*Please note that although Gasunie Transport Services B.V. translated the Dutch network codes with utmost care, Gasunie Transport Services B.V. would like to point out that only the decisions of the Dutch Authority for Consumers and Markets establishing the codes as referred to in article 12f of the Dutch Gas Act, are legally binding. Gasunie Transport Services B.V. is not liable for any losses or damages of any kind arising out of possible errors or omissions.*

# Metering Code Gas TSO
# Effective from 12-05-2016 to the present

Decision of the Dutch Authority for Consumers and Markets of 21 April 2016, reference ACM/DE/2016/202161, adopting the conditions referred to in article 12b of the Dutch Gas Act (Metering Code Gas - TSO)

The Dutch Authority for Consumers and Markets,

In view of article 12f, paragraph 1, of the Dutch Gas Act;

Decision:

**1. General provisions**

**1.1. Scope**

**1.1.1**

The Metering Code Gas TSO contains the conditions regarding the volume and capacity measurements at the connections or system connections to the national grid as well as the gas quality measurements in the national grid.

**1.2. Definitions**

**1.2.1**

Terms that are defined in the Dutch Gas Act or the Definitions Code Gas have the meaning defined in the Dutch Gas Act or Definitions Code Gas.

**1.3. General functional requirements**

**1.3.1**

The measuring system comprises a set of measuring facilities that are used to determine the gas quantity, gas quantity per hour, gas quality and/or quantity of energy of the gas.

**1.3.2**

The measuring system shall comply with the following specifications:

| | |
|---|---|
| measurement uncertainty in quantity of energy on a monthly basis | ≤ 1% |
| measurement uncertainty in quantity of energy per hour | ≤ 2% |
| availability of data per hour (averaged on an annual basis) | ≥ 99% |
| maximum down time for measurement and/or data acquisition | 24 hours |

| | |
|---|---|
| availability of gas chromatograph (GC) (on an annual basis) | ≥ 95% |

The requirements referred to in 1.3 apply on the basis of 95% reliability.

**1.3.3**

Pursuant to chapters 2 and 3 of this Metering Code Gas TSO, the network operator of the national grid shall store the parameters relevant to the measuring process and management process in a register. The data in this register may be called up by the connected party or the distribution network operator insofar as these data relate to their own connection or system connection. After being called up, the data shall be made available within 15 working days.

**1.3.4**

The measuring facilities' local data acquisition systems are remotely readable with a minimum frequency of once every 5 minutes for the purpose of online information provision.

**1.3.5**

The measuring equipment referred to in this Metering Code Gas TSO is considered equivalent to measuring equipment that has been lawfully produced or marketed in another member state of the European Union or lawfully produced or marketed in a state which is not a member state of the European Union, but which is party to a Treaty to that effect (or partly to that effect) that binds the Netherlands, and that satisfies requirements offering a level of protection that is at least equivalent to the level that is striven for with the requirements referred to in this Metering Code Gas TSO.

**1.4. [no longer applicable]**

**1.5. General management and maintenance requirements**

**1.5.1**

The network operator of the national grid shall manage and maintain all its measuring facilities such that they comply with the functional requirements set on a permanent basis.

**1.5.2**

Work on measuring facilities belonging to the network operator of the national grid may only be performed by employees of the network operator of the national grid or by persons authorized by the network operator of the national grid to perform such work.

**1.5.3**

The performance of the work shall be recorded by those who have performed the work in files dedicated to that purpose. This shall include a record of the date, nature of the work, the name of the person who performed the work, the results of the checks and any other features. These data shall be made available to the connected parties or distribution network operators concerned, by the network operator of the national grid, upon request. After being called up, the data shall be made available within 15 working days.

**1.5.4**

After a measuring facility or part thereof has been removed by the network operator of the national grid, the network operator of the national grid shall keep the relevant calibration certificates for at least 1 year after removal. These data shall be made available to the connected parties or distribution network operators concerned, by the network operator of the national grid, upon request. After being

called up, the data shall be made available within 15 working days.

**2. Gas quantity measurement**

**2.1. General points**

**2.1.1**

The quantity of gas under operating conditions shall be measured exclusively by gas meters meeting the requirements for class 1.0 gas meters pursuant to instrument-specific annex MI-002 to Directive 2004/22/EC of 31 March 2004 on measuring instruments.

**2.1.2**

The quantity of gas supplied under normal conditions shall be determined by the ptz method: conversion by using the measured pressure, the measured temperature and the calculated compressibility.

**2.2. Measuring instrument configuration**

**2.2.1**

The measuring equipment for the determination of the quantity of gas delivered under normal conditions shall consist of a gas meter, a temperature transmitter, a pressure transmitter and an Electronic Volume Conversion Device (EVCD).

**2.3. Gas meter**

**2.3.1**

The gas meter has either a mechanical counter or is based on the electronic processing of measuring signals.

