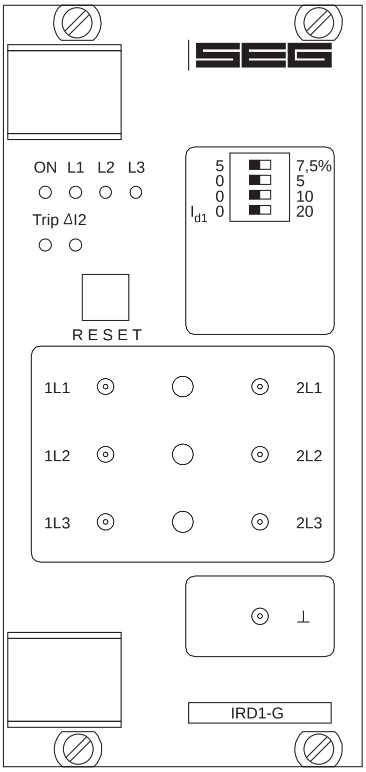
IRD1-G - Differential Protection Relay for Generators and Motors



Contents

1. Introduction

When compared with traditional protection systems the protective relaying with ***MR***- and ***IR***-relays of our *HIGH TECH LINE* offers several advantages.

All ***MR*** protection relays are based on microprocessor technology. They present the generation of our most efficient protection relays, because of their capabilties to process the measuring values digitally and to perform arithmetical and logical operation.
Additional advantages such as very low power consumption, adaptability, possibilities for self-supervision, flexible construction, selection of relay characteristics are completely utilized.

Some ***IR*** protection relays are based on microprocessor and some on analog technology. They present our low-priced protection relay generation and are used for all basic protection application.

The following properties of the ***IR*** protection relays, such as:

- Integration of multiple protection functions into one compact housing,
- User-friendly setting procedure by means of DIP-switches,
- Compact design due to SMD-technique,

are their superiority over the traditional protection systems.

For all applications of a more complex nature, e.g. directional earth fault detection and where operating convenience, fault analysis and communication ability are required, ***MR***-relays are used.

All relays of the *HIGH TECH LINE* are available for through panel mounting and in 19" racks.
Connection terminals are of plug-in type.
All IEC/DIN regulations required for the individual application are reliably met by these relays.

2. Application

Protection devices for electrical systems minimize fault damages, assist in maintaining power system stability and help to limit supply interruptions to consumers.

Differential protection for generators, based on the well-known Merz-Price circulating current principle, which compares currents in two measuring points, e.g. the current to the star point with the current to the busbar, is a fast and selective form of protection. Faults lying within the protected zone are cleared very rapidly, thus limiting fault damage.

Types of faults occuring within the protected zone requiring immediate tripping and isolation of the generator/motor are:

- faults between stator windings
- stator earth faults
- ground faults and faults between phases outside the generator but within the protected zone, e.g. at the generator terminals or on the external connections.

An extremely important feature of any generator differential protection is that it should remain absolutely stable (i.e. no tripping command) for faults or any other transient phenomena outside the protected zone.

For the protection of generators or motors relay type ***IRD1-G*** is available at a very competitive price. The basic version of this relay absolutely meets the requirements of generator differential protection outlined above.

The basic version of the relay can be extended even later by the addition of extra cards. By using a new method of evaluating current signals, the relay can determine whether C.T. saturation is due to internal or external faults and either trip or stabilize accordingly. Thus this extended relay (type ***IRD1-G*** SAT) is particularily appropriate for the protection of high value generators or protecting generators located at a point in the power system where the fault level can be high.

3. Characteristics

- Static, three-phase differential protection relay
- Dual slope percentage bias restraint characteristic with adjustable bias setting
- Electronical storage for indication of the faulty phase
- Applicable for 45 to 65 Hz
- Burden < 0.05 VA at rated current
- Setting ranges:
  Differential current:
  5 to 42.5 % I_N in 16 steps
  Bias slope:
  10 % of actual current (fixed)
- Isolation between all independent inputs
- High electromagnetic compatibility
- The use of precision components guarantees high accuracy
- Permissible temperature range: -20°C to +70°C
- According to the requirements of VDE 0435, part 303 and IEC 255

Extended version (type suffix SAT)

- Ability to recognize saturation of the main current transformers
- Extremely stable even during saturation of current transformers
- Current transformer burden and class requirements are low
- Extremely stable during motor start
- Additional printed circuits for recognition of saturated C.T.s can be added at a later stage, e.g. as the power system develops and fault levels increase

Further features of the unit ***IRD1-G***:

- High reliability and easy-to-service arrangement
- Testing of faulty printed circuit boards is simplified so that faulty boards can be readily identified and exchanged
- LED indication
- Automatic supervision of bias current connections

