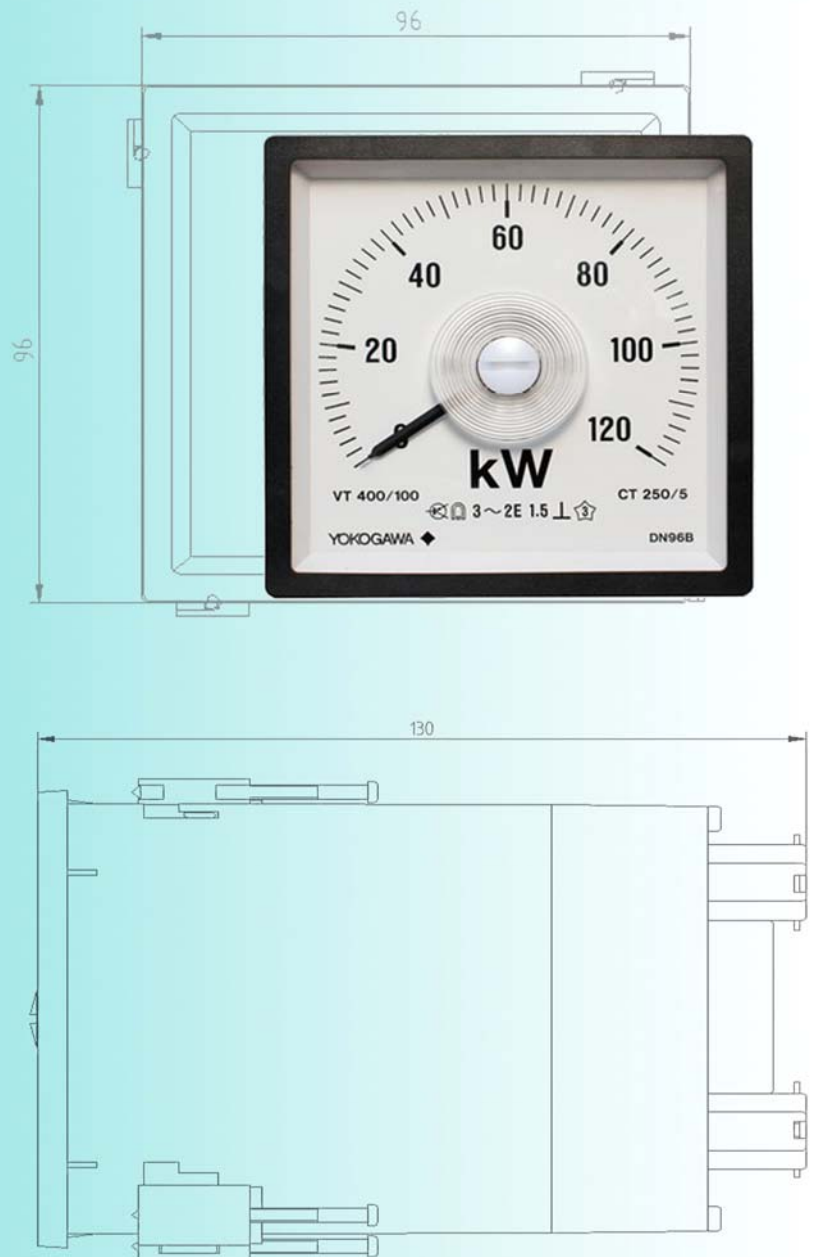


DIN WIDE-SCALE METER SERIES

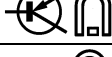
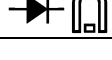
DN96B SERIES



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Meter Product Line-up

Model					Accuracy	Page	
 							
Name			Suspension type	Operating principle	Symbol		
DC	Ammeters		Taut band	Moving coil type		1.5	9
	Voltmeters						11
	Suppressed meters						12
AC	Ammeters			RMS rectifier type		1.5	13
				Mean rectifier type			16
	Voltmeters			RMS rectifier type		1.5	15
				Mean rectifier type			17
Wattmeters	1P2W			Feedback time division multiplier type		1.5	18
	1P3W						
	3P3W	Unbal.					
	3P4W	Bal. Unbal.					
Varmeters	1P2W			Phase detection type		1.5	21
	3P3W	Bal. Unbal.					
		3P4W					
	Power Factor Meters						
3P3W		Bal. Unbal.					
		3P4W		Unbal.			
Frequency Meters				Differential type		0.5 1.0	26
Synchroscope	No Relay Output	1P2W	-----	Cross coil, moving magnets type		2.5	28
		3P3W					
	Relay Output	1P2W	-----				
		3P3W					

Usage Precautions

Safety instructions for DIN wide-scale meters



Warning

Usage precautions must be read to ensure the safety of users and the equipment.

1. Usage environment & conditions

Do not use YOKOGAWA DIN wide-scale meters under the condition such as the following:

- ① The ambient temperature is out of the range of 0 to 55°C.
- ② Relative humidity is out of the range of 25 to 85%.
- ③ A great deal of vibrations or shock.
- ④ Exposed to rain, dew formation, or direct sunlight.
- ⑤ Exposed to large amounts of dust, salt, soot or corrosive gases. (Sulfurous acid gas, ammonia gas, hydrogen sulfide gas or other gases that corrode metals of plastics)
- ⑥ Impact of strong external noise or electromagnetic waves.
- ⑦ Large amounts of static electricity.
- ⑧ Large amounts of high frequencies and waveform distortion which from inverters and the thyristor loop.

2. Mounting method

Set up adhere to safety rules

- ① Check the appearance of the packing box and DIN wide-scale meters to confirm that there is no damage.
- ② Please use metal switchboard and connect it to the ground.

3. Wiring

Adhere to the following rules when connecting the wires:

- ① Make sure none of the wires are live when connect meters with accessories.
- ② The connector terminals on the wires should be appropriate for the electricity load and terminal size.
- ③ Connect the wires properly based on the connection diagrams or product labels.
- ④ Attach to terminal cover for safety.
- ⑤ Choose proper tool for terminal screws. Fasten terminal screws to the proper torque according to the size.

Recommended tightening torque:

M3 screws – 0.6N • m

M4 screws – 1.2N • m

- ⑥ Meters combined with current transformers (CT) should be properly connected to the secondary side of the CT. Otherwise it may result in the fault of CT and meters, components burned, or a fire. When the secondary side of a CT is disconnected, especially while the primary side is powered, the secondary side terminal will carry a high voltage which could result in electrical shock. Therefore, the secondary side should be short-circuited before removing the meters.

4. Usage precautions

- ① Use the meters in the rated specifications.
Otherwise the meters will break down.
- ② While the power is on, do not touch any terminals or

open the cover or case.

- ③ Due to the current transformer emitting heat while powered, do not touch it.

5. What to do if the equipment functions abnormally or fails

If you notice that the equipment has abnormal heating, a strange odor, noises or smoking, it seems to be failed. Please take measures immediately such as cutting off the power. Then contact YOKOGAWA sales office.

6. Maintenance and inspection

To ensure that the meters operate properly, perform the following checks on a regular basis:

- ① Check for the damage to the meters or accessories due to heating or other factors.
- ② Check for the secure of meters and loose of screws. (Turn off the power before doing these to ensure safety)
- ③ The covers of meters have been coated with the antistatic agent to avoid static electricity. Wipe dirt off the cover surfaces gently with a soft, dry cloth. Otherwise it may reduce the antistatic effects if using a wet cloth. Do not use cloths made of synthetic materials to contact the cover for a long time and avoid touching benzene, paint thinner or similar substances. All above may make the cover deformed, discolored or crack.
- ④ Due to static electricity, the indicator becomes unstable. Coat the front and back of the cover with a commercially available antistatic agent.
- ⑤ Working life of meters will be changed according to usage conditions. In general, we recommend replacing the meters after about 10 years.

