



Introduction of Medical Gases Pipeline System

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Introduction of HTM02-01 MGPS

Health Technical Memorandum

- HTM 00 – Policies and principles
- HTM 01 – Decontamination & Sterilization
- HTM 02 – Medical gases
- HTM 03 – Ventilation systems
- HTM 04 – Water Systems
- HTM 05 – Fire Safety
- HTM 06 – Electrical services
- HTM 07 – Environmental and sustainability
- HTM 08 – Specialist services



Introduction of HTM02-01 MGPS

HTM 22

Published in 1972

HTM 2022

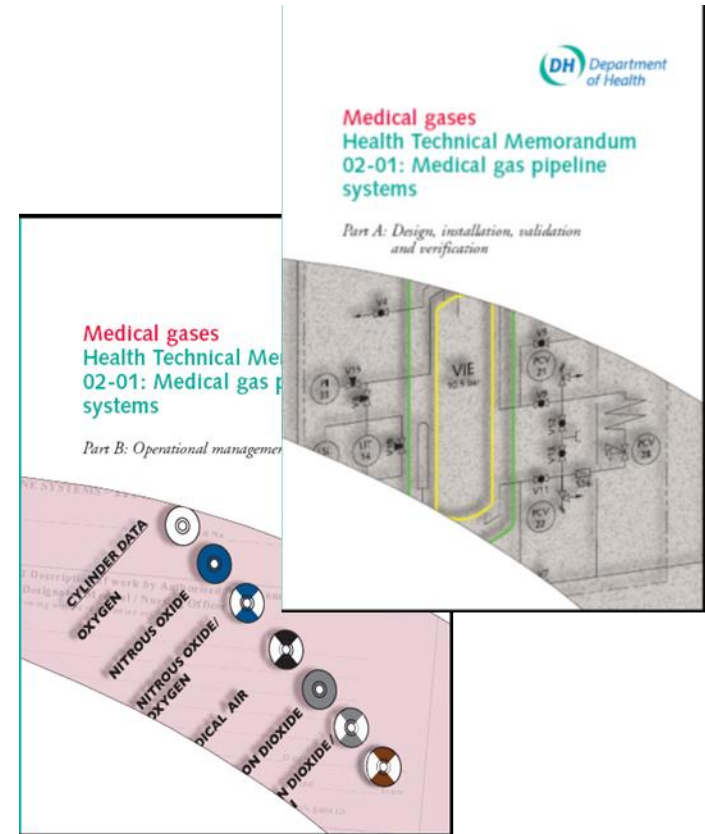
Published in 1994

Revised in 1997 with Supplementary 1 & 2

HTM 02-01

Published in 2008

Supported by Model Engineering Specification C11 (Ed. 1999) & Health Building Notes



Introduction of HTM02-01 MGPS

What is MGPS ?

Service	Symbol	Function
Oxygen	O2	Life Support and Respiratory Therapy
Nitrous Oxide	N2O	Anaesthetic and Analgesic
Nitrous Oxide/Oxygen Mixture	N2O/O2	Analgesic, particularly in maternity departments
Medical Air	MA4	Respiratory therapy for ventilators and anaesthetic machines; carry gas for nebuliser drugs or chemotherapy agents
Surgical Air	SA7	Driving Surgical tools and other equipment
Vacuum	VAC	Removal of bodily fluid from patients
Carbon Dioxide	CO2	Shielding gas for Laparoscopic procedure; stimulant for pulmonary symptom
Helium/Oxygen Mixture	He/O2	Treatment for patients with respiratory or airway obstruction; to relieve respiratory distress
Nitrogen	N2	Driving Surgical tools and other equipment

Cryogenic Oxygen System

Vacuum Insulated Evaporator (VIE)

