이어야 하며, 단자 2 와 4 도 같은 상이어야 합니다.

Technical specifications

Frequency Accuracy	0.03Hz
Phase Resolution	0.1 deg.
Display Resolution	9.0deg/div.
Max. freq. Difference	No limit
Frequency range	40...70Hz (supply)
Temperature	-25...70°C (operating)
Galvanic separation	2200V - 50Hz - 1 min. between inputs
Input range (Un)	110V AC +/- 20%
Consumption	2 x 3.0VA at nominal voltage
Supply for the unit	Max 1.2 x UN, continuously Max 2 x UN, for 10 sec.
EMC	To EN 50081-1/2EN 50082-1/2,SS4361503 (PL4) and IEC 255-3
Safety	To EN 61010-1. Installation cat. III, 300V. Pollution degree 2
Connections	Max. 2.5 mm ² (single-stranded) Max. 1.5 mm ² (multi-stranded)
Materials	All plastic parts are self-extinguishing
Protection	Terminals: IP20 to IEC 529 and EN 60529
Weight	Approx 0.7 kg
Dimensions	96 x 96 x 80mm (H x W x D)
Panel cut out	92 x 92mm (H x W)

The specifications are subject to change without notice.

Generator Synchronizing

If the vector and the light spot turn clockwise, the generator frequency is high and need to be reduced.

If the light spot turn anti clockwise, Lower generator frequency is to be reduced.

Trouble Shooting

Q. On operation with auto-synchronizer, if the circuit breaker closing signal is activated on 6 o'clock position.

A. phase on terminal 1-2 are reverse to the phase on terminal 3-4. Correct wiring..

Q. On operation with auto-synchronizer, if the circuit breaker closing signal is activated on 4 o'clock position or 8 o'clock position

A. The phase on terminal 1 is different from terminal 3 . Or, The phase on terminal 2 is different from terminal 4. Correct wiring.

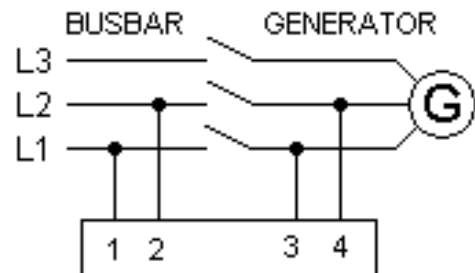
Wiring

The source indicated on upper BUSBAR meter is to be connected to terminal 1 and 2.

The source indicated on lower GENERATOR meter is to be connected to terminal 3 and 4.

The phase on terminal 1 and terminal 3 shall be same.
The phase on terminal 1 and terminal 3 shall be same.

Wiring

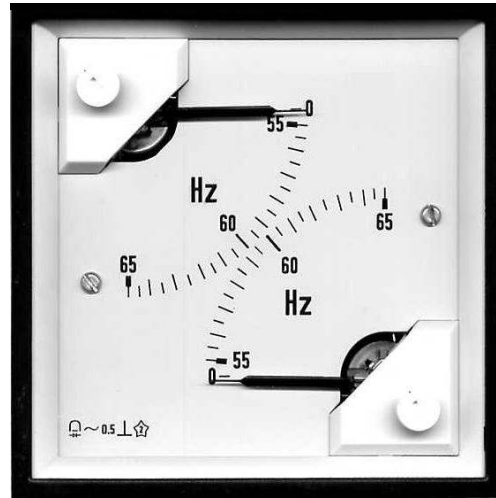


FM96 Two in one Frequency meter

(moving coil movement)

FM96 Two in One Pointer type Frequencymeter

Moving coil movement



Application

The pointer type frequency meters FM96 housed in moulded polycarbonate cases are suitable for the measurement of frequencies in the range of 45 to 450 Hz.

For maximum accuracy, the essential measuring range is obtained by suppressing the unwanted frequency span.

These instruments offer several advantages in switchboards and Generating Set Panels. Number of meters can be mounted in a single Cut out (Mosaic mounting). Front glass, Bezel & Dial can be easily replaced.

Functional Principle

Frequencies are measured with a built in electronic transducer & moving coil indicator. Moving coil movement has pivots of very high hardness. Movement is suspended between spring loaded sapphire jewels. Movement is properly shielded & critically damped by eddy currents induced in coil former.

