VALVE CALCULATION SHEETS

V12/sro	2005-01-10	V12/lf	V12/di	2005-01-20	IFR	FIRST ISSUE / FINAL ISSUE
Name	Date	Name	Name	Date	Status	
Prepared, revised		Checked	Approved			Remark, kind of revision

Contractor:	Owner Project No:	Contractor Order No:	Q.L.	DCC
PETROCHEMICAL INDUSTRIES DESIGN & ENGINEERING CO. شرکت طراحی ومهندسی صنایع پتروشیمی	232000	1182-POR-IN-644	-	-
	SAMSON	Vendor Order Ref. 616 100		

mg engineering Lurgi	Project Name	Lurgi Doc. No.	Vendor Doc. No.	Sheet / of	Revision
	2nd ZAGROS METHANOL PLANT		SAM-100	1 / 105	00

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Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	FV100326	Tag no.	FV100326
Process medium	Purge Gas	State of medium at inlet:	gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	9200	8157	2800
Inlet pressure	p1	[bar(a)]	67,9	67,9	60
Outlet pressure	p2	[bar(a)]	50	48,5	45,5
Inlet temperature	t1	[°C]	40	40	40
Molar mass	M	[g/mol]	11,509	11,509	11,509
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1,0087	1,0087	1,0087
Viscosity	eta	[mPas]	0,014	0,014	0,014

Results and factors

Valve coeff. calculated	***Cv***		***8,55***	***7,36***	***3,03***
Min. req. size	Req. DN	[mm]	21,2	20,2	12,2
Outlet velocity	w	[Mach]	0,0537	0,0491	0,0180
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***78***	***77***	***69***
relative travel	T	[%]	82,4	78,6	55,9
Different. pressure ratio	x		0,26	0,29	0,24
FL value	FL		0,95	0,96	0,97
xT value	xT		0,77	0,77	0,80
Valve style factor	Fd		0,43	0,42	0,38
Level exponent	G1		-4,86	-4,88	-4,96
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***17***	***Type***	***3251***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***31***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***VI***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 [mm] 50
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 54,5 s [mm] 2,89999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 89 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	7,78	req. diff. psu-ps100	d ps	[bar] 0,03
max. act. force	Fmax	[kN]	57,41	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	133,07	Close safety factor	Fa/Fo (SF)	1,44
req. start bench range	ps0req.	[bar]	1,22	Open safety factor	Ff/Fw	-

Propsl./order no.: 616100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV100406 Tag no. FV100406
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	10000	5000	1000
Inlet pressure	p1	[bar(a)]	44	44,9	46
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	50	50	50
Density	rho1	[kg/m³]	989,91	989,95	990
Vapor pressure	pv	[bar(a)]	0,12351	0,12351	0,12351
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,5476	0,54762	0,54764

Results and factors

Valve coeff. calculated	***Cv***		***2,38***	***1,18***	***0,234***
Min. req. size	Req. DN	[mm]	26,7	18,9	8,45
Outlet velocity	w	[m/s]	1,43	0,715	0,143
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***74***	***73***	***67***
Flow condition			Cavitation	Cavitation	Cavitation
relative travel	T	[%]	82,8	64,9	23,5
Different. pressure ratio	xF		0,93	0,94	0,94
FL value	FL		0,74	0,74	0,74
Kc value	Kc		0,55	0,55	0,55
Valve style factor	Fd		0,55	0,35	0,13
z value at capacity	zy		0,55	0,55	0,55
Level exponent	F1		-7,39	-7,67	-8,18
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	4,89	7,53	4,56

Valve data

Body type			***Globe valve***	***Series***	***angle valve***
Valve coefficient	***Cv***		***5***	***Type***	***3256***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A351 CF8C***
Pressure ratings	***PN***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***24***	***Flow direction***	***FTC***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 1,9685 D2 [mm] 50
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 51,1 s [mm] 12,5

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,2 ... 2**
				Supply	**psu [bar]**	**2,24**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	0,31	req. diff. psu-ps100	d ps	[bar] 0,24
max. act. force	Fmax	[kN]	57,41	Actuator force	Fa	[kN] 8,40
max. dp on plug	d. pmax	[bar]	31,78	Close safety factor	Fa/Fo (SF)	26,91
req. start bench range	ps0req.	[bar]	0,05	Open safety factor	Ff/Fw	-

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	FV-100416
Customer			Sizing 1
		Cust. Ref.	
Project	Project Methanol Iran	Date / by	1/30/03 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 12 / 12	Wall thickness	sch 40
Valve duty			Fluid nature
Description	Natural Gas		GAS
Density		Critical pressure	
Molecular weight	17.6	Ratio of specific heats	1.32

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	100000	150000	160000	100000
Upstream temperature	degC	296	290	290	400
Upstream pressure	barA	20.4	33.4	46	46
Differential pressure	bar	4.8	4.8	13.4	13.4
Downstream pressure	barA	15.6	28.6	32.6	32.6
Compressibility		0.998	0.997	0.998	1.003

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	671.74	772.31	405.61	298.18
Percent of full travel	%	64.8	78.6	40.7	31.6
Opening in degrees	deg	61.2	73.2	41.4	33.8
Sound pressure level	dBA	88	88	93	92
Flow velocity (outlet)	Mach	0.09	0.08	0.07	0.06
Valve new dp	bar	1.6	0.60	9.87	11.61
Xt		0.8	0.78	0.83	0.83

VALVE SELECTION

Nominal size	in 12	Maximum capacity	Cv 926.9
Valve type	BALL ANSI 600	FULL BORE BALL VALVE, WITH Q-TRIM FOR NOISE AND	
Valve serie	Q-D1	CAVITATION ABATEMENT, RATING ANSI 600	
Double stage LDFB line diffuser		Diffuser min. outlet dia	in 14.48

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	FV-100428
Customer			Sizing 1
		Cust. Ref.	
Project	Project Methanol Iran	Date / by	1/30/03 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 12 / 12	Wall thickness	sch 40
Valve duty			Fluid nature
Description			WATER
Density		Critical pressure	barA 221.2
Molecular weight		Ratio of specific heats	

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	585000	486676	146000	
Upstream temperature	degC	133	133	133	
Upstream pressure	barA	49	50	50.6	
Differential pressure	bar	0.6	1.6	4.6	
Downstream pressure	barA	48.4	48.4	46	
Vapor pressure	barA	2.95	2.95	2.890	

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	806.39	461.16	82.61	
Percent of full travel	%	74.1	52.4	18.8	
Opening in degrees	deg	67.4	48.8	20.0	
Sound pressure level	dBA	69	82	60	
Flow velocity (inlet)	m/s	5.54	4.61	1.38	
Terminal pressure drop	bar	18.6	27.69	34.67	
Fl		0.83	0.77	0.85	

VALVE SELECTION

Nominal size	in 8	Maximum capacity	Cv	1360.00
Valve type	BUTTERFLY ANSI 600			
Valve serie	860-SH-DWN	WAFER-SPHERE, SOFT SEATED BUTTERFLY VALVE, RATING ANSI 600		

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV100429 Tag no. FV100429
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	29000	26316	5000
Inlet pressure	p1	[bar(a)]	50	51	51,5
Outlet pressure	p2	[bar(a)]	48,2	48	47,5
Inlet temperature	t1	[°C]	151	151	151
Density	rho1	[kg/m³]	918,62	918,68	918,71
Vapor pressure	pv	[bar(a)]	4,89	4,89	4,89
Critical pressure	pc	[bar(a)]	221,2	221,2	221,2
Viscosity	eta	[mPas]	0,1823	0,18232	0,18234

Results and factors

Valve coeff. calculated	***Cv***		***26,8***	***18,7***	***3,05***
Min. req. size	Req. DN	[mm]	47,3	45,0	19,6
Outlet velocity	w	[m/s]	4,47	4,05	0,770
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***53***	***56***	***44***
relative travel	T	[%]	85,6	76,4	30,1
Different. pressure ratio	xF		0,04	0,07	0,09
FL value	FL		0,91	0,93	0,97
Kc value	Kc		0,76	0,80	0,91
Valve style factor	Fd		0,43	0,42	0,21
z value at capacity	zy		0,27	0,30	0,52
Level exponent	F1		-6,83	-6,87	-7,21
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***47***	***Type***	***3251***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***50***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 3"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 80,9 s [mm] 4

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,4 ... 3,6**
				Supply	**psu [bar]**	**3,80**

(Defaults: p1max [bar(a)] 70 p2min [bar(a)] 1,01 t1max [°C] 270)

Actuator results

req. act. force	Fo req.	[kN]	14,37	req. diff. psu-ps100	d ps [bar]	0,08
max. act. force	Fmax	[kN]	50,06	Actuator force	Fa [kN]	16,80
max. dp on plug	d. pmax	[bar]	81,28	Close safety factor	Fa/Fo (SF)	1,17
req. start bench range	ps0req.	[bar]	2,26	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV100512 Tag no. FV100512
Process medium Natural Gas Fue State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	14500	2729	1500
Inlet pressure	p1	[bar(a)]	5,8	5,8	5,8
Outlet pressure	p2	[bar(a)]	2	3,5	1,2
Inlet temperature	t1	[°C]	20	20	20
Molar mass	M	[g/mol]	16,827	16,827	16,827
Isentropic exponent	gamma		1,3	1,3	1,3
Real gas factor	Z		0,995	0,995	0,995
Viscosity	eta	[mPas]	0,011037	0,011037	0,011037

Results and factors

Valve coeff. calculated	***Cv***		***152***	***30,4***	***14,5***
Min. req. size	Req. DN	[mm]	146	48,0	60,8
Outlet velocity	w	[Mach]	0,316	0,0323	0,0527
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***84***	***71***	***71***
relative travel	T	[%]	84,9	43,7	24,7
Different. pressure ratio	x		0,66	0,40	0,79
FL value	FL		0,93	0,97	0,97
xT value	xT		0,73	0,79	0,80
Valve style factor	Fd		0,43	0,30	0,18
Level exponent	G1		-4,58	-4,65	-4,75
Slope exponent	G2		1,02	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***275***	***Type***	***3241***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***130***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 8"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 207 s [mm] 6,3

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,35 ... 3,8**
				Supply	**psu [bar]**	**4,00**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 20)

Actuator results

req. act. force	Fo req.	[kN]	14,80	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	66,29	Actuator force	Fa	[kN] 16,45
max. dp on plug	d. pmax	[bar]	9,22	Close safety factor	Fa/Fo (SF)	1,11
req. start bench range	ps0req.	[bar]	2,33	Open safety factor	Ff/Fw	-

Propsl./order no.: 616100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV100704 Tag no. FV100704
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	60000	52326	10000
Inlet pressure	p1	[bar(a)]	44	44	44
Outlet pressure	p2	[bar(a)]	43	42,3	33
Inlet temperature	t1	[°C]	490	490	490
Density	rho1	[kg/m³]	12,96	12,96	12,96
Isentropic exponent	gamma		1,278	1,278	1,278
Viscosity	eta	[mPas]	0,028241	0,028241	0,028241

Results and factors

Valve coeff. calculated	***Cv***		***631***	***423***	***35,0***
Min. req. size	Req. DN	[mm]	92,1	86,7	42,9
Outlet velocity	w	[Mach]	0,0626	0,0564	0,0138
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***60***	***65***	***82***
relative travel	T	[%]	96,0	85,8	22,1
Different. pressure ratio	x		0,02	0,04	0,25
FL value	FL		0,90	0,91	0,97
xT value	xT		0,69	0,71	0,80
Valve style factor	Fd		0,46	0,43	0,16
Level exponent	G1		-3,40	-3,55	-4,25
Slope exponent	G2		2,48	2,49	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***735***	***Type***	***3254***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A217 WC6***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***200***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 248 s [mm] 12,5

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,7**
				Supply	**psu [bar]**	**3,30**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 500)

Actuator results

req. act. force	Fo req.	[kN]	172,26	req. diff. psu-ps100	d ps [bar]	0,60
max. act. force	Fmax	[kN]	112,43	Actuator force	Fa [kN]	19,60
max. dp on plug	d. pmax	[bar]	82,80	Close safety factor	Fa/Fo (SF)	1,25
req. start bench range	ps0req.	[bar]	1,24	Open safety factor	Ff/Fw	-

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	FV-100805
Customer			Sizing 1
		Cust. Ref.	
Project Project Methanol Iran		Date / by	1/30/03 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 14 / 14	Wall thickness	sch 40
Valve duty			Fluid nature
Description			GAS
Density		Critical pressure	
Molecular weight	17.227	Ratio of specific heats	1.4

		Case 1	Case 2	Case 3	Case 4
Flow rate	Nm3/h	160000	141599	66000	
Upstream temperature	degC	400	400	400	
Upstream pressure	barA	46.5	45.4	45.4	
Differential pressure	bar	1.4	1.5	11.4	
Downstream pressure	barA	45.1	43.9	34	
Compressibility		1	1	1	

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	908.48	838.47	134.76	
Percent of full travel	%	66.3	62.8	23.2	
Opening in degrees	deg	59.9	57.7	23.1	
Sound pressure level	dBA	88	80	103 *	
Flow velocity (outlet)	Mach	0.07	0.06	0.03	
Xt		0.69	0.60	0.68	

VALVE SELECTION

Nominal size	in 10	Maximum capacity	Cv	2100.00
Valve type	BUTTERFLY ANSI 600			
Valve serie	860-SH-DWN	WAFER-SPHERE, SOFT SEATED BUTTERFLY VALVE, RATING ANSI 600		

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	FV-100807
Customer			Copy of Copy of Sizi
		Cust. Ref.	
Project: Project Methanol Iran		Date / by	1/30/03 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 16 / 18	Wall thickness	sch 40
Valve duty			Fluid nature
Description			GAS
Density		Critical pressure	
Molecular weight	17.227	Ratio of specific heats	1.4

		Case 1	Case 2	Case 3	Case 4
Flow rate	Nm3/h	210000	195712	20000	
Upstream temperature	degC	400	400	400	
Upstream pressure	barA	45.4	45.4	45.4	
Differential pressure	bar	2.4	3.4	11.8	
Downstream pressure	barA	43	42	33.6	
Compressibility		1	1	1	

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	887.32	783.03	48.88	
Percent of full travel	%	66.0	44.5	3.1 *	
Opening in degrees	deg	46.1	37.3	5.4	
Sound pressure level	dBA	84	87	93	
Flow velocity (outlet)	Mach	0.07	0.06	0.0082	
Valve new dp	bar	1.6	2.6	11.79	
Xt		0.67	0.67	0.67	

VALVE SELECTION

Nominal size	In 10"	Maximum capacity	Cv 1367.18
Valve type	BUTTERFLY ANSI 300	BALANCED	METAL SEATED BUTTERFLY VALVE,
Valve serie	S-L-ANSI300	RATINGS ANSI 300, DIN PN40	
Double stage LDFB line diffuser		Diffuser min. outlet dia	in 14.14

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

LN + HP

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV100825 Tag no. FV100825
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	40000	30000	8000
Inlet pressure	p1	[bar(a)]	41	41	41
Outlet pressure	p2	[bar(a)]	36	35	11
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	14,111	14,111	14,111
Isentropic exponent	gamma		1,2858	1,2858	1,2858
Viscosity	eta	[mPas]	0,024152	0,024152	0,024152

Results and factors

Valve coeff. calculated	***Cv***		***188***	***130***	***21,6***
Min. req. size	Req. DN	[mm]	78,9	69,3	63,8
Outlet velocity	w	[Mach]	0,0830	0,0640	0,0543
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***84***	***82***	***81***
relative travel	T	[%]	96,0	86,5	40,6
Different. pressure ratio	x		0,12	0,15	0,73
FL value	FL		0,92	0,93	0,97
xT value	xT		0,71	0,74	0,80
Valve style factor	Fd		0,46	0,43	0,28
Level exponent	G1		-5,45	-5,55	-5,68
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***220***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***125***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***25***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 157,1 s [mm] 5,59999

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0 [bar]**	**2,8 ... 3,8**
				Supply	**psu [bar]**	**4,00**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 420)

Actuator results

req. act. force	Fo req.	[kN]	67,88	req. diff. psu-ps100	d ps [bar]	0,03
max. act. force	Fmax	[kN]	60,27	Actuator force	Fa [kN]	78,40
max. dp on plug	d. pmax	[bar]	47,75	Close safety factor	Fa/Fo (SF)	1,15
req. start bench range	ps0req.	[bar]	2,67	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV100831 Tag no. FV100831
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	20000	8000	2000
Inlet pressure	p1	[bar(a)]	41	41	35
Outlet pressure	p2	[bar(a)]	11	11	6
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	14,111	14,111	14,111
Isentropic exponent	gamma		1,2858	1,2858	1,2858
Viscosity	eta	[mPas]	0,024152	0,024152	0,024152

Results and factors

Valve coeff. calculated	***Cv***		***52,3***	***21,6***	***5,55***
Min. req. size	Req. DN	[mm]	101	63,8	41,5
Outlet velocity	w	[Mach]	0,136	0,0543	0,0230
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***85***	***80***	***71***
Flow condition					Choked flow
relative travel	T	[%]	86,1	63,5	28,8
Different. pressure ratio	x		0,73	0,73	0,83
FL value	FL		0,96	0,97	0,98
xT value	xT		0,78	0,80	0,81
Valve style factor	Fd		0,43	0,40	0,20
Level exponent	G1		-5,75	-5,78	-5,85
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***90***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***25***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 157,1 s [mm] 5,59999

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**2,45 ... 3,2**
				Supply	**psu [bar]**	**3,40**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 420)

Actuator results

req. act. force	Fo req.	[kN]	28,44	req. diff. psu-ps100	d ps	[bar] 0,06
max. act. force	Fmax	[kN]	60,27	Actuator force	Fa	[kN] 34,30
max. dp on plug	d. pmax	[bar]	65,55	Close safety factor	Fa/Fo (SF)	1,21
req. start bench range	ps0req.	[bar]	2,23	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV101019 Tag no. FV101019
Process medium Oxigene State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	45000	29500	10000
Inlet pressure	p1	[bar(a)]	39,6	39,8	39,9
Outlet pressure	p2	[bar(a)]	37,2	34	33
Inlet temperature	t1	[°C]	20	20	20
Molar mass	M	[g/mol]	31,999	31,999	31,999
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		0,95868	0,95848	0,95838
Viscosity	eta	[mPas]	0,010282	0,010292	0,010297

Results and factors

Valve coeff. calculated	***Cv***		***214***	***93,5***	***29,3***
Min. req. size	Req. DN	[mm]	68,9	58,4	34,5
Outlet velocity	w	[Mach]	0,0378	0,0264	0,00931
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***70***	***83***	***81***
relative travel	T	[%]	82,7	61,5	31,9
Different. pressure ratio	x		0,06	0,15	0,17
FL value	FL		0,94	0,96	0,97
xT value	xT		0,75	0,78	0,80
Valve style factor	Fd		0,43	0,40	0,22
Level exponent	G1		-3,55	-3,87	-3,91
Slope exponent	G2		2,50	1,77	1,62

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***420***	***Type***	***3251***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***150***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 255 s [mm] 8,8

Actuator data

Type			**3271Tandem**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**5600**	**Bench range**	**ps0 [bar]**	**2 ... 2,6**
				Supply	**psu [bar]**	**2,80**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	100,60	req. diff. psu-ps100	d ps [bar]	0,00949
max. act. force	Fmax	[kN]	162,52	Actuator force	Fa [kN]	112,00
max. dp on plug	d. pmax	[bar]	60,37	Close safety factor	Fa/Fo (SF)	1,11
req. start bench range	ps0req.	[bar]	1,98	Open safety factor	Ff/Fw	-

Propsl./order no.: 616100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV101021 Tag no. FV101021
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	7000	4500	2000
Inlet pressure	p1	[bar(a)]	44	44	44
Outlet pressure	p2	[bar(a)]	37	36,1	33
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	15,216	15,216	15,216
Isentropic exponent	gamma		1,2855	1,2855	1,2855
Viscosity	eta	[mPas]	0,02415	0,02415	0,02415

Results and factors

Valve coeff. calculated	***Cv***		***28,0***	***16,8***	***6,48***
Min. req. size	Req. DN	[mm]	32,5	26,4	18,4
Outlet velocity	w	[Mach]	0,147	0,0959	0,0452
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***83***	***81***	***79***
relative travel	T	[%]	86,8	73,7	49,4
Different. pressure ratio	x		0,16	0,18	0,25
FL value	FL		0,91	0,93	0,96
xT value	xT		0,70	0,74	0,78
Valve style factor	Fd		0,43	0,42	0,33
Level exponent	G1		-3,49	-3,66	-3,81
Slope exponent	G2		1,68	1,59	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***47***	***Type***	***3251***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***50***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 106,3 s [mm] 3,99999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 420)

Actuator results

req. act. force	Fo req.	[kN]	11,42	req. diff. psu-ps100	d ps [bar]	0,08
max. act. force	Fmax	[kN]	44,94	Actuator force	Fa [kN]	14,70
max. dp on plug	d. pmax	[bar]	70,58	Close safety factor	Fa/Fo (SF)	1,29
req. start bench range	ps0req.	[bar]	1,79	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	FV101039	Tag no.	FV101039
Process medium	Oxygen	State of medium at inlet:	gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	59000	54800	15000
Inlet pressure	p1	[bar(a)]	39,6	39,6	39,9
Outlet pressure	p2	[bar(a)]	38,5	38,4	34
Inlet temperature	t1	[°C]	20	20	20
Molar mass	M	[g/mol]	31,999	31,999	31,999
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		0,95868	0,95868	0,95838
Viscosity	eta	[mPas]	0,020823	0,020823	0,020831