7. Disposal of product

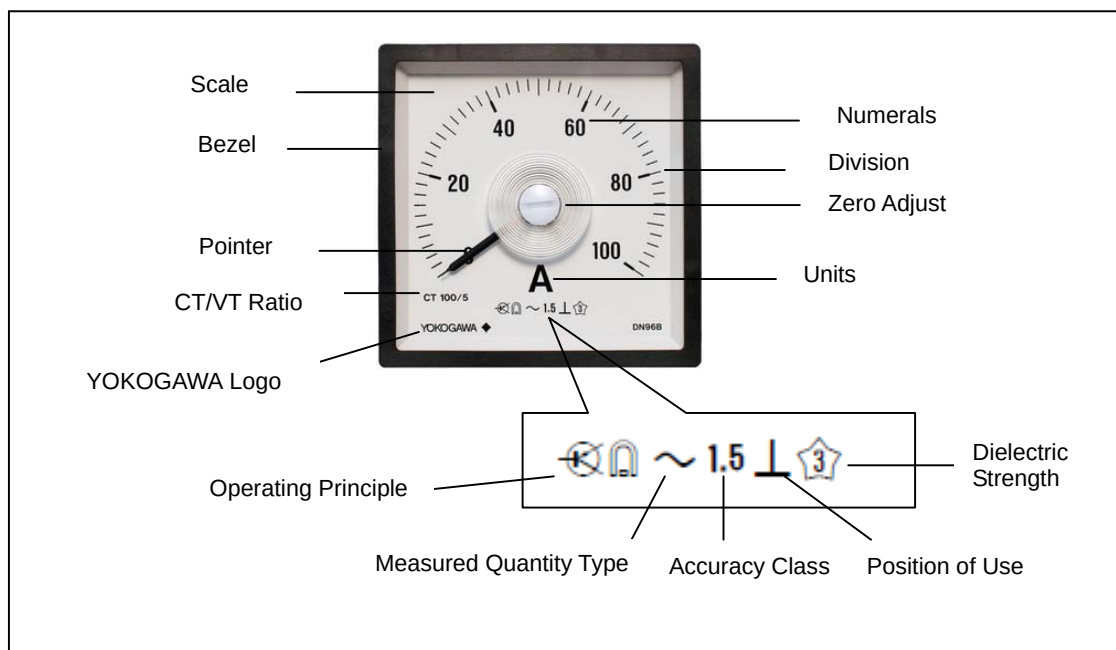
- ① DIN wide-scale meters do not contain batteries.
- ② Dispose DIN wide-scale meters as general industrial waste.

8. Aluminum electrolytic capacitors

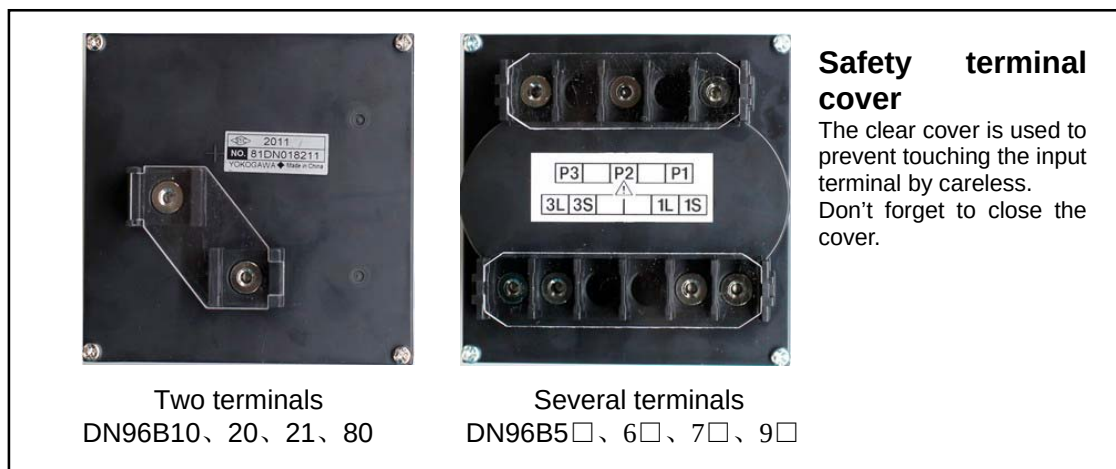
Several DIN wide-scale meters use aluminum electrolytic capacitors of which lifetime is around 10 years when the ambient temperature is 23°C. If aluminum electrolytic capacitors run down, meters will be damaged. Please replace new meters.

View

● Front view



● Back view



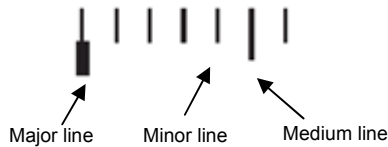
● Set pointer



Scale forms and divisions

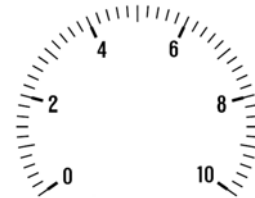
● Scale form

a) Kinds of division lines



b) Standard type

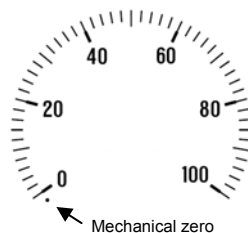
Linear scales



c) Suppressed type

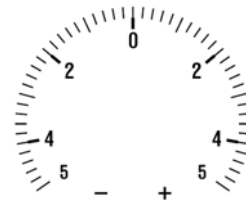
e.g. the specification of 4-20mA

When the value to be input is 4mA, the pointer points to 0; when the value to be input is 0mA, the pointer points to the mechanical zero.



d) Zero-center type

Zero-center: the scale division refers to the standard one.



e) Extended type

Be used in measuring the loading current of the electromotor. The red scale and figure mean that the input beyond the effective range. This kind of scale is used to measure the starting current which overload.

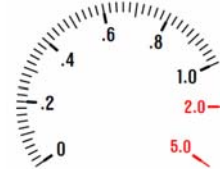
● Two-fold extended



● Three-fold extended



● Five-fold extended



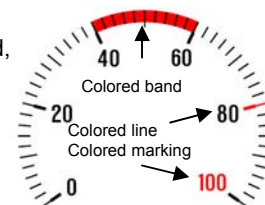
f) Synchroscope

The middle scale marking is synchropoint. The right side means that frequency of incoming side is faster than that of running side and the left side means that frequency of incoming side is slower.



g) Color of scale

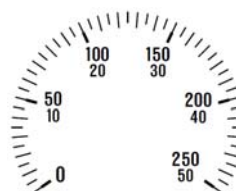
The color confirmed is red, green, blue or yellow.



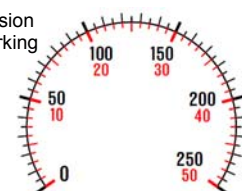
h) Multiple-division & multiple-marking

The large scale is outside; the small one is inside. Multiple-division is combined with the standard scale.

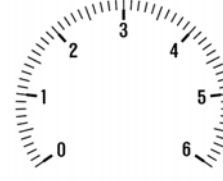
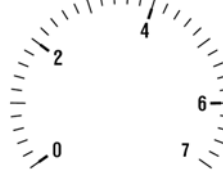
● Single-division Double-marking



● Double-division Double-marking



● Scale division

Maximum scale value	Value of per division	Division	Maximum scale value	Value of per division	Division
1 10 100	0.02 0.2 2	50 division 	4.5 45 450	0.1 1 10	45 division 
1.2 12 120	0.02 0.2 2	60 division 	5 50 500	0.1 1 10	50 division 
1.5 15 150	0.02 0.2 2	75 division 	6 60 600	0.1 1 10	60 division 
2 20 200	0.05 0.5 5	40 division 	7 70 700	0.2 2 20	35 division 
2.5 25 250	0.05 0.5 5	50 division 	8 80 800	0.2 2 20	40 division 
3 30 300	0.05 0.5 5	60 division 	9 90 900	0.2 2 20	45 division 
4 40 400	0.1 1 10	40 division 			

Standard Specifications

Item		DN96B
Suspension type		Taut band
Pointer		Lance type (Black)
Bezel color		White
Dimensions(Width×Height)		96×96mm
Scale arc length		161mm
Full scale deflection angle		250°±5°
Position of use		Vertical(Scale) ⊥
Insulation resistance		Between electrical circuit and the case: More than 10MΩ/500V DC
Dielectric strength		Between current circuit and voltage circuit: 2600V AC for 5 second
		Between electrical circuit and the case: 3320V AC for 5 second
Operating temperature range		0～55℃
Operating humidity range		25～85%RH
Storage temperature range		-20～60℃
Storage humidity range		25～80%RH
Case material		Base material: ABS resin (Nonflammable)
		Window material: PMMA (Anti electrostatic)
		Bezel material: ABS resin (Nonflammable)
Weight	DC A/V	Approx. 400g
	AC A	Approx. 460g
	AC V	Approx. 400g
	WATT	Approx. 550g
	VAR	Approx. 550g
	P.F.	Approx. 550g
	FREQ	Approx. 400g

Remark: Specifications of Synchroscope seeing page 28&29.

