



# CEX57 and GSY51 Angle Impedance Relays

## GE Protective Relays

### For Out-of-step Tripping and Blinder Applications - Generators and Transmission Lines

#### DESCRIPTION

The **CEX57** is a family of high-speed induction cup relays with angle impedance characteristics that can be set parallel to the impedance characteristic of a protected line. Generally, these relays are meant to be used with other protective relays in blinder applications to restrict the tripping zone of a scheme or they may be used in applications that require tripping for out-of-step conditions. These are a single-phase relays that includes two ohm units with opposite polarity and may also include an auxiliary telephone type unit.

The **GSY51** relay includes a mho distance unit with reverse offset, six auxiliary telephone units and a target-seal in unit all mounted in one drawout case. This relay is intended for use with the **CEX57E** angle impedance relay to provide out-of-step protection for a generator.

#### APPLICATION

**CEX57D** and **CEX57F** relays are intended for use in blinder applications where it is desirable to restrict the tripping zone in transmission line protective schemes. Three **CEX** relays are required per terminal for blinder applications. Tripping will be permitted only when the fault impedance plots within the reach of the mho tripping function and inside both the **CEX57** ohm units. See Fig. 1.

The contacts of the **CEX57D** ohm units are brought out separately and are externally connected in series with the contacts of the corresponding mho tripping function to provide supervision. For the **CEX57F**, the contacts are internally connected in series and are used to operate an auxiliary telephone-type relay. The contacts of this auxiliary are then used to supervise the corresponding mho tripping function.

The out-of-step tripping of transmission lines requires one **CEX57E** and one **NAA19B** relay. The **NAA** relay includes an overcurrent supervising unit, six auxiliary telephone units and a target-seal in. For further information on this protection scheme, refer to **NAA19B**.

The usual application of the **GSY51A** with associated **CEX57E** is at the terminals of a generator to provide out-of-step protection for the machine. Formerly system and generator impedance characteristics were such that the electrical center during a loss of synchronism condition was located out on the transmission system. Hence, the swing could be detected by line relaying or by out-of-step relaying schemes a selected line terminals. However, with the advent of EHV systems, larger generators and the expansion of transmission systems, generator and step-up transformers impedances have increased in magnitude while system impedances have tended to decrease. As a result, on many systems today, the system impedance center and the electrical center during swings can occur in the generator or in the generator step-up transformer.

Thus, the combination of one **GSY51A** and one **CEX57E** angle impedance relay located at the machine terminals is intended to detect an out-of-step condition when the swing locus passes through the machine or step-up transformer. See Fig. 2.

It is recommended that the **GSY51A** relay be calibrated at the factory for the user's specific application. Field calibration is difficult because of interaction between the various adjustments. The user should specify the relay forward reach in ohms, phase-to-neutral, at 90 degrees lead (into the generator) and the offset reach in ohms, phase-to-neutral, at 270 degrees lead.

#### OPTIONAL ITEM

A Single-phase-to-ground fault that evolves into a double-phase-to-ground condition may appear as an impedance swing to the CEX-GSY scheme. To avoid the possibility of a misoperation under such conditions, a PJC11AV-A instantaneous ground overcurrent relay may be used to supervise the CEX-GSY contact circuit. See GSY instruction book for further details.