Results and factors

Valve coeff. calculated	***Cv***		***411***	***365***	***47,0***
Min. req. size	Req. DN	[mm]	77,6	74,9	41,6
Outlet velocity	w	[Mach]	0,0470	0,0437	0,0133
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***66***	***66***	***80***
relative travel	T	[%]	99,4	96,4	44,0
Different. pressure ratio	x		0,03	0,03	0,15
FL value	FL		0,91	0,92	0,97
xT value	xT		0,71	0,72	0,80
Valve style factor	Fd		0,47	0,45	0,29
Level exponent	G1		-3,00	-3,06	-3,95
Slope exponent	G2		2,50	2,50	1,76

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***420***	***Type***	***3251***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***150***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 255 s [mm] 8,8

Actuator data

Type			**3271Tandem**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**5600**	**Bench range**	**ps0 [bar]**	**2 ... 2,6**
				Supply	**psu [bar]**	**2,80**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	101,46	req. diff. psu-ps100	d ps	[bar] 0,03
max. act. force	Fmax	[kN]	162,52	Actuator force	Fa	[kN] 112,00
max. dp on plug	d. pmax	[bar]	59,88	Close safety factor	Fa/Fo (SF)	1,10
req. start bench range	ps0req.	[bar]	1,99	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
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SAMSON
Valve Sizing Version 3.56

Item no. FV101041 Tag no. FV101041
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	10000	8400	4000
Inlet pressure	p1	[bar(a)]	44	44	44
Outlet pressure	p2	[bar(a)]	37	36,1	33
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	15,216	15,216	15,216
Isentropic exponent	gamma		1,2855	1,2855	1,2855
Viscosity	eta	[mPas]	0,02415	0,02415	0,02415

Results and factors

Valve coeff. calculated	***Cv***		***39,0***	***31,1***	***12,9***
Min. req. size	Req. DN	[mm]	38,9	36,1	26,0
Outlet velocity	w	[Mach]	0,0803	0,0690	0,0353
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***83***	***82***	***79***
relative travel	T	[%]	86,1	80,4	58,0
Different. pressure ratio	x		0,16	0,18	0,25
FL value	FL		0,93	0,94	0,96
xT value	xT		0,74	0,75	0,78
Valve style factor	Fd		0,43	0,42	0,39
Level exponent	G1		-4,72	-4,86	-4,98
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***67***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 106 s [mm] 4

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 420)

Actuator results

req. act. force	Fo req.	[kN]	17,73	req. diff. psu-ps100	d ps	[bar] 0,04
max. act. force	Fmax	[kN]	44,94	Actuator force	Fa	[kN] 22,40
max. dp on plug	d. pmax	[bar]	68,89	Close safety factor	Fa/Fo (SF)	1,26
req. start bench range	ps0req.	[bar]	1,39	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV101122 Tag no. FV101122
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	4000	3700	3000
Inlet pressure	p1	[bar(a)]	44	44	44
Outlet pressure	p2	[bar(a)]	36,5	36,5	10
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	15,216	15,216	15,216
Isentropic exponent	gamma		1,2855	1,2855	1,2855
Viscosity	eta	[mPas]	0,02415	0,02415	0,02415

Results and factors

Valve coeff. calculated	***Cv***		***15,2***	***14,0***	***7,23***
Min. req. size	Req. DN	[mm]	24,8	23,8	41,0
Outlet velocity	w	[Mach]	0,0767	0,0716	0,214
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***78***	***77***	***84***
relative travel	T	[%]	86,3	84,2	67,3
Different. pressure ratio	x		0,17	0,17	0,77
FL value	FL		0,93	0,94	0,97
xT value	xT		0,74	0,74	0,79
Valve style factor	Fd		0,43	0,43	0,32
Level exponent	G1		-4,44	-4,45	-4,66
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***26***	***Type***	***3251***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***38***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***12***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 3"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 81,7 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**retracts**		
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0**	**[bar]**	**0,2 ... 1**
				Supply	**psu**	**[bar]**	**3,12**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 420)

Actuator results

req. act. force	Fo req.	[kN]	6,74	req. diff. psu-ps100	d ps	[bar]	2,12
max. act. force	Fmax	[kN]	23,14	Actuator force	Fa	[kN]	7,41
max. dp on plug	d. pmax	[bar]	59,83	Close safety factor	Fa/Fo (SF)		1,10
req. start bench range	ps0req.	[bar]	0,12	Open safety factor	Ff/Fw		1,85

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Projec;2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV101125 Tag no. FV101125
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	10000	9800	3000
Inlet pressure	p1	[bar(a)]	44	44	44
Outlet pressure	p2	[bar(a)]	36,5	36,5	34
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	15,216	15,216	15,216
Isentropic exponent	gamma		1,2855	1,2855	1,2855
Viscosity	eta	[mPas]	0,02415	0,02415	0,02415

Results and factors

Valve coeff. calculated	***Cv***		***37,8***	***37,0***	***10,0***
Min. req. size	Req. DN	[mm]	39,1	38,7	22,2
Outlet velocity	w	[Mach]	0,0718	0,0704	0,0231
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***80***	***79***	***75***
relative travel	T	[%]	85,4	84,8	51,5
Different. pressure ratio	x		0,17	0,17	0,23
FL value	FL		0,94	0,94	0,97
xT value	xT		0,74	0,74	0,79
Valve style factor	Fd		0,43	0,43	0,34
Level exponent	G1		-4,58	-4,58	-4,77
Slope exponent	G2		1,64	1,64	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***67***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 3"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 81,7001 s [mm] 3,59999

Actuator data

Type			**3277**	**Fail-safe act.**	**retracts**		
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0**	**[bar]**	**0,2 ... 1**
				Supply	**psu**	**[bar]**	**3,79**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 420)

Actuator results

req. act. force	Fo req.	[kN]	17,73	req. diff. psu-ps100	d ps	[bar]	2,79
max. act. force	Fmax	[kN]	44,94	Actuator force	Fa	[kN]	19,51
max. dp on plug	d. pmax	[bar]	59,61	Close safety factor	Fa/Fo (SF)		1,10
req. start bench range	ps0req.	[bar]	0,08	Open safety factor	Ff/Fw		2,75

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV101229A Tag no. FV101229A
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	40000	10000	
Inlet pressure	p1	[bar(a)]	152	155	
Outlet pressure	p2	[bar(a)]	125	21	
Inlet temperature	t1	[°C]	111	111	
Density	rho1	[kg/m³]	957,32	957,46	
Vapor pressure	pv	[bar(a)]	1,4826	1,4826	
Critical pressure	pc	[bar(a)]	221,2	221,2	
Viscosity	eta	[mPas]	0,25624	0,25631	

Results and factors

Valve coeff. calculated	***Cv***		***9,21***	***1,03***
Min. req. size	Req. DN	[mm]	54,4	27,2
Outlet velocity	w	[m/s]	1,48	0,369
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***61***	***74***
relative travel	T	[%]	89,3	33,4
Different. pressure ratio	xF		0,18	0,87
FL value	FL		0,97	0,98
Kc value	Kc		0,92	0,94
Valve style factor	Fd		0,42	0,18
z value at capacity	zy		0,80	0,80
Level exponent	F1		-6,94	-7,97
Slope exponent	F2		0,30	0,30
Correct. term	delta Lf	[dB]	0	-6,68

Valve data

Body type			***Globe valve***	***Series***	***multistage valve***
Valve coefficient	***Cv***		***14***	***Type***	***3251M***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***1500***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***38***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 233 s [mm] 20

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**2 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 181 p2min [bar(a)] 1,01 t1max [°C] 160)

Actuator results

req. act. force	Fo req.	[kN]	20,81	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	53,82	Actuator force	Fa	[kN] 28,00
max. dp on plug	d. pmax	[bar]	243,17	Close safety factor	Fa/Fo (SF)	1,35
req. start bench range	ps0req.	[bar]	1,64	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project:2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	FV101229B	Tag no.	FV101229B
Process medium	Water/Steam	State of medium at inlet:	liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	350000	270000	50000
Inlet pressure	p1	[bar(a)]	140	152	152
Outlet pressure	p2	[bar(a)]	136	148,5	125
Inlet temperature	t1	[°C]	111	111	111
Density	rho1	[kg/m³]	956,76	957,32	957,46
Vapor pressure	pv	[bar(a)]	1,4826	1,4826	1,4826
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,25592	0,25624	0,25631

Results and factors

			Case 1	Case 2	Case 3
Valve coeff. calculated	***Cv***		***210***	***173***	***11,5***
Min. req. size	Req. DN	[mm]	161	141	60,8
Outlet velocity	w	[m/s]	3,23	2,49	0,462
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***64***	***60***	***63***
relative travel	T	[%]	91,5	86,5	17,3
Different. pressure ratio	xF		0,03	0,02	0,18
FL value	FL		0,94	0,95	0,98
Kc value	Kc		0,83	0,85	0,93
Valve style factor	Fd		0,44	0,43	0,14
z value at capacity	zy		0,20	0,21	0,48
Level exponent	F1		-7,23	-7,25	-7,54
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***290***	***Type***	***3254***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A216 WCB***
Pressure ratings	***PN***		***1500***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***125***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***PTFE (1,6)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 250 s [mm] 40

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 181 p2min [bar(a)] 1,01 t1max [°C] 160)

Actuator results

req. act. force	Fo req.	[kN]	221,92	req. diff. psu-ps100	d ps [bar]	0,03
max. act. force	Fmax	[kN]	150,99	Actuator force	Fa [kN]	44,80
max. dp on plug	d. pmax	[bar]	341,18	Close safety factor	Fa/Fo (SF)	1,84
req. start bench range	ps0req.	[bar]	0,95	Open safety factor	Ff/Fw	-

Dampfkühler-Datenblatt **SA.RV.000769**

DESUPERHEATER-DATA SHEET

Verteiler
Ordner
Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.1**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKVP 088/116U-PH1**
Anlagenkennz./Pos.: item-no	**No.: FV-101432 / 100-22**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**54,00/ 98bar** **420/ 140°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

vor Einspritzung before injection	Menge: flow rate	kg/s	2.78	13.89	15.83
	Druck: pressure	bar abs	45.5	45.5	45.5
	Temperatur: temperature	°C	395	395	395
	Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection	Druck: pressure	bar abs	45.5	45.5	45.5
	Temperatur: temperature	°C	381	323.6	329.7
	Enthalpie: enthalpie	kJ/kg			
	Menge: flow rate	kg/s	2.82	14.89	16.86

Kühlwasser coolwater

Menge flow rate	kg/s	0.04	1	1.03
Druck pressure	bar abs	64	64	64
Temperatur temperature	°C	111	111	111
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	0.03	0.86	0.88

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **1** (K_{vs}) | Kennlinie: characteristic **gl%** | Hub [mm]: stroke **32** | Stellzeit normal/schnell [sek]: stroke time **/**

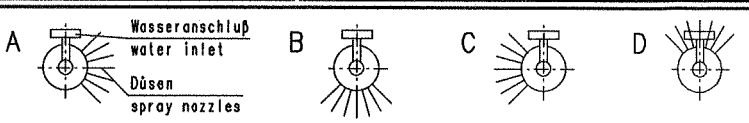
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASMS B 16.5
Montageflansch: mounting flange	4"	600# RF	ASME B 16.5

Gehäuse-Material: body-material **1.5415**

Dampfleitung steam pipe: ä∅ **184,40** x **12,70** Wd

Einbaulage installation: Horizontal horizontal / Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb actuator

Δp-Antrieb: Δp-actuator. öffnen/schließen open/ close **98**	elektr. Drehantr. electric actuator	pneum. Schubantr.: pneumatic actuator	Sonstiges: special **Pneumatikantrieb**	
Hersteller: manufactor **SAMSON**	Typ: type **3277 (700 cm2, 2,1 - 3,3)**			
Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open / schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal pneum. / elektr. ☒ input signal	Eingangssignal: **4-20 mA** input signal
ESR: Stck mA electronic positioner	Stecker plug / Klemmen terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais / Handrad handwheel
Goldkontakte gold contacts		Magnetventil solenoid valve	Zuluftdruck : **10,00**bar air supply	Druckminderer ☒ pressure reducing

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü
Antriebsstange einfahrend schließt Kühler
Ausführung wie unter K03-0227.1 geliefert
Typenschild kompl. in engl. Sprache, mit Angabe cvs = 1,16

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

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SCHROEDAHL
Spezial-Armaturen

Dampfkühler-Datenblatt **SA.RV.000770**

DESUPERHEATER-DATA SHEET

Verteiler
Ordner
Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.2**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKVP 088/117U-LH1**
Anlagenkennz./Pos.: item-no	**No.: FV-101433 / 100-23**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**54,00/ 98bar** **470/ 140°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

					Kühlwasser coolwater				
vor Einspritzung before injection	Menge: flow rate	kg/s	17.5	43.89	50.56	Menge flow rate	kg/s	0.83	3.81	4.39
	Druck: pressure	bar abs	45.5	45.5	45.5	Druck pressure	bar abs	64	64	64
	Temperatur: temperature	°C	336	414	460	Temperatur temperature	°C	111	111	111
	Enthalpie: enthalpie	kJ/kg				Enthalpie enthalpie	kJ/kg			
nach Einspritzung after injection	Druck: pressure	bar abs	45.5	45.5	45.5	Kv errechnet Kv	m^3/h	0.71	3.26	3.77
	Temperatur: temperature	°C	295.5	326.3	351.2					
	Enthalpie: enthalpie	kJ/kg								
	Menge: flow rate	kg/s	18.33	47.7	54.95					

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **4.2** (K_{vs}) | Kennlinie: characteristic **linear** | Hub [mm]: stroke **32** | Stellzeit normal/schnell [sek]: stroke time **/**

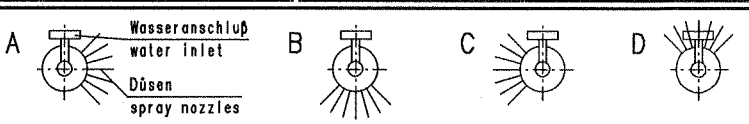
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASME B 16.5
Montageflansch: mounting flange	4"	900# RF	ASME B 16 5

Gehäuse-Material: body-material **1.5415**

Dampfleitung steam pipe: äØ **317,20** x **16,10** Wd

Einbaulage installation: Horizontal horizontal / Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb actuator

Δp-Antrieb: Δp-actuator. öffnen/schließen open/ close **98**	elektr. Drehantr. electric actuator	pneum. Schubantr.: pneumatic actuator	Sonstiges: special **Pneumatikantrieb**		
Hersteller: manufactor **SAMSON**	Typ: type **3277 (700 cm2, 2,1 - 3,3)**				
Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open	schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal input signal	pneum. ☐	elektr. ☒ electr.
Eingangssignal: input signal **4-20 mA**					
ESR: Stck mA electronic positioner	Stecker plug	Klemmen terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais
Handrad handwheel					
Goldkontakte gold contacts		Magnetventil solenoid valve	Zuluftdruck : **10,00**bar air supply	Druckminderer ☒ pressure reducing	

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü
Antriebsstange einfahrend schließt Kühler
Ausführung wie unter K03-0227.2 geliefert
Typenschild kompl. in engl. Sprache, mit Angabe cvs = 4,86

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

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SCHROEDAHL
Spezial-Armaturen

Dampfkühler-Datenblatt **SA.RV.000771**

DESUPERHEATER-DATA SHEET

Verteiler
Ordner
Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.3**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKP 080/110U-PLS**
Anlagenkennz./Pos.: item-no	**No.: FV-101435 / 100-24**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**128,00/ 200bar 565/ 140°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

vor Einspritzung before injection	Menge: flow rate	kg/s	**16.94**	**87.22**	**50.83**
	Druck: pressure	bar abs	**114**	**114**	**114**
	Temperatur: temperature	°C	**551**	**472**	**524**
	Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection	Druck: pressure	bar abs	**114**	**114**	**114**
	Temperatur: temperature	°C	**491**	**457.6**	**479.9**
	Enthalpie: enthalpie	kJ/kg			
	Menge: flow rate	kg/s	**17.86**	**88.47**	**52.91**

Kühlwasser coolwater

Menge flow rate	kg/s	**0.92**	**1.25**	**2.08**
Druck pressure	bar abs	**153**	**153**	**153**
Temperatur temperature	°C	**111**	**111**	**111**
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	**0.54**	**0.74**	**1.23**

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **2.7** (k_{vs}) | Kennlinie: **gl%** (characteristic) | Hub [mm]: **32** (stroke) | Stellzeit normal/schnell [sek]: **/** (stroke time)

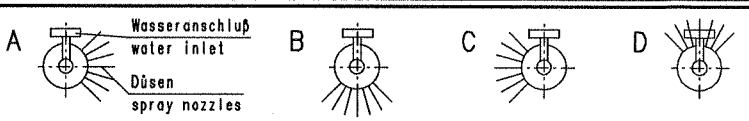
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	**2"**	**2500# RF**	**ASME B 16.5**
Montageflansch: mounting flange	**4"**	**2500# RF**	**ASME B 16.5**

Gehäuse-Material: **1.4903** (body-material)

Dampfleitung steam pipe: ä∅ **322,50** x **31,75** Wd

Einbaulage installation: Horizontal horizontal | Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb actuator

Δp-Antrieb:öffnen/schließen (Δp-actuator. open/ close) **200** | elektr. Drehantr. (electric actuator) | pneum. Schubantr.: (pneumatic actuator) | Sonstiges: **Pneumatikantrieb** (special)

Hersteller: manufactor **SAMSON** | Typ: type **3271 (1400 cm2, 1,1 - 2,4)**

Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open	schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal input signal	pneum. ☐ elektr. ☒	Eingangssignal: **4-20 mA** input signal
ESR: Stck mA electronic positioner	Stecker plug	Klemmen terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais / Handrad handwheel
Goldkontakte gold contacts			Magnetventil solenoid valve	Zuluftdruck : **10,00**bar air supply	Druckminderer ☒ pressure reducing

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü
Antriebsstange einfahrend schließt Kühler
Zusätzlicher Lastfall: Einspritzwasser 4,17 kg/s, 153 bar, 111 °C, kv = 2,46
Ausführung wie unter K03-0227.3 geliefert
Typenschild kompl. in engl. Sprache, mit Angabe cvs = 3,12

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
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SCHROEDAHL
Spezial-Armaturen

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	FV101439	Tag no.	FV-101439
Process medium	Steam	State of medium at inlet:	vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	115000	50000	30000
Inlet pressure	p1	[bar(a)]	101	101	35
Outlet pressure	p2	[bar(a)]	95	95	32
Inlet temperature	t1	[°C]	505	505	450
Spec. volume	v1	[m³/kg]	0,0327	0,0327	0,0919
Isentropic exponent	gamma		1,31	1,31	1,31
Viscosity	ny1	[mm²/s]	0,968	0,968	2,47

Results and factors

Valve coeff. calculated	***Cv***		***329***	***141***	***204***
Min. req. size	Req. DN	[mm]	84,7	55,8	74,0
Outlet velocity	w	[Mach]	0,0957	0,0364	0,0638
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***85***	***76***	***73***
relative travel	T	[%]	125	52,3	76,5
Different. pressure ratio	x		0,06	0,06	0,09
FL value	FL		0,91	0,94	0,92
xT value	xT		0,70	0,75	0,72
Valve style factor	Fd		0,44	0,41	0,43
Level exponent	G1		-4,20	-4,22	-4,12
Slope exponent	G2		1,12	1,49	1,65

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***265***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A217 WC9***
Pressure ratings	***CLASS***		***1500***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***60***	***Charact.***	***linear***
Seat bore	***SB***	***[mm]***	***125***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***25***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 8"
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 187 s [mm] 26

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0**	**[bar]**	**1 ... 3**
				Supply	**psu**	**[bar]**	**3,37**

(Defaults: p1max [bar(a)] 70 p2min [bar(a)] 1,01 t1max [°C] 515)

Actuator results

req. act. force	Fo req.	[kN]	86,29	req. diff. psu-ps100	d ps	[bar] 0,37
max. act. force	Fmax	[kN]	55,77	Actuator force	Fa	[kN] 14,00
max. dp on plug	d. pmax	[bar]	170,03	Close safety factor	Fa/Fo (SF)	1,57
req. start bench range	ps0req.	[bar]	0,70	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV101441Rev3 Tag no. FV101441
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	70000	50000	20000
Inlet pressure	p1	[bar(a)]	55	56	56
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	240	240	240
Density	rho1	[kg/m³]	814,79	814,86	815,1
Vapor pressure	pv	[bar(a)]	33,467	33,467	33,467
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,11122	0,11124	0,1113
Flashing portion	xd2	[%]	21,7	21,7	21,7
spec. Volume	v2	[m³/kg]	0,695	0,695	0,695

Results and factors

			Case 1	Case 2	Case 3
Valve coeff. calculated	***Cv***		***18,0***	***12,6***	***5,05***
Min. req. size	Req. DN	[mm]	250	212	134
Outlet velocity	w	[m/s]	60,1	42,9	17,2
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***84***	***82***	***75***
Flow condition			Flashing	Flashing	Flashing
relative travel	T	[%]	64,0	54,9	31,5
Different. pressure ratio	xF		2,41	2,35	2,35
FL value	FL		0,98	0,98	0,98
Kc value	Kc		0,93	0,93	0,94
Valve style factor	Fd		0,35	0,30	0,15
z value at capacity	zy		0,32	0,35	0,47
Level exponent	F1		-7,45	-7,49	-7,79
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	10,04	9,90	9,89

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***75***	***Type***	***3254***
Nominal size	***DN***	***["]***	***10"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 248 s [mm] 13

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**2,4 ... 3,2**
				Supply	**psu [bar]**	**3,40**

(Defaults: p1max [bar(a)] 70 p2min [bar(a)] 1,01 t1max [°C] 270)

Actuator results

req. act. force	Fo req.	[kN]	24,75	req. diff. psu-ps100	d ps [bar]	0,10
max. act. force	Fmax	[kN]	132,33	Actuator force	Fa [kN]	33,60
max. dp on plug	d. pmax	[bar]	96,98	Close safety factor	Fa/Fo (SF)	1,36
req. start bench range	ps0req.	[bar]	1,94	Open safety factor	Ff/Fw	

