BE1-CDS240 CURRENT DIFFERENTIAL PROTECTION SYSTEM with VOLTAGE

DEVICE FUNCTIONS

24	27	47	50
51	59	60	62
81	87N	87R	87U
	BF	DNP 3 Option	Modbus Option

The **BE1-CDS240 Current Differential Protection System** is a 3 phase multifunction numerical relay that provides percentage restrained differential protection along with overcurrent, voltage, frequency, breaker failure, control, metering, monitoring, and alarm functions in an integrated system. The **BE1-CDS240 Current Differential Protection System** is available with 2, 3, or 4 sets of low impedance 3 phase restraint inputs. All configurations include one set of 3 phase voltage inputs.

ADVANTAGES

- Up to 4 sets of 3 phase current inputs, plus standard 3 phase voltage and independent ground inputs provide complete protection and metering for 2 to 4 terminal differential applications.
- 10 to 14 contact outputs and 8 to 12 contact inputs, all BESTlogic programmable, plus a dedicated alarm output.
- All versions include harmonic restraint for use in transformer applications. Detailed differential check report provides confirmation of proper CT connections.
- "Virtual Circuits" allow internal summing of 2 or 3 sets of currents for use in protection and metering.
- The CDS240 is available in horizontal and vertical configurations to provide cost savings in any installation. The CDS240 uses a drawout module with automatic CT shorting facilities and fits cutout and drilling dimensions for many common Basler Electric, GE, and Westinghouse differential relays.
- Phase shift and tap compensation set automatically based on simple selection of transformer and ct connection, or on direct entry of IEC transformer vector groups through graphical user interface. Compensates for all common combinations of delta, wye, and zig-zag connections.
- Non-volatile storage of all target, oscillography, fault records, and SER data.

(continued)

WINDOWS® SOFTWARE

Interface for setting and communicating with Basler protection products. Request BESTCOMS for BE1-CDS240 (includes "settings compare" feature).

An evaluation copy of BESTWAVE*Plus* program and manual for viewing oscillography files stored in COMTRADE format are provided with the relay. Validation and updates of the program may be obtained from www.BESTWAVEPLUS.com.

ADDITIONAL INFORMATION

INSTRUCTION MANUAL
Request publication 9365200990

MODBUS™ INSTRUCTION MANUAL
Request publication 9365200991

DNP 3.0 INSTRUCTION MANUAL
Request publication 9365200992

Basler Electric

ADVANTAGES, continued

- Variable sample rate for frequency tracking allows for high accuracy in generator and motor differential applications.
- BESTlogic provides the user with complete flexibility in configuring a protection and control system. User programmable variable and switch names make the CDS240 relays completely self-documenting.
- Each CT circuit is low burden and isolated to allow improving zones of protection with fewer costly CTs.
- Large Bit Addressable LCD display allows the relay to replace local indication and control functions such as panel metering, alarm annunciation, and control switches.
- Three independent communications ports allow integration with distributed control systems, modems, and fixed or portable PCs. DNP and Modbus™ protocols are optionally available.
- Current circuits not used for differential protection can be used for independent overcurrent protection functions.
- Direct entry of IEC vector group or transformer winding configuration with automatic calculation of compensation. No need for compensation calculations in most cases.

FEATURES

PROTECTION and CONTROL FUNCTIONS	
24	V/Hz overexcitation for transformer backup applications. One.
27P,127P	Three phase undervoltage protection with pp or pn monitoring and 1 of 3, 2 of 3, 3 of 3 logic. Two.
43, 143-743	Virtual Selector Switches. Eight.
47	Negative Sequence overvoltage. One.
50BF1-50BF4	Breaker Failure. Four.
50TP, 150TP-750TP 50TN, 150TN-450TN 50TQ, 150TQ-350TQ	Instantaneous overcurrent with Settable Time Delay for each operating quantity (A, B, C, N (using IN or IG), Q). Eight sets Phase, Five sets Neutral, Four sets Negative Sequence
51P, 151P-351P	Phase Inverse Time Overcurrent with highest phase timing, voltage restraint or voltage control. Four.
51N, 151N-451N	Ground Inverse Time Overcurrent with ability to monitor IN or IG. Five.
51Q, 151Q-351Q	Negative Sequence Inverse Time Overcurrent. Four.
59P, 159P	Three phase overvoltage protection with pp or pn monitoring and 1 of 3, 2 of 3, 3 of 3 logic. Two.
59X	Zero sequence overvoltage protection for ground faults on ungrounded systems using calculated 3I0.
60FL	VT fuse loss monitoring. One.
62, 162-362	General Purpose Logic Timers. Four.
81, 181, 281, 381, 481, 581	Over/under frequency. Six.
87	Phase Current Differential Protection, restrained and unrestrained trips
87ND, 187ND	Ground Current Differential
101, 101A-101C	Virtual Breaker Control Switch with tagging function. Four.
	Four protection settings groups with Automatic Setting Group Selection with load, unbalance, and logic control.
	All current based functions are individually programmable for which CT input circuit is monitored.
	Programmable logic using BESTlogic.

FEATURES, continued

METERING FUNCTIONS	
Phase Currents	Each circuit, Phase IA, IB, IC
Negative Sequence Current	IQ=1I2
Neutral Current	3 Phase Residual, IN=3I0
Independent Ground Current Input	Aux Ct (IG)
Phase Voltages	VAN, VBN, VCN, VAB, VBC, VCA
Positive Sequence Voltage	V1
Negative Sequence Voltage	V2
Neutral Voltage	3 Phase Residual, 3V0
Frequency on 3 phase input, VP	FREQP
Power Factor**	Based On Total 3 Phase Watts/VARs
Watts 3 Phase**	WATT3
VARs 3 Phase**	VAR3
VA 3 Phase**	S
Watts per phase (with 4W connection only)**	WATTA, WATTB, WATTC
VARs per phase (with 4W connection only)**	VARA, VARB, VARC
Demand Currents, Voltages, Watts, VARs**	IA, IB, IC, Iavg, IN, IG, IQ, VA, VB, VC, Vavg, WATT3, VAR3

** watts, vars, power factor calculated for 1 circuit only. User selects which currents to associate with the voltage inputs for these calculations.

