High Voltage Pulse Generator FPG 1-10NMK5

Operation Manual

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OVERVIEW

High voltage pulse generator FPG 1-10NMK5 (the Generator) is designed to produce voltage pulses with maximum amplitude of up to 1 kV into 50 Ohm load. Operation of the FPG 1-10NMK5 should be carried out according to this Operation Manual. The operator should study this Operation Manual prior to using of the FPG 1-10NMK5.

DISCLAIMER

This Generator contains high voltage power supplies, careless use could result in electric shock. It is assumed that this highly specialized equipment will only be used by qualified personnel. FID GmbH accept no responsibility for any electric shock or injury arising from use or misuse of this equipment, as well as for the consequences of the Generator operation with a user's equipment. It is the responsibility of the user to exercise care and common sense with this highly versatile equipment.

TRANSPORTATION

Transportation of the Generator should be performed with a complete disconnection from all power sources. The Generator should be transferred in a specialized container, protecting it from possible shocks during the transportation.

UNPACKING

Having received the package with the Generator, put it into the horizontal position as labeled on the package. Remove the transportation packing from the package and after that remove the Generator. Make sure that the Generator has no visible mechanical damage. If the packing material was damaged during shipping, please take a photo of the damaged packing and its contents and send it to FID GmbH or its representative immediately upon receiving the package.

