ELIN DRS-LIGHT
Short Technical Description

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Author: Hantsch 26.03.2003
Checked: Schreiber 26.03.2003
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Registered: Hantsch 26.03.2003
First Issue: 24.09.2002
WARNING

Installing, commissioning and operating of this product may be performed by thorough trained and specialised personnel *

only. We explicitly will not take any responsibility for any damage on our products caused by improper installation, configuration and handling. Internal modifications must solely be carried out by specialised personnel authorised by

VA TECH SAT GmbH & Co / Division PE.

* **Definition:** *Specialised personnel*, when authorised and properly instructed, may perform following tasks:

- Installing, mounting, commissioning and operating of the apparatus and the system when familiar with.
- Maintenance and use of safety equipment according to standard rules and regulations.
- First Aid after extensive training.
**Field of application**

The DRS-LIGHT - a member of the protective relay family DRS - is a multifunctional, digital relay. As a single unit the field of application consists of protection for small generators, transformers, motors, feeders and back-up protection. In combination with other devices of the DRS-Family the DRS-LIGHT can be used for an economic complementation of one or the other necessary protective function - independently of the size of the protected plant.

Our know-how and competence for more than 40 years in power station technology and in development and application of protective systems guarantees high performances and qualified solutions.

Concerning the multi-functionality we cover a large range of applications with just a few different types.

**Highlights**

- Extreme reduced costs for spare part storage by only a few different types of hardware
- 4 standard configurations for 50 or 60Hz - applications
- Special configurations for 16,7Hz traction applications
- Customer specific configuration on request
- High integrated and reliable digital technology
- Plant tested protective functions from the "DRS-Protective Library"
- Self monitoring of hard- and software
- 10 LEDs, 8 of them free programmable
- 2-line, 16-digit LCD for local visualisation
- Keypad for local access via menu
- RS485 communication interface with PC
- Optional communication: IEC60870-5-103
- Comprehensive, intuitively learnable, graphic operation software DRS-WIN under MS Windows® on the PC enables easy setting of parameters of the device (optional)
- DRS-WIN also contains fault analysis FFT and remotal diagnosis.
- Cases for panel flush/projection mounting and for 19" racks

**Technical Data**

**Analogue Inputs**

(type specific) depending on connections

- 4 VTs: 100/110/120V

**Nominal frequencies**

- 50; 60; 16.7Hz

**Binary inputs**

- 4 free programmable

**Binary outputs**

- 3 trip-/alarm relays free prog.able
- 1 internal fault
- 8 LEDs, 2 for internal status
- acc. VDEW - recommendation

**Contacts**

**Interfaces**

- RS485, optional IEC 60870-5-103
- integrated software matrix

**Auxiliary Supply**

- 240/220/110/60/24/VDC,(VAC), approx. 10W

**Local operation**

- 6 keys, 2 x 16 digit LCD

**Binary Inputs**

- Input voltages \( V_H \)
- current consumption
- operation value

- 240, 220, 110, 60, 24VDC
- 2.5 – 3 mA
- approx. 0.7 \( \times \) \( V_H \)

**Binary Outputs**

- Contact data
- continuous current 8A
- Trip contact
- OUT1, OUT2
- OUT3.1, OUT3.2
- (OUT4, OUT5, OUT6)

- continuous current 16A
- Further data
- Contact material: AgSnO_2
- Mechanical live duration
- 5\times10^7 switching cycles
- Insulation
- Open contact: 1000 \( V_{RMS} \)
- Contact-coil: 5000 \( V_{RMS} \)

**Current Inputs**

- Nominal current
- 1/5 A according to connections
- Continuous current
- 4 \( \times \) \( I_N \)
- Thermal withstand
- 10 \( \times \) \( I_N \), 30s
- 100 \( \times \) \( I_N \), 1s
- 250 \( \times \) \( I_N \), 1 half cycle
- Burden
- <0.1 VA at \( I_N \)

**Voltage Inputs**

- Nominal Voltage \( V_N \)
- 100/110/120V
- Maximum Voltage
- 220V continuous
- Burden
- 0.3VA at \( V_N \)

