

Electrical Transducers

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Electrical Transducers

0.25% AC Voltage Transducers

General Features

- Accuracy — $\pm 0.25\%$ of Rated Output.
- Accuracy maintained from 10 - 180V input.
- Accuracy load-independent.
- Meets IEEE SWC test.
- Withstands $1.2 \times 50\mu\text{s}$ 6kV crest impulse.
- Negligible temperature effect on accuracy.
- Excellent long term stability.
- Complete technical manual available.

General Description

The CLE-201001 transducer accurately converts a sinusoidal AC voltage to a proportional dc output current. The CLE-201031 transducer accurately converts three sinusoidal AC voltages to three proportional dc output currents. The output current can then be indicated on analog or digital instruments or feed data loggers, records, or computer inputs. The output can also drive analog to digital converters used in Energy Management Systems or other control systems, such as the Model CLE-207100 process amplifier.

An extremely stable constant current amplifier permits the dc signal to be transmitted over long distances with no loss in accuracy. Excellent temperature and long term stability characteristics are provided. Premium selected solid state devices are used for increased reliability. The output is insensitive to load variations, making it ideal for remote instrumentation or control applications where long lead wires and varying load resistance is encountered. Full scale calibration of $\pm 10\%$ is provided through a sliding access port. A multiturn adjustment potentiometer is provided for precise settings. Zero adjustments are not required. The transducer is self-powered for the entire input range and has a burden $< 1.5\text{VA}$.

General Applications

- Transmission of voltage signals over long distance with no loss in accuracy.
- Energy Management Systems.
- Motor and Power Control Circuits.

The 0.25% of rated output accuracy is maintained over the entire Input Range, permitting overloads to be measured with the same accuracy as the Rated Input. As long as the Compliance Voltage Limit (11 volts dc) is not exceeded, ($I_{\text{out}} \times R_L \leq 11\text{V}$) operation above the rated input provides the same linearity, accuracy and performance at the Rated Input.

The transducers are designed to withstand the surge requirements of IEEE STD. 472 and ANSI C37.90A (SWC). Additionally, the unit withstands an Impulse test of $1.2 \times 50\mu\text{s}$ 6kV crest unidirectional and up to 100VRMS, 2 sec. across the output terminals. High dielectric withstand capability and complete input/output/case isolation is provided.

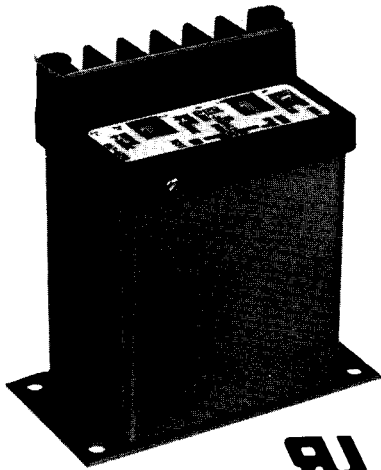
The mounting dimensions and wiring connections match those of other commonly used transducers for ease in replacement.

An in-line test jack can be provided as an option on the CLE-201001 to permit monitoring the output current while in service. Add the letter "T" to the catalog number to specify this option. Available on single phase versions only. It is standard on CLE-201001X.

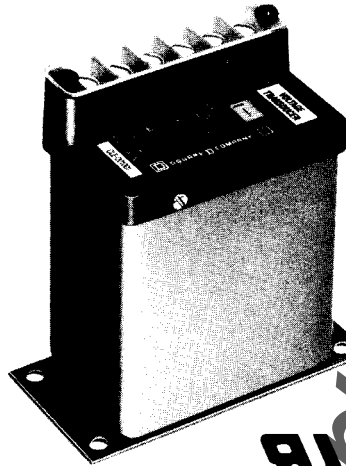


Electrical Transducers

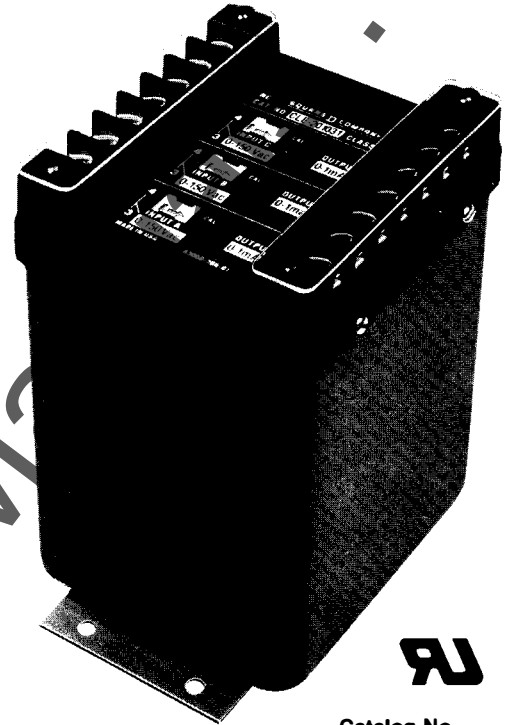
0.25% AC Voltage Transducers



Catalog No.
CLE-201001X



Catalog No.
CLE-201001



Catalog No.
CLE-201031

Specifications

EXPANDED SCALE, CATALOG NO. CLE-201001X

Maximum F.S. Input	150VAC
Accuracy @ 25°C	± 0.25% of F.S.
Overload (max.)	150VAC
Minimum Input	90VAC
Burden (@ 120VAC)	< 2VA
Temperature Influence	± 0.5% of F.S.
Output	0-1mA dc

Calibration Adjustment	10-60 volt span
Zero Adjustment	90-140VAC
Output Ripple	1% of F.S. peak
Test Jack	Included
Connections	Figure 1, Page 13
Dimensions	Style 1, Page 19
All other specifications are those listed below.	

Specifications

Input Range	0-180V
Rated Input	150V
Burden at 120V 60Hz	< 1.5VA
Overload (continuous)	180V
Frequency Range (Specify Nominal)	50-500Hz
Operating Humidity	0-95%
Temperature Range	- 25°C to + 75°C
Maximum Temperature Effects on Accuracy	± 0.5% RO
Accuracy @ 25°C (10-180V) (% RO at nominal frequency)	± 0.25% RO
Output Range	0-1.3mA dc
Output at Rated Input	1mA dc
Output Ripple	< 0.5% RO
Output Load	0-10kΩ
Compliance Voltage (max.)	11Vdc

Calibration Adjustment	± 10%
Response Time (to 99%)	≤ 400ms
Stability, % of full scale per yr.	± 0.25%
Dielectric Withstand Voltage (CLE-201001)	
Input to Output to Case	1500VRMS (1 min.)
Dielectric Withstand Voltage (CLE-201031)	
Input to Output to Case	1500VRMS (1 min.)
Inputs and Outputs of each Transducer Section	
3500VRMS (1 min.)	
Surge Withstand Capability	ANSI C37.90A, IEEE STD.472
Impulse Test	
Unidirectional	
1.2 × 50μs 6kV crest	
70A Short Circuit	
6kV crest 100kHz	
Test Voltage Across Output	100VRMS, 2 sec.
Output Open or Short Circuit	Protected
Open Circuit Output at Rated Input	< 20Vdc

CONNECTIONS: Figures 1 & 3 on page 13
DIMENSIONS: Style 1 & 2 on page 19



Electrical Transducers

0.25% AC Current Transducers

General Features

- Accuracy — $\pm 0.25\%$ of Rated Output.
- Accuracy maintained from 0 - 6.5A input.
- Accuracy load-independent.
- Meets IEEE SWC test.
- Withstands $1.2 \times 50\mu\text{s}$ 6kV crest impulse.
- Negligible temperature effect on accuracy.
- Excellent long term stability.
- Complete technical manual available.

General Description

The CLE-202001 transducer accurately converts a sinusoidal AC current to a proportional dc output current. The CLE-202031 transducer accurately converts three sinusoidal AC currents to three proportional dc output currents. The output current can be indicated on analog or digital instruments or feed data loggers, recorders, or computer inputs. The output can also drive analog to digital converters used in Energy Management Systems or other control systems, such as the Model CLE-207100 process amplifier.

An extremely stable constant current amplifier permits the dc signal to be transmitted over long distance with no loss in accuracy. Excellent temperature and long term stability characteristics are provided. Premium selected solid state devices are used for increased reliability. The output is insensitive to load variations, making it ideal for remote instrumentation or control applications where long lead wires and varying load resistance is encountered. Full scale calibration of $\pm 10\%$ is provided through a sliding access port. A multiturn adjustment potentiometer is provided for precise settings. Zero adjustments are not required. The transducer is self-powered for the entire input range, and has a burden $< .15\text{VA}$.

General Applications

- Transmission of current signals over long distance with no loss in accuracy.
- Energy Management Systems.
- Motor and Power Control Circuits.

The 0.25% of rated output accuracy is maintained over the entire Input Range, permitting overloads to be measured with the same accuracy as the Rated Input. As long as the Compliance Voltage Limit (11 volts dc) is not exceeded, ($I_{\text{out}} \times R_L \leq 11\text{V}$) operation above the rated input provides the same linearity, accuracy and performance as at the Rated Input.

