Meech

Operating Manual

EX Cabinet Cooler

Contents

1. Introduction

The Meech Air Technology Cabinet Cooler (product code: A70025EX) uses compressed air to provide a cold air source which stops industrial cabinet/panels or enclosures overheating and prevents ingress of contamination such as dust or moisture.

The EX Cabinet Cooler Unit (excluding Solenoid Valve and Thermostat) is intrinsically safe, and requires virtually no maintenance. They have no moving parts making them ideal for harsh environments.

Ex Cabinet Coolers can be used with electrical thermostats or solenoids but they need to be positioned outside the hazardous area.

2. Safety and Inspection

Meech Cabinet Coolers are packed carefully at our factory. Nevertheless, we recommend careful examination of the carton and contents for any damage.

To protect yourself and others when using compressed air, you should be aware of the following general safety guidelines:

- Warning – When compressed air is misused, it can cause serious injury or even death.
- Never point an air hose at anyone in fun or to remove dirt from clothing or the body.
- Never use compressed air without adequate eye and ear protection. Use safety glasses with side shields or goggles and ear protectors.
- Before attempting to disconnect a hose from an air line, the air should be cut off, and the remaining air bled from the line.
- Keep air hoses off the floor where they become tripping hazards and are subject to damage by vehicles, doors, and dropped tools. If possible, suspend air hoses from overhead.

Please be aware of the following safety guidelines specific to the Cabinet Cooler:

- Cabinet Coolers create both hot and cold air so parts of the unit will become hot.
- The user shall ensure that the certification of any enclosure onto which this is installed, is not compromised by the installation or operation of this device.
- The equipment shall be suitably earthed (grounded) prior to operation. Earth continuity shall be maintained between the equipment and the enclosure to which it is installed on.
- Inlet pressure shall not exceed 5.5 Bar (80 PSI).

- Inlet air temperature shall not exceed 55°C.

- The Meech Cabinet Cooler has the following IECEx certification:
  Ex h IIC T4 Gb Ta -10°C to +55°C
  All other parts of the Cabinet Cooler System including the Solenoid Valve and Thermostat must be installed outside the hazardous area.

- The cold fraction adjustment valve must not be altered and remain at 2.5 turns open.

- Ambient operating temperature must not exceed 55°C

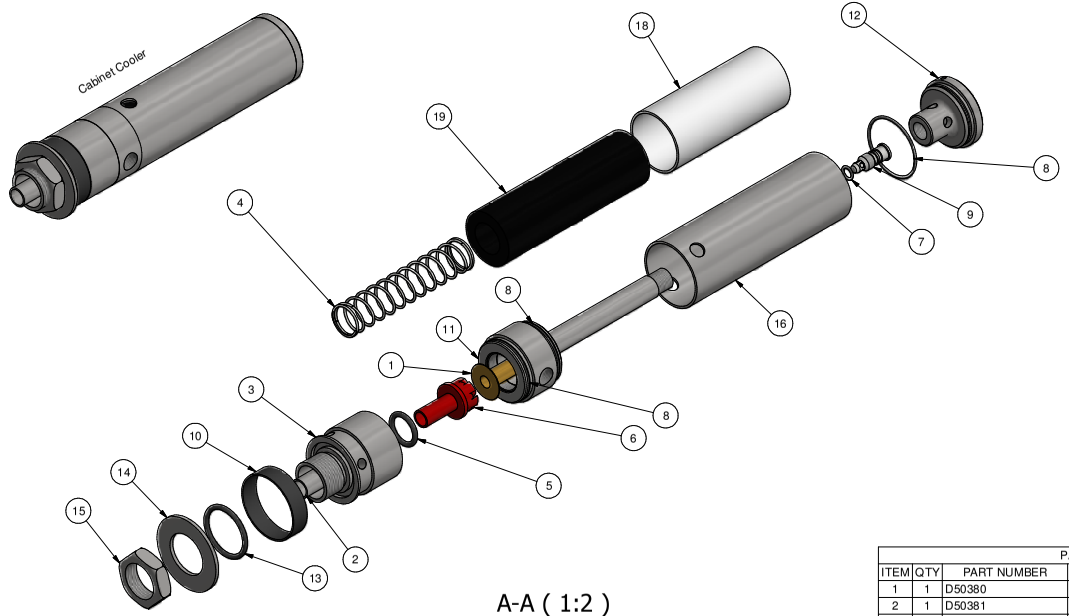
- Ambient operating temperature can not drop lower than -10°C

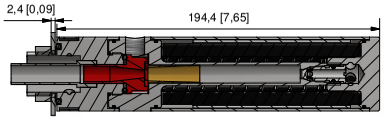
3. Maintenance

The Meech Cabinet Cooler has no moving parts. Clean compressed air moving through the Cabinet Cooler will not cause wear on any of the components.

