Proposal for Guidelines on in-use-surveillance on equipment of gas pressure regulating and measuring stations of transmission and distribution systems

Edition July 2013

Foreword

These guidelines deal with the in-use surveillance and have been prepared by FARECOGAZ.

These guidelines take their justification from the following regulated scenario:

- *Article 2 of the Directive 97/23/EC (PED) in paragraph 1 allows the Members States to adopt all appropriate measures to ensure that the pressure equipment may be put into service only if, when properly installed and used for their intended purpose and maintained, they do not endanger the health and safety of persons and, where appropriate, domestic animals or property.*
- *Further, article 2 of the PED in paragraph 2 says that the provisions of PED shall not affect Members States' entitlement to lay down such requirements as they may deem necessary to ensure that persons and, in particular the workers, are protected during use of the pressure equipment, provided that this does not mean modification to such equipment in a way not specified in PED.*
- *The European Commission has issued the document EC draft – "In-service inspection of pressure equipment in Europe" – version 1.21 October 2007, that shows the major differences/discrepancies between various National Regulations / practices.*
- *The annex II part B of the ATEX 2 establishes, for the equipment in the scope of ATEX 1, the allowed categories for each type of zones included in hazardous places, but does not give any information on the equipment out from the scope of ATEX 1. This lack of indications is the cause of several misunderstanding on the implementation both of ATEX 1 and of ATEX 2 mainly at the 1st commissioning of the equipment out from the scope of ATEX1.*[1]
- *As per the provisions in article 4 items (d) and (f) of the Directive 2004/22/EC (MID) manufacturers have to provide all necessary information to ensure proper measurements under normal working conditions (manufacturer is "responsible for the conformity of the measuring instrument with this Directive with a view to either placing it on the market under his own name and/or putting it into use*[2] *for his own purposes") at and after the 1st commissioning of the measuring instruments.*
- *The annex MI 002 part III (c) of MID foresees that Members States shall ensure the conformity of the temperature range of gas / gas family / MOP with the range of performance of the meter so that the meter is appropriate for proper measurements of consumption foreseen or foreseeable.*
- *As per the provisions in annex I item 9.3 of MID the user manual of the measuring instrument shall include all necessary information relevant to operating conditions, mechanical and electromagnetic classes, environmental conditions and particularly instructions for correct operation and any special conditions of use.*
- *There are some gas measuring stations in which it* ***is not mandatory to use measuring instruments in accordance with the MID provisions*** *(article 2) e.g. those used in the measuring stations at the connection between a transmission pipeline with a distribution network or in the measuring stations supplying fuel gas to the activities as per Annex I - Directive 96/61/EC (ETD) - where does not occur any trading of gas but where European provisions (e.g. 5th para clause 3 doc. C(2007) 3416 –COMMISSION DECISION of 18 July 2007) and/or National Regulations prescribe appropriated maintenance / recalibrations / checks during the use of the measuring instruments themselves.*

[1] *The EC involved on this subject with the letter DG ENTRE/G4/MGC/rfd/2010 dated 30 Sept. 2010 announced that this subject is under the responsibility of the Authorities of the MSs*

[2] *'Putting into use' means the first use of an instrument intended for the end user*

- *Guidelines CEN CEN/TR 16478 on surveillance from first commissioning on measuring devices used in natural gas supply to the installations of the activities under the Directive 2003/87/EC (ETD) establishing a scheme of CO2 emissions trading are already effective*[3].
- *The EN 12186 in force on pressure regulating stations deals with "maintenance"(ref.: EN 13306) only listing three philosophies approaches and establishing four performance objectives in service time, without giving any guideline on how to implement the in-service activities after the first installation. The performance of the stations in-service can be ensured only throughout a global surveillance at site that shall include conformity verification of the installation / in-service inspections / maintenance when needed / integrity of the pressure equipment up to the end of its operating life*[4]*. The EN1776 in force on gas measuring stations deals with the need of post-commissioning checks and maintenance, but in general terms, even if should be recognized that it gives more detailed information than the EN 12186, but still too generic and non-exhaustive.*
- *It is necessary to recognize that DSOs and TSOs need to approach the in-use surveillance taking account their specific needs liaised to the stations design / policy / contractual commitments / etc.*
- *Only in a minority of MSs there are available:*
  - *National Legal Metrological Regulations,*
  - *National regulations on in-use surveillance on pressure equipment*

  In the event of conflicts in terms of more restrictive requirements in National Regulations / standards / code of practices with the requirements of these guidelines, the National Regulations / standards / code of practices shall take precedence
- *An important part of measuring stations are out from the legal metrological regulations*
- *In the context of globalization of the natural gas sector and of transparency of its managing, it is expected that the need to have minimum common provisions on in-use surveillance will involve also MSs where, at the time being, there are not available any national provisions, therefore there is the need to avoid further unjustified differences in this matter*

From above scenario FARECOGAZ evaluated the need of guidelines on in-use-surveillance after the 1st installation till the end of the technical life of the equipment in the gas pressure regulating and measuring stations of the transmission and distribution systems mainly because of:

- *the gas pressure regulating stations are the only functional units ensuring the safety of the whole gas system i.e. which cover all pressure risks,*
- *the lack of indications and/or interpretation of current regulation liaised to ATEX 2 concerning the risks from potentially explosive atmospheres concerning the equipment out from the scope of ATEX 1,*
- *the gas measuring stations ensure the proper measurements of the gas consumption i.e. ensure transparent transactions between the involved parties.*

The common governance on in-use surveillance, is necessary since the products may be designed in one country, manufactured at another country, finally, tested and put into operation in another country and ***the same products are used in different countries, and*** *calls for a future harmonization also for the regulations / codes to ensure proper performance in use.*

In other words, it is essential an extension of the harmonization of the Essential Requirements for the products, by introducing a harmonization of in-use surveillance to address:

[3] *Since the unjustified differences between various National practices showed in table 2 of CEN/ TR 16478 raised the interest of the EC for further investigations, it should be expected that EC will extend its interest also to pressure equipment with the aim to eliminate these differences on the market*

[4] *The in-process revision of this EN is foreseen to repeat the previous approach*

- *safety aspect,*
- *possible "technical" barriers of trade,*
- *proper performance in- service versus operating time,*
- *economical management aspects (servicing and downtime costs),*
- *responsibilities liaised to the use of the products within their technical life and*
- *any impact on the environment.*

These guidelines intend the "in-use surveillance" as all those operations / maintenance activities carried out from the 1st installation of equipment/stations throughout their technical life until the last de-commissioning and their disposal aimed to ensure that:

- *the functional performances during their operating life are within the allowed limits and*
- *the applicable environmental provisions are met*
- *the use of the equipment/stations meets the provisions of previously mentioned Directives.*

Furthermore these guidelines follow the main philosophy of the relevant parts of the documents CEN/TS 15173 - Gas supply systems – frame of reference regarding Pipeline Integrity Management System, CEN/TS 15174 – Gas supply systems – Guideline for safety management systems for natural gas transmission pipelines, CEN/TS 15399 – Gas supply systems – Guidelines for management systems for gas distribution network, OIML 2CD OIML R 137-1 & 2 - Gas meters Part 1: Metrological and Technical Requirements Part 2: Metrological controls and performance tests - of 14 Sept 2010 and CEN/TR 16478 - Surveillance from first commissioning on measuring devices used in natural gas supply to the installations of the activities under the Directive 2003/87/EC (ETD) establishing a scheme of CO2 emissions trading.

In summary, these guidelines detail the minimum in-use surveillance activitiessuggested by FARECOGAZ focused on:

- *safe and proper operation (safety, continuity of supplying, conformity of gas measurement, etc.) during the whole operating life of the equipment,*
- *avoiding any obstacle to free circulation of the equipment inside EU,*
- *minimizing the impact on environment.*

In general speaking these guidelines consider the provisions in the National Regulations and in the Legal Metrological Regulations established by the National Authorities and/or in the codes of practice established by concerned parties on this subject that can be found in some Members States. New National Regulations / Legal Metrological Regulations / codes of practices should take into account the content of these guidelines with the purpose to reach an integrated common flexible practice.

In the event of conflict in terms of more restrictive requirements in National standards / codes of practices of Gas System Operators (GSOs) with the requirements of these guidelines, the National standards and/or codes of practices shall take precedence.

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1. Scope

These guidelines specify the directions that should be followed in the in-use-surveillance of the equipment assembled in the gas pressure regulating and measuring stations of the fuel gas transmission / distribution / supply systems, in order to keep the reliability of the stations themselves ensuring safety, proper measurement of the gas consumption, efficiency and continuity in supply of gas complying at the same time, with the basic environment provisions.

These guidelines are intended to be applied to the equipment of the systems in accordance with following standards:

- *EN 1776 & Metrological Legal Provisions*
- *EN 12186*
- *EN 15001-1*
- *Odorization units as per national practice (e.g. for Germany DVGW paper G280; for Italy UNI 9463 part 1)*

In line with EN 1775 [5], electric installations, buildings, hardware, … are excluded from the scope of these guidelines

These guidelines deal with following equipment:

- *Gas pressure regulators*
- *Gas safety shut-off devices*
- *Devices and systems with a measuring function*
- *Pressure vessels (filters, heat exchangers, ….)*
- *Relief and creep devices*
- *Valves*
- *Pipework*
- *Inlet pipework with relevant devices installed underground*

These guidelines are focused on pressure control and metering systems with flow rate higher than 200 standard m^3/h.

Users of these guidelines should be aware that National Regulations / national standards as well as codes of practices of Gas System Operators (GSOs) sometime approved by National Regulator may exist inside the EU Member States.

When National Regulations or Legal Metrological Regulations have to be applied, these guidelines shall not be considered.

Except in the aforementioned cases, these guidelines should be intended to be applied in association with above applicable National Regulations / national standards and/or codes of practices setting out the above mentioned surveillance provisions.

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[5] *EN 1775 "Gas supply - Gas pipework for buildings - Maximum operating pressure less than or equal to 5 bar - Functional recommendations"*

2. Normative references

The relevant provisions of the following referenced documents shall be taken in consideration for the implementation of these guidelines.