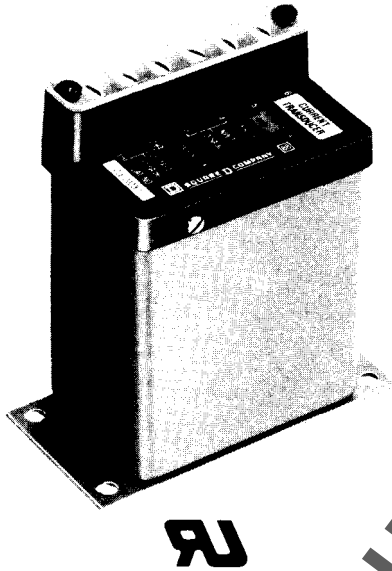
The transducers are designed to withstand the surge requirements of IEEE STD.472 and ANSI C37.90A (SWC). Additionally, the unit withstands an Impulse test of $1.2 \times 50\mu\text{s}$, 6kV crest unidirectional and up to 100VRMS, 2 sec. across the output terminals. High dielectric withstand capability and complete input/output/case isolation is provided.

The mounting dimensions and wiring connections match those of other commonly used transducers for ease in replacement.

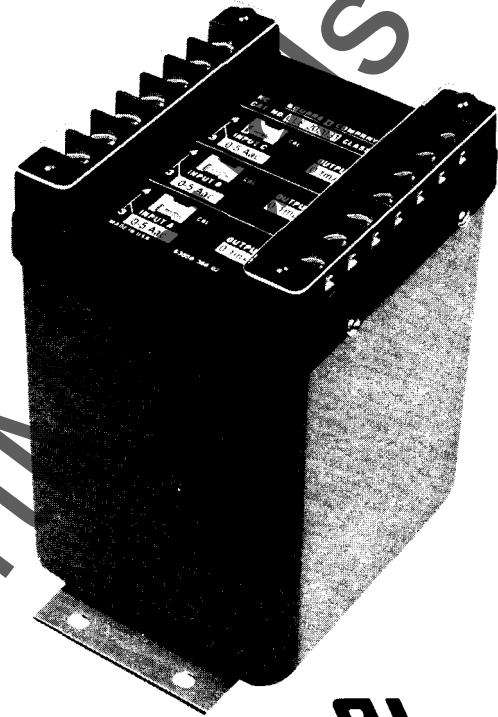
An in-line test jack can be provided as an option on the CLE-202001 to permit monitoring the output current while in service. Add the letter "T" to the catalog number to specify this option. Available on single phase version only.



Electrical Transducers
0.25% AC Current Transducers



Catalog No.
 CLE-202001



Catalog No.
 CLE-202031

Specifications

Input Range	0-6.5A
Rated Input	5A
Burden at 5A 60Hz	< 0.15VA
Overload	10A continuous; 250A for 1 sec.
Frequency Range (Specify Nominal)	50-500Hz
Operating Humidity	0-95%
Temperature Range	- 25°C to + 75°C
Maximum Temperature Effects on Accuracy	± 0.5% RO
Accuracy @ 25°C (0-6.5A) (% RO at nominal frequency)	± 0.25% RO
Output Range	0-1.3mA dc
Output at Rated Input	1mA dc
Output Ripple	< 0.5% RO
Output Load	0-10kΩ
Compliance Voltage (max.)	11Vdc
Calibration Adjustment	± 10%

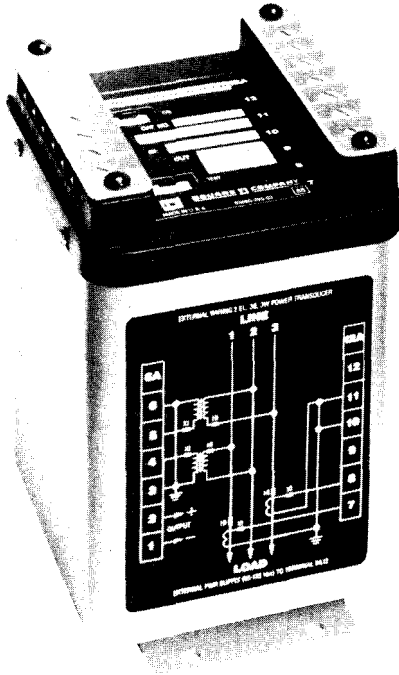
Response Time (to 99%)	≤ 400ms
Stability, % of full scale per yr.	± 0.25%
Dielectric Withstand Voltage (CLE-201001) Input to Output to Case	1500VRMS (1 min.)
Dielectric Withstand Voltage (CLE-201031) Input to Output to Case	1500VRMS (1 min.)
Inputs and Outputs of each Transducer Section	3500VRMS (1 min.)
Surge Withstand Capability	ANSI C37.90A; IEEE STD.472
Impulse Test	Unidirectional
	1.2 x 50μs 6kV crest
	70A Short Circuit
	6kV crest 100kHz
Test Voltage Across Output	100VRMS, 2s
Output Open or Short Circuit	Protected
Open Circuit Output at Rated Input	< 20Vdc

CONNECTIONS: Figures 2 & 4 on page 13
DIMENSIONS: Style 1 & 2 on page 19

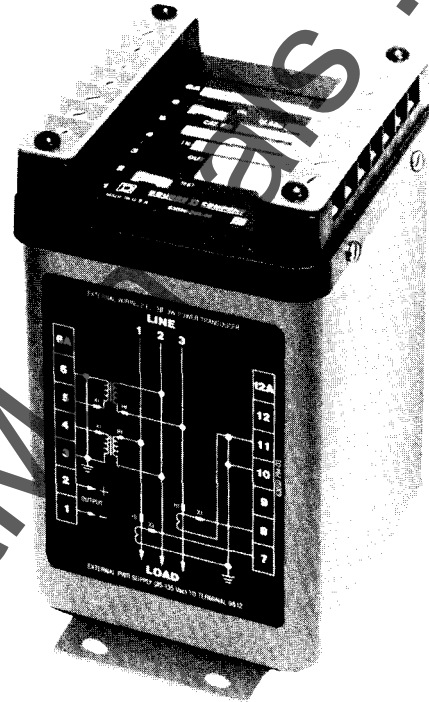


Electrical Transducers

0.2% Watt and VAR Transducers



Catalog No.
CLE-204002



Catalog No.
CLE-205002

WATT TRANSDUCERS SERIES CLE-20400

Description

The CLE-20400 Watt Transducer utilizes unique digital circuitry eliminating zero adjustments while providing excellent long term stability. The 0.2% of reading accuracy provides the optimum overall accuracy/cost ratio. This field serviceable transducer matches industry accepted sizes and connections. Constant current or constant voltage outputs are available. 1, 1½, 2, 2½, and 3 element versions are available. Consult chart on page 7 for type desired. Order by catalog number.

VAR TRANSDUCERS SERIES CLE-20500

Description

The CLE-20500 Var Transducer utilizes unique digital circuitry eliminating zero adjustment while providing excellent long term stability. An internal, extremely stable 90° phase shifter converts the CLE-20400 Watt Transducer to an equally precise Var Transducer. The 0.2% of reading accuracy provides the optimum over-all accuracy/cost ratio. This field serviceable transducer matches industry accepted sizes and connections. Constant current or constant voltage outputs are available. 1, 1½, 2, 2½, and 3 element versions are available. Consult chart on page 7 for type desired. Order by catalog number.

Features

WATT AND VAR TRANSDUCER

- Field serviceable.
- Sliding access doors for calibration and test.
- Complete technical manual available.
- Identified service test points terminals provided on component circuit boards.
- All components symbolized on circuit boards for ease of maintenance.
- DC standards can be used to calibrate multiplier board.

- Multiplier board plugs in to facilitate removal and calibration.
- Test jack provided for monitoring output current while in service.
- All integrated circuits are burned-in to eliminate failures and color coded to indicate the burn-in screening.
- Most components are located on a plug-in multiplier board to facilitate service.



Electrical Transducers

0.2% Watt and VAR Transducers

Specifications

Potential Range (1) 0-150VAC
 Potential Input (nominal) 120VAC
 Potential Overload 175V continuous
 Potential Burden (per element) 0.1VA @ 120V
 Current Range 0-10A AC
 Current Input (nominal) 5A AC
 Current Overload 15A continuous
 50A 10 s/h
 250A 1 s/h
 Current Burden (per-element) 0.2VA @ 5A
 Rated Output (RO) ± 1mA dc or ± 10Vdc
 Accuracy (2) ±(0.2% reading + 0.01% RO)
 Load Resistance (RL) 0-10kΩ for 1mA RO
 2kΩ – ∞ for 10V RO
 Compliance Voltage (3) 11Vdc minimum
 Output Ripple Peak < 0.5% RO
 Response Time (99%) ≤ 400ms
 Open Circuit Output Voltage < 20Vdc (1mA RO)
 Frequency Range (Watt) 58-62Hz
 Frequency Range (VAR)(4) 60Hz

Calibration Adjustment ± 10% RO
 Power Factor Any
 Temperature Range - 25°C to + 75°C
 Temperature Coefficient (Watt) ± 0.005%/°C
 Temperature Coefficient (Var) ± 0.009%/°C
 Relative Humidity 0-95%
 Stability (per year) ± 0.1% RO max.
 Dielectric Withstand Voltage 1800VRMS 1 min.
 Transient Test ANSI C37-90A, IEEE STD.472
 Impulse Test 6kV crest 100kHz
 Unidirectional 6kV crest 1.2 × 50μs; 70A Short Circuit
 Test Voltage Across Output 100VRMS 2 sec.
 Complete Isolation Protection
 Provided Input, output, case, control power
 Output Protection Open and Short Circuit
 Control Power Requirement 85-135VAC, 60Hz, ± 10Hz
 (1.5VA @ 120VAC)

CONNECTIONS: Figures 5-9 on pages 14 & 15
DIMENSIONS: Style 2 on page 19

- NOTES: (1) Limited to 85V to 135V if input voltage signal used to provide control power or if self-powered.
 (2) Includes worst combined effects of current, voltage, PF, Hz, & RL.
 (3) For 1.0mA RO, insure that loxRL is less than 11.0 volts.
 (4) The 90° phase shift circuit causes a frequency influence of 0.015% per 0.1 Hz (VAR Transducers only).