Mechanical Data

Case details	Moulded square case suitable for mounting in control / switchgear panels, machinery consoles.
Case material	Glass filled polycarbonate, Flame retardant and drip proof as per UL 94 V-O.
Front fascia	Glass
Colour of bezel	Black
Position of use	Vertical
Panel fixing	Metal clamps with M4 screw
Mounting	Stackable in a single cutout
Panel thickness	< 40 mm

Terminals

Voltmeters and Ammeters < 30A	Hexagon studs, M4 screws and wire clamps E3 (DIN 46282)
Ammeters > 30A	Threaded studs M6 with nuts
Ammeters > 60A	Threaded studs M8 with nuts

Electrical Data

Measured quantity	Frequency
Input quantity	Alternating voltage in sinewaveform
Power consumption	7.0VA
Overload capacity	(acc. to IS : 1248 / IEC 51)
Continuously	1.2 times rated voltage / current
Short duration	2 times the rated voltage
Enclosures code	IP 52 case
	IP 00 for terminals without back cover
	IP 20 for terminals with back cover
	Group A according to VDE 0410
Insulation class	660 V
Rated insulating voltage	660 V
Proof Voltage Testing	2 kV
Installation category	600 V CAT III (IEC 1010)
Insulation resistance	> 50 Mohm at 500 V d.c.

Standard Measuring Ranges

Frequency range	45.....50.....55 Hz
	48.....50.....52 Hz
	45.....55.....65 Hz
	55.....60.....65 Hz
	58.....60.....62 Hz
	180...200...220 Hz
	360...400...440 Hz
	380...400...420 Hz
Rated input voltage	57.7 V
	63.5V
	100 V
	110 V
	115 V
	120 V
	127V
	208 V
	220 V
	230 V
	240 V
	289 V
	380 V
	400 V
	415 V
	440 V
	500 V

FM96 Two in one Frequency meter

(moving coil movement)

Scale and pointer

Pointer	Knife-edge pointer
Pointer deflection	0 ... 900
Scale characteristics	linear
Scale division	Coarse fine
Scale length	54 mm

Options

Case	
Front facia	Antiglare glass
Colour of bezel	Red, Yellow, Blue, White
Position of use	On request 15degree ... 165 degree
Dial	
Blank dial	With initial and end values marked
Special marking	Numbering / Lettering
Division dials	Basic divisions without numbering
Colour marking/bands	Red, Green, Yellow
Over range (Ammeters)	No over range or 6 times over range over nominal current

Accuracy at Reference Conditions

Accuracy class	0.5 according to IS : 1248 (IEC 51 / DIN EN 60051)
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Reference conditions

Ambient temperature	23 C +/- 2 degree
Position of use	Nominal position +/- 1 degree
Input	Rated value of measured quantity
Other conditions	1248 (IEC 51 / DIN EN 60051)
Preheating time	>= 5 minute

Nominal range of use

Ambient temperature	0 ... 50 C
Position of use	nominal position +/- 5 degree
Voltage	rated voltage +/- 20%
External magnetic field	0.5 MT

Environmental conditions

Climatic suitability	Climatic category II as per IS 1248 Climatic class 3 according to VDE/VDI 3540
Temperature range	-10 ... + 55 C operating -25 ... + 65 C storage
Relative humidity	< 75% annual average, non-condensing
Shock resistance	15g, 11 ms
Vibration resistance	10-150-10 HZ/0.15mm 1.5 g at about 50 Hz.

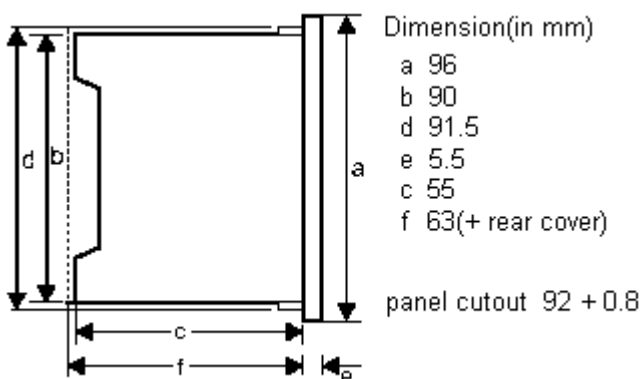
Precautions

- Instruments with damaged bezels or window glasses must be disconnected from the mains.
- Adequate safety clearance must be maintained to control panel fasteners and to sheet metal housing, if non-insulated connector wires are used.
- The back cover must be snapped into place after the connector wires have been clamped for protection against accidental contact.
- Bezels and window glasses may only be replaced under voltagefree conditions.