**2.3.1a**

A gas meter provided with a mechanical counter is equipped with a low frequency (LF) pulse generator connected to the mechanical counter and a high frequency (HF) pulse generator. This type of gas meter has a control possibility to verify the correct functioning of the gas meter, e.g. a HF/LF check. When purchased after 1 January 2012 this type of gas meter is equipped with a provision to perform a remote reading of the counter.

**2.3.1b**

A gas meter based on the electronic processing of measuring signals is equipped with a serial output, an electronically headed pulse signal, serial communication for diagnostic purposes and a provision to assure the correct functioning of the gas meter during a power failure. Besides that this type of meter has an electronic signal to indicate the state of functioning or dis-functioning of the gas meter.

**2.3.2**

At purchase the gas meter must have a licence issued under one the Dutch Metrology Act or the Dutch Calibration Act. If and where available the gas meter has to meet (inter)national standards (e.g. ISO, CEN, NEN) as published for the relevant type of gas meter. For turbine gas meters EN 12261 applies, for rotary gas meters EN 12480 and for ultrasonic gas meters ISO 17089.

**2.3.3**

The gas meter must have a calibration certificate from a recognized calibration agency, where the calibration facility used:

- is accredited to perform these calibrations in accordance with ISO/IEC 17025;
- is traceable to the European Harmonized Reference Value for high pressure natural gas under flow condition;
- meets the requirements as referred to in EN 12261 annex A for the calibration of turbine gas meters.

**2.3.4**

The following shall apply in addition to 2.1.1:

- the flow-weighted average deviation at the highest pressure at which calibration is performed shall be approximately zero. "Approximately zero" means as close to zero as technically possible.
- at the highest pressure at which calibration is performed the deviation in the range between 0.25*Qmax and Qmax shall be less than 0.5%, where Qmax is the maximum flow rate under operating conditions at which the gas meter may be used.
- in the range between 0.25*Qmax and Qmax, the difference between the deviation at the highest pressure at which calibration is performed and the deviation at the lowest pressure at which calibration is performed must not be greater than 0.7%.
- if a gas meter is supplied with a "limited inscription" for the pressure class, it shall be used within the stated range."

**2.3.5**

If a turbine meter is used as a gas meter, then it shall be applied in the following pressure classes:

| Pressure class | Suitable for an overpressure of | If calibrated at an overpressure of |
|---|---|---|
| ANSI 150 | All pressures | Atmospheric and 8 bar |
| ANSI 150 | Between 4 and 8 bar | 8 bar calibration; no low pressure calibration |
| ANSI 300 | All pressures | 8 bar and 20 or 35 bar |
| ANSI 600 | All pressures | 8 or 20 bar and 50 or 60 bar |

**2.3.6**

If a rotor meter is used as a gas meter, then it shall be applied in the following pressure class:

| Pressure class | Suitable for an overpressure of | If calibrated at an overpressure of |
|---|---|---|
| ANSI 150 | Up to 16 bar | Atmospheric and 8 bar |

**2.3.7**

Gas meters shall be incorporated according to the gas meter manufacturer's instructions on the understanding that turbine gas meters shall have a straight upstream pipe length of at least 5 times the nominal pipeline diameter (5D), preceded by a flow conditioner, and a downstream pipe length of at least 2D. For a rotary gas meter no minimum upstream and downstream pipe length applies. For

ultrasonic gas meters a straight upstream pipe length and downstream pipe length according to ISO 17089 applies. Existing facilities with a turbine gas meter that do not meet the requirement of an upstream pipe length of 5D shall not be amended if the upstream pipe length comes to 4D or more.

**2.3.8**

The network operator of the national grid shall at regular intervals (with random sampling) monitor gas meters that are in use, in a systematic manner approved by the regulator of the Dutch Metrology Act appointed by the government.

**2.3.9**

For measuring equipment with an annual usage of at least 250 million $m^3(n)$ per meter run, as of 1 January 2014 the quantity of gas measured by the gas meter will be corrected for the deviation of the relevant gas meter in accordance with this gas meter's calibration certificate.

**2.4. Determination of the quantity of gas under normal conditions**

**2.4.1**

To determine the quantity of gas delivered under normal conditions, the quantity of gas measured by the gas meter under operating conditions is converted to $m^3(n)$, using an EVCD, according to the following formula:

$$V_n = V * \frac{p}{1{,}01325} * \frac{273{,}15}{273{,}15 + t} * \frac{Z_n}{Z}$$

where:
$V_n$= the number of $m^3(n)$;
V = the quantity of gas measured in $m^3$ at p and t (operating conditions);
p = the absolute pressure at which the gas crosses the volume meter in bar;
t = the temperature at which the gas crosses the volume meter in °C.
Z = compressibility under operating conditions
$Z_n$= compressibility under normal conditions

**2.4.2**

The pressure transmitter for determining the pressure p shall be connected at the place where the pressure was representative when calibrating the gas meter. When it is brought into use, the pressure sensor must have a calibration certificate from a recognized calibration agency.