EN 970 - Non-destructive examination of fusion welds - Visual examination

EN ISO 9001 – Quality management systems – Requirements

EN ISO 5167-2 – measurement of fluid flow by means of pressure differential devices in circular cross-sections running full – Part 2: orifice plate (ISO 5167-2:2003)

CEN/TS 15173 – Gas supply systems – frame of reference regarding Pipeline Integrity Management System (PIMS)

CEN/TS 15174 – Gas supply systems – Guideline for safety management systems for natural gas transmission pipelines

CEN/TS 15399 - Gas supply systems – Guidelines for management systems for gas distribution network

ISO 11971 – visual examination of surface quality of steel casting

MSS SP-55-2001 – Quality standard for steel castings for valves, flanges and fittings and other piping components - visual method for evaluation of surface irregolarities

3. Definitions

For the purpose of these guidelines, the following terms and definitions apply. The pilot terms are listed in alphabetic order. The derived terms from a pilot term, if any, are listed in the appropriate order after the relevant pilot term.

authorized person

a competent person who is appointed, at least, as responsible for the running of the gas pressure regulating and measuring stations of the transmission / distribution / supply systems

competent person

person who is trained, experienced and approved to perform one or more surveillance activities.

difference of indication

the difference between the indicated value V_m of a device with measuring function and the one of a reference instrument V_r for a specific operating datum of the same measurand expressed as percentage of the value measured by the reference instrument

$$D = \frac{V_m - V_r}{V_r} \times 100$$

maximum allowable difference

the maximum absolute value of the difference of indication.

Gas System Operator (GSO)

"Gas System Operator" means a natural or legal person who carries out the function of gas transmission / distribution and is responsible for operating, ensuring the maintenance of, and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the gas

safety (ref. ISO IEC Guide 51)

freedom from unacceptable risk

risk (ref. ISO IEC Guide 51)

combination of the probability of occurrence of harm and the severity of that harm

harm (ref. ISO IEC Guide 51)

physical injury or damage to the health of people, or damage to property or the environment

failure

event at which takes place the termination of the ability of an equipment to perform under safe conditions the required function

wear-out-failure

failure whose probability of occurrence increases with the operating time or the number of operations of the equipment and the associated applied stresses

NOTE Wear-out is a physical phenomenon which results in a loss or deformation (e.g. abrasion of seat ring and/or internal erosion of body of pressure regulators from flowing gas at sonic velocity, erosion of the blades of turbine in the meters)

ageing failure

failure whose probability of occurrence increases with the passage of calendar time

NOTE 1 This time is independent of the operating time of the equipment

NOTE 2 Ageing is a physical phenomenon which involves a modification of the physical and/or chemical characteristics of the material (e.g. for elastomeric materials)

in-use-surveillance strategy

all those operation and maintenance activities carried out from the 1st installation of equipment / stations throughout their technical life until the last de-commissioning and their disposal aimed to ensure that the functional performances during their operating life are within the allowed limits and that the applicable environmental requirements are met

integrity strength verification

the activities directed towards the proving that pressure containing parts of pressure equipment can still withstand the maximum allowed pressure printed in the nameplate after a certain period of normal operating conditions

maintenance types:

preventive maintenance

maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning (malfuntions) of of equipment of the gas pressure regulating and, where applicable, of measuring stations

predetermined maintenance

preventive maintenance carried out in accordance with established intervals of time without previous conditions investigations

NOTE Intervals of times may be established by National Regulations / national standards / codes of practices on the basis of knowledge of the failure mechanisms of the concerned equipment

condition based maintenance

preventive maintenance which include a combination of condition monitoring of significant parameters and/or testing, analysis and the ensuing maintenance actions

NOTE The condition monitoring and/or testing may be scheduled or continuous.

corrective maintenance

maintenance carried out after fault recognition and intended to put an item into a state in which it can performa required function

NOTE It includes the activities normally liaised to the replacing of parts of an equipment after malfunctions have been detected or when malfunctions and/or failures are reasonably expected to occur and focused to re-establish the normal operating conditions

malfunction

event at which takes place performances of an equipment under safe conditions, but out from the intended limits

measuring instrument

any device or system with a measuring function (the measurand may be volume, mass, energy)

measuring system

any assembly of several measuring instruments capable to measure a process datum via several other process data (e.g. a gas meter + pressure and temperature transducer + conversion device)

metrological inspector

a competent persons appointed for in-use monitoring of metrological performance of devices with measuring function

NOTE In some Member States the metrological inspector acting in the context of legal metrology is a public officer or, at least, an inspector of third parties authorized by the National Authority

metrological performance

capability of gas meters to measure, memorize and display the quantity of gas that has passed it and /or capability of volume conversion devices fitted to a gas meters to convert automatically the quantity of gas measured at metering conditions into a quantity at base conditions.

National Regulations

any provision issued by National Authorities, National Legal Metrological Authority (Legal Metrological Requirements) and National Regulator (National Measures)

National Regulator

the independent body which regulates, controls and monitors the gas sectors and market within a Member State

Code of practice

internal procedures and network codes of GSOs establishing their behaviour rules on managing of the gas supply systems

NOTE: in some Member States the codes of practice are approved by National Regulators

PED

Directive 97/23/EC of the European Parliament and of the Council of 29may 1997 on the approximation of the law of the Members States concerning pressure equipment

pressure equipment

any vessel, pressure accessory and safety accessory intended as standard pressure equipment in the sense of article 1 item 3.1 of PED or equivalent equipment as those pre-PED

recalibration

activities consisting in the verification that the differences of indication of a device with measuring function are within the limits specified in the relevant standard and re-alignment of the indication when needed

safety accessory to PED

device or system classified as safety accessory as per PED

service engineer

a competent persons appointed for in-use surveillance activities

significant parameter referred to measuring instruments

any measurable characteristic involved in the measuring process which, in case of drift out from pre-established limits, may imply errors of the measuring process (e.g. when in an ultrasonic gas meter, the transient times reflect a significant different speed of sound for one of the paths compared with the average speed of all paths).

These guidelines consider following limits for significant parameter:

- ***normal thresholds:*** *the maximum and/or minimum values of a significant parameter identified in the type test of a measuring instrument for normal operating conditions. When these limits are met it is presumed that the necessary conditions for proper measurements occur*
- ***care thresholds:*** *the limit or the limits range of a significant parameter still ensuring proper measurement, but revealing the risk that the significant parameter may further drift and reach the alarm level*
- ***alarm thresholds:*** *the limit or the limits range of a significant parameter implying inacceptable differences of indication of the measuring process and that, when occur, require the activation of corrective actions to re-establish the necessary conditions under which it is presumed that proper measurement process occurs*

significant parameter referred to other equipment

any measurable functional characteristic of equipment associated to a specific performance of the equipment itself, which, in case of drift out from the pre-established limits, implies unsafe operating conditions and/or compromises the continuity in the supplying of fuel gas (e.g. the differential pressure between the inlet and the outlet of a filter reveals the level of clogging of the straining means of the filter, the value of the motorization pressure in a piloted operated regulator reveals whether there are extra frictions between mobile and fixed parts, etc.).

these guidelines consider following limits for significant parameter:

- ***normal thresholds:*** *the limit or the limits range of significant parameter, within which it can vary under normal operating conditions*
- ***care thresholds****: the limit or the limits range of a significant parameter still ensuring proper operating conditions, but revealing the risk that the significant parameter may further drift and reach the alarm level*
- ***alarm thresholds:*** *The limit or the limits range of a significant parameter, at which corrective maintenance activities shall be carried out to re-establish normal operating conditions*

4. *In-use-surveillance strategy for equipment of gas pressure regulating and measuring stations*

As in-use-surveillance strategy it is intended all those activities carried out at site of the stations after the 1st installation of their equipment during all its technical life focused to ensure the stability of the performances in the time complying with the environmental provisions and those actions to be implemented for disposal.

4.1. General provisions

4.1.1. Admission to gas pressure regulating and/or measuring stations

Any person involved with in-use-surveillance activities, when entering inside stations, should follow, at least, the provisions detailed in Guide of Good Practice COM (2003)515 final - COMMUNICATION FROM THE COMMISSION concerning the non-binding guide of good practice for implementing Directive 1999/92/EC of the European Parliament and of the Council on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres and /or FAREGAZ's specific guide on the implementation of Directive 1999/92/EC (ATEX2) for pressure regulating and measuring stations.

4.1.2. Personnel appointed for in-use surveillance activities

The activities of in-use-surveillance should be carried out by competent persons. The competence of the persons may be proved by a qualification for the type/s of the activity/ies carried out. The qualification of the persons may be implemented in accordance with applicable national code of practice where existing or via the methods indicated in clause 6 of EN ISO 9001 or sub-clause 9.1 of CEN/TS 15173 or in sub-clause 3.2.1.6 of CEN/TS 15174 or in clause 8 of CEN/TS 15399.

4.1.3. Disassembly of gas equipment

Before commencing any disassembly of specified gas equipment, it is necessary:

- *to establish the part of pipewok to be isolated from those that remain in operation;*
- *to verify whether the concerned equipment is equipped with any drain cock and empting the equipment itself. The disposal of the liquids / foreign parts emptied from equipment is carried out in compliance with the applicable environmental provisions;*
- *to vent the vapour phase of odorant from the odorizing system only after suitable treatment.*

The amount of fuel gases vented to atmosphere should be minimized and should be exhausted / vented, preferably into downstream pipework in operation.

Further, when conductive parts (e.g. a valve) are temporary removed from other earthed parts, these last are bonded (e.g. by a temporary electric connection between the two flanges unfastened from removed valve) and the connection to earth is re-established.

When disassembly takes place in underground stations, the sealing of the pipework by blind flanges should be considered.

Disassembly and the re-assembly should be carried out following the instruction of the equipment manufacturer(s).

4.1.4. Test methods and acceptance criteria in tightness and internal sealing tests

Where applicable, in the tightness tests (e.g. end connections in the hazardous place classified as zone 2) and in the internal sealing tests (e.g. valves used as isolation valves during maintenance works at site,

slam shuts / cut-off devices / monitor feeding fuel gas to end users without any creep device) the acceptance criteria, when using "foaming liquid method", should be bubble tight for a time ≥ 5 sec.

Alternative equivalent methods may be used. For internal sealing test it is possible also to make reference to the variation of the pressure in a closed volume taking account obviously the temperature variations or to make reference to the variation of the pressure in two closed volumes (initially in communication) after their isolation where one volume is assumed as "master closed volume" and the other is affected by the internal leakage under monitoring.

4.1.5. Test method on anti-static requirement and relevant acceptance criteria

The electrical resistance between the metallic parts connected by any type of end connection should be measured using a direct-current power source not exceeding 12 V. The resistance should not exceed 10 Ω[6].