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV150411 Tag no. FV150411
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	18000	14000	5000
Inlet pressure	p1	[bar(a)]	5,4	5,4	6
Outlet pressure	p2	[bar(a)]	1,6	1,6	1,6
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	992,42	992,42	992,44
Vapor pressure	pv	[bar(a)]	0,073844	0,073844	0,073844
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,65301	0,65301	0,65302

Results and factors

Valve coeff. calculated	***Cv***		***10,8***	***8,43***	***2,80***
Min. req. size	Req. DN	[mm]	35,8	31,6	18,9
Outlet velocity	w	[m/s]	2,57	2,00	0,713
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***76***	***73***	***65***
relative travel	T	[%]	86,0	79,6	51,4
Different. pressure ratio	xF		0,71	0,71	0,74
FL value	FL		0,95	0,95	0,97
Kc value	Kc		0,85	0,86	0,91
Valve style factor	Fd		0,30	0,27	0,12
z value at capacity	zy		0,40	0,44	0,59
Level exponent	F1		-7,04	-7,10	-7,38
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-2,66	-1,62	0,41

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***20***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***31***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 ["] 2"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 55 s [mm] 2,9

Actuator data

Type			**3277**	**Fail-safe act.**	**retracts**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**0,2 ... 1**
				Supply	**psu [bar]**	**1,36**

(Defaults: p1max [bar(a)] 13 p2min [bar(a)] 1,01 t1max [°C] 40)

Actuator results

req. act. force	Fo req.	[kN]	1,15	req. diff. psu-ps100	d ps	[bar] 0,36
max. act. force	Fmax	[kN]	27,34	Actuator force	Fa	[kN] 1,27
max. dp on plug	d. pmax	[bar]	13,41	Close safety factor	Fa/Fo (SF)	1,10
req. start bench range	ps0req.	[bar]	0,02	Open safety factor	Ff/Fw	13,69

Dampfkühler-Datenblatt **SA.RV.000772**

DESUPERHEATER-DATA SHEET

Verteiler
Ordner
Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.4**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKVP 088/117U-LH1**
Anlagenkennz./Pos.: item-no	**No.: FV-150610 / 150-02**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**54,00/ 98bar** **500/ 160°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

vor Einspritzung before injection	Menge: flow rate	kg/s	3.59	8.72	35.89
	Druck: pressure	bar abs	47	47	47
	Temperatur: temperature	°C	475	475	475
	Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection	Druck: pressure	bar abs	47	47	47
	Temperatur: temperature	°C	269	269	269
	Enthalpie: enthalpie	kJ/kg			
	Menge: flow rate	kg/s	4.42	10.75	44.22

Kühlwasser coolwater

Menge flow rate	kg/s	0.83	2.03	8.33
Druck pressure	bar abs	60	60	60
Temperatur temperature	°C	111	111	111
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	0.85	2.07	8.53

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **9.5** (k_{vs}) | Kennlinie: characteristic **linear** | Hub [mm]: stroke **80** | Stellzeit normal/schnell [sek]: stroke time **/**

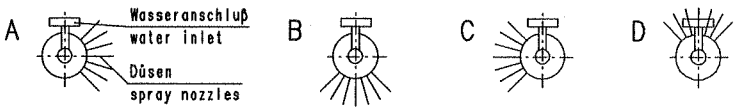
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASME B 16.5
Montageflansch: mounting flange	4"	900# RF	ASME B 16.5

Gehäuse-Material: body-material **1.5415**

Dampfleitung steam pipe: ä∅ **323,80** x Wd

Einbaulage installation: Horizontal horizontal / Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb actuator

Δp-Antrieb: Δp-actuator. öffnen/schließen open/ close **98**	elektr. Drehantr. electric actuator	pneum. Schubantr.: pneumatic actuator	Sonstiges: special **Pneumatikantrieb**		
Hersteller: manufactor **SAMSON**	Typ: type **3271 (1400 cm2, 1,1 - 2,4)**				
Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open	schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal pneum. ☒ elektr. input signal		Eingangssignal: **4-20 mA** input signal
ESR: Stck mA electronic positioner	Stecker plug	Klemmen terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais	Handrad handwheel
Goldkontakte gold contacts			Magnetventil solenoid valve	Zuluftdruck : **10,00**bar air supply	Druckminderer ☒ pressure reducing	

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü

Antriebsstange einfahrend schließt Kühler

Zusätzlicher Lastfall: 11,97 kg/s Dampf, 47 bar / 475 °C auf 269 °C, Kühlw. 2,78 kg/s, 60 bar / 111 °C, kv = 2,84

Ausführung wie unter K03-0227.4 geliefert

Typenschild kompl. in engl. Sprache, mit Angabe cvs = 10,98

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

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SCHROEDAHL
Spezial-Armaturen

Dampfkühler-Datenblatt **SA.RV.000773**

DESUPERHEATER-DATA SHEET

Verteiler / Ordner / Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.5**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKVP 088/117U-PH1**
Anlagenkennz./Pos.: item-no	**No.: FV-150630 / 150-03**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**54,00/ 98bar** **500/ 160°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

vor Einspritzung before injection	Menge: flow rate	kg/s	1.08	6.83	28.06
	Druck: pressure	bar abs	5.7	5.7	5.7
	Temperatur: temperature	°C	364	364	364
	Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection	Druck: pressure	bar abs	5.7	5.7	5.7
	Temperatur: temperature	°C	270	270	270
	Enthalpie: enthalpie	kJ/kg			
	Menge: flow rate	kg/s	1.16	7.36	30.23

Kühlwasser coolwater

Menge flow rate	kg/s	0.08	0.53	2.17
Druck pressure	bar abs	60	60	60
Temperatur temperature	°C	111	111	111
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	0.04	0.26	1.09

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **1.2** (k_{vs}) | Kennlinie: characteristic **gl%** | Hub [mm]: stroke **32** | Stellzeit normal/schnell [sek]: stroke time **/**

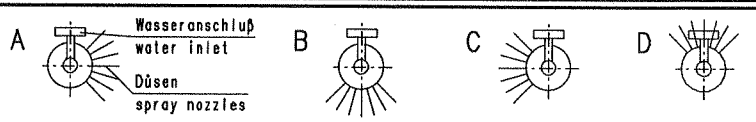
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASME B 16.5
Montageflansch: mounting flange	4"	900# RF	ASME B 16.5

Gehäuse-Material: body-material **1.5415**

Dampfleitung steam pipe: ä∅ **508,00** x Wd

Einbaulage installation: Horizontal horizontal / Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb actuator

Δp-Antrieb: öffnen/schließen Δp-actuator. open/ close **98**	elektr. Drehantr. electric actuator	pneum. Schubantr.: pneumatic actuator	Sonstiges: special **Pneumatikantrieb**	
Hersteller: manufactor **SAMSON**	Typ: type **3277 (700 cm2, 2,1 - 3,3)**			
Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open / schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal pneum. / elektr. ☒ input signal	Eingangssignal: **4-20 mA** input signal
ESR: Stck mA electronic positioner	Stecker / Klemmen plug / terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais / Handrad handwheel
Goldkontakte gold contacts		Magnetventil solenoid valve	Zuluftdruck: air supply **10,00**bar	Druckminderer ☒ pressure reducing

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü
Antriebsstange einfahrend schließt Kühler
Ausführung wie unter K03-0227.5 geliefert
Typenschild kompl. in engl. Sprache, mit Angabe cvs = 1,39

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

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SCHROEDAHL
Spezial-Armaturen

Dampfkühler-Datenblatt **SA.RV.000774**

DESUPERHEATER-DATA SHEET

Verteiler / Ordner / Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.6**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKVP 088/117U-PH1**
Anlagenkennz./Pos.: item-no	**No.: FV-150636 / 150-04**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**54,00/ 98bar** **500/ 160°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

vor Einspritzung before injection – Menge: flow rate	kg/s	**71.16**	**47.44**	**2.37**
Druck: pressure	bar abs	**47**	**47**	**47**
Temperatur: temperature	°C	**482**	**482**	**482**
Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection – Druck: pressure	bar abs	**47**	**47**	**47**
Temperatur: temperature	°C	**400**	**400**	**400**
Enthalpie: enthalpie	kJ/kg			
Menge: flow rate	kg/s	**76.16**	**50.77**	**2.54**

Kühlwasser coolwater

Menge flow rate	kg/s	**5**	**3.33**	**0.17**
Druck pressure	bar abs	**60**	**60**	**60**
Temperatur temperature	°C	**111**	**111**	**111**
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	**5.12**	**3.41**	**0.17**

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **5.7** (k_{vs}) | Kennlinie: characteristic **gl%** | Hub [mm]: stroke **80** | Stellzeit normal/schnell [sek]: stroke time **/**

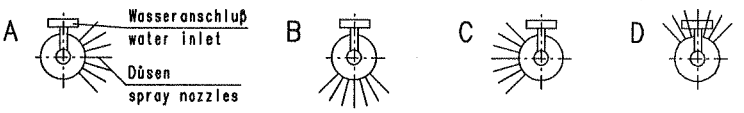
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	**2"**	**1500# RF**	**ASME B 16.5**
Montageflansch: mounting flange	**4"**	**900# RF**	**ASME B 16.5**

Gehäuse-Material: body-material **1.5415**

Dampfleitung steam pipe **äØ 406,40 x Wd**

Einbaulage installation: Horizontal horizontal / Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb actuator

Δp-Antrieb: Δp-actuator. öffnen/schließen open/ close **98** | elektr. Drehantr. electric actuator | pneum. Schubantr.: pneumatic actuator | Sonstiges: special **Pneumatikantrieb**

Hersteller: manufactor **SAMSON** | Typ: type **3271 (1400 cm2, 1,1 - 2,4)**

Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open	schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal input signal	pneum. ☒	elektr. ☒
ESR: Stck mA electronic positioner	Stecker plug	Klemmen terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais
Goldkontakte gold contacts			Magnetventil solenoid valve	Zuluftdruck : **10,00**bar air supply	Druckminderer ☒ pressure reducing

Eingangssignal: input signal **4-20**

Handrad handwheel

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü

Antriebsstange einfahrend schließt Kühler

Zusätzlicher Lastfall: 19,77 kg/s Dampf, 47 bar / 482 °C auf 400 °C, Kühlw. 1,39 kg/s, 60 bar / 111 °C, kv = 1,42

Ausführung wie unter K03-0227.6 geliefert

Typenschild kompl. in engl. Sprache, mit Angabe cvs = 6,59

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
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SCHROEDAHL Spezial-Armaturen

Dampfkühler-Datenblatt **SA.RV.000775**

DESUPERHEATER-DATA SHEET

Verteiler
Ordner
Auftrag

Anlage: project	**2 nd Methanol**	Kom-Nr./Ang.-Nr.: work-no./quotation-no.	**K04-0618.7**
Kunde: customer	**SAMSOMATIC GmbH**	Ventiltyp: type	**DKVP 088/116U-PL1**
Anlagenkennz./Pos.: item-no	**No.: FV-150725 / 150-05**	Stückzahl: quantity	**1.00**
Auftrags-Nr.: order-no.	**976524/4060/742**	Liefertermin: delivery	**08.11.2004**
Spezifikation/Abnahme: specification	**EN 10 204 - 3.1 B**	Auslegungsdaten: design data	**7,00/ 98bar** **380/ 160°C**

Betriebsdaten operating data

Medium: **Dampf** (medium)

vor Einspritzung before injection	Menge: flow rate	kg/s	**5.31**	**26.53**	**39.81**
	Druck: pressure	bar abs	**5.7**	**5.7**	**5.7**
	Temperatur: temperature	°C	**270**	**270**	**270**
	Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection	Druck: pressure	bar abs	**5.7**	**5.7**	**5.7**
	Temperatur: temperature	°C	**160**	**160**	**160**
	Enthalpie: enthalpie	kJ/kg			
	Menge: flow rate	kg/s	**5.87**	**29.31**	**43.98**

Kühlwasser coolwater

Menge flow rate	kg/s	**0.56**	**2.78**	**4.17**
Druck pressure	bar abs	**60**	**60**	**60**
Temperatur temperature	°C	**111**	**111**	**111**
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	**0.28**	**1.39**	**2.09**

Kühlerausführung desuperheater design

K_{vs} [m^3/h]: **2.3** (K_{vs}) | Kennlinie: characteristic **gl%** | Hub [mm]: stroke **32** | Stellzeit normal/schnell [sek]: stroke time **/**

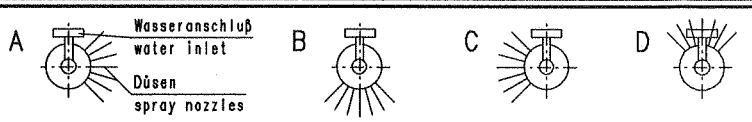
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	**2"**	**1500# RF**	**ASME B 16.5**
Montageflansch: mounting flange	**4"**	**600# RF**	**ASME B 16.5**

Gehäuse-Material: body-material **1.5415**

Dampfleitung steam pipe ä∅ **508,00** x Wd

Einbaulage installation Horizontal horizontal Vertikal ☒ vertical

Abströmrichtung: emitting direction **A**



Anstrich : painting **SA Standard**

Antrieb actuator

Δp-Antrieb: öffnen/schließen Δp-actuator. open/ close **98** | elektr. Drehantr. electric actuator | pneum. Schubantr.: pneumatic actuator | Sonstiges: special **Pneumatikantrieb**

Hersteller: manufactor **SAMSON** | Typ: type **3277 (700 cm2, 2,1 - 3,3)**

Drehm.: Nm torque	U/Hub: revolution/stroke	U/min: revolution/minute	Feder öffnet spring open	schließt ☒ closed	doppeltwirkend double-action
U/f: V/Hz voltage	DE: Stck torque switches	WE: Stck limit switches	Eingangssignal input signal	pneum. elektr.☒ pneum. electr.	Eingangssignal: **4-20 mA** input signal

ESR: Stck mA electronic positioner	Stecker plug	Klemmen terminals	Stellungsregler ☒ positioner	Verstärker ☒ booster	Verblockung interblock relais	Handrad handwheel
Goldkontakte gold contacts			Magnetventil solenoid valve	Zuluftdruck : **10,00**bar air supply	Druckminderer ☒ pressure reducing	

Bemerkungen: remarks

Zuluftdruck 4 - 9 bar ü
Antriebsstange einfahrend schließt Kühler
Ausführung wie unter K03-0227.7 geliefert
Typenschild kompl. in engl. Sprache, mit Angabe cvs = 2,66

Revision	Datum	Änderungen	Name	Unterschrift
1	07.09.2004	Hinweis Typenschild	SKEPPLER	
0	29.07.2004	Erstellung	KEPPLER	

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SCHROEDAHL
Spezial-Armaturen

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV250102 Tag no. FV250102
Process medium Hydrogen State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	23000	19254	5800
Inlet pressure	p1	[bar(a)]	35	35	35
Differential pressure	dp	[bar]	2,8	2,9	3
Inlet temperature	t1	[°C]	50	50	50
Molar mass	M	[g/mol]	2,02	2,02	2,02
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1	1	1
Viscosity	eta	[mPas]	0,00880	0,00880	0,00880

Results and factors

Valve coeff. calculated	***Kv***		***25,5***	***21,1***	***6,26***
Min. req. size	Req. DN	[mm]	27,2	24,9	13,7
Outlet velocity	w	[Mach]	0,0888	0,0746	0,0225
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***60***	***58***	***51***
relative travel	T	[%]	84,4	79,5	48,5
Different. pressure ratio	x		0,08	0,08	0,09
FL value	FL		0,76	0,75	0,74
xT value	xT		0,49	0,48	0,47
Valve style factor	Fd		0,42	0,35	0,22
Level exponent	G1		-3,52	-3,75	-3,87
Slope exponent	G2		2,50	2,50	2,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Kvs***		***47***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A105***
Pressure ratings	***PN***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***48***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***bellows***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 [mm] 50 D2 [mm] 50
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 51 s [mm] 13

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 80)

Actuator results

req. act. force	Fo req.	[kN]	8,04	req. diff. psu-ps100	d ps	[bar] 0,11
max. act. force	Fmax	[kN]	25,45	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	56,42	Close safety factor	Fa/Fo (SF)	1,39
req. start bench range	ps0req.	[bar]	1,26	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV250105 Tag no. FV250105
Process medium Hydrogen State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	3700	2700	1600
Inlet pressure	p1	[bar(a)]	31,2	31,2	31,2
Differential pressure	dp	[bar]	0,4	1,2	2,2
Inlet temperature	t1	[°C]	40	40	40
Molar mass	M	[g/mol]	2,02	2,02	2,02
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1	1	1
Viscosity	eta	[mPas]	0,00880	0,00880	0,00880

Results and factors

Valve coeff. calculated	***Kv***		***10,8***	***4,64***	***2,08***
Min. req. size	Req. DN	[mm]	11,1	9,58	7,50
Outlet velocity	w	[Mach]	0,0147	0,0110	0,00675
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***<30***	***36***	***42***
relative travel	T	[%]	73,8	52,3	31,8
Different. pressure ratio	x		0,01	0,04	0,07
FL value	FL		0,76	0,75	0,74
xT value	xT		0,49	0,48	0,47
Valve style factor	Fd		0,42	0,35	0,22
Level exponent	G1		-3,52	-3,75	-3,87
Slope exponent	G2		2,50	2,50	2,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Kvs***		***30***	***Type***	***3251***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A216 WCB***
Pressure ratings	***PN***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***38***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***12***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***bellows***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 [mm] 50 D2 [mm] 50
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 51 s [mm] 13

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 75 p2min [bar(a)] 1,01 t1max [°C] 40)

Actuator results

req. act. force	Fo req.	[kN]	8,75	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	32,99	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	95,47	Close safety factor	Fa/Fo (SF)	1,28
req. start bench range	ps0req.	[bar]	1,38	Open safety factor	Ff/Fw	-

01	Order-No. :	1064 24081		Customer :	Samson Frankfurt			
02	Name :	Marc Bastius		Project :	P 1725			
03	Pos.-No. :	1	Rev. 1	Process Fluid :	raw methanol			19.10.2004
04	TAG - No. :	FV-300101		Upstream Conditions :	Liquid			

VETEC *Valve Sizing V2000*

	Process and Medium Data			min	norm	max
06	Flow Rate	[kg/h]	W	70.000	239.406	275.000
07	Inlet Pressure	[bara]	p1	5,60	5,40	5,30
08	Outlet Pressure	[bara]	p2	4,60	5,00	5,10
09	Inlet Temperature	[°C]	t1	38,00	38,00	38,00
10	Density	[kg/m³]	rho	788,000	788,000	788,000
11	Vapor Pressure	[bara]	pv	5,480	5,399	5,299
12	Critical Pressure	[bara]	pc	106,8	106,8	106,8
13	Viscosity	[mPas]	eta	0,49	0,49	0,49
14	Ratio. Spc. Heat	[cp/cv]				
15	Compressibility Factor					
16	Flashing	[%]				

	Pipeline					
18	Line size	[mm]	Da * s / PN (In)	323,9 x 9,53 / std	Da * s / PN (Out)	323,9 x 9,53 / std

	Results				
20	***Calculated Valve Coeff.***	**[Kv]**	187,43	728,83	855,30
21	Valve Opening in %		34	82	92
22	Outlet Velocity	[m/s]			
23	Max. admitted Velocity	[m/s]			
24	Mach				
25	Acoustic Cap. Lev. LwA,a	[dB(A)]	72	73	71
26	Sound Pres. Lev. LpA,a	[dB(A)]	58	59	57
27	Flow Remark		Flashing	Flashing	Flashing

	Valve Data							
29	Valve Style			Rotary Plug Valve			Valve Type	72.3 R
30	Body Size	[inch]	DN	8"			Body Material	A216 WCC
31	Press. Rating	[lbs]	PN	150			Plug Material	1.4581 / Stellite 6
32	End Connections			RF			Seat Ring Material	1.4571 / Stellite 6
33	Face to Face	[mm]		543			Guide Material	1.4571
34	Selected Valve Coeff.		**Kvs**	**950**	**Cvs**	**1098**	Plug/Seat Facing	Metallic
35	Seat Diameter	[mm]		135,0	Sitzfaktor	1	Gaskets	S.S. / Graphite
36	Leakage Class			DIN IEC 534 T4, KL IV L1			Packing	PTFE / Graphite
37	Characteristic			Equal %			Bonnet	Standard
38	Noise Reduction						Flow Direction	Flow to Open

	Actuator Data					
					Fail Position	Spring to Close
40	Actuator Style			Pneumatic	Handwheel	Without
41	Actuator Type			R 250v	Stroke Time o/c [s] t	< 20 / < 20
42	Spring Range	[bar]		1,3 - 2,4	Req. Torque [Nm]	300
43	Air Supply	[bar]		3,0 - 6,0	Max. Torque [Nm]	1280
44	Max. Shut Off	[bar]	dp	7,5	Mounting	A

	Accessories				
46	Positioner	Type	FF_3787-100, 4-20 mA, IP 65, gauges	Air Set Type	Norgren B73G-4AK-QP3
47	Limit Switches	Type		Piping	1/2" s.s. / Swagelok
48	Solenoid Valve	Type		Others	Booster, EIL 100 F03

	Certification/Requirements			**Remarks**
50	Material	EN 10204 / 3.1B	55	Zubehör und Rohr 1/2" s.s. wird von Samson beigestellt,
51	Inspection	EN 10204 / 3.1B	56	Verschraubung von VETEC
52	Others		57	
53	Cust. Std.		58	
54	**Weight**	260 kg	59	

036

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV300203 Tag no. FV300203
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	33000	25215	8000
Inlet pressure	p1	[bar(a)]	4,6	4,8	5
Outlet pressure	p2	[bar(a)]	3,6	3,5	3,5
Inlet temperature	t1	[°C]	148	150	151
Density	rho1	[kg/m³]	918,87	917,01	916,08
Vapor pressure	pv	[bar(a)]	4,5112	4,761	4,89
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,18512	0,18246	0,18116
Flashing portion	xd2	[%]	1,63	2,22	2,42
spec. Volume	v2	[m³/kg]	0,589	0,605	0,605