**2.4.3**

For turbine and ultrasonic gas meters, the temperature transmitter for determining the temperature t shall be located in a "measurement and impulse ring" downstream of the gas meter, or directly downstream of the gas meter, with the maximum distance between the outlet flange of the gas meter and the temperature transmitter being 0.5 m. For rotary gas meters, the measurement and impulse ring shall be located on the inlet side of the rotary meter. When it is brought into use, the temperature transmitter must have a calibration certificate from a recognized calibration agency.

**2.4.4**

The EVCD shall use the serial output, the HF or the LF signal of the gas meter as an input signal for determining the quantity of gas measured under operating conditions V.

**2.4.5**

Calculation of compressibilities Z and $Z_n$ in the EVCD shall be performed according to the SGERG (ISO 12213-3) or AGA NX19-mod. method, depending on the design of the EVCD.

**2.4.6**

The set values required for the operation of the EVCD, namely the superior calorific value, relative density, molar percentage of $CO_2$ and molar percentage of $N_2$ are determined by the network operator of the national grid on the basis of multi-year averages of the locally occurring gas and planning details of anticipated future gas streams. These values shall be published by the network operator of the national grid on its website.

**2.4.7**

A further correction is made to the quantity of gas delivered under normal conditions determined pursuant to 2.4.1:

$$V_n' = Cf_z * V_n$$

The network operator of the national grid subsequently applies this correction for the effect of the actual gas quality (at the time of the measurement) on the conversion of the volume, i.e. to the value for the compressibility Z determined by the EVCD. This correction is called the 'Z correction'. When determining the extent of the Z correction factor $Cf_z$ the set values referred to in 2.4.6 are used and the realized values determined pursuant to 3.1.5. As a result of the Z correction, no additional requirements are imposed on the set values programmed in the EVCD nor is a seasonal adjustment required. This correction involves working with the SGERG method or an equivalent method for the ultimate determination of the compressibility.

**2.5. [no longer applicable]**

**2.6. [no longer applicable]**

**2.7. Managing and maintaining gas quantity measurement**

**2.7.1**

The network operator of the national grid shall inspect the gas meter externally, at least 3 times per year, to ensure that the counter is running properly, to make sure there is no moisture behind the glass and that the noise level is acceptable. The gas meter in operation shall also be lubricated 3 times per year.

**2.7.2**

The network operator of the national grid shall check the EVCD, the temperature transmitter, the pressure transmitter using monitoring equipment that complies with the requirements below:

| Component | Maximum permissible deviation in measured value from reference value | Calibration frequency |
|---|---|---|

| | | |
|---|---|---|
| Reference pressure transmitter | 0.1% | 2 x per year |
| Reference temperature transmitter | 0.1 K | 2 x per year |

**2.7.3**

The inspection process includes monitoring for systematic deviations, being deviations between measuring instruments and monitoring equipment occurring several times in the same direction. This monitoring shall take place pursuant to ISO 7871 or a comparable method. This form of monitoring is known as the CUSUM technique. The CUSUM technique means that repeated deviations in the same direction shall lead to corrective action if, when taken together, they exceed a threshold value, whilst each on its own would be deemed to be “not significant”.

**2.7.4**

The CUSUM technique is applied to the inspection results for the pressure transmitters and temperature transmitters and for the gas chromatographs (GCs) (test analyses, see 3.3.5).

**2.7.5**

The network operator of the national grid shall calibrate each EVCD once every year. In order to determine the EVCD deviation, a control device (including reference pressure transmitter and reference temperature transmitter) is connected in parallel. The EVCD deviation (conversion error) is the percentage difference between the conversion factor determined by using the EVCD and the conversion factor shown by the control device, related to the latter conversion factor. Each inspection of the EVCD shall comprise at least 2 measurements.

**2.7.6**

The network operator of the national grid shall check the pressure transmitter once per year by comparing the EVCD pressure transmitter to the control device’s reference pressure transmitter.

**2.7.7**

The network operator of the national grid shall check the temperature transmitter once per year by comparing the EVCD temperature transmitter to the control device’s reference temperature transmitter.

