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INJECTION TEST SET

HEXAN TYPE II

USER GUIDE

Confidentiality level

	Distribution	Free	Restricted	Forbidden	
	Internal	x			
	External	x			

(1) Put a cross in the corresponding box(es)

List of modifications

User Guide	Notes
1.0	1st edition
1.1	USB connection for computer and 5 Vdc for MCM
1.2	Specifications for HEXAN type II 61X (25 A 175 VA amplifiers)
1.21	New amplifiers 15 A 110 VA

Table of Contents

1.   <u>Safety Considerations</u>

Warning!

Read this User Guide completely and follow the instructions below. In addition, follow the instructions concerning the working area around the HEXAN. Supplied with the HEXAN is a mains cable that should be connected to an earthed 230Vac supply.

PREPARATION

1. **Before use**, ensure you have connected the earth either with the Earthing terminal or through the mains supply.
2. **Never connect or supply** an external voltage to the HEXAN without ensuring there is a good earth connection.
3. Always use safety connectors.
4. Ensure that the ON/OFF switch is in the OFF position before connecting the HEXAN to a mains supply.
5. The voltage and current generators can be dangerous for the operator or the system under test.
6. The HEXAN must only operate with the type of supply shown on the front panel.
7. Never let water, other liquids or any object enter the HEXAN or its terminals.
8. Do not use auxiliary equipment not recommended by the manufacturer of the HEXAN. This could be dangerous.
9. Do not try and repair or open the HEXAN yourself, as this could be dangerous. There are residual voltages on the circuit boards containing capacitors.

IMPORTANT!

If you have to return the HEXAN, use its original packaging or equivalent. Ensure it is firmly wedged to protect it from vibrations and shock during transport.

2.   <u>Overview</u>

COTEL thanks you for having bought a HEXAN. If you have any comments or problems in using this new product range, please do no hesitate to contact us at the following address:

For the latest information see the README.TXT file on the installation CD-ROM.
HEXAN is a piece of test equipment for protection relays designed for electrical networks.
It contains the following parts:
- The tester itself with its amplifiers
- A PC or MCM running the control software.

2.1   *Tester*

The tester is modular and can use different types of voltage and current generators. It can also be connected to an external module if extra power or resolution is required.
You can use up to six generators at a time. However, in its basic version the tester can be fitted with eight amplifiers (four voltage and four current) in order to meet all requirements.
There are four signal inputs each associated with a timer.
The HEXAN also has a logic output with a programmable delay. This output is a C/O contact that can be connected to the 5Vdc auxiliary supply in the tester. You can also connect any other voltage less than 127Vdc to the contact.
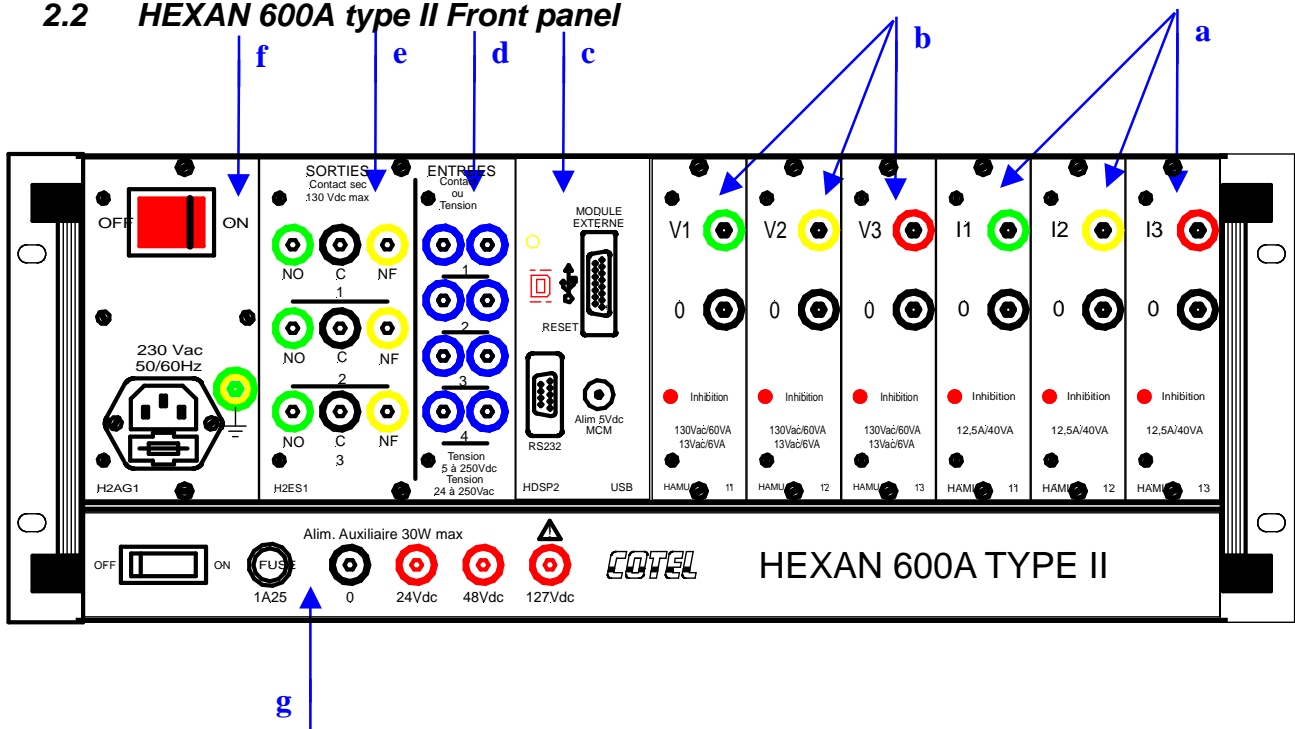You also have a variable auxiliary voltage of 24, 48 or 127Vdc.
The tester cannot operate by itself. It must be connected to a PC or an MCM
A male/female 9-pin RS232 cable connected to a COM port on the PC and the port marked RS232 on the HEXAN connects the computer and the HEXAN.
All the circuit boards have knurled screws to allow you to easily remove them from the backplane in order in order to inspect or repair them. Before any modification please contact COTEL

