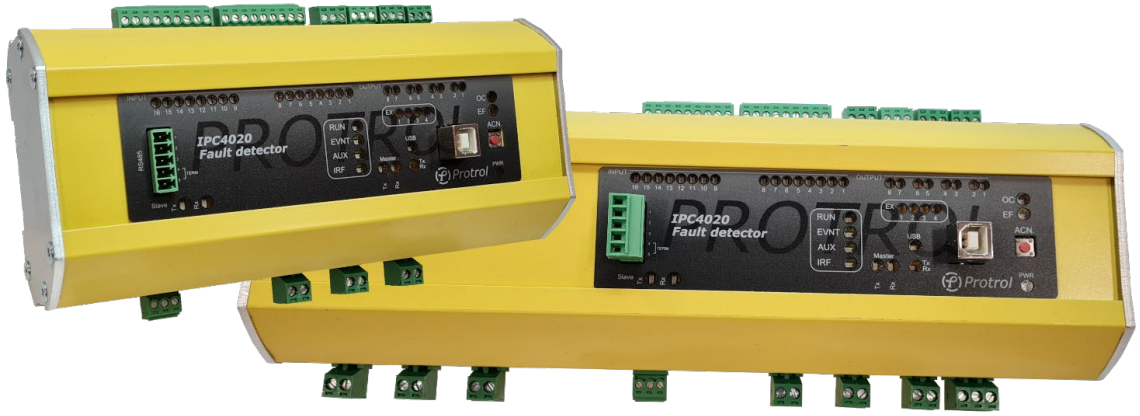
IPC4020

Fault Passage Indicator and Remote Terminal Unit



IPC4020 is a fault passage indicator for overcurrent and earth faults with integrated remote terminal unit functionality. It has I/O for indications and orders and is therefore suitable for a typical secondary substation with up to four objects.

The standard IPC4020 detects faults in one feeder. Expanded versions are available for fault detection in up to six feeders. The communication interface to the remote-control center is IEC 60870-5-101 or -104.

Since the algorithm for earth fault detection does not require any voltage measurement, IPC4020 provides very cost-efficient fault detection and grid automation with a high sensitivity for pass-through faults, also in networks where the earth fault currents are low.

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Fault Detection

Overcurrent, I> and I>>

Range overcurrent: 0.0 – 10 000.0 A, 0 – 10 000 ms. One stage can be configured for inverse time (IEC).

Earth Fault, I_0>

Ensto Protrol's patented Fault Pass Through earth fault detection for all indirectly earthed networks. Capable of detecting high impedance and arcing earth faults. Note that no voltage measurement is necessary for good selectivity at very low currents. The sensitivity is comparable with that of a directional earth fault protective relays.

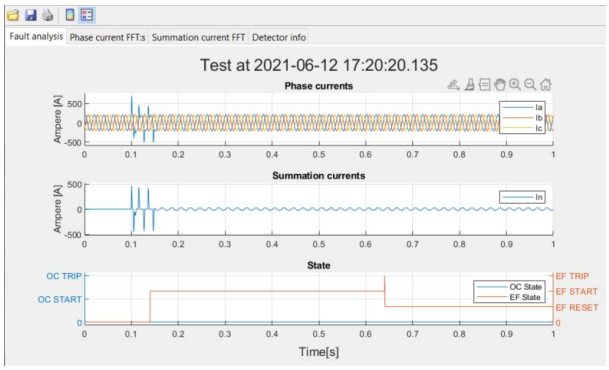
Range high impedance earth fault: 0.1 A – 100.0 A, 0 – 10 000 ms.

An arcing fault is concluded after two earth fault starts within a settable time, range 0 – 25 000 ms.

A non-directional earth fault stage is integrated, as well as phase-break detection.

Transient Fault Recorder

The built-in transient fault recording function registers currents and events from the last detected faults. It is possible to connect to the service port to analyse signals and events in detail. The transient fault recordings can be downloaded using the web interface and be analysed offline. The recordings can be converted to COMTRADE format.



Remote Terminal Unit

Binary objects: 16 inputs [1] (Single Point / Double Point). Also, objects for Start and Trip I> / I>> / Io>, phase break, non-directional Io> (Single Point).

8 outputs [1] (Single Cmd / Double Cmd). Objects for optional functions, e.g., auto reclosure, and remote acknowledge (Single Cmd).