**2.7.8**

[No longer applicable]

**2.7.9**

[No longer applicable]

**2.7.10**

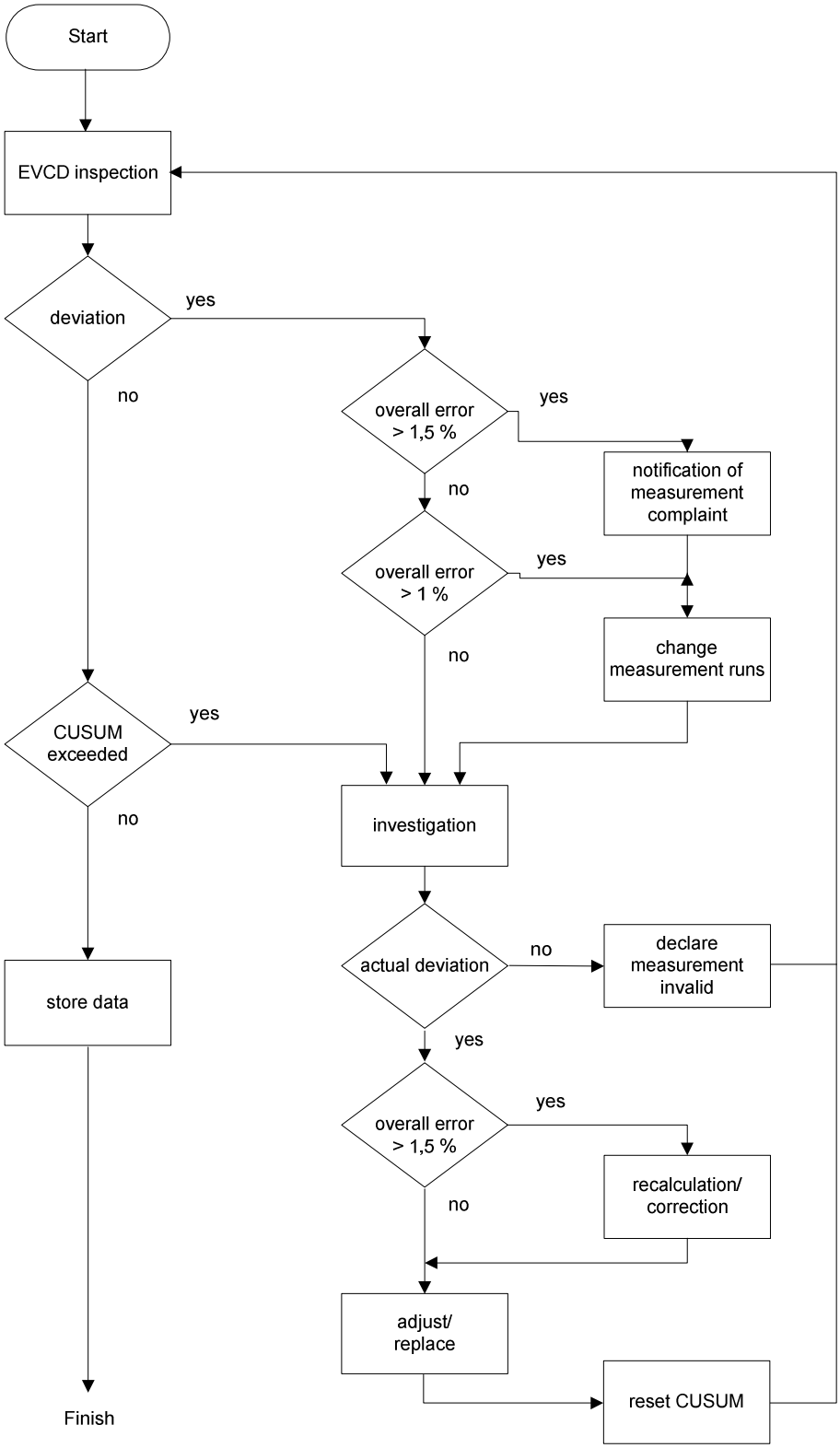
If, while performing the checks referred to in 2.7.5 to 2.7.7 inclusive, the network operator of the national grid finds a deviation greater than the permitted deviation (see table below), then it shall perform a follow-up investigation as well as any adjustment or replacement within 4 weeks. A new check is also performed. If the conversion error is greater than 1%, then the network operator of the national grid shall take the measuring equipment concerned out of operation immediately and back-up measuring equipment shall be brought into use. If the conversion error is greater than 1.5%, then the network operator of the national grid shall correct the measurement readings pursuant to 4.1.7 or

4.6.5.

| Inspection frequency | Deviations to be determined | | maximum permissible deviation |
|---|---|---|---|
| 1 x per year | Conversion error | | 0.5% |
| | Difference in conversion error of the 2 measurements | | 0.3% |
| | p error | | 0.4% |
| | CUSUM p | action limit | 0.45% |
| | | threshold value | 0.08% |
| | t error | | 0.5 K |
| | CUSUM t | action limit | 0.45 K |
| | | threshold value otherwise | 0.08 K |

**2.7.11**

The connected party or distribution network operator may ask the network operator of the national grid for individual inspection results for the connection or system connection concerned. After being called up, the data shall be made available within 15 working days.
By way of illustration, the inspection process described is summarized in the flow chart below:


Start
EVCD inspection
deviation
yes
no
overall error > 1,5 %
yes
notification of measurement complaint
no
overall error > 1 %
yes
change measurement runs
no
CUSUM exceeded
yes
no
investigation
store data
actual deviation
no
declare measurement invalid
yes
overall error > 1,5 %
yes
recalculation/ correction
no
adjust/ replace
reset CUSUM
Finish

**2.8. Local data acquisition of gas quantity data**

**2.8.1**

A local data acquisition system, separately or as an integrated part of the EVCD, records, at the site of the measurement, at the end of each hour, three counter readings: counter readings for the gas meter, the non-converted gas quantity and the converted gas quantity. The last two as determined by the EVCD based on the gas meter at the time of recording.

**2.8.2**

The local data acquisition system clock shall contribute no more than 0.05% inaccuracy towards the determination of the quantity per hour. The local data acquisition system clock shall be synchronized with a central clock at least once every day. If, when synchronizing clocks, a time difference of more than 18 seconds is found, the hourly values shall be corrected on the basis of that time difference.

**2.8.3**

If the local data acquisition system is not an integrated part of the EVCD, the transfer of the counter readings of the gas meter to the data acquisition system takes place, if possible, via another signal than the signal used for the conversion by the EVCD. The transfer of EVCD readings to the data acquisition system takes place via pulses or via a serial link. The data acquisition system counters are called derived counters. The derived counters run synchronously with the primary counters of the gas meter and the EVCD.

**2.8.4**

The network operator of the national grid shall secure that the derived counters are still running synchronously with the primary counters. If the transfer of the signal between the gas meter, the EVCD and/or the local data acquisition system is based on pulse signals, it will be secured by performing a check at least four times per year. Where differences are identified, the data acquisition system counters shall be synchronized with the primary counters on the gas meter and the EVCD. The volume difference involved is processed as a correction pursuant to 4.3.3 and/or as a residual volume pursuant to 4.4.3.

**2.8.5**

The local data acquisition system records, along with the data, the disruption information generated by the measuring equipment.

**3. Gas quality determination**

**3.1. General points**

**3.1.1**

The purpose of the gas quality determination is to establish the superior calorific value and to determine the values necessary for the implementation of 2.4.7.

**3.1.2**

Determining the gas quality involves determining the relative concentrations of the components shown below, with an indication of the operating range also being given.

| Components | Minimum [mol%] | Maximum [mol%] |
|---|---|---|
| Methane | 65.0 | 96.0 |

| | | |
|---|---|---|
| Ethane | 0.2 | 11.0 |
| Propane | 0.1 | 4.0 |
| 2-Methyl propane (Iso-butane) | 0.01 | 0.9 |
| Normal butane | 0.01 | 0.9 |
| Neo-pentane (2,2 dimethyl propane) | 0.001 | 0.5 |
| Methyl butane (Iso-pentane) | 0.001 | 0.6 |
| Normal pentane | 0.001 | 0.6 |
| C6+ | 0.001 | 0.5 |
| $N_2$ | 0.3 | 17.0 |
| $CO_2$ | 0.2 | 11.0 |

**3.1.3**

The Gas quality determination consists of a gas quality measurement and a gas quality system.

**3.1.4**

The network operator of the national grid performs the gas quality measurement with a gas chromatograph (GC) or one or more devices with which gas quality can be determined with equivalent accuracy pursuant to 1.3.2 and 3.2.4.

**3.1.5**

The gas quality system determines the gas quality at a connection or system connection based on one or more gas quality measurements with an accuracy which leads to an accuracy of the determination of the quantity of energy that is equal to or better than the specifications in 1.3.2.

**3.2. Gas chromatograph (GC)**

**3.2.1**

The GC performs the gas analysis based on gas samples taken at representative points from the national grid. The GC has a nominal analysis cycle of 15 minutes or less.

**3.2.2**

The network operator of the national grid announces the locations at which a GC is set up by means of a public report on its website.

**3.2.3**

The GC determines the superior calorific value and the relative density from the gas composition pursuant to ISO 6976.

**3.2.4**

The inaccuracy of the determination of the superior calorific value shall not be greater than 0.4% of the determined value.

**3.3. Managing and maintaining a GC**

**3.3.1**

Before bringing a GC into use and when replacing components (for example, the detector), the network operator of the national grid shall perform a multi-level calibration. In multi-level calibration, a calibration line of 7 direct components is determined on the basis of seven points in the desired operating range. The direct components are $N_2$, $CO_2$, methane, ethane, propane, iso-butane and normal butane.

**3.3.2**

To check the correct operation of the GC a check is performed weekly and automatically with a certified calibration or test gas. The weekly check comprises 3 analyses. Checking takes place based on statistical control methods. The details of this control method are published on the website of the network operator of the national grid. The network operator of the national grid shall report in the yearly evaluation of the metering process as referred to in 4.5.1 that by means of these weekly checks the specified quality requirements are met.