Ordering Information (Watt)

ELEM.	POWER CIRCUIT	SYSTEM REQUIREMENTS		RATED INPUT (Watts)	CATALOG NUMBER★		CONN. DIAGRAM	CONTROL POWER TERMINALS▲
		3 PHASE VOLTAGE	LIMITATION CURRENT		RO = ± 1mA dc	RO = ± 10Vdc		
1	Single Phase	----	----	500	CLE-204000	CLE-204005	Fig. 5	9 & 12
1½	3 Phase 3 Wire	Balanced	Balanced	1000	CLE-204001	CLE-204006	Fig. 6	9 & 12
2	3 Phase 3 Wire	None	None	1000	CLE-204002	CLE-204007	Fig. 7	9 & 12
2½	3 Phase 4 Wire	Balanced	None	1500	CLE-204003	CLE-204008	Fig. 8	6A & 12A
3	3 Phase 4 Wire	None	None	1500	CLE-204004	CLE-204009	Fig. 9	6A & 12A

Ordering Information (VAR)

ELEM.	POWER CIRCUIT	SYSTEM REQUIREMENTS		RATED INPUT (VARS)	CATALOG NUMBER★		CONN. DIAGRAM	CONTROL POWER TERMINALS▲
		3 PHASE VOLTAGE	LIMITATION CURRENT		RO = ± 1mA dc	RO = ± 10Vdc		
1	Single Phase	----	----	500	CLE-205000	CLE-205005	Fig. 5	9 & 12
1½	3 Phase 3 Wire	Balanced	Balanced	1000	CLE-205001	CLE-205006	Fig. 6	9 & 12
2	3 Phase 3 Wire	None	None	1000	CLE-205002	CLE-205007	Fig. 7	9 & 12
2½	3 Phase 4 Wire	Balanced	None	1500	CLE-205003	CLE-205008	Fig. 8	6A & 12A
3	3 Phase 4 Wire	None	None	1500	CLE-205004	CLE-205009	Fig. 9	6A & 12A

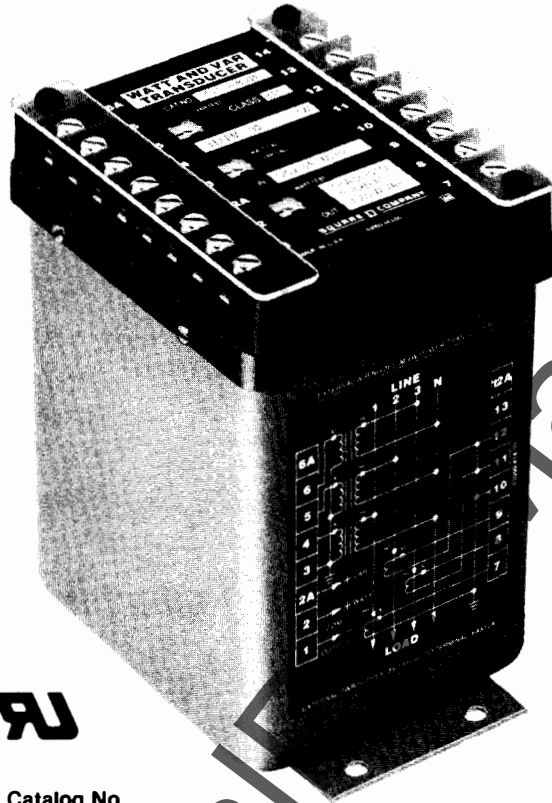
★ Add "S" to catalog number for self-powered version.

▲ Control Power for operation of electrical circuitry can be obtained from voltage input signals or from an auxiliary power source. If voltage input signals are below 85V or above 135V, an auxiliary 120VAC 60Hz 1.5VA source is required to be connected to Control Power terminals. If voltage input signal is between 85V and 135V, the Control Power terminals may be externally jumped to terminals 3 and 4 on the transducer.



Electrical Transducers

0.2% Combination Watt and VAR Transducers



Catalog No.
CLE-208004

Features

- Five element configurations available.
- Designed for customer maintenance.
- Complete technical documentation available.
- Separate in-service Watt and Var output test jacks provided.
- Two transducers in one enclosure, with common power supply.
- Accuracy — 0.2% of reading guaranteed, typically 0.1%.
- Measures active and reactive power flow, forward and reverse.
- Watt and Var circuits completely independent from each other except for shared input transformers and common return in output.

Description

The CLE-20800 Combined Watt and Var Transducers are completely separate Watt and Var Transducers sharing only the input transformers and power supply. Internal Watt and Var switching circuits are eliminated. Standard adjustment is 10% full scale. This unit is the same physical size as the separate Square D Watt and Var Transducers, Series

CLE-20400 and CLE-20500. They represent significant savings in both purchasing and installation costs, since half the panel space and half the connections are required.

Five versions are available as well as a choice of either bipolar constant current or voltage output.

Temperature effects are held to very low levels (0.005%/°C Maximum for Watt circuit and 0.009%/°C Maximum for Var circuit). Extremely stable digital circuits with no zero drift are used to achieve this performance. Long term stability of 0.1% per year non-cumulative is assured.

Square D Company is the first to design transducers for customer maintenance. All components are identified on the circuit cards. Test points are also provided. A detailed technical manual is available to assist in understanding theory of operation, calibration and service. It contains complete diagrams, parts lists and layouts.

Industry accepted connection designations, terminal locations and mounting dimensions are also used. The features designed into this transducer make it the best value.



Electrical Transducers

0.2% Combination Watt and VAR Transducers

Specifications

Potential Range (1) 0-150VAC
 Potential Input (nominal) 120VAC
 Potential Overload 175V continuous
 Potential Burden (per element) 0.1VA@120V
 Current Range 0-10A AC
 Current Input (nominal) 5A AC
 Current Overload 15A continuous
 50A 10 s/h
 250A 1 s/h
 Current Burden (per-element) 0.2VA@5A
 Rated Output (RO) $\pm 1\text{mA dc}$ or $\pm 10\text{Vdc}$
 Accuracy (2) $\pm(0.2\%$ reading + 0.01% RO)
 Load Resistance (RL) 0-10k Ω for 1mA RO
 2k Ω – ∞ for 10V RO
 Compliance Voltage (3) 11Vdc minimum
 Output Ripple Peak <0.5%RO
 Response Time (99%) $\leq 400\text{ms}$
 Open Circuit Output Voltage <20Vdc (1mA RO)
 Frequency 60Hz
 Calibration Adjustment $\pm 10\%$ RO

Power Factor Any
 Temperature Range -20°C to $+70^{\circ}\text{C}$
 Temperature Coefficient $\pm 0.005\%/^{\circ}\text{C}$ Watt
 $\pm 0.009\%/^{\circ}\text{C}$ Var
 Relative Humidity 0-95%
 Stability (per year) Watt and Var $\pm 0.1\%$ RO max.
 Dielectric Withstand Voltage 1800VRMS 1 min.
 Transient Test ANSI C37-90A, IEEE STD.472
 Impulse Test 6kV crest 100kHz
 Unidirectional 6kV crest $1.2 \times 50\mu\text{s}$; 70A Short Circuit
 Test Voltage Across Output 100VRMS 2 sec.
 Complete Isolation Protection
 Provided Input, output, case, control power
 Output Protection Open and Short Circuit
 Control Power Requirement 85-135VAC,60Hz, $\pm 10\%$
 (3.5VA @ 120VAC)

CONNECTIONS: Figures 10-14 on pages 16 & 17
DIMENSIONS: Style 3 on page 19

NOTES:

- (1) Limited to 85V to 135V if input voltage signal used to provide control power or if self-powered.
- (2) Includes worst combined effects of current, voltage, PF, Hz, & RL. Typically is 0.1% of reading accuracy.
- (3) For 1.0mA RO, insure that $\text{Io} \times \text{RL}$ is less than 11.0 volts.

Ordering Information

ELEM.	POWER CIRCUIT	SYSTEM REQUIREMENTS		RATED INPUT (Watts/Vars)	CATALOG NUMBER ★		CONN. DIAGRAM	CONTROL POWER TERMINALS ▲
		3 PHASE VOLTAGE	LIMITATION CURRENT		RO = $\pm 1\text{mA dc}$	RO = $\pm 10\text{Vdc}$		
1	Single Phase	---	---	500	CLE-208000	CLE-208005	Fig. 10	9 & 12
1½	3 Phase 3 Wire	Balanced	Balanced	1000	CLE-208001	CLE-208006	Fig. 11	9 & 12
2	3 Phase 3 Wire	None	None	1000	CLE-208002	CLE-208007	Fig. 12	9 & 12
2½	3 Phase 4 Wire	Balanced	None	1500	CLE-208003	CLE-208008	Fig. 13	6A & 12A
3	3 Phase 4 Wire	None	None	1500	CLE-208004	CLE-208009	Fig. 14	6A & 12A

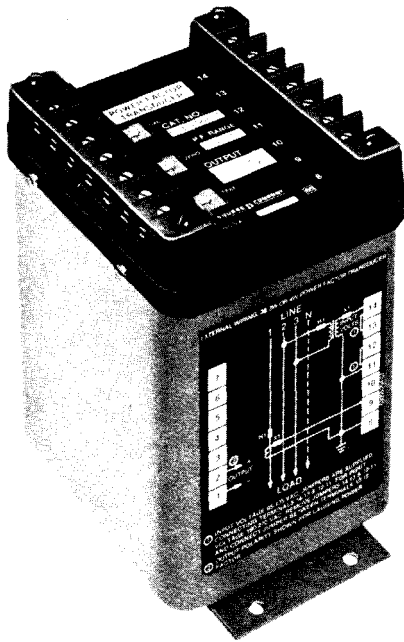
★ Add "S" to catalog number for self-powered version.

