

Oil-free Medical Air Plant

HTM 02-01 / HTM 2022 • 60Hz • ZT-MED Tooth

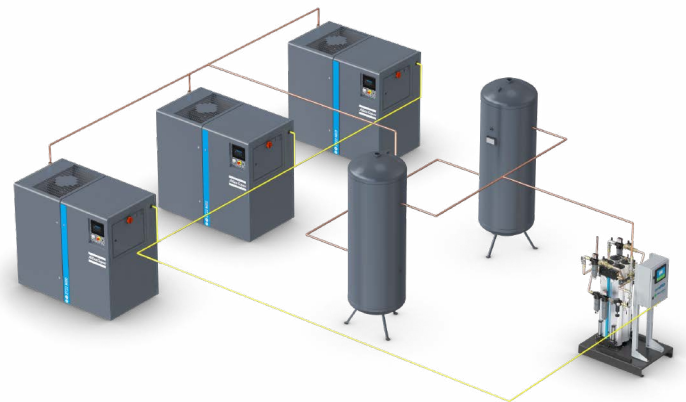
Oilfree Medical Air Plants are intended to provide a continuous supply of medical quality air conforming to the European Pharmacopoeia medicinal air monograph (ref. 1238), for respiratory use in healthcare facilities. The system shall be duplex such that the supply is maintained in single fault condition. For HTM 02-01 standby compressors shall be provided such that the specified volumetric flow is achieved with either one reserve compressor on standby where an automatic backup manifold of sufficient capacity is provided, or two compressors not running if the backup manifold is unable to deliver the medical air system design flow. For HTM 2022, compressors shall be provided such that the specified volumetric flow is achieved with one compressor on standby. Oil-free Medical Air Plants shall be supplied fully tested and comply with the United Kingdom Department of Health (DoH) publication HTM 02-01/HTM 2022, NHS Model Engineering Specification C11 and ISO7396-1. All equipment supplied is Electromagnetic Compatible (EMC) certified as defined in EN 61000-6-2/EN 61326-1 and HTM 02-01 section 2.42 and HTM 06-01 section 12.

Pneumatech Medical Gas Solutions Oil-free Medical Air Plants are CE marked to the Medical Device Directive 93/42/EEC under the auspices of notified body no. 2460 (DNV GL Presafe AS). Under this directive, Medical Air Plants are classified as Class IIb Medical Devices.

Compressors

Compressors shall be Atlas Copco ZT-MED two-stage oil free rotary tooth compressors suitable for both continuous and frequent start/stop operation at a nominal outlet pressure of 850 kPa (8.5 bar) or 1000 kPa (10 bar) gauge. The tooth element shall be stainless steel. The air quality shall be 100% oil free, certified ISO8573-1 Class 0 by an independent agency. The compressor shall have a sound insulating canopy. Compressors shall be supplied with an intercooler and aftercooler with a dedicated radial quiet running fan to maximise cooling and efficiency. Minimum IE3/NEMA Premium electric motors shall be used; motors with lower efficiency ratings are not acceptable. The compressor shall be fitted with a high-definition colour display controller, a dry motor coupling requiring no lubrication and electronic zero-loss water drains. The noise level of the compressor shall be maximum 72dB(A). The compressor shall have the following features as required by HTM02-01/HTM2022:

- Ammeter
- Main switch
- Temperature sensor downstream the aftercooler
- Failed-to-go-on-load feedback pressure switch
- Automatic restart after voltage failure



Purification Module

The duplexed filter and dryer module shall incorporate high efficiency oil coalescing filters, heatless regenerative desiccant dryers (consisting of chamber controlled desiccant towers for ease of service and to prevent desiccant powder molecules escaping the chamber and impacting surrounding valves and orifice operations), impregnated activated carbon filters and bacterial filters.