Analog objects: (spontaneous reporting with settable deadband 0.1 – 100%, or cyclic):
Phase currents, rms
Maximum current
Average current 15 min
Max fault current, I>/I>> [2]
Residual current, $3I_0$
Faulty phase(s), I>/I>> or I_0> [2]
Temperature

[1] The largest device with 4-6 fault detectors has 6 additional binary inputs and 5 binary outputs.
[2] Deadband does not apply, transmitted upon event.

Expansion

IPC4020 can be ordered for fault detection of one line and in larger versions for three or six lines. This means that an expanded IPC4020 can handle both medium and large secondary substations.

Expanded IPC4020 are specified as separate items. The extra current inputs for the additional lines are located to the left of the standard terminals of IPC4020. Also refer to the sections 'Ordering Information' and 'Overview Diagram'.

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Other Functions

Physical Interface

Detected overcurrent or earth fault is indicated by LEDs and can be acknowledged by a push button, remote control and automatically after a pre-defined time.

Separate LEDs indicate binary inputs and outputs, status for power supply, internal supervision, and activity of the communication ports.

Web Interface

The IPC4020 device has a built-in web interface for local and remote access using TCP/IP. This interface enables the user to access status information and to configure the device. It is also possible to upgrade firmware and download transient fault recordings.

Master for Slave RTUs

IPC4020 can act master (IEC -101) for slave RTUs in a local bus. The interface is two-wire RS485 (terminal X13).

The slave RTU function is specified as an option at order, refer to section 'Ordering Information'.

Customer Adaption

The IPC4020 software can optionally be adapted to special customer needs (PLC function).

Technical Data

General

Dimensions[3]: 195 (290/435) x 105(115) x 65 (74) mm
(l x w x h)
Weight: 660/950 g
Assembly: DIN bracket
Ambient temp: -40 – +70 °C
Supply voltage: 24 – 48 VDC
Supply current[4]: appr 100 mA at 24 VDC

Standards: EN 61000-6-2 – Immunity
EN 61000-6-4 – Emission Class B
EN 61000-6-5 – For installation in medium voltage substations
EN 60068-2 – Environmental

Tests according to:
EN 61000-4-2
EN 61000-4-3
EN 61000-4-4
EN 61000-4-6
EN 60068-2-1
EN 60068-2-2
EN 60068-2-30

EU directives: ROHS, EMC

[3] Length 290 mm is for IPC4020exp3.Length 435 mm is for IPC4020exp6. The dimensions 114 mm and 74 mm includes the plugin female contacts.
[4] 100 mA is the supply current for IPC4020.

Inputs and Outputs:

Binary inputs: 16 BI, 24 – 110 VDC
IPC4020exp6 has 22 binary inputs.
Binary outputs: 8 BO, max 115 VAC / 150 VDC
Two groups with 2 relays, 8 A breaking current at 30 VDC (contacts X8 and X10).
Two groups with 2 relays[5], 5 A breaking current at 30 VDC (contacts X7 and X9).
IPC4020exp6 has 5 additional relays, 5 A breaking current at 30 VDC

Analog inputs: 3 (+ 6 / +15)[6] AI, 1 A rated current, I_{th} 2 A cont. / 20 A, 1 s

All binary in- and outputs have LED indicators. Binary outputs are galvanically isolated.

[5] These can in one group be replaced with a latching relay if needed.
[6] In total, 9 analog inputs for IPC4020exp, 18 for IPC4020exp6

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Service Port:

USB: Type B
Ethernet: RJ45 10/100Base – TX Full Dupl.

Time Synchronisation:

Standard: IEC60870-5-101/104 or NTP
Clock drift: Max. 3 ppm

System Port, Slave:

RS485(-422/232):
Plugin contact/DSUB9
Both 2- and 4-wire communication is supported. Bus termination can be done by connecting X11:4 and X11:5, also see section 'Overview Diagram'.

Ethernet: RJ45 10/100Base – TX Full Dupl.

Communication Protocol, Slave:

Standard: IEC60870-5-101/104

System Port, Master:

RS485: Plugin contact.
2-wire communication. Bus termination can be done by connecting X13:2 and X13:3, also see section 'Overview Diagram'.