▲ Control Power for operation of electrical circuitry can be obtained from voltage input signals or from an auxiliary power source. If voltage input signals are below 85V or above 135V, an auxiliary 120VAC 60Hz 2.5VA source is required to be connected to Control Power terminals. If voltage input signal is between 85V and 135V, the Control Power terminals may be externally jumped to terminals 3 and 4 on the transducer.



Electrical Transducers

Power Factor Transducers



Catalog No.
CLE-206B31

Application

A Power Factor Transducer produces a highly accurate dc output that is linearly proportional to the phase angle difference between the voltage and current of the AC power system. This dc output has a direct cosine relationship to power factor. Bipolar output indicates not only power factor but also whether lagging or leading conditions exist. Although the output is directly proportional to the phase angle difference, actual power factor, being equal to the cosine of the angle, is readily available from computation.

Description

The Power Factor Transducer is an all-electronic computing device whose output is accurately proportional to the phase angle difference between the voltage and current of the AC power system. The power factor is equal to the cosine of the phase angle. A conversion is required if the output is to represent power factor. The output polarity is positive for

lagging phase angle (current lagging voltage) and negative for leading phase angle. The output will be "0" for unity PF (0° phase angle). This series of transducers includes single and three phase transducers with output of $\pm 1\text{mA}$ dc or $\pm 10\text{Vdc}$. The three phase transducers provide a true indication of power factor only when balanced load conditions prevail.

Specifications

Potential Range 95-135VAC
 Current Range 0.2-6.5A AC
 Burden Potential Circuit 1.75VA max.
 Burden Current Circuit (5A) 0.4VA max.
 Frequency 50-60Hz
 Temperature Range -25°C to +75°C
 Temperature Influence ± 0.3 deg. max. or $\pm .005$ PF max.

Accuracy* ± 0.60 deg. max. or ± 0.01 PF max.
 Output Ripple (peak) 0.5% max.
 Response Time (to 99%) ≤ 400 ms max.
 Zero Adjustment $\pm 2\%$ of span min.
 Calibration Adjustment $\pm 8\%$ of span min.

* Includes worst combined effects of current, voltage, frequency and load resistance.

Withstand Capabilities

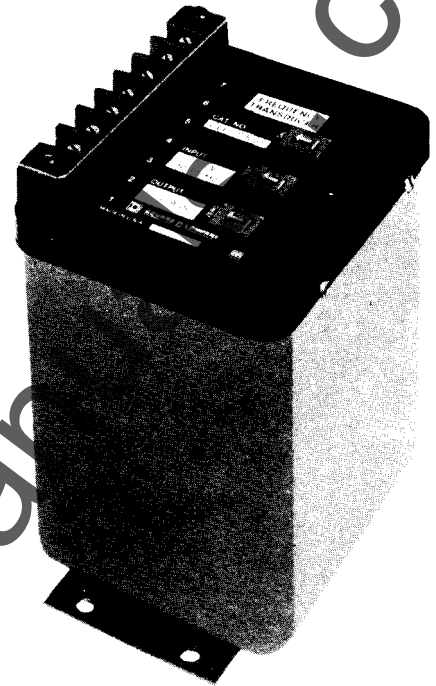
Potential Overload (continuous) 175V
 (depends on potential input connections)
 Current Overload 15A continuous
 50A 10 s/h
 250A 1 s/h
 Dielectric Withstand Voltage 1800VRMS 60Hz
 1 min. between independent
 circuits, input and output
 circuits to case.
 Transient Test Voltage (SWC) ANSI C37.90A - 1974
 IEEE STD.472 - 1974
 Impulse Test 6kV crest 100kHz
 Unidirectional Impulse $1.2 \times 50\mu\text{s}$ 6kV crest
 70A short circuit current
 Test voltage Across Output 100VRMS 2 sec.
 Output Open or Short Circuit Protected

CONNECTIONS: Figure 17 or 18 on page 18
DIMENSIONS: Style 2 on page 19

TYPE SYSTEM	RANGE PHASE ANGLE (PF)	OUTPUT	
		0 \pm 1mA dc (RL = 0-10k)	0 \pm 10Vdc (RL = 2k- ∞)
Single Phase or 3 ϕ , 4W	0 \pm 72.5° (.3-1-.3)	CLE-206A31	CLE-206A32
	0 \pm 60° (.5-1-.5)	CLE-206A51	CLE-206A52
	0 \pm 45.5° (.7-1-.7)	CLE-206A71	CLE-206A72
3 ϕ , 3W or 3 ϕ , 4W	0 \pm 72.5° (.3-1-.3)	CLE-206B31	CLE-206B32
	0 \pm 60° (.5-1-.5)	CLE-206B51	CLE-206B52
	0 \pm 45.5° (.7-1-.7)	CLE-206B71	CLE-206B72



Electrical Transducers
Frequency Transducers
Series CLE-20300



Catalog No.
CLE-203651

Application

A Frequency Transducer produces a highly accurate dc output that is linearly proportional to the input frequency of the driving source. The dc output signal is immune to load variations that fall within the load restrictions as specified in the tables below. This feature permits remote monitoring with no loss in accuracy. The output can drive analog instruments, transducer relays, recorders or the Square D Process Signal Amplifier.

Description

The Square D Company Series CLE-20300 Frequency Transducers are all-electronic devices which provide a highly accurate dc output signal that is linearly proportional to the frequency of the system being monitored. The accuracy of the output signal is maintained within $\pm 0.02\%$ of the nominal center frequency. Units having either a 0-1mA dc or 0-10Vdc

output are available to match the input requirements of indicating or recording devices. The frequency transducer is protected against voltage surges or transients. It is housed in a grey finished steel housing with injection molded plastic cover having unbreakable terminal blocks and sliding access covers for zero and span adjustments.

CONNECTIONS:
DIMENSIONS:

Figure 16 on page 18
Style 4 on page 19

Specifications

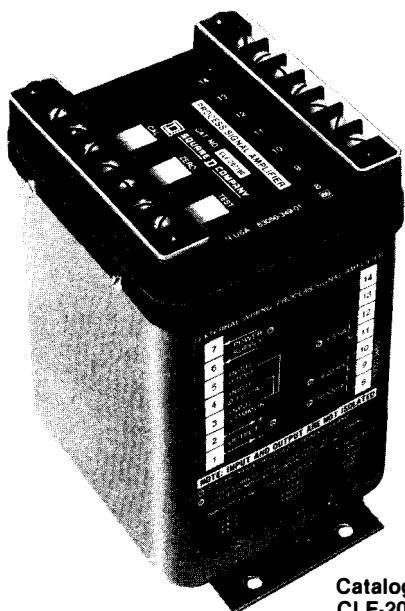
DESCRIPTION	CURRENT OUTPUT MODELS			VOLTAGE OUTPUT MODELS		
	CLE-203451	CLE-203551	CLE-203651	CLE-203452	CLE-203552	CLE-203652
Input Voltage ($\pm 15\%$)	120VAC	same	same	120VAC	same	same
Overload (continuous)	180VAC	same	same	180VAC	same	same
Frequency Range	375-425Hz	45-55Hz	55-65Hz	375-425Hz	45-55Hz	55-65Hz
Burden (max.)	3.0 VA	same	same	3.0 VA	same	same
Temperature Range	-20°C to +70°C	same	same	-20°C to +70°C	same	same
Response (to 99%)	≤ 400 ms	same	same	≤ 400 ms	same	same
Output (RO)	0-1mA dc	0-1mA dc	0-1mA dc	0-10Vdc	0-10Vdc	0-10Vdc
Load Resistance (RL) ohms	0-10k	0-10k	0-10k	2k- ∞	2k- ∞	2k- ∞
Accuracy % of Center Frequency	$\pm 0.02\%$ @ 25°C	same	same	$\pm 0.02\%$ @ 25°C	same	same
Ambient Temperature Effects (max.)	$\pm 0.0025\%/^{\circ}\text{C}$	same	same	$\pm 0.0025\%/^{\circ}\text{C}$	same	same
Ripple (peak)	1.0% max.	same	same	1.0% max.	same	same
Adjustments	Zero ($\pm 10\%$) Span ($\pm 10\%$)	same	same	Zero ($\pm 10\%$) Span ($\pm 10\%$)	same	same
Dielectric Test Voltage (1 min.)	1800VRMS	same	same	1800VRMS	same	same
Transient Test Voltage Across Input Circuit and Input Circuit to Case	ANSI C37.90A - 1974 IEEE STD 472 - 1974					
Impulse Test	6kV Crest 100kHz					
Unidirectional Impulse Test	1.2 x 50 μ s 6kV Crest, 70A Short Circuit Test					



Electrical Transducers

Process Signal Amplifier

Type CLE-207100 and Type CLE-207200



Catalog No.
CLE-207100

Application

The Process Signal Amplifier, Catalog No. CLE-207100 converts either a 0-1mA dc or 0-10Vdc transducer output to the input signal requirements of many recorders, process controllers and signal conditioners. The three most commonly used output signals are available, 1-5mA dc, 4-20mA dc or 10-50mA dc. These outputs are selectable by means of jumper strap provided with the unit. The Process Signal Amplifier is supplied connected for 4-20mA output with either a 0-1mA dc or 0-10Vdc input. 0.25% RO accuracy furnishes the tight accuracies required in transducer applications.