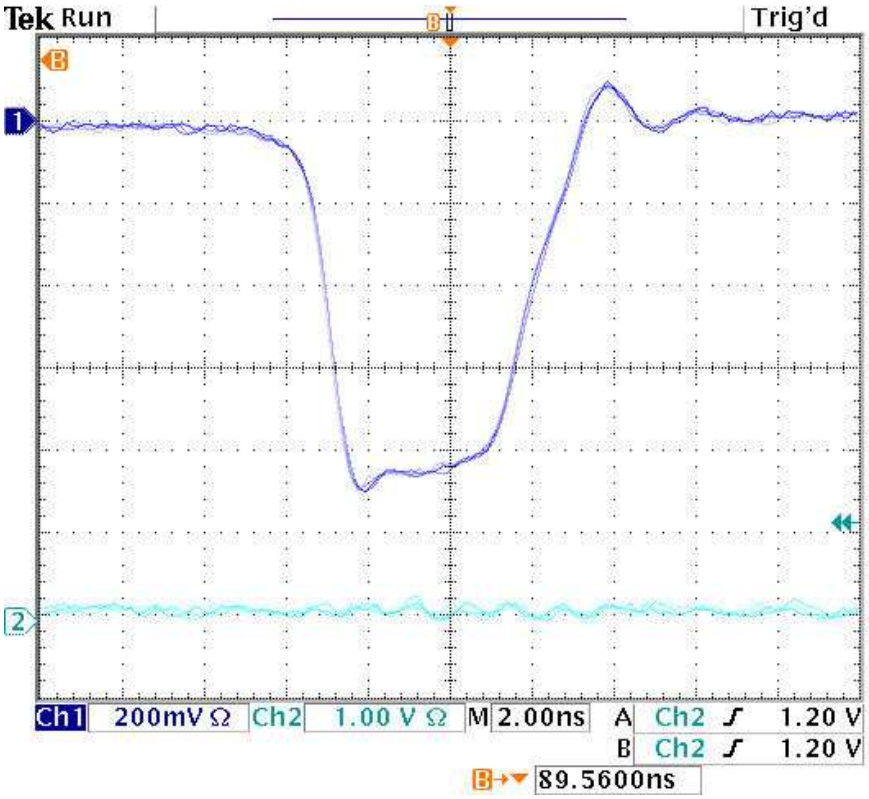
LIMITED EXPRESS PRODUCT WARRANTIES

All Products are warranted to Buyer against defects in materials and workmanship for the period of time of 12 months. FID shall, at its option, repair or replace any Product that proves, in the reasonable opinion of FID, to be defective in materials or workmanship during the warranty period. All Products repaired or replaced under warranty are only warranted for the remaining un-expired period of time in the original warranty for the particular defective Product. FID reserves the right to issue a credit note for any defective Products that have proved effective through normal usage. **THIS WARRANTY EXCLUDES PRODUCTS, PARTS OR EQUIPMENT THAT HAVE BEEN ACCIDENTALLY DAMAGED, DISASSEMBLED, MODIFIED, MISUSED, OR WHICH ARE USED IN APPLICATIONS THAT EXCEED THEIR SPECIFICATIONS OR RATINGS, NEGLECTED, IMPROPERLY INSTALLED OR OTHERWISE ABUSED.** Buyer must claim under the warranty in writing no later than 30 days after the claimed defect is discovered. This warranty does not extend to any third party, including without limitation Buyer's end-users or customers, and does not apply to any parts, equipment or other goods not manufactured by FID. **EXCEPT FOR THE LIMITED WARRANTIES EXPRESSLY SET FORTH ABOVE, FID SPECIFICALLY DISCLAIMS ANY AND ALL OTHER WARRANTIES TO BUYER, INCLUDING WITHOUT LIMITATION, ANY AND ALL IMPLIED WARRANTIES, SUCH AS FREEDOM FROM INFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

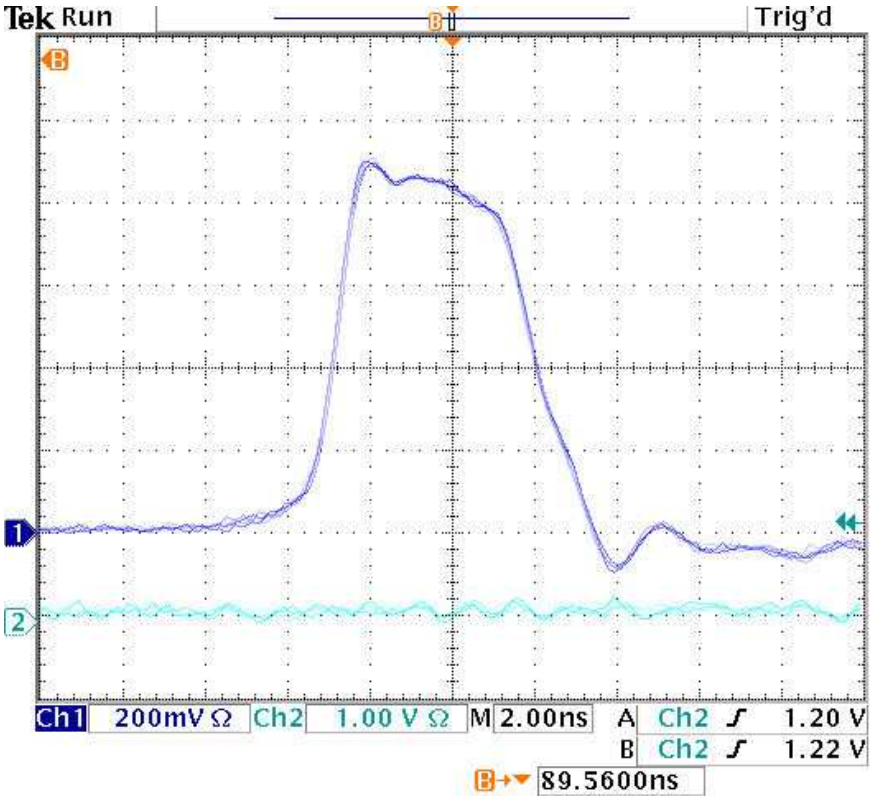
SPECIFICATIONS

Maximum output voltage	– 1 kV into 50 Ohm
Output voltage adjustment	– 400 V-1 kV
Rise time (10-90%)	– 1 ns
Pulse width (50%)	– 5 ns
Pulse repetition rate	– 0,01 - 10 MHz
Triggering	– Internal and External 5 V at 50 Ohm, rise time less than 10 ns, pulse width of not less than 10 ns
Input power	– AC 100-240 V, 50/60 Hz, 3A DC 80-210 V, 10A DC 400-1000V, 20 mA