2.2 HEXAN 600A type II Front panel

a	Current amplifiers	e	.Timer outputs
b	Voltage amplifiers	f	Mains supply for the test set. 230Vac, single phase earthed supply. An 8A fuse protects the mains supply and there is a spare fuse in the socket.
c	Interconnection module for connecting to PC and external power amplifiers (option)	g	Auxiliary supply 24/48/127 Vdc 30 W
d	Timer Inputs		

2.3 Software

MANUSOFT is an application that allows you to easily control the HEXAN manually and is essentially the user interface.
MANUSOFT offers a wide range of tools to allow you to test the majority of protection devices. Programs specific to each protection devices only offer the necessary tools, which makes the tester easier to use in the field. Do not hesitate to contact us for these programs, or for any other information.

You can control the HEXAN with a Manual Control Module (MCM).

2.4 Technical specifications

2.4.1 Power supply

180-264 Vac 50/60 Hz single-phase earthed supply.
Maximum power : 900 VA
The maximum power is measured with all outputs loaded

Option 115 V / 230 V (this range of power supply is available if it's printed on the tester) Range is 90…130 Vac and 180…260 Vac 50/60 Hz single-phase earthed supply

The commutation is automatic and intenally controled by the HEXAN

2.4.2 Connections

On the HEXAN all electrical connections for the injections and timers are by 4mm diameter safety terminals

2.4.3 Case

Flight case.	Laboratory case
Dimension : W = 510, D = 200, H = 450 mm	Dimension : W 490 , D = 210, H = 370 mm
Weight: 20 kg	Weight: 14 kg

2.4.4 Frequency generators

Range:	5…500Hz for the HEXAN
Resolution:	500µHz
Accuracy:	±1mHz at 50Hz

2.4.5 EMC

Emission:	EN 50011 1991 class A
Immunity:	EN 50082-2 1992

2.4.6 Safety

In conformance with IEC1010

2.4.7 Temperature range

Operating temperature: 0…40°C
Storage temperature: -40…70°C

2.4.8 PC configuration

Processor:	Pentium 200
Memory:	32Mbytes
Operating system:	Windows® 95/98/NT/2000/XP