The performance of the filters shall be according to below specifications:

- Oil coalescing high efficiency filter: ISO8573-1 Air Purity Class 1, tested according to ISO 8573-2 & ISO 12500-1;
- Activated carbon filter: max remaining total oil content of 0,003 mg/m³, tested according to ISO 8573-5 & ISO12500-2;
- Bacterial filter: particle removal 0.01 micron.

Contaminants in the delivered air downstream of the bacterial filters shall be maintained at levels below those shown in the table below:

Contaminant	Threshold
H ₂ O	67ppm v/v (-46°C atm. dp)
CO	5 ppm v/v
CO ₂	500 ppm v/v
SO ₂	1 ppm v/v
NO	2 ppm v/v
NO ₂	2 ppm v/v
Dry particulates	ISO 8573-1 particle purity Class 2
Oil (droplet or mist)	0.1 mg/m ³

Tested under factory and site reference conditions.

The purification module shall have the water concentration in the delivered air continuously monitored by a dedicated sensor providing an alarm indication for high dew point on the respective dryer. The outlet air pressure shall be regulated through a duplex arrangement of pressure regulators and protected from over-pressure by duplex pressure safety valves.

Dryer Purge Control

The dryer control system shall incorporate an adjustable purge valve with patented rotating design for accurate flow control. As well as a Purge Saver Energy Management system that freezes the regeneration of the desiccant in the inactive tower once adequate dew point is reached. Only when the dewpoint level in the active tower deteriorates to an unacceptable level, will the intelligent controller switch towers. This shall be achieved by including associated software in the dryer controller to effectively manage the system.

Plant Control Unit

The central control system shall provide an intelligent human machine interface incorporating on board flash memory and real-time clock for recording operational parameters in the in-built event log. The central control system shall operate at low voltage and include BMS connection for plant fault, plant emergency, reserve fault and pressure fault. Visualisation of plant inputs, outputs and status through a web browser, using a simple Ethernet connection shall be available. The central control unit shall incorporate a user friendly 3.5" high- definition colour display with clear pictograms and LED indicators, providing easy access to system operational information. The software shall be developed according to EN 62304. A mechanical back-up facility shall ensure continued operation in the event of a control system malfunction. The control system shall normally employ automatic rotation of the lead compressor to maximise life and ensure even wear.

Digital Dew Point Display

The purification module shall incorporate a dew point hygrometer with an accuracy of $\pm 3^{\circ}\text{C}$ in the range $+20$ to -100°C atmospheric dew point and 4-20 mA analogue output. Aluminium oxide or palladium wire sensors are not acceptable. An alarm condition shall trigger on the dryer control panel if the dew point exceeds a -46°C atmospheric (67 ppm v/v) set point. Voltage-free contacts shall be included to enable the dew point alarm signal (Plant Emergency) to be connected to a central medical gas alarm system and/or building management system (BMS).

Air Receiver(s)

Air receivers shall comply with BS EN 286-1;+A2 2005 and be manufactured from heavy gauge fusion welded steel with a minimum wall thickness of 5 mm and dished ends with a minimum wall thickness of 6 mm. Total air receiver volume shall be at least 50% of the plant capacity in 1 minute in terms of free air delivered at normal working pressure. Air receivers shall be connected to the dryer in parallel such that operation of the system can continue during receiver isolation for periodic internal inspection. The receiver assembly shall be fitted with a pressure safety valve set at 11 or 14bar. The receiver shall be further protected by a fusible plug and include a 100mm nominal diameter pressure gauge complete with isolating valve.

Each air receiver shall be fitted with an electrically actuated drain valve with integral solid-state timer providing user adjustable opening time and actuation frequency. The valve shall be fitted with a manual test button and LED indication

lights to show operating status. The drain shall be protected from blockage by debris with a strainer. Float type mechanically actuated drain valves are not acceptable. Drain valves to be connected locally to a single-phase supply.

Note: Interconnecting pipework between components to be made on site and provided by the installer. Controller CAN cables are provided as a 10m assembly with each compressor which can be shortened on site if required.

