1725IED
Bay Control Unit

Description

1725IED bay control unit is the control unit for control and monitor of switchgear in substation. As its integrated functions, a flexible, reliable and low-cost solution can is provided for substation switchgear.

For different kinds of switchgear, 1725IED BCU can be configured flexibly. Configuration and maintenance can be performed easily via the ***1725IED maintenance software*** in a laptop with a RS232 serial port and an Ethernet port.

A large color LCD with key board is used for operation. Control operation can be performed simply and intuitively. User can view the information on LCD as same as via the maintenance software in the laptop.
1725IED BCU is designed in a standard 4U, 19 inches rack. The rack can be mounted in a panel easily by using 4 screws.
Authority of control operation can be selected via the press-button and switch on integrated key-board. Interlock of control can be canceled also in the same method.
1725IED BCU can acquire high-accuracy measured value, ±0.2% for current and voltage, P and Q can be calculated in ±0.5%.
Analog output function can be added in 1725IED BCU if it is necessary as the requirement of customer.

As 1725IED BCU has flexible interfaces and protocol library, it can be integrated in the existing substation monitoring system easily. The powerful processing, communication and configuration of 1725IED BCU can support the upgrade of substation supervision and automation.

Application

- Basic functions: Digital Input, Digital Output, Analog Input, Analog Output.
- Integrated synchro-check for synchronized close operation of the circuit-breaker.
- Standard configuration of PLC (programmable logic controller), IEC 61131.
- Flexible processing of measured value.
- Acquisition of 3 current and 3 voltage from current transformers and potential

transformers in secondary circuit.

- Monitor DC measured values from the output of traditional transducers, e.g. 4-20mA.
- Configuration is flexible, 11 slots are provided for different functional boards.
- Extension via Ethernet switch.
- Switchgear interlock.
- Communication with different masters simultaneously on different ports and different database.
- Local display of measured values (V, I, P, Q, S, F, cosφ, etc.), values displayed on LCD are configurable.
- Limit processing of measured values.
- Standard 4U, 19 inches rack for panel/cubicle mounting.
- 3 configurable press-button and 16 LED indicators can be defined freely.
- Communication interface can be extendable.
- Overcurrent fault detection.

Communication

Communication ports

1725IED can support communication ports as the following:

- RS232 serial port for maintenance
- RS232 serial port
- RS232/RS485 serial port
- Ethernet port

Serial port can be extended by using COM-6 board which supports 6 serial ports.
Serial transmission rate: 300-115200 BPS (bit per second)
Ethernet transmission rate: 10/100M

Communication protocols

1725IED can build communication with other IEDs via protocols as the following:

Serial protocol:

- ✓ IEC 60870-5-101
- ✓ IEC60870-5-103
- ✓ DNP 3.0
- ✓ MODBUS

Ethernet protocol:

- ✓ IEC 60870-5-104
- ✓ DNP 3.0
- ✓ IEC 61850 (as Server) and GOOSE

1725IED can build communication with all masters and other IEDs simultaneously. The database of each link is separated and can be different, the transmission rate of each port/link can be defined separately also.

Functions

Local HMI

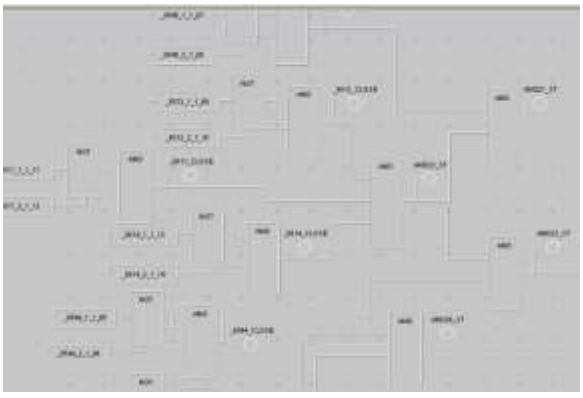
A large color LCD, key board and a maintenance port are integrated in the front of 1725IED.