**Screw type terminals**

- Current inputs
- Rest
- cross section 4 mm²
- cross section 2.5 mm²
Technical data of optional components

| Increase of binary IN/OUTputs (DRS-L-IOX) | 2 IN with common potential, 3 OUT potential free, 4 OUT with common potential |
| NC function of contacts | OUT1, OUT2, OUT3.1 and OUT3.2 |
| Accelerated output relay | OUT2 |
| Sensitive current input I4 | nom. current 20mA |

Tests

| Type tests                  | EN 50263                  |
| Interference emission       | IEC 60255 part 25;        |
| 1MHz burst test             | IEC 60255 part 22-1,     |
| ESD test                    | IEC 60255 part 22-2,     |
| Radiated Electromagnetic Field | IEC 60255 part 22-3;    |
| El. Fast Transiente Burst   | IEC 60255 part 22-4,     |
| Surge test                  | IEC 61000-4-5;           |
| Vibration test              | IEC 60255 part 21-1,-2   |
| Conducted Interference      | IEC 61000-4-6;           |
| Power frequency magnetic fields | IEC 61000-4-8;        |
| Insulation test             | IEC 60255-5;             |
| CE Plaque 2000              | 5kV                      |

Case data

| Protection type | IP51               |
| Mounting        | Panel flush or projection mounting, 19", 6U height / 21U width |
| Dimensions in mm | H x W x D: 243 x 96 x 208 |
| Weight          | Approx. 3 – 4 kg depending on type |

Technical Highlights

• Powerful processor
• Flash-PROM enables easy upgrade
• Long record time of fault records also by disconnected aux. supply
• Hall effect CTs
• Wide range for aux. supply voltage and for binary inputs
• High EMV by galvaniszed surface and EMV-construction
• Continuous hardware and software self monitoring
**DRS-LA4**

- Multi functional current relay
- Analogue Inputs: 4 CTs with 1A or 5A depending on connection
- Generator main or back-up protective relay for current, overload and negative phase sequence faults
- Line-, cable-, transformer- and motor feeder protective relay
- Configurated for 50 or 60 Hz applications
- Not used functions can be blocked
- Available options please refer to table "Options" (Page 10)

**Table of function configuration**

<table>
<thead>
<tr>
<th>ANSI/IEEE</th>
<th>Name of function</th>
<th>DRS-library</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/51</td>
<td>Overcurrent 3-ph., 2 st. IDMT</td>
<td>MI325</td>
</tr>
<tr>
<td>50/51</td>
<td>Overcurrent 1-ph., 2 st. IDMT</td>
<td>MI125</td>
</tr>
<tr>
<td>50/51/37</td>
<td>Over-/Undercurrent 3-ph., 2 st. DT</td>
<td>MI323</td>
</tr>
<tr>
<td>50/51/37</td>
<td>Over-/Undercurrent 1-ph., 2 st. DT</td>
<td>MI121</td>
</tr>
<tr>
<td>46</td>
<td>Negative phase sequence</td>
<td>MN211</td>
</tr>
<tr>
<td>49</td>
<td>Overload 1-ph.</td>
<td>ML121</td>
</tr>
<tr>
<td>-</td>
<td>Signal function</td>
<td>MB111</td>
</tr>
<tr>
<td>-</td>
<td>Basic functions</td>
<td></td>
</tr>
</tbody>
</table>

**Application drawing / typical connections**
DRS-LA6

- Multi functional current relay
- Analogue Inputs: 6 CTs with 1A or 5A depending on connection
- Generator / Unit 2-winding transformer differential relay containing:
  - Blocking at 2nd and 5th harmonic
  - Transformer vector group and CT-ratio compensation by software
  - Zero sequence filter ON/OFF optionally controlled via external signal
  - Overcurrent and Overload protective function
- Configurated for 50 or 60 Hz applications
- Not used functions can be blocked
- Available options please refer to table "Options" (Page 10)

Table of function configuration

<table>
<thead>
<tr>
<th>ANSI/IEEE</th>
<th>Name of function</th>
<th>DRS-library</th>
</tr>
</thead>
<tbody>
<tr>
<td>87T.U</td>
<td>Transformer/Unit Diff. 2-wdg., 3-ph.</td>
<td>MD321</td>
</tr>
<tr>
<td>51/37</td>
<td>Over-/Under current 3-ph., 1 st.</td>
<td>MI313</td>
</tr>
<tr>
<td>51/37</td>
<td>Over-/Under current 3-ph., 1 st.</td>
<td>MI313</td>
</tr>
<tr>
<td>49</td>
<td>Overload 1-ph.</td>
<td>MI313</td>
</tr>
<tr>
<td>-</td>
<td>Signal function</td>
<td>MI313</td>
</tr>
<tr>
<td>-</td>
<td>Basic functions</td>
<td>MI313</td>
</tr>
</tbody>
</table>

