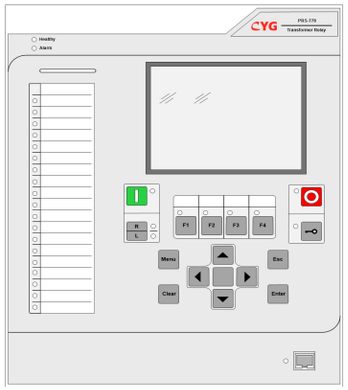
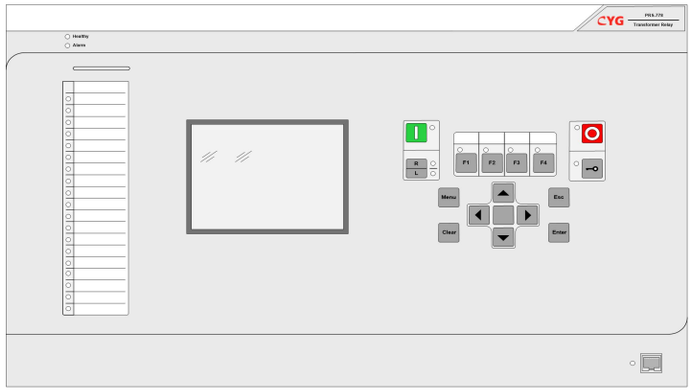
# PRS-778

## General Application

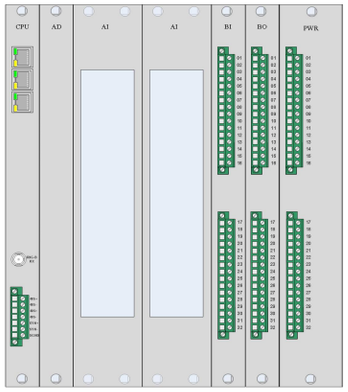
The PRS-778 is a numerical distributed transformer protection intended for protecting and monitoring various transformers of various voltage levels, ranging from 1000kV to 110kV. PRS-778 can detect and clear all types of internal faults.
PRS-778 provides fast and selective protection, monitoring and control for two and three-winding transformers, autotransformers, step-up transformers and generator-transformer block units, phase shifting transformers, special railway transformers, shunt reactors, etc.