Occasionally, dirt, water or oil may enter the cooler from the compressed air supply. This could hinder the performance. If this happens simply take the unit apart, clean the parts with soapy water, allow drying time and then reassemble.

When reassembling ensure you tighten all the components. If the parts are not tightened correctly, the coolers performance may be affected. Also, please ensure the generator is fitted. At the same time the element in the air filter should be changed.





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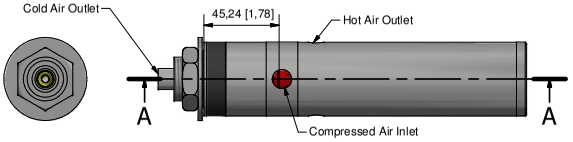

PARTS LIST				
ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
1	1	D50380	Brass Sleeve	Brass
2	1	D50381	Bulk Head Fitting Insert	Stainless Steel
3	1	D50032	Bulkhead Fitting	Stainless Steel
4	1	D50088	Silencer Spring	Steel
5	1	D50075	O Ring 17 x 3	Nitrile
6	1	Multiple See Page 2	Generator	Zytel 101
7	1	D50076	O Ring 3/8 x 1/4	Nitrile
8	3	D50074	O Ring 38 x 1.6	Nitrile
9	1	D50083	Small Hot End Valve	Stainless Steel
10	1	D50035	Relief Valve	Nitrile
11	1	D50383	Spin Chamber	Stainless Steel
12	1	D50056	Hot End Cap	Stainless Steel
13	1	D50034	O Ring 30 x 3	Nitrile
14	1	D50036	Bulk Head Washer	Stainless Steel
15	1	D50033	Bulkhead Nut 33mm	Stainless Steel
16	1	D50061	Hot End Sleeve	Stainless Steel
17	1	D50081	End Cap	PVC
18	1	D50094	Plastic Insert	Plastic
19	1	D50040	Silencer Foam	Foam

Meech

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web: www.meech.com

TITLE: Cabinet Cooler Assembly

DRAWING No: C000015

MATERIAL: Various

FINISH: Various

TOLERANCE UNLESS OTHERWISE SPECIFIED
Machined Work Metric ±0.1mm
Unmachined Fabricators ±1mm
Angular ±0°30'

DIMENSIONS IN MM
DO NOT SCALE
CRITIQUAL TO FUNCTION (CTF) DIMENSIONS AS MARKED

PROJECTION | Sheet: A3 | Scale

Date: 22/08/2016 | Drawn by: David.Hyde

REVISION:

SHEET: 1 / 2

STATUS:

SIGNED OFF:

4. Compressed Air Supply

It is recommended to use a 5-micron (or smaller) filter to remove water and dirt from the compressed air supply. A 5-micron filter will remove 99% of foreign material from the air supply; the use of an oil filter with an effective filtration of 0.01 ppm will remove the oil droplets for an even cleaner compressed air supply.

If this is not EX certified it will need to be installed outside the hazardous area.

Failure to use a filter may cause clogging and freezing of the compressed air line and the components within the Cabinet Cooler.

When the temperature of the compressed air within the Cabinet Cooler reaches 0°C the water vapour in the air will start to freeze. This could potentially cause a problem with ice clogging the orifices of the Cabinet Cooler.

In this instance an air dryer must be used to lower the dew point and keep water vapour out of the air line. A dryer rated at -19°C will produce a dew point low enough to eliminate the water vapour freezing.

5. Compressed Air Lines Sizes

Figuring the correct pipe size for your compressed air system is an important task. Pipe that is sized too small can create big pressure losses and reduce operating efficiency.

Many people who plan the piping never consider the fittings or the future.

FITTINGS: Every pipe fitting creates a certain amount of increased frictional air loss that is equal to a specified length of pipe. Any turns in the pipe at fittings, ells, tees, and valves increase pressure drops even more.

FUTURE: Are you planning to add more equipment in the next year or two? Then plan for larger piping now. Since the material costs in piping are low compared to installation or replacement cost, it's wise to select pipe of an adequate size. If there is any doubt that a pipe size may create a pressure drop, use the next largest size. Remember that an oversize pipe compensates for possible scale build-up and provides for future expansion of the overall air system.