4.1.6. Disposal of replaced parts after any maintenance activity

The disposal of the replaced parts involved in any maintenance activity should be carried out in compliance with the environmental provisions relevant to the level of pollution indicated in the concerned installation, operating and maintenance manual.

Treatment, storage, transportation, and final disposal must be in compliance with applicable National and local waste regulations.

Preferred options for disposal of non-metallic spare parts are (1) recycling, (2) incineration with energy recovery, and (3) landfill. The high fuel value of these non-metallic spare parts makes option (2) very desirable for material that cannot be recycled, but incinerator must be capable of scrubbing out acidic combustion products.

4.1.7. Reports

The reports on specific surveillance activities, should be signed as per the provisions of these guidelines.

The reports should be filed, at least, for whole technical life of the equipment concerned, unless otherwise specified.

Editing and signing with data processing systems are allowed.

4.2. Approach of the in-use surveillance

The in-use-surveillance strategy for the gas pressure regulating and measuring stations should be established by the authorized person in accordance with both the policy of the Gas System Operator (GSO) and, of course where available, with the National Regulations.

When establishing the in-use-surveillance strategy following considerations should be made:

- *the 1st essential top priority shall be the safety,*
- *the 2nd top priority shall be to measure properly of gas consumption foreseen or foreseeable,*
- *to the above top priorities the GSO should add other performances needs liaised to its specific policy and the type of the gas users (e.g. continuity in supplying fuel gas, minimize the risks of leakages of gas to environmental, minimize the risks of the emergencies situations, minimize the risks of non-conforming measures of gas consumption in the time-interval between two*

[6] *Equivalent to the provision into ISO 14313*

subsequent recalibrations, economical management aspects concerning servicing and downtime costs,…).

Due to the fact that the stability in the time of the functional performances depends on both the equipment and on the operating conditions, it should consider when applicable:

- *the specific composition of fuel gas, the specific location and layout of the station (e.g. the cleanliness of the pipeline concerned, redundancy of safety devices and/or of pressure control lines),*
- *the historical performance data of the stations, the reliability of the stations, the presence of the remote control / drive systems,*
- *the presence of remote control to monitor specific operating conditions and/or to close / open valves with key functions,*
- *for the measuring stations:*
  - ✓ *the impact of the difference of indication on the involved parties (e.g. global amount of the gas to be measured, risks liaised to the uncorrected historical measures of gas consumptions between the time interval between two subsequent recalibrations,*
  - ✓ *the presence of the smart auto-diagnosis means*

  and any other elements that may affect the metrological-performances of any measuring instrument,
- *the mandatory need for the continuity of the gas supply (e.g. hospital, specific industries),*

and all other elements that may affect the performances of the stations.

4.3. Specific activities of the in-use-surveillance strategy

The in-use-surveillance strategy should include at least the following activities, where applicable, to be carried out in accordance with environmental provisions:

I. Verifications of the 1st installation of any equipment and/or station;

II. Verifications that should be carried out at 1st commissioning of the equipment and/or stations;

III. Starting up

IV. Periodical visual inspections;

V. Verifications of the metrological performances;

VI. Monitoring of functional performances of various equipment excluded only the monitoring of the metrological performances of the measuring instrument;

VII. Preventive maintenance;

VIII. Corrective maintenance;

IX. Integrity verification of pressure equipment;

X. Final decommissioning and disposal at the end of the life cycle of any equipment and/or station.

In some EU Member States, the activities I, II, V, VI and IX are dealt with in National Regulations or national standard.

In the EU Member States the activities III, VII and VIII are generally dealt with in national standards or in codes of practices of GSOs.

4.4. Notes on planning of the specific activities of in-use-surveillance strategy

For following specific activities it should be noted that:

- *the verifications of the 1st installation take place only at the at the 1st installation or at the 1st commissioning of a new equipment / stations;*
- *the verifications at 1st commissioning take place only at initial starting up of a new equipment / stations;*
- *the corrective maintenance takes place after malfunctions have been detected or when malfunctions and/or failures are reasonably expected to occur;*
- *the integrity verification is applicable to pressure equipment, excluded meters when monitored in service in accordance with these guidelines, and takes place only after a specified time of operation under normal operating condition;*
- *some equipment includes parts in elastomeric materials which are under the risk of wear-out-failure and/or ageing failure, or needs to be re-lubricated therefore such equipment should be subjected to predetermined maintenance.*

Where the legal metrological performances are concerned, in some EU Members States, the verification of the devices with measuring function is dealt with in Legal Metrological Regulations.

Some verifications of other functional performances in some EU members States are dealt with in National Regulations (e.g. functional performances of safety accessories to PED, integrity verifications).

The afterward sub-clauses will give any detail on each type of above verifications / intervention.

4.5. Planning of the specific activities of in-use-surveillance strategy

For the activities V, VI and VII the planning should utilize any one or a combination of various philosophies, such as:

- *at established interval i.e. with regular frequencies;*
- *at variable interval i.e. only when needed on condition basis.*

NOTE: this document do not include any requirement or restriction concerning frequency of maintenance activities

When establishing the time intervals for the activities to be carried out with regular frequencies, it should be considered the scale economy and the environmental benefits that can be reached where the frequencies for different activities are multiple.

Whichever is the approach of the planning, the National Regulations and/or national standard and/or codes of practices of GSOs shall be complied with.

The afterward sub-clauses suggest some details on the implementation of each type of the specific activities of in-use surveillance-activities.

5. *Description of various specific activities of in-use surveillance strategy*

5.1. Verifications of the 1st installation of any equipment and/or station

The verifications of the 1st installation should consider the applicable verifications showed in the table 1.

Table 1: verifications relevant the 1st installation of any equipment and/or stations

description of activities	***equipment involved***	***acceptance criteria***
verification of the type of the equipment installed	*any equipment*	*compliance with approved types showed in the P&ID or in any equivalent document*
conformity verification of the installation	*station and / or installation of any equipment*	*compliance with approved design (drawings, schemes, etc.)*
	any equipment	➢ *specifically existence. where applicable, of:* ✓ *vented lines to safe area or vent limiter device and* ✓ *bonding and earthing of all metallic parts*
	equipment with drainage connections (e.g. filters, heat exchangers, etc.)	*presence of suitable means to conveyance of the emptied liquids in accordance with national environmental provisions*
	gas meters	➢ *compliance of upstream and downstream straight pipework of meters with the approved design* ➢ *conformity of location of the intake for various sensors with the P&ID or equivalent document* ➢ *presence of temporary filters / sieves [(a)] at upstream of mechanical gas meter where appropriated* ➢ *inside stations the location of the injection point of the odorant, if any, after the meter runs*
[(a)] the temporary filters / sieves after appropriated working time shall be removed		

5.1.1. Report on verification of 1st installation

Once the verifications have been completed, they should be reported in a report organized as a sort of checklist.

The checklist should include:

- *the reference to equipment concerned*
- *the description of verifications carried out and*
- *the result of each verification.*

The report should be signed by the service engineer and by the authorized person or, at least, by the authorized person. When the service engineer is not part of the same organization of the authorized person the signature of the service engineer should be mandatory.

When the 1st installation of the concerned equipment is followed by the 1st commissioning and by the starting-up carried out by the same person, the report on the 1st installation shall include also these activities

5.2. Verifications to be carried out at 1st commissioning of any equipment and/or station

The verifications to be carried out at the 1st commissioning should consider the applicable verifications showed in the table 2a (documentation, certificates and warning notices) and table 2b (functional performances verifications of equipment / station).

Table 2a: verifications to be carried out at the 1st commissioning of any equipment and/or station: availability of the relevant documentation / certificates / warning notices

description of activities	***equipment involved***	***acceptance criteria***
verification of the availability of the installation, operating and maintenance manual	*whole stations*	*the manual in a language accepted by the user should include:* ➢ *description of data in the nameplate* ➢ *safety requirements concerning commissioning and de-commissioning activities* ➢ *safety requirements on filling/discharge of gas of/from equipment* ➢ *information on periodic functional checks of the pressure control lines and metering group* ➢ *information on protection needed against exceeding the allowable pressure* ➢ *procedure to carry out the checks / simulations detailed in table 3* ➢ *applicable environmental provisions*
	each type or series of equipment concerned	*the manual in a language accepted by the user should include:* ➢ *provisions, if any, for transport and handling* ➢ *instruction on installation* ➢ *instruction on safe use of various connections* ➢ *description of data in the nameplate* ➢ *safety requirements concerning commissioning and de-commissioning activities* ➢ *information on periodic functional checks, if any* ➢ *instructions on tests / verifications procedure that should be carried out after a maintenance activity* ➢ *information on hazards arising from misuse and, if any, on particular features of design* ➢ *information on protection needed against exceeding the allowable pressure* ➢ *procedure to carry out the checks / simulations detailed in table 3* ➢ *information whether maintenance is possible and the relevant instructions* ➢ *list of replaceable non-metallic parts subjected to wear-out-failure (e.g. seat rig subjected to abrasion by flowing gas) and those involved in the disassembly*

		➢ *list of replaceable non-metallic parts subjected to ageing and those involved in the disassembly* ➢ *list of parts requiring cleaning / lubricating. If applicable* ➢ *how to trace the right spare parts* ➢ *storage requirements for spare parts* ➢ *applicable environmental provisions (classification of the level of pollution of the replaceable parts, etc.)*

Follows table 2a: verifications to be carried out at the 1st commissioning of any equipment and/or station: availability of the relevant documentation / certificates / warning notices

description of activities	***equipment involved***	***acceptance criteria***
verification of the availability of the installation, operating and maintenance manual	*any measuring instrument*	*the manual in a language accepted by the user should include indications related to:* ➢ *rated operating conditions* ➢ *mechanical (from M1 to M3) and electromagnetic (from E1 to E3) environment classes* ➢ *the upper and lower temperature limit, whether condensation is possible or not, open or closed location* ➢ *instructions for installation, maintenance, repairs, permissible adjustments if any* ➢ *instructions for correct operation and any special conditions of use (e.g. on/off conditions yes or not)* ➢ *conditions for compatibility with interfaces, sub-assemblies or measuring instruments*
	specifically for meters	*the manual in a language accepted by the user should include specific indications related to:* ➢ *instructions for installation (e.g. length of upstream and downstream pipework, location of sensors, etc.),* ➢ *instructions for correct operation and any special conditions of use (e.g. on/off conditions yes or not);*
verification of the availability of the relevant certifications	*station and relevant equipment*	*unless otherwise requested availability of the:* ➢ *declaration of conformity as per the relevant standard for station and also as per relevant European Directive for each / each series of the concerned equipment* ➢ *calibration certificate for each meter and sensor liaised to the operating conditions* ➢ *certificate of compliance with EN ISO 5167-2 for the orifice meter referred to orifice plate and to the internal diameter of the direct upstream and downstream pipe*
verification of the availability of the warning notices	*station*	*availability of the warning notice as per the applicable safety and environmental regulations*

