7SG12 DAD N
Numerical High Impedance Relay with CT Supervision

Document Release History

This document is issue 2010/02. The list of revisions up to and including this issue is:
Pre release

2010/02	Document reformat due to rebrand
R6 11/10/06	CT Supervision time delay accuracy added
R5 26/08/2005	Corrected CT burden on 1A tap. Operate Time for CT Supervision added. Time Delay for TCS added.
R4 22/07/2005	Revision 15 software and SEF Current Input Module 2513H10099.
R3 18/10/2004	Corrected Status Input minimum current for operation. Corrected operating time variation over frequency.
R2 24/05/2004	Revision 12 software.
R1 24/10/2002	First Issue for comment.

Software Revision History

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1. Introduction

The following document defines the technical and performance specification of the DAD-N Series relays. DAD-N relays are based upon the VATECH ACP Ltd Modular II series of protection units.

Section 3 describes performance that is common to all Modular II protections.

Section 4 describes the performance of protection elements that may be fitted to DAD-N series relays. Therefore for any one DAD-N series model, only the performance for those elements described in the Description of Operation, as available in that model will be applicable.

Performance Data to:

IEC60255-6, IEC60255-6A and IEC60255-13.

2. Accuracy Reference Conditions

General	IEC60255 Parts 6, 6A & 13
Auxiliary Supply	Nominal
Frequency	50 Hz
Ambient Temperature	20°C

3. Accuracy Influencing Factors

Temperature

Ambient range	-10°C to +55°C
Variation over range	≤ 5%

Frequency

Range 50Hz Model Range 60Hz Model	47Hz to 52Hz 57Hz to 62Hz
Setting variation	≤ 5%
Operating time variation	≤ 5%

4. Modular II Specification

4.1   Environmental Withstand

Temperature - IEC 60068-2-1/2

Operating range	-10°C to +55°C
Storage range	-25°C to +70°C

Humidity - IEC 60068-2-3

Operational test	56 days at 40°C and 95% RH

Transient Overvoltage –IEC 60255-5

Between all terminals and earth or between any two independent circuits without damage or flashover	5kV 1.2/50µs 0.5J

Insulation - IEC 60255-5

Between all terminals and earth	2.0kV rms for 1 min
Between independent circuits	2.0kV rms for 1 min
Across normally open contacts	1.0kV rms for 1 min

High Frequency Disturbance -
IEC 60255-22-1 Class III

	Variation
2.5kV Common (Longitudinal) Mode	≤ 5%
1.0kV Series (Transverse) Mode	≤ 5%

Electrostatic Discharge -
IEC 60255-22-2 Class IV

	Variation

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8kV contact discharge	$\leq 5\%$

Conducted & Radiated Emissions -
EN 55022 Class A (IEC 60255-25)

Conducted 0.15MHz – 30MHz Radiated 30MHz – 1GHz

Conducted Immunity -
(IEC 61000-4-6; IEC 60255-22-6)

	Variation
0.15MHz – 80MHz 10V rms 80% modulation	$\leq 5\%$

Radiated Immunity -
IEC60255-22-3 Class III

	Variation
80MHz to 1000MHz, 10V/m 80% modulated	$\leq 5\%$

Fast Transient – IEC 60255-22-4 Class IV

	Variation
4kV 5/50ns 2.5kHz repetitive	$\leq 5\%$

Surge Impulse -
IEC 61000-4-5 Class IV; (IEC 60255-22-5)

	Variation
4KV Line-Earth (O/C Test voltage 10%) 2KV Line-Line	≤ 10

Vibration (Sinusoidal) –IEC 60255-21-1 Class 1

		Variation
Vibration response	0.5gn	$\leq 5\%$
Vibration endurance	1.0gn	$\leq 5\%$

Shock and Bump–IEC 60255-21-2 Class 1

		Variation
Shock response	5 gn 11ms	$\leq 5\%$
Shock withstand	15 gn 11ms	$\leq 5\%$
Bump test	10 gn 16ms	$\leq 5\%$

Seismic – IEC 60255-21-3 Class 1

		Variation
Seismic Response	1gn	$\leq 5\%$

Mechanical Classification

Durability	In excess of 10^6 operations

4.2   Auxiliary Energizing Quantity

DC Power Supply

Nominal	Operating Range
24/30V	18V to 37.5V dc
50/110V	37.5V to 137.5V dc
220/250V	175V to 286V dc

Auxiliary DC Supply – IEC 60255-11

Allowable superimposed ac component	$\leq 12\%$ of DC voltage
Allowable breaks/dips in supply (collapse to zero from nominal voltage)	≤ 20ms

D.C. Burden

Quiescent (Typical)	15
Max	27

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4.3   A.C Current Inputs

1 Amp and 5 Amp current inputs are both available on the rear terminal blocks for most functions except Capacitor Unbalance.

Thermal Withstand

Continuous and Limited Period Overload
AC Current Inputs

3.0 x In	Continuous
3.5 x In	for 10 minutes
4.0 x In	for 5 minutes
5.0 x In	for 3 minutes
6.0 x In	for 2 minutes
250A	for 1 second
625A peak	for 1 cycle

A.C. Burden

A.C. Burden

1A tap	. 0.2 VA
5A tap	. 0.3 VA

> NB. Burdens are measured at nominal rating.

4.4   Output Contacts

Output contacts functionality is fully programmable. The basic I/O module has 5 output contacts three of which are change over. Additional modules can be added with consequential increases in case size, to provide more contacts. These are added in-groups of eight up to a maximum of 29

Output Contact Performance

Contact rating to IEC 60255-0-2.

