

DAR-001B05 – Differential Amperimetric Relay 5A AC / 48V AC

1. APPLICATION AND MAIN FEATURES

DAR-001B05 is a differential amperimetric relay (DAR) for monitoring the differential current between two loads, such as, two motors or other equipments. Through built-in current transformers, the differential relay measures the current in 1-phase of each load, calculates the differential current between the currents and, depending on the pre-defined limits, activates alarm and command relays. DAR also includes a configurable overcurrent function.

The DAR-001B05 is a microcontroller-based differential amperimetric relay with the following main characteristics:

- Dual motor protection through adjustable:
 - percentage of differential current;
 - measurement time delay;
 - over current.
- Output relays:
 - Command relay;
 - Alarm relay.



Figure 1. DAR-001B05

2. MEASURING PRINCIPLE

With the presence of an external Enable signal, the DAR starts the measurement of the input currents after a stabilization period of 1s. At the end of this stabilization delay time, the DAR measures the currents through the current transformers and calculates the differential current. If the value of the differential current exceeds the preset value, the command and alarm relays are activated. If any of the monitored currents exceeds the predefined overcurrent value, the command and alarm relays are activated equally. On the front panel it is possible to check the origin of the activation of the protection relay.

Whenever the protection relay is activated, either by the differential current or by the overcurrent, it is always necessary to reset the relay in the device itself.

The relay outputs are triggered according predefined adjusted set points and delay time. It is possible to change the factory default values, namely, differential current, overcurrent and measurement delay time.

The DAR includes, on the front panel (figure 4), operational and activation information LEDs. On the front panel, in addition to the Reset button, there is also a Test button to test the functioning of the protection relay.

3. SETTINGS

The differential amperimetric relay DAR-001B05 allows some parameters to be modified within a range of limit values. Changing these parameters should only be carried out by specialized technicians who may adjust the setting points according to the project needs. For this reason, the adjustment potentiometers for setting these parameters are only accessible after removing the front panel and are not accessible to users in general (Figure 2).

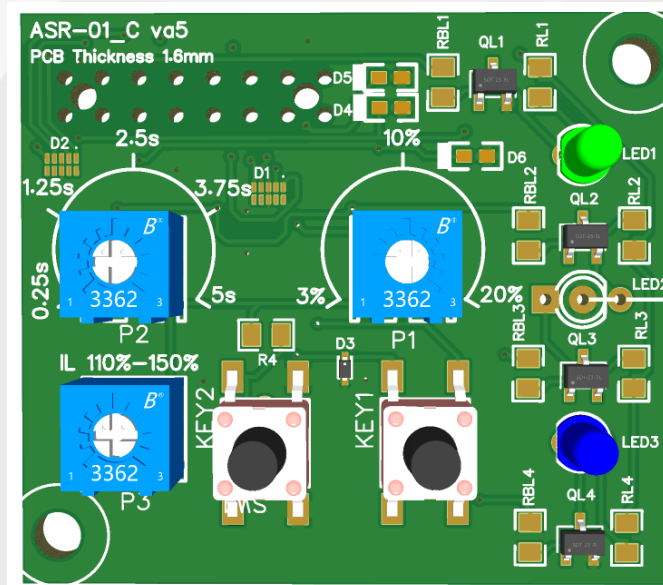


Figure 2. Adjustment potentiometers.

The factory default values of the configuration parameters and the allowable setting ranges are as follows:

Parameter	Factory default value	Allowed configuration range
P1 - Differential current set point (I_D)	10% of I_R	3% to 20% of I_R
P2 - Time delay set point (T_D)	2.5s	0.25s to 5s
P3 - Overcurrent set point (I_{oc})	140% of I_R	110% to 150% of I_R

When setting the configuration values, it should be noted that the DAR is set to the I_R reference value. For DAR-001B05, the I_R value is 5A AC. It is possible to use the device with an I_S service current, different from I_R , within the defined limits, namely between 20% and 140% of I_R . Using DAR with loads with an operating current value different from the reference value, the setting of the configuration parameters must be calculated taking into account the operating zones indicated in figure 3. For more information, particularly how to calculate and set protection relay parameters, the quick installation manual or the product manual should be consulted.

