The IED shall comprise hardware, time synchronization, monitoring, communication capabilities and other specifications as described in the 1MRG033852_en_Sample_specification_General_specifications_Relion_650 document. For the common protection, control, monitoring functionalities please refer to 1MRG033851_en_Sample_specification_Common_functions_Relion_650 document.

The IED shall support protection and control functionality. Control functionalities are described in 1MRG033849_en_Sample_specification_Bay_control_REC650.

For a complete overview of the functions available in this device, please refer to the Product Guide. For more details about the design of the functions and their applications, please refer to the Technical Manual and the Application Manual respectively.

The functions listed below are most typically specified in REQ650, but are available for selection in other types as well, as per the comments under each description.

### Breaker failure protection

The IED shall include breaker failure protection, to ensure fast backup tripping of the surrounding breakers in case the own breaker fails to open. It shall be current-based, contact-based or an adaptive combination of these two conditions. A current check with an extremely short reset time shall be used in order to achieve high security against unwanted operation. The reset time shall be 15ms maximum.

The operating current shall be settable between 5 – 200% of the rated current (I_r). The accuracy of the operating current shall be at least ± 1.0% of I_r.

A contact check criterion can be used where the fault current through the breaker is small. Breaker failure protection shall be single or three-phase initiated. Initiation shall be from an internal or external protection trip signal. The start signal can be phase selective or general (for all three phases).

Phase selective start signal shall enable a single pole retrip function. The retrip function can be done with or without current check and also with or without contact position check. With the current check, the retrip shall only be performed if the current through the circuit breaker is larger than the set operating current level. The retrip timer shall be settable.

A backup trip shall be initiated if the current and/or contact detection has not detected the breaker opening before the back-up timer has elapsed. The timers for the backup trip and the second back up trip shall be settable. The circuit breaker failure function shall be single or three phase initiated to allow use with single phase tripping applications.

*In 650 series, this function is available in the following product types: REB650, RED650, REL650, REQ650, and RET650.*
**Stub protection function**

The IED shall include stub protection which covers the zone between the current transformers and the open disconnector in multi-breaker arrangements. Stub protection shall be a phase overcurrent protection, fed from the two current transformer groups feeding the object taken out of service. The three-phase instantaneous overcurrent function shall be activated only from an auxiliary contact.

The operating current shall be settable between 5 – 2,500% of the rated current (I_r).

*In 650 series, this function is available only in REQ650.*

**Loss-of-voltage check function**

The IED shall include a loss-of-voltage check. This function shall issue a three-pole trip command to the circuit breaker if all three-phase voltages fall below the set value for a time interval longer than the set time, and the circuit breaker remains closed. The operate time delay shall be settable. The accuracy of the operate time delay element shall be at least ± 0.2 % or ± 35 ms, whichever is greater.

The function shall include a time delay for enabling the function after restoration, which shall be settable. The accuracy of the time delay element shall be at least ± 0.2 % or ± 35 ms, whichever is greater.

The operation of the loss-of-voltage check function shall be supervised by the fuse failure supervision.

*In 650 series, this function is available only in REQ650.*