4. Design

4.1 Connections

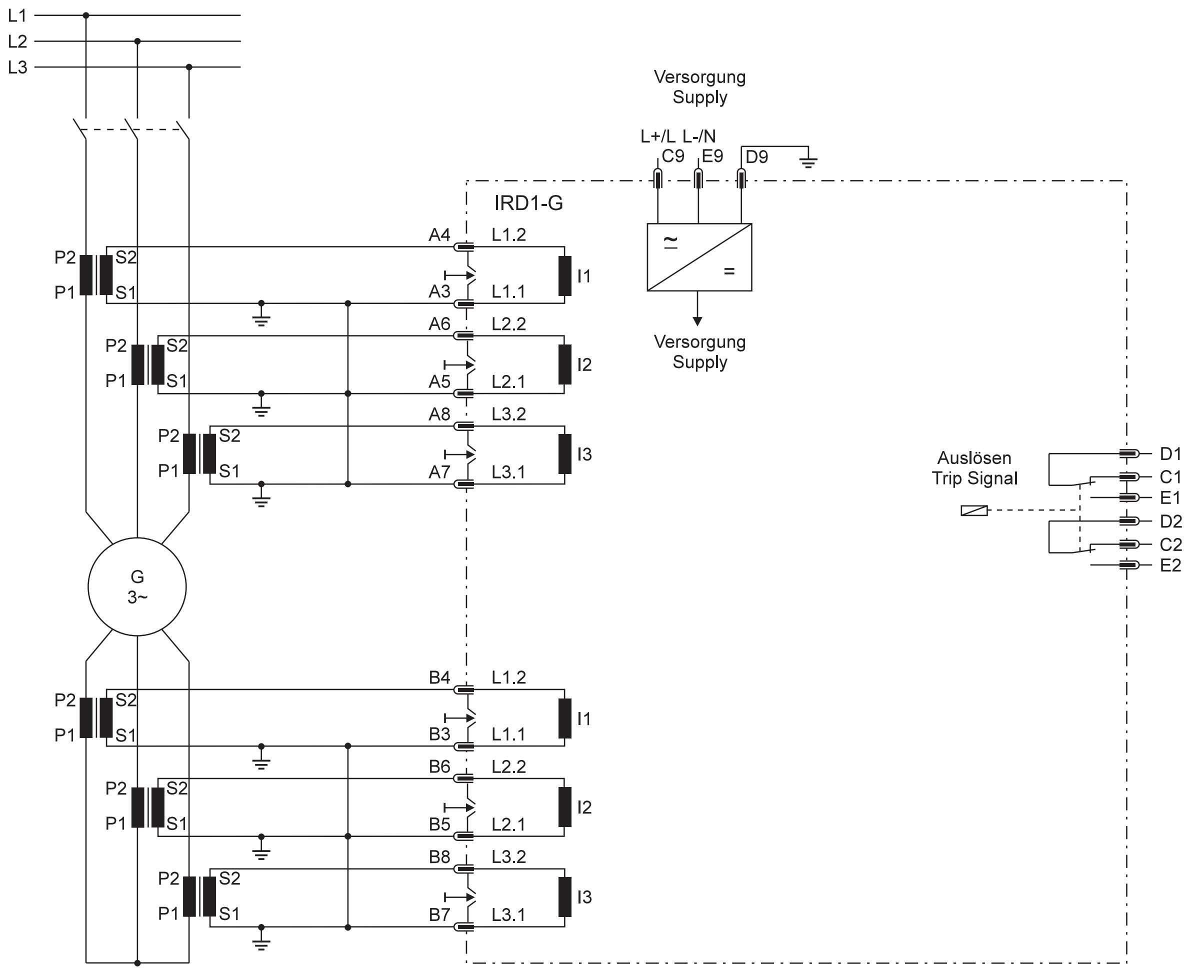


Fig. 4.1: Connection diagram IRD1-G

4.1.1 Current measuring inputs

The analog currents are led to the protection relay via terminals A4 - A8 and B4 - B8.

4.1.2 Output relay

The *IRD1-G* is provided with a tripping relay with two changeover contacts:

Tripping I_d: D1, C1, E1
D2, C2, E2

4.2 Front plate

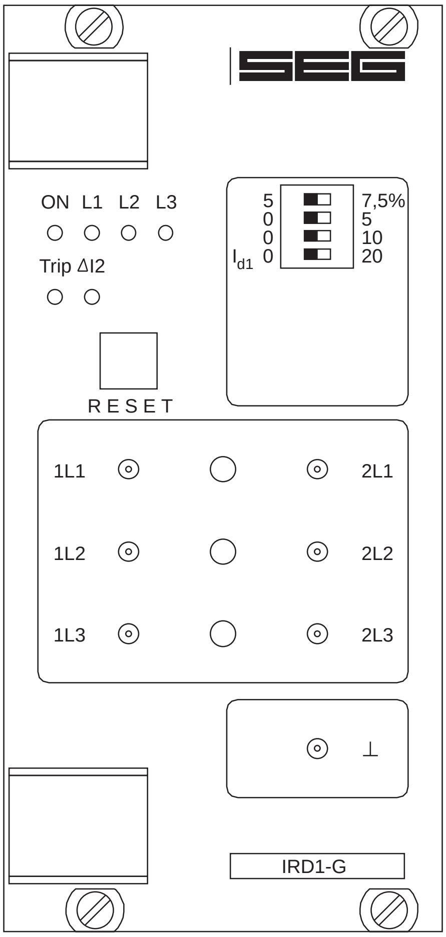


Fig. 4.2: Front plate

At the front of the relay *IRD1-G* the following operating and indicating elements can be found:

- 1 DIP-switches for setting the values of the fine tripping characteristic
- 6 LEDs for indicating faults and readiness to operate
- 1 RESET push-button
- 7 connecting sockets for fine adjustment of C.T.s
- 3 potentiometers for balancing the interposing C.T. current transformer

4.2.1 LEDs

There are 6 LEDs on the front plate of the *IRD1-G* indicating the following operating states:

- readness for service (LED ON green)
- indication of faults (4 LEDs L1, L2, L3, TRIP red)
- coarse tripping characteristic active (LED Δ 12 red)(switching over only possible with additional equipment "SAT")

4.2.2 DIP-switches

The DIP-switch block on the front plate serves to adjust the pickup value for the differential current I_{d1}.

4.2.3 RESET push button

The push button <RESET> is normally used to acknowledge and reset the TRIP LED (E-relay type). For SP-relay type the push button <RESET> is used to acknowledge and reset the TRIP LED and the trip relay after a tripping.

5. Working Principle

5.1 Operating principle of the differential protection

The fundamental operating principle of generator differential protection is based on a comparison of the current to the star point with the current to the busbar. For an ideal generator the currents entering and leaving the generator must be equal. Or according to Kirchhoff's first law "the vector sum of currents entering and leaving any point must be zero". If the sum Id of currents is not zero, an internal fault is indicated.

The basic equipment of relay *IRD1-G* recognizes these differential currents Id and the relay gives the tripping command according to the precision measuring characteristic (see 9.7 Tripping characteristics).

To explain the function at *IRD1-G* the working principle is shown in figure 5.1.

