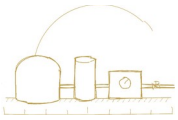
Sample Gas
NETWORKS



SAMPLE · ILLUSTRATIVE TEMPLATE
CONCEPT
EIN-C-003 · Template version 0.1
INJECTION & TREATMENT

CONCEPT · INJECTION & TREATMENT

Odorization concept and odorant record

The concept defines the selection, dosing, monitoring and record-keeping of gas odorization in the Sampleton West supply area. It serves as the basis for planning, commissioning and operation for safe odorization of the gas distributed via GDRM-W.

1 Document type

Discipline / cluster	Injection & treatment
Document class	Concept
Standard reference	GS(M)R 1996, Schedule 3; IGEM/SR/16; BS EN ISO 13734; BS EN 12186; BS EN IEC 60079-10-1; COSHH 2002; DSEAR 2002

2 Document control (to be completed · • = mandatory)

• Project number	**• Project title**
e.g. GN-2431	*e.g. network renewal Sampleton West – new GDRM, MP pipeline & H2 readiness*
Plant / site / bay	**Component / designation (KKS / RDS-PP)**
e.g. GDRM-W, HP 16 bar / MP 1 bar, 4 Industry Road	*e.g. odorization plant OD-W with dosing and monitoring equipment*
• Document number	**• Revision / version**
suggested automatically	*e.g. 00*
Document status (draft/…)	**• Date**
Draft / under review / approved	*DD.MM.YYYY*
• Client / operator	**• Contractor / author**
e.g. Sample Gas Networks	*e.g. Gas Plant South Ltd*

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1 Key data

• Odorization location	*e.g. GDRM-W, 4 Industry Road, Sampleton*
• Pressure stages	*e.g. HP 16 bar / MP 1 bar / downstream LP network*
• Odorant	*e.g. tetrahydrothiophene (THT), subject to approval*
• Target concentration	*e.g. 20 mg/m³, according to approved dosing sheet*
• Minimum concentration	*e.g. according to IGEM/SR/16 and dosing sheet, e.g. 10 mg/m³*
• Design gas flow	*e.g. 1,000 m³/h, reference state documented*
• Measuring and control points	*e.g. GDRM-W, MD-W1, MD-W2, HA-W*

The chapter texts are fully worded sample versions for the consistent sample project; adapt contents, values and responsibilities to the project.

2 Supply area, odorization obligation and system boundaries

In project GN-2431, Sample Gas Networks Ltd operates the gas pressure regulating and metering station GDRM-W with an inlet pressure of 16 bar and an outlet pressure of 1 bar. The gas is supplied via the HP connecting pipeline HD-A in steel DN 200, km 0.0–0.8, and then distributed into the PE medium-pressure pipelines MD-W1 and MD-W2 in West Road. Downstream pressure regulators supply the low-pressure service connections HA-W in PE d 32. Odorization takes place centrally at GDRM-W before the split into MD-W1 and MD-W2, so that all assigned consumers receive an adequate warning odour. The system boundary covers odorant injection, concentration control and the downstream network areas up to the defined control points.

- Supply area: Sampleton West, MD-W1, MD-W2 and HA-W.
- Odorization point: OD-W at GDRM-W, downstream of pressure regulation and upstream of the network branch.
- Gas quality: natural gas according to approved gas quality.
- HD-A and KKS-1: upstream plants without their own odorization function.
- Approval reservation: check and document possible upstream odorization.

Plant section	Pressure	Material	Odorization status	Control function
HD-A	*16 bar*	*Steel DN 200*	*Upstream of OD-W*	*Gas quality*
MD-W1	*1 bar*	*PE*	*Odorized*	*Network concentration*
HA-W	*ND*	*PE d 32*	*Odorized*	*End-point check*

3 Odorant and justification of selection

For GN-2431, tetrahydrothiophene (THT) is provided as a sulfur-containing odorant for further planning. The selection takes into account the perceptibility of the warning odour, operational experience with THT, the availability of suitable measurement methods and compatibility with the existing network odorization. Before procurement, Sample Gas Networks Ltd confirms compatibility with sealing materials, dosing components, downstream plants and the actual gas composition. The odorant must comply with the requirements of BS EN ISO 13734 and IGEM/SR/16 and the approved substance and quality documents. A later hydrogen admixture within the scope of H2 readiness is assessed separately with regard to dosing behavior, measurability, material compatibility and warning odour.

