Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority by Lurgi. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

VALVE CALCULATION SHEETS

V12/sro	2005-07-01	V12/lf	V12/di	2005-07-05	FINAL	FINAL ISSUE
V12/sro	2005-06-20	V12/lf	V12/di	2005-06-27		SECOND ISSUE
V12/sro	2005-01-10	V12/lf	V12/di	2005-01-20		FIRST ISSUE
Name	Date	Name	Name	Date	Status	
Prepared, revised		Checked	Approved			Remark, kind of revision

Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority by Lurgi. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

Valve Calculation Sheets - Table of Contents

Tag No.	Date	Page
FV-100326	2005-06-01	005
FV-100406	2005-06-01	006
FV-100416	2003-06-21	007-014
FV-100428	2003-06-20	015-018
FV-100429	2005-06-01	019
FV-100512	2005-06-01	020
FV-100704	2005-06-01	021
FV-100805	2003-06-20	022-026
FV-100807	2003-06-20	027-031
FV-100825	2005-06-01	032
FV-100831	2005-06-01	033
FV-101019	2005-07-05	034
FV-101021	2005-06-01	035
FV-101039	2005-06-01	036
FV-101041	2005-06-01	037
FV-101122	2005-06-01	038
FV-101125	2005-06-01	039
FV-101229A	2005-06-01	040
FV-101229B	2005-06-01	041-042
FV-101432	2004-09-07	043
FV-101433	2004-09-07	044
FV-101435	2004-09-07	045
FV-101439	2005-06-01	046
FV-101441	2005-06-01	047
FV-150411	2005-06-01	048
FV-150610	2004-09-07	049
FV-150630	2004-09-07	050
FV-150636	2004-09-07	051
FV-150725	2004-09-07	052
FV-250102	2005-06-01	053
FV-250105	2005-07-05	054
FV-300101	2005-06-07	055
FV-300203	2005-06-01	056
FV-300305	2005-06-01	057
FV-300306	2005-06-01	058
FV-300408	2005-06-01	059
FV-300510A	2005-06-01	060
FV-300510B	2005-06-01	061
FV-300611	2005-06-01	062
FV-300920	2005-06-01	063
HV-200204	2003-06-21	064-067
HV-200214	2002-06-21	068-075
HV-200503	2003-06-21	076-079

Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority by Lurgi. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

Valve Calculation Sheets - Table of Contents

Tag No.	Date	Page
LV-100411	2005-06-01	080
LV-100416	2005-06-01	081
LV-101308	2005-06-01	082
LV-101309	2005-06-01	083
LV-101512A	2005-06-01	084
LV-101512B	2005-06-01	085
LV-101602	2005-06-01	086
LV-150101A	2005-06-01	087
LV-150406	2005-06-01	088
LV-150505	2005-06-01	089
LV-200301	2005-06-01	090
LV-200403	2005-06-01	091
LV-300101A	2005-06-01	092
LV-300101B	2005-06-07	093
LV-300202	2005-06-07	094
LV-300203	2005-06-01	095
LV-300305	2005-06-07	096
LV-300406	2005-06-01	097
LV-300407	2005-07-05	098
LV-300508	2005-06-01	099
LV-300609	2005-06-01	100
LV-300910	2005-06-01	101
LV-600301	2005-06-01	102
PCV-100181	(not available)	-
PCV-100182	(not available)	-
PV-100201	2005-06-01	103
PV-100513	2005-06-01	104
PV-100529A/B	2005-06-01	105
PV-100801	2003-06-21	106-109
PV-101502A	2005-06-01	110
PV-101502B	2005-06-01	111
PV-150101	2005-06-01	112
PV-150601A	2005-06-01	113
PV-150601B	2005-06-01	114
PV-150607	2005-06-01	115
PV-150611	2005-06-01	116
PV-150612	2005-06-01	117
PV-150635A/B	2005-06-01	118
PV-150707	2005-06-01	119
PV-200307A	2005-06-01	120
PV-200307B	2005-07-05	159-160
PV-200409	2002-06-20	122-125

Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority by Lurgi. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

Valve Calculation Sheets - Table of Contents

Tag No.	Date	Page
PV-250102A	2005-06-01	126
PV-250102B	2005-06-01	127
PV-250103	2005-07-05	128
PV-300101	2005-06-01	129
PV-300303A	2005-06-01	130
PV-300303B	2005-06-01	131
PV-300808	2005-06-01	132
PV-300909A	2005-06-01	133
PV-300909B	2005-06-01	134
TV-100904A	2003-06-20	135-138
TV-100904B	2003-06-20	139-142
TV-101204A	2002-06-20	143-146
TV-101204B	2002-06-20	147-150
TV-200521A	2002-06-20	151-154
TV-200521B	2002-06-20	155-158

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***8,54***	***7,35***	***3,03***
Min. req. size	Req. DN	[mm]	21,2	20,2	12,2
Outlet velocity	w	[Mach]	0,0560	0,0512	0,0187
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***77***	***77***	***68***
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		-4,66	-4,68	-4,81
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	["]	3"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	82	s	[mm]	7,62

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.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***81***	***79***	***73***
Flow condition			Critical cavitation	Critical cavitation	Critical 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	xFz		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	["]	2"	D2	["]	3"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	79	s	[mm]	5,49

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]	32,00	Close safety factor	Fa/Fo (SF)		26,91
req. start bench range	ps0req.	[bar]	0,05	Open safety factor	Ff/Fw		-

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 09:52:27
Tag No.		**FV-100416**	

Medium selection and state

Medium		**Natural Gas (Aga8)**	
Gas composition		**Standard**	
Operating temperature	t1	**290,0**	°C
State		**Gaseous**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**46,0**	bar(a)
Absolute pressure downstream of valve	p2	**32,6**	bar(a)
Flow coefficient	Cv	**455,96**	GPM(US)
◉ Mass flow rate	qm	**150.000,0**	kg/h
○ Volume flow rate (standard conditio...	qn	**200.090,0**	m³/h
Critical flow-related pressure difference	Δpc	**23,605**	bar(a)
Critical real pressure difference	ΔpXc	**21,338**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**16,422**	kg/m³
Operating density (t2, p2)	ρ2	**11,66**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,020264**	mPa s
Isentropic exponent (t1, p1)	κ	**1,2174**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 600**
Valve selection		**Cv: 3321, 12", Measured values (lin)**
☒ Valve from database	☒ Valve data can be modified	

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**455,96**	GPM(US)
Selected flow coefficient	Cv100	**3.321,0**	GPM(US)
Selected valve size	DN	**12"**	
Flow velocity	u1	**34,774**	m/s
Flow velocity	u2	**48,976**	m/s
Valve modifier (Cv/Cv100 = 0.75)	FL²	**0,42**	-
Valve modifier (Cv/Cv100 = 0.75)	xT	**0,343**	-
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☐ Function for Fl²
☐ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	**25,931**	%
Valve load	Cv/Cv1...	**13,729**	%
Valve modifier (operating conditions)	FL²	**0,638**	-
Valve modifier (operating conditions)	xT	**0,59**	-
Valve style modifier (operating conditions)	Fd	**0,411**	-

Pipe upstream of valve

Flow velocity in the pipe	u1R	**38,733**	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	**12"**	
Pressure class downstream of valve	PN2	**Schedule 80**	
○ Pipe outside diameter downstream ...	Da2	**12,748**	in
Pipe wall thickness downstream of ...	s2	**0,68898**	in
○ Pipe inside diameter downstream of...	Di2	**11,37**	in
Flow velocity in the pipe	u2R	**54,553**	m/s
Material number		**1.0038 R St 37-2**	
Material group		**Steel I**	
Density of pipeline	ρP	**7.850,0**	kg/m³
Sound velocity in pipe material	cP	**5.180,0**	m/s

Noise calculation

Calculation standard (noise)		**IEC 60534-8-3:2000**	

Calculated values

Low-noise design		**n.a.**	
Pressure level (mach no.)	ΔL,Ma	**0,682**	dB
Transmission loss	Rr	**-54,8**	dB
Sound power level	Lwi	**144,0**	dB
Sound pressure (0 m distance, A-weight...	LpAa	**119,0**	dB(A)
Sound pressure level of valve (A-weight...	LpAa	**110,0**	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	**0,083945**	-

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	**290,0**	**400,0**		°C
t2	**290,0**	**400,0**		°C
p1	**46,0**	**46,0**		bar(a)
p2	**32,6**	**32,6**		bar(a)
Cv	**455,96**	**330,96**		GPM(US)
qm	**150.000,0**	**100.000,0**		kg/h
qn	**200.090,0**	**133.390,0**		m³/h
Δpc	**23,605**	**24,3**		bar(a)
cf1	**583,97**	**632,71**		m/s
η1	**0,020264**	**0,023377**		mPa s
κ	**1,2174**	**1,1896**		-
ρ1	**16,422**	**13,67**		kg/m³
ρ2	**11,66**	**9,7185**		kg/m³
LpAa	**110,0**	**107,0**		dB(A)

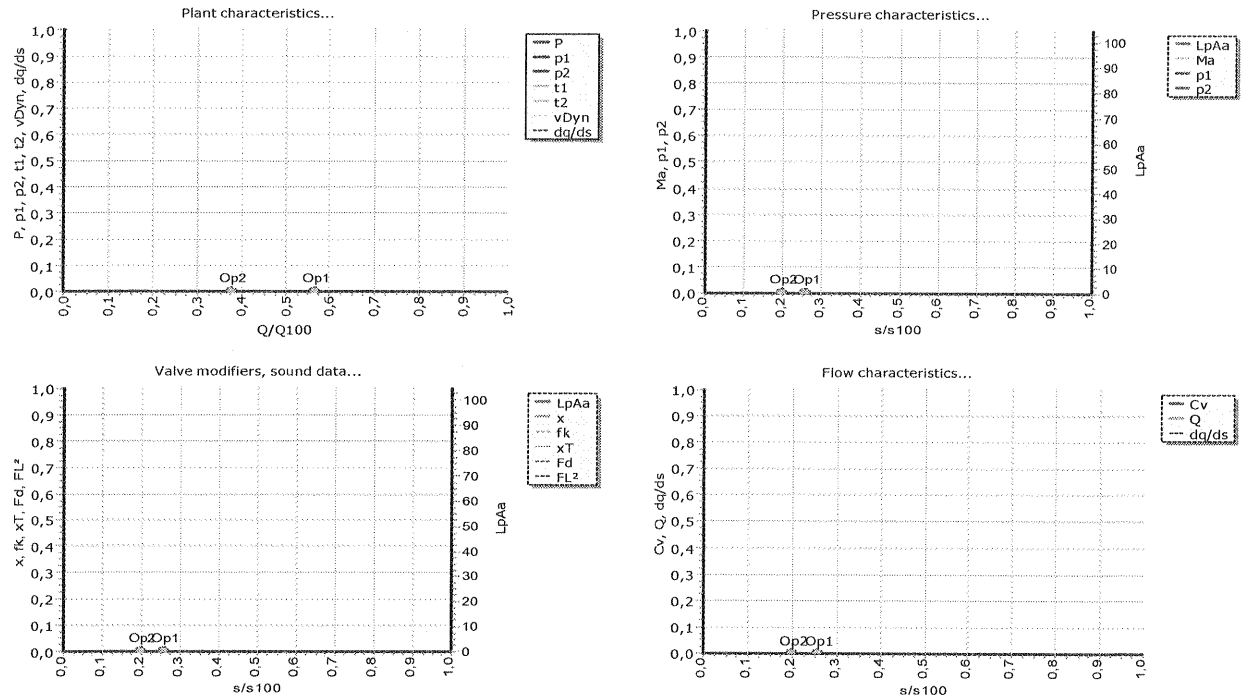
u1	**34,774**	**27,85**	m/s
u2	**48,976**	**39,172**	m/s
P	**4.018,8**	**3.218,7**	kW
MaDN	**0,083945**	**0,062011**	-
s/s100	**25,931**	**19,946**	%
Cv/Cv1...	**13,729**	**9,9657**	%
Fd	**0,411**	**0,377**	-
FL²	**0,638**	**0,666**	-
xT	**0,59**	**0,622**	-
	Turbulent flow	**Turbulent flow**	
	Non-critical	**Non-critical**	
h1'	**676,5**	**1.041,3**	kJ/kg