The accuracy figures are for up to 10% of range between 45 and 65Hz. *THD: Value at full load (100% of range) between 45 and 65Hz
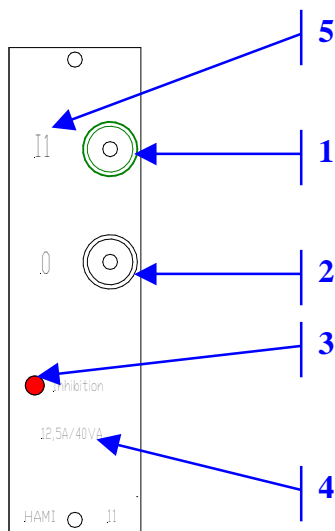
3. The amplifiers

The voltage and current of the HEXAN range have direct outputs. This allows the system to generate very low frequencies, DC signals and harmonics. The software allows you to generate up to eight levels of harmonic for a 50Hz

The **6** vectors of the HEXAN are completely independent in amplitude, phase (the continuity of phase is assured for "vector step" types of test) and even in frequency if this is felt to be necessary (for example when testing a synchro-coupler).

- All the amplifiers have thermal protection and are protected against overloads, open circuits and short circuits
- The neutrals of voltage amplifiers are earthed
- The current amplifiers are isolated

Protection : electronics and fuses

3.1 Current amplifiers (12.5A and 15A type)

1	4mm diameter safety terminal. Live point of current amplifier.	3	The "Inhibit" LEDs show that the amplifier has overheated or is inhibited by the software. If the amplifier has overheated the output is set to 0A
2	4mm diameter safety terminal. Neutral point of current amplifier.	4	Indication of range and maximum power of the amplifier.
5	Amplifier number. No.1 corresponds to phase A, 2 to B and 3 to C		

3.1.1 SPECIFICATIONS

Type	12.5A	15A
Power	40VA at 12.5A	110VA at 15A
Resolution	380µA	460µA
Accuracy	0.1%	0.1%
Distortion	0.1% THD*	0.1% THD*
Phase difference between two vectors	< 0.1°	< 0.1°
Output type	Direct	Direct

It is possible to connect the current generators in parallel in order to increase the injection current. In this case it is imperative to common the neutral points. In addition, do not forget to keep the amplifiers in phase and to lock the respective amplitudes together with the software. If you have three 15A amplifiers available you can inject a single-phase current of 3*15A, i.e. 45A.

Connecting the current amplifiers in series to obtain greater power can damage the system.

3.2   Current amplifiers (25 A 175 VA type)

The amplifiers 25 A 175 VA are with common neutral. The neutral shunt is inside the case. The returns terminals are not on the amplifier module but below the modules.
The return terminals can see a current of 25A each. In case you want to inject with more than one amplifier you must connect the return current on each terminal. You must not drive more than 25A in one terminal.
See below the use of return terminals :
1 output terminal used -> At least 1 return terminal used
2 outputs terminals used -> At least 2 returns terminals used
3 outputs terminals used -> All the 3 returns terminals must be used

3.2.1 Caractéristiques

Type	25 A
Power	175 VA à 25 A
Resolution	760 µA
Precision	0.1 %
Distorsion	0.1 % THD*
Phase difference between two vectors	< 0.1°
Output type	direct

* Le taux de distorsion harmonique (THD) est donné avec l'amplificateur sur sa charge nominale et à pleine échelle

You can put the amplifiers in parallel to generate a current higher than 25A. Don't forget tou put the amplifiers in parallel and locked the amplitude settings in the software. With the three 25A amplifiers, you can inject one current up to 3x25A = 75A.
The serial mode for the amplifiers can damage the test set.