- Real time tap and phase compensated restraint and operate currents for each differential element
- Real time 2nd and 5th harmonic restraint currents for each differential element
- 1% meter accuracy down to 10% nominal current

REPORTS

- Current Demands for phase, neutral and negative sequence for designated CT input — magnitudes and time stamps are recorded for today's peak, yesterday's peak, and peak since reset (calculation settable for thermal, sliding block average, and block average)
- Optional 4000 point log of demand reading
- Breaker operations counter and contact wear duty for up to 4 breakers
- Transformer through-fault duty statistics
- Current and differential check reports to verify proper connection, setup, and operation.

FAULT RECORDING

- 511 event sequence of events report with I/O and alarm sub-reports
- Fault Reporting; 1 or 2 oscillography records per fault report
- All sequence of events, fault record reports, and oscillographic records stored in non-volatile FLASH memory.
- Total number of fault and oscillography records settable from 6 to 32
- Total of 480 cycles oscillography memory @ 24 samples/cycle
- COMTRADE format

COMMUNICATIONS PORTS

- Three independent general purpose communication ports
  - Front RS-232 ASCII communications
  - Rear RS-232 ASCII communications
  - Rear RS-485 ASCII, DNP3.0, or Modbus™
- IRIG-B time sync (unmodulated)

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SELF TEST AND ALARM FUNCTIONS

- Relay Fail, major alarm and minor alarm LEDs, and fail-safe alarm output contact
- Extensive internal diagnostics monitor all internal functions of the relay
- More than 70 additional alarm points — programmable for major or minor priority, including:
  - Phase demand overload alarm
  - Neutral and negative sequence unbalance demand alarms
  - Three breaker alarm points—programmable for slow trip, interruption duty threshold, or operations counter

FEATURES, continued

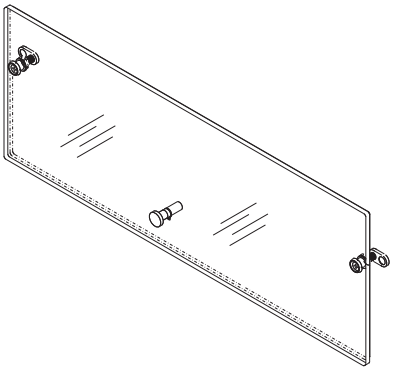
- Three transformer alarm points—programmable for through fault operations or accumulated through fault duty
- Transformer differential alarm monitors Iop/Ires characteristics to alarm if nearing trip condition on load. Diagnostics provide indication of polarity, phase shift and tap mismatch conditions
- Up to 4 trip circuit voltage and continuity monitors, jumper selectable
- Programmable logic alarms

PROGRAMMABLE I/O

Option	Inputs	Form A Outputs	Form C Outputs	Alarm Outputs
A	12	8	2	1
E	8	12	2	1

HARDWARE FEATURES

- Case configurations
  - MX Vertical: M1, M2/FT31, FT32 size, drawout
  - L Vertical: L2/FT42 size, drawout
  - MX Horizontal: panel or 19" rack mount, drawout
- Active CT technology for low burden and increased dynamic range
- Flash Memory for upgrading embedded programming without changing chips
- HMI with Graphic LCD display
- Optional cover (see below)



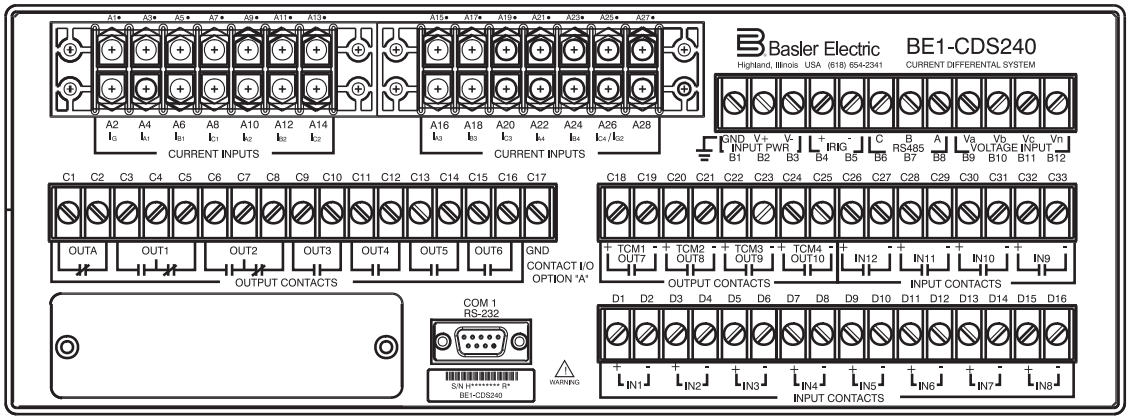


Figure 1 - CDS240 Rear Panel Connections, Contact I/O Option "A"