Control optimization

Valve authority (Δp100/Δp0)	vDyn	**1,0**	-
Calculated short-circuit performance	ax	**1,9607**	-

Characteristics values table

Caption	Unit	5 [%]	24 [%]	50 [%]	75 [%]	100 [%]
s/s100	%					
t1	°C		-130,3			
p1	bar(a)		46,0			
p2	bar(a)		32,6			
Cv	GPM(US)					
qm	kg/h		265.100,0			
qn	m³/h		353.600,0			
Type of flow	-					
vDyn	-		1,0			
ρ1	kg/m³					
κ	-					
LpAa	dB(A)					
MaDN	-					
u2	m/s					
cf	m/s					



Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Lookup value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 10:00:16
Tag No.		**FV-100416**	

Medium selection and state

Medium		**Natural Gas (Aga8)**	
Gas composition		**Standard**	
Operating temperature	t1	**290,0**	°C
State		**Gaseous**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**33,4**	bar(a)
Absolute pressure downstream of valve	p2	**28,6**	bar(a)
Flow coefficient	Cv	**806,42**	GPM(US)
◉ Mass flow rate	qm	**150.000,0**	kg/h
○ Volume flow rate (standard conditio...	qn	**199.570,0**	m³/h
Critical flow-related pressure difference	Δpc	**15,699**	bar(a)
Critical real pressure difference	ΔpXc	**14,525**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**11,945**	kg/m³
Operating density (t2, p2)	ρ2	**10,234**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,020181**	mPa s
Isentropic exponent (t1, p1)	κ	**1,2097**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,75163**	kg/m³
○ Specific gas constant	R	**494,81**	J/(kg K)
◉ Molecular weight	M	**16,803**	kg/kmol

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 600**
Valve selection		**Cv: 3321, 12", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**806,42**	GPM(US)
Selected flow coefficient	Cv100	**3.321,0**	GPM(US)
Selected valve size	DN	**12"**	
Flow velocity	u1	**47,807**	m/s
Flow velocity	u2	**55,797**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☒ Function for Fl^2
☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	41,12	%
Valve load	Cv/Cv1...	24,282	%
Valve modifier (operating conditions)	FL^2	0,572	-
Valve modifier (operating conditions)	xT	0,544	-
Valve style modifier (operating conditio...	Fd	0,495	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	12"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	12,748	in
Pipe wall thickness upstream of val...	s1	0,68898	in
○ Pipe inside diameter upstream of v...	Di1	11,37	in
Flow velocity in the pipe	u1R	53,251	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	12"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	12,748	in
Pipe wall thickness downstream of ...	s2	0,68898	in
○ Pipe inside diameter downstream o...	Di2	11,37	in
Flow velocity in the pipe	u2R	62,151	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,786	dB
Transmission loss	Rr	-57,4	dB
Sound power level	Lwi	134,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	106,0	dB(A)
Sound pressure level of valve (A-weight...	LpAa	97,4	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,095968	-

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	290,0	290,0		°C
t2	290,0	290,0		°C
p1	33,4	20,4		bar(a)
p2	28,6	15,6		bar(a)
Cv	806,42	740,38		GPM(US)
qm	150.000,0	100.000,0		kg/h
qn	199.570,0	133.040,0		m³/h
Δpc	15,699	9,6253		bar(a)
η1	0,020181	0,02011		mPa s
κ	1,2097	1,2022		-
ρ1	11,945	7,307		kg/m³

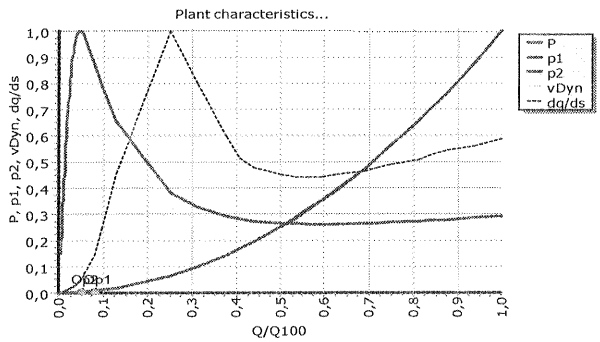
ρ2	**10,234**	**5,5905**	kg/m³
LpAa	**97,4**	**106,0**	dB(A)
u1	**47,807**	**52,1**	m/s
u2	**55,797**	**68,097**	m/s
P	**1.807,6**	**2.080,5**	kW
MaDN	**0,095968**	**0,11757**	-
s/s100	**41,12**	**38,3**	%
Cv/Cv1...	**24,282**	**22,294**	%
Fd	**0,495**	**0,48**	-
FL²	**0,572**	**0,574**	-
xT	**0,544**	**0,549**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	
h1'	**679,58**	**682,86**	kJ/kg

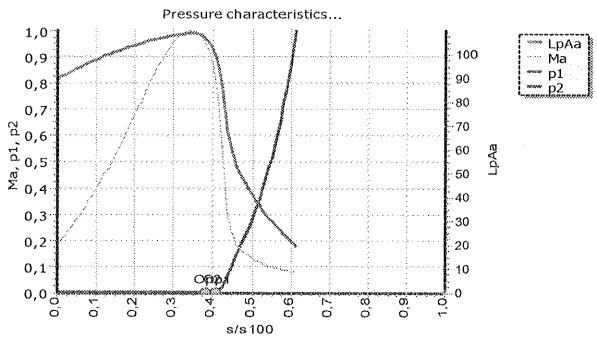
Control optimization

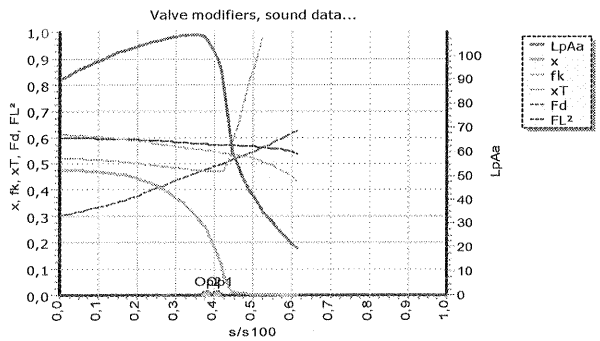
Valve authority (Δp100/Δp0)	vDyn	**0,995**	-
Calculated short-circuit performance	ax	**163,3**	-

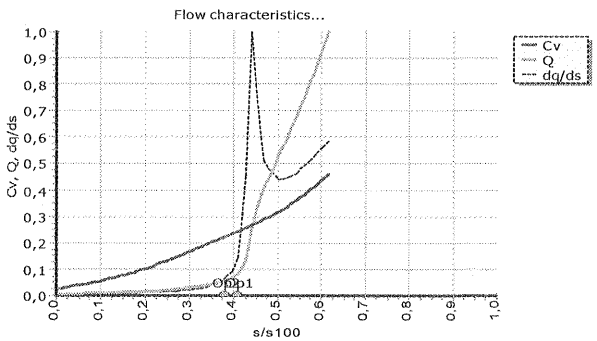
Characteristics values table

Caption	**Unit**	**5 [%]**	**25 [%]**	**50 [%]**	**61 [%]**	**100 [%]**
s/s100	%	5,002	25,0	49,99	61,0	
t1	°C	290,0	290,0	290,0	290,0	
p1	bar(a)	10,11	11,51	924,3	3.219,0	
p2	bar(a)	5,306	6,706	919,5	3.215,0	
Cv	GPM(US)	127,7	435,3	1.047,0	1.505,0	
qm	kg/h	10.120,0	38.050,0	937.300,0	1,756 E6	
qn	m³/h	13.460,0	50.620,0	1,247 E6	2,336 E6	
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	
vDyn	-	1,0	1,0	0,9985	0,9949	
pv1	bar(a)					
ρ1	kg/m³	3,624	4,125	224,2	381,3	
κ	-	1,197	1,198	2,301	3,779	
LpAa	dB(A)	94,02	106,2	41,46	20,22	
MaDN	-	0,03504	0,1042	0,01641	9,825 E-3	
u2	m/s	20,24	60,22	15,96	17,54	
cf	m/s					









Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Lookup value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 16:50:25
Tag No.		**FV-100428**	

Medium selection and state

Medium		**Water**	
Operating temperature	t1	**133,0**	°C
State		**Liquid**	
☒ Automatic phase detection			

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**49,0**	bar(a)
Absolute pressure downstream of valve	p2	**48,4**	bar(a)
Flow coefficient	Cv	**958,39**	GPM(US)
◉ Mass flow rate	qm	**585.000,0**	kg/h
○ Volume flow rate	qv	**629,71**	m³/h
Critical flow-related pressure difference	Δpc	**21,171**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**929,0**	kg/m³
Operating density (t2, p2)	ρ2	**929,0**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,21**	cP
Boiling pressure (t1)	pv1	**2,9541**	bar(a)
Boiling temperature (p1)	tv1	**262,68**	°C

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 600**
Valve selection		**Cv: 1437, 8", Measured values (lin)**
☒ Valve from database	☒ Valve data can be modified	

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**958,39**	GPM(US)
Selected flow coefficient	Cv100	**1.437,0**	GPM(US)
Selected valve size	DN	**8"**	
Flow velocity	u1	**5,3939**	m/s
Flow velocity	u2	**5,3939**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-
☒ Function for Fl²			
☒ Function for xFz			

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	**73,579**	%
Valve load	Cv/Cv1...	**66,694**	%
Valve modifier (operating conditions)	FL²	**0,456**	-
Cavitation modifier (operating conditions)	xFz	**0,23**	-

Valve style modifier (operating conditio...	Fd	0,71	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	12"	
Pressure class upstream of valve	PN1	Schedule 30	
○ Pipe outside diameter upstream of ...	Da1	12,748	in
Pipe wall thickness upstream of val...	s1	0,33071	in
○ Pipe inside diameter upstream of v...	Di1	12,087	in
Flow velocity in the pipe	u1R	2,363	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	12"	
Pressure class downstream of valve	PN2	Schedule 30	
○ Pipe outside diameter downstream ...	Da2	12,748	in
Pipe wall thickness downstream of ...	s2	0,33071	in
○ Pipe inside diameter downstream o...	Di2	12,087	in
Flow velocity in the pipe	u2R	2,363	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise) **IEC 60534-8-4:1994**

Calculated values

Low-noise design		n.a.	
Sound velocity	cf1	1.510,9	m/s
Level exponent	F1	-7,0	-
Inclination exponent	F2	0,0	-