- Intended substance: THT, sulfur-containing odorant.
- Basis of selection: warning odour, network compatibility, measurability.
- Alternatives: low-sulfur or sulfur-free agents after separate assessment.
- Approval: operator decision with documented justification of selection.
- H2 readiness: no automatic approval for changed gas mixtures.

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Criterion	THT	Assessment	Evidence
Warning odour	*Characteristic*	*Suitable*	*Odour test*
Measurability	*Quantitative*	*Suitable*	*Measuring concept*
H2 compatibility	*To be checked*	*Open*	*H2 assessment*

4 Design and function of odorization plant OD-W

The odorization plant OD-W in GDRM-W is designed as a flow-proportionally controlled dosing system with a closed odorant tank. Injection takes place in the medium-pressure section downstream of pressure regulation at a point suitable in terms of flow with adequate mixing before the network outlets MD-W1 and MD-W2. The dosing system receives a gas volume signal matched to the defined reference state from the metering and volume conversion of GDRM-W. The monitored operating variables include gas flow, dosing function, tank level and relevant plant faults; an automatic fault message is transmitted to the network control center. Backflow protection, safe isolation, leak detection and maintenance access are verified in the detailed design.

- OD-W: closed tank with dosing pump and injection line.
- Dosing control: proportional to the normalized gas volume flow.
- Monitoring: level, dosing function, gas volume flow.
- Alarming: fault message to the network control center.
- Commissioning: function test and concentration verification.

Component	Execution	Monitoring	Status
Tank OD-W-B1	*Closed*	*Level*	*Planned*
Dosing OD-W-P1	*Volume-proportional*	*Dosing function*	*Planned*
Injection point	*MP outlet*	*Tightness*	*Planned*

5 Dosing concept and concentration targets

Dosing at GDRM-W is proportional to the measured gas quantity converted to the defined reference state. For the sample calculation, a target concentration of 20 mg/m³ is assumed, to be confirmed by an approved dosing sheet before operation. The minimum concentration to be maintained is governed by IGEM/SR/16 and the project-specific specification; 10 mg/m³ is used as a non-binding example value. At a gas flow of 1,000 m³/h, the target concentration results in a calculated addition rate of 20 g/h. Fluctuating gas flows, possible pre-odorization, start-up conditions and required concentration reserves are taken into account in the setting and test program.

- Calculation: $\dot{m}OD$ [g/h] = QGas [m³/h] × cTarget [mg/m³] / 1,000.
- Volume dosing: $\dot{V}OD = \dot{m}OD / \rho OD$ with consistent units.
- Target value: 20 mg/m³, according to approved dosing sheet.
- Minimum value: 10 mg/m³, subject to verification according to IGEM/SR/16.
- Under-dosing triggers alarming and technical assessment.

Gas flow	Target conc.	Addition rate	Minimum value	Assessment
250 m³/h	*20 mg/m³*	*5 g/h*	*10 mg/m³*	*Design*
500 m³/h	*20 mg/m³*	*10 g/h*	*10 mg/m³*	*Design*
1.000 m³/h	*20 mg/m³*	*20 g/h*	*10 mg/m³*	*Design*

6 Monitoring of odorization in the supply network

The effectiveness of odorization is checked at GDRM-W and at representative and hydraulically unfavorable network points in MD-W1, MD-W2 and HA-W. Sample Gas Networks Ltd carries out quantitative odorant measurements and supplementary qualitative odour tests according to an approved control plan; additional checks take place after interventions, faults and changes in gas quality. The HA-W measuring point is preferably checked at low offtake or after relevant network switching operations in order to detect possible concentration losses. The

measuring instruments are calibrated or checked according to the prescribed procedures, and the measurement uncertainty is taken into account in the assessment. If the defined minimum concentration is not reached, the cause, affected network areas and required safety measures are assessed immediately.

- Quantitative measurements: frequency according to IGEM/SR/16 and control plan.
- Odour tests: supplementary, no substitute for concentration measurement.
- Additional measurement: after a fault, refilling or network switching.
- Record: location, date, gas state, result, instrument, tester.