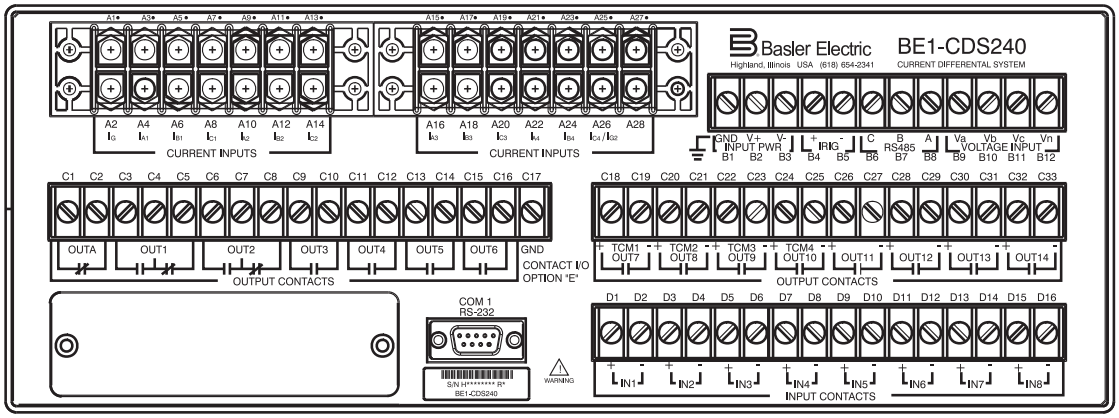


Figure 2 - CDS240 Rear Panel Connections, Contact I/O Option "E"

APPLICATIONS

The BE1-CDS240 Current Differential Protection System provides percentage restrained differential protection along with multiple overcurrent, voltage, and frequency elements and is intended for use in any low impedance current differential protection application including transformer, generator, motor, and bus protection. Its unique capabilities make it ideally suited for applications with the following requirements:

- Applications for differential protection combining 2 to 4 restraint inputs with voltage, frequency, and power monitoring and metering.
- Applications that require low burden to extend the linear range of CTs.
- Applications where dedicated CTs for the differential are not available. Unlike traditional differential relays, dedicated CT circuits are not required because each CT input is isolated from the others and phase shift compensation can be accomplished internally.
- Applications that require high accuracy across a wide frequency range such as for motor, generator, and generator step-up transformer protection or in cogeneration facilities.
- Applications that require the flexibility provided by wide settings ranges, multiple setting groups, and multiple coordination curves in one unit.
- Applications that require the economy and space savings provided by a multifunction, multiphase unit. This one unit can provide all the protection as well as local and remote indication, metering, and control required on a typical circuit.
- Applications that require harmonic restraint to aid security for the differential.
- Applications that require communication capability and protocol support.
- Applications where the optional case configurations facilitate modernizing protection and control systems in existing substations.
- Applications where the capabilities of a digital multifunction relay are required, yet drawout construction is also desirable.
- Applications where bus protection is provided by a high speed overcurrent blocking scheme on the transformer bus mains instead of dedicated bus differential circuit.
- Applications where the capabilities of intelligent electronic devices (IEDs) are used to decrease relay and equipment maintenance costs.

FUNCTIONAL DESCRIPTION

The BE1-CDS240 relays use advanced digital signal processing to enhance differential protection. Numerical technology allows this multifunction relay to provide unprecedented flexibility, security, and performance in differential protection.

Numerical design, with **16 bit A/D** precision, **frequency tracking, digital filters**, and **active CTs** provides high accuracy and wide dynamic range, resulting in wide settings ranges. The differential protection element can even handle mismatch between current inputs with a **tap adjust range of 10:1**.

The percentage restrained differential element can be set to respond to either percent of **maximum** through current or percent of **average** through current. Maximum restraint is recommended, because it uses information from the best-performing CT to restrain the differential element. The flexibility provided by numerical design allows us to also offer average restraint to emulate the operating characteristic of common electromechanical differential relays.

To improve security from misoperation on false differential caused by CT saturation, the differential protection element includes a **transient monitor** that monitors the restraint and operate currents to detect false differential current caused by CT saturation. The relay then modifies its response to enhance security under this condition.

To improve security from misoperation during inrush in transformer protection applications, the percentage restrained differential element includes **2nd harmonic restraint**. Since the 2nd harmonic component of inrush current may not be equally shared on all three phases, misoperation can occur on a phase with low 2nd harmonic content. Our unique method of **2nd harmonic sharing** improves security by allowing the harmonic restraint elements to respond to the ratio of operate current to the sum of harmonic current measured on all three phases. This is superior to other methods of cross blocking, since each phase element operates independently in its comparison of operating current to harmonic current. Thus, security is enhanced without sacrificing dependability, because a faulted phase will not be restrained by inrush on unfaulted phases.

FUNCTIONAL DESCRIPTION, continued

To further enhance security from false tripping on inrush, the operating characteristic responds only to the fundamental component of this highly distorted current – reducing sensitivity to inrush current, yet allowing improved sensitivity to power system faults. Advanced digital signal processing also provides flexibility for application of differential relays with simpler CT connections. **Phase shift** and **zero sequence compensation** can be done internally in the relay, eliminating the need for special CT connections. Connecting CTs in wye simplifies CT circuit checkout and reduces burden on the CT circuit itself, reducing the likelihood of misoperation caused by CT saturation. The internal zero sequence compensation can even accommodate additional ground sources such as zig-zag grounding banks within the zone of protection.

With **all CT inputs isolated** and **low burden**, and the ability to connect all CTs in wye, the need for dedicated CTs for differential protection is eliminated, allowing zones of protection to be improved with fewer CTs required. However, the BE1-CDS can also accept traditional differential CT connections to make retrofit and modernization projects simple.

BESTlogic

BESTlogic programmable logic provides the user with high flexibility in configuring a protection and control system.

Each of the protection and control functions in the BE1-CDS is implemented as an independent function block that is equivalent to its single function, discrete device counterpart. Each independent function block has all the inputs and outputs that the discrete component counterpart might have. Programming BESTlogic is equivalent to choosing the devices required by your protection and control scheme and drawing schematic diagrams to connect the inputs and outputs to obtain the desired operational logic.

The BE1-CDS relay can store, as user settings, one user programmable, custom logic scheme in the relay, and an unlimited number on a PC using Basler's "Logic Library" function. To save you time, several preprogrammed logic schemes have also been provided. Any of the preprogrammed schemes may be copied into the logic settings without making any additional BESTlogic settings.

BESTlogic provides the protection engineer with the flexibility to set up this powerful multifunction system with the same freedom that was once enjoyed with single function, discrete devices. It is no longer necessary to compromise your standard protection and operating practices to deal with the limitations in programmability of previous multifunction devices.

