

VERSION	MARKING
2G1 (gases)	CE Ex II 2G c T6 x TF1
2D1 (gases and dusts)	CE Ex II 2GD c T6 x TF1 IP65 T85°C

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pressure to be indicated on a graduated scale on a dial with a range $\geq 270^\circ$.

5. Materials

The parts that come into contact with the process fluid are made of Hastelloy C276. The housing is made of AISI 304 stainless steel. The gaskets and vent and filler caps are made of EPDM or Viton. The transparent part is made of glass. The dial and indicator are made of aluminium.

6. Data-sheet

Detailed information on the construction and operating characteristics, as well as drawings showing overall dimensions are available on the catalogue sheets for MGS pressure gauges – 2G1 version for gas and 2D1 version for gas and Powders:

Mod. MGS	DN
37	100-150
41	100-150

7. Function

Its typical function is the corrosive process fluids pressure transmission with H2S. This instrument does not pose any risk of causing fires when operating normally or when not in use, and is to be used within the operating limits, avoiding the incorrect uses described below:

8. Intended use limits

Maximum surface temperature – Not due to the instrument working, but only due to the fluid temperature. The temperature produced by a combination of the ambient and process fluid temperatures must be below that for the ATEX temperature class, and must not cause operating problems on the instrument. The process fluid temperature must therefore be kept within the limits indicated in the table:

Class	Tmax (°C)	Instrument case (°C)	
		Dry	Filled
T6	85	70	65
T5	100	85	
T4	135	120	
T3	200	150	
T2	300		
T1	450		

Ambient temperature – This instrument is designed to be used safely at ambient temperatures between -20 and $+60^\circ\text{C}$.

Model - In systems containing compressed gas, it is advisable to select an instrument equipped with an adequate safety device. In the event of unexpected failure of the measuring element, the safety device allows the compressed gas to escape outside the case, thereby preventing the instrument from fracturing. The safety patterns employed on MGS37 is designated type S1 because it consist of a release valve which opens when the pressure inside the sealed case exceeds an established safety limit, putting it in communication with the outside. On the model MGS41 designated type S3, the safety consists of an entire blow-out back and there is an added baffle wall separating the measuring element from the clear solid front, providing further protection to the operator. Select an instrument with an adequate level of protection, consulting the following tables:

Measured fluid: LIQUID					
Case filling	Nothing		Damping liquid		
DN	<100	≥ 100	<100	≥ 100	≥ 100
Range (bar)	≤ 25	>25	≤ 25	>25	>25
Safety	n.a.	n.a.	S1	S1	S1

Measured fluid: GAS o VAPOUR					
Case filling	Nothing		Damping liquid		
DN	<100	≥ 100	<100	≥ 100	≥ 100
Range (bar)	≤ 25	>25	≤ 25	>25	>25
Safety	n.a.	S2	S1	S3	S1

Operating pressure – This instrument is designed to operate at a static pressure of up to 100% of the scale range. When dynamic or pulsating pressure is involved, 90% of the scale range must not be exceeded.

When gaseous fluids are involved it is advisable to use a nominal scale range that is double the operating range.

Chemical compatibility – Check the degree of chemical compatibility between the process fluid and the materials of which wet parts are made, and the atmosphere and the materials of which the exposed parts are made. Use an IP65 protection level for better protection. This mechanism can be used with process fluids that are compatible with Hastelloy C276.

Over pressure limit: 30% of FSV, max 6500 psi - 450 bar (max 12 hours).

Overpressure – The maximum overpressure values are shown in the table for each model:

Mod. MGS	Overpressure (bar)		
	≤ 10 bar	≤ 100 bar	≤ 400 bar
37	60	250	450
41	60	250	450

Ambient pressure – This instrument is designed to work at atmospheric pressures between 0,8 and 1,1 bar A.

Maximum Allowable Pressure of an Assembly - The maximum allowable pressure (PS) of an Assembly is determined by the PS of every component. To calculate the PS of an assembly, simply select the lesser value of the components. For safe operation, the PS of the assembly should not be exceeded.

To determine the maximum allowable pressure of standard product please consult the data sheet available on the web site www.nuovafima.com. For product not present into the NUOVA FIMA catalogue, please refer to the contractual documents. Protection level – As for EN60529 standard. These refer to hermetically sealed ring conditions, with built-in caps located in their seatings. Values shown in the table:

Version.	Case		
	standard	fillable	filled
2G1	IP 55	IP 65 (PN \leq 6bar)	N.D.
2D1	N.D.	IP 65 (PN $>$ 6bar)	IP 65

9. Wrong uses

This instrument is NOT suitable for ZONES 0 and 20.