Results and factors

Valve coeff. calculated	***Cv***		***69,5***	***53,5***	***14,7***
Min. req. size	Req. DN	[mm]	45,6	46,4	27,2
Outlet velocity	w	[m/s]	19,5	20,2	6,94
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***66***	***68***	***59***
Flow condition			Flashing	Flashing	Flashing
relative travel	T	[%]	92,4	85,7	52,7
Different. pressure ratio	xF		11,26	33,33	13,64
FL value	FL		0,89	0,90	0,93
Kc value	Kc		0,69	0,72	0,81
Valve style factor	Fd		0,46	0,46	0,46
z value at capacity	zy		0,36	0,40	0,58
Level exponent	F1		-7,00	-7,00	-7,00
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	14,55	18,18	15,71

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***95***	***Type***	***3241***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 159,3 s [mm] 4,5

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 8 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	4,07	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	22,39	Actuator force	Fa	[kN] 4,90
max. dp on plug	d. pmax	[bar]	8,62	Close safety factor	Fa/Fo (SF)	1,20
req. start bench range	ps0req.	[bar]	1,28	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	FV300305	Tag no.	FV300305
Process medium	Methanol	State of medium at inlet:	liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	71000		
Inlet pressure	p1	[bar(a)]	11		
Outlet pressure	p2	[bar(a)]	3		
Inlet temperature	t1	[°C]	92		
Density	rho1	[kg/m³]	731,21		
Vapor pressure	pv	[bar(a)]	2,7845		
Critical pressure	pc	[bar(a)]	81		
Viscosity	eta	[mPas]	0,396		

Results and factors

Valve coeff. calculated	***Cv***		***35,1***
Min. req. size	Req. DN	[mm]	129
Outlet velocity	w	[m/s]	3,43
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***73***
relative travel	T	[%]	81,0
Different. pressure ratio	xF		0,97
FL value	FL		0,95
Kc value	Kc		0,86
Valve style factor	Fd		0,42
z value at capacity	zy		0,29
Level exponent	F1		-6,98
Slope exponent	F2		0,30
Correct. term	delta Lf	[dB]	-9,40

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***75***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0**	**[bar]**	**0,8 ... 2,4**
				Supply	**psu**	**[bar]**	**2,60**

(Defaults: p1max [bar(a)] 13,5 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	4,38	req. diff. psu-ps100	d ps	[bar]	0,01
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa	[kN]	5,60
max. dp on plug	d. pmax	[bar]	16,35	Close safety factor	Fa/Fo (SF)		1,28
req. start bench range	ps0req.	[bar]	0,69	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project:2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV300306 Tag no. FV300306
Process medium Methanol State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	33000		
Inlet pressure	p1	[bar(a)]	6,4		
Outlet pressure	p2	[bar(a)]	3,1		
Inlet temperature	t1	[°C]	64		
Density	rho1	[kg/m³]	749	749	749
Vapor pressure	pv	[bar(a)]	2	2	2
Critical pressure	pc	[bar(a)]	80,8	80,8	80,8
Viscosity	eta	[mPas]	0,396	0,396	0,396

Results and factors

Valve coeff. calculated	***Cv***		***24,6***
Min. req. size	Req. DN	[mm]	57,6
Outlet velocity	w	[m/s]	2,43
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***77***
relative travel	T	[%]	83,4
Different. pressure ratio	xF		0,75
FL value	FL		0,95
Kc value	Kc		0,86
Valve style factor	Fd		0,43
z value at capacity	zy		0,28
Level exponent	F1		-6,86
Slope exponent	F2		0,30
Correct. term	delta Lf	[dB]	-12,59

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***47***	***Type***	***3241***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 3"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 82,5 s [mm] 3,2

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 8,4 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	2,75	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	23,11	Actuator force	Fa	[kN] 4,90
max. dp on plug	d. pmax	[bar]	14,25	Close safety factor	Fa/Fo (SF)	1,78
req. start bench range	ps0req.	[bar]	0,87	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV300408 Tag no. FV300408
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	160000	125240	90000
Inlet pressure	p1	[bar(a)]	3,6	4,8	6
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	128	141	139
Density	rho1	[kg/m³]	936,58	925,3	927,16
Vapor pressure	pv	[bar(a)]	2,5448	3,7185	3,5139
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,21651	0,19507	0,19813
Flashing portion	xd2	[%]		1,48	1,08
spec. Volume	v2	[m³/kg]		0,695	0,695

Results and factors

			Case 1	Case 2	Case 3
Valve coeff. calculated	***Cv***		***256***	***141***	***69,2***
Min. req. size	Req. DN	[mm]	142	91,5	67,4
Outlet velocity	w	[m/s]	2,69	22,3	12,1
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***76***	***72***	***71***
Flow condition				Flashing	Flashing
relative travel	T	[%]	87,3	72,0	53,8
Different. pressure ratio	xF		0,57	1,66	1,21
FL value	FL		0,91	0,93	0,95
Kc value	Kc		0,76	0,82	0,87
Valve style factor	Fd		0,43	0,41	0,36
z value at capacity	zy		0,21	0,25	0,31
Level exponent	F1		-7,20	-7,27	-7,34
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-10,33	7,91	6,19

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***420***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***150***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 12" D2 ["] 12"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 307,9 s [mm] 8

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,7**
				Supply	**psu [bar]**	**2,90**

(Defaults: p1max [bar(a)] 8 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	13,45	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	52,46	Actuator force	Fa	[kN] 19,60
max. dp on plug	d. pmax	[bar]	10,46	Close safety factor	Fa/Fo (SF)	1,46
req. start bench range	ps0req.	[bar]	1,06	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	FV300510A	Tag no.	FV300510A
Process medium	Methanol	State of medium at inlet:	liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	90000	305420	420000
Inlet pressure	p1	[bar(a)]	14,9	14,2	13,6
Outlet pressure	p2	[bar(a)]	12,3	12,7	13
Inlet temperature	t1	[°C]	128	128	128
Density	rho1	[kg/m³]	679,04	679,04	679,04
Vapor pressure	pv	[bar(a)]	8,2359	8,2359	8,2359
Critical pressure	pc	[bar(a)]	81	81	81
Viscosity	eta	[mPas]	0,396	0,396	0,396

Results and factors

Valve coeff. calculated	***Cv***		***79,3***	***357***	***802***
Min. req. size	Req. DN	[mm]	96,8	178	209
Outlet velocity	w	[m/s]	1,17	3,98	5,47
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***58***	***64***	***60***
relative travel	T	[%]	25,8	64,2	84,9
Different. pressure ratio	xF		0,39	0,25	0,11
FL value	FL		0,96	0,92	0,90
Kc value	Kc		0,89	0,78	0,73
Valve style factor	Fd		0,18	0,40	0,43
z value at capacity	zy		0,43	0,28	0,22
Level exponent	F1		-7,81	-7,65	-7,57
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***butterfly valve***
Valve coefficient	***Cv***		***1447***	***Type***	***14c***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***200***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 12" D2 ["] 12"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 307,9 s [mm] 8

Actuator data

Type			**SRP2000**	**Fail-safe act.**	**extends**
Diaphr. area	**A**	**[cm²]**		**Bench range**	**ps0 [bar] ...**
				Supply	**psu [bar]**

(Defaults: p1max [bar(a)] 16 p2min [bar(a)] 1,01 t1max [°C] 200)

Propsl./order no.: 616100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV300510B Tag no. FV300510B
Process medium Methanol State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	90000		
Inlet pressure	p1	[bar(a)]	15		
Outlet pressure	p2	[bar(a)]	9		
Inlet temperature	t1	[°C]	128		
Density	rho1	[kg/m³]	679,04		
Vapor pressure	pv	[bar(a)]	8,2359		
Critical pressure	pc	[bar(a)]	81		
Viscosity	eta	[mPas]	0,396		

Results and factors

Valve coeff. calculated	***Cv***		***52,2***
Min. req. size	Req. DN	[mm]	110
Outlet velocity	w	[m/s]	4,69
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***80***
relative travel	T	[%]	79,4
Different. pressure ratio	xF		0,89
FL value	FL		0,94
Kc value	Kc		0,83
Valve style factor	Fd		0,42
z value at capacity	zy		0,23
Level exponent	F1		-6,85
Slope exponent	F2		0,30
Correct. term	delta Lf	[dB]	-15,34

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***120***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 16 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	8,13	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	52,46	Actuator force	Fa	[kN] 9,80
max. dp on plug	d. pmax	[bar]	18,27	Close safety factor	Fa/Fo (SF)	1,21
req. start bench range	ps0req.	[bar]	1,28	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV300611 Tag no. FV300611
Process medium Methanol State of medium at inlet: liquid

Process and medium data			Case 1	Case 2	Case 3
Flow	W	[kg/h]	75000	251518	350000
Inlet pressure	p1	[bar(a)]	8,5	8	7,5
Outlet pressure	p2	[bar(a)]	6,3	6,6	7
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	773	773	773
Vapor pressure	pv	[bar(a)]	0,35	0,35	0,35
Critical pressure	pc	[bar(a)]	81	81	81
Viscosity	eta	[mPas]	0,449	0,449	0,449

Results and factors					
Valve coeff. calculated	***Cv***		***67,3***	***284***	***678***
Min. req. size	Req. DN	[mm]	82,8	152	179
Outlet velocity	w	[m/s]	0,858	2,88	4,00
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***55***	***62***	***57***
relative travel	T	[%]	21,6	58,4	80,6
Different. pressure ratio	xF		0,27	0,18	0,07
FL value	FL		0,96	0,92	0,90
Kc value	Kc		0,89	0,78	0,73
Valve style factor	Fd		0,18	0,40	0,43
z value at capacity	zy		0,43	0,28	0,22
Level exponent	F1		-7,81	-7,65	-7,57
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***butterfly valve***
Valve coefficient	***Cv***		***1447***	***Type***	***14c***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A516 Gr.70***
Pressure ratings	***CLASS***		***150***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***200***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 12" D2 ["] 12"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 307,9 s [mm] 8

Actuator data

Type **SRP2000** **Fail-safe act.** **extends**
Diaphr. area **A** **[cm²]** **Bench range** **ps0** **[bar]** ...
Supply **psu** **[bar]**

(Defaults: p1max [bar(a)] 16 p2min [bar(a)] 1,01 t1max [°C] 200)

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. FV300920 Tag no. FV300920
Process medium Methanol State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	109000		
Inlet pressure	p1	[bar(a)]	8,5		
Outlet pressure	p2	[bar(a)]	5		
Inlet temperature	t1	[°C]	40		
Density	rho1	[kg/m³]	773		
Vapor pressure	pv	[bar(a)]	0,32665		
Critical pressure	pc	[bar(a)]	81		
Viscosity	eta	[mPas]	0,41087		

Results and factors

Valve coeff. calculated	***Cv***		***77,5***
Min. req. size	Req. DN	[mm]	99,9
Outlet velocity	w	[m/s]	4,99
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***82***
relative travel	T	[%]	89,5
Different. pressure ratio	xF		0,43
FL value	FL		0,93
Kc value	Kc		0,79
Valve style factor	Fd		0,44
z value at capacity	zy		0,30
Level exponent	F1		-6,81
Slope exponent	F2		0,30
Correct. term	delta Lf	[dB]	-5,05

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***120***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 13 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	6,62	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa	[kN] 9,80
max. dp on plug	d. pmax	[bar]	18,27	Close safety factor	Fa/Fo (SF)	1,48
req. start bench range	ps0req.	[bar]	1,04	Open safety factor	Ff/Fw	-

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	HV 200 204
Customer			Sizing 1
		Cust. Ref.	
Project Project 8		Date / by	2/1/03 / u.l

PROCESS DATA

Pipe size inlet / outlet	in 18 / 18	Wall thickness	sch Std
Valve duty			
Description	Natural Gas	Fluid nature	GAS
Density		Critical pressure	
Molecular weight	11.4	Ratio of specific heats	1.32

		Case 1	Case 2	Case 3	Case 4
Flow rate	Nm3/h	575154	604000		
Upstream temperature	degC	147	170		
Upstream pressure	barA	76.6	82.8		
Differential pressure	bar	0.1	0.1		
Downstream pressure	barA	76.5	82.7		
Compressibility		1.02	1.02		

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	6478.83	6720.34		
Percent of full travel	%	74.7	76.0		
Opening in degrees	deg	68	69.1		
Sound pressure level	dBA	76	76		
Flow velocity (outlet)	Mach	0.03	0.03		
Xt		0.37	0.36		

VALVE SELECTION

Nominal size	in 18	Maximum capacity Cv	12100
Valve type	BUTTERFLY	METAL SEATED BUTTERFLY VALVE, RATINGS	
Valve serie	ANSI ~~600~~ 900, DIN PN40		

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	HV-200214
Customer			Sizing 2
		Cust. Ref.	
Project A-10372 SAMSON F		Date / by	10/16/02 / u.w.

PROCESS DATA

Pipe size inlet / outlet	In 16 / 16	Wall thickness	sch 40
Valve duty			Fluid nature
Description			GAS
Density		Critical pressure	
Molecular weight	29.9	Ratio of specific heats	0.39

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	60075	116146		
Upstream temperature	degC	40	40		
Upstream pressure	barA	4.9	11.6		
Differential pressure	bar	2.4	6.5		
Downstream pressure	barA	2.5	5.1		
Compressibility		1.02	1.02		

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	1660.86	1076.96		
Percent of full travel	%	87.8 *	63.4		
Opening in degrees	deg	79.4	58.1		
Sound pressure level	dBA	85	97 *		
Flow velocity (outlet)	Mach	1.80 *	1.80 *		
Valve new dp	bar	0.17	2.46		
Xt		0.67	0.62		

VALVE SELECTION

Nominal size	In 12	Maximum capacity Cv	1605.96
Valve type	BUTTERFLY ANSI ~~600~~ 900	WAFER-SPHERE,	BUTTERFLY VALVE, RATING ANSI 600
Attenuator plate		Plate size In 16	

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

CONTROL VALVE SIZING SHEET

HV200503

Item		Revision	
Customer		Tag no	Copy of Copy of Copy Sizing 1
Project	Project 8	Cust. Ref.	
		Date / by	2/1/03 / u.l

PROCESS DATA

Pipe size inlet / outlet	in 6 / 6	Wall thickness	sch 40
Valve duty			
Description	Natural Gas	Fluid nature	GAS
Density		Critical pressure	
Molecular weight	11.47	Ratio of specific heats	1.32

		Case 1	Case 2	Case 3	Case 4
Flow rate	Nm3/h	126500	166000		
Upstream temperature	degC	66	66		
Upstream pressure	barA	76.7	76.7		
Differential pressure	bar	4.7	4.7		
Downstream pressure	barA	72	72		
Compressibility		0.891	0.891		

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	177.23	218.18		
Percent of full travel	%	48	61.2		
Opening in degrees	deg	38.4	50.1		
Sound pressure level	dBA	79	77		
Flow velocity (outlet)	Mach	0.06	0.06		
Valve new dp	bar	2.77	1.77		
Xt		0.67	0.67		

VALVE SELECTION

Nominal size	mm 150	Maximum capacity Cv	266.62
Valve type	BUTTERFLY	BALANCED NELDISC, METAL SEATED BUTTERFLY VALVE,	
Valve serie		RATINGS ANSI 300, DIN PN40	600
Attenuator plate		Plate size mm 150	

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

LN + HP

Propsl./order no.: 616100 Customer LURGI - PIDEC
Project 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV100411A Tag no. LV100411
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	35000	27958	5000
Inlet pressure	p1	[bar(a)]	32,5	33,7	23
Outlet pressure	p2	[bar(a)]	30,5	30,5	20
Inlet temperature	t1	[°C]	180	167	140
Density	rho1	[kg/m³]	888,5	902,13	927
Vapor pressure	pv	[bar(a)]	10,026	7,3625	5,4535
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,1507	0,16327	0,1457

Results and factors

Valve coeff. calculated	***Cv***		***30,8***	***19,3***	***3,51***
Min. req. size	Req. DN	[mm]	52,8	46,8	19,5
Outlet velocity	w	[m/s]	2,18	1,71	0,298
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***52***	***54***	***40***
relative travel	T	[%]	77,7	65,7	22,2
Different. pressure ratio	xF		0,09	0,12	0,17
FL value	FL		0,94	0,96	0,97
Kc value	Kc		0,84	0,87	0,93
Valve style factor	Fd		0,42	0,41	0,16
z value at capacity	zy		0,30	0,34	0,57
Level exponent	F1		-6,98	-7,02	-7,59
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***75***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A351 CF8M***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 106,3 s [mm] 3,99999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	12,64	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	52,46	Actuator force	Fa	[kN] 14,70
max. dp on plug	d. pmax	[bar]	45,54	Close safety factor	Fa/Fo (SF)	1,16
req. start bench range	ps0req.	[bar]	1,99	Open safety factor	Ff/Fw	-

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SAMSON
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Item no. LV100416Rev.2Tag no. LV100416
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	112000	92612	40000
Inlet pressure	p1	[bar(a)]	55	56	60
Outlet pressure	p2	[bar(a)]	50	49	48,5
Inlet temperature	t1	[°C]	240	240	240
Density	rho1	[kg/m³]	814,84	814,86	814,89
Vapor pressure	pv	[bar(a)]	33,467	33,467	33,467
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,11123	0,11124	0,11124

Results and factors

Valve coeff. calculated	***Cv***		***64,9***	***45,4***	***15,3***
Min. req. size	Req. DN	[mm]	98,6	89,7	58,9
Outlet velocity	w	[m/s]	2,16	1,79	0,772
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***67***	***75***	***74***
relative travel	T	[%]	84,9	75,8	48,0
Different. pressure ratio	xF		0,23	0,31	0,43
FL value	FL		0,96	0,96	0,97
Kc value	Kc		0,87	0,89	0,92
Valve style factor	Fd		0,43	0,42	0,32
z value at capacity	zy		0,22	0,24	0,34
Level exponent	F1		-6,95	-6,98	-7,09
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-0,48	-2,84	-4,89

Valve data

Body type			***Globe valve***	***Series***	***250***
Valve coefficient	***Cv***		***120***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A351 CF8C***
Pressure ratings	***PN***		***900***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***25***	***Balanced***	***Graphite (10)***
Packing	***Graphit (20)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 [mm] 150
cR [m/s] 5180 rho [kg/m³] 7850 di [inch] 5,9 s [inch] 1,4

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,2 ... 2**
				Supply	**psu [bar]**	**2,32**

(Defaults: p1max [bar(a)] 85 p2min [bar(a)] 1,01 t1max [°C] 270)

Actuator results

req. act. force	Fo req.	[kN]	44,30	req. diff. psu-ps100	d ps	[bar] 0,32
max. act. force	Fmax	[kN]	67,38	Actuator force	Fa	[kN] 16,80
max. dp on plug	d. pmax	[bar]	246,55	Close safety factor	Fa/Fo (SF)	1,93
req. start bench range	ps0req.	[bar]	0,69	Open safety factor	Ff/Fw	-

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SAMSON
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Item no. LV101308 Tag no. LV101308
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	12000	3390	1500
Inlet pressure	p1	[bar(a)]	32	32	21
Outlet pressure	p2	[bar(a)]	3	3	2
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	993,58	993,58	993,58
Vapor pressure	pv	[bar(a)]	0,073844	0,073844	0,073844
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,65323	0,65323	0,65323

Results and factors

Valve coeff. calculated	***Cv***		***2,62***	***0,739***	***0,404***
Min. req. size	Req. DN	[mm]	29,2	15,5	10,3
Outlet velocity	w	[m/s]	1,71	0,483	0,214
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***80***	***75***	***67***
relative travel	T	[%]	85,1	52,8	37,4
Different. pressure ratio	xF		0,91	0,91	0,91
FL value	FL		0,97	0,98	0,98
Kc value	Kc		0,91	0,93	0,93
Valve style factor	Fd		0,30	0,13	0,09
z value at capacity	zy		0,54	0,68	0,72
Level exponent	F1		-7,32	-8,04	-8,30
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	2,59	7,58	6,67

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***5***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***12***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 [mm] 50
cR [m/s] 5180 rho [kg/m³] 7850 di [inch] 2,1 s [inch] 0,11

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**0,2 ... 1**
				Supply	**psu [bar]**	**1,20**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	0,57	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	24,50	Actuator force	Fa	[kN] 0,70
max. dp on plug	d. pmax	[bar]	50,07	Close safety factor	Fa/Fo (SF)	1,24
req. start bench range	ps0req.	[bar]	0,18	Open safety factor	Ff/Fw	-

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Item no. LV101309 Tag no. LV101309
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	28000	20880	5000
Inlet pressure	p1	[bar(a)]	32,8	32,8	22
Outlet pressure	p2	[bar(a)]	3	3	2
Inlet temperature	t1	[°C]	70	70	70
Density	rho1	[kg/m³]	979,17	979,17	979,17
Vapor pressure	pv	[bar(a)]	0,31201	0,31201	0,31201
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,40469	0,40469	0,40469

Results and factors

Valve coeff. calculated	***Cv***		***6,06***	***4,52***	***1,32***
Min. req. size	Req. DN	[mm]	45,0	38,8	19,0
Outlet velocity	w	[m/s]	1,58	1,18	0,282
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***85***	***84***	***76***
Flow condition			Cavitation		
relative travel	T	[%]	82,3	74,7	43,3
Different. pressure ratio	xF		0,92	0,92	0,92
FL value	FL		0,97	0,97	0,98
Kc value	Kc		0,92	0,92	0,93
Valve style factor	Fd		0,28	0,24	0,10
z value at capacity	zy		0,47	0,51	0,65
Level exponent	F1		-7,18	-7,38	-8,12
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-2,48	0,19	6,73

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***12***	***Type***	***3241***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***31***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 70)