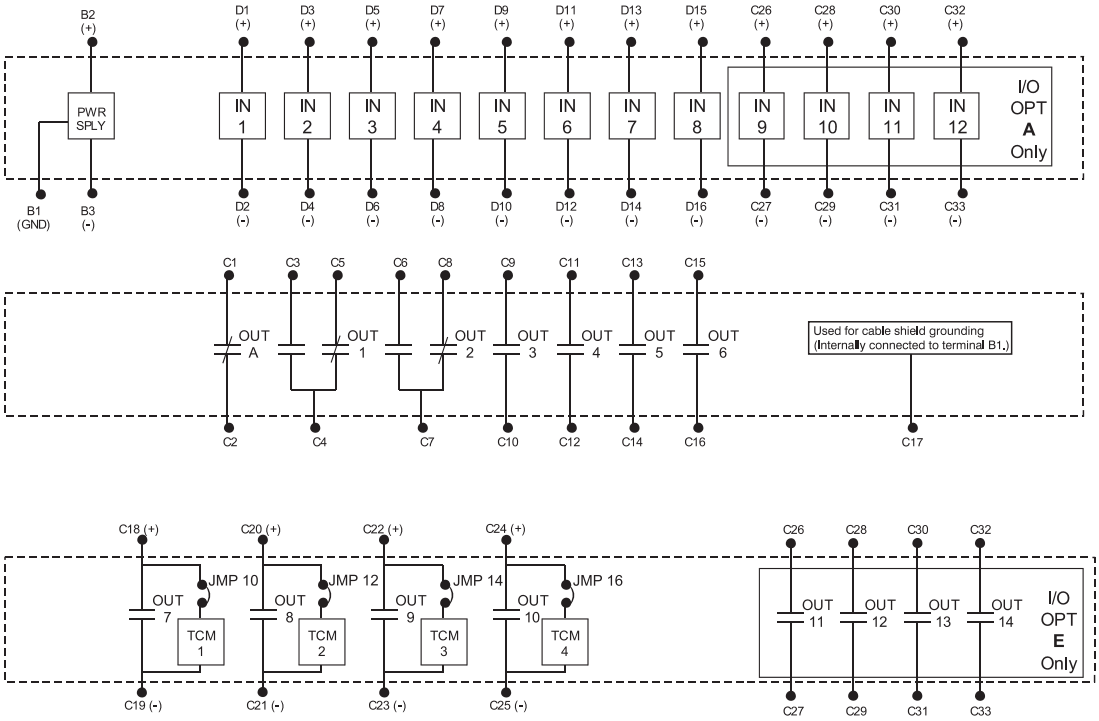


Figure 3 - DC Connections

FUNCTIONAL DESCRIPTION, continued

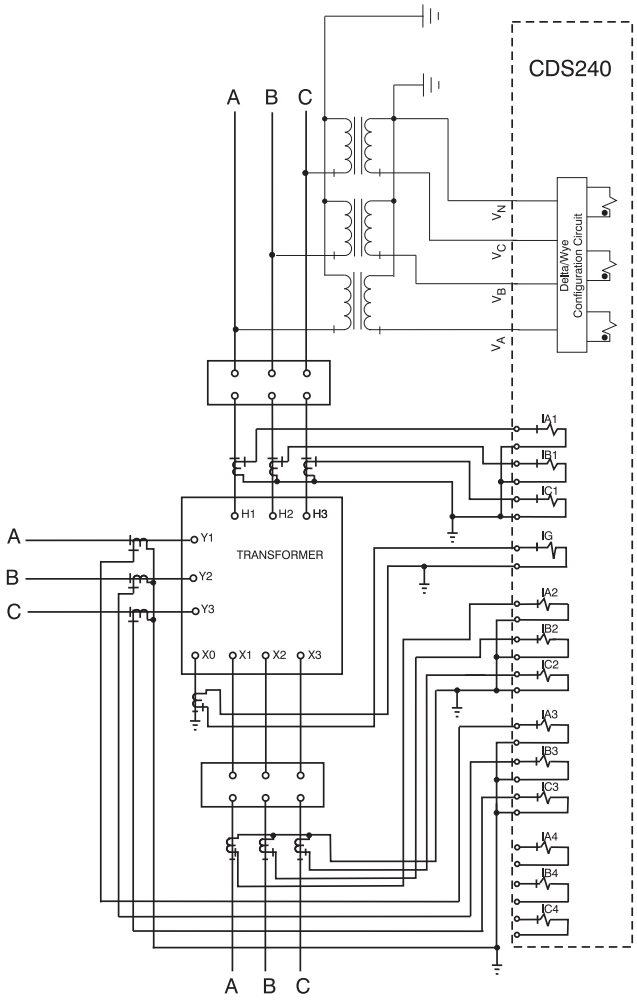


Figure 4 - Typical AC Connection for Three-Winding Application

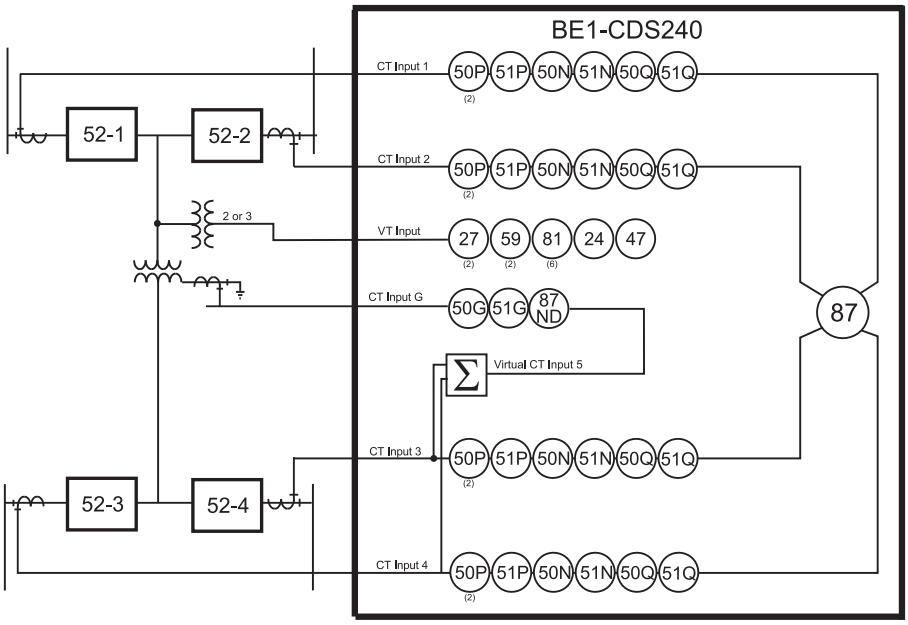


Figure 5 - Typical Application, Two-Winding Transformer with 4 Restraint Connections

FUNCTIONAL DESCRIPTION, continued

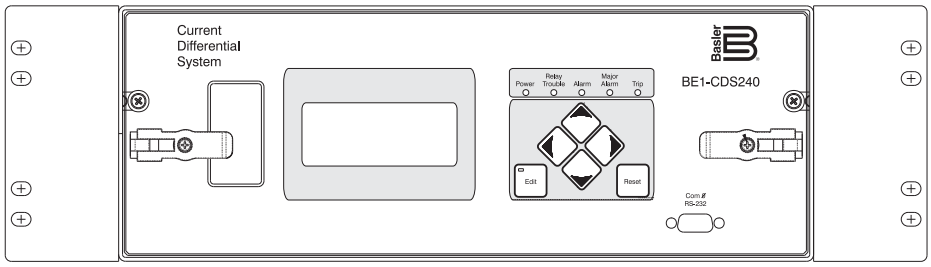


Figure 6 - CDS240 Horizontal Rack Mount Version, Occupies 3U high