Key to Meter numbering system

DN96 B □□-□□□-□-□-□□/□□□

DN96	SHAPE & DIMENSION
96	96X96
B	DIN Wide-Scale Meters
	TYPE CODE
10	DC Ammeter, Voltmeters T/B type
20	RMS rectifier type AC Ammeter, Voltmeters
21	Mean rectifier type AC Ammeter, Voltmeters
51	Wattmeters 1P2W
52	Wattmeters 1P3W
54	Wattmeters 3P4W BAL.
55	Wattmeters 3P3W UNBAL.
56	Wattmeters 3P4W UNBAL.
61	Varmeters 1P2W
63	Varmeters 3P3W BAL.
64	Varmeters 3P4W BAL.
65	Varmeters 3P3W UNBAL.
66	Varmeters 3P4W UNBAL.
71	Power Factor Meters 1P2W
73	Power Factor Meters 3P3W BAL.
75	Power Factor Meters 3P3W UNBAL.
76	Power Factor Meters 3P4W UNBAL.
80	Frequency Meters
90	Synchroscope
91	Synchroscope (Relay Output)
	RATING
□□□	Refer to Suffix Code
	DESIGNATION OF FREQUENCY USED
N	Always "N" or 50/60Hz Common
A	50Hz Only Var & Power Factor
B	60Hz Only Var & Power Factor
C	400Hz
	POINTER
L	Lance type(Black)
	COVER TYPE
BL	Standard type
BS	With set pointer (Red)
	OPTIONAL FEATURE CODE
□□□	See optional feature code table

DC Ammeters

Specify following information from when ordering

Code : Ex. DN96B10 - A07 - N - L - BL / ☐☐☐

Model Suffix Always Pointer Cover color Optional
Code "N" & Set pointer Feature

Scale and unit: Specify full scale value and unit. (Ex. 0 to 75A)

Optional feature: If necessary, specify optional feature.



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B10	96 × 96	Moving coil type	1.5

● Standard descriptions

Name		Suffix Codes	Available Range	Descriptions	Notes
DC Ammeters	Rating	-AEG	0~300μA	Internal resistance 1050Ω	
		-AEM	0~500μA	Internal resistance 630Ω	
		-AFA	0~1mA	Internal resistance 185Ω	
		-AFN	0~3mA	Internal resistance 17Ω	
		-AFX	0~5mA	Internal resistance 10Ω	
		-AGZ	0~10mA	Voltage drop approx. 50 mV	
		-AHM	0~30mA		
		-AHY	0~50mA		
		-AJR	0~100mA		
		-AKG	0~300mA		
		-AKM	0~500mA		
		-ALA	0~1A		
		-ALC	0~1.5A		
		-ALE	0~2A		
		-ALJ	0~3A		
		-ALS	0~5A		
		-AMF	0~7.5A		
		-AMT	0~10A		
		-AND	0~15A		
		-ANG	0~20A		
		-ANL	0~30A		
		-A00	0~(300μA~1A)		
	For external shunt *1	-D00	-a ~ 0 ~ +b a ≤ 72% × (a + b) a + b = 1mA ~ 2A		
		-D00	-a ~ 0 ~ +b (=50mV) a ≤ 50mV		
		-D01	±50mV		
		-D04	±60mV		
		-D07	±75mV		
		-A01	0~50mV	Current consumption 2mA	
		-A04	0~60mV		
		-A05	0~100mV		
		-A07	0~75mV		
	Meter with VR	-A06	0~50mV		
Designation of Frequency Used		-N	Always "-N"		
Pointer		-L	Lance(Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

Remark: * 1 An external shunt is not supplied.

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/010	AC symbol mark	
/011	Shunt leads resistance	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

DC Voltmeters

Specify following information from when ordering:

Code: Ex. **DN96B10** - **VMT** - **N** - **L** - **BL** /

Model	Suffix	Always	Pointer	Cover color	Optional
Code	“N”	“N”	Set pointer	&	Feature

Scale and unit: Specify full scale value and unit.(Ex. 0 to 10V)
 Optional feature: If necessary, specify optional feature.
 Range: For suffix E00, V00, V11, specify rating.



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B10	96 × 96	Moving coil type	1.5

● Standard descriptions

Name		Suffix Codes	Available Range	Descriptions	Notes
DC Voltmeters	Rating	-VLA	0~1V	Current consumption 1mA	
		-VLJ	0~3V		
		-VLS	0~5V		
		-VMT	0~10V		
		-VNL	0~30V		
		-VNT	0~50V		
		-VPK	0~100V		
		-VRX	0~300V		
		-VSF	0~500V		
		-VSJ	0~600V		
		-V00	0~(50mV~600V)		
		-E00	-a~0~+b a≤72%×(a+b) a+b=100mV~600V		
	For external multiplier *1	-E00	-a~0~+b (=1mA) a≤1mA		
		-V01	0~1mA		
	Meter with VR	-V11	0~(10~300)V	±30% Variable	
Designation of frequency used		-N	Always “-N”		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

Remark: * 1 An external multiplier is not supplied

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/010	AC symbol mark	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

Suppressed Meters (DC Ammeters & Voltmeters)

Specify following information from when ordering

Code: Ex. DN96B10 - AHE - N - L - BL / ☐☐☐
 Model Suffix Always Pointer Cover color Optional
 Code "N" & Set pointer Feature

Scale and unit: Specify full scale value and unit. (Ex. 0 ~ 10A)

Optional feature: If necessary, specify optional feature.



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B10	96 × 96	Moving coil type	1.5

● Standard descriptions

	Name	Suffix Codes	Available Range	Descriptions	Notes
Suppressed Meters	DC Ammeters	-AHE	4~20mA	6Ω	
		-AHX	10~50mA	13Ω	
	DC Voltmeters	-VLR	1~5V	4kΩ	
Designation of frequency used		-N	Always "N"		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/010	AC symbol mark	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

AC Ammeters (RMS Rectifier Type)

Specify following information from when ordering:

Code: Ex.	<u>DN96B20</u>	-	<u>A42</u>	-	<u>N</u>	-	<u>L</u>	-	<u>BL</u>	/	<u>□□□</u>
	Model		Suffix		Rated		Pointer		Cover color		Optional
			Code		Frequency				&		Feature
									Set pointer		

Scale and unit: Specify full scale value and unit. (Ex. 0 ~ 100A)

Optional feature: If necessary, specify optional feature.

CT ratio: If necessary, specify CT ratio.



● Product line-up

Model	Descriptions		
Taut band	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B20	96 × 96	RMS Rectifier Type	1.5

● Standard descriptions

Name		Suffix Codes	Available Range	Descriptions	Notes	
AC Ammeters	Rating	-ALA	0~1A	Power Consumption 0.4VA		
		-ALJ	0~3A			
		-ALS	0~5A			
		-AMT	0~10A			
		-AND	0~15A			
		-ANG	0~20A			
		-ANL	0~30A			
		-A00	0~(100mA~30A)			
		-A21	0~(0.5A~1A)		Two-fold extended	
		-A22	0~(1A~2A)			
		-A25	0~(5A~10A)			
		-A26	0~(10A~20A)			
		-A32	0~(1A~3A)		Three-fold extended	
		-A34	0~(3A~9A)			
		-A35	0~(5A~15A)			
		-A36	0~(10A~30A)			
	-A52	0~(1A~5A)	Five-fold extended			
	-A55	0~(5A~25A)				
	For external CT ^{*1}	-A41	0~1A			
		-A42	0~5A			
-A43		0~(1A~2A)	Two-fold extended			
-A44		0~(5A~10A)				
-A45		0~(1A~3A)	Three-fold extended			
-A46		0~(5A~15A)				
-A47		0~(1A~5A)	Five-fold extended			
-A48		0~(5A~25A)				
Designation of frequency used		-N	50/60Hz Common			
		-C	400Hz			
Pointer type		-L	Lance type (Black)			
Cover type	Standard type	-BL	Clear			
	With set pointer (Red)	-BS	Clear			

Remark: *1 An external CT is not supplied.