I_d = differential (tripping) current
I_S = stabilizing current

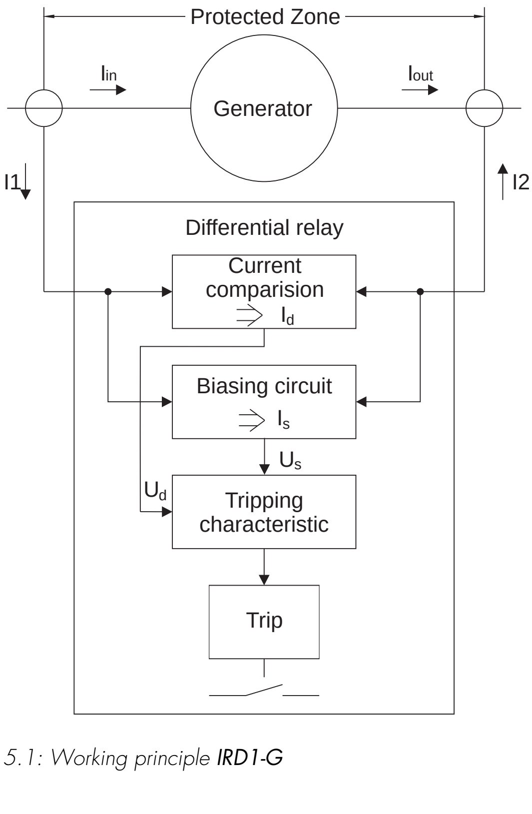


Fig. 5.1: Working principle ***IRD1-G***

5.2 Working principle of the C.T. saturation detector SAT

With many differential protection systems, relay instability may occur on heavy through faults if the main current transformers saturate. In the transient condition of saturation the C.T.s on both ends of the protected zones do not produce the correct secondary current according to the primary current. The differential relay mea-sures a differential current on the secondary C.T. side which is not present on the primary side. Hence a false tripping might occure.

Such transient phenomenons causing C.T. saturation may occur due to:

- Heavy through faults (external short circuit)
- Starting of big motors
- Magnetizing inrush currents of transformers
- Internal faults

The figure 5.2 explains the saturation of the C.T. core due to a short circuit current. In the instant of a short circuit often a DC-component is present in the current. The high primary current induces a flux in the C.T. core, reaching the saturation level. The iron-core retains the high flux level even after the primary current falls to zero. In the time periods of saturation the C.T. does not transform the primary current to the secondary side but the secondary current equals zero.

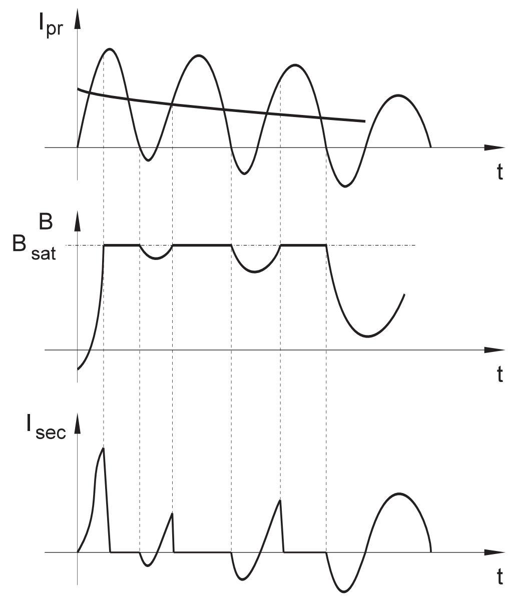


Fig. 5.2: Current transformer saturation
Ipr — Primary current with DC offset
Bsat — Saturation flux density
Isec — Secondary current

Dissimilar saturation in any differential scheme will produce operating current.

Figure 5.3 shows the differential measurement on the example of extremly dissimilar saturation of C.T.s in a differential scheme. Fig. 5.3a shows the secondary current due to C.T. saturation during an transformer fault (internal fault). The differential current id represents the fault current. The differential relay must trip instantanously.

Fig. 5.3b shows the two secondary currents in the instant of an heavy external fault, with current i1 supposed to C.T. saturation, current i2 without C.T. saturation.
The differential current id represents the measured differential current, which is an operating current. As this differential current is caused by an external fault and dissimilar saturation of the two C.T.s, the differential relay should not trip.

Fig. 5.3 Current comparison with C.T.s saturated by DC offset in fault current wave form

5.3a	Internal fault,	i_1 = secondary output current from saturated C.T. (theoretical)
	Single end fed:	i_2 = 0. Internal fault fed from side 1 only.
		i_d = measured differential current
5.3b	External fault:	i_1 as in fig. 5.3a for an internal fault
		i_2 normal current from C.T. secondary on side 2
		i_d = measured differential current

The wave forms for the differential current I_d for internal and external faults are seen to be different for the cases considered.

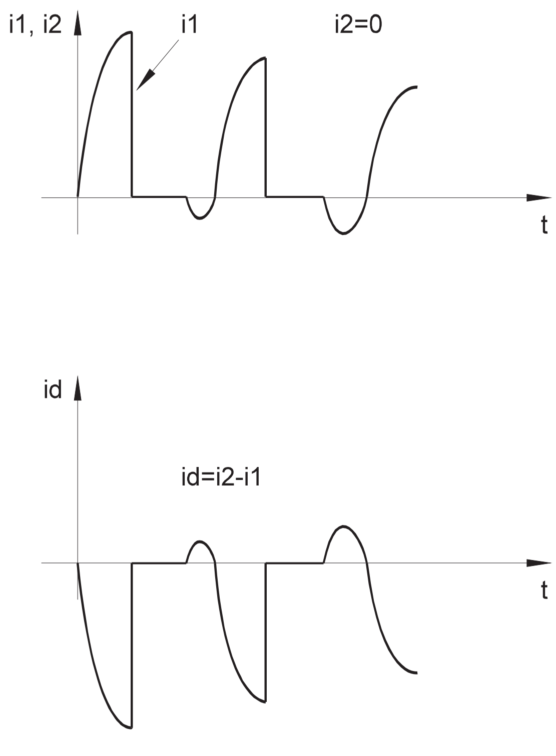


Fig. 5.3a: Current comparsion saturated C.T.s (internal fault)

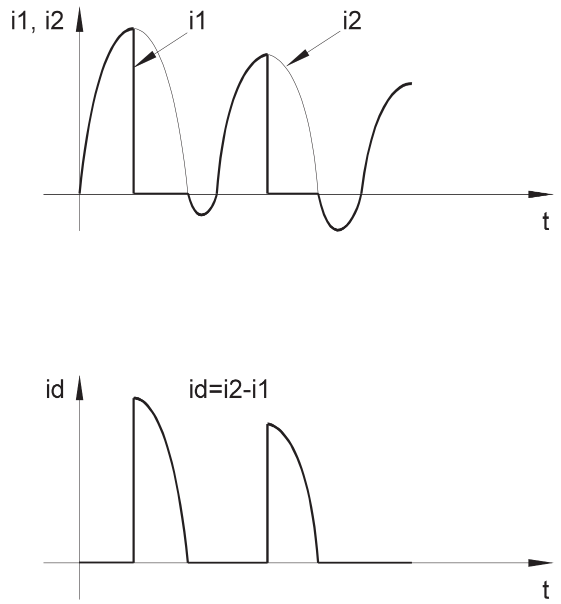


Fig. 5.3b: Current comparsion saturated C.T.s (external fault)