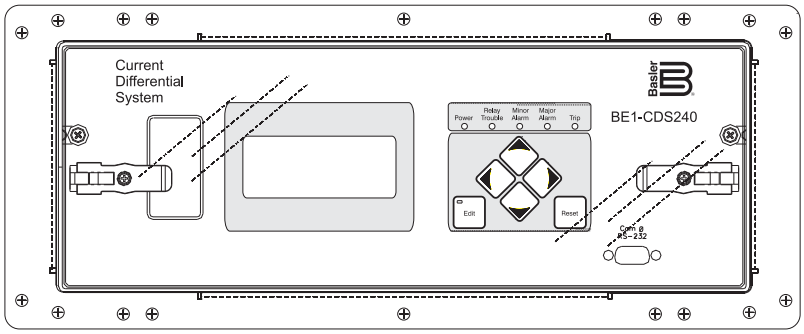


Figure 7 - CDS240 Horizontal Panel Mount Version (with optional cover)

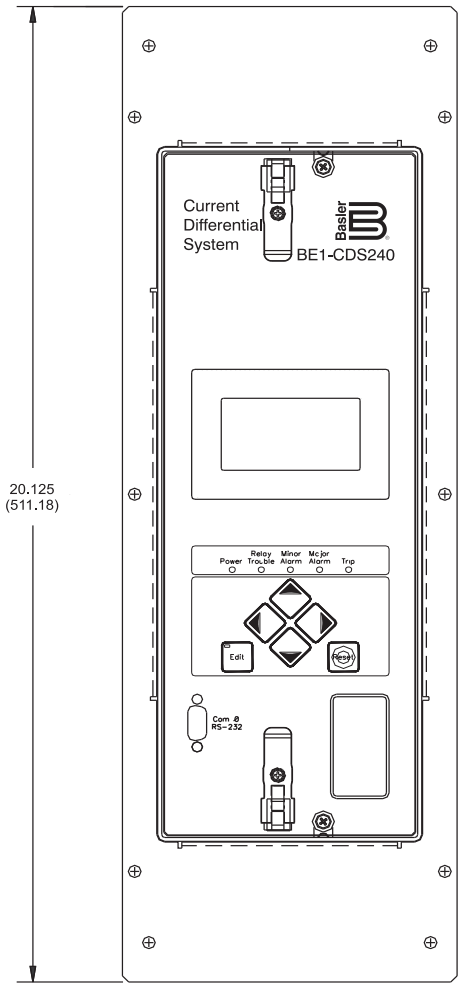


Figure 8 - CDS240 Vertical Panel Mount Version, L-size
Fits cutout and drilling dimensions of GE L2 and Westinghouse FT42 cases

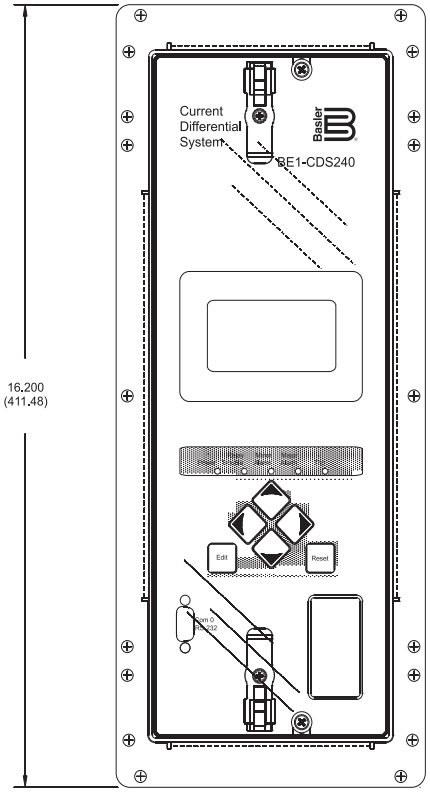


Figure 9 - CDS240 Vertical Panel Mount Version, M-size
Fits cutout and drilling dimensions of BE M1, GE M1 and M2, and Westinghouse FT31 and FT32 cases