Catalog No. CLE-207200 is used with transducers having a ± 1.0 mA dc or ± 10 Vdc Rated Output to provide a bidirectional output of 3 ± 2 mA dc, 12 ± 8 mA dc or 30 ± 20 mA dc. It is generally used with var and power factor transducers when lag & lead PF conditions are present.

Description

The Process Signal Amplifier is an all-electronic device designed to provide a standard, non-isolated Process Signal output. Catalog No. CLE-207100 converts a 0-1mA dc or 0-10Vdc input into a field selectable output current of 1-5mA dc into a 0-4k Ω load, a 4-20mA dc into a 0-1k Ω load or 10-50mA dc into a 0-400 Ω load. Catalog No. CLE-207200 converts a 0 ± 1 mA dc or 0 ± 10 Vdc input into a bipolar field selectable output current of 1-3-5mA into a 0-4k Ω load, 4-12-20mA dc into a

0-1k Ω load or 10-30-50mA dc into a 0-400 Ω load. The amplifier is protected against damage from transients, surges or overloads. The Process Signal Amplifier is housed in a sturdy steel can with injection molded plastic cover. This permits such features as unbreakable terminal block covers, sliding access ports for calibration and zero adjustments, and in-line test jack for monitoring output current during operation.

Specifications

DESCRIPTION	RATING	
	CLE-207100	CLE-207200
Input Resistance		
Current Input	$\approx 600\Omega$	$\approx 600\Omega$
Voltage Input	$\approx 10k\Omega$	$\approx 10k\Omega$
Input Current Range	0-1.25mA dc	0 ± 1.25 mA dc
Rated Input Current	1.0mA dc	± 1.0 mA dc
Input Voltage Range	0-12.5Vdc	0 ± 12.5 Vdc
Rated Input Voltage	10Vdc	± 10 Vdc
Rated Output Current Range (field selectable)	1-5mA dc 4-20mA dc 10-50mA dc	1-3-5mA dc 4-12-20mA dc 10-30-50mA dc

Accuracy	$\pm 0.25\%$ RO
Output Load Resistance	0-4000 Ω 1-5mA range 0-1000 Ω 4-20mA range 0-400 Ω 10-50mA range
Output Ripple Peak	$< 0.5\%$ RO
Response Time (99%)	< 0.1 ms
Open Circuit Output Voltage	< 30 V dc
Temperature Range	-25°C to $+75^\circ\text{C}$

Temperature Influence	$< \pm 0.05\%$ / $^\circ\text{C}$
Relative Humidity	0-95%
Stability (per year)	$< 0.1\%$ RO
Calibration Adjustment	$\pm 10\%$ RO
Zero Adjustment	$\pm 10\%$ RO
Power Supply	85-135V 50-60Hz
Burden @ 120VAC	4.8VA max.
Input Current Overload	5mA dc continuous
Input Voltage Overload	50Vdc continuous
Dielectric Test Voltage	1800VRMS 60Hz 1 min.
Between independent circuits	
Input circuits to case and	
Output Circuits to case	
Transient Test Voltage	ANSI C37.90A- 1974
Across input circuits	
and input circuits to case	IEEE STD.472- 1974
Impulse Test	6kV crest 100kHz
Unidirectional Impulse Test	1.2 x 50 μ s 6kV crest
Output Short or Open Circuit	70A Short Circuit Test Protected

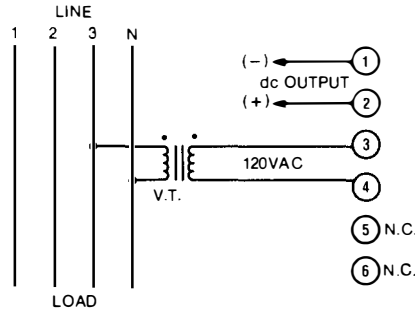
CONNECTIONS:
DIMENSIONS:

Figure 15 on page 18
Style 2 on page 19



AC VOLTAGE TRANSDUCER

CLE-201001
CLE-201001X

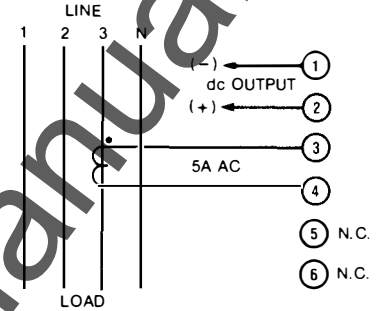


N.C. = No Connection

FIGURE 1

AC CURRENT TRANSDUCER

CLE-202001



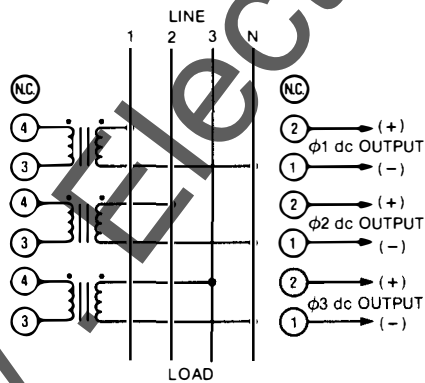
N.C. = No Connection

FIGURE 2

NOTE: Refer to Article 250-L of NEC for Instrument Transformer grounding requirements.

AC TRIPLE VOLTAGE TRANSDUCER

CLE-201031

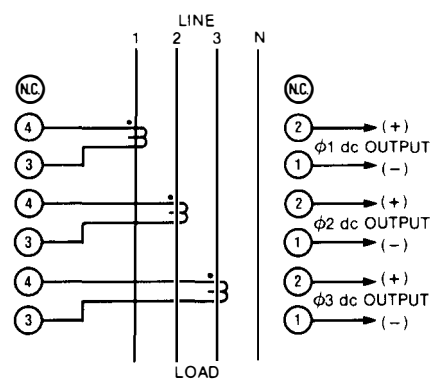


N.C. = No Connection

FIGURE 3

AC TRIPLE CURRENT TRANSDUCER

CLE-202031



N.C. = No Connection

FIGURE 4

NOTE: Refer to Article 250-L of NEC for Instrument Transformer grounding requirements.

Electrical Transducers

Transducer Wiring Diagrams

SINGLE PHASE (1-ELEMENT)
WATT TRANSDUCERS **VAR TRANSDUCERS**
 CLE-204000 CLE-204005 CLE-205000 CLE-205005

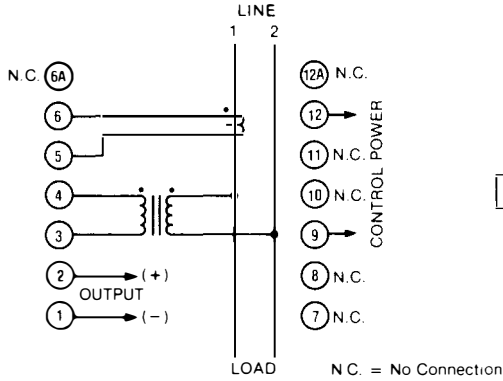


FIGURE 5

3 PHASE 3 WIRE (1½-ELEMENT)
WATT TRANSDUCERS **VAR TRANSDUCERS**
 CLE-204001 CLE-204006 CLE-205001 CLE-205006

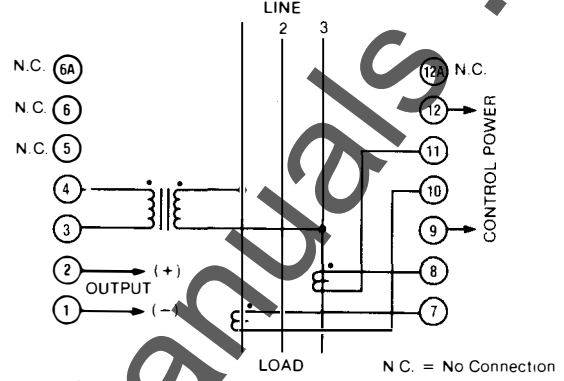


FIGURE 6

3 PHASE 3 WIRE (2-ELEMENT)
WATT TRANSDUCER **VAR TRANSDUCER**
 CLE-204002 CLE-204007 CLE-205002 CLE-205007

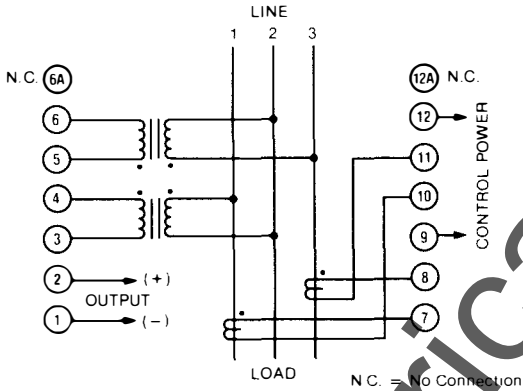


FIGURE 7

3 PHASE 3 WIRE (2½-ELEMENT CONNECTED AS 2-ELEMENT)
WATT TRANSDUCERS **VAR TRANSDUCERS**
 CLE-204003 CLE-204008 CLE-205003 CLE-205008