The saturation detector SAT analyses the differential current of each phase separately. The SAT module differentiates the differential current and detects:

- Rate of change of differential current $d(i_d)/dt$
- Sign of $d(i_d)/dt$
- Internal / external fault
- Time period of saturation, within one cycle
- DC or AC saturation

The instant of an extreme rate of change of differential current d(id)/dt clearly marks the begin of a C.T. saturation.
The sign of this $d(i_d)/dt$ value distinguishes the internal fault from an external fault.
One detected extreme $d(i_d)/dt$ value per cycle indicates a saturation due to DC-current contents.
Whereas two extreme $d(i_d)/dt$ values per cycle indicate a C.T. saturation caused by a high alternating current.

The logic control evaluating above informations derives:

- Only external faults lead to blocking of the trip circuit.
- In case of detected DC-current saturation the differential current measurement is blocked completely until:the transient condition ends, or an internal fault is detected (instantanously), or AC-current saturation is detected.
- In case of detected AC-current saturation only the time periods of saturation are blocked during one cycle. This means that even under severe saturation the differential relay evaluates the differential current in „sound" time periods. This is a major advantage to relays solely applying harmonic filters for saturation detecting.
- All detected transient phenomenons change the tripping characteristic to the „coarse tripping characteristic" (pl. ref. to Technical Data).

5.3 Block diagram

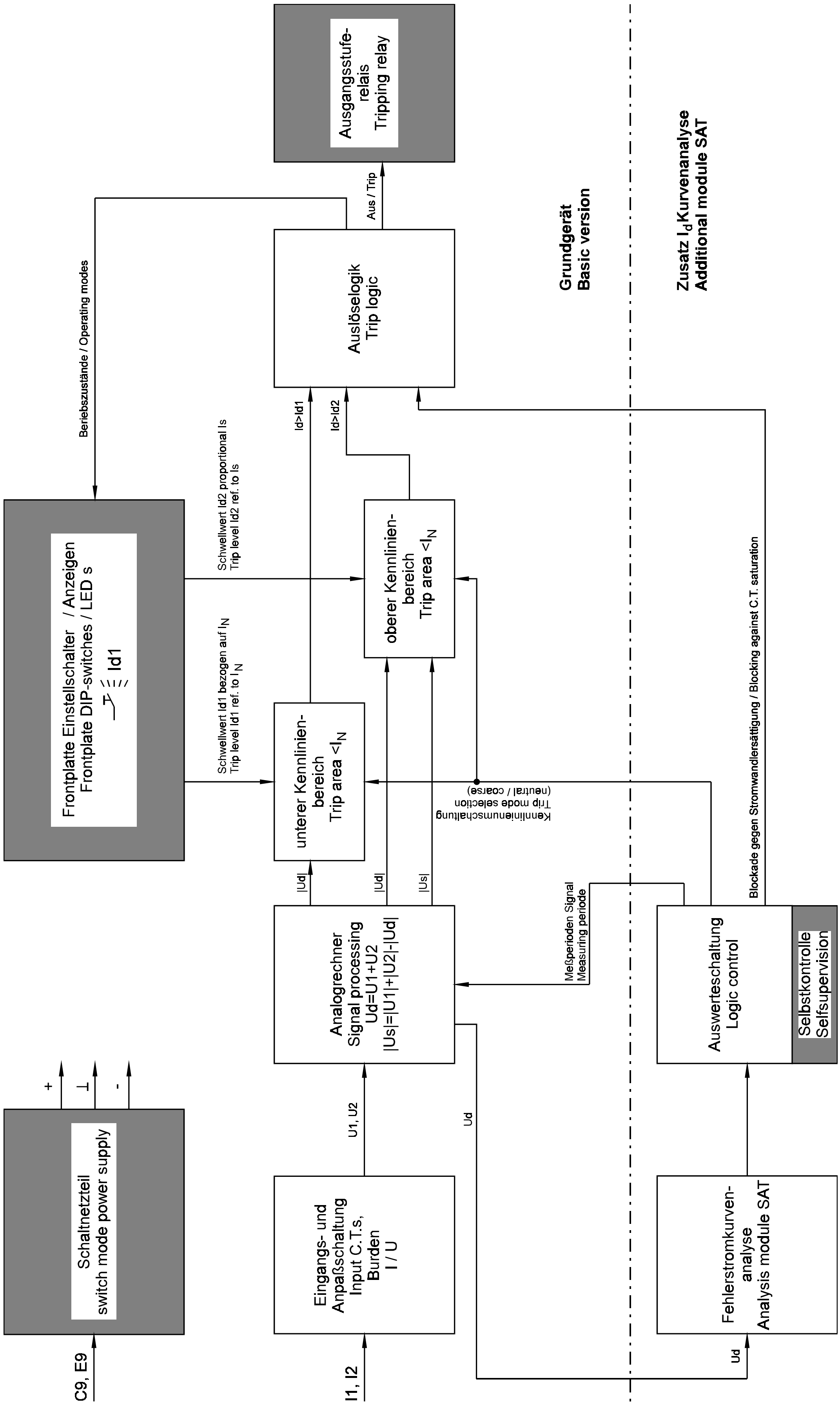


*Fig. 5.3: Block diagram **IRD1-G***

6. Operation and settings

For each phase the relay calculates the differential current I_d and the stabilizing current I_S. The differential current Id is the vector difference between star point and outgoing currents. The value of differential current at which the relay responds is dependent on the stabilizing current, as shown in fig. 5 „Tripping characteristic". I_N is relay rated current (1 A or 5 A) and the two quantities I_d/I_N and I_S/I_N are scaled in multiples of rated current.

The basic version of the relay is equipped with the „fine" tripping characteristic only. The differential current Id is adjustable from 5 % to 42.5 % of rated current. With the extended version the tripping characteristic can be automatically switched from the selected „fine" to the fixed "coarse" characteristic.

The *biased slope characteristic* (right and upper part of the characteristic) prevents incorrect operation of the relay at through faults. The lower section of the characteristic shows the minimum differential current required to operate the relay with zero or low levels of stabilizing current.

