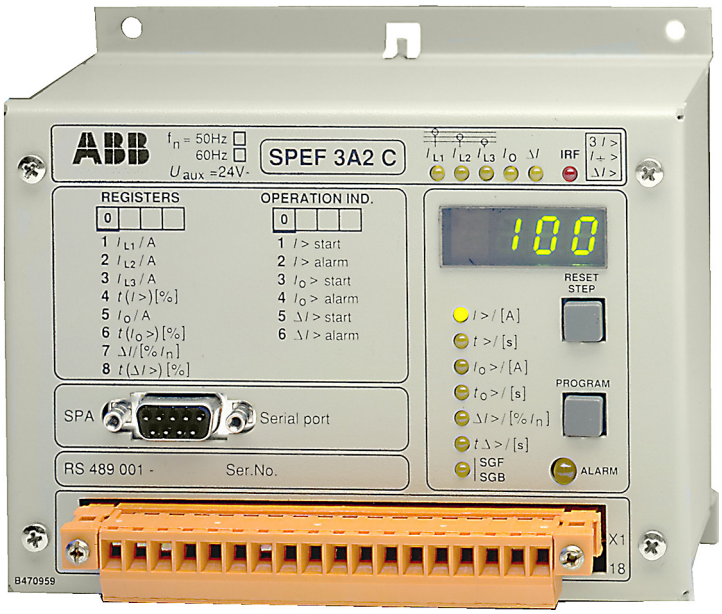
# Fault Indicator SPEF 3A2 C

Product Guide



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## Features

- Versatile, multifunction line fault indicator for distribution networks
- Overcurrent, earth-fault and phase unbalance indication in one
- Definite time operation characteristic and wide setting ranges
- Two current sensors available: type KOHU 24A1 and type KOKU 072G3
- Set values, measured values, fault records, event records and diagnostic data can be read locally and remotely via the serial port
- Serial communication between fault indicator and substation control level system
- Alternative analog or digital outputs, where no fibre-optic SPA bus is available
- Improved system reliability supported by a built-in sophisticated self-supervision system
- High immunity to conducted electromagnetic interference
- Snap-on mounting on standard DIN rail or surface mounting on cabinet wall
- Member of the SPACOM product family, ABB's Distribution Automation system

## Application

The fault indicator type SPEF 3A2 C is used in association with disconnector terminal units (DTUs) for detection of short circuits, earth faults and phase discontinuity in distribution networks. The fault indicator functions a data acquisition unit which allows measured information and alarms from a DTU to be read by a remote control system. The information can be used e.g. for locating faults in the distribution network.

If no serial bus (SPA bus) is available, information can be obtained via the relay outputs and the analog outputs of the fault indicator.

## Design

The fault indicator is energized from current sensors type KOHU 24A1 or KOKU 072G3. The current sensors isolate the power network from the electronics and match the phase currents to suit the measuring circuits of the fault indicator.

The fault indicator comprises three functional units, i.e. an overcurrent unit, an earth-fault unit and a phase unbalance unit. Further, the indicator includes a serial communication unit which communicates with hierarchically superior systems via the serial bus.

The overcurrent unit monitoring the three phase currents starts if one or more of the supervised phase currents exceed the set start value I>. If the fault persists, an alarm will be given after a set time t>.

The earth-fault unit monitoring the residual current starts if the residual current exceeds the set start value $I_0$>. If the fault persists, an alarm will be given after a set time $t_0$>.

The phase unbalance unit monitoring the phase currents starts if the phase unbalance exceeds the set start value ΔI>. If the fault persists, an alarm will be given after a set time tΔ>.

The fault indicator is provided with three analog outputs, one for the load current, one for the earth-fault current and one for the phase unbalance. Further, the indicator has three contact alarm outputs.

### Data communication

The indicator is provided with a serial interface connecting the equipment to the SPA bus.

### Self-supervision

The indicator incorporates a sophisticated self-supervision system with auto-diagnosis, which increases the availability of the device and the reliability of the system. The self-supervision system continuously monitors the hardware and the software of the indicator.

When a permanent internal relay fault is detected, the IRF indicator on the relay front panel is lit. At the same time a fault message is transmitted to the higher-level system over the serial bus. Further, in most fault situations, a fault code is shown on the display of the device. The fault code indicates the type of the fault that has been detected.

### Auxiliary supply voltage

The fault indicator is powered from an external 24 V dc source (20…30 V dc). The power consumption is 1.5…3 W, depending on the state of the indicators and output relays.

