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PPS

TECHNICAL DOCUMENTATION

SYSTEM PPS FOR COMPRESSED AIR NETWORK

CONTENTS

PRODUCT DESCRIPTION

BACKGROUND

Today's companies are faced with the necessity to constantly develop, expand and modify production methods. Coupled with increasingly automated production technologies, this necessity makes large-scale, easy-to-modify compressed air distribution systems a must.

System PPS is specially designed for building compressed air distribution systems.

Its materials and assembly methods make it a flexible and scalable solution that is compatible with all PREVOST systems and able to meet even the most complex equipment problems.

Installation is quick, easy and requires no costly or complicated tools. Once installed, the completed ringmain ensures a good seal, outstanding mechanical strength and lasting efficiency.

CORROSION

The aluminium alloy pipes, baked e-coating finish and render System PPS pipes and fittings completely resistant to internal and external corrosion and damage and significantly extend their service life under normal conditions of use.

IMPACT RESISTANCE

System PPS pipes and fittings are constructed of materials which offer excellent resistance to internal pressure and external impacts, even violent ones.

Exposed main pipes conveying compressed air must be installed at least 8.2 feet above the floor to protect them from any risk of impacts.

UV RAYS

Aluminium is not affected by UV rays, allowing it to be used inside as well as outside.

FIRE RESISTANCE

Aluminium has excellent fire resistance properties. It does not burn or spread flames. PPS system is certified B – s1, d0 according to standard EN 13501-1 : Fire test to Building Material

SOURCES OF HEAT

The extremely tough aluminium system withstands temperatures of up to 176 °F.

See the effect of temperature on pressure on page 3.

FLOW RATE

Because of their low friction coefficient, wide inner sections and the absence of obstacles or narrow passages, PPS fittings offer excellent flow rates.

INSTALLATION

Quick and easy to install, System PPS ringmains are ready to operate in less time.

SIZES AND STANDARDS

Every component is guaranteed when used as indicated and solely within the limits of this technical documentation and meets the American Society of Mechanical Engineers standard for pressure equipment ASME B31-1.

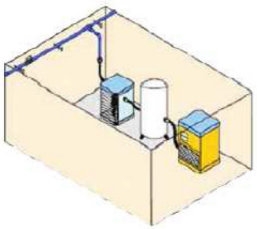
The manufacturer, PREVOST, shall not be held responsible if any ringmain or system built with System PPS components is not used or assembled according to the specifications and limits indicated in this document.

A number of checks are required when installing and commissioning a ringmain.

VIBRATIONS

Compressors generate vibrations which could have an adverse effect on the system. Never connect rigid PPS tubes directly to a compressor. Use flexible connection hoses instead.

If any pipes must be anchored to a source of vibration, attach them with rubber-lined clamps.



COLOUR

The available colours correspond to various applications :

- Blue = Compressed air
- Gray = Vacuum
- Green = Nitrogen

System PPS components are finished with electrocoat treatment that also provides optimum corrosion protection.

COMPATIBILITY WITH COMPRESSOR OILS

Aluminium does not react when in contact with compressor oils.

CALCULATING PIPE DIAMETER

FIELDS OF USE

System PPS is designed to convey compressed air at pressures of up to 232 psi at 68°F.

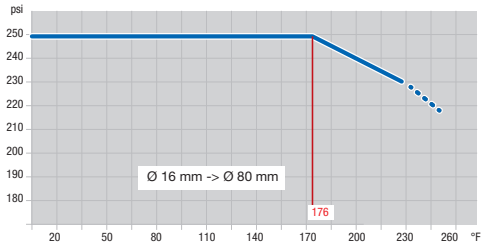
The range consists of components for building complete systems, from compressors and treatment to points of use.

System PPS is fully compatible with all PREVOST product ranges.

EFFECTS OF TEMPERATURE ON PRESSURE

System PPS components can be used at a constant pressure of 232 psi.

As shown in the graph below, the operating pressure drops as the ambient temperature rises.



SIZING

The main network should form a loop.

Install the main pipe with a 1 % slope to enable condensates to drain toward low points. The main pipe must be large enough to carry the entire flow of the compressor.

The main pipe must be large enough to handle maximum flow rates required for the service pressure and avoid pressure drops, which are a waste of energy.