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

AC Voltmeters (RMS Rectifier Type)

Specify following information from when ordering:

Code: Ex.	<u>DN96B20</u>	-	<u>VNT</u>	-	<u>N</u>	-	<u>L</u>	-	<u>BL</u>	/	<u>□□□</u>
	Model		Suffix		Rated		Pointer		Cover color		Optional
			Code		Frequency				&		Feature
									Set pointer		

Scale and unit: Specify full scale value and unit. (Ex. 0 ~ 300V)

Optional feature: If necessary, specify optional feature.

VT ratio: If necessary, specify VT ratio.



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B20	96 × 96	RMS Rectifier Type	1.5

● Standard descriptions

Name		Suffix Codes	Available Range	Descriptions	Notes
AC Voltmeters	Rating	-VNT	0～50V	0.1VA	
		-VPK	0～100V	0.6VA	
		-VPZ	0～150V	0.9VA	
		-VRX	0～300V	1.8VA	
		-VSJ	0～600V	1.2VA	
		-V00	0～(50V～600V)		
		-VSD	0～450V		
		-VSF	0～500V		
		-V20	Extended line 70V～130V	0.5VA	
	-V21	Extended line 140V～260V	1.0VA		
	For external VT ^{*1}	-V12	0～150V	0.9VA	
-V13		0～150/√3V	0.2VA		
Designation of frequency used		-N	50/60Hz Common		
		-C	400Hz		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

Remark: *1 An external VT is not supplied.

● **Optional feature**

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

AC Ammeters (Mean Rectifier Type)

Specify following information from when ordering:

Code: Ex. DN96B21 - ALA - N - L - BL / ☐☐☐

Model Suffix Rated Pointer Cover color Optional
Code Frequency & Feature
Set pointer

Scale and unit: Specify full scale value and unit. (Ex. 0 ~ 1A)

Optional feature: If necessary, specify optional feature.

CT ratio: If necessary, specify CT ratio.(Ex. 300/5A)



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B21	96 × 96	Mean rectifier type	1.5

● Standard descriptions

Name		Suffix Codes	Available Range	Descriptions	Notes
AC Ammeters	Rating	-AEG	0~300μA	Voltage drop 3V	
		-AEM	0~500μA		
		-AFA	0~1mA		
		-AFN	0~3mA		
		-AFX	0~5mA		
		-AGZ	0~10mA		
		-AHM	0~30mA		
		-AHY	0~50mA		
		-AJR	0~100mA		
		-AKG	0~300mA		
		-AKM	0~500mA		
	-A00	300μA~500mA			
	For external CT ^{*1}	-A40	0~10mA		
Designation of frequency used		-N	50/60Hz Common		
		-C	400Hz		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

Remark: ^{*1} An external CT is not supplied.

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

AC Voltmeters (Mean Rectifier Type)

Specify following information from when ordering:

Code: Ex. <u>DN96B21</u> - <u>VRX</u> - <u>N</u> - <u>L</u> - <u>BL</u> / <u>□□□</u>					
Model	Suffix	Rated	Pointer	Cover color	Optional
	Code	Frequency		&	Feature
				Set pointer	

Scale and unit: Specify full scale value and unit. (Ex. 0 ~ 300V)

Optional feature: If necessary, specify optional feature.

VT ratio: If necessary, specify VT ratio.



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B21	96 × 96	Mean rectifier type	1.5

● Standard descriptions

Name		Suffix Codes	Available Range	Descriptions	Notes
AC Voltmeters	Rating	-VLJ	0~3V	Internal resistance 900Ω/V	
		-VLS	0~5V		
		-VMT	0~10V		
		-VNL	0~30V		
		-VNT	0~50V		
		-VPK	0~100V		
		-VPZ	0~150V		
		-VRX	0~300V		
		-VSJ	0~600V		
	-V00	0~(3V~600V)			
	For external VT ^{*1}	-V12	0~150V		
		-V13	0~150/√3 V		
Meter with VR	-V11	0~(10V~300V)			
Designation of frequency used		-N	50/60Hz Common		
		-C	400Hz		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

Remark: * 1 An external VT is not supplied.

● **Optional feature**

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

Wattmeters

Specify following information from when ordering:

Code: Ex. DN96B55 - W52 - N - L - BL /
 Model Suffix Rated Pointer Cover color Optional
 Code Frequency & Feature
 Set pointer

Scale and unit: Specify full scale value and unit. (Ex. 0~120kW)

Calibration watts: In case of using external CT and/or VT, calculate the possible full scale from the follow page to be sure that it is within the range shown above.

(Ex. 600W)

Optional feature: If necessary, specify optional feature.

VT ratio: If necessary, specify VT ratio.(Ex. 400/100V)

CT ratio: If necessary, specify CT ratio.(Ex. 250/5A)



● Product line-up

Model					Dimensions (Width × Height)	Operating Principle	Accuracy Class
1P2W	1P3W	3P3W Unbal.	3P4W Bal.	3P4W Unbal.			
DN96B51	DN96B52	DN96B55	DN96B54	DN96B56	96 × 96	Feedback time division multiplier type	1.5

● Standard descriptions

Name	Suffix Codes	Available Range		Notes
		Voltage	Current	
Wattmeters	-W01	110/ $\sqrt{3}$ V	0.1A	
	-W03	110V		
	-W05	220V		
	-W71	100V		
	-W73	115V		
	-W75	120V		
	-W81	200V		
	-W83	230V		
	-W85	240V		
	-WA1	380V		
	-W02	110/ $\sqrt{3}$ V	0.5A	
	-W04	110V		
	-W06	220V		
	-W72	100V		
	-W74	115V		
	-W76	120V		
	-W82	200V		
	-W84	230V		
	-W86	240V		
	-WA2	380V		
	-W11	110/ $\sqrt{3}$ V	1A	
	-W13	110V		
	-W15	220V		
	-W17	220/ $\sqrt{3}$ V		
	-W19	110V/220V		
	-W21	220V/440V		
	-W51	100V		
	-W53	115V		
	-W55	120V		
	-W61	200V		
	-W63	230V		
	-W65	240V		
	-WA3	380V		

(Continued to next page)

● Standard descriptions

Name		Suffix Codes	Available Range		Notes
			Voltage	Current	
Wattmeters		-W12	110/ $\sqrt{3}$ V	5A	
		-W14	110V		
		-W16	220V		
		-W18	220/ $\sqrt{3}$ V		
		-W20	110V/220V		
		-W22	220V/440V		
		-W52	100V		
		-W54	115V		
		-W56	120V		
		-W62	200V		
		-W64	230V		
		-W66	240V		
		-WA4	380V		
		-WB4	440V		
Designation of frequency used		-N	50/60Hz Common		
		-C	400Hz		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

● Available standard calibration watts

Model			Single phase 2-wire	Single phase 3-wire	3-phase 3-wire	3-phase 4-wire
Rating						
Voltage	Operating voltage range	Current	DN96B51	DN96B52	DN96B55	DN96B54/56
110/ $\sqrt{3}$ V	52~75V	1A	48~80W	—	—	125~285W
		5A	240~400W	—	—	625~1400W
110V, 115V, 120V	90~130V	1A	72~164W	145~330W	125~285W	218~495W
		5A	360~820W	715~1650W	625~1400W	1090~2475W
220/ $\sqrt{3}$ V	104~150V	1A	—	—	—	250~570W
		5A	—	—	—	1250~2850W
200V, 220V, 240V	180~260V	1A	144~328W	290~660W	250~570W	430~990W
		5A	720~1640W	1430~3300W	1250~2850W	2150~4950W
380, 440V	323~506V	1A	—	420~1000W	420~1000W	—
		5A	—	2100~5000W	2100~5000W	—

(1) When using VT and/or CT, calibration watts will be as follows:

$$\text{Calibration watts} = \frac{\text{MAX. Full scale value}}{\text{VT ratio} \times \text{CT ratio}}$$

	Connection	Full scale value	VT	CT	Calibration watts
EX.1	3-phase 3-wire	20kW	440/110V	30/5A	FS= $\frac{20\text{kW}}{440/110 \times 30/5}$ =833.3W Available
EX.2	Single phase 2-wire	7.5kW	660/110V	20/5A	FS= $\frac{7.5\text{kW}}{660/110 \times 20/5}$ =312.5W Special order with TOKUCHU sheet

(2) Calibration watts are 65 to 150%. Standard watts beyond the limits are not available.