Communication Protocol, Master:

Standard: IEC60870-5-101

Ordering Information

Product Code

Basic version IPC4020:	PT101140
Basic version IPC4020exp3:	PT101143
Basic version IPC4020exp4:	PT101154
Basic version IPC4020exp6:	PT101156

Options

IPC4020 can be ordered with additional functionality with the following product codes.

Hardware Options:

RS422-interface (4-wire):	PT850005
RS232 interface:	PT850001
Latching relay at output X7:	PT850002

Software Options:

Auto-reclosing function, 1 line:	PT807711
Auto-reclosing function, 3 lines:	PT807713
IEC -101 master:	PT807721

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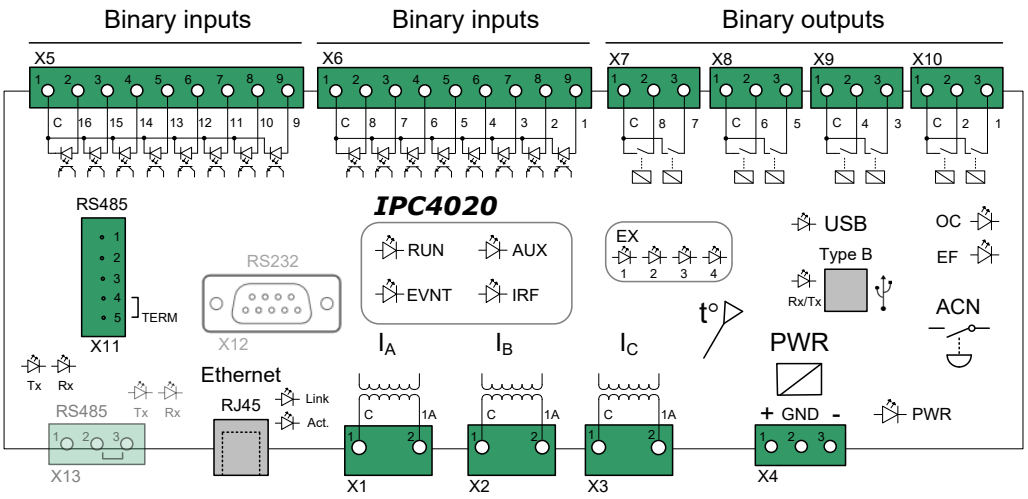
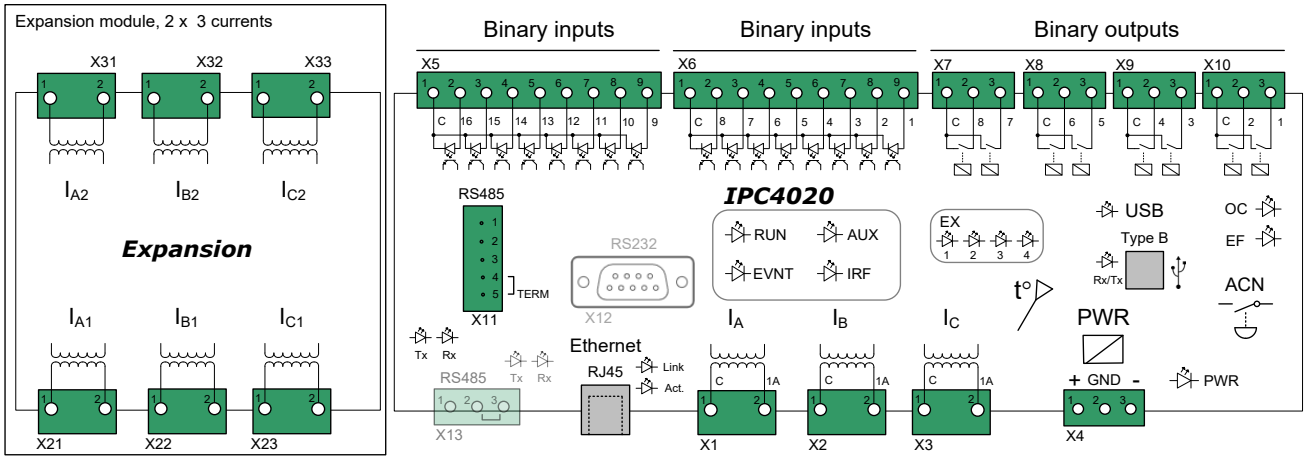
Overview Diagram