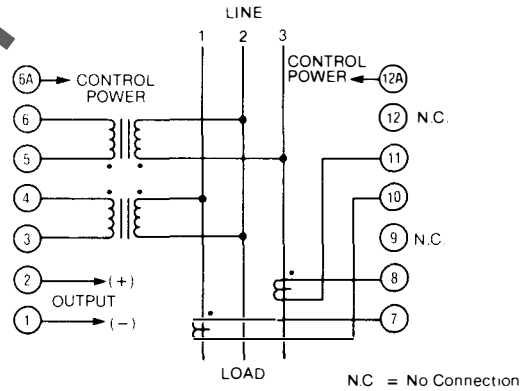


FIGURE 7A

3 PHASE 4 WIRE (2½-ELEMENT)
WATT TRANSDUCERS **VAR TRANSDUCERS**
 CLE-204003 CLE-204008 CLE-205003 CLE-205008

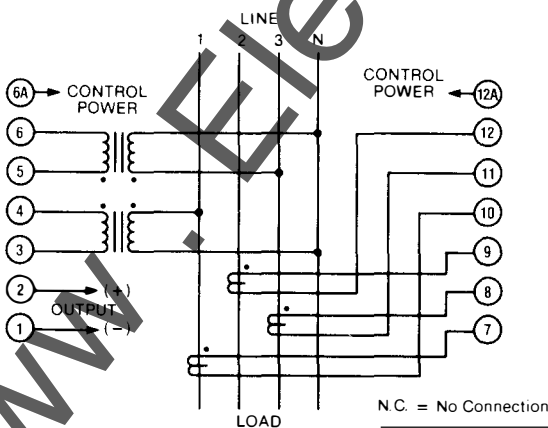


FIGURE 8

NOTE: Refer to Article 250-L of NEC for Instrument Transformer grounding requirements.

3 PHASE 4 WIRE (3-ELEMENT)
WATT TRANSDUCERS **VAR TRANSDUCERS**
 CLE-204004 CLE-204009 CLE-205004 CLE-205009

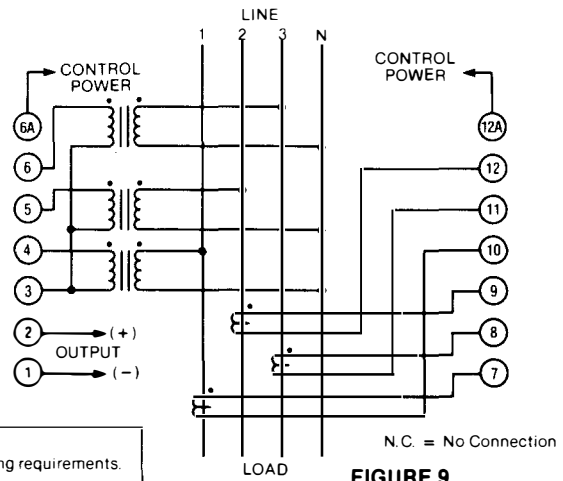


FIGURE 9



Electrical Transducers Transducer Wiring Diagrams

Transducers having catalog numbers with suffix "S" are internally wired to obtain control power from terminals 3 and 4.

SINGLE PHASE (1-ELEMENT)

3 PHASE 3 WIRE (1½-ELEMENT)

WATT TRANSDUCERS
CLE-204000S CLE-204005S

VAR TRANSDUCERS
CLE-205000S CLE-205005S

WATT TRANSDUCERS
CLE-204001S CLE-204006S

VAR TRANSDUCERS
CLE-205001S CLE-205006S

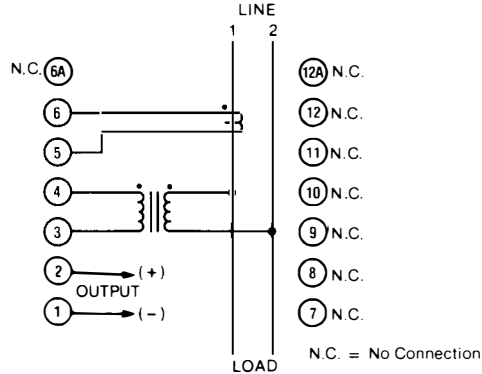


FIGURE 5 (Self Powered)

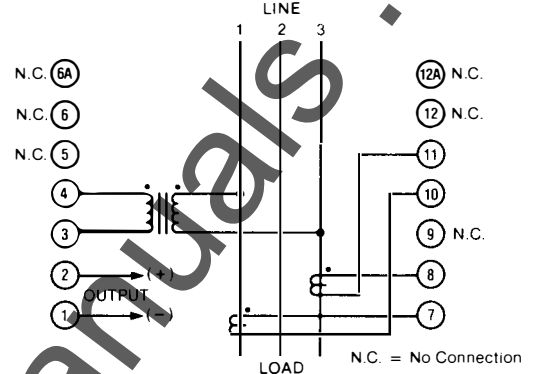


FIGURE 6 (Self Powered)

3 PHASE 3 WIRE (2-ELEMENT)

3 PHASE 3 WIRE (2½-ELEMENT CONNECTED AS 2-ELEMENT)

WATT TRANSDUCER
CLE-204002S CLE-204007S

VAR TRANSDUCER
CLE-205002S CLE-205007S

WATT TRANSDUCERS
CLE-204003S CLE-204008S

VAR TRANSDUCERS
CLE-205003S CLE-205008S

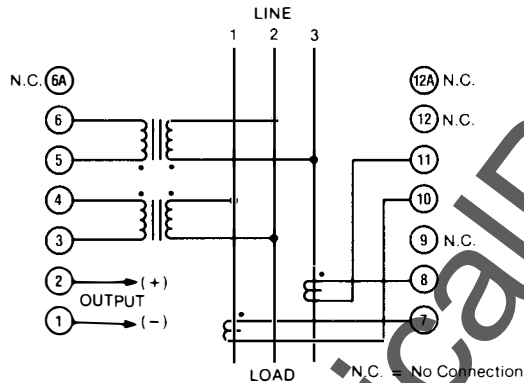


FIGURE 7 (Self Powered)

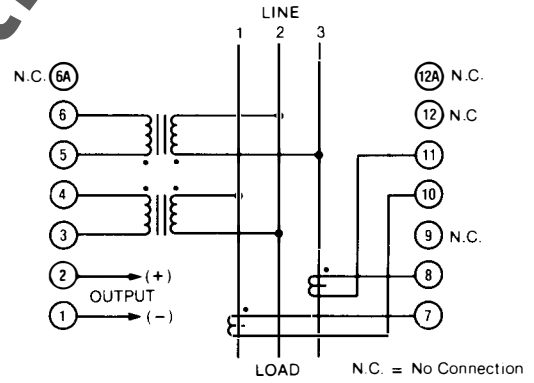


FIGURE 7A (Self Powered)

3 PHASE 4 WIRE (2½-ELEMENT)

3 PHASE 4 WIRE (3-ELEMENT)

WATT TRANSDUCERS
CLE-204003S CLE-204008S

VAR TRANSDUCERS
CLE-205003S CLE-205008S

WATT TRANSDUCERS
CLE-204004S CLE-204009S

VAR TRANSDUCERS
CLE-205004S CLE-205009S

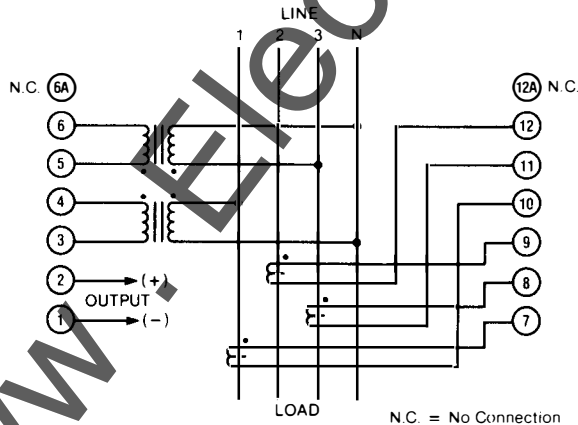


FIGURE 8 (Self Powered)

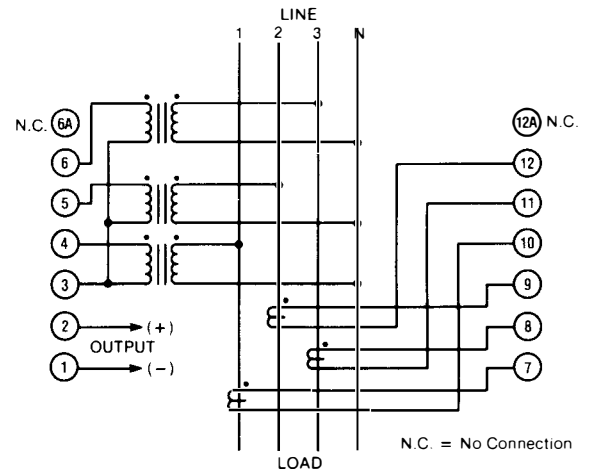


FIGURE 9 (Self Powered)

NOTE: Refer to Article 250-L of NEC for Instrument Transformer grounding requirements.