Single phase 2-wire: Standard watts = Voltage rating × Current rating

Single phase 3-wire: Standard watts = 2 × Voltage rating (P1-N) × Current rating

3-phase 3-wire: Standard watts = $\sqrt{3}$ × Line voltage rating × Current rating

3-phase 4-wire: Standard watts = 3 × Phase voltage rating × Current rating

Varmeters

Specify following information from when ordering: :

Code: Ex. DN96B65 - M52 - A - L - BL / ☐☐☐
 Model Suffix Rated Pointer Cover color Optional
 Code Frequency & Feature
 Set pointer

Scale and unit: Specify full scale value and unit. (Ex. 0~15Mvar)

Calibration vars: In case of using external CT and/or VT, calculate the possible full scale from the follow page to be sure that it is within the range shown above.

(Ex. 625var)

Optional feature: If necessary, specify optional feature.

VT ratio: If necessary, specify VT ratio. (Ex. 6000/100V)

CT ratio: If necessary, specify CT ratio. (Ex. 2000/5A)



● Product line-up

Model					Dimensions (Width × Height)	Operating Principle	Accuracy Class
1P2W	3P3W		3P4W				
	Bal.	Unbal.	Bal.	Unbal.			
DN96B 61	DN96B 63	DN96B 65	DN96B 64	DN96B 66	96 × 96	Feedback time division multiplier type	1.5

● Standard descriptions

Name	Suffix Codes	Available Range		Notes
		Voltage	Current	
Varmeters	-M01	110/√3 V	0.1A	
	-M03	110V		
	-M05	220V		
	-M71	100V		
	-M73	115V		
	-M75	120V		
	-M81	200V		
	-M83	230V		
	-M85	240V		
	-M02	110/√3 V	0.5A	
	-M04	110V		
	-M06	220V		
	-M72	100V		
	-M74	115V		
	-M76	120V		
	-M82	200V		
	-M84	230V		
	-M86	240V		
	-M11	110/√3 V	1A	
	-M13	110V		
	-M15	220V		
	-M17	220/√3 V		
	-M51	100V		
	-M53	115V		
	-M55	120V		
	-M61	200V		
	-M63	230V		
	-M65	240V		

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● Standard descriptions

Name		Suffix Codes	Available Range		Notes
			Voltage	Current	
Varmeters		-M12	110/ $\sqrt{3}$ V	5A	
		-M14	110V		
		-M16	220V		
		-M18	220/ $\sqrt{3}$ V		
		-M52	100V		
		-M54	115V		
		-M56	120V		
		-M62	200V		
		-M64	230V		
		-M66	240V		
Designation of frequency used		-N	50/60Hz Common		DN96B63,DN96B64
		-A	50Hz		DN96B61,DN96B65, DN96B66
		-B	60Hz		
		-C	400Hz		
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

● Optional feature

Code	Feature	Notes
/003	Single-Division, Double-marking	
/004	Double-Division, Double-marking	
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

● Available standard calibration vars(Zero-center meter)

Model			Single phase 2-wire	3-phase 3-wire	3-phase 4-wire
Rating					
Voltage	Operating voltage range	Current	DN96B61	DN96B63/65	DN96B64/66
$110/\sqrt{3}$ V	52~75V	1A	24~80 var	—	62~285 var
		5A	120~400 var	—	312~1400 var
110V, 115V, 120V	90~130V	1A	36~164 var	62~285 var	109~495 var
		5A	180~820 var	312~1400 var	545~2475 var
$220/\sqrt{3}$ V	104~150V	1A	—	—	125~570 var
		5A	—	—	625~2850 var
200V, 220V, 240V	180~260V	1A	72~328 var	125~570 var	218~990 var
		5A	360~1640 var	625~2850 var	1090~4950 var

(1) When using VT and/or CT, calibration vars will be as follows:

$$\text{Calibration vars} = \frac{\text{MAX. Full scale value}}{\text{VT ratio} \times \text{CT ratio}}$$

	Connection	Full scale value	VT ratio	CT ratio	Calibration vars
EX.1	3-phase 3-wire (Balanced)	10kvar	660/110V	20/5A	FS= $\frac{10\text{kvar}}{660/110 \times 20/5}$ =416.7var Available
EX.2	Single phase 2-wire	3kvar	660/110V	20/5A	FS= $\frac{3\text{kvar}}{660/110 \times 20/5}$ =125var Special order with TOKUCHU sheet

(2) Calibration vars are 33 to 150%. Standard vars beyond the limits are not available.

Single phase 2-wire: Standard vars = Voltage rating × Current rating

3-phase 3-wire: Standard vars = $\sqrt{3}$ × Line voltage rating × Current rating

3-phase 4-wire: Standard vars = 3 × Phase voltage rating × Current rating

Power Factor Meters

Specify following information from when ordering:

Code: Ex. DN96B75 - C52 - A - L - BL / ☐☐☐
 Model Suffix Rated Pointer Cover color Optional
 Code Frequency & Feature
 Set pointer

Optional feature: If necessary, specify optional feature.

VT ratio: If necessary, specify VT ratio. (Ex. 440/110V)

CT ratio: If necessary, specify CT ratio. (Ex. 30/5A)



● Product line-up

Model				Dimensions (Width × Height)	Operating Principle	Accuracy Class
1P2W	3P3W		3P4W			
	Bal.	Unbal.	Unbal.			
DN96B71	DN96B73	DN96B75	DN96B76	96 × 96	Phase deflection type (For single-phase and 3-phase(balanced)) Feedback time division multiplier type (For 3-phase(unbalanced))	5.0

● Standard descriptions

Name	Suffix Codes	Available Range		Notes
		Voltage	Current	
Power Factor Meters	-C01	110V	0.1A	
	-C03	220V		
	-C71	100V		
	-C73	115V		
	-C75	120V		
	-C81	200V		
	-C83	230V		
	-C85	240V		
	-CA1	380V		
	-C02	110V	0.5A	
	-C04	220V		
	-C72	100V		
	-C74	115V		
	-C76	120V		
	-C82	200V		
	-C84	230V		
	-C86	240V		
	-CA2	380V		
	-C11	110/√3 V	1A	
	-C13	110V		
	-C15	220V		
	-C17	220/√3 V		
	-C51	100V		
	-C53	115V		
	-C55	120V		
	-C61	200V		
	-C63	230V		
	-C65	240V		
	-CA3	380V		

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● Standard descriptions

Name		Suffix Codes	Available Range		Notes
			Voltage	Current	
Power Factor Meters		-C12	110/ $\sqrt{3}$ V	5A	
		-C14	110V		
		-C16	220V		
		-C18	220/ $\sqrt{3}$ V		
		-C52	100V		
		-C54	115V		
		-C56	120V		
		-C62	200V		
		-C64	230V		
		-C66	240V		
		-CA4	380V		
		-CB4	440V		
Designation of frequency used		-N	50/60Hz Common		DN96B73
		-A	50Hz		DN96B71
		-B	60Hz		DN96B75 DN96B76
Pointer type		-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear		
	With set pointer (Red)	-BS	Clear		

● Optional feature

Code	Feature	Notes
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/009	Polarity change marking (LAG to LEAD)	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

● Operating range

Rating		Operating Range	
Voltage	Current	Voltage	Current
110/ $\sqrt{3}$ V	1A	52~75 V	0.3~1.2 A
	5A		1.5~6 A
100V,110V,115V,120V	1A	90~130 V	0.3~1.2 A
	5A		1.5~6 A
220/ $\sqrt{3}$ V	1A	104~150 V	0.3~1.2 A
	5A		1.5~6 A
220V	1A	180~260 V	0.3~1.2 A
	5A		1.5~6 A
380V,440V	1A	320~510V	0.3~1.2 A
	5A		1.5~6 A

Frequency Meters

Specify following information from when ordering:

Code: Ex. DN96B80 - H11 - N - L - BL / ☐☐☐
 Model Suffix Code Always "N" Pointer Cover color & Set pointer Optional Feature

Optional feature: If necessary, specify optional feature.