GENERAL SPECIFICATIONS

5 Amp CURRENT INPUTS

Continuous:	20 Amps
One Sec. Rating:	400 Amps
Saturation limit:	150 Amps
Burden:	<10 milliohms @ 5A

1 Amp CURRENT INPUTS

Continuous:	4 Amps
One Sec. rating:	80 Amps
Saturation limit:	30 Amps
Burden:	<22 milliohms @ 1A

PHASE AC VOLTAGE INPUTS

Continuous:	300V, Line to Line
One Sec. rating:	600V, Line to Neutral
Burden:	Less than 1VA @ 300Vac

A/D CONVERTERS

Output of FIR filter: 24 samples/cycle*
* Adjusted to input frequency 40-63Hz

POWER SUPPLY

Option 1: DC Range 35-150V, AC Range 55-135V
Burden - 11W continuous, 15W max.
Option 2: DC Range 90-300V, AC Range 90-270V
Burden - 10W continuous, 13W max.
Option 3: DC range 17-32V (down to 8V for momentary dips)
Burden - 12W continuous, 16.5W max.

TRIP CONTACTS

Make and carry:	30A (0.2sec)
Continuous:	7A
Break:	0.3A DC (L/R=0.04)

CONTROL INPUTS

Wetting voltage range:

	Low Range		High Range	
Power Supply Option	Turn-on Voltage Range	Burden	Turn-on Voltage Range	Burden
1) 48/125 Vac/Vdc	26-38 Vac/dc	23k ohms	69-100 Vac/dc	53 k ohms
2) 125/250 Vac/Vdc	69-100 Vac/dc	66k ohms	138-200 Vac/dc	123 k ohms
3) 24 Vdc	N/A	N/A	Approx. 5 Vdc	6 k ohms

Control inputs recognize both DC and AC voltages.

COMMUNICATION PORTS

Response Time: <100mSec for metering control functions
Baud Rate: 300 - 19200
500Vdc in accordance with UL-508

ELECTRICAL ENVIRONMENT

- IEEE C37.90-1989 Standard for Relays and Relay Systems Associated with Electric Power Apparatus
- IEC 255-5 Insulation Test for Electrical Relays Impulse and Dielectric Strength (2000Vac at 50/60Hz)
- IEEE C37.90.1-1989 Standard Surge Withstand Capability Tests for Relays and Relay Systems Associated with Electric Power Apparatus
- IEC 255-22-1 1MHz Burst Disturbance Tests for Electrical Disturbance Tests for Measuring Relays and Protection Equipment
- EN 61000-4-4 Electrical Fast Transient/Burst Immunity Test
- EN 61000-4-3 Radiated, Radio-frequency, Electromagnetic Field Immunity Test
- Type tested using a 5-watt, hand-held transceiver in the ranges of 144 and 440MHz with the antenna placed within 6 inches of the relay.
- IEEE C37.90.3 (Jan. 01) Draft Standard Electrostatic Discharge Tests for Protective Relays
- EN 61000-4-2 Electrostatic Discharge Immunity Test

MECHANICAL ENVIRONMENT

- Operating temperature range: -40°C to 70°C* (-40°F to 158°F)
  *LCD Display is inoperative below -20°C.
- Storage temperature range: -40°C to 70°C (-40°F to 158°F)
- Humidity: Qualified to IEC 68-2-38, 1st Edition 1974, Basic Environmental Test Procedures, Part 2: Test Z/AD: Composite Temperature Humidity Cyclic Test
- Qualified to IEC 255-21-1 (Class 1) Vibration Tests for Electrical Relays
- Qualified to IEC 255-21-2 (Class 1) Shock and Bump Tests for Electrical Relays

CERTIFICATIONS

- UL, CSA, and DNP 3.0 IED
- GOST-R certified per the relevant standards of Gosstandart of Russia
- Republic of Belarus Certificate of Conformity

CASE SIZE (Vertical unit)

5.40" (137.1mm) W x 14.63" (371.6mm) H x 10.491" (266.4mm) D behind panel
Alternate mounting: 5.40" (137.1mm) W x 14.63" (371.6mm) H x 9.241" (234.7mm) D

CASE SIZE (Horizontal unit)

14.63" (371.6mm) W x 5.40" (137.1mm) H x 10.491" (266.4mm) D behind panel
Alternate mounting: 14.63" (371.6mm) W x 5.40" (137.1mm) H x 9.241" (234.7mm) D

CASE SIZE (Rack mount)

14.63" (371.6mm) W x 5.40" (137.1mm) H x 10.491" (266.4mm) D without flanges

SHIPPING WEIGHT

Approx. 16.5 pounds (7.5 kg)

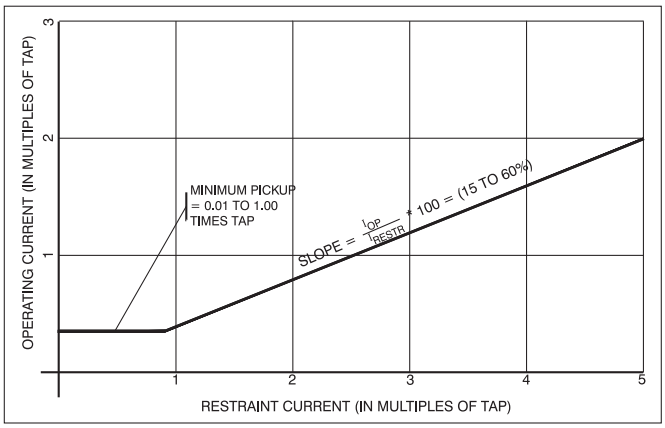
WARRANTY

7 years from ship date

NOTICE: All information and specifications are as of printing date and subject to change.
Consult Basler for latest information and specifications.

