

Introduction of Medical Gases Pipeline System

Darren Cheung

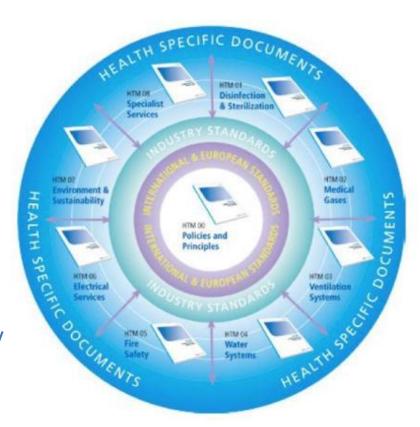
FIHEEM, FIEAust, MHKIE, CEng, IntPE(Aus), RPE 21 February 2019



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

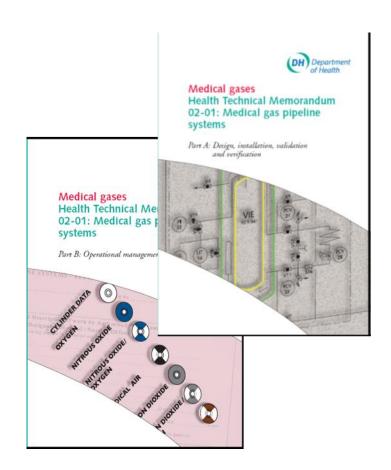
HTM 2022

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	02	Life Support and Respiratory Therapy
Nitrous Oxide	N20	Anaesthetic and Analgesic
Nitrous Oxide/Oxygen Mixture	N20/02	Analgesic, particularly in maternity departments
Medical Air	MA4	Respiratory therapy for ventilators and anaesthetic machines; carry gas for nebuliser drugs or chemotherapy agaents
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/02	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	Operating rooms	400	40(3)	40	80
400 kPa	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	со	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/m³	≤67 vpm (≤0.05 mg/L, atmospheric dew- point of −46°C)	≤5 mg/ m³; ≤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)	8	8	-	-	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/ m³; ≤5 ppm v/v	≤900 mg/ m³; ≤500 ppm v/v	≤2 ppm v/v	≤l 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/ m³; ≤5 ppm v/v	≤900 mg/ m³; ≤500 ppm v/v	≤2 ppm v/v	≤l 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)	8	8	=	-	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

	Trustapplicable*								Permit No 06/ 4530 of Heal	
Part 1 I	Description	of work and	authorisa	tion/permiss	ion to pro	occed			Part 3 Confirmation of work completion and HTM 02-01 engineering test results	
The follo	wing work is	s to be carried ou	T.						Work described in Part 1 has been completed and the following HTM 02-01 engineering tests have been carried out.	1
				G = =					TEST	P/F
The worl	k will take pl	ace betweenar		s on Il not* affect te	rminal unit	s supplying	and_ (Circle gas)	hours es))		
02	N ₂ O	O ₂ /N ₂ O	MA	SA/SN ₂	VAC	AGSS	He/O ₂	co ₂	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.	
to the fol	llowing area!	s)t:							The installation has been left in a safe condition. CP (MGPS) Name (print) Sign Date Time	
UNITS* AP (MG AP (MG Name (p Clinical	iPS) Name (piPS) taking o wint) permission	in"/is not" requi	red for the	Sign Sign e work describ	ed and is p	Date Date granted by*	Time	c	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 Dute Time	
	еря	(print)				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 ser and will advise all the appropriate staff that the service has been reinstanted.*	vice
Ward/De DMO/D Ward/De		******							and will across an tire appropriate staff that the service has been reinstance.	
DMO/D Wand/De	ept ONO Name ((print)		Sign		_ Date	Time		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."	C.
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Original (white) copy to be retained in book by Authorised Person (MGPS). Pink copy to Quality Controller (MGPS). Yellow copy to Connection Person (MGPS).

ospital/Trastelete as applicable*			-			Pen	nir No O	6/	2027	1		Or ric	Litti
Part I Description of work by Authorised Person and permis Medical/Nursing Officer	ion to proc	eed from D	esignated	Part 3 Confirmation for pharm		work co	mpletion,	-	-		st result	s and rea	diness
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													+
Drawing reference NoSpec No													
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on and will affect medical gas pipelines	supplying (C	ircle gas(es))		I have advised the A Test results are*/are The installation has	not" est	isfactory.		is carried	out and pre	wided deta	ils of the	installation	-
O ₂ N ₂ O O ₂ /N ₂ O MA SA/SN ₂ VAC	AGSS	He/O ₂	CO ₂	CP (MGPS) Name	(print)			Sie	gn	Da	te	Time	
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				AP (MGPS) Name	(print)			Sig	gri	Dat	e	Time	
Supplies are*/will be* isolated*/reinstated* at				Comments (Sign ar	ed date)								
Valve(s) No(s) Location(s)				Part 4 Pharmace	utical t	ests and	authorisat	on to u	se system				
AP (MGPS) Name (print)Sign	Date	Time		GAS	0,	N ₂ O	N ₂ O/O ₂	MA	SA/SN ₂	VAC	AGSS	He/O ₂	CO ₂
AP (MGPS) taking over.					P/F	P/F	P/F	P/F	P/F	P/F	P/F	P/F	P/F
Name (print) Signs	Date_	Time	-	Parging and filling	HISHORY							1	111200
Dinkeal/Nursing permission is required for this work and is granted by				Gas Identity									
DMO/DNO Name (print)Sign	Date	Time		Car Quality Perticulate matter									
Ward/Dept				Pipeline Odour									
NO OTHER WORK WILL BE CARRIED OUT UN	DER THIS I	ERMIT		Comments (Sign an	A Street							-	-
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I accept responsibility for the work as described.				QC (MGPS) Name			THE RESERVE		ADD-T-UDS-MUDICION			7.46	
No other work will be carried out by me or persons working under my	control.			The state of the s									
am fully conversant with the work described and relevant health and				AP (MGPS) Name	(print)			29	in	D	ate	I line	
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Type													
CP (MGPS) Name (print) Sign				DMO/DNO Name		-			Sign		ture	7 11910	
CP (MGPS) raiding over. Name (print)Sign	Date	T	lme	Ward/Dept									

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		(Linde HKO-Lal.)			
Name Tenothy Law Part 1B) (if work initiated by C	ontractor)			Date : 31/01/2019
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	hed above will be or may b				
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Name Timothy Law) (if work initiated by C	ontractif)			Dute:
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Key Personnel

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

Thank you