Measuring point	Test method	Measured value	Target	Action
GDRM-W	*Quantitative*	*20 mg/m³*	*20 mg/m³*	*None*
MD-W2	*Quantitative*	*18 mg/m³*	*≥ 10 mg/m³*	*Check trend*
HA-W	*Quantitative*	*16 mg/m³*	*≥ 10 mg/m³*	*Document*

7 Storage, filling and occupational safety

The odorant is stored at the GDRM-W site in a closed tank system secured against unauthorized access. Tanks, pipework, containment and work area are designed in accordance with the substance properties, the safety data sheet and the site-specific risk assessment. Filling is carried out exclusively by instructed staff authorized for this task in accordance with an approved operating instruction. Quantities filled, batch identification, delivery records and remaining tank contents are recorded in the odorant register. In the event of leakage or spillage, the area is secured and the operational hazardous-substance and alarm instructions are followed.

- Storage: closed, secured and appropriate to the substance.
- Filling: only according to the approved operating instruction.
- PPE: according to safety data sheet and risk assessment.
- Documentation: batch, date, delivered quantity, stock, person performing.

Test object	Requirement	Status	Evidence
Safety data sheet	*Available*	*Approved*	*SDB-OD-W*
Containment	*Tight and suitable*	*Planned*	*Plant inspection*
Staff	*Instructed*	*Provided*	*Instruction file*

8 Quantity balance and odorant record

For OD-W, Sample Gas Networks Ltd keeps a monthly quantity register with opening stock, deliveries, odorant mass dispensed, closing stock and calculated target consumption. The target consumption results from the gas quantity measured at GDRM-W and the approved dosing concentration, taking the reference state into account. For the reporting month of September 2026, 120,000 m³ of gas and a target concentration of 20 mg/m³ are assumed, resulting in a target consumption of 2.40 kg. An actual consumption of 2.50 kg leads to a deviation of +0.10 kg or +4.2 per cent, which is investigated with regard to measurement uncertainty, stock measurement, dosing behavior and possible losses. The monthly balance is reconciled with the network concentration measurements and released by the responsible operations engineer.

- Target consumption [kg] = gas quantity [m³] × target conc. [mg/m³] / 1,000,000.
- Actual consumption = opening stock + receipts − closing stock.
- Balance deviation [%] = (actual − target) / target × 100.
- Balance limit: according to operating specification, e.g. ±10 %.

Month	Gas quantity	Target consumption	Actual consumption	Deviation	Assessment
07/2026	*100.000 m³*	*2,00 kg*	*2,05 kg*	*+2.5 %*	*Plausible*
08/2026	*110.000 m³*	*2,20 kg*	*2,25 kg*	*+2.3 %*	*Plausible*
09/2026	*120.000 m³*	*2,40 kg*	*2,50 kg*	*+4.2 %*	*Plausible*

9 Faults, substitute measures and re-release

In the event of dosing pump failure, level below minimum, missing gas volume signal or abnormal concentration measurement, OD-W generates a fault message to the network control center. Operating staff immediately assess possible under-odorization, taking into account gas flow, network volume and the consumers affected. Where technically provided and approved, a redundant dosing unit can be activated or a temporary substitute dosing by qualified staff can be used. If adequate odorization cannot be demonstrated, suitable safety measures up to restriction of the affected gas supply are initiated in accordance with the operational emergency plan. After the fault has been rectified, the dosing function and the odorant concentration are demonstrated again at suitable network points and released by the responsible operations engineer.

- S1 dosing failure: alarm, cause investigation, substitute dosing.
- S2 minimum level: refilling and function check.
- S3 measuring signal fault: secure dosing, check signal.
- S4 under-concentration: network assessment and safety measures.
- Re-release: quantitative concentration measurement documented.

Fault	Detection	Immediate action	Substitute measure	Approval
Dosing failure	*Function alarm*	*Call standby*	*Redundant dosing*	*Measurement record*
Low level	*Level alarm*	*Check stock*	*Secured filling*	*Function test*
Under-odorization	*Concentration measurement*	*Secure network*	*Restrict supply*	*Concentration OK*