Steps to calculating overall piping size for your compressed air system:

1. Determine your air compressor's maximum CFM.

2. Draw a piping schematic and show all pipe fittings, valves, etc.

3. Measure and write the corresponding lengths of pipe on your schematic, then total the length of all straight pipes needed and note that on your schematic.

4. Using TABLE 1 (over page), find your compressor's CFM number on the far left column, and then go to the right until you see the column header with nearest length in feet to your total pipe length. Find where the CFM & PIPE LENGTH intersect on the chart and it will show the recommended pipe size for that length.

5. Take that pipe size to TABLE 2 and use the table to find all the EQUIVELENT

LENGTHS OF PIPE needed for each PIPE FITTING. Write these lengths on your piping schematic at each fitting.

6. TOTAL all the EQUIVELENT LENGTHS OF PIPE needed for each PIPE FITTING and add to your total of straight length of pipe. This will give you a new and more accurate total pipe length needed.

7. Take your new total of EQUIVELENT LENGTH OF PIPE IN FEET back to TABLE 1 and use this number to determine the PIPE SIZE you need.

Specific Cabinet Cooler Pipe Size

To obtain maximum performance from the Cabinet Cooler, accurate measures of air pressure and air volume must be obtained. Line pressure of 70-80 psi (5-5.5 Bar) can be present without a sufficient volume (cfm) of air.

To ensure that both pressure and volume are present to efficiently operate the Cabinet Cooler a line size of 3/8” pipe or ½” hose should be used for applications 10ft from the main header. Use ½” pipe or ¾” hose up to 20ft. For pipe size over 20ft from he header please refer to section 5.

How to determine what size of PIPE you need for compressed air lines:

Your Air Compressor's CFM	TABLE 1: EQUIVALENT LENGTH OF PIPE LINES IN FEET *Don't forget to include *PIPE FITTINGS in your final calculations*							
	25 feet	50 feet	75 feet	100 feet	150 feet	200 feet	250 feet	300 feet
1	½	½	½	½	½	½	½	½
2	½	½	½	½	½	½	½	½
3	½	½	½	½	½	½	½	½
5	½	½	½	½	½	½	½	½
10	½	½	½	¾	¾	¾	¾	¾
15	½	¾	¾	¾	¾	¾	¾	¾
20	¾	¾	¾	¾	¾	¾	¾	¾
25	¾	¾	¾	¾	¾	1	1	1
30	¾	¾	¾	¾	1	1	1	1
35	¾	¾	1	1	1	1	1	1
40	¾	1	1	1	1	1	1	1
50	1	1	1	1	1	1	1	1
60	1	1	1	1	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/4
70	1	1	1	1	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/4
80	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2
100	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2
125	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2
150	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/4	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2
175	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2	2	2	2	2
200	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2	2	2	2	2
225	1 - 1/2	1 - 1/2	1 - 1/2	1 - 1/2	2	2	2	2
250	2	2	2	2	2	2	2	2
275	2	2	2	2	2	2	2 - 1/2	2 - 1/2
300	2	2	2	2	2	2	2 - 1/2	2 - 1/2
350	2	2	2	2	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2
400	2	2	2	2	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2
450	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	3	3
500	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	3	3
550	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	3	3	3	3
600	2 - 1/2	2 - 1/2	2 - 1/2	2 - 1/2	3	3	3	3
750	2 - 1/2	2 - 1/2	2 - 1/2	3	3	3	3	4
1000	3	3	3	3	3	3	4	4