The maximum amount of air required for each downpipe depends on the peak consumption.

Each downpipe, multiplied by a factor (ranging from 0.1 and 1) representing how often the connected equipment is used, provides the amount of average consumption.

The sum of the average consumption rate of each downpipe gives the maximum flow rate required for the main pipe.

As a precaution and to allow for add-ons, add an additional percentage to this value.

Once you have obtained the maximum flow for each downpipe and the main pipe, you can easily calculate the diameter of each pipe using the chart below.

The pipe diameter is calculated taking into account:

- the desired flow rate (max. pressure drop 5% relative to inlet pressure)
- the required length of main pipe

When the main piping is built as a loop, the length to consider is the maximum distance between the air inlet and the further outlet.

The table below can be used to define the pipe diameter (in mm) as a function of the total pipe length and the flow rate* (m^3/h):

COMPRESSOR*					MAIN RING LENGTH								
POWER		FLOW			30 m	76 m	152 m	305 m	610 m	914 m	1219 m	1524 m	1981 m
kW	HP	Nm^3/h	Nl/min	Scfm	100 ft	250 ft	500 ft	1000 ft	2000 ft	3000 ft	4000 ft	5000 ft	6500 ft
2,2	3,00	22	367	13	1/2"	1/2"	3/4"	3/4"	1"	1"	1"	1 1/4"	1 1/4"
3	4,00	30	500	18	1/2"	1/2"	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"
4	5,00	40	668	24	1/2"	3/4"	3/4"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/2"
5,5	7,50	50	833	29	1/2"	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/2"	1 1/2"
7,5	10,00	70	1167	41	3/4"	1"	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"	1 1/2"	1 1/2"
11	15,00	100	1667	59	1"	1"	1 1/4"	1 1/4"	1 1/2"	1 1/2"	2"	2"	2"
15	20,00	150	2500	88	1"	1 1/4"	1 1/4"	1 1/2"	2"	2"	2"	2"	2 1/2"
18	25,00	180	3000	106	1 1/4"	1 1/4"	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"
22	30,00	220	3674	130	1 1/4"	1 1/4"	1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"
26	35,00	260	4167	147	1 1/2"	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"
30	40,00	350	5833	206	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"	3"	3"
37	50,00	370	6179	218	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"	3"	3"	3"
45	60,00	500	8350	294	2"	2"	2"	2 1/2"	2 1/2"	3"	3"	3"	3"
55	75,00	550	9185	324	2"	2"	2"	2 1/2"	2 1/2"	3"	3"	3"	
75	100	750	12500	441	2 1/2"	2 1/2"	2 1/2"	2 1/2"	3"	3"			
90	125	1000	16667	589	2 1/2"	2 1/2"	2 1/2"	3"	3"				
110	150	1100	18370	649	2 1/2"	2 1/2"	2 1/2"	3"					
132	175	1500	25000	883	3"	3"	3"	3"					
160	215	1750	29167	1030	3"	3"	3"						
200	270	2000	33333	1177	3"	3"	3"						

** 6 bar*

Several factors can cause losses in pressure:

- Surface conditions.
- Changes in directions and curves.
- Obstacles (such as valves).
- Sudden or gradual variations in diameter.

INSTALLATION METHOD

EXPANSION - CONTRACTION

All materials change size as temperatures vary. Generally, plastics expand and contract more than metal.

When compared with a reference temperature (installation temperature):

- they expand as temperatures rise,
- and contract as temperatures drop.

The extent of these variations is given by the coefficient of linear expansion d.

For System with aluminium pipes PPS, this efficient d is 13.7 x 10^{-6} in/in/°F or 13.7 x 10^{-6} inch per inch per degree Fahreneit.