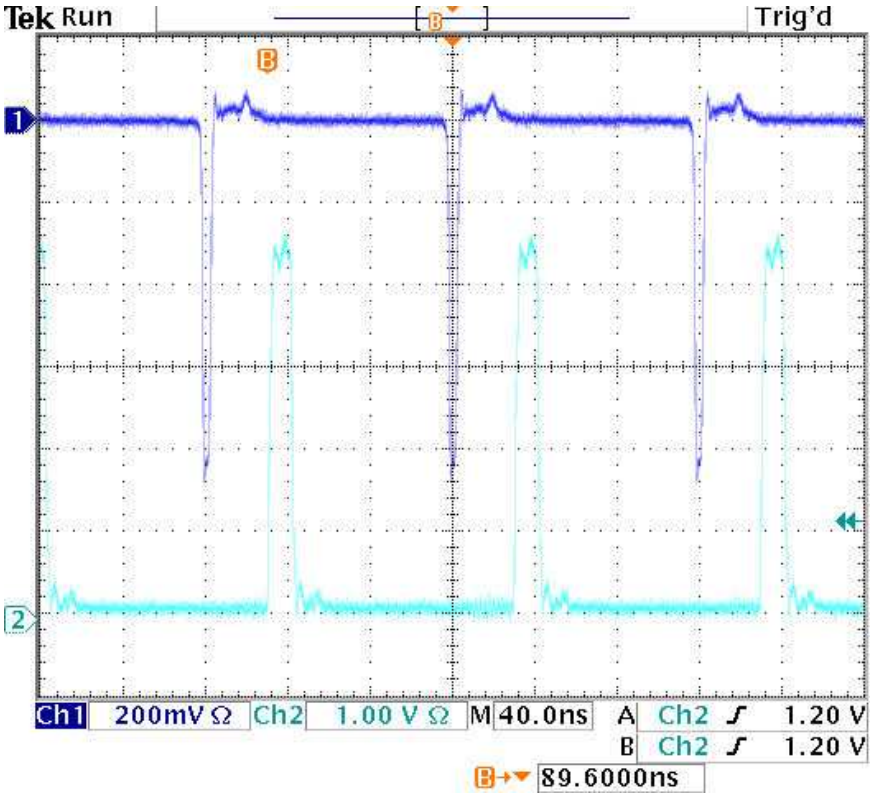
FPG 1-10NMK5 PULSE SHAPE



220 V/div, total attenuation 60,8 dB (1100 times)



Inverted output pulse



Output pulses at maximum pulse repetition rate

OPERATION METHODOLOGY

Generator FPG 1-10NMK5 is designed to operate with a 50 Ohm load. All technical specifications such as voltage amplitude, rise time, pulse duration are provided at the above mentioned particular load of 50 Ohm.

But practically the real load always differs from 50 Ohm value either way because of capacitance of inductance, non-liner effects and other things connected with a particular load.

The FPG 1-10NMK5 is capable of operating in fail-free mode even if the load's impedance differs from the nominal 50 Ohm for +/- 50%.

The higher is the level of variation of the impedance, the smaller amount of energy is consumed by the load. In this case there appear reflected from the load repetitive voltage pulses and almost all energy of the initial pulse is absorbed inside the FPG 1-10NMK5. This induces a significant heating-up of various internal structures of the generator and may lead to the Generator failure.

In any case when the load for the FPG 1-10NMK5 differs from 50 Ohm it is necessary to discuss the modes of operation of the FPG 1-10NMK5 with FID GmbH.

The most important condition of a safe operation of the FPG 1-10NMK5 is the tolerance of the surrounding electronic equipment to the electro-magnetic interference. Usually the source of such interference is the load, as the FPG 1-10NMK5 has two screening layers. The experience in operation of the similar pulse generators shows that users' DC power supplies and triggering generators often do not comply with increased electro-magnetic interference level. Such instability can lead to loss of power supply stabilization and spontaneous triggering of the trigger generators at frequencies higher than 8 MHz. Any of these in its turn could lead to the FPG 1-10NMK5 breaking.