Actuator results

req. act. force	Fo req.	[kN]	3,19	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	25,92	Actuator force	Fa	[kN] 4,90
max. dp on plug	d. pmax	[bar]	61,56	Close safety factor	Fa/Fo (SF)	1,54
req. start bench range	ps0req.	[bar]	1,00	Open safety factor	Ff/Fw	-

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SAMSON
Valve Sizing Version 3.56

Item no. LV101512A Tag no. LV101512A
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	10000	5000	2000
Inlet pressure	p1	[bar(a)]	60	60	60
Outlet pressure	p2	[bar(a)]	30	30	5
Inlet temperature	t1	[°C]	111	111	111
Density	rho1	[kg/m³]	953	953	953
Vapor pressure	pv	[bar(a)]	1,4826	1,4826	1,4826
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,2538	0,2538	0,2538

Results and factors

Valve coeff. calculated	***Cv***		***2,19***	***1,09***	***0,323***
Min. req. size	Req. DN	[mm]	27,2	19,3	12,2
Outlet velocity	w	[m/s]	1,48	0,742	0,297
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***60***	***56***	***77***
relative travel	T	[%]	78,6	60,9	29,7
Different. pressure ratio	xF		0,51	0,51	0,94
FL value	FL		0,97	0,98	0,98
Kc value	Kc		0,92	0,93	0,94
Valve style factor	Fd		0,42	0,40	0,20
z value at capacity	zy		0,65	0,65	0,65
Level exponent	F1		-7,26	-7,62	-8,15
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-2,15	0,12	7,15

Valve data

Body type			***Globe valve***	***Series***	***multistage valve***
Valve coefficient	***Cv***		***5***	***Type***	***3251M***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***31***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 ["] 2"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 53,9001 s [mm] 3,19999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 81 p2min [bar(a)] 1,01 t1max [°C] 140)

Actuator results

req. act. force	Fo req.	[kN]	6,39	req. diff. psu-ps100	d ps	[bar] 0,03
max. act. force	Fmax	[kN]	54,51	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	143,40	Close safety factor	Fa/Fo (SF)	1,75
req. start bench range	ps0req.	[bar]	1,00	Open safety factor	Ff/Fw	-

Propsl./order no. 616100 Customer LURGI - PIDEC
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SAMSON
Valve Sizing Version 3.56

Item no. LV101512B Tag no. LV101512B
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	60000	43404	12000
Inlet pressure	p1	[bar(a)]	30	30	20
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	151	151	151
Density	rho1	[kg/m³]	917,5	917,5	917,5
Vapor pressure	pv	[bar(a)]	4,89	4,89	4,89
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,18179	0,18179	0,18179
Flashing portion	xd2	[%]	3,46	3,46	3,46
spec. Volume	v2	[m³/kg]	0,695	0,695	0,695

Results and factors

			Case 1	Case 2	Case 3
Valve coeff. calculated	***Cv***		***15,0***	***10,8***	***3,81***
Min. req. size	Req. DN	[mm]	94,2	80,1	42,1
Outlet velocity	w	[m/s]	53,3	38,5	10,7
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***82***	***81***	***70***
Flow condition			Flashing	Flashing	Flashing
relative travel	T	[%]	82,9	74,6	47,9
Different. pressure ratio	xF		1,08	1,08	1,13
FL value	FL		0,97	0,97	0,98
Kc value	Kc		0,90	0,91	0,93
Valve style factor	Fd		0,43	0,42	0,32
z value at capacity	zy		0,31	0,32	0,36
Level exponent	F1		-6,88	-6,84	-7,21
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	5,70	5,67	5,87

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***30***	***Type***	***3251***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A351 CF8M***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***38***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 106,3 s [mm] 3,99999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	4,82	req. diff. psu-ps100	d ps	[bar] 0,03
max. act. force	Fmax	[kN]	52,46	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	95,04	Close safety factor	Fa/Fo (SF)	2,32
req. start bench range	ps0req.	[bar]	0,76	Open safety factor	Ff/Fw	-

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Valve Sizing Version 3.56

Item no. LV101602 Tag no. LV101602
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	10000	5000	1000
Inlet pressure	p1	[bar(a)]	4	4	4
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	35	35	35
Density	rho1	[kg/m³]	994,17	994,17	994,17
Vapor pressure	pv	[bar(a)]	0,056286	0,056286	0,056286
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,71932	0,71932	0,71932

Results and factors

			Case 1	Case 2	Case 3
Valve coeff. calculated	***Cv***		***11,7***	***5,87***	***1,21***
Min. req. size	Req. DN	[mm]	26,7	18,9	8,44
Outlet velocity	w	[m/s]	1,42	0,712	0,142
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***38***	***33***	***<30***
relative travel	T	[%]	88,1	70,3	29,9
Different. pressure ratio	xF		0,25	0,25	0,25
FL value	FL		0,94	0,96	0,98
Kc value	Kc		0,84	0,89	0,93
Valve style factor	Fd		0,32	0,21	0,08
z value at capacity	zy		0,38	0,49	0,66
Level exponent	F1		-7,02	-7,15	-7,84
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***20***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***31***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 [mm] 50
cR [m/s] 5180 rho [kg/m³] 7850 di [inch] 2,1 s [inch] 0,11

Actuator data

Type			**3277**	**Fail-safe act.**	**retracts**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**0,2 ... 1**
				Supply	**psu [bar]**	**1,27**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 35)

Actuator results

req. act. force	Fo req.	[kN]	0,85	req. diff. psu-ps100	d ps	[bar] 0,27
max. act. force	Fmax	[kN]	27,58	Actuator force	Fa	[kN] 0,93
max. dp on plug	d. pmax	[bar]	9,01	Close safety factor	Fa/Fo (SF)	1,10
req. start bench range	ps0req.	[bar]	0,02	Open safety factor	Ff/Fw	13,69

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV-150101A Tag no. LV150101A
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	390000	347840	30000
Inlet pressure	p1	[bar(a)]	7	7,2	7,4
Outlet pressure	p2	[bar(a)]	3,3	3,2	3
Inlet temperature	t1	[°C]	35	35	35
Density	rho1	[kg/m³]	994,3	994,31	994,32
Vapor pressure	pv	[bar(a)]	0,056286	0,056286	0,056286
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,71932	0,71932	0,71932

Results and factors

Valve coeff. calculated	***Cv***		***238***	***204***	***16,8***
Min. req. size	Req. DN	[mm]	167	157	46,2
Outlet velocity	w	[m/s]	3,47	3,09	0,267
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***75***	***78***	***71***
relative travel	T	[%]	85,4	81,5	17,6
Different. pressure ratio	xF		0,53	0,56	0,60
FL value	FL		0,94	0,94	0,98
Kc value	Kc		0,82	0,83	0,93
Valve style factor	Fd		0,43	0,42	0,15
z value at capacity	zy		0,50	0,50	0,50
Level exponent	F1		-7,32	-7,34	-7,62
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-5,95	-6,68	-3,83

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***420***	***Type***	***3241***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***200***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 259 s [mm] 7,1

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0**	**[bar]**	**2 ... 2,6**
				Supply	**psu**	**[bar]**	**2,80**

(Defaults: p1max [bar(a)] 11 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	32,99	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	162,52	Actuator force	Fa	[kN] 56,00
max. dp on plug	d. pmax	[bar]	17,27	Close safety factor	Fa/Fo (SF)	1,70
req. start bench range	ps0req.	[bar]	1,30	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV150406 Tag no. LV150406
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	78000	63317	10000
Inlet pressure	p1	[bar(a)]	5,4	5,4	6
Outlet pressure	p2	[bar(a)]	4,6	4,5	4,8
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	992,42	992,42	992,44
Vapor pressure	pv	[bar(a)]	0,073844	0,073844	0,073844
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,65301	0,65301	0,65302

Results and factors

Valve coeff. calculated	***Cv***		***102***	***78,4***	***10,7***
Min. req. size	Req. DN	[mm]	74,6	67,2	26,7
Outlet velocity	w	[m/s]	2,78	2,26	0,356
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***52***	***51***	***40***
relative travel	T	[%]	84,6	77,7	26,9
Different. pressure ratio	xF		0,15	0,17	0,20
FL value	FL		0,92	0,93	0,97
Kc value	Kc		0,77	0,79	0,91
Valve style factor	Fd		0,43	0,42	0,19
z value at capacity	zy		0,22	0,24	0,43
Level exponent	F1		-6,92	-6,95	-7,15
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***190***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***100***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,59999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 10 p2min [bar(a)] 1,01 t1max [°C] 40)

Actuator results

req. act. force	Fo req.	[kN]	7,79	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	64,07	Actuator force	Fa	[kN] 9,80
max. dp on plug	d. pmax	[bar]	11,53	Close safety factor	Fa/Fo (SF)	1,26
req. start bench range	ps0req.	[bar]	1,22	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV150505 Tag no. LV150505
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	11000	6197	1000
Inlet pressure	p1	[bar(a)]	5,5	5,5	5,5
Outlet pressure	p2	[bar(a)]	3,5	3,5	3,5
Inlet temperature	t1	[°C]	50	50	50
Density	rho1	[kg/m³]	988,24	988,24	988,24
Vapor pressure	pv	[bar(a)]	0,12351	0,12351	0,12351
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,54693	0,54693	0,54693

Results and factors

Valve coeff. calculated	***Cv***		***9,18***	***5,16***	***0,832***
Min. req. size	Req. DN	[mm]	28,1	21,1	8,46
Outlet velocity	w	[m/s]	1,57	0,887	0,143
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***48***	***44***	***32***
relative travel	T	[%]	81,8	67,1	20,4
Different. pressure ratio	xF		0,37	0,37	0,37
FL value	FL		0,95	0,96	0,98
Kc value	Kc		0,86	0,89	0,93
Valve style factor	Fd		0,28	0,19	0,07
z value at capacity	zy		0,43	0,51	0,69
Level exponent	F1		-7,08	-7,16	-8,01
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***20***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A105***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***31***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,59999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0**	**[bar]**	**0,8 ... 2,4**
				Supply	**psu**	**[bar]**	**2,60**

(Defaults: p1max [bar(a)] 4 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	0,47	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	22,39	Actuator force	Fa	[kN] 2,80
max. dp on plug	d. pmax	[bar]	33,73	Close safety factor	Fa/Fo (SF)	5,94
req. start bench range	ps0req.	[bar]	0,15	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV200301 Tag no. LV200301
Process medium Raw methanol State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	270000	244013	80000
Inlet pressure	p1	[bar(a)]	68	68	51
Outlet pressure	p2	[bar(a)]	5,5	5,5	5,5
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	782	782	782
Vapor pressure	pv	[bar(a)]	0,35	0,35	0,35
Critical pressure	pc	[bar(a)]	81,3	81,3	81,3
Viscosity	eta	[mPas]	0,437	0,437	0,437

Results and factors

Valve coeff. calculated	***Cv***		***58,1***	***52,6***	***20,0***
Min. req. size	Req. DN	[mm]	156	149	85,1
Outlet velocity	w	[m/s]	3,05	2,76	0,905
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***97***	***97***	***93***
Flow condition			Cavitation	Cavitation	Cavitation
relative travel	T	[%]	82,1	79,6	54,9
Different. pressure ratio	xF		0,92	0,92	0,90
FL value	FL		0,75	0,75	0,74
Kc value	Kc		0,42	0,42	0,41
Valve style factor	Fd		0,42	0,42	0,37
z value at capacity	zy		0,23	0,23	0,31
Level exponent	F1		-7,09	-7,10	-7,19
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-8,91	-8,76	-8,93

Valve data

Body type			***Globe valve***	***Series***	***angle valve***
Valve coefficient	***Cv***		***120***	***Type***	***3256***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTC***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***PTFE (1,6)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 8"
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 205 s [mm] 7,1

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**0,8 ... 1,2**
				Supply	**psu [bar]**	**1,40**

(Defaults: p1max [bar(a)] 89 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	0,92	req. diff. psu-ps100	d ps [bar]	0,06
max. act. force	Fmax	[kN]	162,52	Actuator force	Fa [kN]	11,20
max. dp on plug	d. pmax	[bar]	9,77	Close safety factor	Fa/Fo (SF)	8,49
req. start bench range	ps0req.	[bar]	0,10	Open safety factor	Ff/Fw	-

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Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV200403 Tag no. LV200403
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	195000	154530	30000
Inlet pressure	p1	[bar(a)]	61	67	73
Outlet pressure	p2	[bar(a)]	51	51	51
Inlet temperature	t1	[°C]	112	112	112
Density	rho1	[kg/m³]	952,28	952,57	952,86
Vapor pressure	pv	[bar(a)]	1,5328	1,5328	1,5328
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,25143	0,25158	0,25174

Results and factors

Valve coeff. calculated	***Cv***		***73,9***	***46,3***	***7,67***
Min. req. size	Req. DN	[mm]	120	107	47,2
Outlet velocity	w	[m/s]	7,24	5,74	1,11
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***76***	***79***	***67***
relative travel	T	[%]	88,3	76,3	30,3
Different. pressure ratio	xF		0,17	0,24	0,31
FL value	FL		0,93	0,94	0,97
Kc value	Kc		0,80	0,84	0,92
Valve style factor	Fd		0,43	0,42	0,21
z value at capacity	zy		0,21	0,24	0,41
Level exponent	F1		-6,81	-6,86	-7,07
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0,02	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***120***	***Type***	***3251***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 104,3 s [mm] 4,99999

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0**	**[bar]**	**2 ... 2,4**
				Supply	**psu**	**[bar]**	**3,43**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 160)

Actuator results

req. act. force	Fo req.	[kN]	27,81	req. diff. psu-ps100	d ps	[bar]	0,00677
max. act. force	Fmax	[kN]	53,82	Actuator force	Fa	[kN]	56,00
max. dp on plug	d. pmax	[bar]	105,70	Close safety factor	Fa/Fo (SF)		2,01
req. start bench range	ps0req.	[bar]	1,09	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV300101A Tag no. LV300101A
Process medium Raw Methanol State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	147000	24000	12000
Inlet pressure	p1	[bar(a)]	6,4	6,7	7,8
Outlet pressure	p2	[bar(a)]	5,9	5,7	5,7
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	788	788	788
Vapor pressure	pv	[bar(a)]	0,3	0,3	0,3
Critical pressure	pc	[bar(a)]	106,8	106,8	106,8
Viscosity	eta	[mPas]	0,49	0,49	0,49

Results and factors

Valve coeff. calculated	***Cv***		***277***	***31,6***	***10,9***
Min. req. size	Req. DN	[mm]	115	46,4	32,8
Outlet velocity	w	[m/s]	2,93	0,479	0,239
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***53***	***45***	***44***
relative travel	T	[%]	97,6	42,1	14,9
Different. pressure ratio	xF		0,08	0,16	0,28
FL value	FL		0,91	0,97	0,98
Kc value	Kc		0,75	0,91	0,93
Valve style factor	Fd		0,47	0,29	0,14
z value at capacity	zy		0,20	0,36	0,49
Level exponent	F1		-7,15	-7,32	-7,43
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***300***	***Type***	***3241***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***150***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***130***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 8"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 207,3 s [mm] 5,9

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 90)

Actuator results

req. act. force	Fo req.	[kN]	11,53	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	58,52	Actuator force	Fa	[kN] 14,70
max. dp on plug	d. pmax	[bar]	10,36	Close safety factor	Fa/Fo (SF)	1,28
req. start bench range	ps0req.	[bar]	1,81	Open safety factor	Ff/Fw	-

01	Order-No. :	1064 24081		Customer :	Samson Frankfurt			
02	Name :	Marc Bastius		Project :	P 1725			
03	Pos.-No. :	2	Rev. 2	Process Fluid :	raw methanol			02.12.2004
04	TAG - No. :	LV-300101B		Upstream Conditions :	Liquid			

VETEC *Valve Sizing V2000*

	Process and Medium Data			min	norm	max
06	Flow Rate	[kg/h]	W	30.000	60.000	280.000
07	Inlet Pressure	[bara]	p1	5,60	5,50	6,00
08	Outlet Pressure	[bara]	p2	2,50	2,40	4,80
09	Inlet Temperature	[°C]	t1	38,00	38,00	38,00
10	Density	[kg/m³]	rho	788,000	788,000	788,000
11	Vapor Pressure	[bara]	pv	5,480	5,480	5,480
12	Critical Pressure	[bara]	pc	106,8	106,8	106,8
13	Viscosity	[mPas]	eta	0,49	0,49	0,49
14	Ratio. Spc. Heat	[cp/cv]				
15	Compressibility Factor					
16	Flashing	[%]				

	Pipeline					
18	Line size	[mm]	Da * s / PN (In)	219,1 x 8,18 / std	Da * s / PN (Out)	219,1 x 8,18 / std

	Results				
20	***Calculated Valve Coeff.***	**[Kv]**	80,26	174,17	623,88
21	Valve Opening in %		23	40	93
22	Outlet Velocity	[m/s]			
23	Max. admitted Velocity	[m/s]			
24	Mach				
25	Acoustic Cap. Lev. LwA,a	[dB(A)]	72	75	78
26	Sound Pres. Lev. LpA,a	[dB(A)]	58	61	64
27	Flow Remark		Flashing	Flashing	Flashing

	Valve Data							
29	Valve Style			Rotary Plug Valve			Valve Type	72.3 R
30	Body Size	[inch]	DN	6"			Body Material	A216 WCC
31	Press. Rating	[lbs]	PN	300			Plug Material	1.4581 / Stellite 6
32	End Connections			RF			Seat Ring Material	1.4571 / Stellite 6
33	Face to Face	[mm]		473,2			Guide Material	1.4571
34	Selected Valve Coeff.		**Kvs**	**685**	**Cvs**	**792**	Plug/Seat Facing	Metallic
35	Seat Diameter	[mm]		105,0	Sitzfaktor	1	Gaskets	S.S. / Graphite
36	Leakage Class			DIN IEC 534 T4, KL IV L1			Packing	PTFE / Graphite
37	Characteristic			Equal %			Bonnet	TA-Luft / Viton
38	Noise Reduction						Flow Direction	Flow to Open

	Actuator Data					
					Fail Position	Spring to Close
40	Actuator Style			Pneumatic	Handwheel	Without
41	Actuator Type			R 200	Stroke Time o/c [s] t	< 20 / < 20
42	Spring Range	[bar]		0,4 - 1,2	Req. Torque [Nm]	150
43	Air Supply	[bar]		4,0 - 6,0	Max. Torque [Nm]	1280
44	Max. Shut Off	[bar]	dp	6	Mounting	A

	Accessories				
46	Positioner	Type	FF_3787-100, 4-20 mA, IP 65, gauges	Air Set Type	Norgren B73G-4AK-QP3
47	Limit Switches	Type		Piping	1/2" s.s. / Swagelok
48	Solenoid Valve	Type		Others	

	Certification/Requirements			**Remarks**
50	Material	EN 10204 / 3.1B	55	Zubehör und Rohr 1/2" s.s. wird von Samson beigestellt,
51	Inspection	EN 10204 / 3.1B	56	Verschraubung von VETEC
52	Others		57	
53	Cust. Std.		58	
54	**Weight**	150 kg	59	

01	Order-No. :	1064 24081		Customer :	Samson Frankfurt			
02	Name :	Marc Bastius		Project :	P 1725			
03	Pos.-No. :	3	Rev. 1	Process Fluid :	stabilized methanol			19.10.2004
04	TAG - No. :	LV-300202		Upstream Conditions :	Liquid			

VETEC *Valve Sizing V2000*

	Process and Medium Data			min	norm	max
06	Flow Rate	[kg/h]	W	71.000	236.025	313.500
07	Inlet Pressure	[bara]	p1	11,70	11,20	10,80
08	Outlet Pressure	[bara]	p2	9,80	10,00	10,30
09	Inlet Temperature	[°C]	t1	92,00	92,00	92,00
10	Density	[kg/m³]	rho	742,000	742,000	742,000
11	Vapor Pressure	[bara]	pv	2,400	2,400	2,400
12	Critical Pressure	[bara]	pc	107,1	107,1	107,1
13	Viscosity	[mPas]	eta	0,25	0,25	0,25
14	Ratio. Spc. Heat	[cp/cv]				
15	Compressibility Factor					
16	Flashing	[%]				

	Pipeline					
18	Line size	[mm]	Da * s / PN (In)	323,9 x 9,53 / std	Da * s / PN (Out)	323,9 x 9,53 / std

	Results				
20	***Calculated Valve Coeff.***	**[Kv]**	59,82	251,62	528,03
21	Valve Opening in %		15	41	65
22	Outlet Velocity	[m/s]	0,85	2,81	3,74
23	Max. admitted Velocity	[m/s]	27,81	28,19	28,74
24	Mach				
25	Acoustic Cap. Lev. LwA,a	[dB(A)]	75	78	75
26	Sound Pres. Lev. LpA,a	[dB(A)]	61	64	61
27	Flow Remark				

	Valve Data						
29	Valve Style			Rotary Plug Valve		Valve Type	72.3 R
30	Body Size	[inch]	DN	8"		Body Material	A216 WCC
31	Press. Rating	[lbs]	PN	300		Plug Material	1.4581
32	End Connections			RF		Seat Ring Material	1.4571
33	Face to Face	[mm]		568,4		Guide Material	1.4571
34	Selected Valve Coeff.		**Kvs**	**950**	**Cvs** **1098**	Plug/Seat Facing	Metallic
35	Seat Diameter	[mm]		135,0	Sitzfaktor 1	Gaskets	S.S. / Graphite
36	Leakage Class			DIN IEC 534 T4, KL IV L1		Packing	PTFE / Graphite
37	Characteristic			Equal %		Bonnet	TA-Luft / Viton
38	Noise Reduction					Flow Direction	Flow to Open

	Actuator Data					
					Fail Position	Spring to Close
40	Actuator Style			Pneumatic	Handwheel	Without
41	Actuator Type			R 250v	Stroke Time o/c [s] t	< 20 / < 20
42	Spring Range	[bar]		1,3 - 2,4	Req. Torque [Nm]	500
43	Air Supply	[bar]		4,0 - 6,0	Max. Torque [Nm]	1280
44	Max. Shut Off	[bar]	dp	15	Mounting	A