Working Pressure 8.5 – 12 bar



Cryogenic Oxygen System

Liquid Gas

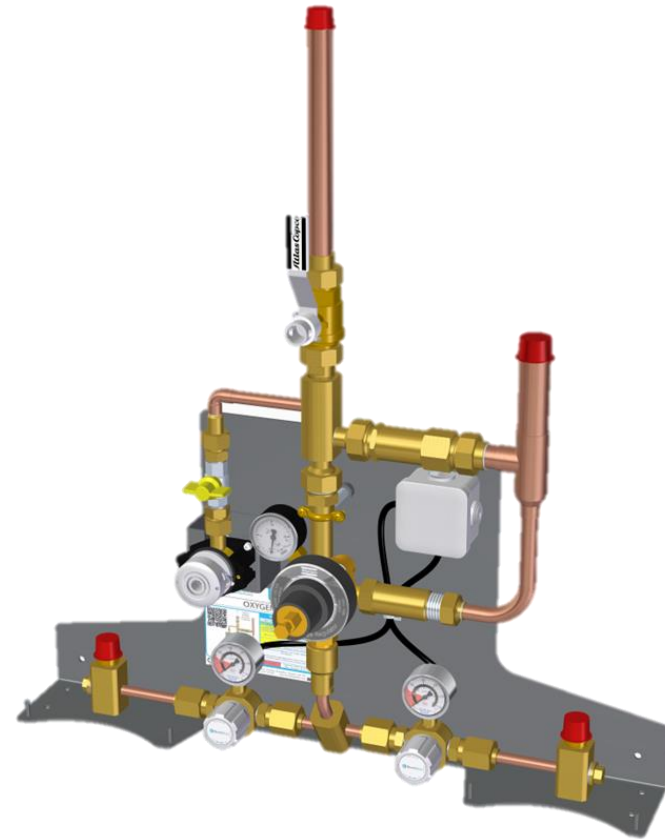
Cylinders (LGC)

Working Pressure

6.8 – 12.5 bar



Manifold System



Working Pressure
4 – 11 bar

Medical/Surgical Air System



Working Pressure
4 – 11 bar

Medical Vacuum System

Working Pressure
Min. 450mmHg
(dynamic)



Anaesthetic Gases Scavenging System



Working Pressure
Min 200 mbar



Gas Flow Requirement

Service	Location	Nominal pressure (kPa)	Design flow (L/min)	Typical flow required (L/min)	Test flow (L/min)
Oxygen	Operating rooms and rooms in which N ₂ O is provided for anaesthetic purposes	400	100 ⁽¹⁾	20	100
	All other areas	400	10	6	40
Nitrous oxide	All areas	400	15	6	40
Nitrous oxide/ oxygen mixture	LDRP (labour, delivery, recovery, post-partum) rooms	310 ⁽²⁾	275	20	275
	All other areas	400	20	15	40
Medical air 400 kPa	Operating rooms	400	40 ⁽³⁾	40	80
	Critical care areas, neonatal, high dependency units	400	80 ⁽³⁾	80	80
	Other areas	400	20	10 ⁽³⁾	80
Surgical air/ nitrogen	Orthopaedic and neurosurgical operating rooms	700	350 ⁽⁴⁾	350	350
Vacuum	All areas	40 (300 mm Hg below atmospheric pressure)	40	40 maximum, further diversities apply	40
Helium/oxygen mixture	Critical care areas	400	100	40	80

Source of Supply

Should comprise of three sources:

- **Primary;**
- **Secondary;**
- **Reserve (Third Means of Supply)**

Warning System



Validation and Verification

Carcass

- Labelling and marking
- Sleeving and supports
- Leakage
- Cross-connection

System

- Leakage
- AVSU - closure and zoning
- Cross-connection
- Terminal units and NIST connectors
- Design flow performance
- Supply function tests
- Pressure safety valves
- Warning systems
- Verification of drawings
- Purging and filling (working gases)
- Gas quality
- Gas identity

Validation and Verification

Quality & Purity Test HTM 02-01 (Eu Phar)