The following applications must be considered potentially dangerous and carefully specified:

- Systems containing compressed gas A4272, E5313
- Systems subject to dynamic or cyclical pressures A4271
- Systems containing toxic fluids A4274
- Systems containing combustible / inflammable fluids - N112
- thermal incompatibility between the filling liquid and the process fluid – NF 113

A4271 - Fatigue Failure - This is caused by mechanical stress resulting from the pressure and takes the form of a small crack from the inside to the outside, generally along an edge. Such failures are more dangerous when the measured medium is a compressed gas rather than a liquid. Fatigue failures release the fluid gradually, and therefore the case pressure build-up is indicated by the opening of the relief valve. When measuring high pressures, the process operating pressure is close to the maximum permissible stress limit, and can therefore result in an explosive failure.

A4274 - The silicone oil should not be used as transmission liquid when highly oxidizing agents are involved since spontaneous chemical, fire or explosion reactions could occur. In this case the use of fluorolube liquids is recommended.

A4275 - Vibration Failure - The most common mode of vibration failure is that where the movement parts wear because of high cyclic loading caused by vibration, resulting in a gradual loss of accuracy and, ultimately, failure of the pointer to indicate a pressure change.

A4362 - Liquid filled Cases - Liquid filling is generally used to dampen the vibrations of moving parts due to vibrations and/or pulsations.

Filling liquids	Ambient temperature
Glycerine 98%	+15...+60°C (+60...+140°F)
Silicon oil	-20...+60°C (-4...+140°F)

E5313 – The temperature inside and on the surface of the instrument may increase significantly due to rapid compression of a gas measured, or an impact wave in a liquid measured. Internal overheating caused by adiabatic compression or by an impact wave can lead to spontaneous combustion of fluids measured, or ignition of explosive atmospheric conditions outside the casing. The surface temperature must not exceed the limit set for the temperature class required in the area in which

the instrument is installed.

N112 – When use is found to be incorrect or the sensitive element is cracked or broken, if the fluid measured is combustible or inflammable and measuring is continuous, an explosive atmosphere may be generated inside and around the instrument casing. In cases such as this it is vitally important that an appropriate maintenance program is activated to replace worn parts on the instrument before any leaks occur.

NF113 - Breaking for high temperatures – The filling liquid expansion due to higher temperatures than those permitted causes a blowing up of the membrane and a permanent damage to the diaphragm seal and/or a gas production due to the filling liquid decomposition. At this stage the assembling is no longer usable.

Transport

The characteristics of the instruments may be affected during transport, despite adequate packing, and must be checked before use. Correct calibration can be checked by excluding the instrument from the process by means of the shut-off valve and checking that the pointer returns to the zero mark (unless the temperature varies greatly from 20°C). Failure of the pointer to return to zero indicates serious damage to the instrument and requires maintenance to be carried out on the instrument.

Storage - Instruments must be kept in their original standard packaging until they are installed, and must be located in closed spaces that are free of any damp. If the instruments come with special packaging (in wooden boxes lined with tar paper or in barrier bags), it is always best to keep them in closed spaces wherever possible, and always where they are protected from the weather. The state of packaging materials must be checked every 3-4 months, especially if the boxes are exposed to the weather. The temperature of the storage area should be between -20 and $+70^\circ\text{C}$, except where otherwise specified in the catalogue data sheets.

Installation

2G1 and 2D1 version of MGS37-41 pressure gauges must be installed in compliance with European Standard EN 837-2, and special care must be taken to avoid any loose mechanical connections.

Install the instrument in a position in which magnetic and electromagnetic induction, ionising radiation, ultrasound and exposure to sunlight will not increase the instrument's surface temperature.

To facilitate removal for maintenance purposes, a shut-off valve can be installed between the pressure gauge and the plant. The pressure connection must be watertight. If the pressure connection has a cylindrical thread, the seal is achieved using an O-ring clamped between the two flat sealing surfaces, one on the pressure connection and the other on the instrument's process connection. If the pressure connection has a tapered thread, the seal is achieved by simply screwing the connection onto the coupling, through the mating of the threads. It is common practice to wrap PTFE tape around the male thread before coupling (see Fig).