	Accessories				
46	Positioner	Type	FF_3787-100, 4-20 mA, IP 65, gauges	Air Set Type	Norgren B73G-4AK-QP3
47	Limit Switches	Type		Piping	1/2" s.s. / Swagelok
48	Solenoid Valve	Type		Others	Booster, EIL 100 F03

	Certification/Requirements			**Remarks**
50	Material	EN 10204 / 3.1B	55	Zubehör und Rohr 1/2" s.s. wird von Samson beigestellt,
51	Inspection	EN 10204 / 3.1B	56	Verschraubung von VETEC
52	Others		57	
53	Cust. Std.		58	
54	**Weight**	260 kg	59	

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project:2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV300203 Tag no. LV300203
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	47500	37975	11400
Inlet pressure	p1	[bar(a)]	32,5	32,6	33
Outlet pressure	p2	[bar(a)]	30,8	30,6	30,3
Inlet temperature	t1	[°C]	115	115	115
Density	rho1	[kg/m³]	948,59	948,59	948,61
Vapor pressure	pv	[bar(a)]	1,6918	1,6918	1,6918
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,2437	0,2437	0,24372

Results and factors

Valve coeff. calculated	***Cv***		***43,9***	***32,3***	***8,33***
Min. req. size	Req. DN	[mm]	59,5	53,2	29,2
Outlet velocity	w	[m/s]	2,77	2,21	0,664
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***54***	***53***	***45***
relative travel	T	[%]	88,0	80,2	45,5
Different. pressure ratio	xF		0,06	0,06	0,09
FL value	FL		0,93	0,94	0,97
Kc value	Kc		0,81	0,83	0,91
Valve style factor	Fd		0,43	0,42	0,31
z value at capacity	zy		0,26	0,29	0,43
Level exponent	F1		-6,92	-6,95	-7,09
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***70***	***Type***	***3241***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,4 ... 3,6**
				Supply	**psu [bar]**	**3,80**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 180)

Actuator results

req. act. force	Fo req.	[kN]	12,60	req. diff. psu-ps100	d ps	[bar] 0,00846
max. act. force	Fmax	[kN]	22,68	Actuator force	Fa	[kN] 16,80
max. dp on plug	d. pmax	[bar]	52,43	Close safety factor	Fa/Fo (SF)	1,33
req. start bench range	ps0req.	[bar]	1,98	Open safety factor	Ff/Fw	-

01	Order-No. :	1064 24081		Customer :	Samson Frankfurt			
02	Name :	Marc Bastius		Project :	P 1725			
03	Pos.-No. :	4	Rev. 2	Process Fluid :	methanol			02.12.2004
04	TAG - No. :	LV-300305		Upstream Conditions :	Liquid			

VETEC *Valve Sizing V2000*

	Process and Medium Data			min	norm	max
06	Flow Rate	[kg/h]	W	24.000	80.197	132.800
07	Inlet Pressure	[bara]	p1	6,60	6,40	6,00
08	Outlet Pressure	[bara]	p2	4,80	5,00	5,50
09	Inlet Temperature	[°C]	t1	64,00	64,00	64,00
10	Density	[kg/m³]	rho	749,000	749,000	749,000
11	Vapor Pressure	[bara]	pv	2,000	2,000	2,000
12	Critical Pressure	[bara]	pc	80,3	80,3	80,3
13	Viscosity	[mPas]	eta	0,33	0,33	0,33
14	Ratio. Spc. Heat	[cp/cv]				
15	Compressibility Factor					
16	Flashing	[%]				

	Pipeline					
18	Line size	[mm]	Da * s / PN (In)	219,1 x 8,18 / std	Da * s / PN (Out)	219,1 x 8,18 / std

	Results				
20	***Calculated Valve Coeff.***	**[Kv]**	20,67	78,41	218,95
21	Valve Opening in %		17	44	84
22	Outlet Velocity	[m/s]	0,50	1,68	2,79
23	Max. admitted Velocity	[m/s]	17,12	17,72	19,14
24	Mach				
25	Acoustic Cap. Lev. LwA,a	[dB(A)]	66	70	68
26	Sound Pres. Lev. LpA,a	[dB(A)]	53	57	55
27	Flow Remark				

	Valve Data							
29	Valve Style			Rotary Plug Valve			Valve Type	72.3 R
30	Body Size	[inch]	DN	6"			Body Material	A216 WCC
31	Press. Rating	[lbs]	PN	300			Plug Material	1.4581
32	End Connections			RF			Seat Ring Material	1.4571
33	Face to Face	[mm]		473,2			Guide Material	1.4571
34	Selected Valve Coeff.		**Kvs**	**275**	**Cvs**	**318**	Plug/Seat Facing	Metallic
35	Seat Diameter	[mm]		73,0	Sitzfaktor	0,4	Gaskets	S.S. / Graphite
36	Leakage Class			DIN IEC 534 T4, KL IV L1			Packing	PTFE / Graphite
37	Characteristic			Equal %			Bonnet	TA-Luft / Viton
38	Noise Reduction						Flow Direction	Flow to Open

	Actuator Data					
					Fail Position	Spring to Open / Locked
40	Actuator Style			Pneumatic	Handwheel	Without
41	Actuator Type			R 200	Stroke Time o/c [s] t	< 20 / < 20
42	Spring Range	[bar]		0,4 - 1,2	Req. Torque [Nm]	200
43	Air Supply	[bar]		4,0 - 6,0	Max. Torque [Nm]	1280
44	Max. Shut Off	[bar]	dp	9	Mounting	A

	Accessories				
46	Positioner	Type	FF_3787-100, 4-20 mA, IP 65, gauges	Air Set Type	Norgren B73G-4AK-QP3
47	Limit Switches	Type		Piping	1/2" s.s. / Swagelok
48	Solenoid Valve	Type		Others	Lock Up Relay, 3 bar

	Certification/Requirements			**Remarks**
50	Material	EN 10204 / 3.1B	55	Zubehör und Rohr 1/2" s.s. wird von Samson beigestellt,
51	Inspection	EN 10204 / 3.1B	56	Verschraubung von VETEC
52	Others		57	
53	Cust. Std.		58	
54	**Weight**	150 kg	59	

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV300406 Tag no. LV300406
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	84000	70090	21000
Inlet pressure	p1	[bar(a)]	32,7	32,9	33,2
Outlet pressure	p2	[bar(a)]	30,4	30,4	30,3
Inlet temperature	t1	[°C]	144	144	144
Density	rho1	[kg/m³]	924,11	924,12	924,14
Vapor pressure	pv	[bar(a)]	4,0432	4,0432	4,0432
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,19139	0,1914	0,1914

Results and factors

Valve coeff. calculated	***Cv***		***67,7***	***54,1***	***15,0***
Min. req. size	Req. DN	[mm]	80,2	73,2	40,1
Outlet velocity	w	[m/s]	3,21	2,68	0,804
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***62***	***61***	***52***
relative travel	T	[%]	86,0	80,3	47,5
Different. pressure ratio	xF		0,08	0,09	0,10
FL value	FL		0,93	0,94	0,97
Kc value	Kc		0,81	0,83	0,90
Valve style factor	Fd		0,43	0,42	0,32
z value at capacity	zy		0,22	0,23	0,34
Level exponent	F1		-6,82	-6,84	-6,97
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***120***	***Type***	***3251***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 157,1 s [mm] 5,6

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 144)

Actuator results

req. act. force	Fo req.	[kN]	20,27	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	54,37	Actuator force	Fa	[kN] 22,40
max. dp on plug	d. pmax	[bar]	43,18	Close safety factor	Fa/Fo (SF)	1,10
req. start bench range	ps0req.	[bar]	1,59	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV300407 Tag no. LV300407
Process medium stabilized MethaState of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	166000	138280	41500
Inlet pressure	p1	[bar(a)]	8,9	8,9	8,9
Outlet pressure	p2	[bar(a)]	4,5	4,3	4
Inlet temperature	t1	[°C]	137	111,69	111,69
Density	rho1	[kg/m³]	704	704	704
Vapor pressure	pv	[bar(a)]	8,6	8,6	8,6
Critical pressure	pc	[bar(a)]	123,2	123,2	123,2
Viscosity	eta	[mPas]	0,16	0,16	0,16
Flashing portion	xd2	[%]	5,17	5,49	6
spec. Volume	v2	[m³/kg]	0,479	0,5	0,535

Results and factors

Valve coeff. calculated	***Cv***		***219***	***181***	***52,8***
Min. req. size	Req. DN	[mm]	160	153	90,4
Outlet velocity	w	[m/s]	38,3	35,2	12,3
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***80***	***79***	***74***
Flow condition			Flashing	Flashing	Flashing
relative travel	T	[%]	92,6	87,7	56,3
Different. pressure ratio	xF		14,67	15,33	16,33
FL value	FL		0,94	0,94	0,97
Kc value	Kc		0,83	0,84	0,91
Valve style factor	Fd		0,44	0,43	0,38
z value at capacity	zy		0,30	0,30	0,30
Level exponent	F1		-7,23	-7,25	-7,38
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	16,76	16,99	17,18

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***290***	***Type***	***3241***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***125***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 258,8 s [mm] 7,1

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,7 ... 3,2**
				Supply	**psu [bar]**	**3,40**

(Defaults: p1max [bar(a)] 12 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	14,53	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	143,52	Actuator force	Fa	[kN] 23,80
max. dp on plug	d. pmax	[bar]	18,44	Close safety factor	Fa/Fo (SF)	1,64
req. start bench range	ps0req.	[bar]	1,14	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV300508 Tag no. LV300508
Process medium Methanol State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	118000	97742	29000
Inlet pressure	p1	[bar(a)]	6,6	7	7,9
Outlet pressure	p2	[bar(a)]	5,1	4,4	2,5
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	798,46	798,47	798,51
Vapor pressure	pv	[bar(a)]	0,32665	0,32665	0,32665
Critical pressure	pc	[bar(a)]	81	81	81
Viscosity	eta	[mPas]	0,41087	0,41087	0,41087

Results and factors

Valve coeff. calculated	***Cv***		***128***	***79,9***	***16,3***
Min. req. size	Req. DN	[mm]	102	93,1	50,7
Outlet velocity	w	[m/s]	5,23	4,33	1,28
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***73***	***84***	***82***
relative travel	T	[%]	90,3	78,2	37,7
Different. pressure ratio	xF		0,24	0,39	0,71
FL value	FL		0,91	0,93	0,97
Kc value	Kc		0,75	0,79	0,90
Valve style factor	Fd		0,44	0,42	0,26
z value at capacity	zy		0,21	0,24	0,38
Level exponent	F1		-6,90	-6,95	-7,11
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-0,89	-2,64	-8,14

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***190***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***100***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 159,3 s [mm] 4,5

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 15 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	11,71	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa	[kN] 14,70
max. dp on plug	d. pmax	[bar]	17,77	Close safety factor	Fa/Fo (SF)	1,26
req. start bench range	ps0req.	[bar]	1,84	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV300609 Tag no. LV300609
Process medium Water/Steam State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	46000	26317	7900
Inlet pressure	p1	[bar(a)]	59,2	67,4	69,1
Outlet pressure	p2	[bar(a)]	58,2	56,8	56,1
Inlet temperature	t1	[°C]	117	114	114
Density	rho1	[kg/m³]	948,32	951,05	951,13
Vapor pressure	pv	[bar(a)]	1,8051	1,6373	1,6373
Critical pressure	pc	[bar(a)]	220,64	220,64	220,64
Viscosity	eta	[mPas]	0,23995	0,24691	0,24695

Results and factors

Valve coeff. calculated	***Cv***		***55,5***	***9,70***	***2,63***
Min. req. size	Req. DN	[mm]	58,6	44,2	24,2
Outlet velocity	w	[m/s]	2,68	1,53	0,459
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***48***	***61***	***53***
relative travel	T	[%]	92,7	48,2	14,8
Different. pressure ratio	xF		0,02	0,16	0,19
FL value	FL		0,94	0,97	0,98
Kc value	Kc		0,83	0,92	0,93
Valve style factor	Fd		0,44	0,32	0,14
z value at capacity	zy		0,25	0,42	0,62
Level exponent	F1		-6,93	-7,10	-7,93
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	0	0	0

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***75***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 106,3 s [mm] 4

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0**	**[bar]**	**2 ... 3**
				Supply	**psu**	**[bar]**	**3,20**

(Defaults: p1max [bar(a)] 71 p2min [bar(a)] 1,01 t1max [°C] 160)

Actuator results

req. act. force	Fo req.	[kN]	22,38	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	53,82	Actuator force	Fa	[kN] 28,00
max. dp on plug	d. pmax	[bar]	87,95	Close safety factor	Fa/Fo (SF)	1,25
req. start bench range	ps0req.	[bar]	1,76	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project:2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	LV300910	Tag no.	LV300910
Process medium	Methanol	State of medium at inlet:	liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	130000	110600	33000
Inlet pressure	p1	[bar(a)]	8,3	8,5	8,6
Outlet pressure	p2	[bar(a)]	5,5	5	3
Inlet temperature	t1	[°C]	40	40	40
Density	rho1	[kg/m³]	798,52	798,53	798,53
Vapor pressure	pv	[bar(a)]	0,32665	0,32665	0,32665
Critical pressure	pc	[bar(a)]	81	81	81
Viscosity	eta	[mPas]	0,41087	0,41087	0,41087

Results and factors

Valve coeff. calculated	***Cv***		***102***	***77,4***	***18,3***
Min. req. size	Req. DN	[mm]	107	99,0	54,1
Outlet velocity	w	[m/s]	2,56	2,18	0,650
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***75***	***80***	***81***
relative travel	T	[%]	84,4	77,4	40,5
Different. pressure ratio	xF		0,35	0,43	0,68
FL value	FL		0,94	0,95	0,97
Kc value	Kc		0,84	0,86	0,92
Valve style factor	Fd		0,43	0,42	0,28
z value at capacity	zy		0,30	0,32	0,37
Level exponent	F1		-7,05	-7,08	-7,22
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-3,50	-5,62	-11,10

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***190***	***Type***	***3241***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***100***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 159,3 s [mm] 4,5

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 13 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	10,14	req. diff. psu-ps100	d ps [bar]	0,02
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa [kN]	14,70
max. dp on plug	d. pmax	[bar]	17,77	Close safety factor	Fa/Fo (SF)	1,45
req. start bench range	ps0req.	[bar]	1,59	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. LV600301 Tag no. LV600301
Process medium Water State of medium at inlet: liquid

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	35000	25000	3000
Inlet pressure	p1	[bar(a)]	4,5	5	5,5
Outlet pressure	p2	[bar(a)]	2,5	2,4	2,2
Inlet temperature	t1	[°C]	38	38	38
Density	rho1	[kg/m³]	991	991	991
Vapor pressure	pv	[bar(a)]	0,0666	0,0666	0,0666
Critical pressure	pc	[bar(a)]	221	221	221
Viscosity	eta	[mPas]	0,679	0,679	0,679

Results and factors

Valve coeff. calculated	***Cv***		***29,6***	***18,3***	***1,94***
Min. req. size	Req. DN	[mm]	50,0	42,2	14,6
Outlet velocity	w	[m/s]	5,00	3,57	0,428
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***76***	***76***	***51***
relative travel	T	[%]	88,2	76,0	18,5
Different. pressure ratio	xF		0,45	0,53	0,61
FL value	FL		0,91	0,93	0,97
Kc value	Kc		0,75	0,80	0,92
Valve style factor	Fd		0,43	0,42	0,15
z value at capacity	zy		0,30	0,36	0,59
Level exponent	F1		-6,82	-6,87	-7,55
Slope exponent	F2		0,30	0,30	0,30
Correct. term	delta Lf	[dB]	-0,37	-2,13	-0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***47***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A105***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***48***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 3"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 82,5 s [mm] 3,2

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**0,8 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 8,5 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	1,76	req. diff. psu-ps100	d ps [bar]	0,03
max. act. force	Fmax	[kN]	24,50	Actuator force	Fa [kN]	2,80
max. dp on plug	d. pmax	[bar]	13,20	Close safety factor	Fa/Fo (SF)	1,59
req. start bench range	ps0req.	[bar]	0,55			

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV100201 Tag no. PV100201
Process medium H2 (Start Up) State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	6000	5275	2000
Inlet pressure	p1	[bar(a)]	5,4	5,4	6
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	92	92	50
Molar mass	M	[g/mol]	2,01	2,01	2,01
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1,003	1,003	1,003
Viscosity	eta	[mPas]	0,017291	0,017291	0,015709

Results and factors

			Case 1	Case 2	Case 3
Valve coeff. calculated	***Cv***		***26,8***	***23,5***	***7,24***
Min. req. size	Req. DN	[mm]	46,9	43,9	26,2
Outlet velocity	w	[Mach]	0,111	0,0979	0,0357
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***71***	***70***	***65***
relative travel	T	[%]	88,5	85,1	55,1
Different. pressure ratio	x		0,44	0,44	0,50
FL value	FL		0,95	0,95	0,97
xT value	xT		0,76	0,76	0,80
Valve style factor	Fd		0,43	0,43	0,37
Level exponent	G1		-4,62	-4,64	-4,82
Slope exponent	G2		0,74	0,74	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***42***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A217 WC6***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***50***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***bellows***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 104 s [mm] 5

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	12,51	req. diff. psu-ps100	d ps	[bar] 0,05
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa	[kN] 14,70
max. dp on plug	d. pmax	[bar]	65,02	Close safety factor	Fa/Fo (SF)	1,17
req. start bench range	ps0req.	[bar]	1,97	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV100513 Tag no. PV100513
Process medium Natural gas FueState of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	3000	2000	1000
Inlet pressure	p1	[bar(a)]	1,4	1,4	1,4
Outlet pressure	p2	[bar(a)]	1	1	1
Inlet temperature	t1	[°C]	40	40	40
Molar mass	M	[g/mol]	16,827	16,827	16,827
Isentropic exponent	gamma		1,3	1,3	1,3
Real gas factor	Z		0,995	0,995	0,995
Viscosity	eta	[mPas]	0,011738	0,011738	0,011738

Results and factors

Valve coeff. calculated	***Cv***		***162***	***108***	***53,4***
Min. req. size	Req. DN	[mm]	95,7	78,2	55,3
Outlet velocity	w	[Mach]	0,275	0,183	0,0916
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***78***	***75***	***71***
relative travel	T	[%]	96,4	85,9	67,9
Different. pressure ratio	x		0,29	0,29	0,29
FL value	FL		0,90	0,91	0,94
xT value	xT		0,69	0,71	0,75
Valve style factor	Fd		0,36	0,21	0,12
Level exponent	G1		-3,50	-3,50	-3,50
Slope exponent	G2		1,50	1,50	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***190***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***100***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***V***
Sealing	***lapped-in (20)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 107,1 s [mm] 3,59999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	12,66	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	57,41	Actuator force	Fa	[kN] 14,70
max. dp on plug	d. pmax	[bar]	10,57	Close safety factor	Fa/Fo (SF)	1,16
req. start bench range	ps0req.	[bar]	1,99	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV100529A/B Tag no. PV100529A
Process medium Natural Gas FuεState of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	26000	8636	500
Inlet pressure	p1	[bar(a)]	55	55	55
Outlet pressure	p2	[bar(a)]	30	8,6478	6,0089
Inlet temperature	t1	[°C]	40	40	40
Molar mass	M	[g/mol]	16,827	16,827	16,827
Isentropic exponent	gamma		1,248	1,248	1,248
Real gas factor	Z		0,9299	0,9299	0,9299
Viscosity	eta	[mPas]	0,012629	0,012629	0,012629

Results and factors

Valve coeff. calculated	***Cv***		***30,9***	***9,06***	***0,508***
Min. req. size	Req. DN	[mm]	52,0	55,8	16,1
Outlet velocity	w	[Mach]	0,141	0,162	0,0135
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***88***	***83***	***69***
Flow condition				Choked flow	Choked flow
relative travel	T	[%]	96,8	65,5	->0
Different. pressure ratio	x		0,45	0,84	0,89
FL value	FL		0,95	0,96	0,98
xT value	xT		0,69	0,75	0,80
Valve style factor	Fd		0,37	0,12	0,00616
Level exponent	G1		-5,20	-5,20	-5,20
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***35***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***50***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 157,1 s [mm] 5,6

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 75 p2min [bar(a)] 1,01 t1max [°C] 75)

Actuator results

req. act. force	Fo req.	[kN]	16,18	req. diff. psu-ps100	d ps	[bar] 0,00667
max. act. force	Fmax	[kN]	60,19	Actuator force	Fa	[kN] 22,40
max. dp on plug	d. pmax	[bar]	105,55	Close safety factor	Fa/Fo (SF)	1,38
req. start bench range	ps0req.	[bar]	1,27	Open safety factor	Ff/Fw	-

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	PV100801
Customer			Sizing 1
		Cust. Ref.	
Project **Project Methanol Iran**		Date / by	1/27/03 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 12 / 12	Wall thickness	sch 40
Valve duty			Fluid nature
Description	Natural Gas		GAS
Density		Critical pressure	
Molecular weight	16.827	Ratio of specific heats	1.248

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	14200	127687.71	134900	7100
Upstream temperature	degC	40	40	40	40
Upstream pressure	barA	55	54.6	54.6	55
Differential pressure	bar	9.1	8	4.5	25
Downstream pressure	barA	46.9	46.5	50	30
Compressibility		0.906	0.907	0.907	0.906

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	29.77	283.6	393.47	10.48
Percent of full travel	%	9.3	56.4	73.3	3.3
Opening in degrees	deg	16.6	64.7	68.4	11.7
Sound pressure level	dBA	72	82	76	76
Flow velocity (outlet)	Mach	0.0088	0.07	0.07	0.0087
Valve new dp	bar	9.07	5.20	1.6	24.99
Xt		0.82	0.80	0.75	0.82