Table 2b: verifications to be carried out only at the 1st commissioning of station and equipment: internal cleanness of pipework, protection against exceeding allowable pressure and functional performances verifications

description of activities	***equipment involved***	***acceptance criteria***
verification of internal cleanness of the pipework	*concerned pipewok*	*ensure that all swarf and debris have been removed and purged*
verification of the protection against exceeding the allowable pressure of the pressure equipment	*each pressure equipment*	***1. Equipment installed upstream and equipment installed downstream except that indicated in the following item 2*** ➢ *allowable pressure of the equipment (PS [(a)]) ≥ the declared maximum upstream incidental pressure (MIPu [(b)]);* ➢ *at the of writing these guidelines, only for pressure regulators to EN 334, safety devices to EN 14382 and valves to EN 13774 the relevant 1,1xPS ≥ MIPu;* ***2. Equipment with PS < the declared maximum upstream incidental pressure (MIPu) installed at downstream side of the station*** ➢ *inclusion in the pressure control system [(c)] of a safety accessory with its maximum downstream incidental pressure (MIPd) ≤ the allowable pressure (PS) of the pressure equipment to be protected (only for pressure regulators to EN 334, safety devices to EN 14382 and valves to EN 13774 the MIPd [(b)] ≤ 1,1 PS);* ➢ *availability of the declaration of conformity for the safety accessory where it is stated:* ✓ *that it has been classified as a safety accessory to PED [(d)],* ✓ *its category as per annex II of the PED;* ➢ *category as per annex II of PED of the protected pressure equipment not higher than the above category of the safety accessory;*
verification of the protection against risks from explosive atmospheres		➢ *compliance with the requirements detailed in table 1 of FAREGAZ specific guide on the implementation of Directive 1999/92/EC (ATEX2);* ➢ *availability of the fitness declaration for the equipment out from the scope of the Directive ATEX 1;*
verification of the proper use of the measuring instruments	*any measuring instrument*	➢ *conformity of :* ✓ *rated operating conditions,* ✓ *mechanical and electromagnetic classes,* ✓ *upper and lower temperature limits, condensation, open or closed location,* ✓ *condition of use,* *related to the instrument with the operating conditions;* ➢ *compatibility with various interfaces, if any*
	any gas meters	*as above and specifically:* ➢ *verification that the choice of the type of meter is not in contradiction with the selection criteria listed in item B.2 annex B of EN 1776* ➢ *conformity of temperature range of the gas, the gas family or group and the maximum operating pressure of the meter with the data declared by GSO* ➢ *conformity of upstream and downstream pipework with the indication reported in the relevant manual and detailed in the "type examination report"* ➢ *conformity of the content of calibration certificate with the measuring operating pressure*
	any conversion devices	*conformity of the relevant constants and formulae used in the calculations with the applicable regulations and / or the appropriated and agreed standards*

Follows table 2b: verifications to be carried out only at the 1st commissioning of station and equipment: internal cleanness of pipework, protection against exceeding allowable pressure and functional performances verifications

description of activities	***equipment involved***	***acceptance criteria***
verification of the proper use of the measuring instruments	*any measuring instrument*	➢ *conformity of :* ✓ *rated operating conditions,* ✓ *mechanical and electromagnetic classes,* ✓ *upper and lower temperature limits, condensation, open or closed location,* ✓ *condition of use,* *related to the instrument with the operating conditions;* ➢ *compatibility with various interfaces, if any*
	any gas meters	*as above and specifically:* ➢ *verification that the choice of the type of meter is not in contradiction with the selection criteria listed in item B.2 annex B of EN 1776* ➢ *conformity of temperature range of the gas, the gas family or group and the maximum operating pressure of the meter with the data declared by GSO* ➢ *conformity of upstream and downstream pipework with the indication reported in the relevant manual and detailed in the "type examination report"* ➢ *conformity of the content of calibration certificate with the measuring operating pressure*
	any conversion devices	*conformity of the relevant constants and formulae used in the calculations with the applicable regulations and / or the appropriated and agreed standards*
verification of instrument contributing to the end results of measurement	*sensors, signal convertors, power supply unit, etc. forming a measuring chain*	*conformity of the readouts taken from concerned displays / recorders / printers with the physical conditions prevailing at the sensor*
specific verification of the performance of specific meters	*Coriolis meters*	*zero shift test and if needed the so-called zero-adjusting procedure shall be performed according to the instructions of the manufacturer and ISO 10790*
	ultrasonic meters	*zero reading (no counting below low-flow cut off) on each cord when the meter is isothermal and isolated from any flow*

(a) - maximum allowable pressure as per article 2 item 2.3 of PED

(b) – as per sub-clause 8.3.3 of EN 12186

(c) – as per sub-clause 8.1 of EN 12186

(d) – where pre-PED safety devices / systems:

- ✓ *are functionally equivalent to devices / systems classified as safety accessories to PED and*
- ✓ *are subjected at the same in-use surveillance,*

they should be considered as safety accessories to PED

5.2.1. Report on verification of 1st commissioning

Once the verifications have been completed, they should be reported in a report organized as a sort of checklist.

The checklist should include:

- *the reference to equipment concerned*
- *the description of verifications carried out and*
- *the result of each verification.*

The report should be signed by the service engineer and by the authorized person or, at least, by the authorized person. When the service engineer is not part of the same organization of the authorized person the signature of the service engineer should be mandatory.

When the 1st commissioning of the concerned equipment is followed by the starting-up carried out by the same person, the report on the 1st commissioning shall include also this activity.

5.3. Starting up

The starting up of a station and / or of equipment should include the activities liaised to the safety and proper measurement as showed in table 3. All other activities should be carried out as per the indication of the relevant installation, operating and maintenance manual.

Only the applicable activities should be implemented.

Table 3: activities related to stating up

description of the activity	***equipment concerned***	***acceptance criteria***
fill in the lubricant	*all equipment where requested (e.g. rotary and turbine meters)*	*ensure that lubricants of the correct grade, quality and viscosity have been added in accordance with the user manual*
drainage	*filter, orifice meter, etc*	*all reservoir used to collect liquid, fittings of orifice meters, etc. shall be drained*
visual inspection	*all equipment*	*no visible damage*
verification of external tightness	*all flanged/threaded/compression fitting connections*	*no visible leakage as per clause 4.1.4*
verification of internal sealing	*equipment for which the requirement of internal sealing should be complied with to ensure the expected performances at normal operating conditions*	*no visible leakage as per clause 4.1.4 when not otherwise specified*
	valves used for isolating: ➢ *pressure regulating lines and* ➢ *an equipment for which it is planned to maintain at site with other equipment of the station under pressure* ➢ *any by-pass line (e.g. by-pass of pressure control line, by-pass of meters)*	
setting	➢ *equipment whose performance can be modified by a normal manual intervention.* ➢ *any equipment with setting device sealed does not need any resetting*	*as per the instruction of the authorized person*
simulation test of intervention of pressure safety systems	*stand-by monitors*	➢ *Automatic taking over of monitor at the pre-established pressure and* ➢ *regulation of controlled pressure at the pre-established value* *after the opening of active regulator*
	working monitors	
	relief devices	➢ *Opening pressure at the pre-established value and* ➢ *subsequent closing pressure at the pre-established value with internal sealing*
	safety shut-off devices	*Automatic closing at the pre-established pressure value*
Simulation of intervention of stand-by pressure control line	*stand-by line*	➢ *Automatic taking over of stand-by line at the pre-established pressure and* ➢ *regulation of controlled pressure at the pre-established value* *after a manual exclusion of working line*

Follows table 3: activities related to stating up

description of the activity	***equipment concerned***	***acceptance criteria***
verifications of controlled pressure at steady conditions after starting up	*pressure regulators and/or pressure regulating station*	*variations of controlled pressure as per the order specifications*
sealing of variable set point device	*equipment with set-point adjustment*	*as per the instruction of the authorized person*
verification of readability of indicator	*any concerned measuring instrument*	*readable over operating temperature*
verification of alignment between meter indicator and the indication of conversion device	*any measuring system including a meter and a conversion device*	*same indication by the two indicators for the same measurand*
verification of noise emission	*meter with movable internal parts (e.g. turbine meter and rotary displacement meters)*	*no any emission of abnormal noise*
verification of movement of the index of measuring instrument	*any meter*	*no irregular movement*
specific verification of the performance of specific meters	*Coriolis meters*	*zero shift test and if needed the so-called zero-adjusting procedure shall be performed according to the instructions of the manufacturer and ISO 10790*
	ultrasonic meters	*zero reading (no counting below low-flow cut off) on each cord when the meter is isothermal and isolated from any flow*

5.3.1. Report on starting up

Once the activities / verifications have been completed, they should be reported as a checklist.

The checklist should include:

- *the description of verifications / activities carried out,*
- *the setting values and*
- *the result of each verification.*

The report should be signed by the service engineer and by the authorized person or, at least, by the authorized person. When the service engineer is not part of the same organization of the authorized person the signature of the service engineer should be mandatory

5.4. Periodical visual inspection

The main purpose of this inspection is to verify the situation of external status of the equipment and, if any, the emission of abnormal noise and the irregular movement of the index of the meters.

The following table 4 lists the suggested verifications.