# Technical data

### Table 1: Energizing inputs

| Type | | Primary current | KOHU 24A/ KOKU 073G2 secondary current |
|---|---|---|---|
| Measuring range of phase current input | | 0…700 A | 0…0.175 A |
| Thermal withstand | continuously | 400 A | 0.1 A |
| | for 1 s, with connection box SPEC 3 | 20 kA ($I_{th}$) | 2.3 A |
| Dynamic current withstand, including connection box SPEC 3 | Half-wave value | 50 kA ($I_{dyn}$) | 5.7 A |
| Earth-fault protection measuring range | | 0…70 A | - |
| Input impedance | | <100 Ω | |
| Rated frequency $f_n$, according to order | | 50 Hz or 60 Hz | |

### Table 2: Overcurrent unit

| | |
|---|---|
| Start current I> | 30…300 A |
| Start time, typically | 60 ms |
| Operate time t> | 0.06…300 s |
| Reset time, typically | 60 ms |
| Drop-off/pick-up ratio, typically | 0.95 |
| Operate time accuracy | ±2% of set value or ±25 ms |
| Operation accuracy | ±3% of set value |

### Table 3: Earth-fault current unit

| | |
|---|---|
| Start current $I_0$> | 2…20 A |
| Start time, typically | 60 ms |
| Operate time t> | 0.1…300 s |
| Reset time, typically | 60 ms |
| Drop-off/pick-up ratio, typically | 0.95 |
| Operate time accuracy | ±2% of set value or ±25 ms |
| Operation accuracy | ±5% of set value or ±1% of $I_{load}$ |

### Table 4: Phase unbalance unit

| | |
|---|---|
| Start current ΔI> | 10…60% of $I_n$ |
| Start time, typically | 90 ms |
| Operate time t> | 0.1…300 s |
| Reset time, typically | 90 ms |
| Drop-off/pick-up ratio, typically | 0.90 |
| Operate time accuracy | ±2% of set value or ±75 ms |
| Operation accuracy | ±5% of displayed value |

### Table 5: Output contact ratings

| According to IEC 60255-0-20 | |
|---|---|
| Rated voltage | 250 V ac |
| Breaking capacity (L/R < 7 ms) | 2 A , 20 V dc or 250 V ac |
| Making capacity | 5 A, 0.5 s |
| Minimum load | 10 mA at 5 V dc |

Technical data (cont´d)

### Table 6: Analog outputs

| | | |
|---|---|---|
| Voltage range | | 0…5 V dc |
| Load impedance, min. | | 10 kΩ |
| Response delay | | <500 ms |
| Accuracy | $I_{load}$ when current >5 A | 5% or 30 mV |
| | $I_0$ | 5% or ±30 mV |
| | ΔI when $I_{phase}$ ($I_{L1}$, $I_{L2}$ or $I_{L3}$) ≥ 10 A | ±200 mV |

### Table 7: External control input

| | |
|---|---|
| Control voltage | 18…30 V dc |
| Control current at activated input, typically | 10 mA |

### Table 8: Data transmission

| | |
|---|---|
| Transmission mode | Serial bus |
| Transmission protocol | SPA bus |
| Data transfer rate, selectable | 4800 Bd or 9600 Bd |

### Table 9: Power supply

| | |
|---|---|
| Supply voltage | 20…30 V dc |
| Power consumption, depending on relays and indicators | 1.5…3 W |

### Table 10: Tests and standards

| | | |
|---|---|---|
| Test voltages (for the output relays) | Insulation test (IEC 60255-5) | 2 kV, 50 Hz, 1 min |
| | Impulse test (IEC 60255-5) | 5 kV, 1.2/50 μs, 0.5 J |
| | Insulation resistance (IEC 60255-5) | >100 MΩ, 500 V dc |
| Interference tests (the test arrangement includes the connection box SPEC 3 and a ≥ 2 m connection cable) | High frequency disturbance test (IEC 60255-6), common mode | 2.5 kV, 1 MHz |
| | High frequency disturbance test (IEC 60255-6), differential mode | 1.0 kV, 1 MHz |
| | Electrostatic discharge test (IEC 60255-22-2, class III), air discharge | 8 kV |
| | Electrostatic discharge test (IEC 60255-22-2, class III), contact discharge | 6 kV |
| | Fast transient test (IEC 60255-22-4, class III) | 2 kV |
| Environmental conditions | Specified ambient service temperature range | -10…+55°C |
| | Transport and storage temperature range | -40…+70°C |
| Climatic environmental tests | Damp heat test (IEC 60068-2-30) | RH=93%, +55°C, 6 cycles |
| | Dry heat test (IEC 60068-2-2) | +55°C/16 h |
| | Dry cold test (IEC 60068-2-1) | -10°C/16 h |
| | Degree of protection by enclosure of the device case (IEC 60529) | IP 20 |
| | Weight | about 1.3 kg |