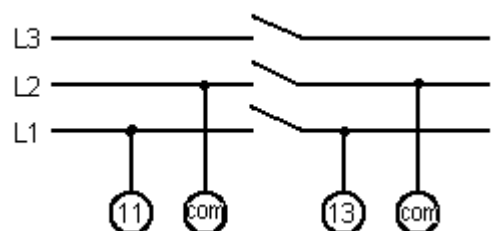
Applicable standards

Nominal case & cutout dimensions for Indicating electrical instruments	IS 2419 DIN 43700
Scale and pointer for electrical measuring instruments	IS 1248 DIN 43802
Connections and terminal marking for Panel meters	IS 1248-1983 DIN 43807
Terminal bolts / leads	DIN 46200/ DIN 46282
Safety requirement and protective measures for electrical indicating instruments and their accessories	IS 9249-1979 DIN 40050/8-70 VDE 0110 / 11-72 VDE 0410 / 10-76 IEC 529, IEC 1010
Performance specifications for direct acting indicating analogue electrical measuring instruments and their accessories	IS 1248-1983 IEC 51/ DIN EN 60051 DIN 43701
Environmental conditions	IS 1248-1983 IS:9000, Part 5,7,8, VDE/VDI 3540 DIN 43718
Front frame for indicating measuring instruments, principle dimensions	DIN 43718
UL Combustibility class	UL 94 V-O

Dimension



Wiring

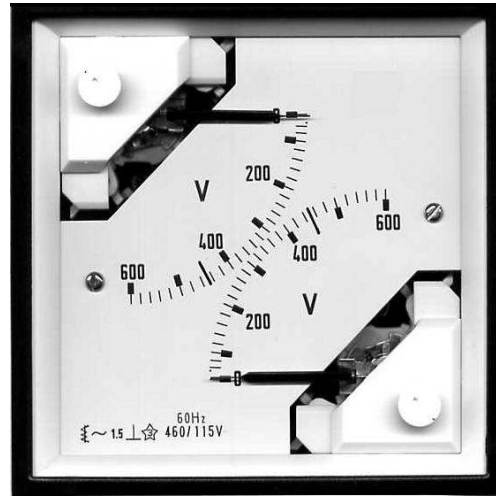


EQ96 Two in one Voltmeter

(moving iron movement)

EQ96 Two in One Analog Voltmeter

Moving iron movement



Application

The moving-iron panel meters 2-in-1 EQ housed in moulded polycarbonate cases are suitable for the measurement of AC currents and voltages in the usual frequency range of 15 ... 100 Hz. Moving-iron meters indicate rms-values practically independent of wave form even of high harmonic. Error of indication may occur for extreme wave forms (e.g. phase gating controls) and for frequencies above 100 kHz.

These meters offer several advantages in switchboard and generating set panels. Number of meters can be mounted in a single cut out (mosaic mounting). Front window glass and Bezel can be easily replaced.

Movement

Moving-iron movement has pivots of very high hardness. Movement is suspended between spring loaded sapphire jewels. Movement is critically damped by use of silicon oil.

Mechanical Data

Case details	Moulded square case suitable for mounting in control / switchgear panels, machinery consoles.
Case material	Glass filled polycarbonate, Flame retardant and drip proof as per UL 94 V-O.
Front fascia	Glass
Colour of bezel	Black
Position of use	Vertical
Panel fixing	Metal clamps with M4 screw
Mounting	Stackable in a single cutout
Panel thickness	< 40 mm

Terminals

Voltmeters and Ammeters < 30A	Hexagon studs, M4 screws and wire clamps E3 (DIN 46282)
Ammeters > 30A	Threaded studs M6 with nuts
Ammeters > 60A	Threaded studs M8 with nuts

Electrical Data

Measured quantity	AC voltage or current
Power consumption	
Voltmeters	< 4.5 VA
Ammeters < 15 A	< 0.5 VA
Ammeters > 15 A	< 0.8 VA
Overload capacity	(acc. to IS : 1248 / IEC 51)
Continuously	1.2 times rated voltage / current
Short duration	2 times the rated voltage
Voltmeters	Max 1000 V upto max 5 seconds
Ammeters	2-in-1 EQ
5 s max	10times
1 s max	40 times (250A max.)
Enclosures code	IP 52 case
	IP 00 for terminals without back cover
	IP 20 for terminals with back cover
Insulation class	Group A according to VDE 0410
Rated insulating voltage	1000 V
Proof Voltage Testing	3 kV
Installation category	600 V CAT III (IEC 1010)
Insulation resistance	> 50 Mohm at 500 V d.c.