	500-1000 Hz	1000-2000 Hz	2000-4000 Hz	4000-8000 Hz	
ΔL	-3,0	-3,0	-3,0	-3,0	dB

Pressure level	LA1	90,2	dB
Sound power level	Lwi	90,2	dB
Sound power level (A-weighted)	LwAa	83,0	dB(A)
Sound pressure level of valve (A-weight...	LpAa	69,7	dB(A)

Minor noise prediction data

Pressure ratio	xF	0,013	-
Acoustical efficiency factor	η	100,0 E -9	-
Ring frequency	fr	5.370,8	Hz
Speed of sound (fluid)	cf	1.510,9	m/s
Power loss	P	10,495	kW
Stream power	Wm	23,012	kW

Spectrum

	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Lwi	87,3	84,3	81,3	78,3	75,3	dB
Rr	29,6	23,7	18,3	14,9	16,9	dB
LwAa	70,3	76,2	78,9	77,6	71,5	dB(A)
LpAa	56,9	62,8	65,5	64,2	58,1	dB(A)

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,21	cP

Influence of fittings

Piping geometry factor	FP	0,945	-

Further operating points

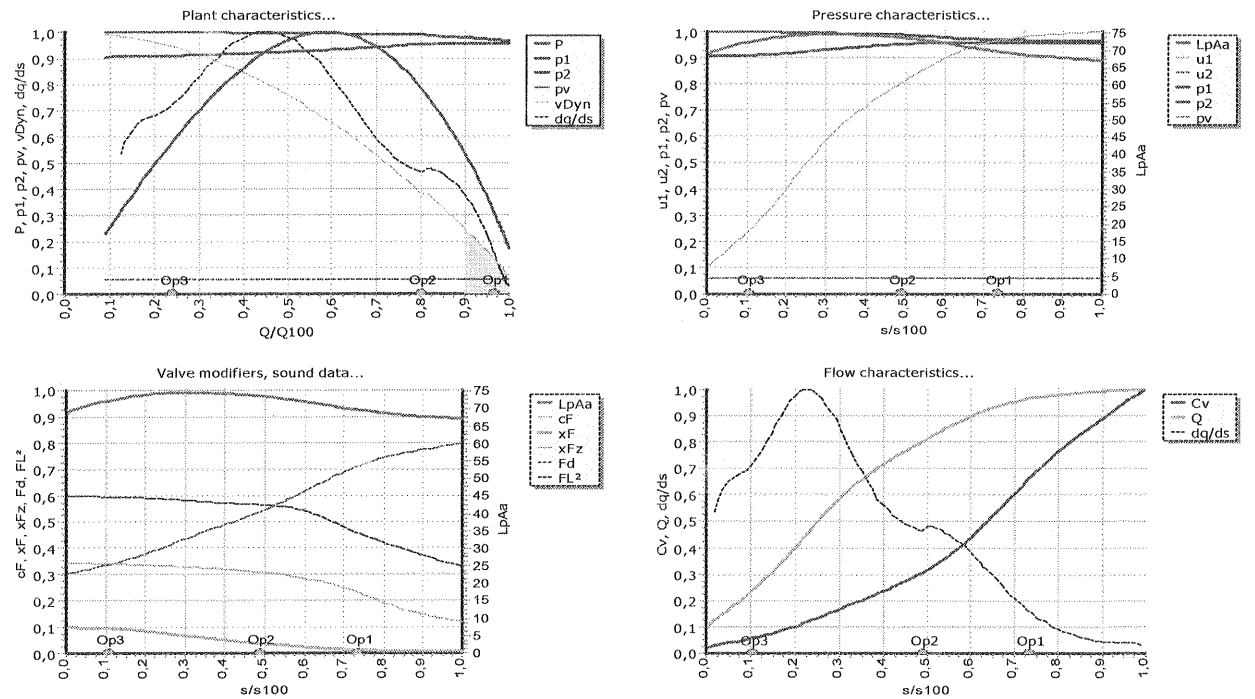
	Maximum flow	Mean flow	Minimum flow	
t1	133,0	133,0	133,0	°C
t2	133,0	133,0	133,0	°C
p1	49,0	50,0	50,5	bar(a)
p2	48,4	48,2	46,0	bar(a)
Cv	958,39	440,46	82,59	GPM(US)
qm	585.000,0	486.580,0	146.000,0	kg/h
qv	629,71	523,76	157,16	m³/h
Δpc	21,171	26,779	28,529	bar(a)
cf1	1.510,9	1.511,2	1.511,3	m/s
η1	0,21	0,21	0,21	cP
pv1	2,9541	2,9541	2,9541	bar(a)
ρ1	929,0	929,0	929,0	kg/m³
ρ2	929,0	929,0	929,0	kg/m³
LpAa	69,7	73,6	72,4	dB(A)
u1	5,3939	4,4864	1,3462	m/s
u2	5,3939	4,4864	1,3462	m/s
P	10,495	26,188	19,645	kW
s/s100	73,579	49,055	10,751	%
Cv/Cv1...	66,694	30,651	5,7474	%
Fd	0,71	0,539	0,337	-
FL²	0,456	0,565	0,596	-
xFz	0,23	0,309	0,341	-
FP	0,945	0,988	1,0	-
	Turbulent flow Non-critical	Turbulent flow Non-critical	Turbulent flow Non-critical	
h1'	562,29	562,36	562,39	kJ/kg

Control optimization

Valve authority (Δp100/Δp0)	vDyn	0,072	-
Calculated short-circuit performance	ax	1,0743	-

Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,002	25,0	50,0	75,0	99,93
t1	°C	133,0	133,0	133,0	133,0	133,0
p1	bar(a)	50,53	50,34	49,95	48,97	48,77
p2	bar(a)	45,88	46,7	48,21	48,41	48,45
Cv	GPM(US)	55,23	188,3	453,3	992,5	1.436,0
qv	m³/h	106,8	321,9	529,6	632,3	651,6
qm	kg/h	99.210,0	299.100,0	492.000,0	587.400,0	605.400,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9741	0,7647	0,3831	0,1265	0,07214
pv1	bar(a)	2,954	2,954	2,954	2,954	2,954
ρ1	kg/m³	929,0	929,0	929,0	929,0	929,0
ρ2	kg/m³	929,0	929,0	929,0	929,0	929,0
LpAa	dB(A)	70,85	74,59	73,54	69,45	67,14
u1	m/s	0,9147	2,758	4,536	5,416	5,582
FP	-	0,9998	0,9977	0,9869	0,9416	0,8881



Warning:

⚠ The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

ℹ Influence of fittings

Legend

- Calculated value
- Modified calculated value
- Lookup value
- ⚠ Warning
- ℹ Hint

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***51***	***54***	***43***
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	xFz		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]	81	s	[mm]	5,49

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no. FV100512 Tag no. FV100512
Process medium Natural Gas Fuel 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***		***153***	***30,4***	***14,5***
Min. req. size	Req. DN	[mm]	146	48,0	60,8
Outlet velocity	w	[Mach]	0,311	0,0327	0,0523
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***81***	***68***	***68***
relative travel	T	[%]	83,4	42,1	23,1
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***		***290***	***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 ["] 12" D2 ["] 12"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 308 s [mm] 9,53

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.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***62***	***67***	***84***
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]	15,09

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	Fm req.	[kN]	15,72	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		-

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 18:11:49
Tag No.		**FV-100805**	

Medium selection and state

Medium		**Feed Gas**	
Operating temperature	t1	**400,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**46,5**	bar(a)
Absolute pressure downstream of valve	p2	**46,0**	bar(a)
Absolute pressure downstream of resist...	p2,end	**45,1**	bar(a)
Flow coefficient	Cv	**1.635,3**	GPM(US)
○ Mass flow rate	qm	**115.290,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**150.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**11,752**	bar(a)
Critical real pressure difference	ΔpXc	**12,286**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**14,312**	kg/m³
Operating density (t2, p2)	ρ2	**14,159**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s
Isentropic exponent (t1, p1)	κ	**1,208**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,76858**	kg/m³
○ Specific gas constant	R	**482,64**	J/(kg K)
◉ Molecular weight	M	**17,227**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer	**LEUSCH**
Series	**LDE Class 600**
Valve selection	**Cv: 2281, 10", Measured values (lin)**
☒ Valve from database	☒ Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**1.635,3**	GPM(US)
Selected flow coefficient	Cv100	**1.705,0**	GPM(US)
Selected valve size	DN	**10"**	
Flow velocity	u1	**44,158**	m/s
Flow velocity	u2	**44,638**	m/s
Valve modifier (Cv/Cv100 = 0.75)	FL²	**0,42**	-

Valve modifier (Cv/Cv100 = 0.75)	xT	0,343	-
Valve style modifier (Cv/Cv100 = 1)	Fd	0,8	-
☐ Function for Fl²			
☐ Function for xT			

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	96,225	%
Valve load	Cv/Cv1...	95,911	%
Valve modifier (operating conditions)	FL²	0,367	-
Valve modifier (operating conditions)	xT	0,293	-
Valve style modifier (operating conditio...	Fd	0,789	-

Pipe downstream of valve

◉ Size class downstream of valve	DN2	16"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	16,0	in
Pipe wall thickness downstream of ...	s2	0,84252	in
○ Pipe inside diameter downstream o...	Di2	14,315	in
Flow velocity in the pipe	u2R	21,783	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise) **VDMA 24422-05.89**

Calculated values

Low-noise design		n.a.	
Level exponent	G1	-3,0	-
Inclination exponent	G2	1,0	-

	500-1000 Hz	1000-2000 Hz	2000-4000 Hz	4000-8000 Hz	
ΔL	3,0	3,0	3,0	3,0	dB

Pressure level (correction)	ΔL,Co	-10,0	dB
☐ Pressure level (mach no.)	ΔL,Ma		dB
Pressure level (resistances)	ΔL,Res	-5,0	dB
Sound power level	Lwi	113,0	dB
Sound power level (A-weighted)	LwAa	86,2	dB(A)
Sound pressure level of valve (A-weight...	LpAa	74,5	dB(A)
Sound pressure level of resistance struc...	La,res	86,7	dB(A)
Total sound level (valve and resistances)	La,tot	87,0	dB(A)

Minor noise prediction data

Pressure ratio	x	0,011	-
Acoustical efficiency factor	η	35,235 E -6	-
Ring frequency	fr	4.534,8	Hz
Speed of sound (p2)	cf2	626,47	m/s
Mach number (valve outlet)	MaDN	0,071252	-
Mach number (vena contracta)	MaVC	0,18771	-
Recommended nominal diameter (100...	DN	8,0	in
Power loss	P	112,48	kW
Stream power	Wm	200,56	kW

Spectrum

	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Lwi	98,6	102,0	105,0	108,0	111,0	dB
Rr	42,5	37,0	37,9	40,8	43,8	dB

LwAa	**66,3**	**78,0**	**81,3**	**81,2**	**79,1**	dB(A)
LpAa	**54,6**	**66,3**	**69,5**	**69,5**	**67,4**	dB(A)

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s

Influence of fittings

Piping geometry factor	FP	**0,977**	-

Influence of resistance structures

Absolute pressure downstream of valve	p2	**46,0**	bar(a)
Absolute pressure downstream of resist...	p2,end	**45,1**	bar(a)
Type of resistance structure		**Silencer (direct)**	
Diameter of bores	d	**5,0**	mm
No. of resistances	n	**1**	-
Mach number per resistance (selected)	Ma	**0,3**	-
Type of flow		**Non-critical**	
Sound pressure level of resistance struc...	La,res	**86,7**	dB(A)
Sound pressure level of valve (A-weight...	LpAa	**74,5**	dB(A)
Total sound level (valve and resistances)	La,tot	**87,0**	dB(A)
DN of last perforated plate	DN	**12,0**	in
Bore spacing	a	**8,0**	mm
Number of bores in last plate	nΦ	**1.178**	-