In both cases the torque must be applied using two hexagonal spanners, one on the flat faces of the instrument/process coupling and the other on the pressure connection. **Do not use the case as a means of tightening as this may cause damage to the instrument.** When pressurising the system for the first time, check the tightness of the connection seal. All instruments must be mounted in such a way that the dial is vertical, unless otherwise indicated on the dial itself. When the instrument includes a safety device, this must be at least 20 mm from any other object. - For wall or panel mount instruments, make sure that the pipe conveying the pressurised fluid is connected to the instrument coupling without exerting torsion or force.

Effect of liquid columns - The installer must be aware that, if the instrument is subjected to the load of a liquid column, it must be calibrated to compensate for this effect. This occurs when the instrument is fitted above or below the pressure connection to which it is connected. When dealing with gas or steam this does not occur. In this case, we recommend installing the instrument above the pressure connection.

Ventilation – The casing must be ventilated as indicated in the instructions shown on the sticker supplied with the instrument.

Temperature – Verify that the process fluid temperature is \leq to the permitted one.

E721 - Mechanical stress - Pressure gauges must not be subjected to mechanical stress.

Equipotentiality – The instrument is made equipotent with the plant it is fitted on by means of an Ohmic contact between the threaded process connection and the pressure connection.

10. Use

The user must be aware of the risks related to the chemical and physical characteristics of the gases, vapours, and/or powders in the system, and carry

1. Safety notes

- Safety results from the careful selection and installation of the instrument in the pressurised system, as well as from compliance with the maintenance procedures set out by the manufacturer. The user is entirely responsible for ensuring correct installation and maintenance.
- This manual is an integral part of the supply. Carefully read the above instructions before using this product. Keep it in a safe place.
- In order to correctly specify the functional and constructive characteristics of the instruments, it is recommended to consult the most up-to-date version of the catalogue data sheets, available on-line at the website www.nuovafima.com
- Improper use may damage the instrument, resulting in failure and possible injury to persons or damage to the plant.
- The persons charged with the selection, installation and maintenance of the instrument must be able to recognise the conditions that may negatively impact on the instrument's ability to perform its function and which may lead to premature failure. They must therefore be qualified technically and trained, and must carry out the procedures called for in the plant regulations.

2. Directives

The MGS37-41 pressure gauges are conform to the essential Health and Safety Requirements laid down in European Directive 94/9/EC for Group II, Category 2G or 2GD equipment in the T6 temperature class.

EMC Directive 89/336/EEC on electromagnetic compatibility (EMC) does not apply to this product. Under the terms of directive 97/23/EC (P.E.D.), NUOVA FIMA pressure gauges are classified into 2 categories:

- PS ≤ 200 bar these instruments do not have to meet the essential safety requirements, but must only be designed and constructed in accordance with "Sound Engineering Practice" and are not required to bear the CE mark;

- PS > 200 bar these instruments must comply with the essential safety requirements prescribed by the PED, are classified as Category 1 and certified according to Form A. They must bear the CE mark illustrated below.

3. Standards

NF instruments are designed and constructed to comply with the safety requirements prescribed by the international regulations in force, extracts of which are given in this manual. A full knowledge of these and complete compliance of the same are necessary for installing and commissioning the instrumentation: EN837-1, EN837-2, EN1127-1, EN13463-1, EN13463-5, ASME B40.1, ISO 15156.

4. Operative principle

The MGS37 and 41 models are made up of a Bourdon tube pressure gauge and combined with a diaphragm seal. The inner volume between the seal and the tube is filled up with liquid. According to the liquids non-compressibility principle, the tube sensing element moves linearly according to the pressure level working on the diaphragm seal membrane. The rack on the indicator arm is keyed into the pinion, allowing the

out a thorough preliminary check before putting into service.

Putting into service - The instrument must always be put into service with care, to avoid pressure surges or sudden changes in temperature.

Intermittent measuring - It is advisable to measure when necessary by slowly opening the shut-off valve and then closing it again once the reading has been taken. This will ensure a long lifespan and safe operation of the instruments.

Zero adjustment - Any ambient or process fluid temperature variation could bring a filling liquid volume variation. This could involve a variation of the system inner temperature and brings to the zero error on the measurement instrument. Wait until the instrument and the diaphragm seal reach the working temperature and adjust the instrument to zero. In some cases this procedure is not necessary because the instrument calibration temperature has already been established during order.