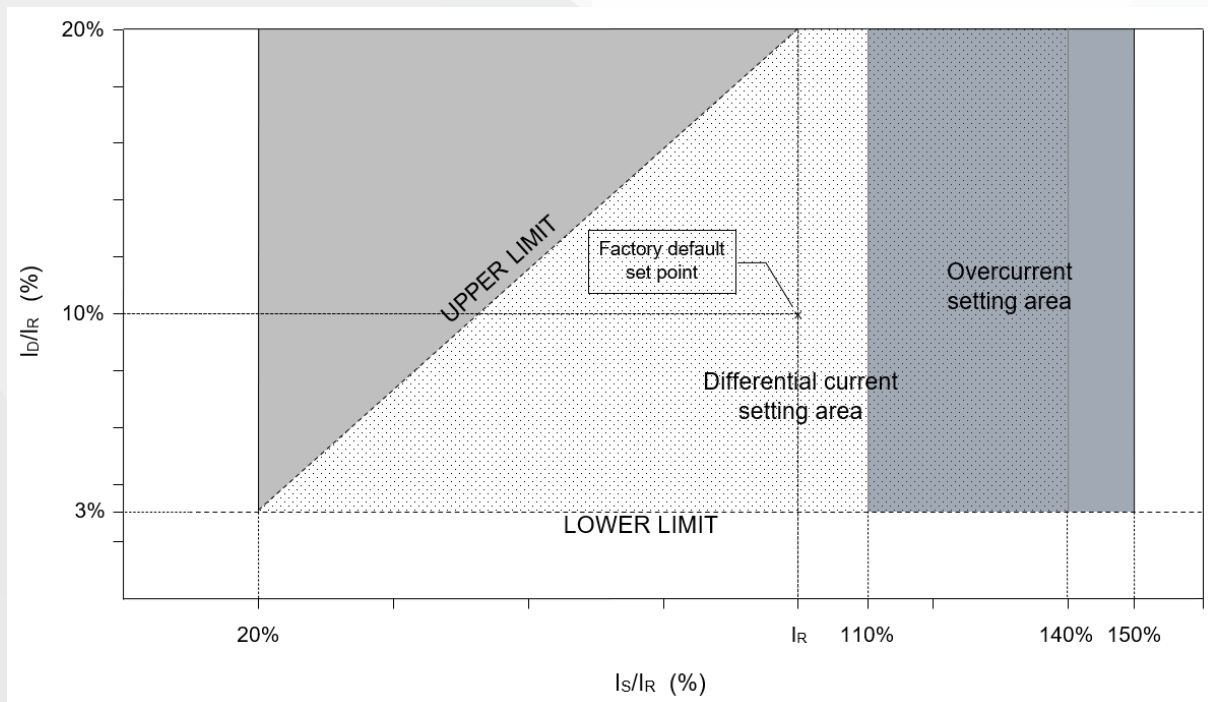


Figure 3. Differential Amperimetric Relay operating zones

4. DAR-001B05 INTERFACES

The DAR has 15 connection terminals (Figure 4) with the following functions:

ID Terminal	Function
1	Alarm output relay – COMMON connection
2	Alarm output relay – NO connection
3	Command output relay – COMMON connection
4	Command output relay – NO connection
5	Command output relay – NC connection
6	Not used
7	Not used
8	Supply voltage (48V AC)
9	Supply voltage (48V AC)
10	Input current (Load 1) – I1a
11	Input current (Load 1) – I1b
12	External input trigger – Enable contact
13	External input trigger – Enable contact
14	Input current (Load 2) – I2a
15	Input current (Load 2) – I2b



Figure 4. DAR front panel and connection terminals.