PERFORMANCE SPECIFICATIONS

PERCENTAGE RESTRAINED DIFFERENTIAL (87R)



Tap:	5A CT	2.0-20 Amps
	1A CT	0.4-4.0 Amps
Minimum PU	0.10-1.00 times tap	
Restraint Method	Maximum Average	
Restraint Slope:	15-60%, off	
2nd & 5th Harmonic	5-75%, off	
Response Time:	<2 cycles @ 5 x pickup <3 cycles @ 1.5 x pickup	

UNRESTRAINED DIFFERENTIAL (87U)

Unrestrained PU	1-21 times Tap up to 30 times I nominal, symmetrical
Response Time:	<1 cycle @ 5 x pickup <2 cycles @ 1.5 x pickup

RESTRICTED EARTH FAULT GROUND DIFFERENTIAL (87ND, 187ND)

Tap:	5A CT	2.0-20 Amps
	1A CT	0.4-4.0 Amps
Minimum PU	0.10-1.00 times tap	
Restraint Slope	15-60%	

Curve Type	Constants					
	A	B	C	N	K	R
S1	0.2663	0.03393	1.000	1.2969	0.028	0.5000
S2	0.0286	0.02080	1.000	0.9844	0.028	0.0940
L1	5.6143	2.18592	1.000	1.000	0.028	15.750
L2	2.3955	0.00000	1.000	0.3125	0.028	7.8001
D	0.4797	0.21359	1.000	1.5625	0.028	0.8750
M	0.3022	0.12840	1.000	0.5000	0.028	1.7500
I1	8.9341	0.17966	1.000	2.0938	0.028	9.0000
I2	0.2747	0.1042	1.000	0.4375	0.028	0.8868
V1	5.4678	0.10814	1.000	2.0469	0.028	5.5000
V2	4.4309	0.0991	1.000	1.9531	0.028	5.8231
E1	7.7624	0.02758	1.000	2.0938	0.028	7.7500
E2	4.9883	0.0129	1.000	2.0469	0.028	4.7742
A	0.01414	0.00000	1.000	0.0200	0.028	2.0000
B	1.4636	0.00000	1.000	1.0469	0.028	3.2500
C	8.2506	0.00000	1.000	2.0469	0.028	8.0000
G	12.1212	0.00000	1.000	1.000	0.028	29.000
F	0.0000	1.00000	0.000	0.0000	0.028	1.0000
46	*	0	0	2	0.028	100
P	0 to 600	0 to 25	0 to 1	.5 to 2.5	0.028	0 to 30

S1, S2 = CO Short Inv, IAC Short Inv
L1, L2 = CO Long Inv, IAC Long Inv
D = CO Definite Time
M = CO Moderately Inverse
I1, I2 = CO Inverse, IAC Inverse
V1, V2 = CO Very Inv, IAC Very Inv
E1, E2 = CO Ext Inverse, IAC Ext. Inverse
A = IEC Standard Inverse
B = IEC Very Inverse
C = IEC Extremely Inverse
G = IEC Long Time Inverse
F = Fixed Time
46 = Negative Sequence Overcurrent
P = Programmable

* Constant A is variable for the 46 curve and is determined as necessary based on generator full load current, minimum pickup, and K factor settings.

INSTANTANEOUS OVERCURRENT WITH SETTABLE DELAY (50TP, 150TP, 250TP, 350TP, 450TP, 550TP, 650TP, 750TP, 50TN, 150TN, 250TN, 350TN, 450TN, 50TQ, 150TQ, 250TQ, 350TQ)

Pickup:	5A CT	0.5-150.0 Amps
	1A CT	0.1-30.0 Amps
Pickup Time:		2¼ cyc @ 5 times PU 3 cyc @ 1.5 times PU 4 cyc @ 1.05 times PU
Delay Time:		0.00-60.0 Sec
		PU time with TD=0.000 Sec 2¼ cyc for P, N, & G @ 5 x PU 3¼ cyc for Q @ 5 x PU
Delay time:		0.000 - 60 sec
Time Accuracy:		±0.5% or ±½ cyc for P & N ±0.5% or ±1 cyc for Q

TIME OVERCURRENT (51P, 151P, 251P, 351P, 51N, 151N, 251N, 351N, 451N, 51Q, 151Q, 251Q, 351Q)

Pickup:	5A CT	0.5-16.0 Amps
	1A CT	0.1-3.2 Amps
Time Dial:	TD=K=0-99 for 46 curve TD=0.0 - 9.9 for all other curves	
Time-Current Characteristics:		Same curves as 51 elements

PERFORMANCE SPECIFICATIONS, continued

BREAKER FAILURE (50BF, 150BF, 250BF, 350BF)

Time:		50 - 999mSec
Dropout:	5A CT	0.5A
	1A CT	0.1A
Time Accuracy:		±0.5% or -½ cyc

GENERAL PURPOSE LOGIC TIMERS (62, 162, 262, 362)

Modes:	PU/DO, 1 Shot Non-Retrig., 1 Shot, Retrig., Oscillator, Integrating, and Latch
T1 and T2 Delay TIme:	0.000 - 9999 Sec.
Time Accuracy:	±0.5% or ±½ cyc

CURRENT PICKUP ACCURACY (All 50 and 51)

Phase and Ground:	5A	2% or 50mA
	1A	2% or 10mA
Neutral and Negative	5A	3% or 75mA
Sequence:	1A	3% or 75mA

VOLTAGE PICKUP ACCURACY (All 27, 47 and 59)

±2% or 1V

Delay Time: 0.050 - 600 Sec.