Combined Air Plant Sizing Guide

In HTM02-01, the relative size of receiver capacity and compressor capacity on surgical air or combined medical/ surgical air systems changes according to the design flow rate. In order to correctly calculate the receiver capacity and compressor capacity, both the medical and surgical design flow-rates (DF's) are required. It should be noted that for all combined air systems, an additional duplex regulating station (ordered separately) is needed to supply the medical air pipeline.

	Design Flow (l/min)	Value 'A' FAD(l)
Surgical Air Compressors	<500	0.33 x DF
	500 - 3500	0.66 x DF
	>3500	0.5 x DF

Table 1: Surgical Air Flow Rate Multiplier Value 'A'

	Design Flow (l/min)	Value 'B' FAD(l)
Surgical Air Receivers	<500	1 x 200% x DF
	500 - 2000	2 x 66.6% x DF
	2001 - 3500	2 x 50% x DF
	>3500	3 x 33.3% x DF

Table 2: Surgical Air Receiver Multiplier Value 'B'

Example

Flow Rate and Dryer Sizing

Medical Air DF = 1550 l/min (FAD) (4 Bar) Surgical Air DF = 1550 l/min (FAD) (7 Bar)

Combined/total DF = 3100 l/min (FAD) (11 Bar high pressure system)

A dryer greater than 3100 l/min outlet flow should be selected

(Outlet flow is the inlet flow minus purge losses)

= PureMED35 inlet flow 3710 l/min, outlet flow 3328 l/min

Flow Rate and Compressor Sizing

From Table 1 surgical air DF is between 500-3500 l/min, so the multiplying factor 'A' = 0.66

Compressor flow rate = Med. DF + (Surg. DF x A)

= 1550 + (1550 x 0.66)

= 1550 + 1023

= 2573 l/min

We also need to add the purge losses to the compressor output. For additional purge consumption use: -

Inlet - outlet = purge losses l/min

= 3710 - 3328 = 382 l/min

Compressors should be selected with a flow rate greater than

2573 l/min + 382 l/min = 2955 l/min

Flow Rate and Dryer Sizing

From Table 2 surgical air DF is between 500-2000 l/min, so the multiplying factor 'B' = 2 x 2/3

Capacity = (Med. DF x 0.5) + (Surg. DF x B)

= (1550 x 0.5) + (1550 x 2 x 2/3)

= 775 + 2046

= 2821 litres

A combination of receivers with a minimum number of 2 should be selected

Selected receiver capacity = 3000 litres (2 x 1500 litre)

If no standard model is available for selection from the standard range a bespoke configuration of dryer, compressors and receivers are available and can be quoted by our sales and sales support teams.

Receiver selection table

Receiver Capacity (litres)	250	500	1000	1500	2000	3000
Maximum working pressure (bar)	11	11	11	11	11	11
Receiver Dimensions (diameter, height) mm	457/2020	610/2105	762/2630	900/2670	1067/2775	1220/3050
Receiver Weight (kg)	155	195	380	520	800	1000
Receiver Inlet/Outlet (mm)	28	28	42	42	42	42
Receiver Part Number	8102340570	8102340574	8102340576	8102340578	8102340580	8102340582
Receiver Kit *	8102340590	8102340594	8102340596	8102340598	8102340600	8102340602

*Receiver kit complete with pressure safety valve, zero loss electronic drain valve (with isolation and bypass valve), pressure gauge (with isolation valve), pressure relief valve, fusible plug, copper inlet/outlet connection pipes (each with isolation valve).

Receiver Capacity (litres)	250	500	1000	1500	2000	3000
Maximum working pressure (bar)	14	14	14	14	14	14
Receiver Dimensions (diameter, height) mm	457/2050	610/2105	762/2650	915/2650	1067/2725	1220/3200
Receiver Weight (kg)	160	200	500	575	950	1400
Receiver Inlet/Outlet (mm)	28	28	42	42	42	42
Receiver Part Number	8102340571	8102340575	8102340577	8102340579	8102340581	8102340583
Receiver Kit *	8102340591	8102340595	8102340597	8102340599	8102340601	8102340603

For single vessel applications, lockable bypass line valves are available.