A432 - It is not advisable to use the instruments for measuring pressures near zero, as in that range the accuracy tolerance can represent a significant percentage of the applied pressure. For this reason, these instruments should not be used for measuring residual pressures inside large volume containers such as tanks, surge tanks, and the like. In fact, such containers may retain pressures that are dangerous for the operator, even when the instrument indicates a zero pressure. It is recommended to install a ventilation device on tanks in order to achieve zero pressure before removing covers or connections, or performing similar tasks.

A44 - It is not advisable to successively install instruments on systems with different operating media, to avoid initiating chemical reactions that may cause explosions resulting from contamination of the wetted

parts.

Caps - The filling and vent caps must not be removed while the system is working.

11. Possible malfunctions

Indication failure (pointer to zero) : filling up system empty.

Indication steady on the same value: Pressure pipes clogged. Initial valve closed.

Indication steady outside the graduated scale: Excess pressure - temporary or permanent reading error.

Indication error exceeds that stated for the instrument. Calibration altered.

Pointer oscillating rapidly: Harmful pulsations in the process fluid. Harmful mechanical vibrations.

Ejection of the safety cap: Excess Temperature: Breaking / cracking of the sensitive element probable.

12. Maintenance

Maintenance is to be carried out in accordance with the requirements of European Standards EN60079-14, EN50281-1-2.

Maintenance of the initial mechanical and construction characteristics must be ensured by means of a specific maintenance programme, drawn up and managed by qualified technicians. Mechanical parts must be maintained in such a way as to avoid the dangers associated with high temperatures, and the risk of fire and explosion due to any abnormality that arises when they are working.

Thorough check - The window must not show any crack. Filling plug and blow out vent must be placed in the right position. The pointer must be within the graduated scale. Il trasparente non deve presentare incrinature.

As for the liquid filled instrument, they must be refilled when the level is 85%. Use Nuova Fima liquids only.

Check from time to time that dust deposits on the instrument are not thicker than 5 mm. Where this occurs the instrument must be cleaned. Use a cloth soaked in a water and soap solution.

Removal - The instruments must be cut off from the system by closing the initial valve, and the pressure inside the instrument must be reduced to zero by opening the vent in the system. The process fluid left in the instrument's process connection must not be disposed of in the environment, so as not to cause pollution or harm people. Dangerous and toxic fluids must be handled with care.

Routine check - Instruments used on plants subject to demanding conditions (vibrations, pulsating pressures, corrosive or combustible / inflammable fluids) must be replaced at the time intervals indicated in the maintenance programme. Where not covered by the maintenance programme, the state of the sensitive element should be checked every 3/6 months, as well as the indicating precision, degree of corrosion on the sensitive element (for fluid separators), the seal on the gaskets, and the presence of condensate inside the casing. If the instrument malfunctions, an unscheduled check must be carried out.

The sensing element corrosion level cannot be verified in the details because its construction cannot be inspected: it is necessary to consider the theoretical values concerning a membrane 0,06 mm thick.

The testing fluid must be compatible with the fluid to be measured in the pressurised system. Fluids containing hydrocarbons must not be used when the fluids to be measured are oxygen or any other oxidising substance. To check the integrity of the sensitive element, fit the instrument on a pressure generator, with a shut-off

valve between the two. Submit the instrument to the maximum pressure allowed and disconnect it from the pressure source by closing the shut-off valve. If there are any leaks on the sensitive element, the pointer will slowly return to zero. In order to check indication precision, a stable pressure must be generated in a laboratory and applied to the instrument being checked and to a pressure sample or primary pressure. The precision of the latter must be 4 times higher than the nominal precision for the instrument being checked. The values indicated by the two instruments as the pressure rises and falls a number of times makes it possible to establish non-linearity, hysteresis, and repeatability for the instrument being checked.

Check the soundness of the gaskets and the consequent IP protection level.

Recalibration - If the calibration check produces measured values that differ from the nominal values indicated in the catalogue, the instrument must be recalibrated. We recommend returning the instrument to NUOVA FIMA for recalibration.

NUOVA FIMA does not accept any responsibility for instruments used that are subject to work not expressly authorised by them, and such work shall cause the CE Declaration of Conformity and Contractual Guarantee to be null and void.

13. Demolition

We recommend removing transparent parts and caps and disposing of them as aluminium and stainless steel. The fluid left in the instrument may be dangerous or toxic.

ATEX