Application drawing / typical connections
DRS-LA4 16.7Hz

- Multi functional current relay
- Analogue Inputs: 4 CTs with 1A or 5A depending on connection
- For specific 16.7Hz-traction applications
- Differential-, Current-, Overload-, CB-failure protection relay for 2-phase systems
- Not used functions can be blocked
- Available options please refer to table "Options" (Page 10)

Table of function configuration

<table>
<thead>
<tr>
<th>ANSI/IEEE</th>
<th>Name of function</th>
<th>DRS-library</th>
</tr>
</thead>
<tbody>
<tr>
<td>87T,U</td>
<td>Transformer/Unit diff. 2-wdg., 2-ph.</td>
<td>MD221</td>
</tr>
<tr>
<td>51/37</td>
<td>Over-/Under current 1-ph., 1 st.</td>
<td>MI111</td>
</tr>
<tr>
<td>51/37</td>
<td>Over-/Under current 1-ph., 1 st.</td>
<td>MI111</td>
</tr>
<tr>
<td>50</td>
<td>Over current 3-ph., 1 st.</td>
<td>MI317</td>
</tr>
<tr>
<td>49</td>
<td>Overload 1-ph.</td>
<td>ML121</td>
</tr>
<tr>
<td>49</td>
<td>Overload 1-ph.</td>
<td>ML121</td>
</tr>
<tr>
<td>-</td>
<td>CB-failure protection</td>
<td>1xMI111</td>
</tr>
<tr>
<td>-</td>
<td>Signal function</td>
<td>7xMB111</td>
</tr>
<tr>
<td>-</td>
<td>Basic functions</td>
<td></td>
</tr>
</tbody>
</table>

Application drawing / typical connections
DRS-LV4

- Multi-functional voltage relay
- Analogue Inputs: 4 VTs with 100/110/120V
- Over-/Underfrequency and V/Hz-protection
- Configurated for 50 and 60 Hz applications
- Not used functions can be blocked
- Available options please refer to table "Options" (Page 10)

Table of function configuration

<table>
<thead>
<tr>
<th>ANSI/IEEE</th>
<th>Name of function</th>
<th>DRS-library</th>
</tr>
</thead>
<tbody>
<tr>
<td>59/27</td>
<td>Over-/Under voltage 3-ph., 2 st.</td>
<td>MU323</td>
</tr>
<tr>
<td>59/27</td>
<td>Over-/Under voltage 3-ph., 1 st.</td>
<td>MU313</td>
</tr>
<tr>
<td>81</td>
<td>Frequency 4 st.</td>
<td>MF141</td>
</tr>
<tr>
<td>59/27</td>
<td>Over-/Under voltage 1-ph., 2 st.</td>
<td>MU121</td>
</tr>
<tr>
<td>51/37</td>
<td>Over-/Under voltage 1-ph., 1 st.</td>
<td>MU111</td>
</tr>
<tr>
<td>24</td>
<td>Overfluxing (V/Hz) 2 st.</td>
<td>MX121</td>
</tr>
<tr>
<td>-</td>
<td>Signal function</td>
<td>MB111</td>
</tr>
<tr>
<td>-</td>
<td>Signal function</td>
<td>MB111</td>
</tr>
<tr>
<td></td>
<td>Basic functions</td>
<td></td>
</tr>
</tbody>
</table>

Application drawing / typical connections
DRS-LP8

- Combined multi-functional protective relay
- Analogue Inputs: 4 CTs with 1A or 5A depending on connection,
  4 VTs with 100/110/120V
- Minimum impedance, directional over-current, directional earth fault and reverse power
- Generator main- or back-up protective relay, line-, cable-, transformer-, motor feeder protection
- Configurated for 50 and 60 Hz applications
- Not used functions can be blocked
- Available options please refer to table "Options" (Page 10)