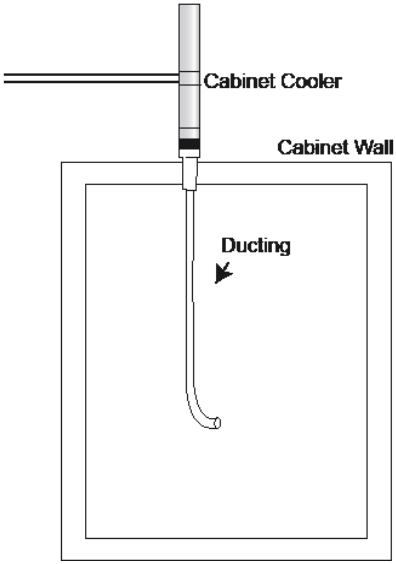
TABLE 2: * EQUIVALENT LENGTH OF PIPE (FT.) for PIPE FITTINGS *Add these numbers for each pipe fitting to total length of straight pipe*					
Pipe Size	Long Rad, Ell or run of tee	STD. Ell or Run of reduced tee	Tee Thru side outlet	Globe Valve	Gate Valve
½	0.62	1.55	3.1	17.3	0.36
¾	0.82	2.06	4.12	22.9	0.48
1	1.05	2.62	5.24	29.1	0.61
1 - 1/4	1.38	3.45	6.9	38.3	0.81
1 - 1/2	1.61	4.02	8.04	44.7	0.94
2	2.07	5.17	10.3	57.4	1.21
2 - 1/2	2.47	6.16	12.3	68.5	1.44
3	3.07	6.16	15.3	85.2	1.79
4	4.03	7.67	20.2	112	2.35

6. Installation

The Meech Cabinet Cooler is suitable for category 1 (zone 1) T4 applications where ATEX and/or IECEx certification is required.

All other parts of the Cabinet Cooler System including the Solenoid Valve and Thermostat must be installed outside the hazardous area.

The drawing below shows the recommended way to fit Meech EX Cabinet Cooler.



To fit the Cabinet Cooler follow the steps below:

A. Drill Hole

Drill 1.02” (26 mm) hole in the position you would like to fit the Cabinet Cooler.

Please be aware that 200mm of the Cabinet Cooler will extend from the outside of the enclosure so allow clearance.

It's recommended that the Cabinet Cooler is installed in the top of the enclosure. However, if space is an issue the Cabinet Cooler can be installed in any position, even upside down, with no loss of performance.

B. Remove bulk head nut & washer from the bottom of the Cabinet Cooler

C. Fit desired generator

As standard the Cabinet Cooler is supplied with a red (Refrig) 15cfm, 293W (1000 Btu/hr) generator. To change the generator simply unscrew the bulk head fitting and replace the generator with another colour. Please remember to re-fit the o-ring and screw bulk head fitting until tight.

Four generators are provided with the Meech Cabinet Cooler. Information on all generators and sizing can be found in section 7.

D. Fit Cabinet Cooler in place

From outside the enclosure, place the cold end of the Cabinet Cooler into the drilled hole.

E. Re-fit bulk head nut and washer

Once this is done tighten bulk head nut & washer until the Cabinet Cooler is secure.

F. Connect cold air ducting to the end.

It's recommended that the cold air ducting is directed from the cabinet cooler to the bottom of the enclosure. This will allow for increased cooling throughout the cabinet/ panel. This will also avoid any excess water vapour in the compressed air being blown over components.

If the air is clean and dry the cold air ducting can be directed to particularly hot areas of the enclosure. Alternatively you can drill holes in the cold air ducting and allow air to be distributed to several areas. If you choose this method you will need to plug the end of the cold air ducting and ensure the holes drilled into the tube are equal to the hole at the end.

Where necessary please fit appropriate filters.

G. Connect air supply

The Cabinet Cooler has a ¼" bsp female air inlet. Standard pneumatic push-fit compressed air fittings can be used on the Cabinet Cooler.

Please refer to section 5 when deciding on pipe sizes.

7. Operation

1. Cabinet Cooler

The Cabinet Cooler is factory set to deliver the most efficient cooling needed to maintain a desired temperature inside an enclosure.

At 80psi (5.5 Bar), 10cfm (70% of 15 cfm, red generator) of cold air will exit from the Cabinet Cooler providing 293 Watts (1,000 Btu) of Cooling.

The bladder valve acts as a pressure relief valve. This will automatically release air from the enclosure maintaining approximately 8” water column (0.0199 Bar) positive pressure inside the cabinet/panel.

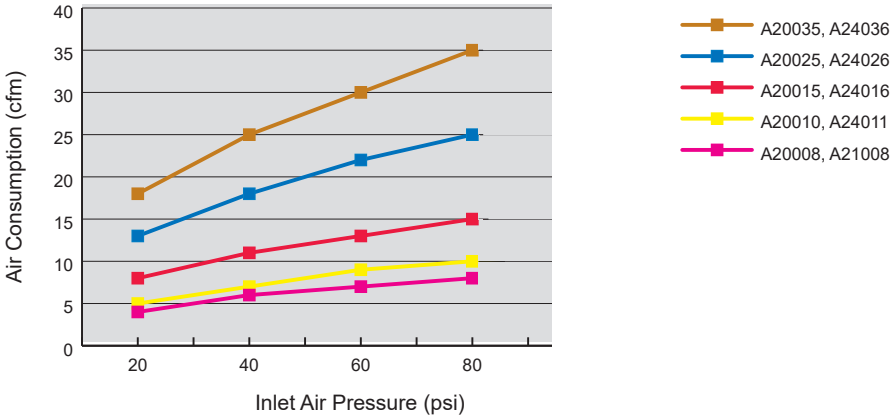
2. Generators

The generators within the Cabinet Cooler control the air consumption and air flow. They also influence the achievable temperatures.