Table 4: periodical visual inspections on the external status, the abnormal noise emission and irregularity in the movement of the index of meters

description of activities	***equipment involved***		***acceptance criteria***
visual inspection of external surfaces	*any equipment*		➢ *absence of unacceptable damages of external protection* ➢ *no visible damages on external parts (e.g. process and sensing lines)*
qualitative verification of the alarm signals [(a)]	*any involved equipment*		*no alarm signal activated*
qualitative verifications of the external indicators of internal conditions [(a)]	*filters equipped with maximum and real clogging indicator*		*maximum occurred and actual clogging lower than the maximum allowable value (when applicable, within the normal/care thresholds)*
	gas safety shut-off devices		*full open position*
	stand by monitor (not applicable to working monitor type)		
verification of the seals of measuring devices	*measuring devices*		*no visible damages*
verification of readability of indicator	*any concerned measuring instrument*		*readable over operating temperature*
verification of noise emission	➢ *meter with movable internal parts (e.g. turbine and rotary displacement meters)* ➢ *any other equipment with internal movable p arts (e.g. water pump for heating system of gas)*		*no any emission of abnormal noise*
verification of movement of the meters index	*any meters*		*no any irregular movement*
verification of differential pressure across the rotary displacement meter	*a rotary displacement meter*		*differential pressure for the actual flow rate as per the figures indicated in the user manual*
record of the values of the significant parameters [(a)]	*filters (degree of clogging)*		*clogging as per the expected value at normal operating condition*
	pressure regulators	*Regulated pressure*	*within the normal / care thresholds* [(b)]
		Other pressure values classified as significant parameter (e.g. motorization pressure, pilot inlet pressure, etc.)	
	gas safety shut-off devices	*Pressure values classified as significant parameter*	

[(a)]- *these checks / records may be carried out at remote point*

[(b)] *in case of care thresholds corrective activities shall be started within an appropriated time*

5.4.1. Report on periodical visual inspection

Once the verifications have been completed, they should be reported as a checklist. The checklist should include:

- *the reference to equipment concerned and*
- *the description of verifications carried out and*
- *the result of each verification.*

The report should be signed by service engineer and by the authorized person or, at least, by the authorized person. When the service engineer is not part of the same organization of the authorized person the signature of the service engineer should be mandatory.

5.5. Verification of metrological performances

In the approach of this verification, as already specified, it shall be considered whether National Regulations / national standards / codes of practices of GSOs are available.

In the event of conflicts in terms of more restrictive requirements in National Regulations / national standard / codes of practices with the provisions of these guidelines, the National Regulations / national standards / codes of practices shall take precedence.

In the approach of verification of metrological performances one of the following philosophies should be followed:

- *periodical recalibration,*
- *condition based recalibration,*
- *self periodical recalibration for gas chromatograph.*

5.5.1. Periodical recalibration

This method may be applied to any meter and any conversion device.

The procedure that may be followed should include following steps in the order of listing:

- *verification of the metrological performances of the meter / conversion device as it is i.e. without any modification / realignment;*
- *subsequently, if needed, provide the appropriated corrective actions to realign the error of indication within the applicable limits of "maximum permissible error of indication".*

  The applicable "maximum permissible error of indication" may be established by:

  - ✓ *National Regulations where available or,*
  - ✓ *the OIML document 2CD OIML R 137-1 & 2 Table 2 column dealing with subsequent verification and in-service accuracy class when National Regulations do not exist or*
  - ✓ *by the GSO if more stringent than previous provisions.*

  Of course in case of availability of any National Regulation it is mandatory;
- *recalibration of the meter / conversion device after applying the corrective actions.*

The recalibration test method shall be in accordance with relevant standard or applicable recognized methods to be implemented at site.

The frequencies applicable at national level at the time of writing these guidelines, are summarized in CEN/SFG_I document N. 78.

The frequencies of recalibration activities in case of lack of National Regulations or national standard may be established by GSO on the basis of the available frequencies in various Members States.

Following this method, in the event of the need of a corrective action following a periodical recalibration, there is the risk of disputes / claims between the involved parties due to the non-conforming historical measurements since the previous recalibration. To avoid these disputes / claims the GSO may provide intermediate periodical monitoring with appropriate frequencies capable to identify when it is expected a critical drifting of the metrological performances. In these cases may be applied a monitoring method described in sub-clause 5.5.2.

5.5.1..1. Self periodical recalibration of gas chromatograph

The gas chromatograph can carry out the recalibration automatically at site.

This method should evaluate following pre-conditions:

- *the composition of the gas samples should be certified with reference to "master sample" certified by an accredited test laboratory*
- *the installation conditions (temperature, protection, etc.) of the bottles of gas samples should be carried out as per the recommendations listed in the relevant installation manual;*
- *the replacement of the bottles of gas samples should be done as per the recommendations listed in the installation manual;*
- *the electronic memory of gas chromatograph should give evidence of an appropriated number of last automatic self-recalibration carried out (e.g. 10 last self-recalibrations) as well as the relevant errors of indication based on a statistical data collection. All these historical data should be periodically examined by a competent person to evaluate whether there is a need to introduce some corrective actions aimed to ensure in the time the expected reliability of the performance.*

Further it shall be noted that the examination of historical data should comply with National Regulations / national standards / codes of practices where available.

5.5.1..2. Periodical recalibration of orifice meters

The orifice meters are the only meters for which the calibration procedure consists in the following dimensional verifications:

- *upstream square edge of the orifice bore and*
- *upstream face of the orifice plate*

whose results should comply with the requirements specified in EN ISO 5167-2.

5.5.1..3. Report on periodical recalibration

Once the recalibration has been completed, it should be reported as a checklist. The checklist should include:

- *the reference to measuring instrument concerned and*
- *the description of the recalibration test method and*
- *the result of the recalibration of the meter/ conversion device as it is*

— *the corrective actions, if any*

— *the result of the recalibration after applying the corrective actions.*

The report should be signed by competent person as "metrological inspector".

5.5.2. Condition based recalibration

This method, as alternative to periodical recalibration, is based on the periodical verification at field of the difference of indication of the measuring instrument and subsequent recalibration where the historical trend of the difference of indication data reveals that it should be expected that the pre-established metrological performances will not be met.

The periodical verification of the difference of indication may be carried out either for the end-output data of the measuring chain (e.g. output data of gas-volume of an electronic conversion device part of a measuring chain including a gas meter, pressure and temperature transducers) or/and for single unit of the measuring chain (e.g. gas meter, pressure transducer, etc.). In this second event, the periodical verification of the difference of indication should involve at least those single units whose malfunction may affect the end-output measuring data.

The practical method to verify the difference of indication may be for example:

— *measuring of the same datum by two different independent meters (two gas meters in series for the same flowing gas e.g. winter meter and summer meter)*

— *any other suitable method capable to quantify the difference of indications of gas meter under verification for one or more operating conditions within the normal operating range.*

The reference instrument may be based on measurement of flow in closed conduits by tracer (dilution or transit time methods according to the principles of the ISO 2975/I).

One of the methods described in sub clauses 5.5.2.1 and 5.5.2.2 may be chosen by the GSO.

These methods may be applied both in case of lack of any official regulations and also in case of existing official regulations when the GSOs decide to avoid the risks of disputes / claims liaised to the unnoticed non-conforming measurements between two subsequent recalibrations as detailed in 5.5.1.

5.5.2..1. Measuring of the same datum at the same time by two different independent gas meters

This method may be applied only when for the two meters, it should be expected that the probability of malfunctions is not the same because of, for example, the two meters are of different technology, the working time are different (e.g. winter meter and summer meter), etcetera.

5.5.2..1.1. Monitoring of two gas meters of the same size connected in-series

This method practically consists in comparing the two values of the same datum measured by two different gas meters at the same time. It should be compared at least two couples of measured values within the normal operating range of both meters.

The two gas meters may be of different technology and may have different full scales. However in this last case, it is necessary to have suitable overlapping of operating ranges in such way to have the possibility to compare two couples of measured values of the same datum far each to the other of an appropriated amount.

Where the operating conditions of the installation do not allow carrying out the tests consequently, it is recommended to pick up the measured values of the two couples within 24 hours.

EXAMPLE

This method should include following steps:

- *the measuring of the concerned processing datum by the two different gas meters;*
- *calculation of the deviation between of the two measured values by:*

$$D_{mi} = \frac{|M_{1i} - M_{2i}|}{M_{1i} + M_{2i}} \times 200$$

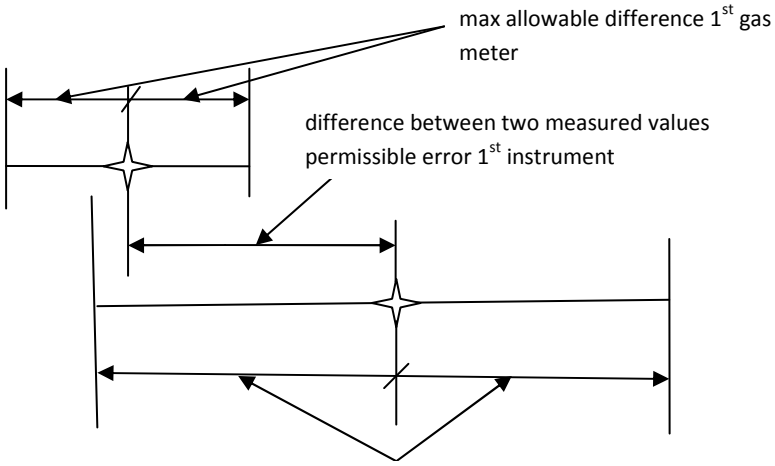
where:

D_{mi} = *deviation of the two measured value as % of the average measured value*

M_{1i} = *measured value by 1st gas meter at the test "i"*

M_{2i} = *measured value by 2nd gas meter at the test "i"*

When for one or both couples of the two measured values the deviation differs more than the highest maximum permissible error of indication of the two concerned gas meters or exceeds the value fixed by the GSOs according to its experience, a recalibration of both meters within appropriate time should be planned. The following scheme shows the overlapping of the maximum allowable difference of the two gas meters.



Measured values M_{1i} and M_{2i} at the test "i"

5.5.2..1.2. Monitoring of two gas meters of different size connected in-series

This method practically consists in comparing the values of the same flow measured by a larger gas meter and a that measured by a smaller gas meter (e.g. larger gas meter used normally in winter period and the smaller gas meter used normally in summer period) in the overlapping operating range that, for both gas meters should be > Q_t[7] (transitional flow) and < Q_{max}[8] (maximum flow).

In this case it should be sufficient to compare the measured values of the two gas meters only for one operating conditions.

[7] As per relevant standard
[8] As per relevant standard

In above case when the deviation of two readings calculated as detailed in the previous sub clause is higher than a value fixed by the GSO according to its experience (e.g. 75% of the highest maximum permissible error of indication of the two meters), a recalibration activity of both gas meters within appropriate time should be planned (see also above scheme).