Table of function configuration

<table>
<thead>
<tr>
<th>ANSI/IEEE</th>
<th>Name of function</th>
<th>DRS-library</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum Impedance 3-ph., 2 st.</td>
<td>MZ322</td>
</tr>
<tr>
<td>21</td>
<td>Directional over-current 3-ph., 3 st.</td>
<td>MI332</td>
</tr>
<tr>
<td>67</td>
<td>Directional earth fault 1-ph., 1 st.</td>
<td>MS111</td>
</tr>
<tr>
<td>67</td>
<td>Reverse power 3-ph., 1 st.</td>
<td>MP312</td>
</tr>
<tr>
<td>32</td>
<td>Basic functions</td>
<td></td>
</tr>
</tbody>
</table>

Application drawing / typical connections
Communication

The DRS-LIGHT has got two interfaces for communication.

One connection is provided for operation by the protection engineer and for maintenance and service (e.g. flash memory enables upgrading).

It is a local RS485-interface for a Windows PC with an operation cable or for remotal access via MODEM or multi-connector DRS-COM.

A second optional interface is provided for the station control system. This interface supports either the usual IEC 60870-5-103 protocol or the protocol IEC 60870-5-104 via ETHERNET. A third also optional connection is prepared for expansions of I/O-periphery via CAN-bus-devices.

Table "Options"
Possibility of application in the different model types

<table>
<thead>
<tr>
<th></th>
<th>DRS-LA4</th>
<th>DRS-LA6</th>
<th>DRS-LA4 16.7</th>
<th>DRS-LV4</th>
<th>DRS-LP8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase of numbers of Binary IN/OUTputts (DRS-L-IOX)</td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Auto reclose function</td>
<td>●</td>
<td></td>
<td></td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Contacts with NC function</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Accelerated trip relay</td>
<td>● ●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>Sensitive current input 4</td>
<td>●</td>
<td>●</td>
<td>● (*)</td>
<td>● (*)</td>
<td>●</td>
</tr>
</tbody>
</table>

*) on request
### General type code

**DRS-LXXXX/G/V/Hz/X/I/A/M/F/S**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Type of relay (inputs)</td>
</tr>
<tr>
<td>V</td>
<td>Current relay</td>
</tr>
<tr>
<td>P</td>
<td>Voltage relay</td>
</tr>
<tr>
<td>P</td>
<td>Current- / voltage relay</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Number of measuring inputs</td>
</tr>
<tr>
<td>6</td>
<td>4 currents</td>
</tr>
<tr>
<td>8</td>
<td>6 currents</td>
</tr>
<tr>
<td>11</td>
<td>8 currents, 4 voltages</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Protective functions</td>
</tr>
<tr>
<td>XX</td>
<td>Standard configuration according to short technical description</td>
</tr>
<tr>
<td>XX</td>
<td>Special configuration (XX-allocation by VA TECH SAT)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mechanical design (case)</td>
</tr>
<tr>
<td>E</td>
<td>projection mounting</td>
</tr>
<tr>
<td>E</td>
<td>panel flush and 19&quot;-rack mounting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Auxilliary supply voltage and input voltage for binary inputs</td>
</tr>
<tr>
<td>240/220 VDC; threshold binary inputs: approx. 150 V</td>
<td></td>
</tr>
<tr>
<td>110 VDC; threshold binary inputs: approx. 73 V</td>
<td></td>
</tr>
<tr>
<td>24 VDC; threshold binary inputs: approx. 17 V</td>
<td></td>
</tr>
<tr>
<td>60 VDC; threshold binary inputs: approx. 41 V</td>
<td></td>
</tr>
<tr>
<td>Special voltage</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Nominal frequency $f_N$</td>
</tr>
<tr>
<td>16.7 Hz</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>50 Hz</td>
</tr>
<tr>
<td>60</td>
<td>60 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Additional Hardware (for traction applications)</td>
</tr>
<tr>
<td>–</td>
<td>Without extensions</td>
</tr>
<tr>
<td>X</td>
<td>Increase of numbers of binary IN/OUTputs (DRS-L-I0X)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Communication to SCADA and CAN-Bus</td>
</tr>
<tr>
<td>1</td>
<td>Interface for IEC 60870-5-103 (fibre optic)</td>
</tr>
<tr>
<td>2</td>
<td>Interface for IEC 60870-5-104</td>
</tr>
<tr>
<td>3</td>
<td>Interface for CAN-Bus</td>
</tr>
<tr>
<td>4</td>
<td>Interface for IEC 60870-5-103 (fibre optic)+CAN-Bus</td>
</tr>
<tr>
<td>5</td>
<td>Interface for IEC 60870-5-104 + CAN-Bus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Auto reclose function</td>
</tr>
<tr>
<td>1</td>
<td>Without auto reclose function</td>
</tr>
<tr>
<td>1</td>
<td>With auto reclose function</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>Type of contacts (Standard contacts / NC-function)</td>
</tr>
<tr>
<td>–</td>
<td>Contacts have standard functions</td>
</tr>
<tr>
<td>R</td>
<td>Contacts have normally close (NC) function (no auto reclose possible!)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>Output relays, operation times</td>
</tr>
<tr>
<td>–</td>
<td>Output relay standard</td>
</tr>
<tr>
<td>1</td>
<td>Output relay OUT2 accelerated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>–</td>
<td>Sensitivity of current inputs (measuring range)</td>
</tr>
<tr>
<td>S</td>
<td>Current input 4 (channel 4) in standard version</td>
</tr>
<tr>
<td>S</td>
<td>Current input 4 (channel 4) has sensitive range</td>
</tr>
</tbody>
</table>
List of installed protective functions with parameters and options