Bias characteristic setting (fixed)
(related to stabilizing current I_S)

$$I_{d2}\ \% = I_d/I_S = 10\ \%$$

Differential current settings
(related to relay rated current I_N)

$$I_{d1}\ \% = I_d/I_N = 5\ \% \ ...42.5\ \%$$

For stability during transient conditions with extended version (SAT) of the relay the protection automatically changes over to the fixed "coarse" tripping characteristic. In this case the following settings apply:

Bias setting (related to I_S):

$$I_{d2}\ \% = I_d/I_S = 60\ \%$$

Differential setting (related to I_N):

$$I_{d1}\ \% = I_d/I_N = 100\ \%$$

The relay has a stepped tripping characteristic:

- For differential currents up to rated current the time delay is 100 ms.
- For differential currents greater than rated current the relay trips instantanuously (approx. 40 ms).

6.1 Layout of the operating elements

The DIP-switches required to set the protection relays parameter are located on the front plate.

6.2 Parameter setting by using DIP-switches

The pickup value for the differential current I_{d2} cannot be changed. The value for this parameter remains constantly 10% of the current actually flowing through the protection zone.

6.2.1 Setting of the pickup value for the differential current I_{d1} fine tripping characteristic

The pickup value of the fine tripping characteristic can be adjusted in the lower section by means of the DIP switch I_{d1} in the range from 5 - 42.5 %. (Scale 2.5 %). The response value is based on the total of the individual values of all DIP-switches.

Example:
Adjustment of the characteristic shown on the following diagram:

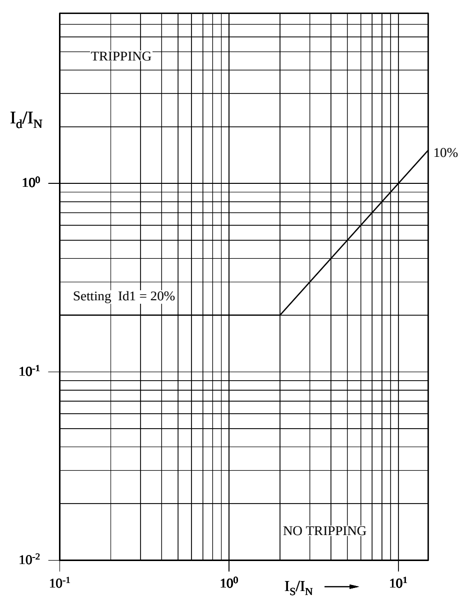


Fig. 6.1: Diagram tripping characteristic

For this DIP-switches for I_{d1} have to be in the following positions:

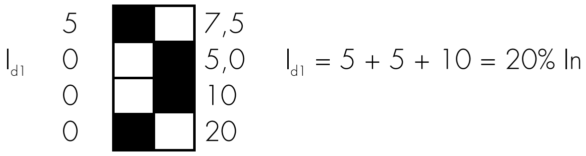


Fig. 6.2: DIP-switch setting

(I_{d2} is fixed at 10 % Un)

6.2.2 Indication of faults

For fault indication, there are 5 LEDs on the front plate of the *IRD1-G*. In case of a fault, the LEDs L1, L2 or L3 light up red according to the faulty phase.
The LED TRIP lights up red after tripping of the of the output relay.

When coarse tripping characteristic ist activated the LED Δ2 lights up red (only active in cooperation with saturation detection).

6.3 Reset

6.3.1 Manual reset

Pressing of <RESET> results in reset of the tripping relay and the LED indication extinguishes.

6.3.2 Automatic reset

The output relay and the indicatioins LEDs will be reset automatically after trip of relay as soon as the C. B. is switched on again and a current flows.

7. Relay case

The *IRD1-G* can be supplied in an individual housing for flush-mounting or as a plug-in module for installation in a 19" mounting rack according to DIN 41494. Both versions have plug-in connections.
Relays of variant D are complete devices for flush mounting, whereas relays of variant A are used for 19" rack mounting. Housing variant A to be installed in switchboards of protection class IP51. For switchboards of lower protection classes housing variant D can be used.

7.1 Individual housing

The individual housing of the *IRD1-G* is constructed for flush-mounting. The dimensions of the mounting frame correspond to the requirements of DIN 43700 (72 - 144 mm). The cut-out for panel mounting is 68 x 138 mm.

The front panel of the *IRD1-G* is covered with a transparent, seelable flap (IP54).

For case dimensions and cut-out refer to "technical data". The individual housing is fixed with the supplied clasps from the rear of the panel.

7.2 Rack mounting

The *IRD1-G* is in general suitable for installation in a modular carrier according to DIN 41494. The installation dimensions are: 12TE; 3HE.

According to requirements, the *IRD1-G* devices can be delivered mounted in 19" racks.

7.3 Terminal connections

The plug-in module has a very compact base with plug connectors and screwed-type connectors.

- 12 poles screw terminals for current circuits (terminal connectors series A and B with short time current 500 A / 1 s).
- 27 poles screw-type terminals for relay outputs, supply voltage etc.(terminal connectors series C, D and E, max. 6 A current carrying capacity). Connection with tabs 6.3 x 0.8 mm for cable up to max. 1.5 mm^2 or with tabs 2.8 x 0.8 mm for cable up to max. 1 mm^2.

By using 2.8 x 0.8 mm tabs a bridge connection between different poles is possible.

The current terminals are equipped with self-closing short-circuit contacts. Thus, the *IRD1-G* module can be unplugged even with current flowing, without endangering the current transformers connected.

The following figure shows the terminal block of *IRD1-G*

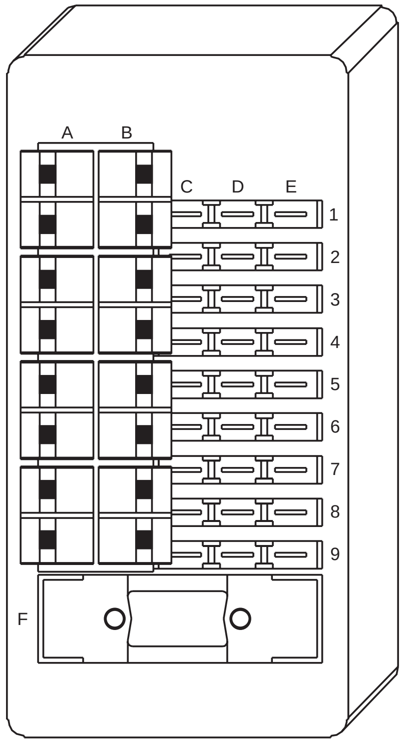


Fig. 7.1: Terminal block IRD1-G

8. Relay testing and commissioning

The following test instructions should help to verify the protection relay performance before or during commis-sio-ning. To avoid a relay damage and to ensure a correct relay operation, be sure that:

- the auxiliary power supply rating corresponds to the auxiliary voltage on site,
- the rated voltage corresponds to the plant data on site,
- the voltage transformer circuits are connected to the relay correctly,
- all control- and measuring circuits as well as the output relays are connected correctly.