VALVE SELECTION

Nominal size	in 8	Maximum capacity Cv	487
Valve type	BALL ANSI 600	FULL BORE BALL VALVE, WITH Q-TRIM FOR NOISE AND	
Valve serie		CAVITATION ABATEMENT. RATING ANSI 600	
Attenuator plate		**Plate size in 8**	

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV101502A Tag no. PV101502A
Process medium Reformed Gas State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	500	300	50
Inlet pressure	p1	[bar(a)]	33,7	33,7	33,7
Outlet pressure	p2	[bar(a)]	30,7	30,7	30,7
Inlet temperature	t1	[°C]	167	167	50
Molar mass	M	[g/mol]	13,221	13,221	13,221
Isentropic exponent	gamma		1,34	1,34	1,34
Real gas factor	Z		0,984	0,984	0,984
Viscosity	eta	[mPas]	0,017082	0,017082	0,013094

Results and factors

Valve coeff. calculated	***Cv***		***1,87***	***1,12***	***0,160***
Min. req. size	Req. DN	[mm]	7,18	5,56	2,10
Outlet velocity	w	[Mach]	0,0294	0,0176	0,00252
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***51***	***46***	***38***
relative travel	T	[%]	88,6	75,5	25,7
Different. pressure ratio	x		0,09	0,09	0,09
FL value	FL		0,96	0,96	0,98
xT value	xT		0,77	0,79	0,81
Valve style factor	Fd		0,33	0,24	0,08
Level exponent	G1		-3,62	-3,87	-3,93
Slope exponent	G2		2,31	2,31	2,31

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***3***	***Type***	***3251***
Nominal size	***DN***	***["]***	***1"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***12***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***12***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 ["] 2"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 54,5 s [mm] 2,89999

Actuator data

Type			**3277**	**Fail-safe act.**	**retracts**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**0,2 ... 1**
				Supply	**psu [bar]**	**1,20**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	0,64	req. diff. psu-ps100	d ps	[bar] 0,20
max. act. force	Fmax	[kN]	27,01	Actuator force	Fa	[kN] 0,70
max. dp on plug	d. pmax	[bar]	43,61	Close safety factor	Fa/Fo (SF)	1,10
req. start bench range	ps0req.	[bar]	0,04	Open safety factor	Ff/Fw	5,80

Propsl./order no.: 616100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV101502B Tag no. PV101502B
Process medium Reformed Gas State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	300	20	10
Inlet pressure	p1	[bar(a)]	30,7	30,7	30,7
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	151	151	151
Molar mass	M	[g/mol]	13,221	13,221	13,221
Isentropic exponent	gamma		1,34	1,34	1,34
Real gas factor	Z		0,984	0,984	0,984
Viscosity	eta	[mPas]	0,016535	0,016535	0,016535

Results and factors

Valve coeff. calculated	***Cv***		***0,580***	***0,0384***	***0,0192***
Min. req. size	Req. DN	[mm]	17,6	4,55	3,22
Outlet velocity	w	[Mach]	0,149	0,00993	0,00496
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***74***	***61***	***57***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	93,5	24,0	6,32
Different. pressure ratio	x		0,90	0,90	0,90
FL value	FL		0,97	0,98	0,98
xT value	xT		0,80	0,81	0,81
Valve style factor	Fd		0,38	0,08	0,06
Level exponent	G1		-3,91	-3,94	-4,04
Slope exponent	G2		1,50	1,50	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***0,75***	***Type***	***3251***
Nominal size	***DN***	***["]***	***1"***	***Body material***	***A351 CF8C***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***6***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***12***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 1" D2 ["] 1"
cR [m/s] 5180 rho [kg/m³] 7850 di [inch] 1,1 s [inch] 0,1

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**0,4 ... 2**
				Supply	**psu [bar]**	**2,20**

(Defaults: p1max [bar(a)] 40 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	0,64	req. diff. psu-ps100	d ps	[bar] 0,04
max. act. force	Fmax	[kN]	27,01	Actuator force	Fa	[kN] 1,40
max. dp on plug	d. pmax	[bar]	107,66	Close safety factor	Fa/Fo (SF)	2,20
req. start bench range	ps0req.	[bar]	0,20	Open safety factor	Ff/Fw	-

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SAMSON
Valve Sizing Version 3.56

Item no. PV150101 Tag no. PV150101
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	12000	7463	1000
Inlet pressure	p1	[bar(a)]	5,5	5,5	5,5
Outlet pressure	p2	[bar(a)]	2	2	2
Inlet temperature	t1	[°C]	160	160	160
Density	rho1	[kg/m³]	2,8807	2,8807	2,8807
Isentropic exponent	gamma		1,302	1,302	1,302
Viscosity	eta	[mPas]	0,014369	0,014369	0,014369

Results and factors

Valve coeff. calculated	***Cv***		***206***	***125***	***16,3***
Min. req. size	Req. DN	[mm]	165	130	47,5
Outlet velocity	w	[Mach]	0,361	0,225	0,0301
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***86***	***83***	***73***
relative travel	T	[%]	92,6	79,9	27,7
Different. pressure ratio	x		0,64	0,64	0,64
FL value	FL		0,92	0,94	0,97
xT value	xT		0,71	0,75	0,80
Valve style factor	Fd		0,44	0,42	0,19
Level exponent	G1		-4,86	-4,75	-4,70
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***275***	***Type***	***3241***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***130***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 159,3 s [mm] 4,49999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**2,1 ... 3,3**
				Supply	**psu [bar]**	**3,50**

(Defaults: p1max [bar(a)] 8 p2min [bar(a)] 1,01 t1max [°C] 300)

Actuator results

req. act. force	Fo req.	[kN]	10,20	req. diff. psu-ps100	d ps [bar]	0,02
max. act. force	Fmax	[kN]	49,04	Actuator force	Fa [kN]	14,70
max. dp on plug	d. pmax	[bar]	10,36	Close safety factor	Fa/Fo (SF)	1,44
req. start bench range	ps0req.	[bar]	1,60	Open safety factor	Ff/Fw	-

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SAMSON
Valve Sizing Version 3.56

Item no. PV-150601A Tag no. PV150601A
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	187300	7500	4200
Inlet pressure	p1	[bar(a)]	101	101	101
Outlet pressure	p2	[bar(a)]	95	95	95
Inlet temperature	t1	[°C]	505	505	505
Density	rho1	[kg/m³]	30,537	30,537	30,537
Isentropic exponent	gamma		1,279	1,279	1,279
Viscosity	eta	[mPas]	0,029131	0,029131	0,029131

Results and factors

Valve coeff. calculated	***Cv***		***524***	***21,5***	***12,0***
Min. req. size	Req. DN	[mm]	109	21,8	16,3
Outlet velocity	w	[Mach]	0,0886	0,00308	0,00173
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***88***	***72***	***69***
relative travel	T	[%]	79,4	1,33	->0
Different. pressure ratio	x		0,06	0,06	0,06
FL value	FL		0,79	0,74	0,74
xT value	xT		0,53	0,47	0,47
Valve style factor	Fd		0,43	0,11	0,08
Level exponent	G1		-4,55	-4,59	-4,67
Slope exponent	G2		1,00	1,30	1,30

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***650***	***Type***	***3254***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A217 WC9***
Pressure ratings	***CLASS***		***1500***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***60***	***Charact.***	***linear***
Seat bore	***SB***	***[mm]***	***200***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 233 s [mm] 20

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0**	**[bar]**	**1,7 ... 3,2**
				Supply	**psu**	**[bar]**	**3,80**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 515)

Actuator results

req. act. force	Fo req.	[kN]	172,27	req. diff. psu-ps100	d ps [bar]	0,60
max. act. force	Fmax	[kN]	112,03	Actuator force	Fa [kN]	23,80
max. dp on plug	d. pmax	[bar]	116,22	Close safety factor	Fa/Fo (SF)	1,51
req. start bench range	ps0req.	[bar]	1,24	Open safety factor	Ff/Fw	-

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Item no. PV-150601B Tag no. PV150601B
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	10000	7500	4200
Inlet pressure	p1	[bar(a)]	101	101	101
Outlet pressure	p2	[bar(a)]	47	47	47
Inlet temperature	t1	[°C]	505	505	505
Density	rho1	[kg/m³]	30,537	30,537	30,537
Isentropic exponent	gamma		1,279	1,279	1,279
Viscosity	eta	[mPas]	0,029131	0,029131	0,029131

Results and factors

Valve coeff. calculated	***Cv***		***12,1***	***9,08***	***5,06***
Min. req. size	Req. DN	[mm]	35,7	30,9	23,1
Outlet velocity	w	[Mach]	0,0598	0,0448	0,0218
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***81***	***79***	***76***
relative travel	T	[%]	83,7	76,2	61,3
Different. pressure ratio	x		0,53	0,53	0,53
FL value	FL		0,96	0,97	0,97
xT value	xT		0,79	0,79	0,80
Valve style factor	Fd		0,43	0,42	0,40
Level exponent	G1		-5,29	-5,33	-5,42
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***23***	***Type***	***3151***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A351 WC9***
Pressure ratings	***CLASS***		***1500***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***38***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 10" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 233 s [mm] 20

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**2 ... 2,4**
				Supply	**psu [bar]**	**2,84**

(Defaults: p1max [bar(a)] 116 p2min [bar(a)] 1,01 t1max [°C] 515)

Actuator results

req. act. force	Fo req.	[kN]	13,78	req. diff. psu-ps100	d ps	[bar] 0,04
max. act. force	Fmax	[kN]	41,69	Actuator force	Fa	[kN] 28,00
max. dp on plug	d. pmax	[bar]	240,16	Close safety factor	Fa/Fo (SF)	2,03
req. start bench range	ps0req.	[bar]	1,08	Open safety factor	Ff/Fw	-

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Item no. PV-150607 Tag no. PV150607
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	80700	43609	10000
Inlet pressure	p1	[bar(a)]	41	41	41
Outlet pressure	p2	[bar(a)]	25	25	25
Inlet temperature	t1	[°C]	420	420	420
Density	rho1	[kg/m³]	13,486	13,486	13,486
Isentropic exponent	gamma		1,2841	1,2841	1,2841
Viscosity	eta	[mPas]	0,025242	0,025242	0,025242

Results and factors

Valve coeff. calculated	***Cv***		***280***	***154***	***36,1***
Min. req. size	Req. DN	[mm]	136	100	47,9
Outlet velocity	w	[Mach]	0,139	0,0657	0,0151
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***91***	***89***	***83***
relative travel	T	[%]	92,6	77,3	40,1
Different. pressure ratio	x		0,39	0,39	0,39
FL value	FL		0,78	0,76	0,74
xT value	xT		0,51	0,49	0,47
Valve style factor	Fd		0,45	0,42	0,28
Level exponent	G1		-4,98	-4,88	-4,92
Slope exponent	G2		0,73	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***375***	***Type***	***3254***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A217 WC6***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***150***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 16"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 374,401 s [mm] 16

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,7**
				Supply	**psu [bar]**	**3,18**

(Defaults: p1max [bar(a)] 8 p2min [bar(a)] 1,01 t1max [°C] 470)

Actuator results

req. act. force	Fo req.	[kN]	14,63	req. diff. psu-ps100	d ps	[bar] 0,48
max. act. force	Fmax	[kN]	113,56	Actuator force	Fa	[kN] 19,60
max. dp on plug	d. pmax	[bar]	98,30	Close safety factor	Fa/Fo (SF)	2,49
req. start bench range	ps0req.	[bar]	0,62	Open safety factor	Ff/Fw	-

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SAMSON
Valve Sizing Version 3.56

Item no. PV-150611 Tag no. PV150611
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	65000	35000	5000
Inlet pressure	p1	[bar(a)]	101	101	101
Outlet pressure	p2	[bar(a)]	72	30,077	10,308
Inlet temperature	t1	[°C]	505	505	505
Density	rho1	[kg/m³]	30,537	30,537	30,537
Isentropic exponent	gamma		1,279	1,279	1,279
Viscosity	eta	[mPas]	0,029131	0,029131	0,029131

Results and factors

Valve coeff. calculated	***Cv***		***93,6***	***41,2***	***5,55***
Min. req. size	Req. DN	[mm]	73,6	83,5	53,9
Outlet velocity	w	[Mach]	0,0627	0,0808	0,0388
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***89***	***87***	***75***
Flow condition					Choked flow
relative travel	T	[%]	89,0	38,0	3,36
Different. pressure ratio	x		0,29	0,70	0,90
FL value	FL		0,94	0,96	0,98
xT value	xT		0,76	0,79	0,81
Valve style factor	Fd		0,44	0,41	0,15
Level exponent	G1		-5,27	-5,39	-5,69
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***105***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A217 WC9***
Pressure ratings	***CLASS***		***1500***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***linear***
Seat bore	***SB***	***[mm]***	***80***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***25***	***Balanced***	***without (0,0)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 10"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 233 s [mm] 20

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0 [bar]**	**3,3 ... 3,8**
				Supply	**psu [bar]**	**4,00**

(Defaults: p1max [bar(a)] 116 p2min [bar(a)] 1,01 t1max [°C] 515)

Actuator results

req. act. force	Fo req.	[kN]	59,10	req. diff. psu-ps100	d ps	[bar] 0,03
max. act. force	Fmax	[kN]	55,77	Actuator force	Fa	[kN] 92,40
max. dp on plug	d. pmax	[bar]	108,27	Close safety factor	Fa/Fo (SF)	1,56
req. start bench range	ps0req.	[bar]	2,32	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
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SAMSON
Valve Sizing Version 3.56

Item no. PV-150612 Tag no. PV150612
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	140000	21700	7800
Inlet pressure	p1	[bar(a)]	30	41	41
Outlet pressure	p2	[bar(a)]	22,5	4	3
Inlet temperature	t1	[°C]	350	420	420
Density	rho1	[kg/m³]	13,486	13,486	13,486
Isentropic exponent	gamma		1,2841	1,2841	1,2841
Viscosity	eta	[mPas]	0,025242	0,025242	0,025242

Results and factors

Valve coeff. calculated	***Cv***		***624***	***74,7***	***26,9***
Min. req. size	Req. DN	[mm]	175	176	122
Outlet velocity	w	[Mach]	0,130	0,130	0,0620
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***95***	***94***	***87***
Flow condition				Choked flow	Choked flow
relative travel	T	[%]	59,2	5,29	0,594
Different. pressure ratio	x		0,25	0,90	0,93
FL value	FL		0,77	0,74	0,74
xT value	xT		0,51	0,47	0,47
Valve style factor	Fd		0,43	0,22	0,11
Level exponent	G1		-4,34	-4,66	-4,81
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***1040***	***Type***	***3254***
Nominal size	***DN***	***["]***	***12"***	***Body material***	***A217 WC6***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***120***	***Charact.***	***linear***
Seat bore	***SB***	***[mm]***	***250***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 12" D2 ["] 24"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 686,001 s [mm] 12,5

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0 [bar]**	**0,8 ... 2,4**
				Supply	**psu [bar]**	**2,78**

(Defaults: p1max [bar(a)] 8 p2min [bar(a)] 1,01 t1max [°C] 470)

Actuator results

req. act. force	Fo req.	[kN]	37,59	req. diff. psu-ps100	d ps	[bar] 0,38
max. act. force	Fmax	[kN]	113,56	Actuator force	Fa	[kN] 22,40
max. dp on plug	d. pmax	[bar]	87,64	Close safety factor	Fa/Fo (SF)	1,87
req. start bench range	ps0req.	[bar]	0,47	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2 nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

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ValveSizing Version 3.56

Item no. PV150635A/B Tag no. PV150635A
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	135000	40000	33750
Inlet pressure	p1	[bar(a)]	47	47	47
Outlet pressure	p2	[bar(a)]	42	42	42
Inlet temperature	t1	[°C]	395	395	395
Density	rho1	[kg/m³]	16,332	16,332	16,332
Isentropic exponent	gamma		1,2853	1,2853	1,2853
Viscosity	eta	[mPas]	0,024149	0,024149	0,024149

Results and factors

Valve coeff. calculated	***Cv***		***586***	***173***	***145***
Min. req. size	Req. DN	[mm]	134	72,9	67,0
Outlet velocity	w	[Mach]	0,134	0,0398	0,0336
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***92***	***80***	***79***
relative travel	T	[%]	89,9	25,0	20,8
Different. pressure ratio	x		0,11	0,11	0,11
FL value	FL		0,90	0,95	0,95
xT value	xT		0,69	0,76	0,77
Valve style factor	Fd		0,47	0,41	0,40
Level exponent	G1		-4,28	-4,30	-4,32
Slope exponent	G2		0,93	1,52	1,52

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***650***	***Type***	***3254***
Nominal size	***DN***	***["]***	***8"***	***Body material***	***A217 WC6***
Pressure ratings	***CLASS***		***900***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***60***	***Charact.***	***linear***
Seat bore	***SB***	***[mm]***	***200***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 8"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 199 s [mm] 10

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,7**
				Supply	**psu [bar]**	**3,30**

(Defaults: p1max [bar(a)] 55 p2min [bar(a)] 1,01 t1max [°C] 470)

Actuator results

req. act. force	Fo req.	[kN]	172,27	req. diff. psu-ps100	d ps	[bar] 0,60
max. act. force	Fmax	[kN]	113,56	Actuator force	Fa	[kN] 19,60
max. dp on plug	d. pmax	[bar]	82,80	Close safety factor	Fa/Fo (SF)	1,25
req. start bench range	ps0req.	[bar]	1,24	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV150707 Tag no. PV150707
Process medium Water/Steam State of medium at inlet: vapor

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	93000	6500	3500
Inlet pressure	p1	[bar(a)]	5,7	5,7	5,7
Outlet pressure	p2	[bar(a)]	3	2	1,8
Inlet temperature	t1	[°C]	270	270	270
Density	rho1	[kg/m³]	2,3137	2,3137	2,3137
Isentropic exponent	gamma		1,3013	1,3013	1,3013
Viscosity	eta	[mPas]	0,01897	0,01897	0,01897

Results and factors

Valve coeff. calculated	***Cv***		***1826***	***117***	***62,2***
Min. req. size	Req. DN	[mm]	399	129	99,9
Outlet velocity	w	[Mach]	0,298	0,0313	0,0187
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***92***	***79***	***77***
relative travel	T	[%]	87,2	3,64	0,999
Different. pressure ratio	x		0,47	0,65	0,68
FL value	FL		0,90	0,97	0,98
xT value	xT		0,69	0,79	0,80
Valve style factor	Fd		0,40	0,03	0,01
Level exponent	G1		-4,50	-4,50	-4,50
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***2080***	***Type***	***3254***
Nominal size	***DN***	***["]***	***16"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***120***	***Charact.***	***linear***
Seat bore	***SB***	***[mm]***	***350***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***40***	***Balanced***	***Graphite (10)***
Packing	***Graphite (10)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***insulating s***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 16" D2 ["] 16"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 384,401 s [mm] 11

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0 [bar]**	**1,1 ... 1,8**
				Supply	**psu [bar]**	**2,32**

(Defaults: p1max [bar(a)] 8 p2min [bar(a)] 1,01 t1max [°C] 380)

Actuator results

req. act. force	Fo req.	[kN]	71,59	req. diff. psu-ps100	d ps [bar]	0,52
max. act. force	Fmax	[kN]	119,59	Actuator force	Fa [kN]	30,80
max. dp on plug	d. pmax	[bar]	121,05	Close safety factor	Fa/Fo (SF)	1,90
req. start bench range	ps0req.	[bar]	0,64	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2 nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	PV200307A	Tag no.	PV200307A
Process medium	Flare Gas	State of medium at inlet:	gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	140000		
Inlet pressure	p1	[bar(a)]	67,9		
Outlet pressure	p2	[bar(a)]	35		
Inlet temperature	t1	[°C]	40		
Molar mass	M	[g/mol]	11,51		
Isentropic exponent	gamma		1,3		
Real gas factor	Z		1		
Viscosity	eta	[mPas]	0,014		

Results and factors

Valve coeff. calculated	***Cv***		***113***
Min. req. size	Req. DN	[mm]	101
Outlet velocity	w	[Mach]	0,135
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***90***
relative travel	T	[%]	83,0
Different. pressure ratio	x		0,48
FL value	FL		0,95
xT value	xT		0,69
Valve style factor	Fd		0,32
Level exponent	G1		-5,20
Slope exponent	G2		0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***220***	***Type***	***3251***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***60***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***125***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***25***	***Balanced***	***PTFE (1,6)***
Packing	***PTFE (3,2)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 16"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 378 s [mm] 14,2

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**0,8 ... 2,4**
				Supply	**psu [bar]**	**2,73**

(Defaults: p1max [bar(a)] 89 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	112,21	req. diff. psu-ps100	d ps	[bar] 0,07
max. act. force	Fmax	[kN]	77,52	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	127,07	Close safety factor	Fa/Fo (SF)	1,22
req. start bench range	ps0req.	[bar]	0,72	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV200307B Tag no. PV200307B
Process medium Recycle Gas State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	35000	22670	
Inlet pressure	p1	[bar(a)]	67,9	67,9	
Outlet pressure	p2	[bar(a)]	30	14,037	
Inlet temperature	t1	[°C]	40	40	
Molar mass	M	[g/mol]	11,51	11,51	
Isentropic exponent	gamma		1,4	1,4	
Real gas factor	Z		1	1	
Viscosity	eta	[mPas]	0,014	0,014	

Results and factors

Valve coeff. calculated	***Cv***		***26,2***	***16,2***
Min. req. size	Req. DN	[mm]	53,3	62,7
Outlet velocity	w	[Mach]	0,141	0,194
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***87***	***85***
Flow condition				Choked flow
relative travel	T	[%]	92,5	80,4
Different. pressure ratio	x		0,56	0,79
FL value	FL		0,94	0,96
xT value	xT		0,75	0,78
Valve style factor	Fd		0,44	0,42
Level exponent	G1		-5,25	-5,32
Slope exponent	G2		0,07	0,39