The chart below shows the various coefficients of linear expansion for a number of widely used materials:

Steel	7.2 x 10^{-6} in/in/°F
Copper	9.4 x 10^{-6} in/in/°F
PPS	**13.7 x 10^{-6} in/in/°F**
ABS	60 x 10^{-6} in/in/°F
PVDF	72 x 10^{-6} in/in/°F
PP	90 x 10^{-6} in/in/°F
PE	120 x 10^{-6} in/in/°F

This phenomenon should be taken into consideration when designing and building any kind of system. It is obtained by the following formula:

$$\Delta L = d \times L \times \Delta T$$

Where:

d = coefficient of expansion

L = length of pipe

ΔT = temperature difference in degrees Fahreneit

DL = difference in length (expansion or contraction)

Example: installation temperature 60°F; length of pipe 60 ft (720 in); service temperature 100°F

ΔT = 100 - 60 = 40°F

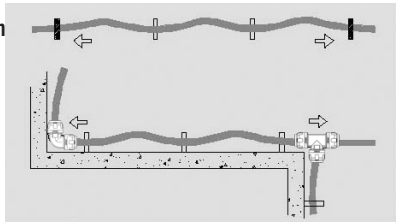
DL = 13.7 x 10^{-6} x 720 x 40 = **0.39 in**

Expansion

- Bending of pipes between two fixed points.
- Compression of structures, clamps or devices forming fixed points that could cause pipes to bend, sag or burst.

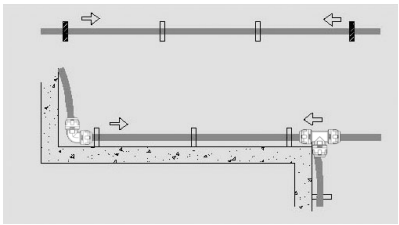
Contraction

- Tension



in pipes between two fixed points.

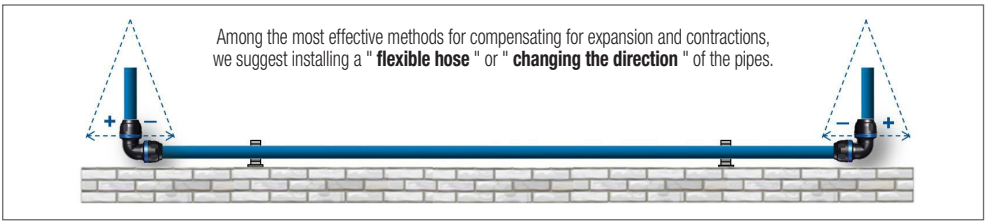
- Compression of structures, clamps or devices forming fixed points that could cause pipes to bend or burst



To prevent the effects of expansion and contraction from significantly damaging the system and its appearance, follow the directions below to allow the pipes to flex and compensate for expansion and contraction:

- Support and strengthen the system such that pipework can flex freely between two fixed points.
- Add a special fitting between fixed points that are spaced far enough apart to cause significant contraction or expansion.

The main consequences of expansion and contraction are:



ANCHORING METHOD

Pipe clamps and anchoring systems must be selected with great care. They must have a number of features:

- Clamps should firmly anchor pipes to structures in the room;
- They must neither scratch nor mar pipes in any way;
- They must provide enough space between pipe work and walls or other obstacles to allow maintenance and other work;
- They must hold pipes perfectly straight and be able to support the weight of accessories and loaded pipes by fastening them to each anchoring point;
- Be especially careful when fastening accessories and valves, which open and close. They should not be anchored to pipes and be fastened such that they can operate and be removed.
- Take particular care when anchoring pipe ends (caps, wall brackets, downpipes).
- The aluminium pipes don't ensure the supporting of additional elements (filters, water separators, valves...). Wall brackets are provided for this purpose.

When spacing clamps, use the distances given in standard charts calculated according to the diameter, temperature and weight of the particular utility being conveyed.

Sliding clamps must not come into contact with connections or other accessories so that the pipe can continue to move freely.

When installing pipes horizontally or vertically at less than 8.2 feet above the floor, double the number of clamps to make sure that the pipes are firmly anchored to the structure.

DISTANCES BETWEEN CLAMPS		
Diameter	Clamps	Space between clamps at 86°F
1/2''	PPS1 CI16	10 ft
3/4''	PPS1 CI20	10 ft
1''	PPS1 CI25	10 ft
1 1/4''	PPS1 CI32	10 ft
1 1/2''	PPS1 CI40	13 ft
2''	PPS1 CI50	13 ft
2 1/2''	PPS1 CI63	13 ft
3''	PPS1 CI80	13 ft

ASSEMBLY: GENERAL RULES AND PRECAUTIONS

WARNING : Carefully follow the instructions given when choosing the type of ring main to be installed.