Electrical Transducers

Transducer Wiring Diagrams

COMBINATION WATT/VAR TRANSDUCERS SINGLE PHASE (1-ELEMENT)

CLE-208000 CLE-208005

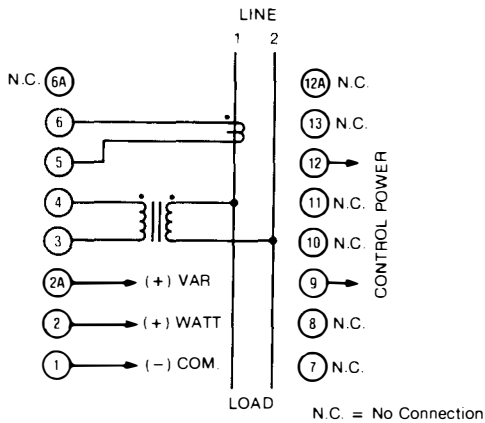


FIGURE 10

COMBINATION WATT/VAR TRANSDUCER 3 PHASE 3 WIRE (1½-ELEMENT)

CLE-208001 CLE-208006

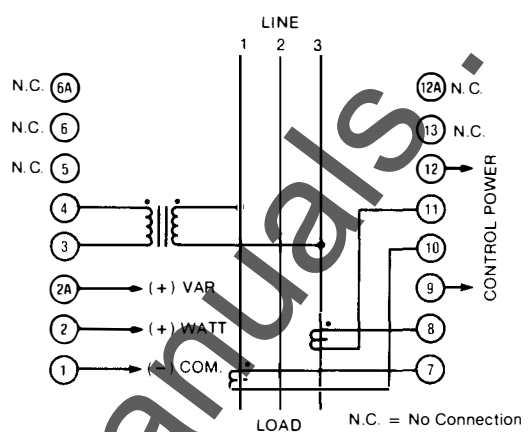


FIGURE 11

COMBINATION WATT/VAR TRANSDUCERS 3 PHASE 3 WIRE (2-ELEMENT)

CLE-208002 CLE-208007

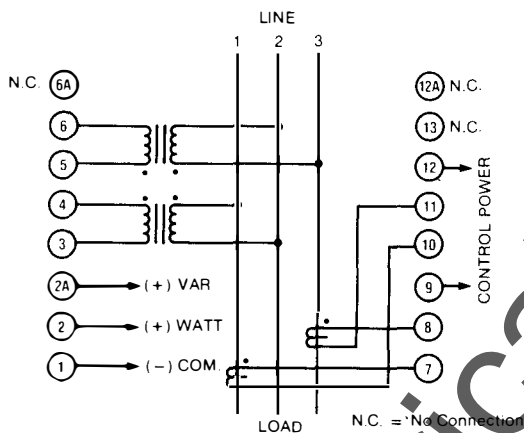


FIGURE 12

COMBINATION WATT/VAR TRANSDUCER 3 PHASE 3 WIRE (2½-ELEMENT CONNECTED AS 2-ELEMENT)

CLE-208003 CLE-208008

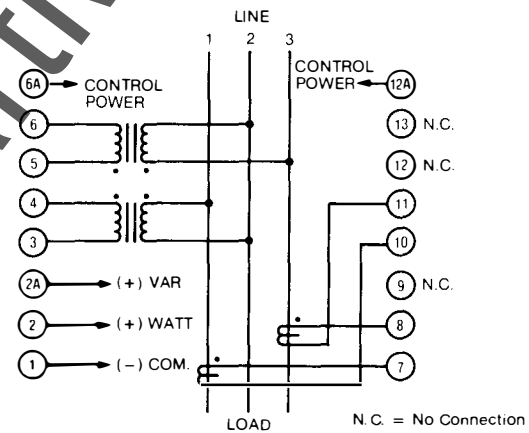


FIGURE 12A

COMBINATION WATT/VAR TRANSDUCERS 3 PHASE 4 WIRE (2½-ELEMENT)

CLE-208003 CLE-208008

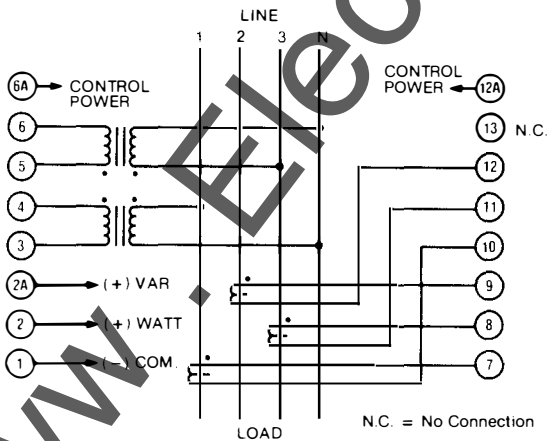


FIGURE 13

COMBINATION WATT/VAR TRANSDUCER 3 PHASE 4 WIRE (3-ELEMENT)

CLE-208004 CLE-208009

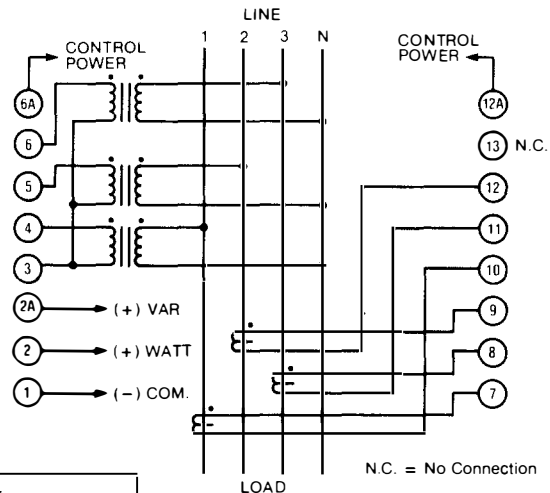


FIGURE 14

NOTE: Refer to Article 250-L of NEC for Instrument Transformer grounding requirements.



Electrical Transducers Transducer Wiring Diagrams

Transducers having catalog numbers with suffix "S" are internally wired to obtain control power from terminals 3 and 4.

COMBINATION WATT/VAR TRANSDUCERS SINGLE PHASE (1-ELEMENT)

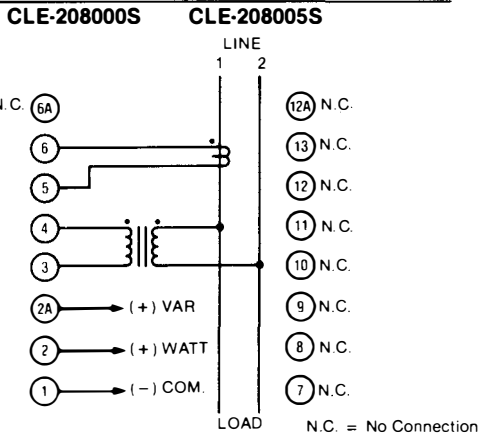


FIGURE 10 (Self Powered)

COMBINATION WATT/VAR TRANSDUCER 3 PHASE 3 WIRE (1½-ELEMENT)

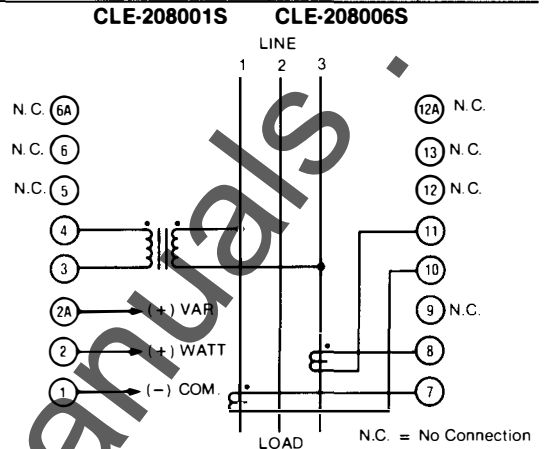


FIGURE 11 (Self Powered)

COMBINATION WATT/VAR TRANSDUCERS 3 PHASE 3 WIRE (2-ELEMENT)

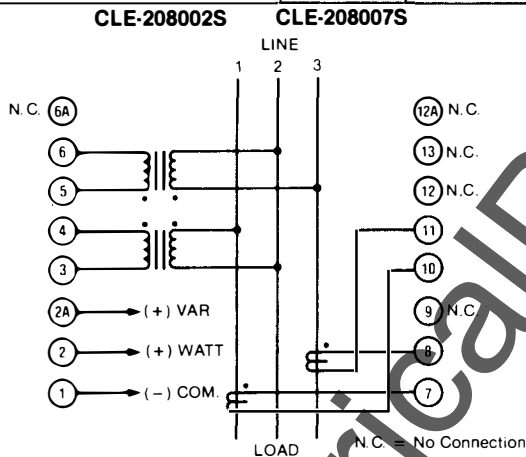


FIGURE 12 (Self Powered)

COMBINATION WATT/VAR TRANSDUCER 3 PHASE 3 WIRE (2½-ELEMENT CONNECTED AS 2-ELEMENT)