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10 Approval criteria

No.	Test characteristic	Target / tolerance (source)	Evidence	Actual / finding	OK	In case of deviation
1	**Selection of odorant**	Odorant suitable according to IGEM/SR/16; selection and network compatibility confirmed according to approved operator assessment.	Selection matrix, safety data sheet, substance approval	*THT provided; operator approval still pending*	☐	Revise substance selection; block procurement and filling.
2	**Dosing design**	Dosing covers the defined gas flow range and target value according to the dosing sheet, e.g. 20 mg/m³, according to IGEM/SR/16.	Design calculation, setting record, function test	*20 g/h at 1,000 m³/h verified by calculation*	☐	Resize the dosing system and re-check the setting.
3	**Minimum concentration**	Concentration at relevant network points ≥ approved minimum value according to IGEM/SR/16 and dosing sheet, e.g. 10 mg/m³.	Quantitative measurement records with measurement uncertainty	*HA-W: 16 mg/m³; minimum value met*	☐	Assess fault, secure supply and eliminate cause.
4	**Monitoring and measuring points**	Control points and quantitative measurements fully defined according to IGEM/SR/16 and the approved control plan.	Measuring point plan, test calendar, control records	*GDRM-W, MD-W1, MD-W2 and HA-W taken into account*	☐	Complete the measuring point plan and carry out missing measurements.
5	**Storage and filling**	Risk assessment, safety data sheet and operating instruction approved; storage and filling in accordance with COSHH 2002 and DSEAR 2002.	Risk assessment, operating instruction, filling record	*Tank concept in place; instruction pending*	☐	Prohibit filling until protective measures are verified.
6	**Quantity balance**	Monthly gas and odorant balance plausible; deviation within operating specification, e.g. ±10 %, or technically clarified.	Quantity register, delivery notes, stock record	*September 2026: +4.2 %; plausible by calculation*	☐	Check measuring chain, dosing, level and losses.
7	**Fault and re-release procedure**	Alarming, substitute measures and re-release verified according to IGEM/SR/16 and the operational emergency plan.	Alarm test, emergency plan, re-release record	*Alarm chain defined; function test pending*	☐	Defer operational release and re-check the emergency procedure.
8	**Completeness of operating documentation**	Approved operating, test, measurement, quantity and fault records are available; document status corresponds to operator approval.	Document register, review notes, approval record	*Concept revision 01; technical approval pending*	☐	Request missing evidence and revise the document until ready for approval.

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11 Completion notes

- All project, quantity, measured and concentration values are sample values and not actual approvals.
- Minimum and target concentrations must be defined bindingly on the basis of IGEM/SR/16, odorant, gas quality and operator approval.
- The quantity balance consistently uses the same documented gas volume reference state; measurement uncertainties must be taken into account.
- H2 readiness does not constitute approval for hydrogen admixture; separate technical and safety-related evidence is required before conversion.
- Hazardous-substance duties, explosion protection and local operating instructions must be checked for the specific plant.

12 Applicable documents

- Process flow diagram GDRM-W and odorization plant OD-W
- Piping and instrumentation diagram OD-W
- Gas quality and pressure stage concept
- Odorant specification and safety data sheet
- Dosing calculation and setting sheet OD-W
- Measuring point plan MD-W1, MD-W2 and HA-W
- Test and control plan gas odorization
- Odorant quantity register and filling record
- Operating instruction and emergency plan OD-W
- Commissioning and approval record OD-W

13 Standards and regulations

Rules (edition)	Application in this document
IGEM/SR/16; BS EN ISO 13734	Gas odorization: odorant selection, dosing technology, concentration, monitoring and safe handling.
Gas Safety (Management) Regulations 1996, Schedule 3	Gas quality and odour: content and characteristics of the gas conveyed, including the stenching requirement.
BS EN 12186	Gas pressure regulating stations: technical requirements for design and operation of GDRM-W.
BS EN IEC 60079-10-1; DSEAR 2002	Hazardous areas: assessment and classification of explosive gas atmospheres; DSEAR duties.
COSHH 2002	Hazardous substances: risk assessment, storage and handling of the odorant.

The edition agreed in the project is authoritative; deviations in the contract or in the grid operator's technical specifications take precedence.

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Approval / signatures

Role	Name	Date	Signature
Prepared: operations engineer gas pressure regulation and odorization		*DD.MM.YYYY*	
Technically reviewed: competent person for odorization plants		*DD.MM.YYYY*	
Safety review: occupational safety specialist		*DD.MM.YYYY*	
Operationally released: head of gas network operations		*DD.MM.YYYY*	
Approved: technically responsible person		*DD.MM.YYYY*	

Revision history

Rev	Date	Description	Author	Approval
00	*DD.MM.YYYY*	Initial issue (template)		

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