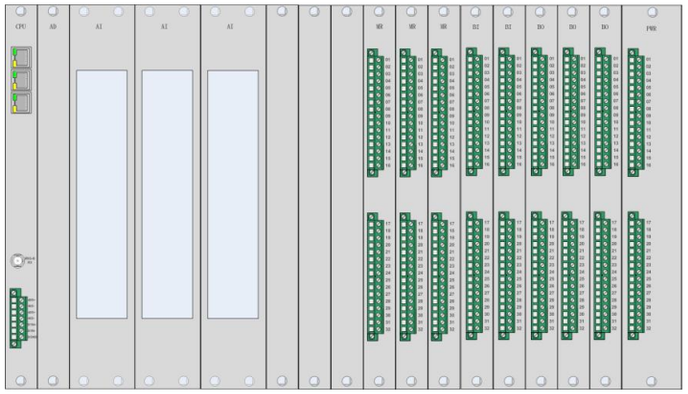
❖ Front Panel



❖ Front Panel



❖ Rear Panel



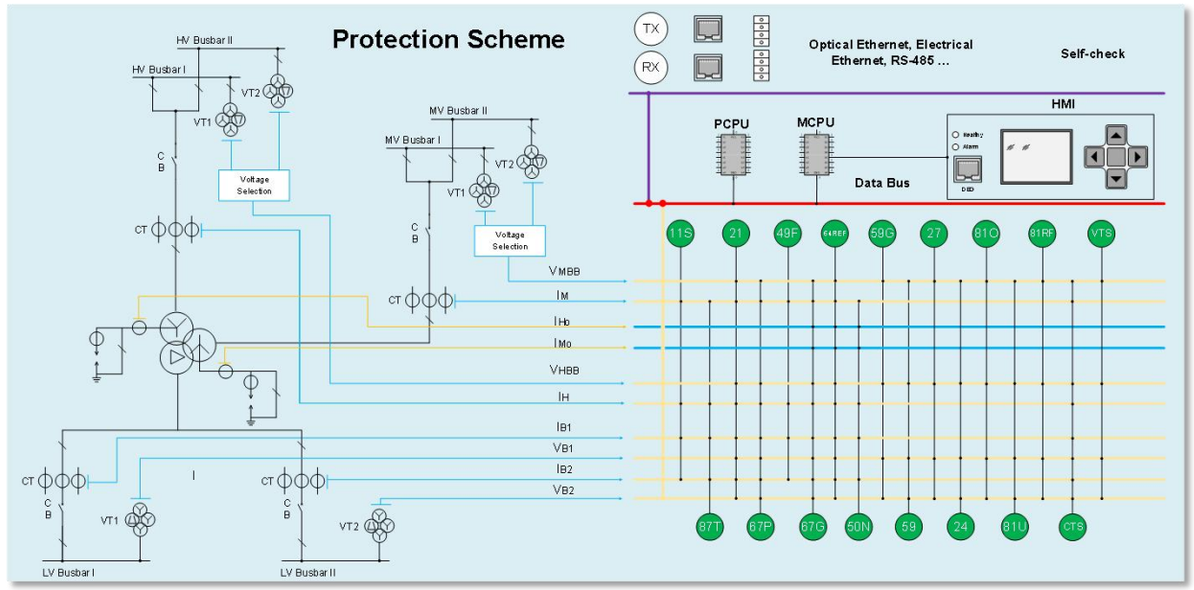
❖ Rear Panel



## Feature

| Item | Parameter |
|---|---|
| Performance | 32-bit high performance dual-core processor, internal high speed bus and intelligent I/O ports |
| Hardware | Modularized hardware design, flexibly configurable, easy extension |
| Interface | HMI with a control module (a 320×240-dot LCD, 9-key keypad and 31 LED indicators) |
| Communication | Ethernet network, RS-485 serial ports. Communication protocol optional: IEC61850, IEC60870-5-103, DNP3.0 or ModBus. |
| Time Synchronization | SNTP, IEEE 1588, pulse per second (PPS) and IRIG-B |
| Analog | Support the protocol IEC60044-8, IEC61850-9-2 and GOOSE, constantly measures and calculates voltage, current, power and frequency. |
| Recording | Fault and disturbance waves, operation reports, supervision, control operation records and time tagged sequence of event. |
| Monitor & Control | Optional: BI, BO, measurement and control |

## Protection Functions



# Protection Functions

| Description | IEC 60617 | ANSI | CYG Code |
|---|---|---|---|
| Transformer differential protection | 3Id/I | 87T | 87T |
| Winding Differential Protection | 3Id/I | 87W | 87W |
| Mho Impedance protection | Z< | 21 | 21M |
| Quadrilateral Impedance protection, | Z< | 21 | 21Q |
| Power swing detection | Zpsb | 68 | 68PS |
| Four stage directional overcurrent protection | 3I> | 67P | 67P |
| Three-phase thermal overload protection | - | 49 | 49 |
| Earth Fault protection | IN> | 51G_67G | 51G |
| Restricted Earth Fault protection | IdN/I | 87NL | 64REF |
| Non-directional Instantaneous earth fault protection | IN>> | 50N | 50/51N |
| Breaker Failure Protection | 3I0><br>I> | 50BF | 50BF |
| Three stage residual overvoltage protection | 3U0 | 59N | 59N |
| Two stage three-phase overvoltage protection | 3U> | 59P | 59P |
| Two stage three-phase undervoltage protection | 3U< | 27P | 27P |
| Overexcitation protection | U/f | 24 | 24 |
| Overfrequency protection | f> | 81O | 81O |
| Underfrequency protection | f< | 81U | 81U |
| Rate-of-change frequency protection | Df/dt<> | 81R | 81R |
| Reactor differential protection | 3Id/I | 87R | 87R |
| Reactor zero-sequence differential protection | IdN/I | 87N | 87N |
| Reactor interturn Protection | - | 21IT | 21IT |

# Supervision Functions

| Description | IEC 60617 | ANSI | CYG Code |
|---|---|---|---|
| Current circuit supervision | - | CTS | CTS |
| Fuse failure supervision | - | - | VTS |



# Protection Specifications

## Biased Differential Protection

| | |
|---|---|
| Tolerance of 2nd harmonic settings | 0.01 |
| Tolerance of 5th harmonic settings | 0.02 |
| Tolerance of operating current | ≤2.5% of operating current or 0.02In., whichever is greater |
| Operating time (without blocking criteria) | 50Hz: ≤ 30ms (Id>2 times current setting)<br>60Hz: ≤ 25ms (Id>2 times current setting) |
| Operating time (with blocking criteria) | 50Hz: ≤ 35ms (Id>2 times current setting)<br>60Hz: ≤ 30ms (Id>2 times current setting) |

## Instantaneous Differential Protection

| | |
|---|---|
| Tolerance of current setting | ≤2.5% of setting or 0.02In, whichever is greater |
| Operating time | 50Hz: ≤ 20ms (Id>1.5 times current setting)<br>60Hz: ≤ 20ms (Id>1.5 times current setting) |

## Impedance Protection

| | |
|---|---|
| Accuracy | ≤ 2.5% Setting or 0.02In, whichever is greater |
| Time delay accuracy | ≤25ms(at 4 times current setting) |