8.1 Connection of the auxiliary voltage

Note!
Prior to switch on the auxiliary power supply, be sure that the auxiliary supply voltage corresponds with the rated data on the type plate.

When the auxiliary power supply is switched on (terminals C9/E9) please observe that the LED "ON" is alight.

8.2 Checking the set values

Due to a check of the DIP-switch positions, the actual tresholds can be established.
The setting values can be corrected, if necessary by means of the DIP-switches.

8.3 Secondary injection test

8.3.1 Test equipment

- Ammeter, class 1 or better,
- Auxiliary voltage supply corresponding to the nominal auxiliary voltage of the device
- Single-phase AC supply (adjustable from 0 - 1x I_N)
- Timer for the measuring of the trip delays
- Switching device
- Test leads and tools

NOTE! Before conducting secondary tests, assure that the relay does not cause unwanted tripping (danger of blackouts).

8.3.2 Checking of the pickup and dropout value

When checking the pickup value for I_{d1}, the analog input signals of the single phase alternating test current have to be fed to the relay via terminals A3/A4.

When testing the pickup value, the alternating test current must first be lower than the set pickup value for I_{d1}. Then the current will be increased until the relay picks up. The value that can be read from the Ammeter may not deviate by more than ± 2% of I_{d1}

The tripping values I_{d1} for the other current inputs should be checked accordingly.

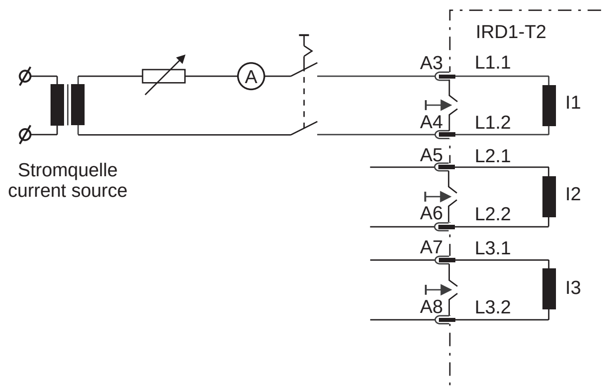


Fig. 8.1: Trip level test circuit

8.3.3 Checking the trip delay

For checking the tripping time (time element of the relay), a timer is connected to the contact of the trip relay.

The timer has to be started simultaneously with connection of the test current and must be stopped when the relay trips.

8.4 Primary injection test

Generally, a primary injection test could be carried out in the similar manner as the secondary injection test above. Since the cost and potential hazards are very high for such a test, primary injection tests are usually limited to very important protective relays in power system.

8.5 Adjustment of the interposing c.t.s

Correct connection and fine balance of the c.t.s can be checked by using a voltmeter. Relevant sockets are provided at the front of the *IRD1-G*.

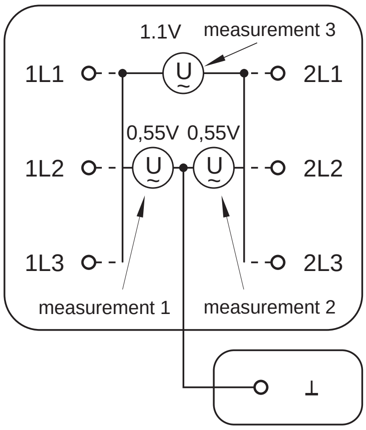


Fig. 8.1: Connection sockets at the front plate

Information about measuring results can be found on the following table.

a)	Measuring 1 (1L1 - 0) Measuring 2 (2L1 - 0) Measuring 3 (1L1 - 2L1)	550 mV 550 mV 1100 mV	Correct connection
b)	Measuring 1 (1L1 - 0) Measuring 2 (2L1 - 0) Measuring 3 (1L1 - 2L1)	550 mV 550 mV 0 mV	Current flow of a C.T. (S1 and S2) is reversed)
c)	Measuring 1 (1L1 - 0) Measuring 2 (2L1 - 0) Measuring 3 (1L1 - 2L1)	550 mV 550 mV 550 mV	Phase position mixed-up (e.g. one current from phase L1, the other one from phase L2)
d)	Measuring 1 (1L1 - 0) Measuring 2 (2L1 - 0) Measuring 3 (1L1 - 2L1)	550 mV 550 mV 960 mV	Current flow and phase position of a C.T. is mixed-up

Table 8.1: Measuring results

Comments on the measuring results:

Measuring results are based on values at rated relay current. If the test is carried out at partial current, the values differ accordingly.

Minimal measuring value deviations, e.g. due to unequal transformer ratio of the C.T.s, can be rectified by balancing the corresponding potentiometer.

For phases L2 and L3 measurements a) - d) to be done in similar manner.

8.6 Maintenance

Maintenance testing is generally done on site at regular intervals. These intervals vary among users depending on many factors: e.g. the type of protective relays employed; the importance of the primary equipment being protected; the users past experience with the relay, etc.
For static relays like *IRD1-G*, maintenance testing will be performed at least once a year according to the experiences.

8.7 Function test

Attention: Reconnect the trip circuit at the end of all commissioning tests and perform the following "hot" test:

Load the generator with minimum 50% load. Assure that the tripping of the generator C.B. does not cause unwanted damages (blackout).

To operate the differential relay use a shorting link between one of the phase measuring sockets and ⊥, e.g. connect 1L1 to ⊥. The relay should trip immediately. If no trip occurs, make sure that the load current exceeds the set value of I_{d1}.