FREQUENCY (81, 181, 281, 381, 481, 581)

Mode:	Over, Under
Pickup:	40.00 - 70.00 Hz
Delay Time:	0.000 - 600 Sec.
Time Accuracy:	±0.5% or +1 cyc

(Min. trip time affected by minimum 3 cycle security count

SETTING GROUPS

Setting Groups:	4
Control Modes:	Automatic: CLP; Dynamic load or unbalance External: Discrete input logic Binary: Input Logic

METERING

Current Range:	5A	0.5 to 15.0
	1A	0.1 to 3.0
Current Accuracy:	±1%	
Phase Voltage Range:	3W	0 - 300 V_{L-L}
	4W	0 - 300 V_{L-L}
Phase Voltage Accuracy:	±0.5% of reading, ±1 least significant digit at 25°C	
Watt/VAR:	5A	0 to ±7500
	1A	0 to ±1500
Watt Accuracy:	1% @ Unity PF	
VAR Accuracy:	1% @ Zero PF	
Energy:	0 to ±1.0E12 (F/R registers)	
Frequency:	10 - 75Hz	
Frequency Accuracy:	0.01Hz	

DEMANDS (IA, IB, IC, IN, IQ)

Demand Interval:	1 - 60 min.
Demand Mode:	Thermal Sliding Block Average Block

BREAKER MONITORING AVERAGE

Duty Mode:	I or I^2
Duty Alarm Range:	0 - to 100%
Op Counter Alarm Range:	0 - 99999
Trip Time Alarm Range:	20 - 1000mSec

TRANSFORMER MONITORING

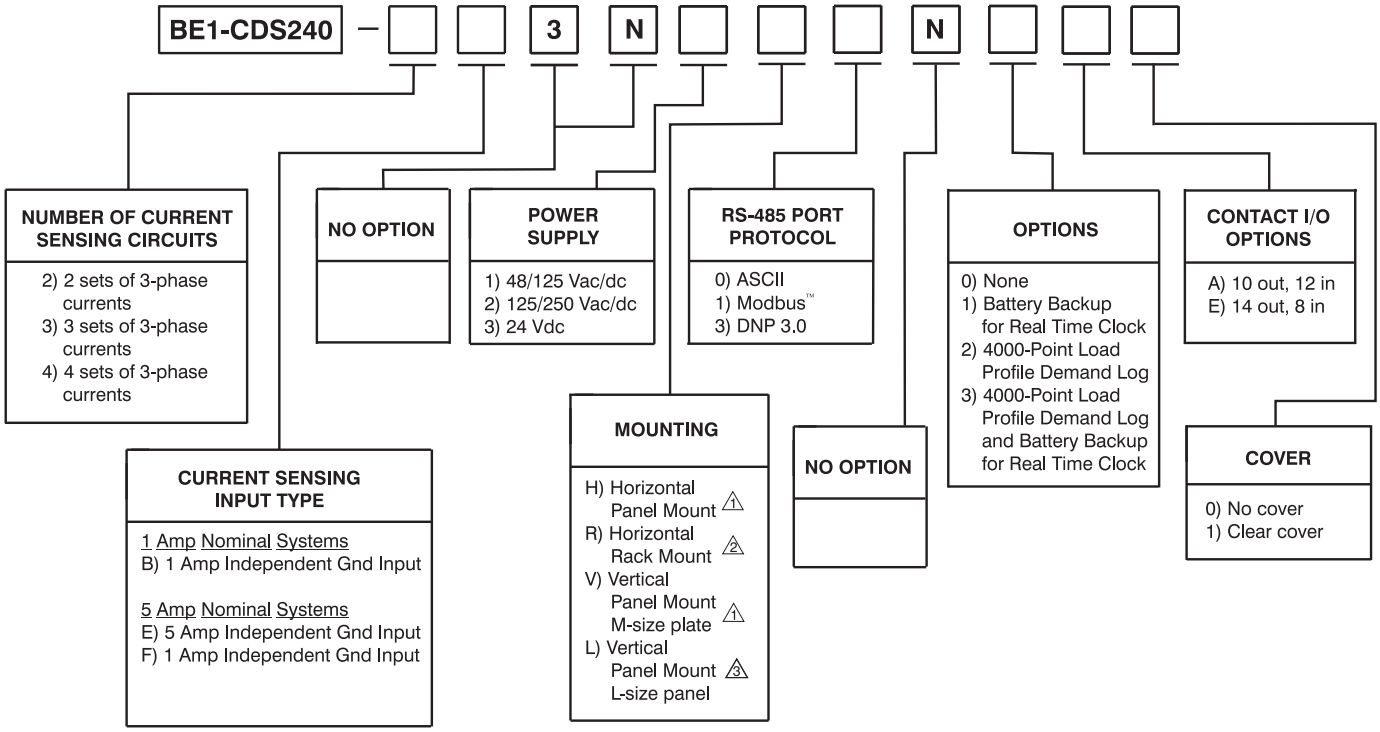
Accumulated Duty Alarm:	0-100%
Fault Counter Alarm:	0-99999

ORDERING

SAMPLE STYLE NUMBER

The style number identification chart defines the electrical characteristics and operation features included in BE1-CDS240 relays. For example, if the style number were **CDS240 3E-3N-2R-0N3-E0,** the device would have the following:

- **(3)** - 3 sets of 3-phase currents
- **(E)** - 5 Amp Nominal System with 5 Amp Independent Ground Input
- **(3N)** - No Option
- **(2)** - 125/250 Vac/dc Power Supply
- **(R)** - Horizontal with 19" Rack Mount Brackets
- **(0)** - ASCII Communications
- (N) - No Option
- **(3)** - 4000 point Load Profile Recording, plus battery backup clock
- **(E)** - 14 Out, 8 In
- **(0)** - No cover



NOTES:

1. Medium size vertical escutcheon plate for retrofit of GE BDD15/BDD16 (M1/M2) relays and Westinghouse HU/HU1 (FT31) relays. This plate can also be used for horizontal panel mounting (included with "H" and "V" mounting options).
2. Rack mounting flanges for 19" EIA rack mounting (included with "R" mounting option).
3. Large size vertical escutcheon plate for retrofit of GE BDD17 (L2) and Westinghouse HU4 (FT42) relays (included with "L" mounting option).