5.5.2..2. Monitoring of the changing of the difference of indication of gas meters during their use

This method is applicable to any gas meter and consists mainly in a periodical monitoring of difference of indication without dismantling the gas meter from the inlet / outlet pipework (e.g. using tracers systems).

The maximum allowable difference of indication should be established by GSO on the basis of:

- *its experience taking in mind also the indication of the meter manufacturer and*
- *the OIML document 2CD OIML R 137-1 & 2 Table 2 column dealing with subsequent verification and in-service accuracy class.*

One of the following methods should be chosen by the GSO.

Method A: examination of the trend over time of the weighted mean difference of indication

Verification should include, at least, tests for two different values of flow rate. The two different flow rates should be chosen in the range:

- *from Q_t to 40% of Q_{max} and*
- *from 60% to 100% of Q_{max}*

of the gas meter under monitoring.

Where the operating conditions of the installation do not allow carrying out the tests subsequently, it is recommended to pick up the measured values for the two flow rates within 24 hours.

The difference of indication for the verifications carried out at above specified flow rates should be calculated with:

$$D_i = \frac{|Q_{mi} - Q_{ri}|}{Q_{ri}} \times 100$$

where:

Di = *difference of indication referred to measured flow rate* Q_{mi}

Q_{mi} = *measured flow rate by the gas meter under monitoring at the test "i"*

Q_{ri} = *measured flow rate by the reference measuring system at the test "i"*

For each couple of tests carried out for two different values of flow rates, the weighted mean difference of indication (WMDI) is calculated with:

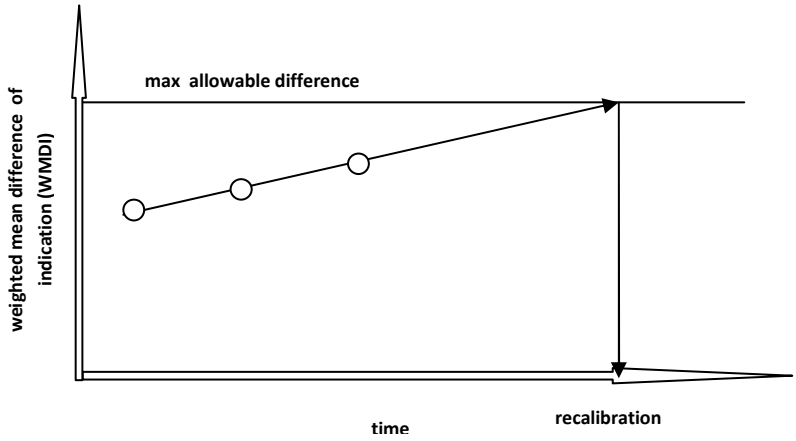
$$D_{wm} = \frac{\sum_1^2 \frac{Q_{mi}}{Q_{\max}} \times D_i}{\sum_1^2 \frac{Q_{mi}}{Q_{\max}}}$$

where:

D_{wm} = *value of the weighted mean difference of indication (WMDI)*

The frequency of the verification of the weighted mean difference of indication should be at least yearly.

When the trend of weighted mean difference of indication (D_{wm}) for the subsequent period based on the trend of historical data (at least three) reaches a deterioration equal to the maximum allowable difference (see following scheme), a recalibration activity within appropriate time should be planned



◯ *Weighted mean difference of indication D_{wm}*

Where the historical consumption data (data logger) give evidence that the gas meter is significantly used also with flow rate $< Q_t$ the tests would include also a test with a flow rate from Q_{min}[9] to Q_t.

In this case the difference of indication is calculated by:

$$D_{lf} = \frac{|Q_{mlf} - Q_{rlf}|}{Q_{rlf}} \times 100$$

where:

Q_{mlf} *measured flow rate by the gas meter under monitoring*

Q_{rlf} *measured flow rate by the reference measuring system*

The trend of this difference of indication in the time should be evaluated as above considering its relevant maximum allowable difference value. A recalibration should be planned at earliest time deduced from the two trends whichever is the nearest.

METHOD B: Monitoring of the changing of the difference of indication of gas meters compared with the one determined at the 1st commissioning

a) the first verification should be carried out at the first commissioning

b) The frequency of the periodical monitoring should be yearly

c) The difference between the periodically determined difference of indication and its value determined according to a) must not exceed half of the maximum allowable difference.

This method should be carried out at appropriated flow rates established / specified by the GSO.

[9] Minimum flow rate as per the relevant standard

5.5.2..3. Specific conditions for a decreasing of the frequency of periodical recalibrations for gas meters equipped with smart self-diagnostic means

Where the gas meters are equipped with smart self-diagnostic means and the periodical recalibration method has been chosen for the in-use-surveillance, the GSO can prolong the pre-established period of time between two subsequent recalibrations if the self-diagnostic function is capable to detect care threshold and alarm threshold for significant parameters.

Some gas meters, e.g. the ultrasonic and Coriolis gas meters, can be equipped with smart self-diagnostic software capable to warn when the necessary conditions for proper measurement are not met. These conditions are often identified by limiting minimum and maximum values for certain diagnostic functions or parameters used in the process calculation of gas consumption. Practically the warning consists in alarms notifying that some of these significant parameters are outside the identified limits.

For example in the ultrasonic meters it is very common to introduce some limits for the differences of the various speeds of sound calculated for each path from the average speed of sound of all paths. In other words when these limits are exceeded the cause (dirty, fault, etc.) should be traced and investigated and appropriate corrective actions implemented.

The smart self-diagnostic function can detect following two different warnings for a significant parameter:

- *a care threshold (e.g. yellow light) or*
- *an alarm threshold (e.g. red light).*

Commonly the alarm threshold warns that the limits of the concerned significant parameter have been exceeded and the care threshold warns that it is expected that the limits of the concerned significant parameter can be exceeded.

When above thresholds are warned it should be planned following actions:

- *In case of care threshold, an investigation by a competent person on the cause of the driftage from the normal conditions for proper measurements and relevant corrective actions should be implemented within appropriate time.*
- *In the case of alarm threshold an investigation by a competent person on the cause of the deviation from necessary conditions for proper measurements and, consequently, the necessary intervention (e.g. cleaning of transducer faces in ultrasonic meters) to re-establish adequate operating conditions that should be proved by a recalibration.*

5.5.2..4. Report on the monitoring as basis conditions for recalibration

Once any monitoring activity has been completed, it should be reported as a checklist. The checklist should include:

- *the reference to measuring instrument concerned and*
- *the description of the monitoring test method and*
- *the result of the monitoring test*
- *the indication whether a recalibration is needed*

The report should be signed by competent person as "metrological inspector".

5.6. Monitoring of functional performances of various equipment excluded only the monitoring of the metrological performances described in sub-clause 5.5

In the approach of these functional verifications it should be considered:

- *whether National Regulations / national standards / codes of practices of GSOs exist. In the event of conflicts in terms of more restrictive requirements in National Regulations / national standards / codes of practices with the provisions of these guidelines, the National Regulations / national standards / codes of practices shall take precedence;*
- *the recommendations of the manufacturer of the concerned equipment.*

One or a combination of the following philosophies should be followed:

- *periodical monitoring*
- *verifications with variable frequencies depending on the trend of historical performance data as per clause 5.6.2*
- *condition based verifications*

5.6.1. Method with periodical monitoring of functional performances of various equipment

The minimum frequencies should be established on the basis of the:

- *provisions of the National Regulations / national standards / codes of practices of GSOs where available,*
- *recommendations of the manufacturer of the equipment in other cases.*

The recommended frequencies available at national level at the time of writing these guidelines, are summarized in annex A.

5.6.2. Method with verifications with variable frequency

The logic of this method is to adapt the frequency of the verifications to the real need based on the trend of historical events or on the driftage of the significant parameters as hereinafter detailed.

5.6.2..1. Trend of historical events

This method commences the verifications of the performances as per the method detailed in the previous sub-clause 5.6.1 and the relevant frequencies should not be reviewed before 4 years from the 1st commissioning of a specified series of equipment at specified location. The main task of the review should be a tailored modification of the pre-established frequencies based on the trend of historical events relevant to the performance data. 0nly with this objective in view, available historical events data picked up before the issue of these guidelines, may be used where they are compatible with the provisions of this document.

5.6.3. Condition based verifications

The planning of the relevant verification activities is based on the type of signal received as follows:

- *With a care threshold signal: it would be necessary to carry out some corrective activities within an appropriate time;*
- *With an alarm threshold signal: it would be necessary to carry out some verification activities sooner*

To apply this method it is necessary:

- *To trace, via a risk analysis, the "significant parameter" required for safe operation and/or the continuity in supplying fuel gas by the concerned equipment.*
- *To have a supervision system capable to signal the reaching of:*
  - ✓ *normal threshold or*
  - ✓ *care threshold or*
  - ✓ *alarm threshold*

  for the relevant "significant parameter".

5.6.4. List of main verifications that should be included in the monitoring of functional performances

The monitoring of the functional performances requires manual activities on the equipment that may be carried out on site or from remote point.

The monitoring of the functional performances may require manual activities similar to those carried out during a maintenance activity, such as adjusting of settings, drain of the filters, cleaning of the breathers devices, lubricating, fastening of connections, etcetera, but do not require the disassembly of the concerned equipment.

The specific test procedure should be that recommended in the installation, operating and maintenance manual of the relevant equipment.

The table 5 lists all concerned activities liaised to the safety of pressure control lines; the other activities that should be carried out are listed in the installation, operating and maintenance manual of the relevant equipment (e.g. heating group).