Standard Measuring Ranges

AC Voltage	AC current
6 V	100 mA
10 V	150 mA
15 V	250 mA
25 V	400 mA
40 V	600 mA
60 V	1 A
100 V	1.5 A
120 V	2.5 A
132 V	3 A
150 V	4 A
200 V	5 A
250 V	6 A
300 V	10 A
400 V	15 A
500 V	20 A
600 V	25 A
	30 A
	40 A
	50 A
	60 A
	100 A
For use on voltage transformer	
.../ 100 V secondary	
.../ 110 V secondary	
	For use on current transformer
	.../ 1A secondary or .../ 5A secondary

EQ96 Two in one Voltmeter

(moving iron movement)

Scale and pointer

Pointer	Knife-edge pointer
Pointer deflection	0 ... 90 degree
Scale characteristics	Near-linear
	Above 10% of nominal full-scale value
Scale division	Coarse-fine
Scale length	54 mm
Over range	
Ammeters	2 times nominal current
Voltsmeters	1.2 times nominal voltage

Options

Case	
Front facia	Antiglare glass
Colour of bezel	Red, Yellow, Blue, White
Position of use	On request 15degree ... 165 degree
Dial	
Blank dial	With initial and end values marked
Special marking	Numbering / Lettering
Division dials	Basic divisions without numbering
Colour marking/bands	Red, Green, Yellow
Over range	No over range or 6 times over range

Accuracy at Reference Conditions

Accuracy class	1.5 according to IS : 1248 (IEC 51 / DIN EN 60051)
Reference conditions	
Ambient temperature	23 C + 2 degree
Position of use	Nominal position + 10 degree
Input	Rated value of measured quantity
Wave form	Sine wave, distortion factor < 5%
frequency	45 ... 65 Hz
Other conditions	IS : 1248 (IEC 51 / DIN EN 60051)

Nominal range of use

	0 ... 50 C
Ambient temperature	Vertical +/- 5 degree
Position of use	15 ... 100 Hz (voltage)
Frequency	15 ... 400 Hz (current)
External magnetic field	At 0.4 kA/m, less than 6% of fiducial value (not as a percentage class index)

Environmental conditions

Climatic suitability	Climatic category II as per IS 1248
Operating	Climatic class 3 according to VDE/VDI 3540
Temperature range	-10 ... + 55 C operating -25 ... + 65 C storage
Relative humidity	< 75% annual average, non-condensing
Shock resistance	15g, 11 ms
Vibration resistance	1.5 g at about 50 Hz.

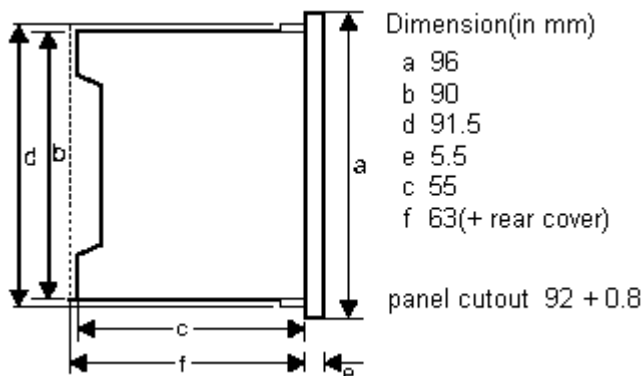
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- The back cover must be snapped into place after the connector wires have been clamped for protection against accidental contact.
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Applicable standards

Nominal case & cutout dimensions for	IS 2419
Indicating electrical instruments	DIN 43700
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Terminal bolts / leads	DIN 46200/ DIN 46282
Safety requirement and protective measures for electrical indicating instruments and their accessories	IS 9249-1979 DIN 40050/8-70 VDE 0110 / 11-72 VDE 0410 / 10-76 IEC 529, IEC 1010
Performance specifications for direct acting indicating analogue electrical measuring instruments and their accessories	IS 1248-1983 IEC 51/ DIN EN 60051 DIN 43701
Environmental conditions	IS 1248-1983 IS:9000, Part 5,7,8, VDE/VDI 3540 DIN 43718
Front frame for indicating measuring instruments, principle dimensions	
UL Combustibility class	UL 94 V-O

Dimension



Wiring