5. DAR LEDs on the front panel

The LEDs on the front panel provide the following information:

POWER LED	
Color Blue – Status: ON steady	- Status of the microcontroller - The microcontroller is working properly
Color Blue – Status: OFF	- Status of the microcontroller - The microcontroller is not powered on or not working properly
OK/FAIL double color LED	
Color RED – Status: ON steady	- Fail due to over-current - At least one of the input currents has exceeded the overcurrent limit setpoint
Color RED – Status: ON blinking	- Fail due to differential current limit - Differential current setpoint exceeded within the delay time TD
Color GREEN – Status: ON steady	- Balanced operation - Differential current setpoint not exceeded or overcurrent operation
Color GREEN – Status: ON blinking	- Unbalanced operation within the set delay time - Differential current or overcurrent setpoints exceeded but relay contacts still not activated
Color RED/GREEN – Status: OFF	- Not measuring - The enable input is not active
EN LED	
Color YELLOW – Status: ON steady	- Measuring on - The DAR is in metering operation enabled by the enable input
Color YELLOW – Status: ON blinking	- Enable time delay - The enable input is active, but the DAR is still in the process of enabling delay for stabilization
Color YELLOW – Status: OFF	- Not measuring - The enable input is not active

6. TECHNICAL SPECIFICATIONS


6.1. Electrical characteristics:

Electrical characteristics:	
Supply voltage	48V AC \pm 10%
Power consumption	1.5W
Measurement current range (In)	
Reference current – I_R	5A AC
Service current – I_S	20% to 140% of I_R 1.0A AC to 7A AC
Overcurrent – I_{oc}	110% to 150% of I_R 5.5A AC to 7.5A AC
Maximum input current	
I_{S_MAX}	18A
Current transformer characteristics	
Insulation voltage	2.5kVA
Frequency operation	50/60Hz
Output Relays	
Command Relay (NC or NO contacts)	NC or NO contacts
- Relay Contact Form	1 Form C (SPDT-NO, NC)
- Contact Current Rating	10A
- Switching Voltage	277V AC, 30V DC
Alarm Relay (NO contact)	NO contact
- Relay Contact Form	1 Form A (SPDT-NO)
- Contact Current Rating	5A
- Switching Voltage	250V AC, 30V DC
Connectors	
Number of terminals	15
Terminal type	Screw terminal
Wire dimension UL Standard	24 AWG to 12 AWG
Wire dimension IEC Standard	1.0mm ² to 2.5mm ²
Rated voltage/current UL Standard	300V/20A
Rated voltage/current IEC Standard	250V/18A

6.2. General characteristics:

Enclosure characteristics	
Width	52.5 mm
Height	90 mm
Depth	65 mm
Material	Self-extinguishable ABS UL94 V0
IP degree	IP20
Operating temperature	
Operating temperature	-20°C to 70°C

6.3. Certifications and harmonized standards compliant:

Certifications	
EU Declaration of Conformity	
Harmonised Standards	
- RoHS-2 Compliant	EN IEC 63000:2018
- EMC Standards	EMC Immunity - EN 61000-6-1:2019 EMC Emission - EN 61000-6-3:2021

7. AVAILABLE VARIANTS

Item reference	Model	Reference current I _R	Lower current	Upper current	Overload current	Maximum current	Supply voltage
9890000020000	DAR-001A05	5A AC	1.0A AC	7A AC	5.5-7.5A AC	18A AC	24V DC
9890000030000	DAR-001B05	5A AC	1.0A AC	7A AC	5.5-7.5A AC	18A AC	48V AC
9890000040000	DAR-001C05	5A AC	1.0A AC	7A AC	5.5-7.5A AC	18A AC	85-264V AC
9890000020100	DAR-001A10	10A AC	2.0A AC	14A AC	11-15A AC	18A AC	24V DC
9890000030100	DAR-001B10	10A AC	2.0A AC	14A AC	11-15A AC	18A AC	48V AC
9890000040100	DAR-001C10	10A AC	2.0A AC	14A AC	11-15A AC	18A AC	85-264V AC

8. DISCLAIMER / LEGAL NOTICE

ARS Electronics reserves the right to change the content of this document without prior notice.

ARS Electronics is not responsible for misuse of the DAR-001B05 device or for the damage it may cause to third party systems.