Over/Under current protection (51 / 37):
Type: MI323/MI121, 3-phase/1-phase, 2-stage
Setting range: 0.1 - 5 x I\text{N} in steps of 1 % + 0.1 - 30 x I\text{N} in steps of 5 %
Time delay: 0 to 10 s in steps of 50 ms
Measuring method: amplitude of 1st harmonic each phase

Over/Under current protection (51 / 37):
Type: MI313/MI111, 3-phase/1-phase, 1-stage
Setting range: 0.1 - 5 x I\text{N} in steps of 1 %
Time delay: 0 to 10 s in steps of 50 ms
Measuring method: amplitude of 1st harmonic each phase

Inverse time over current protection (51):
Type: MI325/MI125, 3-phase/1-phase, 2-stage
Operation value stage 1: 0.05 - 2 x I\text{N} in steps of 1 %
Time multiplier stage 1: 0.05 - 1 in steps of 0.025
Characteristic stage 1: extremely, very, normal, long inverse
Operation value stage 2: 1 - 31 x setting value stage 1 in steps of 1
Time delay stage 2: 0 - 10 s in steps of 50 ms (definite time)
Measuring method: amplitude of 1st harmonic each phase

Overload thermal (49):
Type: ML121, 1-phase
Time constant: 2 - 100 min in steps of 1 min
CT ratio compensation setting: 0.4 - 2 in steps of 1 %
Temperature alarm: 25 - 150% in steps of 1%
Temperature trip: 25 - 150% in steps of 1%
Measuring method: Replica of heating curve
(Temperature ~ I^2 with exponential relation: thermal time constant of winding)

Negative phase sequence (46):
Type: MN211, 1-stage
Operating value: 5 - 50% in steps of 5 %
Time delay: 0 - 10s in steps of 50 ms
Measuring method: Calc. of neg. seq. component with I_L1 and I_L3

Over/Under voltage protection (27 / 59):
Type: MU313/MU323, 3-phase, 1- /2-stage
Setting range: 2-200 V in steps of 0.2 V
Time delay: 0 to 10 s in steps of 50 ms
Measuring method: amplitude of 1st harmonic each phase

Over/Under voltage protection (27 / 59):
Type: MU111, 1-phase, 1-stage
Setting range: 2-200 V in steps of 0.2 V
Time delay: 0 bis 10 s in steps of 50 ms
Measuring method: amplitude of 1st harmonic each phase

Transformer differential protection (87T):
Type: MD321/MD221, ∆I, 3-phase/2-phase, 2-winding
Setting range: 0.2 - 0.6 x I\text{N} in steps of 1 %
Bias: 40 - 60% in steps of 5 %
Rush stabilizing: 2. harm.: 20-50 % in steps of 1 %
5. harm.: 10-20 % in steps of 1 %
High set stage: 2-15 x I\text{N} in steps of 1 x I\text{N}
Zero sequence filter: selectable OFF / ON / EXT
Vector group: selectable: No, 1, 7, 5, 11, 0, 6
Measuring method: 3 x current difference L1, L2, L3 for system 1-2; 2 x current difference L1, L3 for system 1-2