● Product line-up

Model	Dimensions (Width × Height)	Operating Principle	Accuracy Class
DN96B80	96 × 96	Differential type	0.5/1.0

● Standard descriptions

Name	Suffix Codes	Available Range	Accuracy Class	Notes
Frequency Meters	-H10	45~55Hz	0.5	
	-H11	55~65Hz		
	-H12	45~65Hz		
	-H19	350~450Hz	1.0	
	-H20	45~55Hz		
	-H21	55~65Hz		
	-H22	45~65Hz	0.5	
	-H29	350~450Hz		
	-H30	45~55Hz		
	-H31	55~65Hz	1.0	
	-H32	45~65Hz		
	-H39	350~450Hz		
	-H40	45~55Hz	0.5	
	-H41	55~65Hz		
	-H42	45~65Hz		
	-H49	350~450Hz	1.0	
	-H50	45~55Hz		
	-H51	55~65Hz		
	-H52	45~65Hz	0.5	
	-H59	350~450Hz		
	-H60	45~55Hz		
	-H61	55~65Hz	1.0	
	-H62	45~65Hz		
	-H69	350~450Hz		
	-HA0	45~55Hz	0.5	
	-HA1	55~65Hz		
	-HA2	45~65Hz		
	-HD0	45~55Hz	1.0	
	-HD1	55~65Hz		
	-HD2	45~65Hz		
	-HB0	45~55Hz	0.5	
	-HB1	55~65Hz		
	-HB2	45~65Hz		
Designation of frequency used	-N	Always "N"		
Pointer type	-L	Lance type (Black)		
Cover type	Standard type	-BL	Clear	
	With set pointer (Red)	-BS	Clear	

● Optional feature

Code	Feature	Notes
/005	Color line (Red, Green, Yellow, Blue)	
/006	Color band (Red, Green, Yellow, Blue)	
/007	Color marking (Red, Green, Yellow, Blue)	
/008	Position of use	
/022	Vibration proof	
/023	Damp proof	
/CJ	Pass the attestation used in ship	

Synchroscope

Specify following information from when ordering:

Code: Ex. DN96B90 - VPM - N - L - BL /

Model	Suffix Code	Rated Frequency	Pointer	Cover color & Set pointer	Optional Feature
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Optional feature: If necessary, specify optional feature.



● Product line-up

Model	Dimensions (Width× Height)	Operating Principle	Accuracy Class
DN96B90	96×96	Cross coil、moving magnets type	2.5 (For synchropoint)
DN96B91 (Relay Output)			

● Standard descriptions

Name	Suffix Codes	Available Range	Notes
Synchroscope	No Relay Output	-VPM 110V	
		-VRM 220V	
	Relay Output	-VPM 110V	
		-VRM 220V	
Designation of frequency used	-N	50/60Hz Common	
	-C	400Hz	
Pointer type	-L	Lance(Black)	
Cover type	Standard type	-BL	Clear

● Feature

Synchroscope	DN96B90 Series	DN96B91 Series (Relay Output)
Applicable Specification	China CCS institute classification specifications GB7676-1998 CAT III 600V	
Phase line	Single phase/ Three phase	
Applicable instructions	EU RoHS	
Operating principle	Cross coil、moving magnets type	
Accuracy class	2.5 (For synchropoint)	
Dimensions	Width× Height: 96mm×96mm Depth: 130mm	
Weight	Approx. 480g	Approx. 620g
Position of use	Vertical	
Scale	Scale: Synchropoint SLOW – FAST ±15° (Optional)	
Pointer	Lance (Black)	
Frequency	50/60Hz Common	
Rated voltage	110V、220V	
Operating Temperature and Humidity Range	Temperature: 0~55℃ Humidity: 25~85%RH	
Storage Temperature and Humidity Range	Temperature: -20~60℃ Humidity: 25~85%RH	
Insulation Resistance	Between electrical circuit and the case: More than 10MΩ/500V DC	
Dielectric Strength	Between electrical circuit and the case: AC 3320V for 5 second	
	Between current circuit and voltage circuit: AC 1500V for 5 second	

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●Feature

Synchroscope	DN96B90 Series	DN96B91 Series (Relay Output)
Response time	Less than 3 second	
Access frequency	1.5Hz	
Departure frequency	1.5 Hz	
OPEN	Out of $\pm 30\text{deg}$ according to synchropoint	
Rated power	5VA	7VA
The output condition of synchronizing signal	none	Frequency difference: less than $\pm 0.3\text{Hz}$ (Optional: $\pm 0.05\text{Hz}$, $\pm 0.1\text{Hz}$, $\pm 0.15\text{Hz}$, $\pm 0.2\text{Hz}$, $\pm 0.25\text{Hz}$, $\pm 0.3\text{Hz}$, $\pm 0.35\text{Hz}$, $\pm 0.4\text{Hz}$)
		Phase difference: less than $\pm 15\text{deg}$ (Optional: $\pm 3\text{deg}$, $\pm 5\text{deg}$, $\pm 10\text{deg}$, $\pm 15\text{deg}$, $\pm 20\text{deg}$, $\pm 25\text{deg}$, $\pm 30\text{deg}$, $\pm 35\text{deg}$)
		Signal delay: less than 0.03Hz , 0.3deg (Optional: 0Hz , 0deg ; 0.01Hz , 0.1deg ; 0.02Hz , 0.2deg ; 0.03Hz , 0.3deg)
		Frequency difference: $\pm 0.03\text{Hz}$ Phase difference: $\pm 2^\circ$
Output accuracy		
Contact capacity		AC 250V/5A, 3 contact
Synchronizing LED	none	have

●Optional feature

Code	Feature	Notes
/008	Position of use	
/CJ	Pass the attestation used in ship	

●Special Optional feature of Synchroscope(Relay Output):

DN96B91 - □□□ - N - L - BL / □□□ / □□□ / □□□

① ② ③

Optional Code	①	Optional Code	②	Optional Code	③
	Frequency difference (if none means $\pm 0.3\text{Hz}$)		Phase difference (if none means $\pm 15^\circ$)		Signal delay (if none means 0.03Hz , 0.3°)
/081	$\pm 0.05\text{Hz}$	/091	$\pm 3^\circ$	/101	0Hz , 0°
/082	$\pm 0.1\text{ Hz}$	/092	$\pm 5^\circ$	/102	0.01Hz , 0.1°
/083	$\pm 0.15\text{ Hz}$	/093	$\pm 10^\circ$	/103	0.02Hz , 0.2°
/084	$\pm 0.2\text{ Hz}$	/094	$\pm 20^\circ$		
/085	$\pm 0.25\text{ Hz}$	/095	$\pm 25^\circ$		
/086	$\pm 0.35\text{ Hz}$	/096	$\pm 30^\circ$		
/087	$\pm 0.4\text{ Hz}$	/097	$\pm 35^\circ$		

●Operating principle of Synchroscope

The function of Synchroscope is to compare the frequency and phase between incoming side and running side. The faster the pointer is rotated, the larger frequency difference is. Turn a circle per second equivalent to frequency difference of 1Hz .

Clockwise rotating means frequency of incoming side faster than that of running side. Anticlockwise rotating means frequency of incoming side slower than that of running side. Pointer in the ultimate stable position indicates the frequency difference between two sides. Zero is located in 12 o'clock position.