**3.3.3**

The calibration gases referred to in 3.3.1 and 3.3.2 shall be prepared gravimetrically pursuant to ISO 6142 and supplied with a certificate for each of the 7 components pursuant to ISO 6711. The GC used to check the prepared calibration gas shall be calibrated with primary reference material. Following inspection and approval of the newly produced calibration gas, a certificate shall be drawn up pursuant to ISO 6141.

**3.3.4**

In order to check that the GC is working correctly, the network operator of the national grid shall perform a monthly test gas analysis. A test gas is a sample of gas taken from the national grid. The gas quality of the test gas for a GC must be in the realized operating range of the GC concerned. The test gas shall have a certificate stating the superior calorific value, which has been established on the basis of a laboratory analysis. The test gas test comprises at least 3 analyses. Calculation shall be based on the average of the last two analyses. Where there is a difference between the analysis result and the certificate of more than 0.3%, an investigation shall be performed, if necessary followed by corrective action to the GC, and the network operator of the national grid shall make a proposal for correction of the measurement values pursuant to 4.1.7 or 4.6.5.

**3.3.5**

The test gas process involves monitoring for systematic deviations. This monitoring shall take place pursuant to ISO 7871 or a comparable method. This method is known as the CUSUM method, see 2.7.3.

**3.4. Local data acquisition of gas quality data**

**3.4.1**

A local data acquisition system, separately or as an integrated part of the GC, records, at the site of the

measurement, for each analysis cycle, the analysis values obtained pursuant to 3.1.2, the determined values pursuant to 3.2.3 and the time of recording. Every quarter of an hour, the results are stored for processing pursuant to 4.1.1.

**3.4.2**

The local data acquisition system clock shall be synchronized with a central clock at least once every day.

**3.4.3**

The local data acquisition system records, along with the data, the disruption information generated by the measuring facility.

**3.5. Gas quality system**

**3.5.1**

A gas quality system comprises a control method which is used to establish that the requirements pursuant to 1.3.2 are being observed.

**3.5.2**

The (fixed set points of the) parameters and control methods necessary for the gas quality system applied are determined and kept up to date by the network operator of the national grid on the basis of the national grid configuration. These (fixed set points of the) parameters and control methods are published by the network operator of the national grid on its website yearly.

**4. Processing the data**

**4.1. Processing the measurement data**

**4.1.1**

The measurement data pursuant to 2.8.1, 2.8.5, 3.4.1 and 3.4.3 are collected and processed at least once per day by the network operator of the national grid.

**4.1.2**

[No longer applicable]

**4.1.3**

The network operator of the national grid checks the data for completeness while they are being processed and verifies the data.

**4.1.4**

Whilst verifying the gas quantity measurement, the network operator of the national grid checks that the signals have been correctly transferred from the gas meter to the EVCD and that they have been correctly converted by the EVCD. The data shall be verified every hour in this way. The same verification shall take place every month, with a view to detecting any long-term effects. Measurements that do not meet the specified criteria shall be subjected to further investigation. The criteria in question are dependent on the specific situation at the measurement site and shall, at the request of the network operator of the national grid, be made available to the connected parties or distribution network operators concerned. After being called up, the data shall be made available within 15 working days.

**4.1.5**

When verifying the gas quality measurement, a plausibility check is performed on the analysis values obtained and the derived variables pursuant to 3.2.3.

**4.1.6**

Verification takes place in such a way that the availability requirements referred to in 1.3.2 can be realized.

**4.1.7**

Any disruption information generated by the measurement instruments or other special situations lead to an automatic correction or further investigation into the accuracy of the data, followed by a manual correction where necessary.

**4.1.8**

All errors found in the gas quantity measurement or the gas quality measurement shall be corrected by the network operator of the national grid.

**4.1.9**

The network operator of the national grid shall update all corrections to the data in logbooks. These logbooks shall state, as a minimum, the original measurement value, the replacement measurement value, the reason for the correction, the manner of the correction, the time of correction and the person who performed the correction.

**4.2. Correction procedures for gas quality measurement before expiry of the deadline for sending the allocation data on the 16th working day**

**4.2.1**

The network operator of the national grid shall apply a correction procedure if the measuring instrument for gas quality measurement is unavailable due to a disruption, performance of a test gas procedure or maintenance and the measuring instrument itself does not determine a replacement value. For this period, measurement values are replaced by the average of the three preceding correct values. The first value before the correction period is excluded.

**4.2.2**

If there are interruptions lasting longer than 60 hours for the purpose of determining the superior calorific value, the network operator of the national grid shall consult with the distribution network operator concerned regarding the value to be used. If there is an interruption lasting longer than 60 hours for the purpose of determining the superior calorific value for a single connected party, then the network operator of the national grid shall consult with this connected party.