Resistance structure in detail

No.	t1	p1	p2	Cv	rho1	rho2	La [dB]	Ma	DN Mx	DN M0,3	DN M0,7	DN M1,0
1	400,0	46,0	45,1	1.193,0	14,16	13,88	86,73	0,2907	5,0	5,0	4,0	2,7

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	**400,0**	**400,0**	**400,0**	°C
t2	**400,0**	**400,0**	**400,0**	°C
p1	**46,5**	**45,4**	**45,4**	bar(a)
p2	**46,0**	**44,702**	**34,125**	bar(a)
p2,end	**45,1**	**43,9**	**34,0**	bar(a)
Cv	**1.635,3**	**1.316,5**	**147,75**	GPM(US)
qm	**115.290,0**	**108.830,0**	**43.040,0**	kg/h
qn	**150.000,0**	**141.600,0**	**56.000,0**	m³/h
Δpc	**11,752**	**13,12**	**24,83**	bar(a)
η1	**0,023**	**0,023**	**0,023**	mPa s
κ	**1,208**	**1,208**	**1,208**	-
ρ1	**14,312**	**13,974**	**13,974**	kg/m³
ρ2	**14,159**	**13,759**	**10,504**	kg/m³
LpAa	**74,5**	**76,1**	**90,6**	dB(A)
La,res	**86,7**	**85,8**	**70,5**	dB(A)
La,tot	**87,0**	**86,2**	**90,7**	dB(A)
u1	**44,158**	**42,694**	**16,885**	m/s
u2	**44,638**	**43,361**	**22,463**	m/s
P	**112,48**	**152,17**	**1.108,8**	kW
MaDN	**0,071252**	**0,069215**	**0,035857**	-
s/s100	**96,225**	**80,31**	**17,544**	%
Cv/Cv1...	**95,911**	**77,217**	**8,6655**	%
Fd	**0,789**	**0,743**	**0,365**	-
FL²	**0,367**	**0,406**	**0,676**	-
xT	**0,293**	**0,335**	**0,634**	-
FP	**0,977**	**0,985**	**1,0**	-

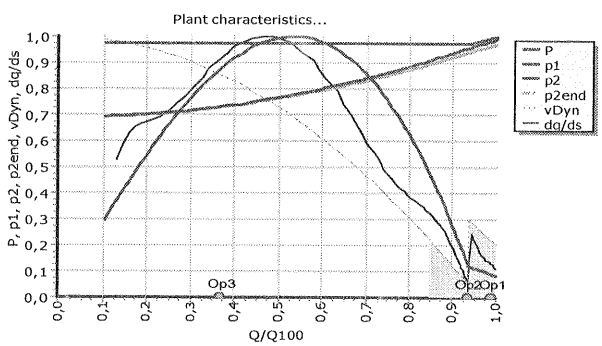
Turbulent flow Non-critical	Turbulent flow Non-critical	Turbulent flow Non-critical

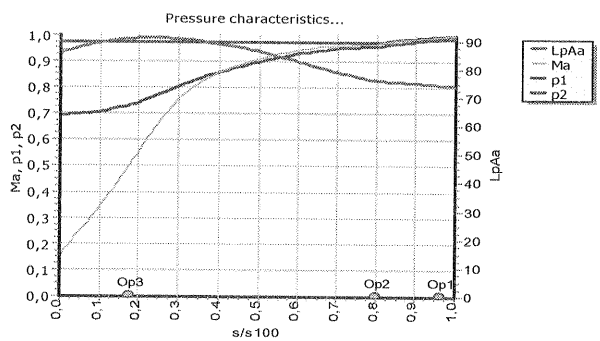
Control optimization

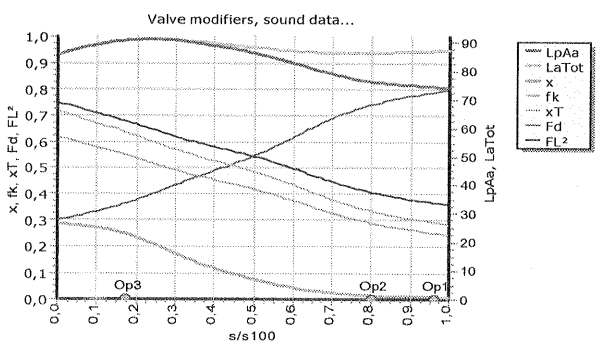
Valve authority (Δp100/Δp0)	vDyn	**0,201**	-
Calculated short-circuit performance	ax	**1,1291**	-

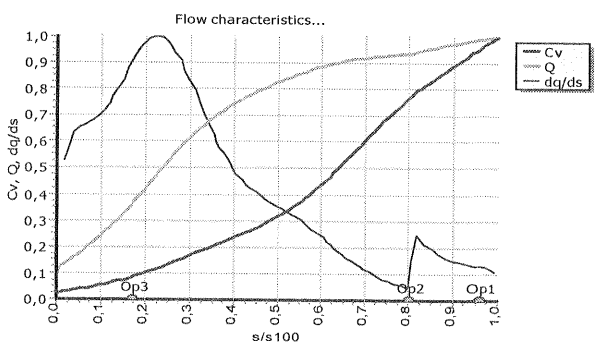
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,0	25,0	50,0	74,99	100,0
t1	°C	400,0	400,0	400,0	400,0	400,0
p1	bar(a)	45,4	45,4	45,4	45,4	46,68
p2	bar(a)	32,6	36,04	41,93	44,54	46,21
p2,end	bar(a)	32,57	35,79	41,3	43,75	45,3
Cv	GPM(US)	65,53	223,5	537,9	1.177,0	1.705,0
qm	kg/h	20.200,0	60.510,0	96.030,0	108.100,0	116.300,0
qn	m³/h	26.280,0	78.730,0	124.900,0	140.700,0	151.300,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9674	0,7071	0,2625	0,06509	0,2014
pv1	bar(a)					
κ	-	1,208	1,208	1,208	1,208	1,208
LpAa	dB(A)	87,67	91,06	86,24	77,33	74,16
La,res	dB(A)	57,68	76,39	83,88	85,73	86,87
La,tot	dB(A)	87,67	91,2	88,23	86,31	87,09
MaDN	-	0,01762	0,04773	0,06512	0,06901	0,07155
u2	m/s	11,04	29,9	40,79	43,24	44,83
FP	-	0,9999	0,9994	0,9972	0,9878	0,9752









Warning:

⚠ The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

- Influence of fittings
- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Warning
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 18:16:18
Tag No.		**FV-100807**	

Medium selection and state

Medium		**Feed Gas**	
Operating temperature	t1	**400,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**45,4**	bar(a)
Absolute pressure downstream of valve	p2	**44,0**	bar(a)
Absolute pressure downstream of resist...	p2,end	**43,0**	bar(a)
Flow coefficient	Cv	**1.409,8**	GPM(US)
○ Mass flow rate	qm	**161.400,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**210.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**12,487**	bar(a)
Critical real pressure difference	ΔpXc	**12,889**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**13,974**	kg/m³
Operating density (t2, p2)	ρ2	**13,543**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s
Isentropic exponent (t1, p1)	κ	**1,208**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,76858**	kg/m³
○ Specific gas constant	R	**482,64**	J/(kg K)
◉ Molecular weight	M	**17,227**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 600**
Valve selection		**Cv: 2281, 10", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**1.409,8**	GPM(US)
Selected flow coefficient	Cv100	**1.705,0**	GPM(US)
Selected valve size	DN	**10"**	
Flow velocity	u1	**63,319**	m/s
Flow velocity	u2	**65,333**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☒ Function for Fl²
☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	84,497	%
Valve load	Cv/Cv1...	82,688	%
Valve modifier (operating conditions)	FL²	0,377	-
Valve modifier (operating conditions)	xT	0,319	-
Valve style modifier (operating conditio...	Fd	0,757	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	14"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	14,0	in
Pipe wall thickness upstream of val...	s1	0,74803	in
○ Pipe inside diameter upstream of v...	Di1	12,504	in
Flow velocity in the pipe	u1R	40,498	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	16"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	16,0	in
Pipe wall thickness downstream of ...	s2	0,84252	in
○ Pipe inside diameter downstream o...	Di2	14,315	in
Flow velocity in the pipe	u2R	31,883	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise) **VDMA 24422-05.89**

Calculated values

Low-noise design		n.a.	
Level exponent	G1	-3,0	-
Inclination exponent	G2	1,0	-

	500-1000 Hz	1000-2000 Hz	2000-4000 Hz	4000-8000 Hz	
ΔL	3,0	3,0	3,0	3,0	dB

Pressure level (correction)	ΔL,Co	-10,0	dB
☐ Pressure level (mach no.)	ΔL,Ma		dB
Pressure level (resistances)	ΔL,Res	-5,0	dB
Sound power level	Lwi	123,0	dB
Sound power level (A-weighted)	LwAa	96,0	dB(A)
Sound pressure level of valve (A-weight...	LpAa	84,2	dB(A)
Sound pressure level of resistance struc...	La,res	80,0	dB(A)
Total sound level (valve and resistances)	La,tot	85,6	dB(A)

Minor noise prediction data

Pressure ratio	x	0,031	-
Acoustical efficiency factor	η	93,801 E -6	-
Ring frequency	fr	4.534,8	Hz
Speed of sound (p2)	cf2	626,47	m/s
Mach number (valve outlet)	MaDN	0,10429	-
Mach number (vena contracta)	MaVC	0,30627	-
Recommended nominal diameter (100...	DN	10,0	in
Power loss	P	456,25	kW
Stream power	Wm	747,51	kW

Spectrum

	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
Lwi	**109,0**	**112,0**	**115,0**	**118,0**	**121,0**	dB
Rr	**42,6**	**37,2**	**38,1**	**41,0**	**44,0**	dB
LwAa	**76,1**	**87,8**	**91,0**	**91,0**	**88,9**	dB(A)
LpAa	**64,4**	**76,1**	**79,3**	**79,3**	**77,2**	dB(A)

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s

Influence of fittings

Piping geometry factor	FP	**0,982**	-

Influence of resistance structures

Absolute pressure downstream of valve	p2	**44,0**	bar(a)
Absolute pressure downstream of resist...	p2,end	**43,0**	bar(a)
Type of resistance structure		**Silencer (direct)**	
Diameter of bores	d	**5,0**	mm
No. of resistances	n	**2**	-
Mach number per resistance (selected)	Ma	**0,3**	-
Type of flow		**Non-critical**	
Sound pressure level of resistance struc...	La,res	**80,0**	dB(A)
Sound pressure level of valve (A-weight...	LpAa	**84,2**	dB(A)
Total sound level (valve and resistances)	La,tot	**85,6**	dB(A)
DN of last perforated plate	DN	**16,0**	in
Bore spacing	a	**8,0**	mm
Number of bores in last plate	nΦ	**2.272**	-