3.3 Voltage amplifiers

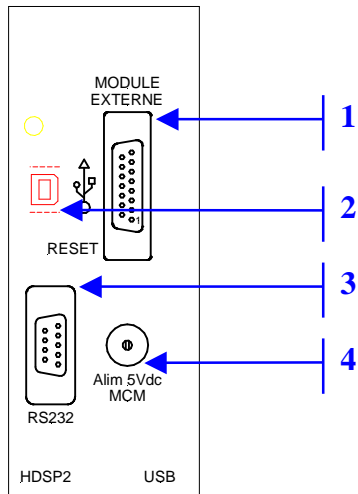Voltage amplifiers outputs can be dangerous for the operator or the system under test.
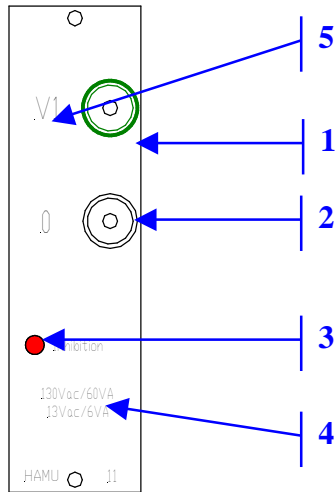
1	4mm diameter safety terminal. Live terminal of voltage amplifier	4	Indication of range and maximum power of the amplifier
2	4mm diameter safety terminal. Neutral of voltage amplifier. All neutrals are earthed.	5	Amplifier number. No.1 corresponds to phase A, 2 to B and 3 to C
3	The "Inhibit" LEDs show that the amplifier has overheated or is inhibited by the software. If the amplifier has overheated the output is set to 0 V		

3.3.1 Specifications

Type	13V / 130V	130V / 260V
Power	6VA at 13 V; 60VA at 130V	30VA at 130 V; 60VA at 260V
Resolution	400µV at 13 V; 4mV at 130V	4mV at 130 V; 8mV at 260V
Accuracy	0.1%	0.1%
Distortion	0.1% THD*	0.1% THD*
Phase difference between two vectors	< 0.1°	< 0.1°
Output type	Direct	Direct

Warning: you are strongly advised not to connect the voltage amplifiers in parallel in order to obtain a greater power. This can damage them.

4. Interconnection Module

1	Sub D 15-pin connector for connection to the external module. This connector contains the amplifier control signals at a low level (7.07Veff) and the control signals for the external modules.	2	Sub D 9-pin RS232 connector. Connect to the PC or MCM using a straight through cable.

4.1 Low level outputs

Level: 0…7.07Veff
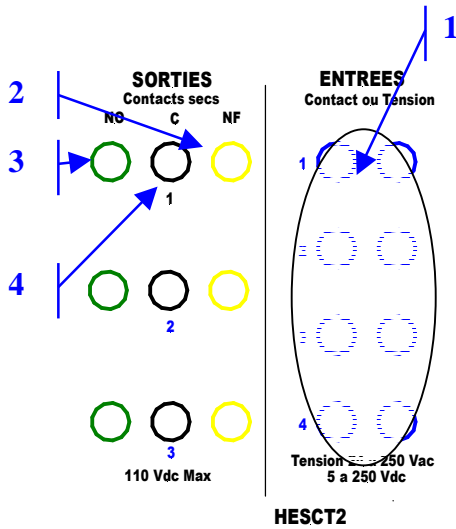   Resolution: 215µV
    Accuracy: 0.1%
    Distortion: 0.1%THD*
    Output current: 4mA Max
Phase:
    Resolution: 0.005°
    Accuracy: 0.1°

5.   Main supply
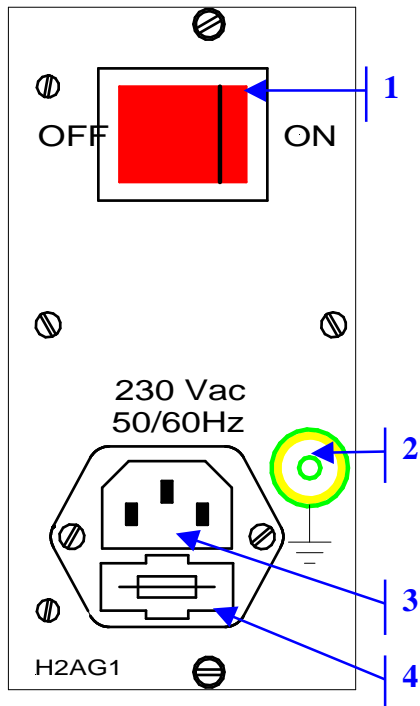
1	Neon On/Off switch
2	Earthing terminal
3	Mains supply for the test set. 230Vac, 50/60Hz, single-phase earthed supply.
4	Main fuse. There is a spare fuse in the socket. Value : 8 A slow blow for models 60X et 65X 10 A slow blow for models 61X.