9. Technical Data

9.1 Measuring input

Rated data:	Rated current	1 A / 5 A
	Rated frequency f_N:	50 / 60 Hz

Power consumption in current circuit:	at I_N = 1 A	< 0.1 VA
	at I_N = 5 A	< 0.5 VA

Thermal withstand capability in current circuit:	dynamic current withstand (half-wave)	250 x In
	for 1 s	100 x In
	for 10 s	30 x In
	continuously	4 x In

9.2 Auxiliary voltage

Rated auxiliary voltages U_H:	24 V	working range	16 - 60 V AC / 16 - 80 V DC
	110 V	working range	50 - 270 V AC / 70 - 360 V DC
Power consumption:	at 24 V	quiescent approx. 3 W	operating approx. 6 W
	at 110 V	quiescent approx. 3 W	operating approx. 6 W

9.3 General data

Returning time:	50 ms
Dropout to pickup ratio:	> 97%
Returning time:	100 ms ± 10ms
Minimum operating time:	30 ms

9.4 Output relays

The output relay has the following characteristics:

Maximum breaking capacity 250 V AC / 1500 VA / continuous current 6 A

For DC-voltage:

	ohmic	L/R = 40 ms	L/R = 70 ms
300 V DC	0.3 A / 90 W	0.2 A / 63 W	0.18 A / 54 W
250 V DC	0.4 A / 100 W	0.3 A / 70 W	0.15 A / 40 W
110 V DC	0.5 A / 55 W	0.4 A / 40 W	0.20 A / 22 W
60 V DC	0.7 A / 42 W	0.5 A / 30 W	0.30 A / 17 W
24 V DC	6.0 A / 144 W	4.2 A / 100 W	2.50 A / 60 W

Max. rated making current:	64 A (VDE 0435/0972 and IEC 65/VDE 0860/8.86)
Mechanical life span:	30 x 10^6 operating cycles
Electrical life span:	2 x 10^5 operating cycles at 220 V AC / 6 A
Contact material:	silver cadmium oxide (AgCdO)

9.5 System data

Design standard:	
Generic standard:	EN 50082-2, EN 50081-1
Product standard:	EN 60255-6, IEC 255-4, BS 142
Specified ambient service	
Storage temperature range:	- 40°C to + 85°C
Operating temperature range:	- 20°C to + 70°C
Environmental protection class F as per DIN 40040 and per DIN IEC 68 2-3:	relative humidity 95 % at 40°C for 56 days
Insulation test voltage, inputs and outputs between themselves and to the relay frame as per EN 60255-6 and IEC 255-5:	2.5 kV (eff.), 50 Hz; 1 min
Impulse test voltage, inputs and outputs between themselves and to the relay frame as per EN 60255-6 and IEC 255-5:	5 kV; 1.2 / 50 µs; 0.5 J
High frequency interference test voltage, inputs and outputs between themselves and to the relay frame as per EN 60255-6 and IEC 255-22-1:	2.5 kV / 1MHz
Electrostatic discharge (ESD) test as per EN 61000-4-2 and IEC 255-22-1:	8 kV air discharge, 6 kV contact discharge
Electrical fast transient (Burst) test as per EN 61000-4-8 and IEC 801-4:	4 kV / 2.5 kHz, 15 ms
Power frequency magnetic field test as per ENV 50141:	electric field strength 10 V/m
Surge immunity EN 61000-4-5:	4 kV
Radio interference suppression test as per EN 55011:	limit value class B
Radio interference radiation test as per EN 55011:	limit value class B
Mechanical tests:	
Shock:	class 1 as per DIN IEC 255 part 21-2
Vibration:	class 1 as per DIN IEC 255 part 21-1
Degree of protection:	IP54 by enclosure of the relay and front panel (only D-version single unit)
Weight:	ca. 1.5 kg
Mounting position:	any
Overvoltage class:	III
Influence characteristics:	
Frequency influence:	40 Hz < f < 3% from setting value
Temperature influence:	-20 °C to + 70 °C
Influence of aux. Voltage:	no influence

9.6 Accuracy details

for Is < I_N:

$$f = \left|\frac{I_{dtrip} - I_{dset}}{I_N}\right| \times 100\%$$

für $I_S \geq I_N$:

$$f = \left|\frac{I_{dtrip} - I_{dset}}{I_S}\right| \times 100\%$$

where

I_S = stabilizing current
I_N = rated current
I_{dtrip} = measured differential current which results in tripping
I_{dset} = differential current setting

Note: The accuracy details quoted are based on interposing current transformer with the exact correction ratio

Accuracy at reference conditions

- temperature range:
  - 5°C...40°C: $f \leq 2$ %
- frequency range
  50 Hz...60 Hz: $f \leq 2$ %

If the operating temperature or frequency are outside the ranges quote, additional errors are:

Additional fault:

- temperature range
  - 20°C...70°C $f_{add} < 2.5$ %
- frequency range
  45 Hz...66 Hz: $f_{add} \leq 1$ %