Resistance structure in detail

No.	t1	p1	p2	Cv	rho1	rho2	La [dB]	Ma	DN Mx	DN M0,3	DN M0,7	DN M1,0
1	400,0	44,0	43,5	2.275,0	13,54	13,39	77,01	0,293	6,0	6,0	4,0	4,0
2	400,0	43,5	43,0	2.301,0	13,39	13,24	76,97	0,2964	6,0	6,0	4,0	4,0

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	**400,0**	**400,0**	**400,0**	°C
t2	**400,0**	**400,0**	**400,0**	°C
p1	**45,4**	**45,4**	**45,4**	bar(a)
p2	**44,0**	**42,869**	**33,609**	bar(a)
p2,end	**43,0**	**42,0**	**33,6**	bar(a)
Cv	**1.409,8**	**990,92**	**52,414**	GPM(US)
qm	**161.400,0**	**150.420,0**	**15.372,0**	kg/h
qn	**210.000,0**	**195.710,0**	**20.000,0**	m³/h
Δpc	**12,487**	**14,323**	**23,864**	bar(a)
η1	**0,023**	**0,023**	**0,023**	mPa s
κ	**1,208**	**1,208**	**1,208**	-
ρ1	**13,974**	**13,974**	**13,974**	kg/m³
ρ2	**13,543**	**13,195**	**10,345**	kg/m³
LpAa	**84,2**	**87,9**	**86,9**	dB(A)
La,res	**80,0**	**78,8**	**39,8**	dB(A)
La,tot	**85,6**	**88,4**	**86,9**	dB(A)
u1	**63,319**	**59,01**	**6,0303**	m/s
u2	**65,333**	**62,495**	**8,1459**	m/s
P	**456,25**	**778,85**	**417,17**	kW

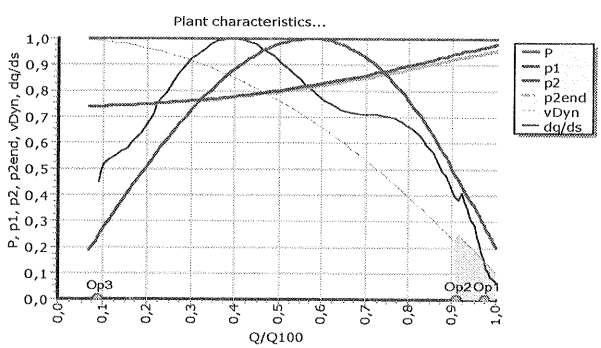
MaDN	**0,10429**	**0,099757**	**0,013003**	-
s/s100	**84,497**	**68,644**	**2,3978**	%
Cv/Cv1...	**82,688**	**58,118**	**3,0741**	%
Fd	**0,757**	**0,679**	**0,309**	-
FL²	**0,377**	**0,48**	**0,597**	-
xT	**0,319**	**0,366**	**0,609**	-
FP	**0,982**	**0,991**	**1,0**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	**Turbulent flow Non-critical**	

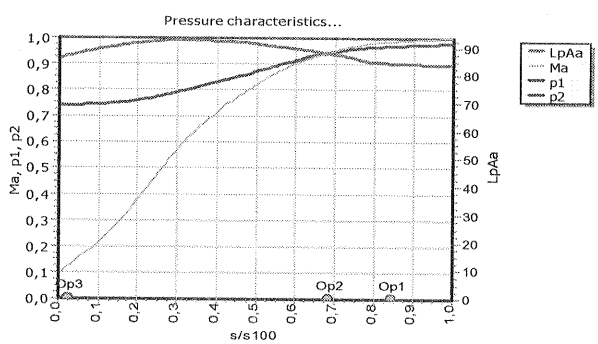
Control optimization

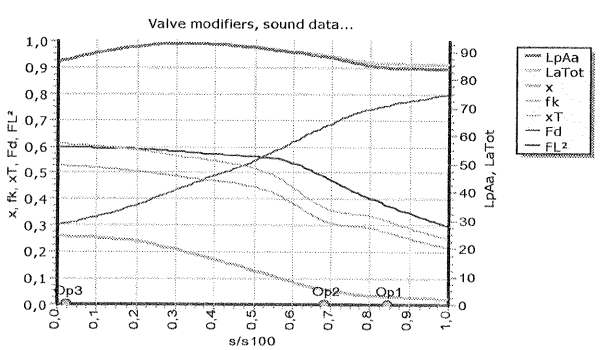
Valve authority (Δp100/Δp0)	vDyn	**0,101**	-
Calculated short-circuit performance	ax	**1,0783**	-

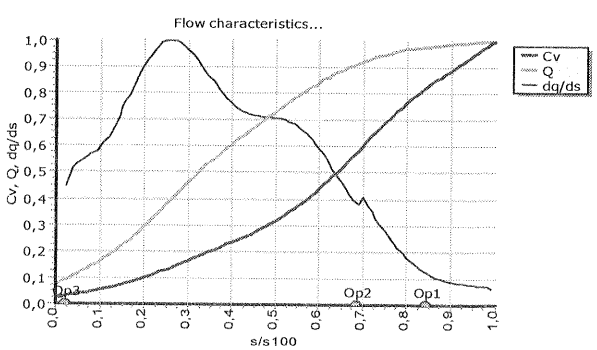
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,004	25,0	50,0	75,0	99,56
t1	°C	400,0	400,0	400,0	400,0	400,0
p1	bar(a)	45,4	45,4	45,4	45,4	45,4
p2	bar(a)	33,66	35,11	39,5	43,49	44,38
p2,end	bar(a)	33,65	34,96	38,94	42,55	43,34
Cv	GPM(US)	65,54	223,5	537,9	1.178,0	1.698,0
qm	kg/h	19.180,0	62.130,0	120.300,0	156.600,0	164.900,0
qn	m³/h	24.960,0	80.840,0	156.600,0	203.700,0	214.600,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9872	0,8657	0,4963	0,1905	0,1008
pv1	bar(a)					
κ	-	1,208	1,208	1,208	1,208	1,208
LpAa	dB(A)	87,84	92,27	91,25	86,07	83,71
La,res	dB(A)	43,95	64,21	75,28	79,51	80,35
La,tot	dB(A)	87,84	92,27	91,36	86,94	85,35
MaDN	-	0,0162	0,05031	0,08661	0,1024	0,1057
u2	m/s	10,15	31,52	54,26	64,12	66,19
FP	-	0,9999	0,9994	0,9969	0,9876	0,9742









30

Warning:

- The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

- Influence of fittings
- Approximate value: Density of pipeline´- ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Warning
- Hint

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***	***21,5***
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)]***	***81***	***79***	***78***
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	s	[mm]	10,97

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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	41
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***	***21,5***	***5,13***
Min. req. size	Req. DN	[mm]	101	63,8	43,2
Outlet velocity	w	[Mach]	0,136	0,0543	0,0249
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***82***	***77***	***69***
Flow condition					Choked flow
relative travel	T	[%]	86,1	63,5	26,8
Different. pressure ratio	x		0,73	0,73	0,85
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	s	[mm]	10,97

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.: 525 000 Customer LURGI - PIDEC
Project: 4th Methanol Plant Date: 05.07.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.05B

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***	***84***	***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		-3,95	-4,20	-4,30
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	***Graphit (20)***			***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]	6,35

Actuator data

Type			**3271Tandem**	**Fail-safe act.**		**extends**		
Diaphr. area	**A**	**[cm²]**	**5600**	**Bench range**		**ps0**	**[bar]**	**2 ... 2,6**
				Supply		**psu**	**[bar]**	**3,93**

(Defaults: p1max [bar(a)] 42 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	79,74	req. diff. psu-ps100	d ps	[bar]	0,05
max. act. force	Fmax	[kN]	162,52	Actuator force	Fa	[kN]	112,00
max. dp on plug	d. pmax	[bar]	59,17	Close safety factor	Fa/Fo (SF)		1,40
req. start bench range	ps0req.	[bar]	1,57				

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***80***	***77***	***76***
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	s	[mm]	8,56

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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]	0,0471	0,0439	0,0133
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***70***	***70***	***84***
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]	6,35

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
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***38,9***	***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)]***	***80***	***79***	***76***
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]	8,56

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]	17,74	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***	***7,25***
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)]***	***74***	***74***	***81***
relative travel	T	[%]	86,3	84,2	67,4
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]	82	s	[mm]	7,62

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]	7,42
max. dp on plug	d. pmax	[bar]	59,88	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
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***37,9***	***37,1***	***10,0***
Min. req. size	Req. DN	[mm]	39,1	38,7	22,2
Outlet velocity	w	[Mach]	0,0810	0,0800	0,0261
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***76***	***76***	***72***
relative travel	T	[%]	85,4	84,9	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	["]	4"	D2	["]	4"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	106	s	[mm]	8,56

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]	17,74	req. diff. psu-ps100	d ps	[bar]	2,79
max. act. force	Fmax	[kN]	44,94	Actuator force	Fa	[kN]	19,53
max. dp on plug	d. pmax	[bar]	59,68	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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]	10000	60000	
Inlet pressure	p1	[bar(a)]	155	152	
Outlet pressure	p2	[bar(a)]	21	125	
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***		***1,03***	***13,8***
Min. req. size	Req. DN	[mm]	27,2	66,6
Outlet velocity	w	[m/s]	0,369	2,22
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***72***	***61***
Flow condition			Critical cavitation	
relative travel	T	[%]	33,4	99,6
Different. pressure ratio	xF		0,87	0,18
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	xFz		0,80	0,80
Level exponent	F1		-6,94	-7,97
Slope exponent	F2		0,30	0,30
Correct. term	delta Lf	[dB]	-7,54	-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]	31,75

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	FV101229B-1	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]	270000	270000	350000
Inlet pressure	p1	[bar(a)]	152	152	140
Outlet pressure	p2	[bar(a)]	125	148,5	136
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

Valve coeff. calculated	***Cv***		***62,2***	***173***	***210***
Min. req. size	Req. DN	[mm]	141	141	161
Outlet velocity	w	[m/s]	2,50	2,49	3,23
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***81***	***62***	***54***
relative travel	T	[%]	60,4	86,5	91,5
Different. pressure ratio	xF		0,18	0,02	0,03
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	xFz		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]	31,75

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	Fm req.	[kN]	24,29	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]	341,19	Close safety factor	Fa/Fo (SF)		1,84
req. start bench range	ps0req.	[bar]	0,95	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	FV101229B-2	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]	60000	70000	50000
Inlet pressure	p1	[bar(a)]	152	140	155
Outlet pressure	p2	[bar(a)]	148,5	136	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

Valve coeff. calculated	***Cv***		***38,4***	***41,9***	***10,9***
Min. req. size	Req. DN	[mm]	66,6	71,9	60,8
Outlet velocity	w	[m/s]	0,554	0,647	0,462
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***56***	***57***	***64***
relative travel	T	[%]	48,1	50,3	15,9
Different. pressure ratio	xF		0,02	0,03	0,20
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	xFz		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]	31,75

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	Fm req.	[kN]	24,29	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]	341,19	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]: 32 (stroke) | Stellzeit normal/schnell [sek]: / (stroke time)

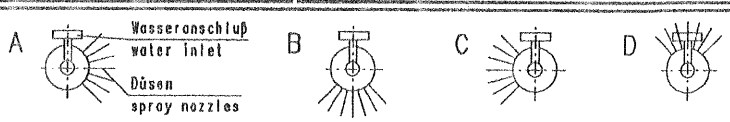
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASMS B 16.5
Montageflansch: mounting flange	4"	600# RF	ASME B 16.5