Carry continuously   5A ac or dc

Make and Carry
(limit   L/R $\leq$ 40ms and V $\leq$ 300 volts)

for 0.5 sec	20A ac or dc
for 0.2 sec	30A ac or dc

Break
(limit $\leq$ 5A or $\leq$ 300 volts)

Ac resistive	1250VA
Ac inductive	250VA @ PF $\leq$ 0.4
Dc resistive	75W
Dc inductive	30W @ L/R $\leq$ 40 ms 50W @ L/R $\leq$ 10 ms

Minimum number of operations	1000 at maximum load
Minimum recommended load	0.5W, limits 10mA or 5V

4.5   Status inputs

Status Inputs functionality is fully programmable. The basic I/O module has 3 status inputs these can be set to high speed for signalling. Additional modules can be added to provide more inputs. Additional inputs are added in-groups of eight up to a maximum of 27. A pickup timer is associated with each input and each input may be individually inverted where necessary.

Nominal Voltage	Operating Range
30 / 34	18V to 37.5V
48 / 54	37.5V to 60V
110 / 125	87.5V to 137.5V
220 / 250	175 to 280V

NB: the status input operating voltage does not have to be the same as the power supply voltage.

Status Input Performance

Minimum DC current for operation	48V 10mA 110V 2.25mA 220V 2.16mA
Reset/Operate Voltage Ratio	$\geq$ 90%
Typical response time	< 5ms
Typical response time when programmed to energise an output relay contact	< 15ms
Minimum pulse duration	40ms

To meet the requirements of ESI 48-4 then 48V status inputs should be ordered together with external dropper resistors as follows:-

Status Input External Dropper Resistances

Nominal Voltage	Resistor Value (Wattage)
110 / 125V	2k7 ± 5% ; (2.5W)
220 / 250V	8k2 ± 5% ; (6.0W)

Each status input has an associated timer that can be programmed to give time-delayed pick-up. The pick-up timers can be set to 20ms to provide immunity to an AC input signal. Status inputs will then not respond to the following:

- 250V RMS 50/60Hz applied for two seconds through a $0.1\mu F$ capacitor.
- 500V RMS 50/60Hz applied between each terminal and earth.
- Discharge of a $10\mu F$ capacitor charged to maximum DC auxiliary supply voltage.

4.6 Indication

There are two types of LED indication, General and Protection Healthy.

Case Size	Number of LEDs
E8	16 General + Protection Healthy
E12/E16	32 General + Protection Healthy

All General LED indication is fully configurable by the user. All General indications are stored in non-volatile memory without the use of an internal backup battery.

4.7 Settings And Configuration

Settings changes may be done via the front panel user-friendly fascia keypad and LCD or via standard Reydisp Evolution windows software either locally or remotely. Settings changes are stored in EEPROM memory. Configuration changes may be achieved locally via the front serial port with a Windows based toolbox support package. Configuration changes and software upgrades are stored in Flash EPROM memory.

4.8 Recording

Up to 5 fault records may be stored within the relay, Fault records are accessible via the front panel showing the date and time of trips. New faults automatically overwrite the oldest fault record when they occur.

Waveform records are automatically stored whenever a trip is generated. Waveform recording can also be triggered by the status inputs. New waveform records automatically overwrite the oldest waveform record when they are triggered. The exact number and duration of waveform records, for any particular relay model, is available from the Relay Settings section of this Manual in the Data Storage Menu listing.

Up to 500 time tagged event records are stored within the relay. New events automatically overwrite the oldest event record when the 500 are used up.

4.9 Communications

IEC 60870-5-103 communications is standard on Reyrolle Modular II numerical product range. IEC 60870-5-103 has the advantage of built in time synchronisation of all devices, reduced communications overhead, high data security and compatibility with all of the major substation automation and control systems.

COM1 is a dedicated rear fibre optic serial port. COM2 can be auto-switched between rear fibre optic serial port and a front isolated RS232 serial port. IEC 60870-5-103 may be directed to use either COM1 or COM2.

All fibre optic ports can be star connected to a Sigma passive hub or simply daisy-chained in a loop-in loop-out configuration with other Reyrolle relays e.g. Argus, Delta, Ohmega, Tau.

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4.10 IRIG-B Time Synchronisation

The relay incorporates an IRIG-B time synchronisation port as standard for connection to a GPS time receiver.
The input accepts an a.c. modulated input signal that should be in the range 3Vp-p or 6Vp-p.

5. Protection Elements

5.1 Common Performance

Disengaging Time	30ms

Note: Output contacts have a default minimum dwell time of 100ms, which may be altered via a setting, after which the disengaging time is as above.

5.2 87/50-1, 87/50-2 Differential

Phase segregated High impedance Overall Differential scheme using external stabilizing resistors. Function is insensitive to third harmonic currents.

Pickup	± 5% of setting or ± 0.01 I_n whichever is the greater
Reset	95% of I_s
Repeatability	± 2%
Transient Overreach	ı5%
Operate Time 2 x Setting 4 x Setting	Operate Time 1 cycle < 1 cycle
Time Delay	± 1% or ± 5ms whichever is the greater

5.3 CT-50 CT Supervision

Pickup	± 5% of setting or ± 0.01 I_n whichever is the greater
Reset	95% of I_s
Repeatability	± 2%
Transient Overreach	5%
Operate Time 2 x Setting	Operate Time < 1.5 cycles
Time Delay	Time Delay setting +/- 5% or +/- 10 milliseconds, whichever is the greater**

**NB: - Minimum Time Delay setting is 100milliseconds

5.4 Trip Circuit Supervision

Time Delay	± 1% or +0, +20 ms whichever is the greater

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