Table 5 - monitoring of the performances that require manual activities on the equipment

Description of the activity	***Equipment concerned***	***Acceptance criteria***
visual inspection of external surfaces	*those involved in monitoring*	*as per table 4*
qualitative verification of the alarm signals		
check of internal sealing	*pressure regulators*	*no visible leakage as per clause 4.1.4 when not otherwise specified*
	valves used to isolate: ➢ *pressure control lines and* ➢ *an equipment for which it is planned to maintain at site with other equipment of the assembly under pressure* ➢ *any by-pass*	
simulation of functionality of the safety accessories and safety devices	*Stand-by monitors*	*taking over of the monitor:* ➢ *at the pre-established pressure and* ➢ *regulating of the controlled pressure at the pre-established value*
	working monitors	
	specific device, if any, covering the risk of sticking phenomena in stand-by monitor	*no internal leakage as per clause 4.1.4:* ➢ *under normal operating conditions for active regulator* ➢ *under normal operating conditions for monitor after taking over of the active pressure regulator in full open position* ➢ *with monitor in closed position*
	safety shut-off devices	➢ *Closing at the at the pre-established trip pressureand* ➢ *internal sealing as per clause 4.1.4 at closed position*
	safety relief devices	➢ *1st internal leakage of devices at the pre-established over pressure* ➢ *Re-closing at the pre-established pressure and* ➢ *no internal leakage as per 4.1.4 at closed position*
simulation of functionality of the systems that ensures the continuity of the supplying of fuel gas when failures occur	*stand-by pressure control lines*	➢ *Taking over of the stand-by pressure regulating line after the cutting off the working regulating line and* ➢ *regulation of the controlled pressure at the pre-established value*

Follows table 5 - monitoring of the performances that require manual activities on the equipment

description of the activity	***equipment concerned***	***acceptance criteria***
monitoring of the operability	*isolating valves*	➢ *Manual valve:* *Closing / opening with acceptable human force* ➢ *Power actuated valve:* *Closing / opening as expected with the pre-established external power*
monitoring of the functionality of clogging indicator devices	*filters*	*pointer to zero ΔP for zero flow*
drain		*drainage of dirt in accordance with environmental provisions*
verification of the external tightness	*flanged / screwed / compression connections*	*no visible leakage as per 4.1.4*

5.6.5. Report on monitoring of functional performances of various equipment

Once the monitoring has been completed, the single verifications should be reported as a checklist.

The checklist should include:

- *the reference to concerned equipment and*
- *the description of verifications carried out and*
- *the result of each verification,*
- *value of measurable functional characteristics relevant to each "significant parameter"*
- *"significant parameter" for which the care threshold has occurred.*

The report should be signed by service engineer and by the authorized person or, at least, by the authorized person. When the service engineer is not part of the same organization of the authorized person, the signature of the service engineer should be mandatory.

5.7. Preventive maintenance

The main goal of preventive maintenance is to minimize the probability of failures / malfunctions of the equipment of gas pressure regulating station on the basis of criteria established by the GSOs and tailored for the conditions and the expected performances of the pipeline concerned.

The preventive maintenance may be carried out:

- *in accordance with established regular intervals of time without previous conditions investigations (predetermined maintenance) or*
- *on based conditions as when a care threshold for significant parameter occurs(condition based maintenance).*

The annex A shows the established regular intervals (frequencies) adopted in some Member States.

For the relevant equipment, the preventive maintenance should include the following activities:

- *temporarily decommissioning*

- *partial or complete disassembly;*
- *visual inspection of control trims;*
- *visual inspection of internal and external surfaces of metallic pressure containing parts*[10]*;*
- *replacement of parts involved by failure and/or ageing failure;*
- *recommended cleaning and/or lubrication if appropriate;*
- *re-assembly,*
- *verification and testing;*
- *starting up as per 5.3.*

The procedures to be followed for the activities should comply with those detailed in the installation, operation and maintenance manual of concerned equipment.

Before proceeding with any re-assembly, all internal accessible surfaces of pressure containing parts should be visually inspected to verify whether any damage (wear-out-failure, fusion discontinuity, cracks, chemical corrosion, etc.) potentially affecting the capability to withstand the internal pressure has occurred.

It should be assumed that for all metallic pressure containing parts whose internal surfaces are as per ISO 11971 or MSS SP - 55 or EN 970 as appropriate, no any damage has occurred.

In the case of significant damage has occurred in a pressure containing part (e.g. mechanical erosion and/or chemical corrosion), the visual inspection should be extended:

- *to the whole trim and*
- *to all surfaces of any pressure containing parts*

and to proceed in accordance with the provisions detailed in chapter 8.

When the visual inspection on:

- *any vessel reveals evident damages from chemical corrosion on the surfaces of pressure containing parts, the integrity verification should be extended to the pipework;*
- *the bodies of gas pressure regulators shows evident damages on the surfaces from erosion and/or chemical corrosion, the integrity verification should be extended to whole trim and, at least, to the pipework connected to inlet / outlet flanges of the concerned equipment*

and it should be recommended to proceed as per clause 8 .

Generally, the non-metallic parts to be replaced in the preventive maintenance are those subjected to:

- *abrasion due to gas flowing and*
- *ageing.*

The parts affected to abrasion and/or ageing are those listed in the relevant installation, operation and maintenance manual.

It is good practice, where technically and/or economically sensible, to replace those non-metallic parts not subjected to any erosion/ageing effect, but involved in the disassembly of the equipment.

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10 - this inspection should be carried out by an inspector with appropriated qualification

The table B.1 of the annex B shows a non-exhaustive list of the parts subject to erosion and the table B.2 shows a non-exhaustive list of the parts subjected to ageing and/or requiring cleaning and/or lubrication.

5.7.1. Report on preventive maintenance

Once the activities of preventive maintenances have been completed, they should be reported as a checklist.

The checklist should include:

- *the reference to the equipment concerned,*
- *the list of parts replaced,*
- *the evaluation of visual inspection on internal and external surfaces of metallic pressure containing parts,*
- *the list of cleanings / lubrications carried out if any,*
- *the results of each verification and/or test carried out and*
- *the result of the starting-up.*

The report should be signed by the service engineer and by the authorized person.

5.8. Corrective maintenance

The corrective maintenance should be carried out after malfunctions have been detected or when malfunctions and/or failures are reasonably expected to occur or when an alarm threshold occurs.

For the relevant equipment, the corrective maintenance should include the following activities:

- *temporarily putting out of commissioning ;*
- *partial or complete disassembly;*
- *visual inspection of trim;*
- *visual inspection of internal surfaces of pressure containing parts;*
- *identifying of the part/s damaged,*
- *identifying of the cause of the failure (only when appropriate),*
- *removal, when appropriate, of the cause of the failure,*
- *replacement of damaged part/s;*
- *re-assembly,*
- *verifications and tests;*
- *starting up as per 5.3.*

The procedures to be followed for the activities should comply with the ones specified in the installation, operation and maintenance manual of relevant equipment.

Before proceeding with any re-assembly, all internal accessible surfaces should be visually inspected to verify whether any damage occurred.

It should be assumed that for all metallic pressure containing parts whose internal surfaces are as per ISO 11971 or MSS SP - 55 or EN 970 as appropriate, no any damage occurred.

In the case that significant damage has occurred in a pressure containing part (e.g. mechanical erosion and/or chemical corrosion), it should be necessary to extend the visual inspection:

— *to the whole trim and*

— *to all surfaces of any pressure containing parts*

and to proceed in accordance with the provisions detailed in chapter 8.

After the identification of the cause of the failure the authorized person should consider whether a review of the adopted surveillance planning is needed (e.g. review of frequencies for periodical visual inspections / performances monitoring, preventive maintenance, limits for normal threshold / care threshold, etc.)

A corrective maintenance intervention may be used as the new starting point for the planning of periodical visual inspection / performances monitoring, predetermined maintenance and integrity strength verification.

6. *Spare parts used in the maintenance activities*

Following provisions should be followed in any maintenance activity:

— *The spare parts used should comply with the characteristics specified in the approved design of the concerned equipment. Therefore, for the spare parts should be available a declaration of conformity with the requirements specified in the design of the relevant equipment.*

— *The non-metallic spare parts used should have been stored and protected (e.g. against UV radiations) as per the recommendations specified in the installation, operating and maintenance manual.*

— *Each spare part should be identified (by marking or labelling or special packing) and its location in the relevant equipment specified.*

7. *Integrity verification of pressure equipment*

The integrity verification is applicable to some pressure equipment and, under hereinafter specified conditions, to pipework.

The integrity verification should not apply to gas meters when subjected to in-use surveillance as per the sub-clause 5.5 of these guidelines.

The main task of the integrity verification is to ensure the safe use with regards the pressure risks, of pressure equipment and pipework during their whole technical life.

The integrity verification:

— *shall comply with the National Regulations / national standards / codes of practices of GSOs, where existing and*

— *in the event of conflicts in terms of more restrictive requirements in National Regulations / national standard / codes of practices with the provisions of these guidelines, the National Regulations / national standards / codes of practices shall take precedencees.*

The integrity verification should be carried out:

— *on the shell of vessels, categories I to IV according to Annex II of PED,*

— *on the bodies of gas pressure regulators.*

within 10 to 12 years from 1st commissioning and subsequently every 10 to 12 years.

The integrity verification may be carried out wholly or partially at site.

The integrity verification may consist of a visual inspection both of the internal surfaces and of the external surface of the pressure containing parts carried out by an inspector with appropriated qualification.

Visual inspection by endoscopic means is allowed.

Where after this inspection no visible damage is detected and the defects of surfaces, if any, are within the acceptance criteria detailed in ISO 11971 or MSS SP- 55 and EN 970 as appropriate, the relevant equipment should be qualified to be used for a further 10 to 12 years for the original allowable pressure.

Where the surfaces are not accessible to visual inspection, the inspection on relevant metallic pressure containing parts may be replaced by:

- *a pressure strength test (e.g. hydrostatic pressure test) at the same pressure adopted during routine test. The test result is positive when no visible leakage is detected or by*
- *non-destructive testing of the material of the walls and of, where existing, the welds. The methods and the acceptance criteria should be those adopted during construction or those detailed in the applicable standards. Non-destructive testing should be coupled to the monitoring of the thickness of the walls. The detected thickness shall not be less than the minimum value considered in the strength design.*

Any liquid used during integrity verification tests shall be treated, stored, transported and disposed in compliance with applicable National and local waste Regulations.

It should be allowed to qualify the pressure equipment to be used for a further 10 to 12 years under the original allowable pressure without any further inspections where it is possible to prove that:

- *no visible damages have been detected both on internal and external surface of metallic pressure containing parts during any previous periodical visual inspection and, at least, in two previous preventive maintenance and*
- *the defects detected of surfaces, if any, are within the acceptance criteria detailed in ISO 11971 or MSS SP- 55 and EN 970 as appropriate*

on the basis of historical and registered data.

***NOTE:** above method is applicable only if the materials of the equipments are comparable*

When the visual inspection on:

- *any equipment (vessels, pressure accessories, etc.) reveals evident damages from chemical corrosion on the surfaces of pressure containing parts, the integrity verification should be extended to the pipework;*
- *the bodies of gas pressure regulators shows evident damages on the surfaces from erosion, the integrity verification should be extended at least to the downstream pipework connected to outlet flange of the concerned equipment*

and it should be recommended to proceed as per clause 8 .

