



# L90 Current Differential Settings

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There are four basic settings for the Current Differential (87L) element: pickup, slope 1 percentage, slope 2 percentage, and breakpoint.

- Since the 87L pickup is immune to the load, the **CURR DIFF PICKUP** setting must be considered in conjunction with a line charging current. If charging current is significant (more than 0.05 to 0.07 pu), the charging current compensation feature must be enabled and pickup setting to be calculated as:

$$87L \text{ Pickup} = 1.5 \times \text{Line Charging Current} \quad (\text{EQ 1})$$

Otherwise (in most application cases), the setting can be left at the default sensitive value of 0.2 pu

- The slope 1 percentage is defined by the **CURR DIFF 1 RESTRAINT** setting and indicates the percentage of restraint used in differential calculations when fault current is below the breakpoint. Usually, those are small currents, without distortions, and restraint doesn't need to be high, typically value of 20% for **CURR DIFF RESTRAINT 1** can be used
- The slope 2 percentage is defined by the **CURR DIFF 2 RESTRAINT** setting and indicates the percentage of restraint used in differential calculations when fault current is above the breakpoint. This setting provides security against high current external faults where currents can be distorted due to noise, harmonics, and CT saturation. Typically, the **CURR DIFF RESTRAINT 2** setting is 40 to 50%. However, if asymmetrical CT saturation can be expected, it can be increased up to 70%
- The breakpoint between slopes 1 and 2 has to be estimated below the fault current level where CT saturation and spurious transient differential current can be expected.

The following figure illustrates how these four settings affect the restraint characteristics. Remote and local currents are 180° apart, representing an external fault. The breakpoint between the two slopes indicates the point where the restraint area becomes wider to override uncertainties that arise from CT saturation, fault noise, harmonics, etc. Increasing the slope percentage results in a wider restraint area.

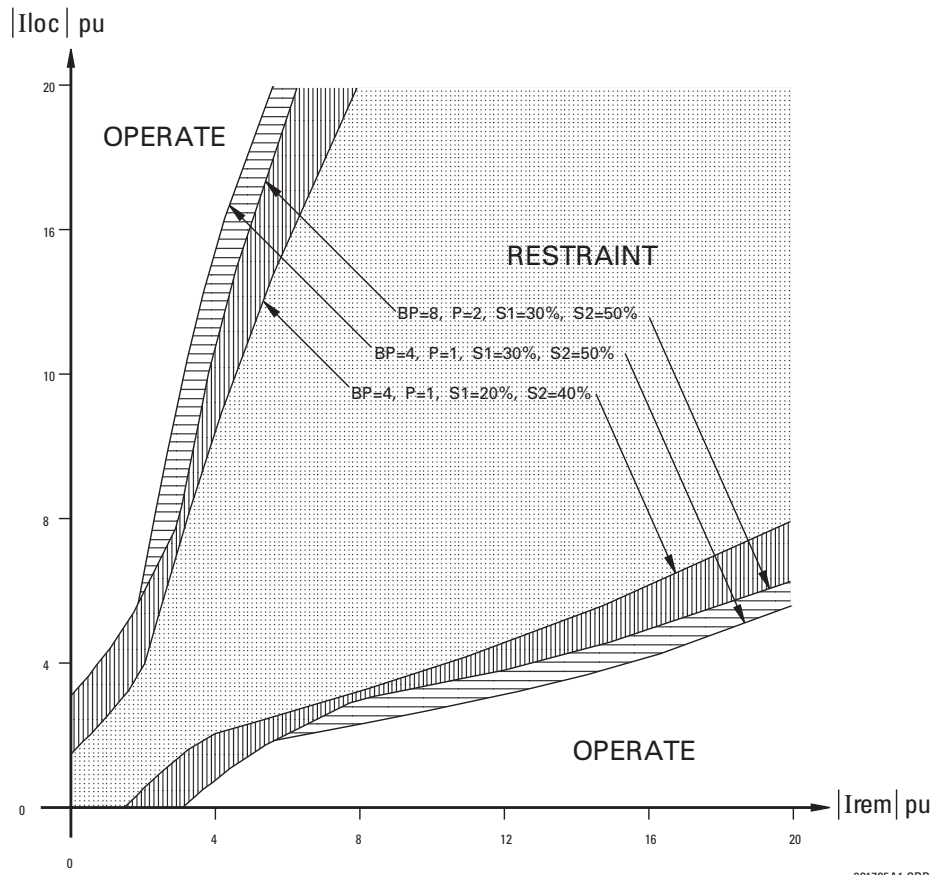


FIGURE 1. Settings Impact on Restraint Characteristic