28mm lockable line valve - 6000723

42mm lockable line valve - 6000725

*Output flow rate includes calculated purge lost during the regeneration process.

Purification Module selection table

Model Name	PureMED 21	PureMED 35	PureMED 52	PureMED 71	PureMED 104	PureMED 142
Inlet flow (l/min) at 7.5 bar	1274	2124	3115	4248	6230	8495
Outlet flow (l/min) at 4 bar line pressure *	1045	1742	2554	3483	5109	6966
Inlet flow (l/min) at 10 bar	1756	2917	4276	5833	8523	11638
Outlet flow (l/min) at 7 bar line pressure *	1527	2535	3715	5068	7402	10109
Inlet flow (l/min) at 13 bar	2237	3710	5465	7447	10902	14866
Outlet flow (l/min) at 10 bar line pressure *	2008	3328	4904	6682	9781	13337
Footprint L x W x H (mm)	1050 x 750 x 1580	1050 x 750 x 1580	1050 x 750 x 1830	1050 x 750 x 1960	1100 x 1080 x 1680	1100 x 1080 x 2060
Dryer weight (kg)	250	290	310	380	520	670
Inlet/outlet connection (mm)	28	28	28	28	42	42
Supply voltage (v)	115/230	115/230	115/230	115/230	115/230	115/230
Supply frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60
Central control supply – single phase (mm ² /Amps)	1.5 (1)	1.5 (1)	1.5 (1)	1.5 (1)	1.5 (1)	1.5 (1)
Part number – Dryer @ 4 bar outlet	8102371019	8102371025	8102371031	8102371034	8102371040	8102371043
Part number – Dryer @ 7 bar outlet	8102371020	8102371026	8102371032	8102371035	8102371041	8102371044
Part number – Dryer @ 10 bar outlet	8102371021	8102371027	8102371033	8102371036	8102371042	8102371045

*Output flow rate includes calculated purge lost during the regeneration process.



ZT MED (Tooth) Oil-free Compressor Selection Table – Fixed Speed 60Hz

Model Name	ZT15 MED	ZT18 MED	ZT22 MED
Output flow (l/min) 8.6 bar variant *	2052	2724	3222
Output flow (l/min) 10 bar variant *	1842	2310	2736
Footprint L x W x H (mm)	1760 x 1026 x 1621	1760 x 1026 x 1621	1760 x 1026 x 1621
Compressor weight (kg)	1060	1080	1086
Service connection (mm)	42	42	42
Noise level (dB[A])	65	67	69
Maximum ambient temperature (°C)	50	50	50
Supply voltage (v)	380	380	380
Supply frequency (Hz)	60	60	60
Nominal motor rating (kW)	15	18	22
Full load current per compressor (A)	27.1	32.5	39.7
Part number – 8.6 bar	8102 3397 56	8102 3397 78	8102 3398 00
Part number - 10 bar	8102 3397 46	8102 3397 68	8102 3397 90

*Output flow stated at reference conditions



ZT MED (Tooth) Oil-free Compressor Selection Table – Variable Speed 60Hz

Model Name	ZT22 VSD MED	ZT37 VSD MED	ZT55 VSD MED
Output flow (l/min) 8.6 bar variant *	1206 - 3102	2472 - 5706	2472 - 8328
Output flow (l/min) 10 bar variant *	1182 - 2844	N/A	N/A
Footprint L x W x H (mm)	2195 x 1026 x 1621	2440 x 1026 x 1880	2440 x 1026 x 1880
Compressor weight (kg)	1120	1432	1432
Service connection (mm)	42	42	42
Noise level (dB[A])	72	71	71
Maximum ambient temperature (°C)	46	46	46
Supply voltage (v)	380	380	380
Supply frequency (Hz)	60	60	60
Nominal motor rating (kW)	22	37	55
Full load current per compressor (A)	39.7	66.8	99.2
Part number – 8.6 bar	N/A	on request	on request
Part number - 10 bar	8102 3398 12	N/A	N/A