- LCD dimension: 4.7 inches, 480 * 272 points.
- 2 LED indicators for the status of device power supply and device running status.
- 14 LED indicators can be configured freely as the requirements of customer.
- Press button: direction selection, cancel, enter, Local/Remote (with 2 LED indicators), Interlock/Unlock (with 2 LED indicators), plus and minus (for value modification), open and close (for command control).
- 3 (three) press button can be configured freely as the requirements of customer.
- Maintenance port: RS232, DB9 female.

LCD functions

- ✓ SLD (single ling diagram) display (for one bay)
- ✓ Digital Output/Command Control local operation can be performed via SLD and keyboard.
- ✓ Analog Input/Measured values display together with SLD, values are configurable.
- ✓ SOE.
- ✓ Digital Input/Indication.
- ✓ Internal time clock of 1725IED display and modification.
- ✓ Communication buffer view.

Switchgear interlocking



1725IED BCU can perform switchgear interlocking via ISAGRAF. Using ISAGRAF the bay interlock conditions can be edited in program, downloading the program to 1725IED BCU and restart it, interlocking will be available.

Information for interlocking can be from BCU self or from other BCUs or other IEDs via Ethernet on IEC61850-GOOSE. Interlocking information can be from IEDs on other communication protocols also.

Command control operation authorization

Switching authorization is selected via 2 (two) press buttons: Interlock/Unlock, Local/Remote.

Interlock/Unlock

A bypass press button on the key board is used to enable/cancel the interlocking function, two LED indicators are for switch position, **Unlock/Interlock**. When switch

position is on Unlock, Command control function will be performed without Switchgear interlocking and there is no requirement of Command control function. When switch position is on Interlock interlocking function is enabled.

If Switchgear interlocking is enabled and conditions meet the requirements, the switch control will be performed. When the conditions can't meet requirements the selection of command control will be cancelled and a pop-up information will be on the LCD.

Local/Remote

Just like Unlock/Interlock selection, another press button integrated on key board is used to select Local or Remote.

In Local mode, the command control can only be operated via local HMI (LCD and keyboard) of 1725IED. In Remote mode, command control can be operated via LDMS and master station including local HMI.

Synchronization

Before the close operation of a switch, 1725IED will check the synchronization conditions. Until the conditions of both sides of circuit breaker are met, the close operation will be performed.

The synchronization conditions can be specified easily via ISAGRAF software.

1725IED supports synchronous and asynchronous networks. In synchronous networks there are little differences with regard to voltage, phase angle, so it is not necessary to consider the circuit breaker response time. If networks are asynchronous, the differences of phase angle and voltage are larger than synchronous networks, the circuit breaker response time should be taken into consideration. The control command is dated in advance of this time automatically, so the circuit breaker will be closed at the right time.

1725IED can distinguish dead line or dead bus bar automatically, a voltage value shall be set, if the detected voltage value is not more than preset voltage value, the line/busbar will be identified as dead line/busbar.

The synchronization parameters are as the following:

- ✧ Voltage
  (Umin < U < Umax) & (ΔU <ΔUmax)
- ✧ Angle difference
  $\Delta\varphi < \Delta\varphi max$
- ✧ Frequency difference
  (fmin < f < fmax) & (Δf <Δfmax)
- ✧ Advance time
  This time should be modified as the circuit breaker status.

Analog Input/Measured value

1725IED support ACAI (Alternating Current Analog Input) and DCAI (Direct Current Analog Input).

ACAI

1725IED can be connected to CT (current transformer) and PT/VT (potential/voltage transformer) directly. The current and voltage value are measured, then P, Q, S, power factor are calculated. Three phase currents and three phase voltages of one line are necessary for calculated values.

Rated voltage: 100V/110V AC

Rated current: 1A/5A

DCAI

1725IED shall be connected to the output of transducers. The following types of signal can be connected to 1725IED:

- Voltage: -5V — +5V, -10V — +10V.
- Current: 0mA — 20mA, 4mA — 20mA, 4mA — 12mA — 20mA, 0mA — 1mA.

