Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Network Type	Gas	Calc. Method	Modified Darcy
Description	Typical Compressed Air distribution network		

Typical Compressed Air distribution network.
Consists of two 750 CFM Compressors, 1500CFM Air Dryer, 3000lt, Air Receiver, Air Filter and main plant ring main.
Note: Velocity of air flow should be limited to less than 6m/s to prevent carry over of moisture past drain legs - Ref. Guide to the Selection and Installation of Compressed Air Services, 3rd Ed, British Compressed Air Society.

All node pressures are in absolute units. i.e gauge plus atmospheric. Atmospheric pressure at this site is 14.53 psi, therefore pressure at Compressor No 1 is 101.2 psia-14.53 ~ 86.67 psi (g).
Fitting losses in ringmain and distribution outlets not listed in detail, only a k value entered.
Minimum pressure calculated as 99.55 psia (85 psi g) at Pump Assembly area, minimum required is 75 psi gauge, so compressor pressure settings could be reduced, resulting in operating cost savings.

No allowance for leakage consumption has been made, this should be added as a consumption of say 5 to 10%.
Detailed design of each offtake / consumption area can be done in it's own network model, this model is merely the overall compressor feed and ringmain model.

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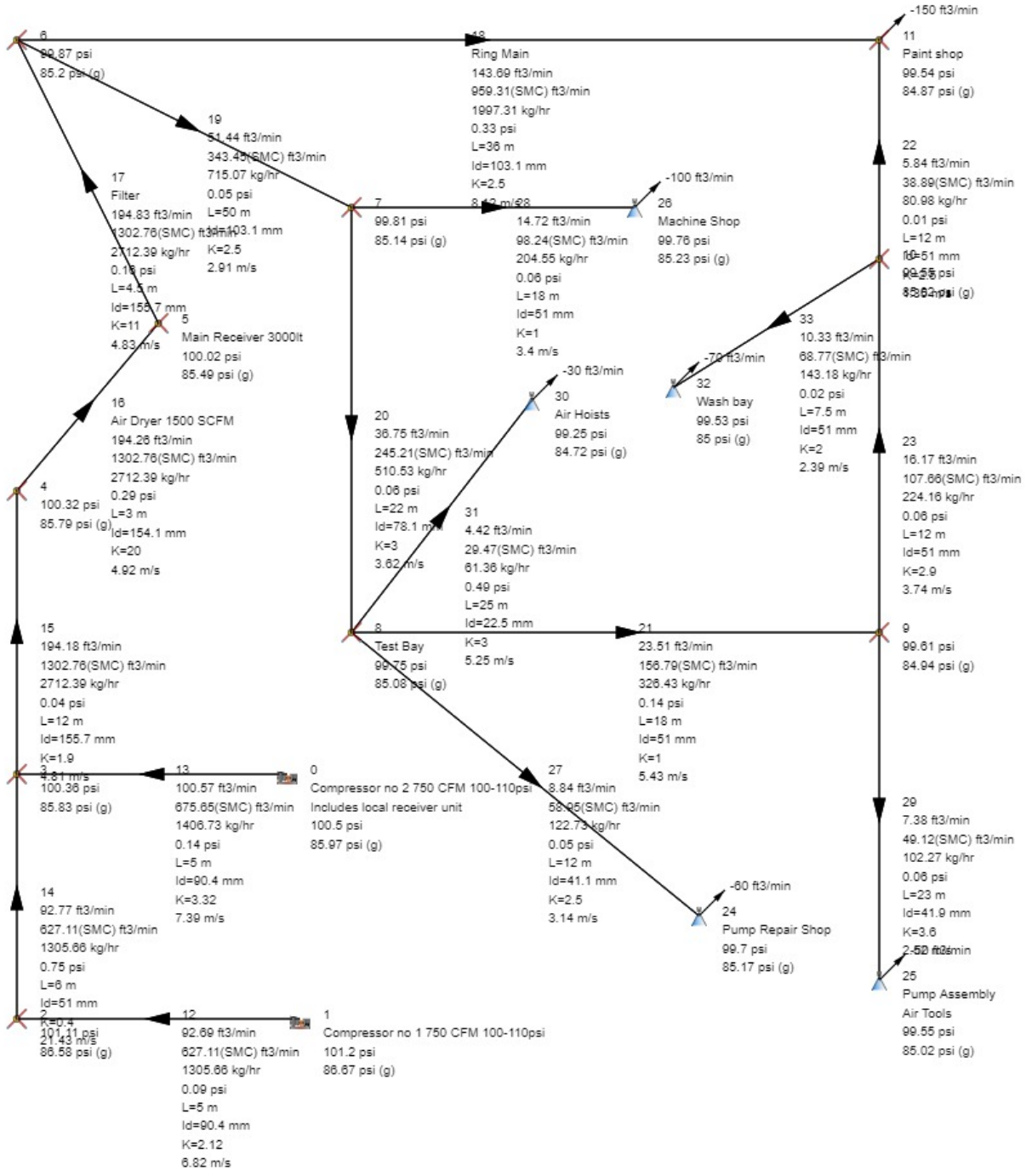
Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		