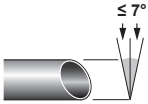
A poorly designed ring main could create a safety hazard. Observe the following precautions :

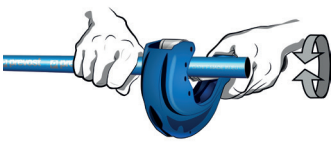
- **Ringmains in diameter must be installed by a professional**
- The networks must be as straight as possible so as to avoid pressure drops and a multiplication of the opposing forces (complicated runs with a large number of elbows, tees, etc., should be avoided).
- Flexible expansion (or connection) hoses with swivel couplings must be installed on all straight runs over 164 feet long in order to:
  - facilitate assembly of the network (much shorter installation time)
  - protect the systems by absorbing and dissipating forces (expansion and retraction)
- Fit one fixed clamp every 65 feet and at least one of each ring main to fasten it securely to the building wall.
- Cut pipes cleanly to avoid any strain on the components

1 CUT THE PIPE

Cuts must be straight and perpendicular to the axis of the tube. A maximum of 7° in relation to the ideal theoretical plane of 90° is tolerated for cuts.

Use an " **PPS CTU** " pipe cutter.

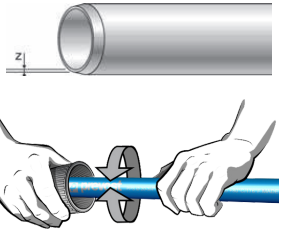




Warning: To re a proper seal, make sure all ends are smooth and free of scratches, impacts or ovalisation.

2 CHAMFER - BURR

Burr the inside of the pipe. Make sure to bevel the outside end of the pipe (Z = half the pipe's thickness).



Diameter	Bevelling tools
1/2" to 2"	PPS CH50
2 1/2" to 3"	PPS CH110

Ensure that the quality of the chamfer is good and that there is no chip inside.

3 CLEANING THE TUBE AND COUPLING

To avoid potential problems with pneumatic equipment, check the appearance of the sealing area surfaces and eliminate residue, dust and shavings inside the pipe after cutting.

We highly recommend cleaning the components – especially the ends of the tubes and the insides of the couplings – with a clean cloth and a gentle degreaser formulated for surfaces. We recommend using **soapy water** (Ref : **PPS AL**), as grease and lubricants impair the quality of the products during their service life.

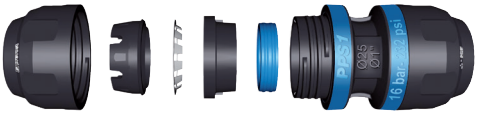
Avoid damage from scratches or impacts.

4 ASSEMBLE COUPLING ON TUBE

1_Loosen the nut about one turn *(do not remove it)*.

2_Check for contaminants inside the fitting *(seal and teeth)*.

3_Make sure that all the components are inside the coupling and correctly positioned. Make sure that the retaining teeth are in the same direction as shown on the diagram below.



4_Before inserting the tube, tighten the outer nut by hand in order to take up any play between the components.

5_ With a felt-tip pen, mark the full length of the pipe that will be nesting inside the fitting. The use of a marker on the coupling or the PPS1 CLE wrench makes it easier to determine the insertion depth.

The tightening of the nut is included in this nesting length.

Pipe Ø	Length (in)
PPS TUB16	1.3
PPS TUB20	1.5
PPS TUB25	1.7
PPS TUB32	2
PPS TUB40	2.4
PPS TUB50	2.8
PPS TUB63	3.3
PPS TUB80	3.7

• Check the insertion length from the stop shoulder inside the coupling to the top of the nut

(Ref : **PPS1 CLE**)

• Draw the insertion length on the tube for each new connection to be made

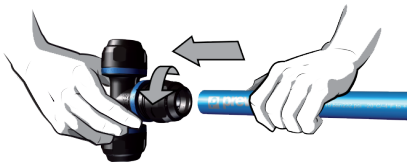
• Put lubricant on tube end and into the fitting with the assembly fluid (PPS AL)

WARNING

It is forbidden to use lubricants, oils or greases if you are uncertain about their chemical compatibility. We advise using soapy water, as the presence or use of any kind of grease leads to uncertainty and reduces the connection capacities between the tube and the couplings.