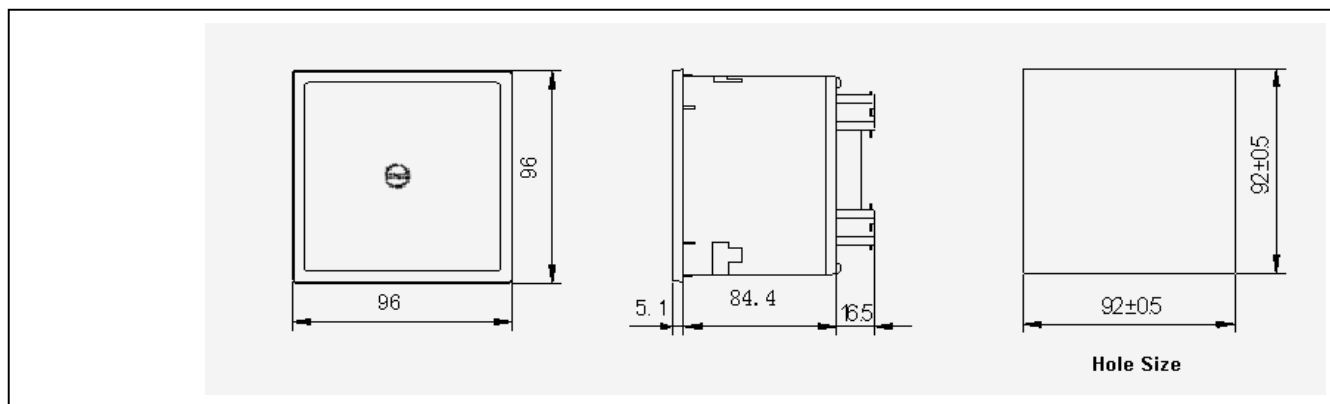
When Synchroscope(Relay Output) meet with the condition of frequency difference and phase difference at the same time, Synchronizing LED is lighted up and relay output is produced.

Synchroscope(Relay Output)output status table:

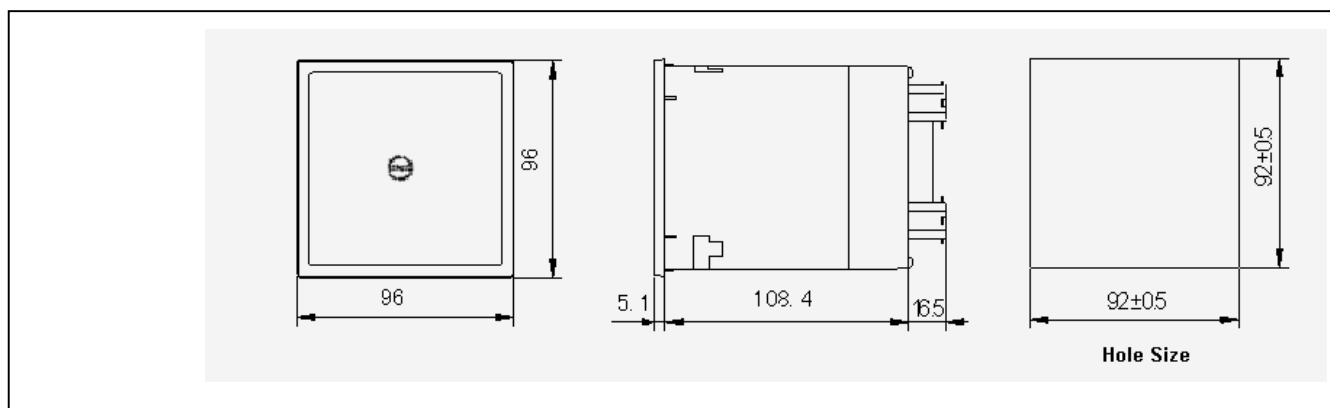
The output condition of synchronizing signal	Did not meet with the conditions	Meet with the conditions
Synchronizing LED	Did not light up	Light up
NO、C	OFF	ON
C、NC	ON	OFF