Typical Compressed Air distribution network

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	12	From node to node	1 - 2
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.29 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 3.5" ISO 336 / BS 3600 5.6mm wall	Pipe Class	
Nominal Diameter	90 mm	Inside Diameter	90.4 mm
Outside Diameter	101.6 mm	Pipe Length	5 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Entrance - flush 1/2	1	0.5	0
Butterfly Valve up to 200mm	1	0.9	45
Bend - 90 degree elbow r/d = 3	3	0.24	12

Total Fittings k	2.12	Total Fittings kf	0

Flow Rate	92.69 ft3/min	Flow at SMC	627.11 ft3/min
Mass Flow Rate	1305.66 kg/hr	Velocity	6.82 m/s
Mach number	0.1		
Friction Loss	0.03 psi	Fitting Losses	0.06 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.09 psi		
Entry Total Pressure	101.2 psi	Exit Total Pressure	101.11 psi
Reynolds No.	2352743	Friction Factor	0.01729 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	13	From node to node	0 - 3
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.23 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 3.5" ISO 336 / BS 3600 5.6mm wall	Pipe Class	
Nominal Diameter	90 mm	Inside Diameter	90.4 mm
Outside Diameter	101.6 mm	Pipe Length	5 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Entrance - flush 1/2	1	0.5	0
Butterfly Valve up to 200mm	1	0.9	45
Bend - 90 degree elbow r/d = 3	3	0.24	12
Tee - Line to Branch	1	1.2	60

Total Fittings k	3.32	Total Fittings kf	0

Flow Rate	100.57 ft3/min	Flow at SMC	675.65 ft3/min
Mass Flow Rate	1406.73 kg/hr	Velocity	7.39 m/s
Mach number	0.05		
Friction Loss	0.03 psi	Fitting Losses	0.11 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.14 psi		
Entry Total Pressure	100.5 psi	Exit Total Pressure	100.36 psi
Reynolds No.	2517328.35	Friction Factor	0.01728 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	14	From node to node	2 - 3
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.28 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 2" ISO 336 / BS 3600 4.5mm wall	Pipe Class	
Nominal Diameter	50 mm	Inside Diameter	51 mm
Outside Diameter	60.3 mm	Pipe Length	6 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Tee - Line to Line	1	0.4	20

Total Fittings k	0.4	Total Fittings kf	0

Flow Rate	92.77 ft3/min	Flow at SMC	627.11 ft3/min
Mass Flow Rate	1305.66 kg/hr	Velocity	21.43 m/s
Mach number	0.08		
Friction Loss	0.64 psi	Fitting Losses	0.11 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.75 psi		
Entry Total Pressure	101.11 psi	Exit Total Pressure	100.36 psi
Reynolds No.	4166807.41	Friction Factor	0.01962 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	15	From node to node	3 - 4
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.22 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 6" ISO 336 / BS 3600 6.3mm wall	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	155.7 mm
Outside Diameter	168.3 mm	Pipe Length	12 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Sudden Enlargement - 1:5	1	1	50
Butterfly Valve up to 200mm	1	0.9	45

Total Fittings k	1.9	Total Fittings kf	0
Flow Rate	194.18 ft3/min	Flow at SMC	1302.76 ft3/min
Mass Flow Rate	2712.39 kg/hr	Velocity	4.81 m/s
Mach number	0.07		
Friction Loss	0.02 psi	Fitting Losses	0.03 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.04 psi		
Entry Total Pressure	100.36 psi	Exit Total Pressure	100.32 psi
Reynolds No.	2814212.37	Friction Factor	0.01542 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	16	From node to node	4 - 5
Description	Air Dryer 1500 SCFM	Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.22 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 6" ISO 336 / BS 3600 7.1mm wall	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	154.1 mm
Outside Diameter	168.3 mm	Pipe Length	3 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No