9.7 Tripping characteristics

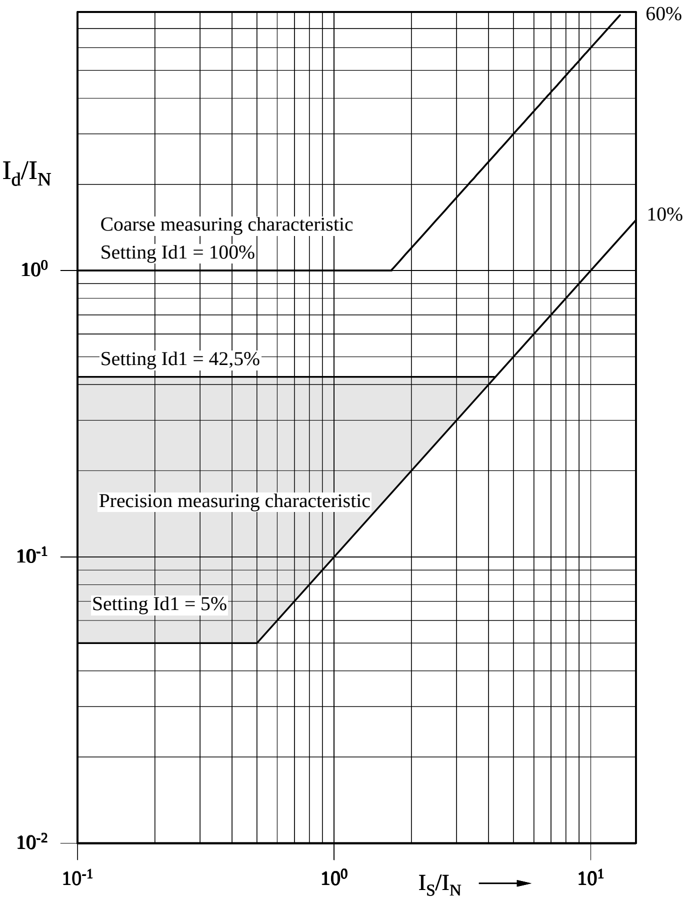


Fig. 9.1: Tripping range

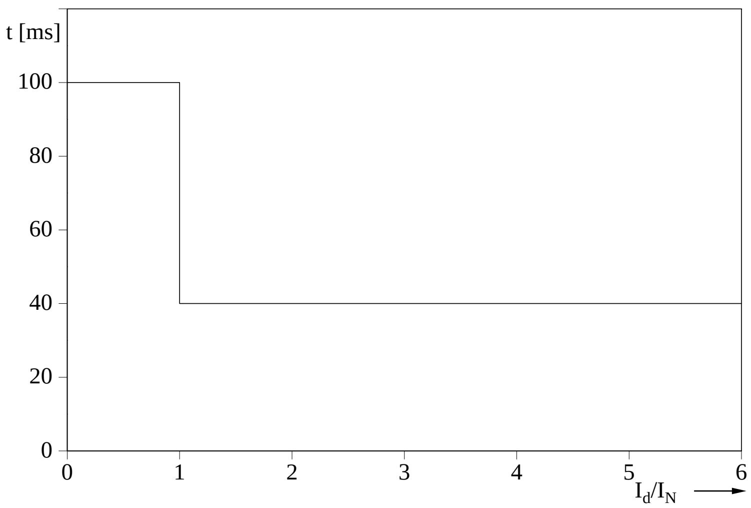


Fig. 9.2: Tripping time

9.8 Dimensional drawings

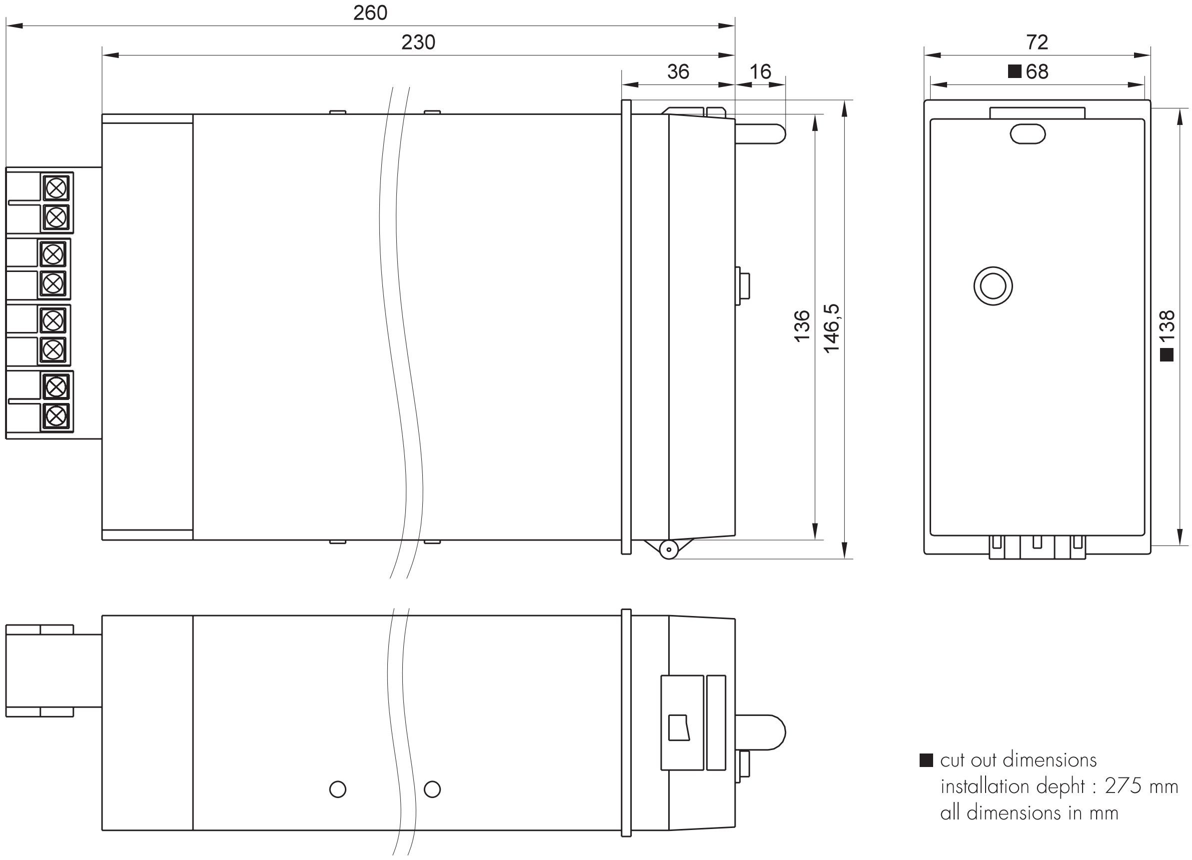


Fig. 9.3: Dimensional drawings

Please observe:

A distance of 50 mm is necessary when the units are mounted one below the other for the housing bonnet to be easily opened. The front cover can be opened downwards.

10. Order form

Generator-differential relay		***IRD1-G***	**G**
Rated current	1 A		**1**
	5 A		**5**
Tripping type			
relay without latching			**E**
latching relay with hand reset			**SP**
Extra equipment for reliable functioning during CT saturation			**SAT**
Auxiliary voltage	24 V (16 bis 60 V AC / 16 bis 80 V DC)		**L**
	110 V (50 bis 270 V AC / 70 bis 360 V DC)		**H**
Housing (12TE)	19" rack		**A**
	Flush mounting		**D**

Technical data subject to change without notice!

Setting list *IRD1-G*

Note !
All settings must be checked at site and should the occasion arise, adjusted to the object / item to be protected.

Project: ____________________________ SEG job.-no.: __________________

Function group: =____________ Location: +________ Relay code: -________________

Relay functions: ____________________________

Setting of parameters

Parameter		Unit	Default settings	Actual settings
Id1	Differential current	% In	5	

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