Gas and source	Particulates	Oil	Water	CO	CO ₂	NO and NO ₂	SO ₂	Poly-test tube (Optional)	Odour
Oxygen from PSA plant	Free from visible particles in a 75 L sample	≤0.1 mg/m ³	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	≤5 mg/m ³ ; ≤5 ppm v/v	≤300 ppm v/v	≤2 ppm v/v	≤1 ppm v/v	No discoloration	None
Nitrous oxide	Free from visible particles in a 75 L sample	–	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	–	–	–	–	No discoloration	SAFETY Not performed
Nitrous oxide/oxygen mixture	Free from visible particles in a 75 L sample	–	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	–	–	–	–	No discoloration	SAFETY Not performed
Medical and surgical air	Free from visible particles in a 75 L sample (for medical air) and 175 L sample (for surgical air)	≤0.1 mg/m ³	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	≤5 mg/m ³ ; ≤5 ppm v/v	≤900 mg/m ³ ; ≤500 ppm v/v	≤2 ppm v/v	≤1 ppm v/v	No discoloration	None
Dental compressed air	Free from visible particles in a 75 L sample	≤0.1 mg/m ³	≤1020 vpm (≤0.78 mg/L, atmospheric dew-point of -20°C)	≤5 mg/m ³ ; ≤5 ppm v/v	≤900 mg/m ³ ; ≤500 ppm v/v	≤2 ppm v/v	≤1 ppm v/v	No discoloration	None
Synthetic air	Free from visible particles in a 75 L sample	–	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	–	–	–	–	No discoloration	None
Oxygen from bulk liquid or cylinders	Free from visible particles in a 75 L sample	–	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	–	–	–	–	No discoloration	None
Helium/oxygen mixture O ₂ , <30%	Free from visible particles in a 75 L sample	–	≤67 vpm (≤0.05 mg/L, atmospheric dew-point of -46°C)	–	–	–	–	No discoloration	None

Permit-to-Work System

MEDICAL GAS PIPELINE SYSTEMS – **LOW** HAZARD PERMIT TO WORK – in accordance with HTM 02-01



Hospital/Trust _____
Delete as applicable*

Permit No. **06/ 4530**

Part 1 Description of work and authorisation/permission to proceed

The following work is to be carried out:

The work will take place between _____ hours on _____ and _____ hours on _____ and will*/will not* affect terminal units supplying (Circle gas(es))

O ₂	N ₂ O	O ₂ /N ₂ O	MA	SA/SN ₂	VAC	AGSS	He/O ₂	CO ₂
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to the following area(s):

NO OTHER WORK WILL BE CARRIED OUT UNDER THIS PERMIT

WARD SUPPLIES WILL*/WILL NOT* BE ISOLATED FOR WORK ON ALARMS*/TERMINAL UNITS*

AP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____

AP (MGPS) taking over:
Name (print) _____ Sign _____ Date _____ Time _____

Clinical permission is*/is not* required for the work described and is granted by*

DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____

Ward/Dept _____

DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____

Ward/Dept _____

DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____

Ward/Dept _____

Part 2 CP (MGPS) acceptance of work and conditions

I accept responsibility for the work as described.

No other work will be carried out by me or persons working under my control.

I am **fully conversant** with the work described and relevant health and safety requirements.

CP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____

CP (MGPS) taking over:
Name (print) _____ Sign _____ Date _____ Time _____

Part 3 Confirmation of work completion and HTM 02-01 engineering test results

Work described in Part 1 has been completed and the following HTM 02-01 engineering tests have been carried out.

TEST	P/F

I have advised the AP (MGPS) of all work and tests carried out and provided details of the installation.

Test results are*/are not* satisfactory.

The installation has been left in a safe condition.

CP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____

Part 4 AP (MGPS) authorisation to use system

The system may be taken into use.*

The system may not be taken into use, as further work under a new Permit is now necessary.*

AP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____

Part 5 Acceptance of system status by Designated Medical/Nursing Officer

I declare that all aspects of the work have been explained to me. I hereby accept the system back into service and will advise all the appropriate staff that the service has been reinstated.*

I understand that further work on the system is now required and will ensure that all patients likely to be affected by this work will have alternative provision and/or will not be put at risk.*

DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____

Ward/Dept _____

DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____

Ward/Dept _____

DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____

Ward/Dept _____

Permit-to-Work System

MEDICAL GAS PIPELINE SYSTEMS – HIGH HAZARD PERMIT TO WORK – in accordance with HTM 02-01										Department of Health
Hospital/Trust _____										Permit No. <u>06/ 2027</u>
Delete as applicable*										
Part 1 Description of work by Authorised Person and permission to proceed from Designated Medical/Nursing Officer										
The following work is to be carried out. _____ _____ _____ _____										
Drawing reference No. _____ Spec No. _____ Dated _____										
The work will take place between _____ hours on _____ and _____ hours on _____ and will affect medical gas pipelines supplying (Circle gas(es))										
O ₂	N ₂ O	O ₂ /N ₂ O	MA	SA/SN ₂	VAC	AGSS	He/O ₂	CO ₂		
to the following area(s): _____										
Supplies are*/will be* isolated*/reinstated* at										
Valve(s) No(s) _____ Location(s) _____										
AP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____										
AP (MGPS) taking over: Name (print) _____ Sign _____ Date _____ Time _____										
Clinical/Nursing permission is required for this work and is granted by										
DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____										
Ward/Dept _____										
NO OTHER WORK WILL BE CARRIED OUT UNDER THIS PERMIT										
Part 2 CP (MGPS) acceptance of work and conditions										
I accept responsibility for the work as described. No other work will be carried out by me or persons working under my control. I am fully conversant with the work described and relevant health and safety requirements.										
Other Permits to be used Type _____ No _____										
during this work: Type _____ No _____										
CP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____										
CP (MGPS) taking over, Name (print) _____ Sign _____ Date _____ Time _____										
Part 3 Confirmation of work completion, HTM 02-01 engineering test results and readiness for pharmaceutical testing										
Work described in Part 1 has been completed and the following engineering tests have been carried out.										
TEST	P/F	TEST	P/F	TEST	P/F	TEST	P/F	TEST	P/F	
I have advised the AP (MGPS) of all work and tests carried out and provided details of the installation. Test results are*/are not* satisfactory. The installation has been left in a safe condition.										
CP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____										
The system is*/is not* ready for pharmaceutical testing. This Permit is hereby cancelled*										
AP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____										
Comments (Sign and date) _____										
Part 4 Pharmaceutical tests and authorisation to use system										
GAS	O ₂	N ₂ O	N ₂ O/O ₂	MA	SA/SN ₂	VAC	AGSS	He/O ₂	CO ₂	
P/F	P/F	P/F	P/F	P/F	P/F	P/F	P/F	P/F	P/F	
Purging and filling										
Gas Identity										
Gas Quality										
Particulate matter										
Pipeline Odour										
Comments (Sign and date) _____										
The test results are*/are not* satisfactory. The system may*/may not* be taken into use.										
QC (MGPS) Name (print) _____ Sign _____ Date _____ Time _____										
AP (MGPS) Name (print) _____ Sign _____ Date _____ Time _____										
Part 5 Acceptance of system status by Designated Medical/Nursing Officer										
I declare that all aspects of the work have been explained to me. I hereby accept that the system is ready*/not ready* for service and I will undertake to advise all the appropriate staff of this service status.										
DMO/DNO Name (print) _____ Sign _____ Date _____ Time _____										
Ward/Dept _____										

Original (white) copy to be retained in book by Authorised Person (MGPS)

Pink copy to Quality Controller (MGPS)

Yellow copy to Competent Person (MGPS)

Green copy to be retained in book by Authorised Person (MGPS)