Pipe Fitting Description	Qty	K value	Kft value
Air Dryer Pressure Drop	1	20	3

Total Fittings k	20	Total Fittings kf	0
Flow Rate	194.26 ft3/min	Flow at SMC	1302.76 ft3/min
Mass Flow Rate	2712.39 kg/hr	Velocity	4.92 m/s
Mach number	0.1		
Friction Loss	0 psi	Fitting Losses	0.29 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.29 psi		
Entry Total Pressure	100.32 psi	Exit Total Pressure	100.02 psi
Reynolds No.	2842222.65	Friction Factor	0.01545 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	17	From node to node	5 - 6
Description	Filter	Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.19 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 6" ISO 336 / BS 3600 6.3mm wall	Pipe Class	
Nominal Diameter	150 mm	Inside Diameter	155.7 mm
Outside Diameter	168.3 mm	Pipe Length	4.5 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	11	Total Fittings kf	0
Flow Rate	194.83 ft3/min	Flow at SMC	1302.76 ft3/min
Mass Flow Rate	2712.39 kg/hr	Velocity	4.83 m/s
Mach number	0.26		
Friction Loss	0.01 psi	Fitting Losses	0.15 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.16 psi		
Entry Total Pressure	100.02 psi	Exit Total Pressure	99.87 psi
Reynolds No.	2804799.33	Friction Factor	0.01542 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	18	From node to node	6 - 11
Description	Ring Main	Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.18 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 4" ISO 336 / BS 3600 5.6mm wall	Pipe Class	
Nominal Diameter	100 mm	Inside Diameter	103.1 mm
Outside Diameter	114.3 mm	Pipe Length	36 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	2.5	Total Fittings kf	0
Flow Rate	143.69 ft3/min	Flow at SMC	959.31 ft3/min
Mass Flow Rate	1997.31 kg/hr	Velocity	8.12 m/s
Mach number	0.11		
Friction Loss	0.23 psi	Fitting Losses	0.1 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.33 psi		
Entry Total Pressure	99.87 psi	Exit Total Pressure	99.54 psi
Reynolds No.	3114127.06	Friction Factor	0.01676 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	19	From node to node	6 - 7
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.18 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 4" ISO 336 / BS 3600 5.6mm wall	Pipe Class	
Nominal Diameter	100 mm	Inside Diameter	103.1 mm
Outside Diameter	114.3 mm	Pipe Length	50 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	2.5	Total Fittings kf	0
Flow Rate	51.44 ft3/min	Flow at SMC	343.45 ft3/min
Mass Flow Rate	715.07 kg/hr	Velocity	2.91 m/s
Mach number	0.08		
Friction Loss	0.04 psi	Fitting Losses	0.01 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.05 psi		
Entry Total Pressure	99.87 psi	Exit Total Pressure	99.81 psi
Reynolds No.	1114910.12	Friction Factor	0.01705 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	20	From node to node	7 - 8
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.18 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 3" ISO 336 / BS 3600 5.4mm wall	Pipe Class	
Nominal Diameter	80 mm	Inside Diameter	78.1 mm
Outside Diameter	88.9 mm	Pipe Length	22 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	36.75 ft3/min	Flow at SMC	245.21 ft3/min
Mass Flow Rate	510.53 kg/hr	Velocity	3.62 m/s
Mach number	0.09		
Friction Loss	0.04 psi	Fitting Losses	0.02 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.06 psi		
Entry Total Pressure	99.81 psi	Exit Total Pressure	99.75 psi
Reynolds No.	1050220.35	Friction Factor	0.01807 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	21	From node to node	8 - 9
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.17 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 2" ISO 336 / BS 3600 4.5mm wall	Pipe Class	
Nominal Diameter	50 mm	Inside Diameter	51 mm
Outside Diameter	60.3 mm	Pipe Length	18 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	1	Total Fittings kf	0
Flow Rate	23.51 ft3/min	Flow at SMC	156.79 ft3/min
Mass Flow Rate	326.43 kg/hr	Velocity	5.43 m/s
Mach number	0.02		
Friction Loss	0.12 psi	Fitting Losses	0.02 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.14 psi		
Entry Total Pressure	99.75 psi	Exit Total Pressure	99.61 psi
Reynolds No.	1027698.93	Friction Factor	0.01985 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	22	From node to node	11 - 10
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.15 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 2" ISO 336 / BS 3600 4.5mm wall	Pipe Class	
Nominal Diameter	50 mm	Inside Diameter	51 mm
Outside Diameter	60.3 mm	Pipe Length	12 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	2.5	Total Fittings kf	0
Flow Rate	5.84 ft3/min	Flow at SMC	38.89 ft3/min
Mass Flow Rate	80.98 kg/hr	Velocity	1.35 m/s
Mach number	0.04		
Friction Loss	0.01 psi	Fitting Losses	0 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.01 psi		
Entry Total Pressure	99.55 psi	Exit Total Pressure	99.54 psi
Reynolds No.	254425.83	Friction Factor	0.02068 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	23	From node to node	10 - 9
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.16 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 2" ISO 336 / BS 3600 4.5mm wall	Pipe Class	
Nominal Diameter	50 mm	Inside Diameter	51 mm
Outside Diameter	60.3 mm	Pipe Length	12 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	2.9	Total Fittings kf	0
Flow Rate	16.17 ft3/min	Flow at SMC	107.66 ft3/min
Mass Flow Rate	224.16 kg/hr	Velocity	3.74 m/s
Mach number	0.02		
Friction Loss	0.04 psi	Fitting Losses	0.02 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.06 psi		
Entry Total Pressure	99.61 psi	Exit Total Pressure	99.55 psi
Reynolds No.	704726.37	Friction Factor	0.01998 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	27	From node to node	8 - 24
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.17 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 1.5" ISO 336 / BS 3600 3.6mm wall	Pipe Class	
Nominal Diameter	40 mm	Inside Diameter	41.1 mm
Outside Diameter	48.3 mm	Pipe Length	12 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	2.5	Total Fittings kf	0
Flow Rate	8.84 ft3/min	Flow at SMC	58.95 ft3/min
Mass Flow Rate	122.73 kg/hr	Velocity	3.14 m/s
Mach number	0.15		
Friction Loss	0.04 psi	Fitting Losses	0.01 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.05 psi		
Entry Total Pressure	99.75 psi	Exit Total Pressure	99.7 psi
Reynolds No.	479446.13	Friction Factor	0.02115 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	28	From node to node	7 - 26
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.18 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 2" ISO 336 / BS 3600 4.5mm wall	Pipe Class	
Nominal Diameter	50 mm	Inside Diameter	51 mm
Outside Diameter	60.3 mm	Pipe Length	18 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	1	Total Fittings kf	0
Flow Rate	14.72 ft3/min	Flow at SMC	98.24 ft3/min
Mass Flow Rate	204.55 kg/hr	Velocity	3.4 m/s
Mach number	0.06		
Friction Loss	0.05 psi	Fitting Losses	0.01 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.06 psi		
Entry Total Pressure	99.81 psi	Exit Total Pressure	99.76 psi
Reynolds No.	644368.19	Friction Factor	0.02002 (Darcy f)