**4.3. Correction procedures for gas quantity measurement before expiry of the deadline for sending the allocation data on the 16th working day**

**4.3.1**

The circumstances which, pursuant to 4.1.7, result in an automatic correction or further investigation of the data by the network operator of the national grid shall, in any case, include: work on the measuring equipment, replacement of equipment, power failure to the entire measuring equipment or a part thereof, reports of disruptions in equipment and synchronizing, pursuant to 2.8.4, counter readings of measuring instruments and counter readings derived from these in data acquisition systems.

**4.3.2**

If no values per hour are available for a specific period but the total quantity measured during that period is known, the network operator of the national grid shall distribute this total quantity over the period in accordance with a period with a similar load curve if this match is plausible.

**4.3.2***

If, when synchronizing counter readings pursuant to 2.8.4, a difference is found, the network operator of the national grid shall examine the historical data already available for periods in which values per hour are missing. The part of the difference that can plausibly be attributed to a period without values per hour shall be processed pursuant to 4.3.2, while the remainder shall be processed as residual volume pursuant to 4.4.4.

**4.4. Determination of hourly and monthly values**

**4.4.1**

The derived counter of the converted quantity of the EVCD determines the gas quantity per hour, where applicable corrected pursuant to 4.3 and 2.4.7.

**4.4.2**

The quantity of energy supplied per hour is equal to the measured quantity of gas, determined pursuant to 4.4.1, times the superior calorific value of this gas in the hour concerned, determined pursuant to 3.1.3.

**4.4.3**

A quantity of gas that is not attributable to an hour consists of a quantity of non-converted gas that is not to be attributed to an hour, being a quantity of gas called the 'residual volume dV', and a quantity of converted gas that is not to be attributed to an hour, being a quantity of gas called the 'residual volume $\Delta V_n$' The residual volume dV consists of the sum of any difference between the volume determined with the gas meter and the non-converted volume determined by the EVCD plus the quantity that is determined, pursuant to 2.8.4, during synchronization of the derived counters of the gas meter and/or the non-converted volume of the EVCD, minus the quantity of gas which is used, pursuant to 4.3.3, to correct a period in which values per hour are missing. The residual volume dV is converted for each day with the average realized conversion factor for the day in question for the measuring equipment in question. At the same time, a daily average Z correction factor for the realized gas quality is calculated and applied.

**4.4.4**

The residual volume $\Delta V_n$ consists of the quantity determined, pursuant to 2.8.4,during synchronization of the derived counter for the converted volume of the EVCD minus the quantity of gas which is used, pursuant to 4.3.3, to correct a period in which values per hour are missing. For the residual volume $\Delta V_n$ a daily average Z correction factor for the realized gas quality is calculated and applied for each day.

**4.4.5**

Residual volumes dV and $\Delta V_n$ may also arise while synchronizing the time of the data acquisition equipment's internal clock.

**4.4.6**

If establishing residual volumes dV and $\Delta V_n$, performed by the network operator of the national grid takes place every day calculated from 0.00 hours to 24.00 hours, they will be attributed to the gas day with the same date designation as the calendar day.

**4.4.7**

Each month, the sum of the daily values of the converted and Z-corrected residual volume dV plus the sum of the daily values of the Z-corrected residual volume $\Delta V_n$ shall be determined and multiplied by the monthly average volume-weighted superior calorific value. The result is called the 'residual energy'.

**4.4.8**

The quantity of energy supplied per month is equal to the sum of the quantities per hour pursuant to 4.4.2 plus the quantity of residual energy pursuant to 4.4.7.

**4.4.9**

The network operator of the national grid shall provide measurement data with a reference mark indicating whether they comply with the requirements governing measurement uncertainty in quantity of energy per hour pursuant to 1.2. This reference mark is called the accuracy identifier. Measurement data are deemed to be accurate as standard. Measurement data in respect of which, following correction pursuant to 4.2 and/or 4.3 it cannot be determined with certainty that they meet the general requirements as formulated in 1.2.2., shall be labelled as 'inaccurate'. Measurement data that have been corrected pursuant to 4.3.2 are deemed to be accurate.

**4.5. Annual evaluation of the measurement process**

**4.5.1**

The network operator of the national grid shall evaluate, every year, gas quantity determinations and gas quality determinations and shall report on this in general terms by means of a public report on the website; the results shall not be directly traceable to individual measurements.