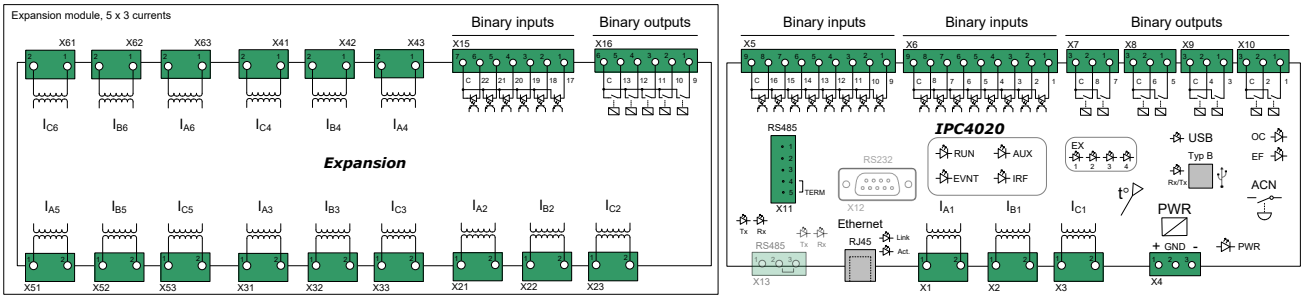
IPC4020 – one fault detector



IPC4020exp3 – three fault detectors



IPC4020exp4, IPC4020exp6 – four to six fault detectors



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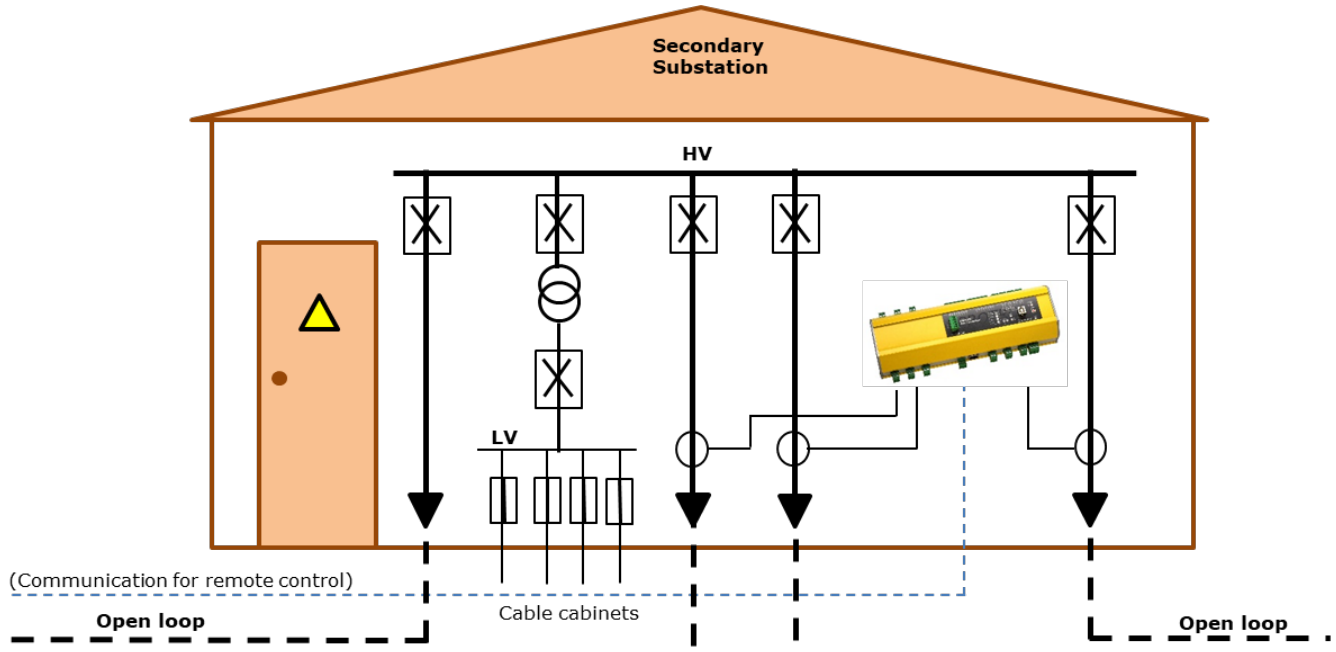
Typical Application

The IPC4020exp3 can handle a 3+1 secondary substation - fault detection of three lines/cables, indications and control of four objects.



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