6.   Timer

HESCT2

1	Four software configurable timer inputs.
2	Normally Open terminal for volt-free contact N°1
3	Normally Closed terminal for volt-free contact N°1. Outputs for volt-free contacts with programmable delay. The outputs are protected by an F200mA fuse on circuit board and are programmed by the SMARTEST software.
4	Common of the volt-free contact N°1

6.1   Specifications

Timer inputs

| Number of inputs	4
Isolation	The inputs are opto-isolated
Protection	By GMOV and F100 mA fuse on circuit board
Maximum voltage	250 Vac or 250 Vdc
Tripping Criteria	Closing or opening of contact. Appearance or disappearance of AC or DC voltage – software configurable.
Detection thresholds	5Vdc or 24Vac in voltage mode
Measurement range	Infinite
Resolution	1 ms
Accuracy	0.02 % of displayed value ± 1ms

Volt-free contact outputs

Number of outputs	3
Protection	By F200mA fuse on circuit board
Switching power	130Vdc, 200mA

7. <u>Auxiliary supply (option)</u>

Auxiliary supply outputs can be dangerous
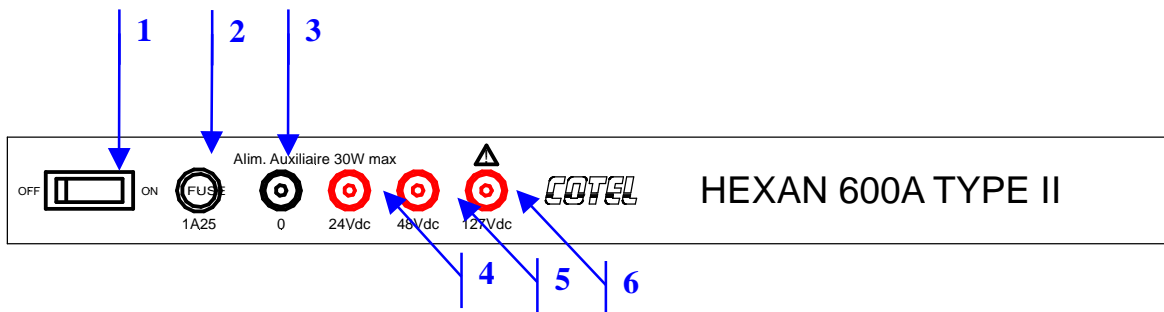
1	Auxiliary supply switch
2	Protection fuse (1A25 fast)
3	Neutral of auxiliary supply
4	output 24 Vdc 30 W
5	ouput 48 Vdc 30 W
6	output 127 Vdc 30 W

7.1 Specifications

The HEXAN contains an auxiliary voltage supply to power a relay or to supply a contact. The maximum power this supply can produce is 30W. The voltage source is a rectified and filtered signal and is protected by a fuse. This supply is live as soon as the HEXAN is powered up

8. Powering up the HEXAN

When you test electrical protection devices it is important to **connect the cables to the Equipment Under Test prior to plugging the banana plugs into the voltage or current outputs of the HEXAN.**
When your test has finished it is important to **disconnect the banana plugs into the voltage or current outputs of the HEXAN before removing the cables to the Equipment Under Test.**
This prevents a return current into the HEXAN's amplifiers due to the bouncing of the test connector.

1. Connect the power cable to the 230Vac, 50/60Hz mains outlet and the HEXAN. The earth MUST be connected
2. Connect the Equipment Under Test to the voltage and current outputs of the HEXAN.
3. Connect the trip signals from the Equipment Under Test to the timer inputs of the HEXAN.
4. Press the On/Off switch
5. The HEXAN is ready to be connected to the PC.
6. Connect the RS232 cable or USB cable between the HEXAN and the PC
7. Start the software
8. A message on the screen indicates that the software is looking for a port. When the port is found a progress bar indicates the HEXAN is being downloaded
9. Once the HEXAN has been downloaded you can check and adjust your values