Helix Technologies Pty Ltd

Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	29	From node to node	9 - 25
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.16 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 1.5" ISO 336 / BS 3600 3.2mm wall	Pipe Class	
Nominal Diameter	40 mm	Inside Diameter	41.9 mm
Outside Diameter	48.3 mm	Pipe Length	23 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3.6	Total Fittings kf	0
Flow Rate	7.38 ft3/min	Flow at SMC	49.12 ft3/min
Mass Flow Rate	102.27 kg/hr	Velocity	2.52 m/s
Mach number	0.05		
Friction Loss	0.04 psi	Fitting Losses	0.01 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.06 psi		
Entry Total Pressure	99.61 psi	Exit Total Pressure	99.55 psi
Reynolds No.	391359.37	Friction Factor	0.02118 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	31	From node to node	8 - 30
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.17 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 1" ISO 336 / BS 3600 5.6mm wall	Pipe Class	
Nominal Diameter	25 mm	Inside Diameter	22.5 mm
Outside Diameter	33.7 mm	Pipe Length	25 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	3	Total Fittings kf	0
Flow Rate	4.42 ft3/min	Flow at SMC	29.47 ft3/min
Mass Flow Rate	61.36 kg/hr	Velocity	5.25 m/s
Mach number	0.01		
Friction Loss	0.45 psi	Fitting Losses	0.05 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.49 psi		
Entry Total Pressure	99.75 psi	Exit Total Pressure	99.25 psi
Reynolds No.	437894.13	Friction Factor	0.02448 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Pipe No	33	From node to node	10 - 32
Description		Equipment No	
Gas	Air 20 deg C	Molecular Mass	28.96 kg/kmol
Ratio Cp/Cv	1.4	Viscosity	0.018 cP
Temperature	20 C	Density	8.15 kg/m3
Gas SG to Air	1	Gas Specific Vol	0.12 m3/kg
Gas Constant R	287.1	Abs. Gas Temp.	0.12 deg K
Flow Condition	Free Flow	Net Exp.Factor Y	1
Pipe Description	Steel Pipe 2" ISO 336 / BS 3600 4.5mm wall	Pipe Class	
Nominal Diameter	50 mm	Inside Diameter	51 mm
Outside Diameter	60.3 mm	Pipe Length	7.5 m
Pipe Roughness	0.05 mm	Allowable Press.	0 psi
Orifice Plate Dia	-	Non Return Valve	No
Total Fittings k	2	Total Fittings kf	0
Flow Rate	10.33 ft3/min	Flow at SMC	68.77 ft3/min
Mass Flow Rate	143.18 kg/hr	Velocity	2.39 m/s
Mach number	0.02		
Friction Loss	0.01 psi	Fitting Losses	0.01 psi
Orifice Losses	0 psi	Fixed Pressure Drop	0 psi
Total Pressure Drop	0.02 psi		
Entry Total Pressure	99.55 psi	Exit Total Pressure	99.53 psi
Reynolds No.	449856.17	Friction Factor	0.02021 (Darcy f)