Gehäuse-Material: body-material 1.5415

Dampfleitung steam pipe äØ 184,40 x 12,70 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: Pneumatikantrieb special
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. ☒	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: 10,00bar 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	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com Internet: http://www.schroedahl.de

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: medium		Dampf		
vor Einspritzung before injection				
Menge: flow rate	kg/s	17.5	43.89	50.56
Druck: pressure	bar abs	45.5	45.5	45.5
Temperatur: temperature	°C	336	414	460
Enthalpie: enthalpie	kJ/kg			
nach Einspritzung after injection				
Druck: pressure	bar abs	45.5	45.5	45.5
Temperatur: temperature	°C	295.5	326.3	351.2
Enthalpie: enthalpie	kJ/kg			
Menge: flow rate	kg/s	18.33	47.7	54.95

Kühlwasser coolwater				
Menge flow rate	kg/s	0.83	3.81	4.39
Druck pressure	bar abs	64	64	64
Temperatur temperature	°C	111	111	111
Enthalpie enthalpie	kJ/kg			
Kv errechnet Kv	m^3/h	0.71	3.26	3.77

Kühlerausführung desuperheater design

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

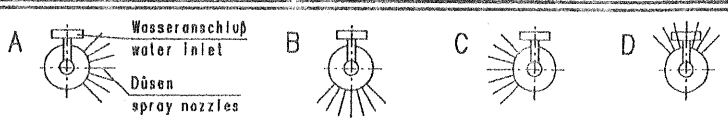
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASME B 16.5
Montageflansch: mounting flange	4"	900# RF	ASME B 16 5

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: 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. ☐ 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 : air supply 10,00bar	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	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com Internet: http://www.schroedahl.de

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: medium	Dampf			
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 | Kennlinie: characteristic gl% | Hub [mm]: stroke 32 | Stellzeit normal/schnell [sek]: stroke time /

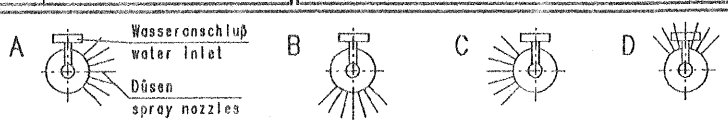
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	2500# RF	ASME B 16.5
Montageflansch: mounting flange	4"	2500# RF	ASME B 16.5

Gehäuse-Material: body-material 1.4903

Dampfleitung steam pipe äØ 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: 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. ☒ / 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: 10,00bar 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
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com Internet: http://www.schroedahl.de

SCHROEDAHL
Spezial-Armaturen

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.04

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)]	47	47	32
Inlet temperature	t1	[°C]	505	505	450
Density	rho1	[kg/m³]	30,6	30,6	10,9
Isentropic exponent	gamma		1,31	1,31	1,31
Viscosity	eta	[mPas]	0,0296	0,0296	0,0269

Results and factors

Valve coeff. calculated	***Cv***		***141***	***60,3***	***204***
Min. req. size	Req. DN	[mm]	122	80,2	74,0
Outlet velocity	w	[Mach]	0,197	0,0750	0,0639
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***85***	***82***	***60***
relative travel	T	[%]	52,4	21,2	76,5
Different. pressure ratio	x		0,53	0,53	0,09
FL value	FL		0,93	0,96	0,92
xT value	xT		0,74	0,78	0,71
Valve style factor	Fd		0,43	0,40	0,45
Level exponent	G1		-6,06	-5,99	-5,80
Slope exponent	G2		0,60	0,75	1,17

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	Fm req.	[kN]	8,94	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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

Valve coeff. calculated	***Cv***		***18,0***	***12,6***	***5,04***
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	xFz		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	["]	4"	D2	["]	10"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	248	s	[mm]	12,7

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***73***	***71***	***62***
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	xFz		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]	5,54

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]	1,26
max. dp on plug	d. pmax	[bar]	13,33	Close safety factor	Fa/Fo (SF)		1,09
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: medium	**Dampf**			
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** (Kvs) | Kennlinie: characteristic **linear** | Hub [mm]: stroke **80** | Stellzeit normal/schnell [sek]: stroke time **/**

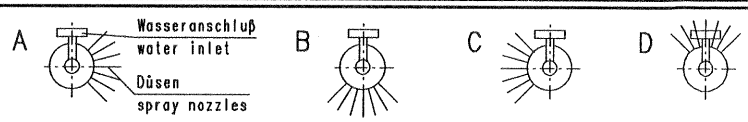
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	**2"**	**1500# RF**	**ASME B 16.5**
Montageflansch: mounting flange	**4"**	**900# RF**	**ASME B 16.5**

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

Dampfleitung steam pipe äØ **323,80** 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 **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. ☒ electr.
Eingangssignal: input signal F.F.B 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: air supply **10,00**bar
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	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com Internet: http://www.schroedahl.de

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: 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

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

Kühlerausführung (desuperheater design)

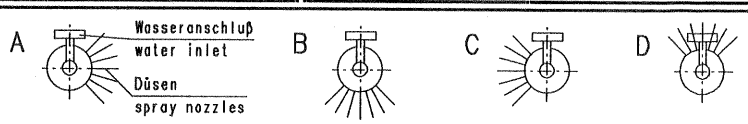
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	2"	1500# RF	ASME B 16.5
Montageflansch: mounting flange	4"	900# RF	ASME B 16.5

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

Dampfleitung steam pipe: äØ **508,00** x Wd

Einbaulage Installation: Horizontal horizontal / Vertikal vertical ☒

Abströmrichtung: emitting direction **A**



Anstrich: painting **SA Standard**

Antrieb (actuator)

Δp-Antrieb: 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. ☒
Eingangssignal: input signal	F.F.B 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: 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	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com Internet: http://www.schroedahl.de

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: medium	**Dampf**			
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]: k_{vs} **5.7**	Kennlinie: characteristic **gl%**	Hub [mm]: stroke **80**	Stellzeit normal/schnell [sek]: stroke time **/**

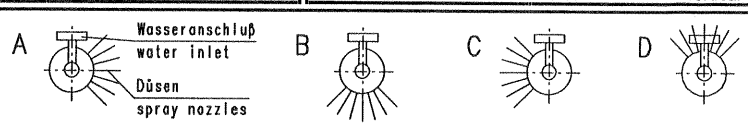
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	**2"**	**1500# RF**	**ASME B 16.5**
Montageflansch: mounting flange	**4"**	**900# RF**	**ASME B 16.5**

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: öffnen/schließen Δp-actuator. 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. — electr. ☒		Eingangssignal: input signal F.F.B 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: 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
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com **Internet:** http://www.schroedahl.de

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: medium **Dampf**

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**

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

Kühlerausführung desuperheater design

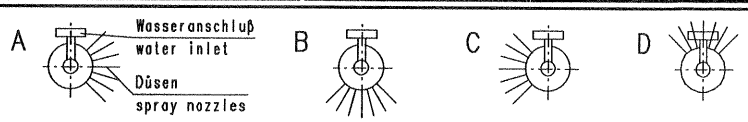
	DN	PN	Flansch-Norm type of flange
Eintritt-Kühlwasser: inlet coolwater	**2"**	**1500# RF**	**ASME B 16.5**
Montageflansch: mounting flange	**4"**	**600# RF**	**ASME B 16.5**

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

Dampfleitung steam pipe äØ **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. ☐ electr. ☒
Eingangssignal: input signal F.F.B 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 : air supply **10,00**bar	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	

Schroedahl-Arapp Spezial-Armaturen GmbH & Co KG
Schönenbacher Str.4 - 51580 Reichshof - Mittelagger
Telefon (02265) 99 27 -0 - Telefax (02265) 99 27 27

© SCHROEDAHL ARAPP Spezialarmaturen GmbH & Co. KG, D-51580 Reichshof-Mittelagger

email: info@schroedahl.com **Internet:** http://www.schroedahl.de

SCHROEDAHL
Spezial-Armaturen

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***26,3***	***21,5***	***6,28***
Min. req. size	Req. DN	[mm]	27,2	24,9	13,7
Outlet velocity	w	[Mach]	0,0922	0,0761	0,0230
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***65***	***63***	***57***
relative travel	T	[%]	85,1	80,0	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	["]	4"	D2	["]	4"
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	101	s	[mm]	6,02

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.: 525 000 Customer LURGI - PIDEC
Project: 4th Methanol Plant Date: 05.07.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.05B

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***	***33***	***35***
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		-3,82	-4,35	-4,97
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 WCC***
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	["]	2"	D2	["]	2"
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	51	s	[mm]	5,54

Actuator data

Type			**3277**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**	**700**	**Bench range**	**ps0**	**[bar]**	**1,2 ... 2**
				Supply	**psu**	**[bar]**	**2,20**

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

Actuator results

req. act. force	Fo req.	[kN]	9,23	req. diff. psu-ps100	d ps	[bar]	0,09
max. act. force	Fmax	[kN]	32,99	Actuator force	Fa	[kN]	8,40
max. dp on plug	d. pmax	[bar]	66,60	Close safety factor	Fa/Fo (SF)		0,91
req. start bench range	ps0req.	[bar]	1,45	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. 3	Process Fluid :	raw methanol
04	TAG - No. :	FV-300101	Upstream Conditions :	Liquid

VETEC
Valve Sizing V2000

07.06.2005

	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, gaug	Air Set Type	Norgren B74G-4AK-AP3
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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***69,2***	***53,3***	***14,8***
Min. req. size	Req. DN	[mm]	50,4	46,4	27,2
Outlet velocity	w	[m/s]	19,5	20,2	6,94
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***64***	***66***	***57***
Flow condition			Flashing	Flashing	Flashing
relative travel	T	[%]	92,3	85,6	52,8
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	xFz		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]	7,11

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				

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 42th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	11,7		
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***		***33,8***
Min. req. size	Req. DN	[mm]	129
Outlet velocity	w	[m/s]	3,43
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***71***
relative travel	T	[%]	80,0
Different. pressure ratio	xF		0,98
FL value	FL		0,95
Kc value	Kc		0,86
Valve style factor	Fd		0,42
z value at capacity	xFz		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]	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)] 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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***75***
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	xFz		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]	5,49

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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	125238	37000
Inlet pressure	p1	[bar(a)]	3,6	4,8	6
Outlet pressure	p2	[bar(a)]	3	3	3
Inlet temperature	t1	[°C]	128,7	152	151,8
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

Valve coeff. calculated	***Cv***		***256***	***142***	***28,5***
Min. req. size	Req. DN	[mm]	142	97,8	53,1
Outlet velocity	w	[m/s]	2,69	22,3	4,99
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***76***	***71***	***68***
Flow condition				Flashing	Flashing
relative travel	T	[%]	87,3	72,0	31,2
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	xFz		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]	9,53

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]	13,46	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***57***	***63***	***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	xFz		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]	0,28	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***		***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]	9,53

Actuator data

Type			**SRP2000**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**		**Bench range**	**ps0**	**[bar]**	**...**
				Supply	**psu**	**[bar]**	**4**

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

Actuator results

req. act. force	Fo req.	[kN]	48,57	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				

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***78***
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	xFz		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]	6,02

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***54***	***61***	***56***
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	xFz		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]	9,53

Actuator data

Type			**SRP2000**	**Fail-safe act.**	**extends**		
Diaphr. area	**A**	**[cm²]**		**Bench range**	**ps0**	**[bar]**	**...**
				Supply	**psu**	**[bar]**	**4**