The chart below shows achievable temperatures with different generators fitted. Please note these are approximate temperatures and should only be used as a guide. The Cabinet Cooler will perform differently when used in other environments.

			Inlet air pressure			
Product Code	Generator Colour	Consumption in CFM (l/min)	60 PSI (4.1 Bar)		80 PSI (5.5 Bar)	
			CFM at test	2.5 turns of needle valve	CFM at test	2.5 turns of needle valve
			cfm (l/min)	°C	cfm (l/min)	°C
A21010	**Green**	10L (283)	15 (425)	-26.9	19 (538)	-35.5
A20010	**Yellow**	10H (283)	13 (368)	-27.2	18 (510)	-35.0
A21015	**White**	15L (425)	17 (481)	-29.8	22 (623)	-34.2
A20015	**Red**	15H (425)	16 (453)	-28.3	21 (595)	-32.9
A21025	**Grey**	25L (708)	23 (651)	-23.3	28 (793)	-23.7
A20025	**Blue**	25H (708)	23 (651)	-19.0	30 (849)	-23.4
A21035	**Beige**	35L (991)	27 (765)	-16.7	34 (963)	-16.5
A20035	**Brown**	35H (991)	30 (849)	-15.8	36 (1019)	-18.6

The graph below shows air consumption at varying inlet air pressures.



4 x High fraction generators are supplied as standard:

Yellow 10cfm (283 l/min) - Cooling capacity of 190W (650 Btu/hr)
Red 15cfm (425 l/min) – Cooling capacity of 293W (1000 Btu/hr)
Blue 25cfm (708 l/min) – Cooling capacity of 499W (1,700 Btu/hr)
Brown 35cfm (991 l/min) – Cooling capacity of 703W (2,400 Btu/hr)

A single Meech Cabinet Cooler is capable of cooling up to 703 Watts (2,400 Btu/hr). Optimising the cooling capacity is still a vitally important factor, choosing the correct generator will not only reduce running costs but also extend the life of the compressor.

To choose the most efficient generator you must calculate the total heat load in Watts Btu/hr to which the enclosure is exposed. The total heat load is a combination of the heat transfer from outside due to ambient air temperature and the heat which is created internally.

For more information on calculating test loads refer to the Meech Air Technology brochure, available to download from www.meech.com.

3. Humidity

If a cabinet cooler is run constantly relative humidity inside the cabinet stabilises at approximately 45%.

To prevent condensation forming on the cold air pipe close off any vents or fan outlets on the outside wall of the enclosure. This reduces the ambient air from circulating within the cabinet/panel and reduces the chance of condensation.

Fans can be installed into the enclosure which will help to circulate air.

9. Approvals

The Meech Cabinet Cooler is IP56 (Nema 4/12)

CE Ex h IIC T4 Gb Ex II 2G

1180 Temp Class T4(135°C); T amb -10°C to +55°C

Model: Cabinet Cooler Ex Baseefa16ATEX0042X

IECEx BAS 16.0087X

A Declaration of manufacture is available on request.

10. Troubleshooting

Air flow

Problems with compressed air flow can be caused by:

1. Air pressure too low – increase air pressure at the relevant regulator

2. Undersized compressed air lines – replace pipes with correct sizes, see section 5

3. Blocked compressed air line – remove blockage

4. Insufficient compressor size – Check compressor size for fitting Cabinet Cooler

Air Temperature

Problems with air temperature can be caused by:

1. Incorrect generator fitted – Check and replace generator, see section 7

2. Ambient compressed air temperature too high – Check compressed air temperature and use cooler if necessary

3. Loose/missing parts – Check all Cabinet Cooler parts are screwed in tightly and there are no missing parts.

4. Water vapour in the compressed air supply – Check compressed air supply

5. Air pressure too low – increase air pressure at the relevant regulator

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