## Block diagram

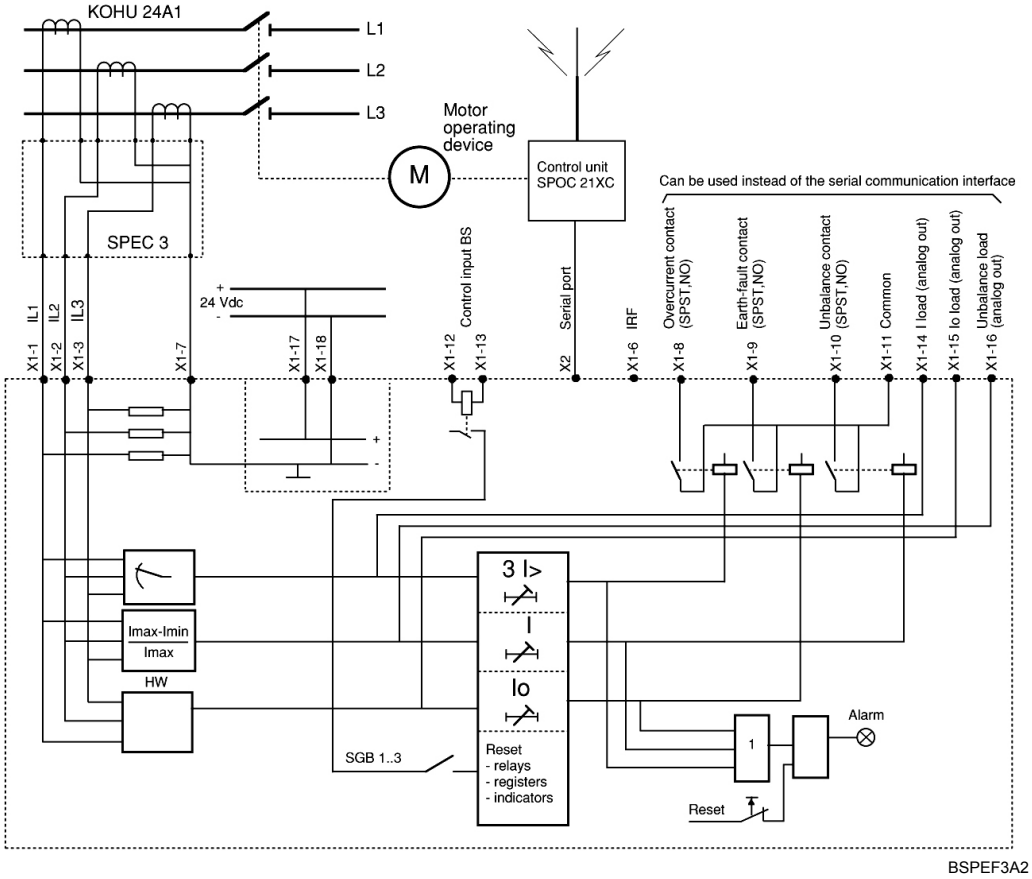


Fig. 1 Block diagram and sample connection diagram

## Ordering

### When ordering, please specify:

| Ordering information | Ordering example |
|---|---|
| 1. Type designation and quantity | SPEF 3A2 C, 5 pieces |
| 2. Order number | RS 489 001-AA |
| 3. Rated frequency | $f_n$ = 50 Hz |
| 4. Special requirements | - |

### Order numbers

| | |
|---|---|
| Fault indicator SPEF 3A2 C | RS 489 001-AA, BA |
| The last two letters of the order number indicate the rated frequency $f_n$ of the indicator as follows: | AA equals $f_n$ = 50 Hz |
| | BA equals $f_n$ = 60 Hz |

## References

### Additional information

| | |
|---|---|
| User's manual and technical description "Fault indicator SPEF 3A2 C" | 1MRS 751719-MUM |

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