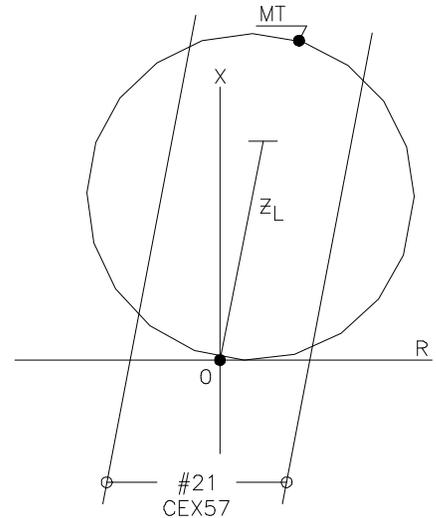


Fig. 1. Typical characteristic CEX57D or CEX57F as a blinder

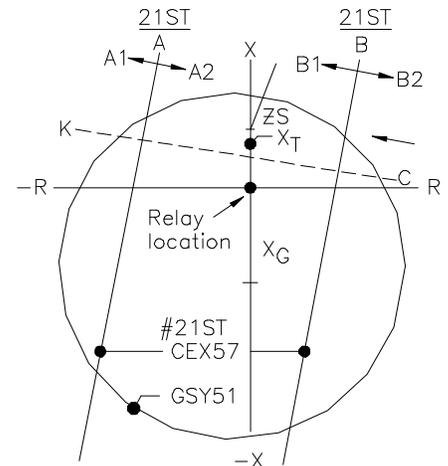


Fig. 2. Typical characteristic CEX57E with GY51A for out-of-step tripping



# CEX57 and GSY51

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#### RATINGS

The CEX57 and GSY51 relays are rated 120- volts, 5-amperes and forms are available for 50 or 60 Hertz applications. The basic minimum ohmic reach taps. Phase-to-neutral are :

CEX57--0.5/1.5/3.0 ohms

GSY51--2/4/6 ohms

#### CONTACTS

The contacts of the CEX57 and GSY51 relays will close and carry momentarily 30 amperes, up to 250V dc. However, the circuit breaker trip circuit must be opened by an auxiliary switch contact or other suitable means since the relay contacts have no interrupting rating.

#### BURDENS

Relay Type	Frequency Hz	Maximum Current Burden ②		Maximum Potential Burden①	
		PF.	VA.	PF.	VA.
CEX57	60	0.80	5.13	0.59	21.8
CEX57	60	0.81	4.41	0.69	20.0
GSY51	60	0.93	3.3	0.84	14.87
③GSY51	③50	....	....	....	....

① Maximum burden is for restraint set at 100% . For other settings see instruction book.

② Burden imposed by each current circuit at 5 amperes and highest basic ohm tap.

③ Burden at 50 Hz will be slightly lower.

#### SELECTION GUIDE

##### Blinder Applications--Angle Impedance Units

TYPE CEX57D- (Single phase - 3 Required ) - 1 NO & 1NC Contact per Unit, Electrically Separate

AC Rating 60 Hz 120V 5 Amp	DC Control Volts .....	Ohm Unit Range Ohms 0.5-30	Max Torque Angle 5-35§	Model Number CEX57D1A	Case Size M2	Approx Wt Lb(Kg)	
						Net 30(13.6)	Ship 36(16.3)
50 Hz 120V 5 Amp	.....	0.5-30	5.35§	CEX57D2A			

TYPE CEX57F--(Single-phase-3 Required)- Auxiliary Telephone Unit Output of 2 NO Contacts per Relay

AC Rating 60Hz 120V 5 Amp	DC Control Volts 48/125/250	Ohm Unit Range 0.5.30	Max Torque Angle 5.35§	Model Number CEX57F1A	Case Size M2	Approx Wt Lb(Kg)	
						Net 31(14.1)	Ship 37(16.8)
50 Hz 120V 5 Amp	48/125/250	0.5.30	5.35§	CEX57F2A			

#### Out-of-Step Tripping Applications

TYPE GSY51A- (One Required)- Use with One CEX57E for Generator Protection

AC Rating 60Hz 120V 5Amp	DC Control Volts 125	Target Seal-In Amp 0.6/2	Mho Unit Range Ohms 2-60	Mho Unit Max Torque Angle Lead 90§	Mho Unit Offset Offset① 0/4	Offset Max Torque Angle Lead 270§	Model Number② GSY51A1A	Case Size L2	Approx Wt Lb(kg)	
									Net 33(15)	Ship 39(17.7)
50Hz 120V 5 Amp	125 220	0.6/2 0.6/2	2-60 2-60	90§ 90§	0/4 0/4	270§ 270§	GSY51A2A A3A			

① Mho unit has offset steps of 0.5 ohm

② When ordering specify forward reach and offset ohms settings required.

TYPE CEX57E-- (One Required) Use with GSY51A Above or Use with NAA19B for Transmission Lines (1NO & 1NC Contact per Unit- Common Connection)

Ac Rating 60 Hz 120V 5 Amp	DC Control Volts .....	Ohm Unit Range Ohms 0.5-3.0	Max Torque Angle 5-35§	Model Number CEX57E1A	Case Size M2	Approx Wt Lb(Kg)	
						Net 30(13.6)	Ship 36(16.3)
50 Hz 120V 5 Amp	.....	0.5-3.0	5-35§	CEX57E2A			

NOTE : Information on Type NAA19B relay is in Section 3