

# RefleX Protection and Control

RefleX - 1504

**Overcurrent protection**  
**Directional earth fault protection**  
**Phase unbalance protection**  
**Communication (IEC 60 870-5-103)**



2-stage OC, 2-stage dir.EF  
and phase-unbalance  
Model 1504

# RefleX Overcurrent, Directional EF and Phase Unbalance Protection

## Menu (setting group #1)

|  |  |  |
|--|--|--|
| <p>In-service display</p>  | <p>(See separate description of the sub-menu)</p>                | <p>In-service display<br/>Press 'enter' to toggle displays</p>   |
| <p>Trip records</p>  | <p>(See separate description of the sub-menu 'Trip Records')</p> | <p>Press 'enter' to display recorded data<br/>After selecting a record use 'arrow up' or 'arrow down' to display additional information.<br/>Leave monitor by pressing 'Esc'.</p>      |
| <p>Low current #1<br/>I&gt; 160/4A<br/>t&gt; 1.5s Def.t<br/>CT 200/5A In5A</p>             | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Low phase current Setting group #<br/>Primary/secondary current set value<br/>Delay Characteristic<br/>Primary/secondary CT and rated phase current</p>                             |
| <p>High current #1<br/>I&gt;&gt; 1200/30A<br/>t&gt;&gt; 0.05s Def.t<br/>CT 200/5A In5A</p> | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>High phase current Setting group #<br/>Primary/secondary current set value<br/>Delay Characteristic<br/>Primary/secondary CT and rated phase current</p>                            |
| <p>Ph unbalance #1<br/>I2 0.4*I1<br/>t2 3s<br/>Trip Off</p>                                | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Phase unbalance Setting group #<br/>Neg. seq. starting ratio (I1: pos. seq. current)<br/>Delay (definite time)<br/>Trip On / Off</p>  |
| <p>DEF Uo/angle #1<br/>Uo 30V Trip ON<br/>Iø direction 90°<br/>Iø sector 120°</p>          | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Dir. EF voltage / ang Setting group #<br/>Secondary voltage set value Trip ON/OFF<br/>Tripping sector direction for Iø with Uo reference<br/>Tripping sector opening angle</p>      |
| <p>DEF current #1<br/>Io&gt; 80/0.8A<br/>tø&gt; 1.5s<br/>CT 100/1A In1A</p>                | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Dir. earth fault low c Setting group #<br/>Primary/secondary current set value<br/>Delay (after Io&gt;&gt;, Uo and angle 'operation')<br/>Primary/secondary C Rated EF current</p>  |
| <p>DEF current #1<br/>Io&gt;&gt; 90/0.9A<br/>tø&gt;&gt; 1.0s<br/>CT 100/1A In1A</p>        | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Dir. earth fault high c Setting group #<br/>Primary/secondary current set value<br/>Delay (after Io&gt;&gt;, Uo and angle 'operation')<br/>Primary/secondary C Rated EF current</p> |
| <p>Comm. IEC ON<br/>Config. Ring<br/>Address 1<br/>Meas. value 1.2</p>                     | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Configuration Comm. On/Off<br/>Relay address<br/>Value of measurand</p>   |
| <p>YMD 2002-05-29<br/>HMS 13:52:36<br/>Password ****<br/>Freq. 50Hz</p>                    | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Year - month - day<br/>24 hour clock<br/>Four-digit password Factory default: 1111<br/>Rated power system frequency</p>   |