Dimensions and Panel Mountings

● DN96B Series



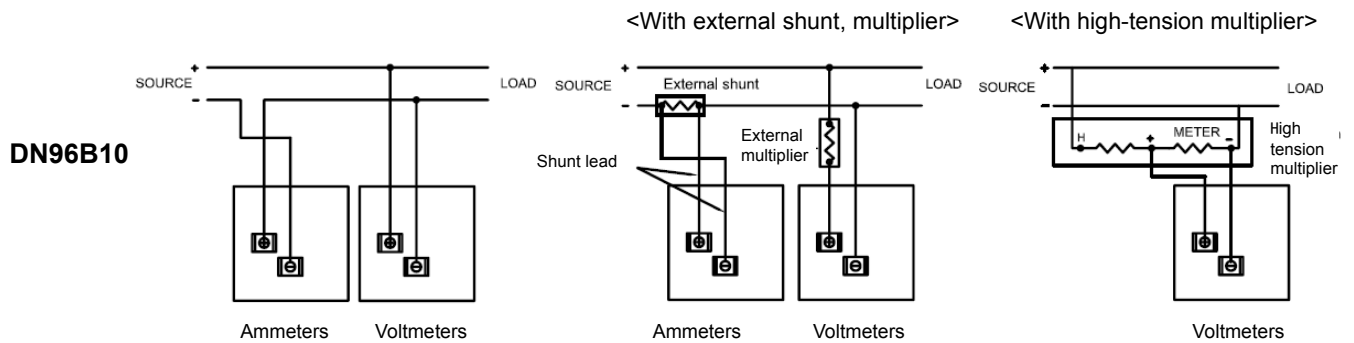
DN96B10
DN96B20、21
DN96B80



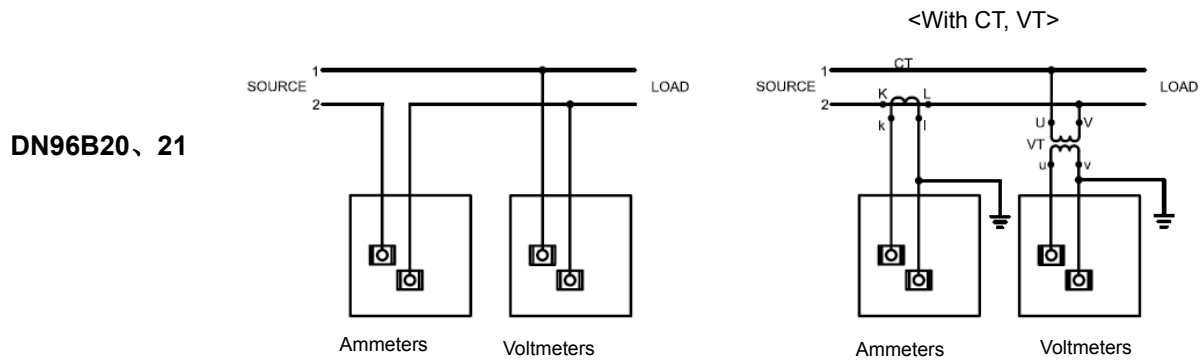
DN96B5□
DN96B6□
DN96B7□
DN96B9□

Connection Diagrams

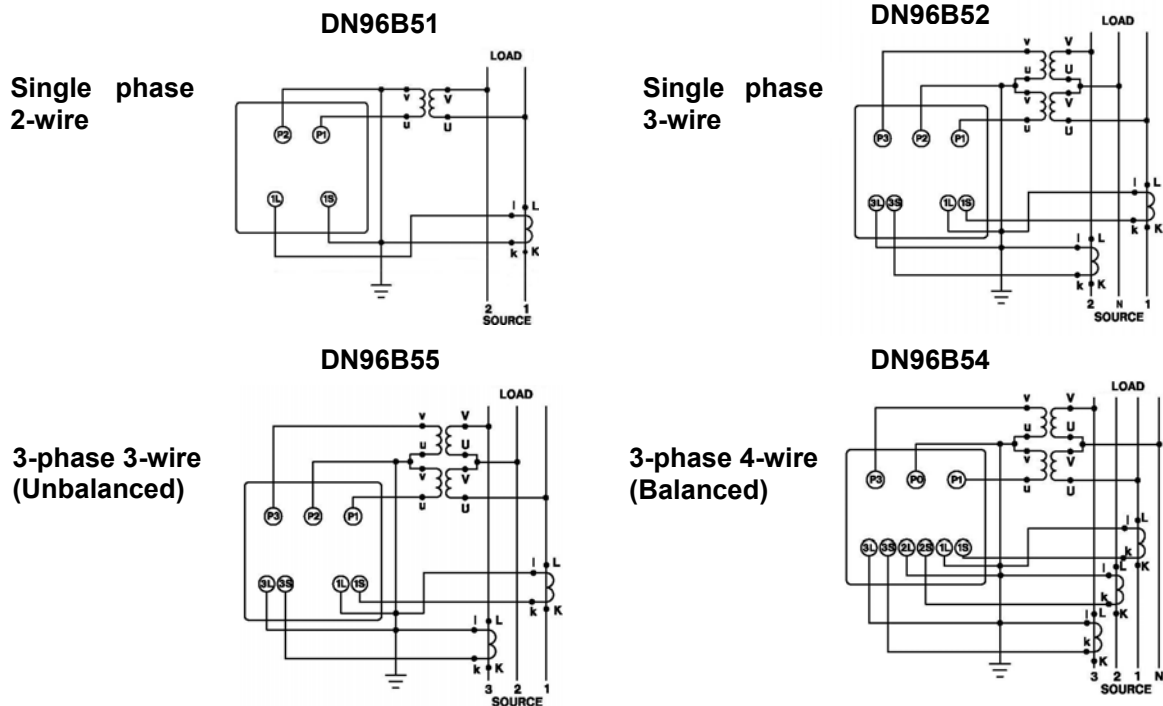
● DC Ammeters, Voltmeters



● AC Ammeters, Voltmeters

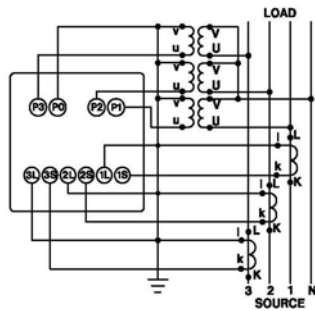


● Wattmeters



DN96B56

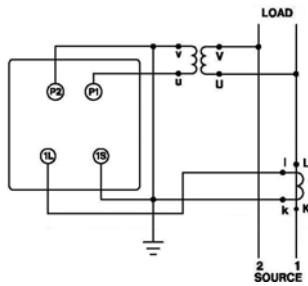
**3-phase 4-wire
(Unbalanced)**



● Varmeters

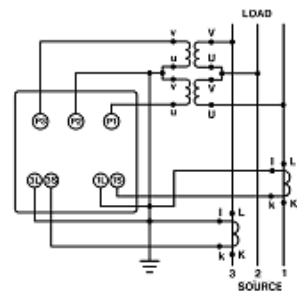
DN96B61

**Single phase
2-wire**



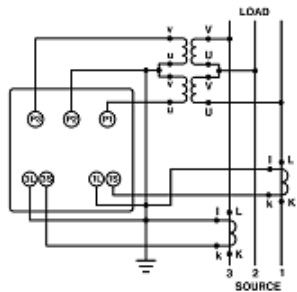
DN96B63

**3-phase 3-wire
(Balanced)**



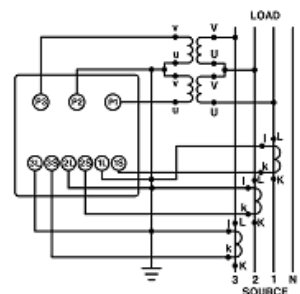
DN96B65

**3-phase 3-wire
(Unbalanced)**



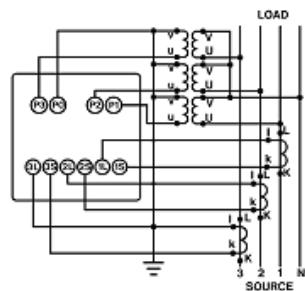
DN96B64

**3-phase 4-wire
(Balanced)**

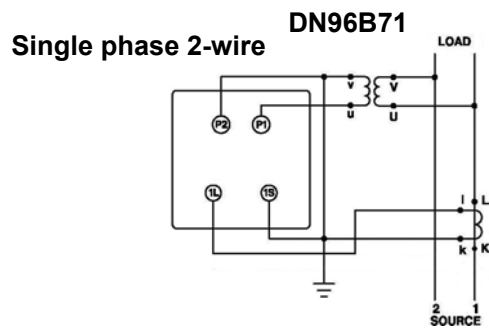


DN96B66

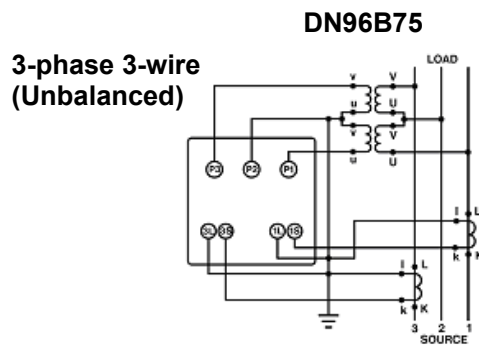
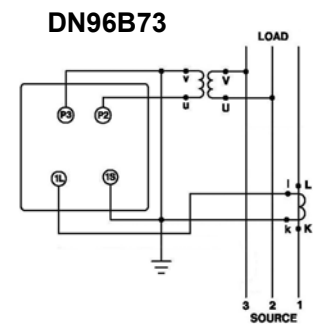
**3-phase 4-wire
(Unbalanced)**



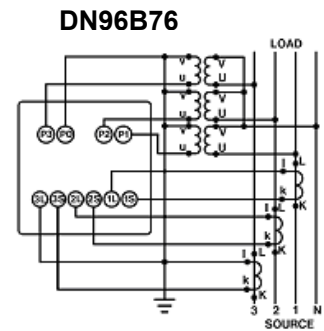
● Power factor meters



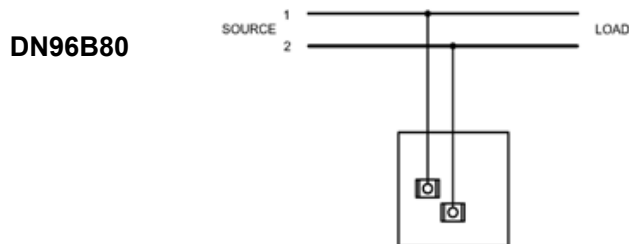
3-phase 3-wire (Balanced)



3-phase 4-wire (Unbalanced)



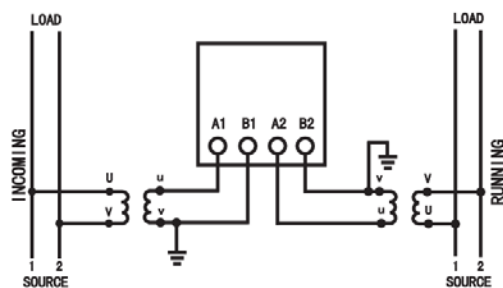
● Frequency meters



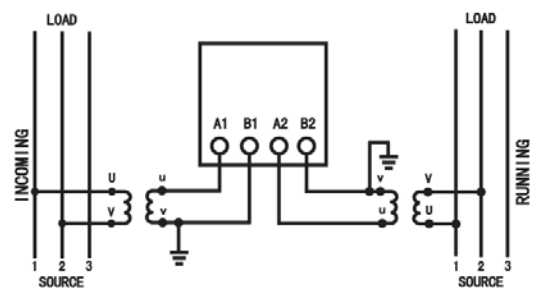
● Synchroscope

Synchroscope DN96B90

Single phase 2-wire

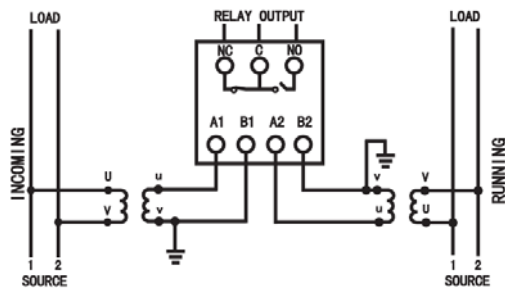


3-phase 3-wire

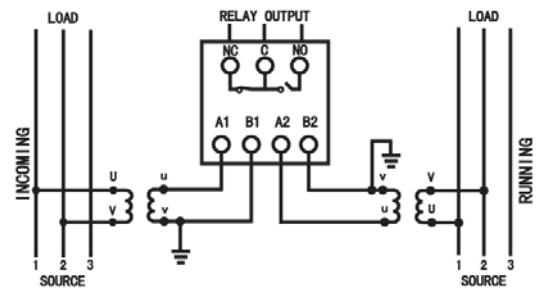


Synchroscope DN96B91

Single phase 2-wire



3-phase 3-wire



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