INSTALLATION

1. Put the Generator into the horizontal position. Make sure that it does not have any mechanical damage.
2. Connect the Generator to AC outlet using an AC socket on the rear panel.
3. Using the included cable connect the external DC power supply to the 4-pin terminal on the rear panel.
4. If required, connect the external triggering pulser to the BNC connector labeled “TRIGGER IN” on the rear panel.
5. If required, connect the BNC synch output on the rear panel of the Generator labeled “SYNC OUT” to the oscilloscope.
6. Using the coaxial cables connect the 50 Ohm loads to the Generator's output connectors of the front panel. The load should be connected by the cables with minimum inductance possible to avoid pulse reflection back to the Generator and presence of after-pulses.
7. Make sure that the black “POWER” switch on the rear panel is in “0” position.

Attention!!!

The triggering generator should be capable to withstand high frequency electromagnetic interference. Malfunction of the triggering generator may lead to damage of the FPG 1-10NMK5

Do not obstruct the front air vents.

TURNING ON THE FPG 1-10NMK5

1. Check if the Generator is properly connected (see section INSTALLATION)

   The Generator can operate in two triggering modes – using internal triggering circuit and using the user's triggering pulser. For the requirements to the external triggering pulser please see sections SPECIFICATIONS and INSTALLATION.

   FID GmbH recommends to perform the initial testing of the FPG 1-10NMK5 using internal triggering mode.

2. For operation in the internal triggering mode proceed as follows:

   2.1. Turn-on the black "POWER" switch (position "1").

   2.2. Apply DC voltage from the external DC power supply.

   2.3. Using a group of tumblers labeled "CHANNELS" select the required number of operating channels. The output channels can be selected in any combination. It is necessary to make sure that the loads are connected to the selected channels.

   2.4. Depending on the desired pulse repetition rate put the "TRIGGER MODE" tumbler located on the rear panel of the Generator into "HI" (0,1-1 MHz) or "LO" (1-8 MHz) position. The green LED located near this switch will glow.

   2.5. Turn on the "ON/OFF" switch on the rear panel. The "ON/OFF" LED will glow and pulse generation will begin.

   2.6. The pulse repetition rate can be adjusted by the knob on the rear panel of the Generator labeled "FREQUENCY".

   2.7. Pulse amplitude can be adjusted by varying the input DC voltage. After change of input DC the Generator responds in 15 seconds.

3. For operation in the external triggering mode proceed as follows:

   3.1. Turn-on the black "POWER" switch (position "1").

   3.2. Apply DC voltage from the external DC power supply.

3.3. Using a group of tumblers labeled “CHANNELS” select the required number of operating channels. The output channels can be selected in any combination. It is necessary to make sure that the loads are connected to the selected channels.

3.4. Put the “TRIGGER MODE” tumbler located on the rear panel of the Generator into “EXT” (middle) position. Apply the external triggering pulses. The green LED located near this switch will glow.

IMPORTANT – Never exceed the maximum PRF of 8 MHz (see notes regarding the triggering pulser in the INSTALLATION section).

3.5. Turn on the “ON/OFF” switch on the rear panel. The “ON/OFF” LED will glow and pulse generation will begin.

3.6. The pulse repetition rate can be adjusted by the external triggering source.

3.7. Pulse amplitude can be adjusted by varying the input DC voltage. After change of input DC the Generator responds in 15 seconds.

TURNING OFF THE FPG 1-10NMK5

Proceed in reverse order.

1. Turn off the pulse generation using “ON/OFF” switch
2. Put the “TRIGGER MODE” switch to “EXT” (middle) position. If external triggering has been used then turn off the external triggering source.
3. Turn off the external DC power supply
4. Turn off the control circuits of the Generator using the black AC power switch.

IMPORTANT – Turning DC power on and off should be done when triggering is off. This relates to both internal and external triggering.

EXTERNAL POWER SUPPLY OPERATION

1. Turn on the circuit breaker for the channels to be used.

2. Using the knob on the control panel set the required DC voltage from 85 to 205 V