# RefleX Overcurrent, Directional EF and Phase Unbalance Protection

## Menu (setting group #2)

|  |  |   |
|--|--|---|
| <p>In-service display</p>  | <p>(See separate description of the sub-menu)</p>                | <p>In-service display<br/>Press 'enter' to toggle displays</p>  |
| <p>Trip records</p>  | <p>(See separate description of the sub-menu 'Trip Records')</p> | <p>Press 'enter' to display recorded data<br/>After selecting a record use 'arrow up' or 'arrow down' to display additional information.<br/>Leave monitor by pressing 'Esc'.</p>     |
| <p>Low current #2<br/>I&gt; 160/4A<br/>t&gt; 1.5s Def.t<br/>CT 200/5A In5A</p>             | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Low phase current Setting group #<br/>Primary/secondary current set value<br/>Delay Characteristic<br/>Primary/secondary CT and rated phase current</p>                            |
| <p>High current #2<br/>I&gt;&gt; 1200/30A<br/>t&gt;&gt; 0.05s Def.t<br/>CT 200/5A In5A</p> | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>High phase current Setting group #<br/>Primary/secondary current set value<br/>Delay Characteristic<br/>Primary/secondary CT and rated phase current</p>                           |
| <p>Ph unbalance #2<br/>I2 0.4*I1<br/>t2 3s<br/>Trip Off</p>                                | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Phase unbalance Setting group #<br/>Neg. seq. starting ratio (I1: pos. seq. current)<br/>Delay (definite time)<br/>Trip On / Off</p>   |
| <p>DEF Uo/angle #2<br/>Uo 30V Trip ON<br/>Iø direction 90°<br/>Iø sector 120°</p>          | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Dir. EF voltage / angle Setting group #<br/>Secondary voltage set value Trip ON/OFF<br/>Tripping sector direction for Iø with Uo reference<br/>Tripping sector opening angle</p>   |
| <p>DEF current #2<br/>Io&gt; 80/0.8A<br/>tø&gt; 1.5s<br/>CT 100/1A In1A</p>                | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Dir. earth fault low c Setting group #<br/>Primary/secondary current set value<br/>Delay (after Io&gt;&gt;, Uo and angle 'operation')<br/>Primary/secondary C Rated EF current</p> |
| <p>DEF current #2<br/>Io&gt;&gt; 90/0.9A<br/>tø&gt;&gt; 1.0s<br/>CT 100/1A In1A</p>        | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Dir. earth fault high Setting group #<br/>Primary/secondary current set value<br/>Delay (after Io&gt;&gt;, Uo and angle 'operation')<br/>Primary/secondary C Rated EF current</p>  |
| <p>Comm. IEC ON<br/>Config. Ring<br/>Address 1<br/>Meas. value 1.2</p>                     | <p>_____</p> <p>_____</p> <p>_____</p>                           | <p>Configuration Comm. On/Off<br/>Relay address<br/>Value of measurand</p>  |
| <p>YMD 2002-05-29<br/>HMS 13:52:36<br/>Password ****<br/>Freq. 50Hz</p>                    | <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>              | <p>Year - month - day<br/>24 hour clock<br/>Four-digit password Factory default: 1111<br/>Rated power system frequency</p>  |

# RefleX Overcurrent, Directional EF and Phase Unbalance Protection

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## In-service displays

By commissioning of the relay the in-service display will show the primary phase currents.

Press 'enter' to switch between the different in-service displays

Chosen in-service display will automatically be default in-service display

In-service display

|               |      |
|---------------|------|
| OC,DEF,Ph-Unb |      |
| IL1           | 124A |
| IL2           | 120A |
| IL3           | 123A |

In service display  
Primary current in phase 1  
Primary current in phase 2  
Primary current in phase 3

|               |      |
|---------------|------|
| OC,DEF,Ph-Unb |      |
| Io            | 0.1A |
| Uo            | 5V   |
| EF Angle      | 86°  |

Alternativ in-service display  
Primary EF-current  
Secondary EF-voltage  
EF angle

|               |        |
|---------------|--------|
| OC,DEF,Ph-Unb |        |
| I1            | 100A   |
| I2            | 0.1*I1 |

Alternativ in-service display  
Pos. seq. of the primary load current  
I2 = Negative sequence factor \* I1

# RefleX Overcurrent, Directional EF and Phase Unbalance Protection

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## Trip records

After a relay trip the display showing date and time of the trip automatically appears.

Each trip is automatically assigned a separate serial number.

All displays show recordings subsequent to relay tripping. The last five recordings are always stored.

By using arrow up/arrow down the user may access all relevant information in the displays below.

Only trip records (displays) with active information is stored and/or displayed after a trip.

Trip records

This display is part of the main menu  
After selecting a record use 'arrow up' or 'arrow down' to display additional information.  
Leave trip records by pressing 'Esc'.

```
Trip 333
2002-12-24
12:13:14.123
Delay 0.05s
```

Header (in this case looking at trip no. 333)  
Date of 'trip 333'  
Time of 'trip 333'  
Delay of 'trip 333'

```
Trip 333
I> I>>*
Io> Io>>
I2
```

Trip indication (trip 333)  
\* indicates type of trip

```
Trip 333
IL1      1400A
IL2      1390A
IL3      1400A
```

Trip 333  
Primary phase current  
Primary phase current  
Primary phase current

```
Trip 333
Io        0A
Uo        0V
EF Angle  0°
```

Trip 333  
Primary Earth fault current  
Earth fault voltage  
Earth fault angle

```
Trip 333
I1        100A
I2        0*I1
```

Trip 333  
Phase unbalance (positiv sequence current)  
Phase unbalance (negative sequence current)