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

Actuator results

req. act. force	Fo req.	[kN]	48,57	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***81***
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	xFz		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 WCC***
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]	6,02

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		-

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 08:58:08
Tag No.		**HV-200204**	

Medium selection and state

Medium		**MAKE UP GAS**	
Operating temperature	t1	**170,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**82,8**	bar(a)
Absolute pressure downstream of valve	p2	**82,65**	bar(a)
Flow coefficient	Cv	**5.629,1**	GPM(US)
○ Mass flow rate	qm	**301.180,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**604.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**23,097**	bar(a)
Critical real pressure difference	ΔpXc	**23,888**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**25,618**	kg/m³
Operating density (t2, p2)	ρ2	**25,572**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,018**	mPa s
Isentropic exponent (t1, p1)	κ	**1,39**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,49864**	kg/m³
○ Specific gas constant	R	**729,34**	J/(kg K)
◉ Molecular weight	M	**11,4**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,02**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 6158, 18", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**5.629,1**	GPM(US)
Selected flow coefficient	Cv100	**6.158,0**	GPM(US)
Selected valve size	DN	**18"**	
Flow velocity	u1	**19,892**	m/s
Flow velocity	u2	**19,928**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-
☒ Function for Fl²			

☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	92,238	%
Valve load	Cv/Cv1...	91,411	%
Valve modifier (operating conditions)	FL^2	0,342	-
Valve modifier (operating conditions)	xT	0,281	-
Valve style modifier (operating conditio...	Fd	0,779	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	18"	
Pressure class upstream of valve	PN1	Schedule 60	
○ Pipe outside diameter upstream of ...	Da1	18,0	in
Pipe wall thickness upstream of val...	s1	0,74803	in
○ Pipe inside diameter upstream of v...	Di1	16,504	in
Flow velocity in the pipe	u1R	23,661	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	18"	
Pressure class downstream of valve	PN2	Schedule 60	
○ Pipe outside diameter downstream ...	Da2	18,0	in
Pipe wall thickness downstream of ...	s2	0,74803	in
○ Pipe inside diameter downstream o...	Di2	16,504	in
Flow velocity in the pipe	u2R	23,704	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,25	dB
Transmission loss	Rr	-84,7	dB
Sound pressure level	Lpi	111,0	dB
Sound power level	Lwi	85,8	dB
Sound pressure (0 m distance, A-weight...	LpAa	31,3	dB(A)
Sound pressure level of valve (A-weight...	LpAa	23,8	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,029731	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,018	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	170,0	147,0		°C
t2	170,0	147,0		°C
p1	82,8	76,6		bar(a)
p2	82,65	76,45		bar(a)
Cv	5.629,1	5.426,7		GPM(US)
qm	301.180,0	286.790,0		kg/h

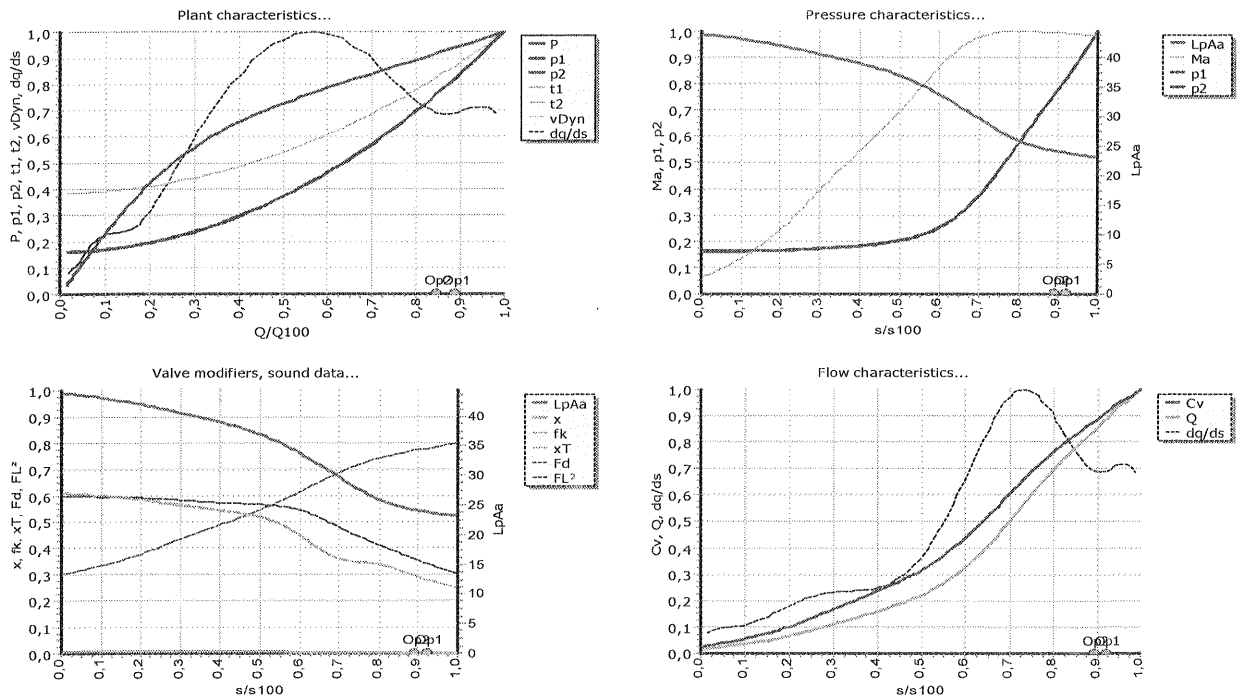
qn	**604.000,0**	**575.150,0**	m³/h
Δpc	**23,097**	**22,5**	bar(a)
cf1	**670,27**	**652,64**	m/s
η1	**0,018**	**0,018**	mPa s
κ	**1,39**	**1,39**	-
ρ1	**25,618**	**24,997**	kg/m³
ρ2	**25,572**	**24,948**	kg/m³
LpAa	**23,8**	**24,2**	dB(A)
u1	**19,892**	**19,412**	m/s
u2	**19,928**	**19,45**	m/s
P	**49,029**	**47,851**	kW
MaDN	**0,029731**	**0,029802**	-
s/s100	**92,238**	**89,248**	%
Cv/Cv1...	**91,411**	**88,125**	%
Fd	**0,779**	**0,771**	-
FL²	**0,342**	**0,358**	-
xT	**0,281**	**0,296**	-
	Turbulent flow	**Turbulent flow**	
	Non-critical	**Non-critical**	

Control optimization

Valve authority (Δp100/Δp0) vDyn **1,0** -

Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,002	25,01	50,01	75,0	99,93
t1	°C	-76,49	-74,39	-61,62	37,32	234,9
p1	bar(a)	16,35	16,92	20,36	47,03	100,3
p2	bar(a)	16,2	16,77	20,21	46,88	100,1
Cv	GPM(US)	236,7	807,3	1.943,0	4.253,0	6.154,0
qm	kg/h	8.424,0	29.070,0	74.430,0	204.700,0	338.500,0
qn	m³/h	16.890,0	58.300,0	149.300,0	410.500,0	678.800,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	1,0	1,0
pv1	bar(a)					
κ	-	1,39	1,39	1,39	1,39	1,39
LpAa	dB(A)	43,54	41,25	36,9	27,59	23,12
MaDN	-	2,825 E-3	9,471 E-3	0,02076	0,02982	0,02953
u2	m/s	1,262	4,251	9,611	16,73	21,19
cf	m/s					



Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 09:36:28
Tag No.		**HV-200214**	

Medium selection and state

Medium		**RECYCLE GAS**	
Operating temperature	t1	**40,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**4,9**	bar(a)
Absolute pressure downstream of valve	p2	**3,2**	bar(a)
Absolute pressure downstream of resist...	p2,end	**2,5**	bar(a)
Flow coefficient	Cv	**1.036,8**	GPM(US)
○ Mass flow rate	qm	**58.852,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**45.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**1,7223**	bar(a)
Critical real pressure difference	ΔpXc	**1,7089**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**5,627**	kg/m³
Operating density (t2, p2)	ρ2	**3,6748**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,014**	mPa s
Isentropic exponent (t1, p1)	κ	**1,39**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**1,3078**	kg/m³
○ Specific gas constant	R	**278,08**	J/(kg K)
◉ Molecular weight	M	**29,9**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,02**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 2624, 12", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**1.036,8**	GPM(US)
Selected flow coefficient	Cv100	**1.620,0**	GPM(US)
Selected valve size	DN	**12"**	
Flow velocity	u1	**39,816**	m/s
Flow velocity	u2	**60,969**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☒ Function for Fl²
☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	72,006	%
Valve load	Cv/Cv1...	63,999	%
Valve modifier (operating conditions)	FL²	0,463	-
Valve modifier (operating conditions)	xT	0,354	-
Valve style modifier (operating conditio...	Fd	0,701	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	12"	
Pressure class upstream of valve	PN1	Schedule 60	
○ Pipe outside diameter upstream of ...	Da1	12,748	in
Pipe wall thickness upstream of val...	s1	0,56299	in
○ Pipe inside diameter upstream of v...	Di1	11,622	in
Flow velocity in the pipe	u1R	42,448	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	12"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	12,748	in
Pipe wall thickness downstream of ...	s2	0,68898	in
○ Pipe inside diameter downstream o...	Di2	11,37	in
Flow velocity in the pipe	u2R	67,912	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (correction)	ΔL,Co	-10,0	dB
Pressure level (mach no.)	ΔL,Ma	1,51	dB
Pressure level (resistances)	ΔL,Res	-5,0	dB
Transmission loss	Rr	-53,0	dB
Sound pressure level	Lpi	154,0	dB
Sound power level	Lwi	137,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	92,1	dB(A)
Sound pressure level of valve (A-weight...	LpAa	83,3	dB(A)
Sound pressure level of resistance struc...	La,res	76,4	dB(A)
Total sound level (valve and resistances)	La,tot	84,1	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,17524	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,014	mPa s

Influence of resistance structures

Absolute pressure downstream of valve	p2	3,2	bar(a)
Absolute pressure downstream of resist...	p2,end	2,5	bar(a)
Type of resistance structure		Silencer (direct)	

Diameter of bores	d	**5,0**	mm
No. of resistances	n	**2**	-
Mach number per resistance (selected)	Ma	**0,3**	-
Type of flow		**Non-critical**	
Sound pressure level of resistance struc...	La,res	**76,4**	dB(A)
Sound pressure level of valve (A-weight...	LpAa	**83,3**	dB(A)
Total sound level (valve and resistances)	La,tot	**84,1**	dB(A)
DN of last perforated plate	DN	**16,0**	in
Bore spacing	a	**8,0**	mm
Number of bores in last plate	nΦ	**2.174**	-

Resistance structure in detail

No.	t1	p1	p2	Cv	rho1	rho2	La [dB]	Ma	DN Mx	DN M0,3	DN M0,7	DN M1,0
1	40,0	3,2	2,828	1.947,0	3,675	3,248	73,67	0,2855	10,0	10,0	8,0	6,0
2	40,0	2,828	2,5	2.202,0	3,248	2,871	73,19	0,2243	12,0	12,0	8,0	6,0