Threshold

For each Analog Input/measured value, threshold parameters can be set for alarm.

Dead band

Parameters for dead band are associated with the transmission of measured value. If the change of measured value is more than predefined dead band, Analog Input/measured value will be sent to master.

Coefficient

If choosing “AI multiply coe”, AI value sent to master will be multiplied with coe. Formula: real value * a / b + c

Metered value

When 1725IED calculates the P, Q, the energy metered values can be calculated. Four kinds of energy metered values are available: positive active, negative active, positive reactive, negative reactive.

If the pulse output of external meter is available, the Digital Input of 1725IED can be defined as counter for pulses.

Digital Input/Indication value

In 1725IED, DI/Indication signals can be defined to be SPI (single point input), DPI (double point input) and energy pulse input.

DI signal voltage: 24V DC, 48V DC, 110V DC, 220V DC.

1725IED can build SOE for each status change of each DI signal with 1ms accuracy.

Chatter filter

For chatter blocking function, there are 2(two) configurable parameters: a period of time and the number of signal’s status changes. For each signal, 1725IED will detect the number of status changes in the preset time period.

If the status change’s number is more than preset number, status change will be considered as contact chattering and there is no status change. Otherwise status change is valid, status change and associated SOE will be transmitted to mast.

Debounce

After opening/closing switch, perhaps the auxiliary contacts will vibrate. For this

problem, a configurable parameter can be set, Debounce Time. Debounce time can be set from 5ms to 60,000 ms in 1ms step and the debounce time of each DI signal can be set separately.

1725IED will detect the voltage/potential change of DI signal. 1725IED will detect the time period until the next voltage/potential change.

If the detected time period is not more than predefined Debounce time, the status change will be consider invalid, otherwise the status change and SOE will be transmitted to master.

Analog Output

1725IED support AO (analog output) function. Normally AO is used for motor, generator, etc. During the test together with high accurate meter AO can be the DC standard source for DCAI function.

Via jumpers and corresponding parameters configuration, the output of AO function can be changed. The AO types are as the following:

- Voltage Output: 0V — +5V, 0V — +10V, -5V — +5V.
- Current Output: 0mA — 1mA, 0mA — 5mA, 0mA — 10mA, 0mA — 20mA, 4mA — 20mA.

An external 24V DC power supply is necessary for AO. With this external power supply, 1725IED can hold the output value even if the power supply of 1725IED is failed.

Digital Output/Command Control

1725IED provides NO (normal open) contacts for DO/Command Control function. DO function is used to control (open/close) external devices. Quantity of contacts can be configured as the requirements of the site.

Contact rating: 12A, 250V AC, NO.

There are 2(two) modes of control function:

- SBO (select before operate).
- Direct operation.

Operation time (contact closing time period) of each DO contact is configurable. Default operation time: 2000 ms, operation time range: 1000ms to 60,000 ms, step: 1 ms.

In SBO mode, after receiving the selection of control and transmitting “selection right” frame to master, in a certain time period, if the following operation command is not available, the selected Command Control will be cancelled. This time period is cancelling time. Default cancelling time is 30 seconds, time range: 30 seconds to 255 seconds, step: 1 second.

Fault detection

1725IED can detect several kinds of overcurrent fault on the line.

Fault types: 3 (three) Phase Over Current with direction, Earth Fault.

Time Synchronization

1725IED can correction its internal clock via receiving external time information. The following methods are valid:

- PPS (pulse per second) signal, via PPS port.
- IRIG-B signal, via IRIG-B port.
- SNTP (simple network time protocol) on Ethernet, via Ethernet port.
- Receiving time synchronization command from master, via corresponding communication port.

Power Supply

The auxiliary power supply of 1725IED: 24V DC, 48V DC, 110V/220V DC, 220V AC.
Tolerance of power supply: -20% to +20%