Minimum impedance protection (21):
Type: MZ322, 3-phase, 2-stage
Current stage 1: 0.5 - 5 x I\text{N} in steps of 1 %
Impedance stage 2: 0.5 - 20 % in steps of 0.1%, circle characteristic
Time delay: 0 - 10 s in steps of 50 ms
Measuring method: Impedance of the 3 systems from phase currents and phase voltages
(3 x current, 3 x voltage)

Overfluxing protection (24):
Type: MX121, 2-stage
Operating values: both stages: 0.8 ... 1.5 p.U. in steps of 1%
Time delay: both stages: 0 ... 10 s in steps of 50 ms
Measuring method: Calculation of overfluxing by V/f

Reverse power protection (32 / 37):
Type: MP312, 3-phase, 1-stage
Setting range: -5 to –0.2% P/P\text{N} in steps of 0.1%
Time delay: 0 - 180 s in steps of 0.1 s
Selection: phase sequence, current direction, Over / Under detection, CT error correction
Measuring method: Calculation of power of the positive phase sequence system
**Frequency protection (81):**
Type: MF141, 4-stage
Operation values: 10 - 65 Hz in steps of 0.01 Hz
Time delay: 0 - 10 s in steps of 50 ms
Operation voltage: 60 – 100V / 100 – 140V
Selections: Under/Over detection
Measuring method: Measuring of phase angle between measured voltage vector and synchronising frequency

**Directional over current (67):**
Type: MI332/MI132, 3-phase/1-phase, 3-stage
Operation values: 0.1 - 5 x I_N in steps of 1 %
Time delay: 0 - 10 s in steps of 50 ms
Measuring method: Calculation of direction via phase currents and phase to phase voltages.

**Overcurrent high speed (50):**
Type: MI317, 3-phase, 1-stage
Operation values: 0.5 – 5 x I_N in steps of 10 %
Time delay: 100 to 500 ms in steps of 10 ms
Measuring method: fast current measuring

**Automatic reclose function (79) (Option)**
Type: MA311, 3-pol. multi-shot reclosing
Number of reclosing cycles each event: max. 10
Dead time 1: 0,2 - 2,0 s in steps of 0.1s
Dead time 2-4: 1 - 60 s in steps of 1s
Dead time 5+: 1 - 60 s in steps of 1s
Reclaim time: 2,0 - 180,0 s in steps of 0.5 s
Reclaim time manual-ON: 2-10 s in steps of 0.5 s
CB-ON command: 0.25 - 5 s in steps of 0.05s
CB-ON command double pole via OUT 3.1 and OUT 3.2

**Signal function 1:**
Type: MB111, 1-signal, 1-stage
Operation: raising, falling
Time delay: 0 – 10 s in steps of 50 ms

**Base functions in every relay**
Fault recording
Alarm protocol
Self supervision
CT / VT supervision
Time synchronisation
Operation Software
Dimensional Drawing

Case for flush panel mounting of DRS-LP8 (6 U height, 21 U width in 19"-rack) (Dwg.No.:3-534.523, 8/11)

Case for projection mounting of DRS-LP8 (Dwg.No.:3-534.523, 9/11)
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Table of Contents

Warning for Commissioning .................................................................................................................. 2

Field of application, Highlights, Technical Data (1) ........................................................................ 3

Technical Data (2), Tests, Technical Highlights .................................................................................. 4

DRS-LA4 .............................................................................................................................................. 5

DRS-LA6 .............................................................................................................................................. 6

DRS-LA4 16.7, ................................................................................................................................... 7

DRS-LV4 .............................................................................................................................................. 8

DRS-LP8 .............................................................................................................................................. 9

Communication, Possibility of application of the Options ................................................................. 10

General Type code .............................................................................................................................. 11

List of installed protective functions (1) ............................................................................................. 12

List of installed protective functions (2) ............................................................................................. 13

Communication ................................................................................................................................. 14

Mechanical Drawing .......................................................................................................................... 15

Delivery Conditions ........................................................................................................................... 16

List of Contents ................................................................................................................................. 17

Copyright, Remarks, Address ............................................................................................................. 18
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