## Breaker Failure Protection

| | |
|---|---|
| Tolerance of current setting | ≤ 2.5% Setting or 0.02In, whichever is greater |
| Reset ratio | 98% |
| Reset time | ≤ 12.5ms |
| Tolerance of time setting | ≤ 1% Setting + 40ms |

## Directional Overcurrent Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.02In, whichever is greater |
| Reset ratio | 98% |
| Time delay accuracy (definite-time characteristic) | ≤1% of setting +30ms (at 2 times current setting) |
| Time delay accuracy (inverse-time characteristic) | ≤ 2.5% of operating time or 30ms, whichever is greater (start value multiples in range of 1.2…20 when I> In)<br>≤5.0% of operating time or 40ms, whichever is greater (start value multiples in range of 2…20 when I≤ In) |

# Protection Specifications

## Thermal overload protection

| | |
|---|---|
| Accuracy | ≤ 2.5% Setting or 0.02In, whichever is greater |
| Reset ratio | 98% |
| Time delay accuracy | ≤ 2.5% of operating time or 30ms, whichever is greater (start value multiples in range of 1.2…20 when I> In)<br>≤5.0% of operating time or 40ms, whichever is greater (start value multiples in range of 2…20 when I≤ In) |

## Directional Earth Fault Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.02In, whichever is greater |
| Reset ratio | 98% |
| Time delay accuracy (definite-time characteristic) | ≤1% of setting +30ms (at 2 times current setting) |
| Time delay accuracy (inverse-time characteristic) | ≤ 2.5% of operating time or 30ms, whichever is greater (start value multiples in range of 1.2…20 when I> In)<br>≤5.0% of operating time or 40ms, whichever is greater (start value multiples in range of 2…20 when I≤ In) |

## Restricted Earth Fault Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.02In, whichever is greater |
| Time delay accuracy | ≤30ms(at 4 times current setting) |

## Non-directional Instantaneous Earth Fault Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.02In, whichever is greater |
| Resetting ratio | 98% |

## Residual Overvoltage Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.01Un, whichever is greater |
| Resetting ratio | 98% |
| Time delay accuracy (definite-time characteristic) | ≤1% of setting +30ms (at 1.2 times voltage setting) |
| Time delay accuracy (inverse-time characteristic) | ≤ 2.5% of operating time or 30ms, whichever is greater (for voltage between 1.2 and 2 multiples of pickup) |



# Protection Specifications

## Overvoltage Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.01Un, whichever is greater |
| Resetting ratio | 98% |
| Time delay accuracy (definite-time characteristic) | ≤1% of setting +30ms (at 1.2 times voltage setting) |
| Time delay accuracy (inverse-time characteristic) | ≤ 2.5% of operating time or 30ms, whichever is greater (for voltage between 1.2 and 2 multiples of pickup) |

## Undervoltage Protection

| | |
|---|---|
| Accuracy | ≤2.5% of setting or 0.01Un, whichever is greater |
| Resetting ratio | 102% |
| Time delay accuracy (definite-time characteristic) | ≤1% of setting +30ms (at 0.8 times voltage setting) |
| Time delay accuracy (inverse-time characteristic) | ≤ 2.5% of operating time or 30ms, whichever is greater (for voltage between 0.5 and 0.8 multiples of pickup) |

## Overexcitation Protection

| | |
|---|---|
| Multiple setting of definite time | 1.0~1.6 |
| Multiple setting of inverse time | 1.0~1.7 |
| Tolerance of Multiple setting | ≤2.5% of setting or 0.01, whichever is greater |
| Drop-off to pickup ratio | ≥97% |
| Operating time | 50Hz: ≤25 ms (at 2 times current setting)<br>60Hz: ≤23 ms (at 2 times current setting) |
| Time delay setting | 0.1~9999 (s) |
| Tolerance of time setting | ≤1% of setting +30ms (at 2 times current setting) |
| Drop-off time | ≤30ms |

## Overfrequency Protection

| | |
|---|---|
| Accuracy | ≤ 0.02Hz |
| Time delay accuracy | ≤1%Setting+30ms (at 1.2 times frequency setting) |

# Protection Specifications

## Underfrequency Protection

| | |
|---|---|
| Accuracy | ≤ 0.02Hz |
| Time delay accuracy | ≤1%Setting+30ms (at 0.8 times frequency setting) |

## Rate-of-change Frequency Protection

| | |
|---|---|
| Frequency setting | 45~60 (Hz) |
| Tolerance of frequency setting | ≤ 0.02Hz |
| Time setting | 0~100 (s) |
| Tolerance of time setting | ≤1%Setting+100ms (at 1.2 times frequency setting) |



Protection Specifications