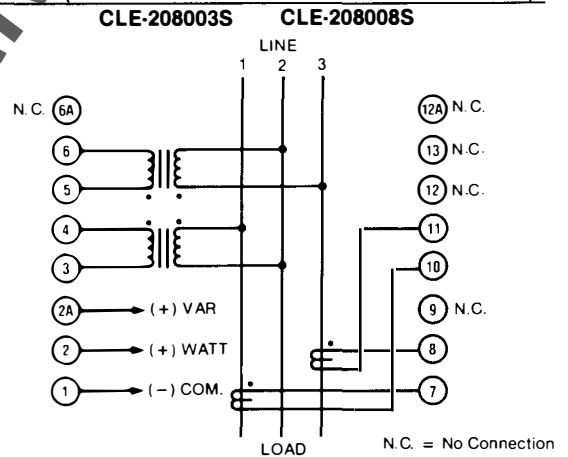


FIGURE 12A (Self Powered)

COMBINATION WATT/VAR TRANSDUCERS 3 PHASE 4 WIRE (2½-ELEMENT)

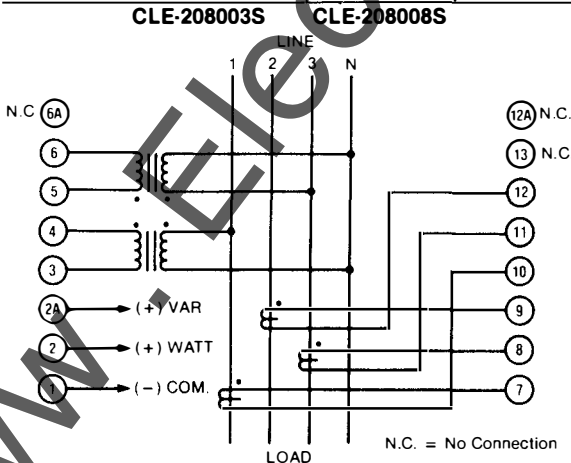


FIGURE 13 (Self Powered)

COMBINATION WATT/VAR TRANSDUCER 3 PHASE 4 WIRE (3-ELEMENT)

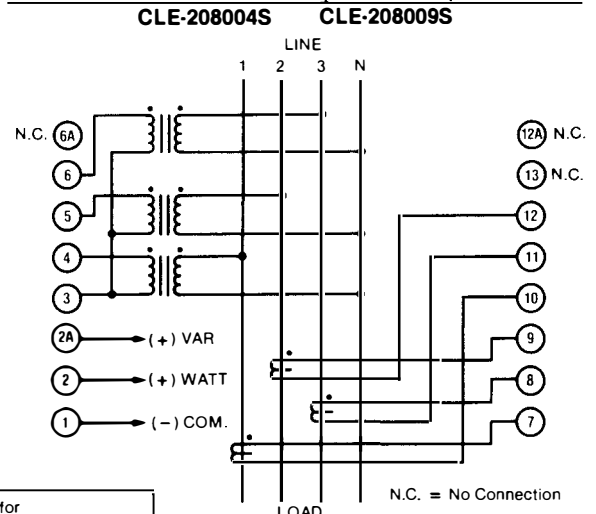


FIGURE 14 (Self Powered)

NOTE: Refer to Article 250-L of NEC for Instrument Transformer grounding requirements.

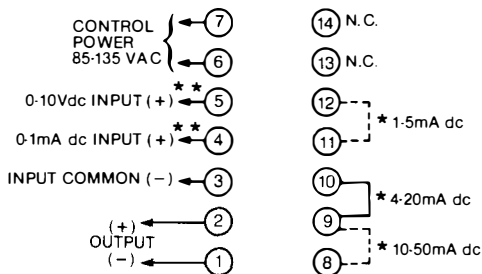


Electrical Transducers

Transducer Wiring Diagrams

PROCESS SIGNAL AMPLIFIER

CLE-207100
CLE-207200



* STRAP POSITION FOR OUTPUT CURRENT DESIRED. SHOWN CONNECTED FOR 4-20mA dc OUTPUT.

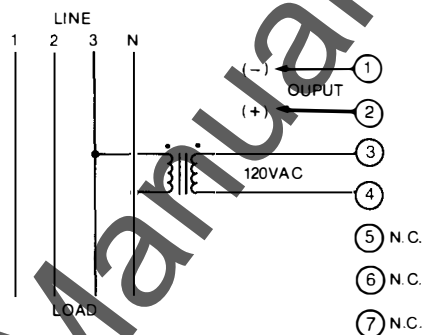
** 0 ± 10Vdc or 0 ± 1mA dc for CLE-207200

N.C. = No Connection

FIGURE 15

FREQUENCY TRANSDUCERS

CLE-203451 CLE-203452
CLE-203551 CLE-203552
CLE-203651 CLE-203652

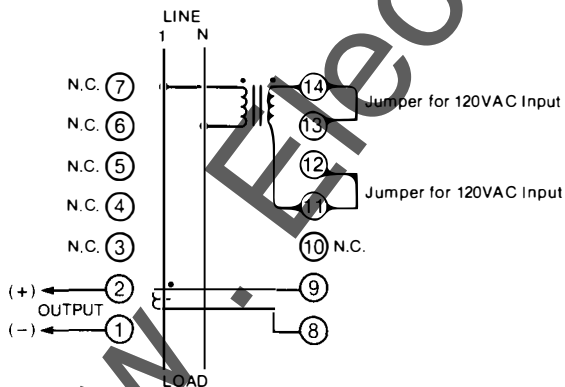


N.C. = No Connection

FIGURE 16

POWER FACTOR TRANSDUCERS (SINGLE PHASE OR 3φ, 4W)

CLE-206A31, CLE-206A32
CLE-206A51, CLE-206A52
CLE-206A71, CLE-206A72

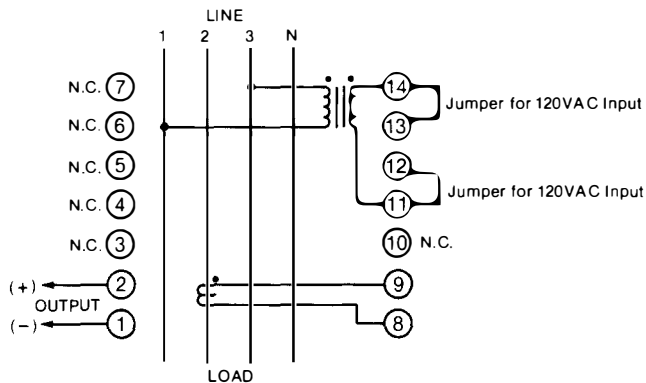


N.C. = No Connection

FIGURE 17

POWER FACTOR TRANSDUCERS (3φ3W or 3φ, 4W)

CLE-206B31, CLE-206B32
CLE-206B51, CLE-206B52
CLE-206B71, CLE-206B72



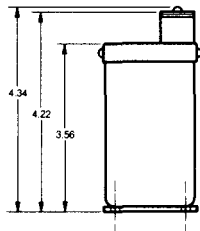
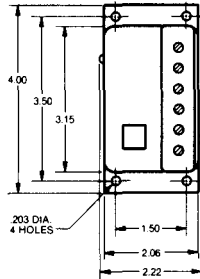
N.C. = No Connection

FIGURE 18



Electrical Transducers Transducer Dimensions

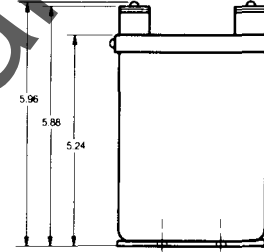
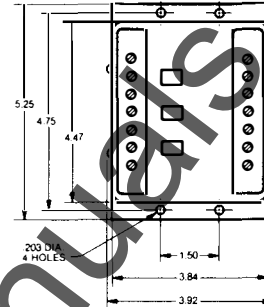
AC VOLTAGE TRANSDUCER
AC EXPANDED SCALE
VOLTAGE TRANSDUCER
AC CURRENT TRANSDUCER



STYLE 1

Approx. Shipping Wt. = 1 lb.

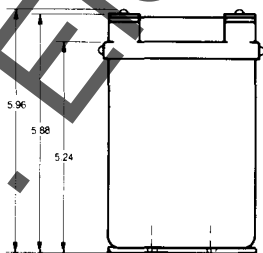
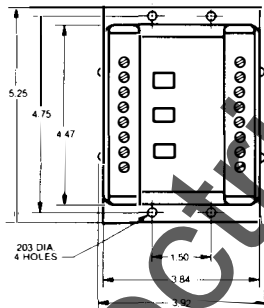
AC TRIPLE VOLTAGE TRANSDUCER
AC TRIPLE CURRENT TRANSDUCER
WATT TRANSDUCERS
VAR TRANSDUCERS
PROCESS SIGNAL AMPLIFIER
POWER FACTOR TRANSDUCERS



STYLE 2

Approx. Shipping Wt. = 3.2 lbs.

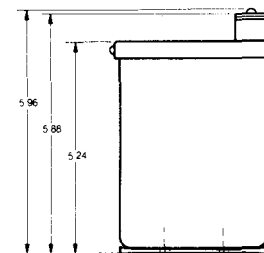
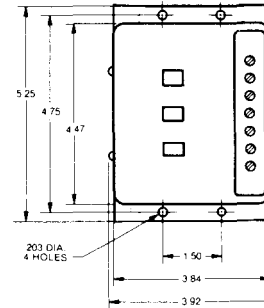
COMBINATION WATT/VAR TRANSDUCERS



STYLE 3

Approx. Shipping Wt. = 3.7 lbs.

FREQUENCY TRANSDUCERS



STYLE 4

Approx. Shipping Wt. = 2.7 lbs.

www.ElectricalPartManuals.com

For ordering information on
Electrical Transducers, contact:

Square D Company
P.O. Box 6440
Clearwater, FL 34618-6440
1-800-525-0012
Attn: Marketing Department