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***35***	***Type***	***3251***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***50***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***V***
Sealing	***lapped-in (20)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 8"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 204,9 s [mm] 7,10001

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	4,88	req. diff. psu-ps100	d ps	[bar] 0,01
max. act. force	Fmax	[kN]	57,41	Actuator force	Fa	[kN] 22,40
max. dp on plug	d. pmax	[bar]	97,14	Close safety factor	Fa/Fo (SF)	4,59
req. start bench range	ps0req.	[bar]	0,38	Open safety factor	Ff/Fw	-

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	PV-200409
Customer			Sizing 1
Project	A-10372 SAMSON F	Cust. Ref.	
		Date / by	10/17/02 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 12 / 12	Wall thickness	sch 40
Valve duty			
Description	Steam	Fluid nature	GAS
Density		Critical pressure	
Molecular weight	18.02	Ratio of specific heats	1.3

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	165000	161437	20000	
Upstream temperature	degC	262	262	262	
Upstream pressure	barA	48	48	48	
Differential pressure	bar	0.5	1	2	
Downstream pressure	barA	47.5	47	46	
Compressibility		0.8	0.8	0.8	

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	1746.07	1139.24	107.45	
Percent of full travel	%	72.8	59.7	16.6	
Opening in degrees	deg	66.2	55	16.8	
Sound pressure level	dBA	84	88	80	
Flow velocity (outlet)	Mach	0.06	0.05	0.0066	
Xt		0.55	0.61	0.68	

VALVE SELECTION

Nominal size	in 12	Maximum capacity	Cv	2900	
Valve type	BUTTERFLY ANSI 600				
	WAFER-SPHERE,		BUTTERFLY VALVE, RATING ANSI 600		

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	PV250102A	Tag no.	PV250102A
Process medium	Purge Gas	State of medium at inlet:	gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	45000	38100	10000
Inlet pressure	p1	[bar(a)]	67,9	67,9	67,9
Outlet pressure	p2	[bar(a)]	36	36	36
Inlet temperature	t1	[°C]	40	40	40
Molar mass	M	[g/mol]	11,51	11,51	11,51
Isentropic exponent	gamma		1,42	1,42	1,42
Real gas factor	Z		1,01	1,01	1,01
Viscosity	eta	[mPas]	0,013446	0,013446	0,013446

Results and factors

Valve coeff. calculated	***Cv***		***34,8***	***29,4***	***7,64***
Min. req. size	Req. DN	[mm]	55,0	50,6	25,9
Outlet velocity	w	[Mach]	0,0906	0,0767	0,0201
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***89***	***87***	***80***
relative travel	T	[%]	88,3	84,0	49,6
Different. pressure ratio	x		0,47	0,47	0,47
FL value	FL		0,95	0,95	0,97
xT value	xT		0,76	0,77	0,80
Valve style factor	Fd		0,43	0,43	0,33
Level exponent	G1		-5,55	-5,67	-5,72
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***55***	***Type***	***3251***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***bellows***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 106,3 s [mm] 3,99999

Actuator data

Type			**3271**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**2800**	**Bench range**	**ps0 [bar]**	**2 ... 2,4**
				Supply	**psu [bar]**	**3,00**

(Defaults: p1max [bar(a)] 89 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	28,29	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	57,41	Actuator force	Fa	[kN] 56,00
max. dp on plug	d. pmax	[bar]	176,81	Close safety factor	Fa/Fo (SF)	1,98
req. start bench range	ps0req.	[bar]	1,11	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	PV250102B	Tag no.	PV250102B
Process medium	purge gas	State of medium at inlet:	gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	3000	2500	500
Inlet pressure	p1	[bar(a)]	36	36	36
Outlet pressure	p2	[bar(a)]	18	13,264	2,9306
Inlet temperature	t1	[°C]	40	40	40
Molar mass	M	[g/mol]	11,51	11,51	11,51
Isentropic exponent	gamma		1,42	1,42	1,42
Real gas factor	Z		1	1	1
Viscosity	eta	[mPas]	0,013069	0,013069	0,013069

Results and factors

Valve coeff. calculated	***Cv***		***4,25***	***3,39***	***0,662***
Min. req. size	Req. DN	[mm]	20,1	21,3	20,3
Outlet velocity	w	[Mach]	0,0483	0,0547	0,0495
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***71***	***70***	***59***
Flow condition					Choked flow
relative travel	T	[%]	80,9	75,0	33,3
Different. pressure ratio	x		0,50	0,63	0,92
FL value	FL		0,96	0,97	0,98
xT value	xT		0,79	0,79	0,81
Valve style factor	Fd		0,42	0,42	0,23
Level exponent	G1		-5,31	-5,34	-5,58
Slope exponent	G2		0,25	0,25	0,25

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***9***	***Type***	***3251***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***600***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***24***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (3,2)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 2" D2 ["] 2"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 54,5 s [mm] 2,89999

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**350**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 3 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	0,40	req. diff. psu-ps100	d ps	[bar] 0,05
max. act. force	Fmax	[kN]	57,41	Actuator force	Fa	[kN] 4,90
max. dp on plug	d. pmax	[bar]	100,96	Close safety factor	Fa/Fo (SF)	12,19
req. start bench range	ps0req.	[bar]	0,13	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV250103 Tag no. PV250103
Process medium Hydrogen State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	23000	19254	5800
Inlet pressure	p1	[bar(a)]	35	35	35
Outlet pressure	p2	[bar(a)]	32,2	32,1	32
Inlet temperature	t1	[°C]	40	40	40
Strd. density	rhon	[kg/m³(N)]	0,0900	0,0900	0,0900
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1	1	1
Viscosity	ny1	[mm²/s]	3,25	3,25	3,25

Results and factors

Valve coeff. calculated	***Cv***		***28,9***	***23,8***	***7,03***
Min. req. size	Req. DN	[mm]	27,0	24,7	13,6
Outlet velocity	w	[Mach]	0,0391	0,0333	0,00993
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***72***	***70***	***59***
relative travel	T	[%]	106	101	69,7
Different. pressure ratio	x		0,08	0,08	0,09
FL value	FL		0,91	0,92	0,96
xT value	xT		0,70	0,71	0,78
Valve style factor	Fd		0,43	0,43	0,34
Level exponent	G1		-3,18	-3,34	-3,78
Slope exponent	G2		2,37	2,36	2,35

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***23***	***Type***	***3241***
Nominal size	***DN***	***["]***	***3"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***Flow Div.III***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***48***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***V***
Sealing	***lapped-in (10)***			***Bonnet***	***bellows***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 107,1 s [mm] 3,6

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,6 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 3 p2min [bar(a)] 1,01 t1max [°C] 80)

Actuator results

req. act. force	Fo req.	[kN]	1,98	req. diff. psu-ps100	d ps	[bar] 0,02
max. act. force	Fmax	[kN]	25,45	Actuator force	Fa	[kN] 11,20
max. dp on plug	d. pmax	[bar]	52,90	Close safety factor	Fa/Fo (SF)	5,66
req. start bench range	ps0req.	[bar]	0,31	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV300101 Tag no. PV300101
Process medium Expansion gas State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	5000	4182	1200
Inlet pressure	p1	[bar(a)]	5,4	5,4	5,5
Outlet pressure	p2	[bar(a)]	4,9	4,2	1,3
Inlet temperature	t1	[°C]	38	38	38
Molar mass	M	[g/mol]	26,05	26,05	26,05
Isentropic exponent	gamma		1,31	1,31	1,31
Real gas factor	Z		0,98	0,98	0,98
Viscosity	eta	[mPas]	0,014	0,014	0,014

Results and factors

Valve coeff. calculated	***Cv***		***138***	***78,7***	***15,6***
Min. req. size	Req. DN	[mm]	62,0	61,3	59,0
Outlet velocity	w	[Mach]	0,131	0,125	0,116
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***69***	***79***	***82***
relative travel	T	[%]	92,3	77,9	36,5
Different. pressure ratio	x		0,09	0,22	0,76
FL value	FL		0,90	0,93	0,97
xT value	xT		0,69	0,73	0,79
Valve style factor	Fd		0,44	0,42	0,25
Level exponent	G1		-3,12	-3,57	-3,95
Slope exponent	G2		2,24	1,50	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***190***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***100***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 159 s [mm] 4,5

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 38)

Actuator results

req. act. force	Fo req.	[kN]	7,00	req. diff. psu-ps100	d ps [bar]	0,02
max. act. force	Fmax	[kN]	64,29	Actuator force	Fa [kN]	9,80
max. dp on plug	d. pmax	[bar]	11,53	Close safety factor	Fa/Fo (SF)	1,40
req. start bench range	ps0req.	[bar]	1,10	Open safety factor	Ff/Fw	-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV300303A/B Tag no. PV300303A/B
Process medium Off gas State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	600	1989	2400
Inlet pressure	p1	[bar(a)]	1,8	1,7	1,6
Outlet pressure	p2	[bar(a)]	1	1,1	1,1
Inlet temperature	t1	[°C]	120	120	120
Molar mass	M	[g/mol]	40,18	40,18	40,18
Isentropic exponent	gamma		1,25	1,25	1,25
Real gas factor	Z		1,002	1,002	1,002
Viscosity	eta	[mPas]	0,018	0,018	0,018

Results and factors

Valve coeff. calculated	***Cv***		***39,4***	***144***	***189***
Min. req. size	Req. DN	[mm]	56,9	98,7	108
Outlet velocity	w	[Mach]	0,0460	0,138	0,168
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***78***	***76***	***71***
relative travel	T	[%]	25,4	58,5	65,6
Different. pressure ratio	x		0,44	0,35	0,31
FL value	FL		0,90	0,93	0,97
xT value	xT		0,69	0,73	0,79
Valve style factor	Fd		0,44	0,42	0,25
Level exponent	G1		-3,12	-3,57	-3,95
Slope exponent	G2		2,24	1,50	1,50

Valve data

Body type			***Globe valve***	***Series***	***butterfly valve***
Valve coefficient	***Cv***		***729***	***Type***	***14c***
Nominal size	***DN***	***["]***	***6"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***150***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***V***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 8" D2 ["] 8"
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 206,5 s [mm] 6,3

Actuator data

Type **SRP3000** **Fail-safe act.** **extends**
Diaphr. area **A** **[cm²]** **Bench range** **ps0** **[bar]** ...
Supply **psu** **[bar]**

(Defaults: p1max [bar(a)] 9 p2min [bar(a)] 1,01 t1max [°C] 38)

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no.	PV300808	Tag no.	PV300808
Process medium	Nitrogen	State of medium at inlet:	gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	4000	3600	360
Inlet pressure	p1	[bar(a)]	6,1	7,3	8
Outlet pressure	p2	[bar(a)]	1,4	1,4	1
Inlet temperature	t1	[°C]	30	30	30
Molar mass	M	[g/mol]	28,0	28,0	28,0
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1	1	1
Viscosity	eta	[mPas]	0,0175	0,0175	0,0175

Results and factors

Valve coeff. calculated	***Cv***		***49,9***	***37,1***	***3,29***
Min. req. size	Req. DN	[mm]	103	98,0	36,7
Outlet velocity	w	[Mach]	0,320	0,288	0,0403
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***82***	***82***	***66***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	92,4	84,9	23,0
Different. pressure ratio	x		0,77	0,81	0,88
FL value	FL		0,94	0,95	0,98
xT value	xT		0,75	0,76	0,81
Valve style factor	Fd		0,44	0,43	0,17
Level exponent	G1		-4,59	-4,64	-5,00
Slope exponent	G2		0,75	0,75	0,75

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***67***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***Flow Div.I***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***63***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 4" D2 ["] 4"
cR [m/s] 5100 rho [kg/m³] 7800 di [mm] 107,1 s [mm] 6,02

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**0,8 ... 2,4**
				Supply	**psu [bar]**	**2,60**

(Defaults: p1max [bar(a)] 11,5 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	3,75	req. diff. psu-ps100	d ps [bar]	0,01
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa [kN]	5,60
max. dp on plug	d. pmax	[bar]	16,35	Close safety factor	Fa/Fo (SF)	1,49
req. start bench range	ps0req.	[bar]	0,59	Open safety factor	Ff/Fw	-

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Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV300909A Tag no. PV300909A
Process medium Methanol-Gas State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	700		
Inlet pressure	p1	[bar(a)]	1,1		
Outlet pressure	p2	[bar(a)]	1,05		
Inlet temperature	t1	[°C]	40		
Molar mass	M	[g/mol]	28,01		
Isentropic exponent	gamma		1,3		
Real gas factor	Z		1		
Viscosity	eta	[mPas]	0,01006		

Results and factors

Valve coeff. calculated	***Cv***		***139***
Min. req. size	Req. DN	[mm]	51,3
Outlet velocity	w	[Mach]	0,0900
SPL (DIN IEC 534 8-3)	***LA***	***[dB(A)]***	***49***
relative travel	T	[%]	92,4
Different. pressure ratio	x		0,05
FL value	FL		0,90
xT value	xT		0,69
Valve style factor	Fd		0,44

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***190***	***Type***	***3241***
Nominal size	***DN***	***["]***	***4"***	***Body material***	***A216 WCB***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***30***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***100***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***16***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 6" D2 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 159,3 s [mm] 4,5

Actuator data

Type			**3277**	**Fail-safe act.**	**retracts**	
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0 [bar]**	**0,2 ... 1**
				Supply	**psu [bar]**	**1,54**

(Defaults: p1max [bar(a)] 4,5 p2min [bar(a)] 1,01 t1max [°C] 150)

Actuator results

req. act. force	Fo req.	[kN]	3,47	req. diff. psu-ps100	d ps [bar]	0,54
max. act. force	Fmax	[kN]	54,17	Actuator force	Fa [kN]	3,81
max. dp on plug	d. pmax	[bar]	3,90	Close safety factor	Fa/Fo (SF)	1,10
req. start bench range	ps0req.	[bar]	0,02	Open safety factor	Ff/Fw	14,22

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 10.01.05 Data entered by: V12/Di

SAMSON
Valve Sizing Version 3.56

Item no. PV300909B Tag no. PV300909B
Process medium Nitrogen State of medium at inlet: gas

Process and medium data

			Case 1	Case 2	Case 3
Flow	Qn	[m³/h(N)]	706	600	180
Inlet pressure	p1	[bar(a)]	6,9	7,9	8
Outlet pressure	p2	[bar(a)]	1,02	1,01	1
Inlet temperature	t1	[°C]	30	30	30
Molar mass	M	[g/mol]	28,013	28,013	28,013
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		0,99593	0,99535	0,9953
Viscosity	eta	[mPas]	0,018069	0,01808	0,018081

Results and factors

Valve coeff. calculated	***Cv***		***7,66***	***5,64***	***1,65***
Min. req. size	Req. DN	[mm]	50,9	47,1	25,9
Outlet velocity	w	[Mach]	0,346	0,294	0,0865
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***82***	***81***	***74***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	89,2	81,4	49,9
Different. pressure ratio	x		0,85	0,87	0,88
FL value	FL		0,95	0,96	0,97
xT value	xT		0,77	0,78	0,80
Valve style factor	Fd		0,33	0,27	0,12
Level exponent	G1		-3,72	-3,76	-3,79
Slope exponent	G2		1,52	1,51	1,50

Valve data

Body type			***Globe valve***	***Series***	***globe valve***
Valve coefficient	***Cv***		***12***	***Type***	***3241***
Nominal size	***DN***	***["]***	***2"***	***Body material***	***A105***
Pressure ratings	***CLASS***		***300***	***Noise reduction***	***without***
Travel	***S***	***[mm]***	***15***	***Charact.***	***Equal perc.***
Seat bore	***SB***	***[mm]***	***24***	***Flow direction***	***FTO***
Stem diameter	***Sd***	***[mm]***	***10***	***Balanced***	***without (0,0)***
Packing	***PTFE (1,6)***			***Leakage rate***	***IV***
Sealing	***metal (2,0)***			***Bonnet***	***standard***

Pipe data

Type of pipe Steel pipe Pipe insulation none D1 ["] 3" D2 ["] 3"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 82,5 s [mm] 3,2

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**	
Diaphr. area	**A**	**[cm²]**	**120**	**Bench range**	**ps0 [bar]**	**1,4 ... 2,3**
				Supply	**psu [bar]**	**2,50**

(Defaults: p1max [bar(a)] 11,5 p2min [bar(a)] 1,01 t1max [°C] 75)

Actuator results

req. act. force	Fo req.	[kN]	0,68	req. diff. psu-ps100	d ps	[bar] 0,05
max. act. force	Fmax	[kN]	25,68	Actuator force	Fa	[kN] 1,68
max. dp on plug	d. pmax	[bar]	32,50	Close safety factor	Fa/Fo (SF)	2,49
req. start bench range	ps0req.	[bar]	0,62	Open safety factor	Ff/Fw	-

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	Copy of Tag
Customer		TV 10090A/B	Sizing 1
		Cust. Ref.	
Project		Date / by	1/27/03 /

PROCESS DATA

Pipe size inlet / outlet	in 14 / 14	Wall thickness	sch 40
Valve duty			Fluid nature
Description	Natural Gas		GAS
Density		Critical pressure	
Molecular weight	17.39	Ratio of specific heats	1.32

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	20000	142220	146000	76360
Upstream temperature	degC	330	330	330	328
Upstream pressure	barA	48	48	48.6	48
Differential pressure	bar	0.3	0.2	0.2	0.2
Downstream pressure	barA	47.7	47.8	48.3	47.8
Compressibility		0.999	0.999	0.999	0.999

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	329.06	2863.91	2875.02	1511.22
Percent of full travel	%	11.4	56.4	56.6	38.7
Opening in degrees	deg	13	52.1	52.2	36.7
Sound pressure level	dBA	68	78	77	74
Flow velocity (outlet)	Mach	0.0065	0.04	0.04	0.02
Xt		0.63	0.42	0.42	0.52

VALVE SELECTION

Nominal size	in 14	Maximum capacity	Cv	11000
Valve type	BUTTERFLY			
Valve serie	METAL SEATED BUTTERFLY VALVE, PROCESS RATED			

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator			
Required open		Required close	
Opening load factor		Closing load factor	
Req control to open			
Ctrl open load factor			
Req control to close			
Ctrl close load factor			

NOTES

TV-1012048

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	????
Customer			Sizing 1
		Cust. Ref.	
Project A-10372 SAMSON F		Date / by	10/16/02 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 16 / 16	Wall thickness	sch 40
Valve duty			Fluid nature
Description			GAS
Density		Critical pressure	
Molecular weight	17.227	Ratio of specific heats	1.307

		Case 1	Case 2	Case 3	Case 4
Flow rate	kg/h	153300	109600	68400	
Upstream temperature	degC	400	370	380	
Upstream pressure	barA	46.8	46.8	46.8	
Differential pressure	bar	0.1	0.3	0.3	
Downstream pressure	barA	46.7	46.5	46.5	
Compressibility		0.980	0.990	0.990	

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	4663.74	1884.09	1012.34	
Percent of full travel	%	86.6 *	56.3	37.2	
Opening in degrees	deg	78.4	51.1	35.4	
Sound pressure level	dBA	74	78	74	
Flow velocity (outlet)	Mach	0.04	0.02	0.01	
Xt		0.46	0.62	0.66	

VALVE SELECTION

Nominal size	in 16	Maximum capacity	Cv 5100
Valve type	BUTTERFLY ANSI 600		
	WAFER-SPHERE,		BUTTERFLY VALVE, RATING ANSI 600

ACTUATOR SIZING DATA

Supply pressure		Valve seat	
Max shut off dp		Gland packing	
Load factor		Bearings	

ACTUATOR SELECTION

Selected actuator				
Required open		Required close		
Opening load factor		Closing load factor		
Req control to open				
Ctrl open load factor				
Req control to close				
Ctrl close load factor				

NOTES

0,5% Leakage

099

CONTROL VALVE SIZING SHEET

Item	Revision	Tag no	TV-200521B/A
Customer			Sizing 1
		Cust. Ref.	
Project A-10372 SAMSON F		Date / by	10/16/02 / u.w.

PROCESS DATA

Pipe size inlet / outlet	in 24 / 24	Wall thickness	sch 40
Valve duty			Fluid nature
Description			GAS
Density		Critical pressure	
Molecular weight	11.5	Ratio of specific heats	1.35

		Case 1	Case 2	Case 3	Case 4
Flow rate	Nm3/h	1396600	1266340	80000	
Upstream temperature	degC	66	66	66	
Upstream pressure	barA	77.6	77.6	77.6	
Differential pressure	bar	0.8	0.8	0.8	
Downstream pressure	barA	76.8	76.8	76.8	
Compressibility		1.01	1.01	1.01	

CALCULATED PERFORMANCE

		Case 1	Case 2	Case 3	Case 4
Capacity	FpCv	6666.91	5143.84	243.31	
Percent of full travel	%	79.7	76.1	10.1	
Opening in degrees	deg	72.3	68.3	11.8	
Sound pressure level	dBA	81	80	62	
Flow velocity (outlet)	Mach	0.06	0.06	0.0022	
Xt		0.61	0.63	0.68	

VALVE SELECTION

Nominal size	in 20	Maximum capacity	Cv	7950.00	
Valve type	BUTTERFLY ANSI 600				
		WAFER-SPHERE,		BUTTERFLY VALVE, RATING ANSI 600	

ACTUATOR SIZING DATA

Supply pressure			Valve seat	
Max shut off dp			Gland packing	
Load factor			Bearings	

ACTUATOR SELECTION

Selected actuator				
Required open			Required close	
Opening load factor			Closing load factor	

Req control to open				
Ctrl open load factor				
Req control to close				
Ctrl close load factor				

NOTES

Index of Revisions

Rev.	Sheet	Prepared, revised		Checked	Approved			Remark, kind of revision
		Name	Date	Name	Name	Date	Status	
00	**1 - 105**	**V12/sro**	**2005-01-10**	**V12/lf**	**V12/di**	**2005-01-20**	**IFR**	**FIRST ISSUE / FINAL ISSUE**