HTM 02-01 PWS/2 Ver 1.4

Permit-to-Work System

Work Requisition Form (WRF) for Medical Gas Pipeline System			
Hospital	PYNEH		Type of Gas: <u>O₂, MA4 & Vacuum</u>
Serial No.	<u>11/MG/PYNEH/645062</u>		
Part 1A		Hazard Level: <u>Low</u>	
The works of <u>O₂, MA4 & VAC system isolation at E6 of PYNEH (for the ward renovation of E6)</u>			
will be carried out on the piped medical gas system which will <u>will not</u> be interrupted for a period of approximately <u> </u> days / <u> </u> hours			
as listed hereunder:			
From	<u>09/30</u>	(time)	<u>18 Feb 2019</u>
		(date)	
To	<u>09/30</u>	(time)	<u>18 Feb 2019</u>
		(date)	
A preliminary survey on the existing system has been carried out. The system and zones described as follows will be or may be affected:			
<u>O₂, MA4 and Vacuum Supply Systems at E6 of PYNEH</u>			
Other associated work requisition form(s) in use is / are <u>Nil</u>			
issued to <u>Nil</u> dated <u>Nil</u>			
#	(Name: Timothy Law)		(Contractor Name: Linde HKO Ltd.)
			Date: <u>11/01/2019</u>
Part 1B			
Part 1A refers, according to the preliminary survey (##) conducted by Contractor (mentioned above) and in far as the existing information allows, the system and zone described above will be or may be affected.			
#	** EMSTF Authorized Person (MGPS) / Hospital Authorized Person (MGPS) (Name:)		Date: _____
Part 1C			
Work on the piped Medical Gas Systems described above can be carried out and the System ## can <u>cannot</u> be taken out of service to permit essential engineering work.			
#	Chief of Service or designated officer (Title: _____)		# Quality Controller
(Name:)	Date: _____		(Name:) Date: _____
* ensure the continuity of gas supply			
Part 2			
I accept responsibility for carrying out the work as indicated above. No attempt will be made by me or by any person under my control to work on any other part of the installation. I am fully conversant with the relevant fire and safety precautions required.			
#	(Contractor Name: Linde HKO Ltd.)		Date: _____
(Name: Timothy Law)	(if work initiated by Contractor)		
Part 3A (*Initial where the type of test has been completed)			
I confirm that the work described in Part 1 is now completed. System performance * / Supply system * / Decoupler safety valve * / Air valve service and * / MA4 connections * / leakage * / Gas connections * / Flow rate and pressure drops * / Warning system * / tests have been successfully carried out. The system(s) is / are internally cleaned * / purged * / and ready for identity and Quality tests. No additional fire hazards exist in association with this work. (##) All modifications have been recorded marked at the 'As Fitted' drawings in ink.)			
#	(Contractor Name: Linde HKO Ltd.)		Date: _____
(Name: Timothy Law)	(if work initiated by Contractor)		
Part 3B I have witnessed the tests mentioned in Part 3A which have been carried out by Contractor.			
#	** EMSTF Authorized Person (MGPS) / Hospital Authorized Person (MGPS) (Name:)		Date: _____
For completion where the works are of High level hazard or have involved cutting of an in-service pipeline / brazing			
Part 4A (*Initial where the type of test has been completed)			
Identity tests have been undertaken by the Contractor and witnessed by Q.C. for O ₂ * MA4 * MA4-Q2 * Air * MA4-Q2 * Vacuum *			
Purity tests have been carried out for O ₂ * MA4 * MA4-Q2 * Air * MA4-Q2 *			
The works have been completed. The installation can be taken into use.			
#	(Contractor Name: Linde HKO Ltd.)		Quality Controller
(Name: Timothy Law)	(Name:)		Date: _____
Part 4B			
I have witnessed the tests mentioned in Part 4A. The installation can be taken into use.			
#	** EMSTF Authorized Person (MGPS) / Hospital Authorized Person (MGPS) (Name:)		Date: _____
For completion where the works are of low level hazard or have <u>not</u> involved cutting of an in-service pipeline or brazing.			
Part 5A			
The works have been completed. The installation can be taken into use.			
#	(Contractor Name: Linde HKO Ltd.)		Date: _____
(Name: Timothy Law)			Time: _____
Part 5B			
I have witnessed the work. The installation can be taken into use.			
#	** EMSTF Authorized Person (MGPS) / Hospital Authorized Person (MGPS) (Name:)		Date: _____
Part 6A			
Based on ## Part 4B, I acknowledge notification of completion of the work.			
#	Chief of Service or		Date: _____
(Name:)	designated officer (Title: _____)		Time: _____
Part 6B			
The installation is put back into normal operation.			
#	** EMSTF Authorized Person (MGPS) / Hospital Authorized Person (MGPS) (Name:)		Date: _____
Original - to Contractor Duplicate - to Quality Controller Triplicate - to C.O.S.			
Quadruplicate - retained in Book for permanent record and retained for at least two years.			
On completion, the original should be filed by the hospital engineering staff for a period of at least six months.			
# Place for signature			
## Delete as appropriate			
### Delete this statement if not applicable			
** Delete Hospital Authorized Person (MGPS) for Schedule I Hospitals and delete EMSTF Authorized Person (MGPS) for Schedule II Hospitals			
Form No. WCR 2019 (Version Date: May 2015)			

Permit-to-Work System

Key Personnel

- Executive Manager
- Authorised Person (MGPS)
- Competent Person (MGPS)
- Designated Medical/Nursing Officer
- Quality Controller (MGPS)

Thank you