*Variable speed drive compressors operate from 4-13 bar – start current not applicable for VSD



HTM 02-01 4 Bar 60Hz Medical Air Plant Specifications – ZT MED

Model Name	MEDAIR - ZT 4233600474	MEDAIR - ZT 4233600475	MEDAIR - ZQ 4233600476	MEDAIR - ZQ 4233600477	MEDAIR - ZQ 4233600478	MEDAIR - ZP 4233600479
Model Description	MEDAIR- ZT4-1670 HTM02-01 60Hz	MEDAIR- ZT4-2554 HTM02-01 60Hz	MEDAIR- ZT4-3339 HTM02-01 60Hz	MEDAIR- ZQ4-4327 HTM02-01 60Hz	MEDAIR- ZQ4-5109 HTM02-01 60Hz	MEDAIR- ZP4-6643 HTM02-01 60Hz
Free Air Delivered (l/min)(1)	1670	2554	3339	4327	5109	6643
Nominal Motor Power per Compressor (kW)	15	22	15	18	22	18
Compressor Model	ZT15 MED 8.6 Bar	ZT22 MED 8.6 Bar	ZT15 MED 8.6 Bar	ZT18 MED 8.6 Bar	ZT22 MED 8.6 Bar	ZT18 MED 8.6 Bar
Electrical Supply	380 V 3~ 60 Hz	380 V 3 ~ 60 Hz	380 V 3~ 60 Hz	380 V 3 ~ 60 Hz	380 V 3~ 60 Hz	380 V 3 ~ 60 Hz
Starting Method	SD	SD	SD	SD	SD	SD
Full Load Current per Compressor (A)(2)	27.1	39.7	27.1	32.5	39.7	32.5
Approx. Starting Current (A)	211	307	211	245	321	245
Motor Rated Supply per Compressor (A)	32	50	32	40	50	40
Compressor Configuration	Triplex	Triplex	Quadruplex	Quadruplex	Quadruplex	Pentaplex
Duty Compressors	1	1	2	2	2	3
Standby Compressors	2	2	2	2	2	2
Sound Pressure Level/ Compressor dB(A)(4)	67	72	67	70	72	70
Cooling air flow per compressor (m ³ /s)	0.7	1.0	0.7	0.8	1.0	0.8
Air Receiver(s)	2	2	2	2	2	2
Receiver Volume (litres)	500 11 Bar	1000 11 Bar	1000 11 Bar	1500 11 Bar	1500 11 Bar	2000 11 Bar
Air Receiver Total Capacity (litres)	1000	2000	2000	3000	3000	4000
Dryer Model	PureMED35 7.5-4 Bar	PureMED52 7.5-4 Bar	PureMED71 7.5-4 Bar	PureMED104 7.5-4 Bar	PureMED104 7.5-4 Bar	PureMED142 7.5-4 Bar

1. Data measured and stated in accordance with ISO1217 Ed.4, Annex C & Annex E and Pneurop/Cagi PN2CPTC2 with one compressor on standby and with an air intake at 1013 mbar, 20°C and 0% RH. Tropical thermostats may reduce the free air delivery marginally.
2. These are typical figures and may vary with the specific motor used. Consult the motor nameplate for exact figures.
3. Two standby compressors should be provided unless the automatic backup manifold is of sufficient capacity to deliver the system design flow.
4. Measured in free field conditions in accordance with the Pneurop/Cagi PN8TNC2.2 test code. Subject to a tolerance of +/- 3 dB
5. Other models and layouts are available to suit particular site requirements. Contact your local representative for support.
6. Design flow in terms of free air delivered after losses at working pressure with reserve compressor(s) on standby. Tolerance ±5%.