**4.6. Handling corrections after expiry of the deadline for sending the allocation data on the 16th working day**

**4.6.1**

If the connected party or the distribution network operator or the network operator of the national grid has valid reasons for assuming that the measurement results are incorrect, they shall inform each other of this as soon as possible, stating the valid reason(s). If, as a result of this communication, a difference of opinion concerning the measurement results arises between the network operator of the national grid and the distribution network operator or the network operator of the national grid and the connected party, they shall carry out a more detailed investigation, inform each other of the results of this investigation and endeavour to resolve the dispute by agreement. Without prejudice to the provisions of article 19 of the Dutch Gas Act, the network operator of the national grid and connected party may jointly appoint a third party to resolve the dispute if they cannot reach agreement together. This third party may also carry out a more detailed investigation. The costs of this third party and of this investigation shall be borne by the party found to be in the wrong.

**4.6.2**

If the situation referred to in 4.6.1 arises and this leads to a correction, the network operator of the national grid shall inform the shipper(s) concerned about this and involve it (them), if and insofar as necessary, in the consultations in which efforts are made to resolve the dispute.

**4.6.3**

The network operator of the national grid or the connected party may take the initiative to perform a correction as a result of internal controls pursuant to 2.7, 3.3 or 4.1 if the deviation is greater than 1.5%. If, when checking a volume conversion pursuant to 2.7, a deviation of more than 1.0% is found, then the measuring equipment concerned is taken out of operation immediately while, for a deviation greater than 1.5%, a correction shall take place.

**4.6.4**

The network operator of the national grid shall perform corrections only if the quantity of energy involved comes to more than 25000 kWh (≅2,559 $m^3$(n;35,17)) per month

**4.6.5**

Corrections shall be processed as a quantity of energy per month and have, consequently, no effect on the quantity of energy per hour already assigned.

**4.6.6**

If, as a result of a correction, doubt has arisen regarding the quantity of energy per hour during the correction period, consultations shall take place between the connected party, its shipper(s) and the network operator of the national grid.

**5. Other gas quality measurements**

**5.1. General points**

**5.1.1**

This article concerns how the chemical composition and extent to which the odour of the gas (to be transported) is perceptible, is checked, insofar as this has not yet been addressed in 3.1 to 3.5 inclusive.

**5.1.2**

'Other parameters for gas quality' means:

- Wobbe index
- Oxygen content
- Content of aromatic hydrocarbons
- Inorganic sulphur content
- Mercaptan content (alkylthiols)
- Total sulphur
- Odorant content (THT).

The extent to which the odour of the gas is perceptible, is directly linked to the odorant and is therefore tested on the basis of the odorant content.
THT is added to the gas to make it smell of 'gas'. The gas is deemed to have a sufficient odour level if at least 10 $mg/m^3$ THT is detected at the inspection points.

**5.1.3**

The following test methods are used for the gas quality measurements:

| Quality | Method | Detection level | Uncertainty | Frequency |
|---|---|---|---|---|
| Wobbe index | ISO 6974 + 6976 | | 0.5% | Continuous |
| Oxygen | ISO 6974 | 0.01 mol % | 5% | Continuous on-line measurement at N2 injection points; Other: randomly |
| Aromatics | ISO 6975 | | 5% | Randomly |

| | | | | |
|---|---|---|---|---|
| Inorganically bound sulphur in H2S | ISO 19739 | 0.4 mg/$m^3$ | 1 mg | Continuous on-line measurements + randomly |
| Alkylthiol S content | ISO 19739 | 1 mg/$m^3$ | 2 mg | Randomly |
| Total sulphur content | ISO 19739 | 1 mg/$m^3$ | 1 mg | Randomly |
| THT content | Device-specific | | < 13% | Once every three weeks, THT measurement at each odorization location |

**5.2. Determination of the Wobbe index**

**5.2.1**

To assess the Wobbe index $W_S$ downstream of a blending station, account must be taken of the measurement and control inaccuracy of the blending station. In connection with this, the contractual limit value for $W_S$ may be used as a set point by the network operator of the national grid, provided that the resulting breaches on an hourly basis are within a normal distribution around the limit value with a standard deviation of 0.1 MJ/$m^3$(n). Where this limit curve is exceeded, there will be an additional check on the GC used for the $W_S$ control. A contractual breach shall only apply if, within one month, the limit curve is exceeded by more than 0.09 MJ/$m^3$(n), being the standard deviation for $W_S$ determined by the GC. Where the limit curve is exceeded without there being a contractual breach, the location concerned shall be inspected again the following month.

**6. Final provisions**

**6.1.**

The Metering Conditions Gas - TSO, as established by the Decision of 21 November 2006 and subsequently amended several times, is withdrawn.

**6.2**

This Decision enters into force with effect from the day after the date of issue of the Dutch Government Gazette in which it has been published.

**6.3**

This Decision is cited as: Metering Code Gas TSO.

This Decision and its explanatory notes shall be published in the Dutch Government Gazette .

’s-Gravenhage, 21 April 2016

The Dutch Authority for Consumers and Markets,
on behalf of the authority:

F.J.H. Don

board member