# RefleX Overcurrent, Directional EF and Phase Unbalance Protection

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## Technical data

### Overcurrent protection

|   |         |                             |
|---|---------|-----------------------------|
| Measurement                                       |         | Three phases                |
| Current settings 1A rated input.                  | I>, I>> | 0.200 - 75.0 A and block    |
| Current settings 5A rated input.                  | I>, I>> | 1.00 - 375 A and block      |
| Time characteristics                              |         | NI, VI, EI, LTI and fasttid |
| Time multipliers for inverse time characteristics | k>,k>>  | 0.10 - 1.20 and block       |
| Definite time settings                            | t>,t>>  | 0.01 - 9.99 s and block     |
| Resetting ratio                                   |         | >0.97                       |
| Harmonic measurement                              |         | 1st harmonic                |

### Phase unbalance protection

|   |    |                            |
|---|----|----------------------------|
| Negative sequence starting ratio *)                       | I2 | 0.100 - 0.5 * I1 and block |
| Positive sequence measuring limit 1A rated input          |    | 0.1 A                      |
| Positive sequence measuring limit 5A rated input          |    | 0.5 A                      |
| Timer   | t2 | 0.10 - 99.9 s and block    |
| Resetting ratio   |    | >0.97                      |
| Trip function   |    | On / Off                   |
| *) I1 = the positive sequence value of the phase currents |    |                            |
| *) I2 = the negative sequence value of the phase currents |    |                            |

### Directional Earth Fault protection

|  |           |                          |
|--|-----------|--------------------------|
| Current setting 1A rated input             | Io>, Io>> | 0.005 - 2.00 A and block |
| Current setting 5A rated input             | Io>, Io>> | 0.075 - 30.0 A and block |
| Timer - definite time                      | tø>, tø>> | 0.01 - 30.0 s and block  |
| Directional reference. Voltage setting     | Uo        | 1.00 - 170 V             |
| Directional reference. Measuring direction | Direction | 0 - 360°                 |
| Directional reference. Operational sector  | Sector    | 0 - 360°                 |
| Resetting ratio (current and voltage)      |           | >0.97                    |
| Harmonic measurement (current and voltage) |           | 1st harmonic             |

### Breaker failure protection

|                                   |  |       |
|-----------------------------------|--|-------|
| Trip transfer delay (fixed value) |  | 0.2 s |
|-----------------------------------|--|-------|

### Selection between two setting groups

|  |  |               |
|--|--|---------------|
| Setting group #1 is active when 'low' input voltage is applied to                  |  | Input B13-B14 |
| Setting group #1 can also be selected by signal from comm.                         |  | <CD 23>       |
| Setting group #2 is active when 'high' input voltage is applied to                 |  | Input B13-B14 |
| Setting group #2 can also be selected by signal from comm.                         |  | <CD 24>       |
| Setting group is selected by communication when 'high' input voltage is applied to |  | Input B3-B4   |

### System data

|   |  |             |
|---|--|-------------|
| Factory default password                    |  | 1111        |
| Pulse-extension circuit on all trip outputs |  | 0.2 s pulse |
| Pulse-extension circuit at blocking inputs  |  | 50 ms pulse |
| Rated frequency                             |  | 50 / 60 Hz  |

# RefleX Overcurrent, Directional EF and Phase Unbalance Protection

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## Technical data

### Communication (IEC 870-5-103 protocol)

|                                 |               |
|---------------------------------|---------------|
| Configuration system            | Star or Ring  |
| Address of protection equipment | 1 to 254      |
| Value of measurand ( x In)      | 1.2 or 2.4    |
| Optical fibre transmitters      | Outputs D3,D5 |
| Optical fibre receivers         | Inputs D4,D6  |

### Selection of standard information numbers in monitor direction (MDxxx)

|  | Type | Info.no | ASDU | Gi |
|--|------|---------|------|----|
| Protection inactive (internal fault)                 | 160  | 18      |      | x  |
| LED-reset  | 160  | 19      |      | -  |
| Local parametersettings                              | 160  | 22      |      | x  |
| Characteristic 1 (selected setting group)            | 160  | 23      |      | x  |
| Characteristic 2 (selected setting group)            | 160  | 24      |      | x  |
| Earth fault protection is directed forward i.e. line | 160  | 51      |      |    |
| General trip   | 160  | 68      |      | -  |
| General start  | 160  | 84      |      | x  |
| Breaker failure                                      | 160  | 85      |      | -  |
| Trip I>  | 160  | 90      |      | -  |
| Trip I>>   | 160  | 91      |      | -  |
| Trip IN>   | 160  | 92      |      | -  |
| Trip IN>>  | 160  | 93      |      | -  |
| Measurands IN, VEN                                   | 160  | 147     |      | -  |
| Measurands IL1,2,3                                   | 160  | 148     |      | -  |

### Selection of standard information numbers in control direction (CDxxx)

|                        |     |    |
|------------------------|-----|----|
| LED-reset              | 160 | 19 |
| Select setting group 1 | 160 | 23 |
| Select setting group 2 | 160 | 24 |