When a doubt, contact us!

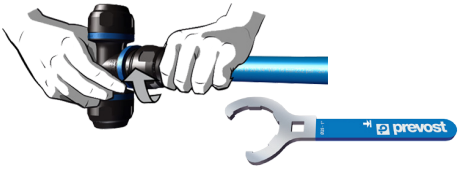
6_ Insert the pipe in a slight twisting motion until it reaches the back of the fitting



5 TIGHTENING THE NUT of the coupling

Tighten the nut manually as far as possible, then tighten up to the recommended torque value using the wrench (ref. **PPS1 CLE**) while maintaining the coupling with the key PPS CLESTD.

Check that the pen mark is no longer showing.



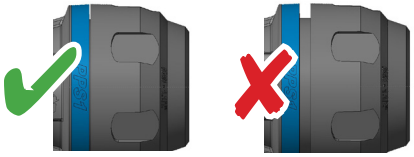
A torque wrench may be used in the square on the PPS1 CLE wrench.

Draw a mark on the nut, body and tube so as to easily see the extent of tightening and, if necessary, retighten the nut when the network is first pressurised.

After pressurising, check that the mark is aligned and that no nuts are not loose.

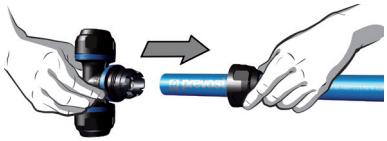
Pipe Ø	lbf-ft
PPS TUB16	10
PPS TUB20	10
PPS TUB25	15
PPS TUB32	22
PPS TUB40	22
PPS TUB50	30
PPS TUB63	37
PPS TUB80	37

Final checking: right / wrong



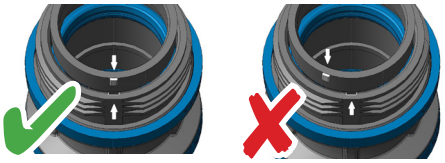
6 DISASSEMBLY

PPS pipes and fittings disassemble in a snap. Simply loosen the nut on the fitting completely and carefully pull out the pipe



Warning: Before refitting the nut, always check the pipe for damage. ***See section 2 for information.***

In case of reassembling operation, check position of the lug



7 THREAD SEALS

For a tighter seal, apply Teflon® (Ref: TEFLON 12), Teflon® thread sealant, oakum or pipe joint compound to pipe threads and tappings.

Moderately tighten with the key to avoid damaging the fitting.

8 EXPANSION OR CONTRACTION CAUSED BY TEMPERATURE FLUCTUATIONS

Install a compensation system that will absorb pipe expansion or contraction, to be calculated at the drawing up.

The client is responsible in case of non respect of the conception rules.

PREVOST stays at your disposal to create or validate your plans.

9 CLEANING THE RINGMAIN

Before fitting couplings and accessories to the ring main, blow air through it to remove any burrs inside.

10 BEFORE PRESSURISING

System PPS ringmains can be pressurised immediately once installed.

1_Once the system is installed, check for any anomalies and any signs of impacts, dents or abrasion. Make sure that all fittings have been correctly connected to the pipe and that the mark made during installation is no longer visible.

Immediately replace any defective or uneven sections on the ringmain.

2_Check all clamp or wall bracket anchoring points.

3_Pressurise the ringmain in two phases:

- Before reaching the required test pressure, test for leaks and / or faulty connections first by gradually raising the pressure to 43 psi.
  Once all checks and adjustments have been made, maintain the pressure at 3 bar and wait at least 5 minutes before raising it again.
- When pressurising, raise the pressure gradually and continuously (15 psi every 4 to 6 seconds) until the gauge registers half of the test valuee.

When the gauge registers the test pressure, maintain it for at least 10 minutes (slight dips are tolerated).

After the first 48 to 96 hours, check all seals and make sure that no nuts have been loosened after components have been installed. The mark made when tightening the nuts *(section 6)* should be aligned.

PROBLEMS/INCIDENTS

In the event of problems, the customer or fitter must provide the following information in order to file a claim:

- the operating pressure
- the temperature in the room
- the total meterage and the various sections used
- the description of the incident: when, exactly where, etc.
- pictures of the network,

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