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	0	Node Type	Pump
Description	Compressor no 2 750 CFM 100-110psi	Equipment No	Includes local receiver unit
Rel. Level (RL)	0 m	Pressure Input	100.5 psi
Ext Flow (+In/-Out)	-	Abs. Node Pressure	100.5 psi
Int.(Gauge) Head	2273369.68 psi		
Pump / Fan Efficiency	70 %	Pump Absorbed Power	0 kW
Casing Pressure	85.97 psi		
Pump NPSH required	0 ft	Pump NPSH available	0 ft

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	1	Node Type	Pump
Description	Compressor no 1 750 CFM 100-110psi	Equipment No	
Rel. Level (RL)	0 m	Pressure Input	101.2 psi
Ext Flow (+In/-Out)	-	Abs. Node Pressure	101.2 psi
Int.(Gauge) Head	2289204.1 psi		
Pump / Fan Efficiency	70 %	Pump Absorbed Power	0 kW
Casing Pressure	86.67 psi		
Pump NPSH required	0 ft	Pump NPSH available	0 ft

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	2	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	101.11 psi
Int.(Gauge) Head	2287258.22 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	3	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	100.36 psi
Int.(Gauge) Head	2270207.03 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	4	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	100.32 psi
Int.(Gauge) Head	2269241.51 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	5	Node Type	Junction
Description	Main Receiver 3000lt	Equipment No	
Rel. Level (RL)	0 m	Pressure Input	70 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	100.02 psi
Int.(Gauge) Head	2262613.59 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	6	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	12 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	99.87 psi
Int.(Gauge) Head	2258981.03 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	7	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	12 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	99.81 psi
Int.(Gauge) Head	2257757.73 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	8	Node Type	Junction
Description	Test Bay	Equipment No	
Rel. Level (RL)	12 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	99.75 psi
Int.(Gauge) Head	2256334.33 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	9	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	12 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	99.61 psi
Int.(Gauge) Head	2253163.99 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	10	Node Type	Junction
Description		Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	0 ft3/min	Abs. Node Pressure	99.55 psi
Int.(Gauge) Head	2251782.59 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	11	Node Type	Junction
Description	Paint shop	Equipment No	
Rel. Level (RL)	12 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	-150 ft3/min	Abs. Node Pressure	99.54 psi
Int.(Gauge) Head	2251563.5 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	24	Node Type	Nozzle
Description	Pump Repair Shop	Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	-60 ft3/min	Abs. Node Pressure	99.7 psi
Int.(Gauge) Head	2255222.99 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	25	Node Type	Nozzle
Description	Pump Assembly	Equipment No	Air Tools
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	-50 ft3/min	Abs. Node Pressure	99.55 psi
Int.(Gauge) Head	2251903.24 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	26	Node Type	Nozzle
Description	Machine Shop	Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	-100 ft3/min	Abs. Node Pressure	99.76 psi
Int.(Gauge) Head	2256544.47 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	30	Node Type	Nozzle
Description	Air Hoists	Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	-30 ft3/min	Abs. Node Pressure	99.25 psi
Int.(Gauge) Head	2245191.8 psi		

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Project	Demo QA	Client	Helix Demo QA
Project No.	4567	Design Date	12/07/2017
Category	Demo Gas Compressed Air	Atmos. Press	14.53 psi
Description	Typical Compressed Air distribution network		

Node No	32	Node Type	Nozzle
Description	Wash bay	Equipment No	
Rel. Level (RL)	0 m	Pressure Input	0 psi
Ext Flow (+In/-Out)	-70 ft3/min	Abs. Node Pressure	99.53 psi
Int.(Gauge) Head	2251403.27 psi		