HTM 2022 4 Bar 60Hz Medical Air Plant Specifications – ZT MED

Model Name	MEDAIR - ZD 4233600483	MEDAIR - ZD 4233600484	MEDAIR - ZD 4233600485	MEDAIR - ZT 4233600486	MEDAIR - ZT 4233600487	MEDAIR - ZT 4233600488	MEDAIR - ZQ 4233600489
Model Description	MEDAIR- ZD4-1712 HTM 2022 50Hz	MEDAIR- ZD4-2000 HTM 2022 50Hz	MEDAIR- ZD4-2427 HTM 2022 50Hz	MEDAIR- ZT4-3423 HTM 2022 50Hz	MEDAIR- ZT4-4363 HTM 2022 50Hz	MEDAIR- ZT4-5109 HTM 2022 50Hz	MEDAIR- ZQ4-6697 HTM 2022 50Hz
Free Air Delivered (l/min)(1)	1712	2000	2554	3423	4363	5109	6697
Nominal Motor Power per Compressor (kW)	15	18	22	15	18	22	18
Compressor Model	ZT15 MED 8.6 Bar	ZT18 MED 8.6 Bar	ZT22 MED 8.6 Bar	ZT15 MED 8.6 Bar	ZT18 MED 8.6 Bar	ZT22 MED 8.6 Bar	ZT18 MED 8.6 Bar
Electrical Supply	400 V 3~ 50 Hz	400 V 3 ~ 50 Hz	400 V 3~ 50 Hz	400 V 3 ~ 50 Hz	400 V 3~ 50 Hz	400 V 3 ~ 50 Hz	400 V 3~ 50 Hz
Starting Method	SD	SD	SD	SD	SD	SD	SD
Full Load Current per Compressor (A)(2)	27.1	32.5	39.7	27.1	32.5	39.7	32.5
Approx. Starting Current (A)	204	234	305	204	234	305	234
Motor Rated Supply per Compressor (A)	32	40	50	32	40	50	40
Compressor Configuration	Duplex	Duplex	Duplex	Triplex	Triplex	Triplex	Quadruplex
Duty Compressors	1	1	1	2	2	2	3
Standby Compressors	1	1	1	1	1	1	1
Sound Pressure Level/ Compressor dB(A)(4)	67	70	72	67	70	72	70
Cooling air flow per compressor (m ³ /s)	0.7	0.8	1.0	0.7	0.8	1.0	0.8
Air Receiver(s)	1	1	1	1	1	1	2
Receiver Volume (litres)	1000 11 Bar	1000 11 Bar	1500 11 Bar	2000 11 Bar	3000 11 Bar	3000 11 Bar	2000 11 Bar
Air Receiver Total Capacity (litres)	1000	1000	1500	2000	3000	3000	4000
Dryer Model	PureMED35 7.5-4 Bar	PureMED52 7.5-4 Bar	PureMED71 7.5-4 Bar	PureMED71 7.5-4 Bar	PureMED104 7.5-4 Bar	PureMED104 7.5-4 Bar	PureMED142 7.5-4 Bar

1. Data measured and stated in accordance with ISO1217 Ed.4, Annex C & Annex E and Pneurop/Cagi PN2CPTC2 with one compressor on standby and with an air intake at 1013 mbar, 20°C and 0% RH. Tropical thermostats may reduce the free air delivery marginally.
2. These are typical figures and may vary with the specific motor used. Consult the motor nameplate for exact figures.
3. Two standby compressors should be provided unless the automatic backup manifold is of sufficient capacity to deliver the system design flow.
4. Measured in free field conditions in accordance with the Pneurop/Cagi PN8TNC2.2 test code. Subject to a tolerance of +/- 3 dB
5. Other models and layouts are available to suit particular site requirements. Contact your local representative for support.
6. Design flow in terms of free air delivered after losses at working pressure with reserve compressor(s) on standby. Tolerance ±5%.

Pneumatech Medical Gas Solutions reserves the right to change or revise specifications and product design in connection with any features or our products. Such changes do not entitle the buyer to corresponding changes, improvements, additions or replacements for equipment previously sold or shipped.