7.1. Report on integrity verification of pressure equipment

Once the integrity verification has been completed, it should be reported as a checklist.

The checklist should include:

- *the reference to equipment concerned and*
- *the description of the verifications carried out and*

— *the evaluation of the verifications carried out.*

The report should be signed by service engineer and by the authorized person.

When several service engineers are involved for different verifications of the same equipment, the report:

— *should deals with all types of verifications and*

— *each type of verification should be signed by the concerned service engineer.*

8. Activities to be implemented after a detection of damage of pressure containing parts of pressure equipment and/or pipework

When damage on pressure containing parts is detected it should be necessary to proceed with:

— *detection of the structural integrity as detailed in clause 8.1 and, where necessary, as explained in last sentence of sub-clause 8.1, with*

— *an appropriate repair complying with the provisions detailed in sub-clause 8.2.*

8.1. Verification of structural integrity of pressure equipment and/or pipework with damages on metallic pressure containing parts

The verification of structural integrity of pressure equipment and/or pipework should be carried out where one/several pressure containing part/s shows/show:

a) any mechanical damage such as strains, deep indentations, cracks, flaws, etc.

b) chemical corrosion.

The pressure equipment and/or pipework concerned should be subjected to:

— *a verification of the wall thickness of the pressure containing parts. This verification should be extended to:*

- ✓ *all pressure containing parts damaged in the case of damage type a);*
- ✓ *all pressure containing parts in case of damage type b).*

Where it is proved that the wall thicknesses are not less than the minimum design thicknesses the pressure equipment and/or pipework should be subject to a pressure strength test at the same pressure used during manufacturing tests.

With a positive result of both verifications, the pressure equipment and/or pipework can be used under the original operating conditions.

For this type of pressure equipment and/or pipework all information on the verification of the structural integrity should be filed in order to verify, in the subsequent surveillance activities, whether the extent of the damage has enlarged with time.

With a negative result of only one verification, the pressure equipment shall be subjected to a specific repair as detailed in the following sub-clause

8.2. Repair of pressure containing parts

The repair may include:

→ *the replacing of the damaged pressure containing part(s) and, where technically possible and economically convenient,*

→ *specific repairing welding of damaged pressure containing parts.*

Both the new pressure containing part(s) and the repairing welding shall comply with the characteristics detailed in the original design.

9. Disposal of equipment at the end of life cycle

Treatment, storage, transportation, and final disposal must be in compliance with applicable National and local waste regulations.

At the time of writing these guidelines the reference regulations shall be the European Directive 2008/98/EC.

Annex A: examples of national practice

GERMANY (G 495 –Code of practice, July 2006

Table 1 – Maximum predetermined maintenance intervals in accordance with Section 6.1

Maximum inlet pressure[b]	Maximum volume flow at NTP[c]	Maintenance		
		Surveillance		Overhaul[a]
bar	m^3/h	Inspection	Function check-out[a]	
up to 0.1	–	as required	as required	as required
> 0.1 to 1	≤ 200[d]	as required	every 12 years	as required
	> 200		every 4 years	every 8 years
> 1 to 5	≤ 200[d]	as required	every 6 years	as required
	> 200		every 2 years	every 4 years
> 5 to 16		every 6 months	every 12 months	every 2 years
> 16 to 100		every 3 months	every 6 months	every 2 years

As required:
Maintenance according to operating requirements on the basis of operating experience. The need for maintenance of residential pressure and meter regulators shall also be established and documented.

[a] Overhaul includes function check-out and inspection, function check-out includes inspection.
[b] Maximum pressure at which the gas system is operated.
[c] Maximum flow at which the gas system is operated (NTP = 0 °C and 1013.25 mbar)
[d] The intervals specified for systems > 200 m^3/h shall apply to gas pressure regulating installations featuring devices in accordance with DIN EN 334 and DIN EN 14382

Table 2 – Recommended intervals for condition-based maintenance in accordance with Section 6.2

Maximum inlet pressure[b]	Maximum volume flow at NTP[c]	Maintenance			
		Surveillance		Overhaul[a] of all system parts other than safety devices	Overhaul[a] of safety devices
bar	m^3/h	Inspection	Function check-out[a]		
up to 0.1	–	as required	as required	as required	as required
> 0.1 to 1	≤ 200[d]	as required	every 12 years × BF	as required	as required
	> 200		every 4 years × BF	as required	every 8 years × BF
> 1 to 5	≤ 200[d]	as required	every 6 years × BF	as required	as required
	> 200		every 2 years × BF	as required	every 4 years × BF
> 5 to 16		every 6 months × BF	annually × BF	as required	every 2 years × BF
> 16 to 100		every 3 months × BF	every 6 months × BF	as required	every 2 years × BF

BF: rating factor in accordance with Section 6.2
As required:
Maintenance according to operating requirements on the basis of operating experience and statistical quality control, see Section 6.2. The need for maintenance of residential pressure and meter regulators shall also be established and documented.

[a] Overhaul includes function check-out and inspection, function check-out includes inspection.
[b] Maximum pressure at which the gas system is operated.
[c] Maximum flow at which the gas system is operated (NTP= 0 °C and 1013.25 mbar)
[d] The intervals specified for systems > 200 m^3/h shall apply to gas pressure regulating installations featuring devices in accordance with DIN EN 334 and DIN EN 14382

ITALY

Frequencies of periodical specific surveillance activities on equipment of gas pressure regulating stations connected directly to the transmission system according to Italian national standard UNI 9571-1: Jan. 2012 - Initial pressure reduction plants for natural gas part 1: Surveillance and Italian decree 16 April 2008 – Technical Regulations on design, construction, tests, manage and surveillance of the buildings and distribution systems and of the direct pipeline with natural gas with density not higher than 0,8	
Description of the activity	***frequency***
activities requiring no any manual actions	
Monitoring of the presence of power supply for equipment requiring electricity	*monthly*
monitoring of the value of significant parameters	
visual inspection of the external conditions of the station	*half-yearly*
visual inspection of the station building	
visual inspection of the warning notices	
monitoring of the normal operation of the heating group	
activities requiring manual actions	
verification of the external tightness of flanged / threaded connections	*half-yearly*
Verification of the manoeuvrability of the general isolating valve	*yearly*
drainage of air from hot water system	*half-yearly*
verification of the functional performance of the equipment in the pressure control system	*half-yearly*
verification of the functional performance of the stand-by pressure control stream	
simulation of the effective operation of the remote control	*two-yearly*
monitoring of the calibration of the p / t / position transducer s	
simulation of the effective operation of the alarms	
monitoring of the conformity of the signals at remote point with the real situation at field	
simulation of reaching of care / alarm thresholds for significant parameters	
monitoring of functional performance of the pressure regulating station supplying the boiler	*yearly*
monitoring of the performance of the boiler	
monitoring of the combustion of the boiler	*two-yearly*
predetermined maintenance of elastomeric parts subjected to erosion	
elastomeric seat rings	*six years*
elastomeric parts with the function of tightness between the metallic parts where, at least one, moves in normal operating conditions	
predetermined maintenance of elastomeric parts subjected to ageing	
elastomeric parts giving the feedback of the controlled pressure	*six years*
elastomeric parts with the function of tightness / operation	
lubricating of isolation valves	*yearly*
cleaning of combustion chamber and chimney	*two-yearly*

Frequencies of periodical specific surveillance activities on gas pressure regulator and associated safety devices according to Italian national standard UNI 10702: 1998 pressure reduction stations of the distribution system with inlet pressures from 0,04 bar to 12 bar and Italian decree 16 April 2008 – Technical Regulations on design, construction, tests, manage and surveillance of the buildings and distribution systems and of the direct pipeline with natural gas with density not higher than 0,8

P_{emax} bar	Q in kW					
	Q > 1200			600 < Q ≤ 1200		Q ≤ 600
	visual inspection	functional check	preventive maintenance	functional checks	preventive maintenance	preventive maintenance
0,04 to 0,5	°)	1/two years	1/eight years	1/three years	According to the need °°°)	According to the need °°°)
0,5 to 5	°)	1/year °°)	1/seven years	1/two years		
5 to 12	°)	1/year °°)	1/five years	1/year		

°) – *in the interval between two subsequent functional checks*

°°) – *but at least within 18 months*

°°°) – *to be understood as corrective maintenance or replacement of the failed equipment*

Annex B: replaceable parts

Table C.1: Replaceable parts subjected to erosion

Description of the replaceable part	***Equipment concerned***
Seat ring of valve seat	*Pressure regulators and relevant fixtures*
	Equipment used as safety accessories and relevant fixtures
	Equipment included in the pressure safety system and relevant fixtures
Non-metallic parts of equipment whose function of the internal sealing is required during maintenance activities	*Upstream and downstream isolating valves of pressure reduction lines*
	Valves used as isolating valves to isolate an equipment under maintenance activities
Non-metallic parts with the function of internal sealing/external tightness between two parts, where, at least, one of which moves at normal operating conditions / now and then / during manual and/or actuated operations	*Pressure regulators and relevant fixtures*
	Valves and relevant fixtures
	Pressure relief devices and relevant fixtures
	Slam shut and shut off devices and relevant fixtures
Other non-metallic parts suggested by the manufacturers	*Equipment specified by manufacturers*

Table C.2: Replaceable parts subjected to ageing and/or parts requiring cleaning and/or lubrication

Description of the replaceable part	***Equipment concerned***
Non-metallic parts with the function to give the feed-back (sensing elements) of the controlled pressure for safety accessories and safety devices	*Safety devices and/or safety accessories and relevant fixtures*
Non-metallic parts with the function of internal sealing / external tightness and liaised to the performances (diaphragms)	*Pressure regulators and relevant fixtures*
	Pressure relief devices and relevant fixtures
	Slam shut and shut-off devices and relevant fixtures
Non-metallic parts of the equipment with the function of internal sealing: ➢ *at normal operating conditions* *or* ➢ *during at any maintenance activity*	*Pressure relief devices*
	Isolating valves of pressure reduction lines
	Valves used as Isolating valves to isolate another equipment during its maintenance
Non- metallic parts with the function of internal sealing / external tightness under static conditions	*All type of pressure equipment*
Parts requiring lubrication	*Valves where specified by manufacturer*
Strainer elements	*Filters*

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