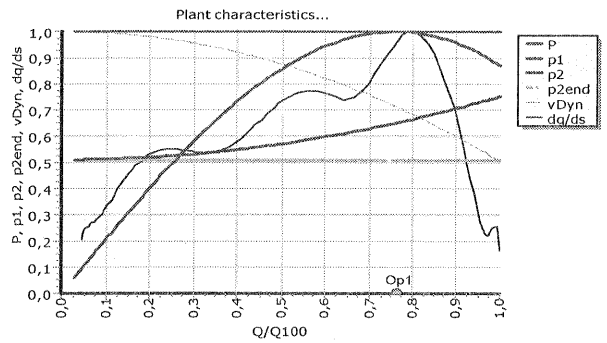
Further operating points

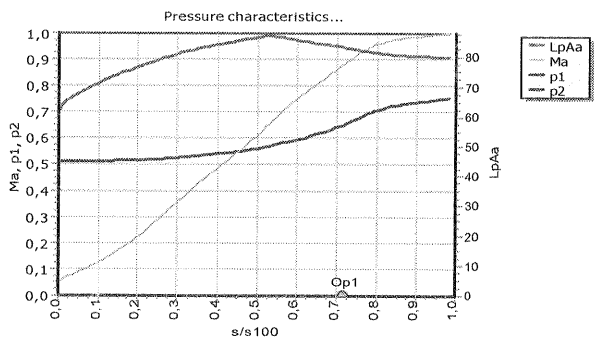
Control optimization

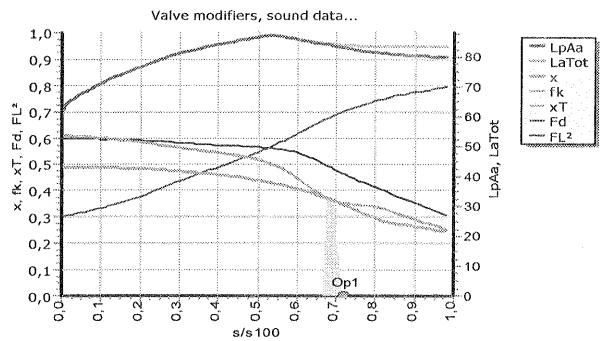
Valve authority (Δp100/Δp0)	vDyn	**0,505**	-
Calculated short-circuit performance	ax	**1,8516**	-

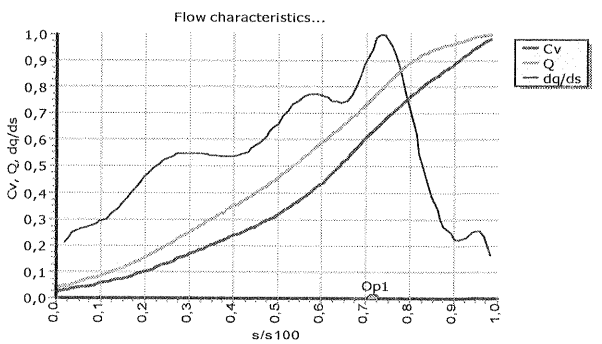
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	98 [%]
s/s100	%	5,005	25,0	50,0	75,0	97,9
t1	°C	40,0	40,0	40,0	40,0	40,0
p1	bar(a)	4,9	4,9	4,9	4,9	4,9
p2	bar(a)	2,504	2,547	2,745	3,302	3,687
p2,end	bar(a)	2,5	2,5	2,5	2,5	2,5
Cv	GPM(US)	62,28	212,3	511,1	1.119,0	1.584,0
qm	kg/h	4.564,0	15.230,0	34.850,0	62.990,0	76.620,0
qn	m³/h	3.489,0	11.640,0	26.650,0	48.170,0	58.590,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9982	0,9805	0,8977	0,6658	0,5055
pv1	bar(a)					
κ	-	1,39	1,39	1,39	1,39	1,39
LpAa	dB(A)	67,7	79,08	86,7	82,62	80,01
La,res	dB(A)	31,77	52,7	67,13	77,51	80,95
La,tot	dB(A)	67,7	79,09	86,75	83,78	83,51
MaDN	-	0,01736	0,05696	0,121	0,1818	0,198
u2	m/s	6,041	19,82	42,08	63,24	68,9
cf	m/s					









Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 09:39:59
Tag No.		**HV-200214**	

Medium selection and state

Medium		**RECYCLE GAS**	
Operating temperature	t1	**40,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**11,5**	bar(a)
Absolute pressure downstream of valve	p2	**7,9**	bar(a)
Absolute pressure downstream of resist...	p2,end	**5,0**	bar(a)
Flow coefficient	Cv	**813,33**	GPM(US)
○ Mass flow rate	qm	**113.780,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**87.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**4,6467**	bar(a)
Critical real pressure difference	ΔpXc	**4,4761**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**13,206**	kg/m³
Operating density (t2, p2)	ρ2	**9,0721**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,014**	mPa s
Isentropic exponent (t1, p1)	κ	**1,39**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**1,3078**	kg/m³
○ Specific gas constant	R	**278,08**	J/(kg K)
◉ Molecular weight	M	**29,9**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,02**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 2624, 12", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**813,33**	GPM(US)
Selected flow coefficient	Cv100	**1.620,0**	GPM(US)
Selected valve size	DN	**12"**	
Flow velocity	u1	**32,799**	m/s
Flow velocity	u2	**47,746**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-
☒ Function for Fl²			

☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	64,044	%
Valve load	Cv/Cv1...	50,205	%
Valve modifier (operating conditions)	FL^2	0,522	-
Valve modifier (operating conditions)	xT	0,407	-
Valve style modifier (operating conditio...	Fd	0,646	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	12"	
Pressure class upstream of valve	PN1	Schedule 60	
○ Pipe outside diameter upstream of ...	Da1	12,748	in
Pipe wall thickness upstream of val...	s1	0,56299	in
○ Pipe inside diameter upstream of v...	Di1	11,622	in
Flow velocity in the pipe	u1R	34,967	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	12"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	12,748	in
Pipe wall thickness downstream of ...	s2	0,68898	in
○ Pipe inside diameter downstream o...	Di2	11,37	in
Flow velocity in the pipe	u2R	53,183	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (correction)	ΔL,Co	-10,0	dB
Pressure level (mach no.)	ΔL,Ma	1,15	dB
Pressure level (resistances)	ΔL,Res	-5,0	dB
Transmission loss	Rr	-55,3	dB
Sound pressure level	Lpi	159,0	dB
Sound power level	Lwi	138,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	95,1	dB(A)
Sound pressure level of valve (A-weight...	LpAa	86,3	dB(A)
Sound pressure level of resistance struc...	La,res	86,8	dB(A)
Total sound level (valve and resistances)	La,tot	89,6	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,13724	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,014	mPa s

Influence of resistance structures

Absolute pressure downstream of valve	p2	7,9	bar(a)
Absolute pressure downstream of resist...	p2,end	5,0	bar(a)
Type of resistance structure		Silencer (direct)	
Diameter of bores	d	5,0	mm

No. of resistances	n	**2**	-
Mach number per resistance (selected)	Ma	**0,3**	-
Type of flow		**Non-critical**	
Sound pressure level of resistance struc...	La,res	**86,8**	dB(A)
Sound pressure level of valve (A-weight...	LpAa	**86,3**	dB(A)
Total sound level (valve and resistances)	La,tot	**89,6**	dB(A)
DN of last perforated plate	DN	**14,0**	in
Bore spacing	a	**8,0**	mm
Number of bores in last plate	nΦ	**1.490**	-

Resistance structure in detail

No.	t1	p1	p2	Cv	rho1	rho2	La [dB]	Ma	DN Mx	DN M0,3	DN M0,7	DN M1,0
1	40,0	7,9	6,285	1.201,0	9,072	7,217	84,21	0,2484	10,0	10,0	6,0	5,0
2	40,0	6,285	5,0	1.510,0	7,217	5,742	83,31	0,2168	12,0	12,0	8,0	6,0

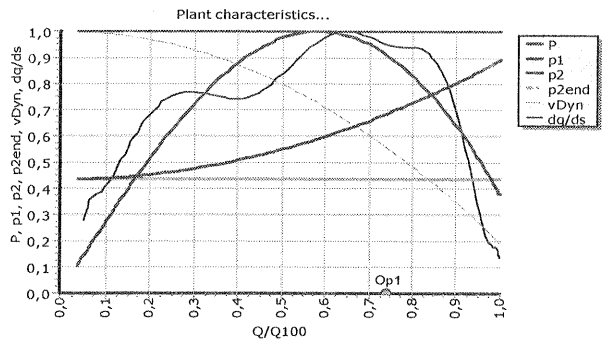
Further operating points

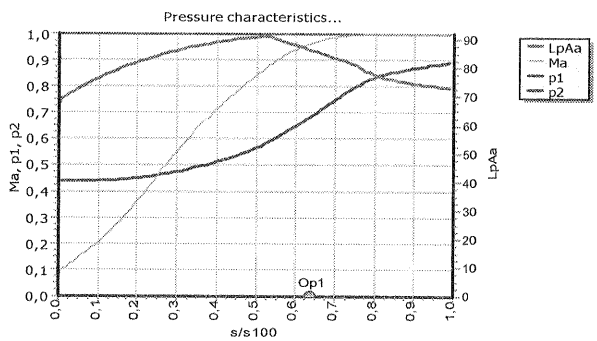
Control optimization

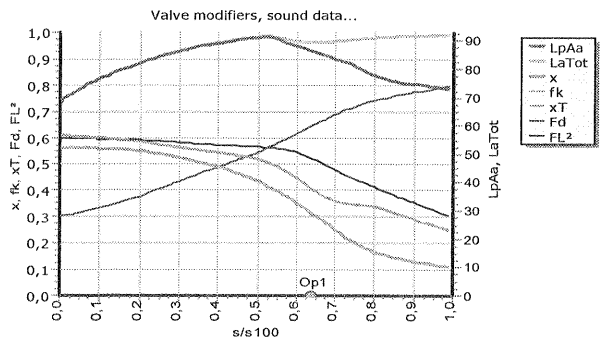
Valve authority (Δp100/Δp0)	vDyn	**0,191**	-
Calculated short-circuit performance	ax	**1,4971**	-

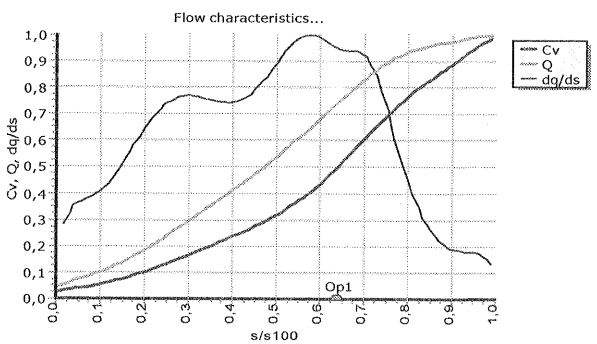
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	99 [%]
s/s100	%	5,004	25,0	50,0	74,99	98,91
t1	°C	40,0	40,0	40,0	40,0	40,0
p1	bar(a)	11,5	11,5	11,5	11,5	11,5
p2	bar(a)	5,026	5,291	6,495	9,177	10,24
p2,end	bar(a)	5,0	5,0	5,0	5,0	5,0
Cv	GPM(US)	62,28	212,3	511,1	1.119,0	1.602,0
qm	kg/h	10.850,0	36.060,0	81.700,0	136.600,0	152.900,0
qn	m³/h	8.294,0	27.570,0	62.470,0	104.400,0	116.900,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9959	0,9552	0,7699	0,3573	0,1945
pv1	bar(a)					
κ	-	1,39	1,39	1,39	1,39	1,39
LpAa	dB(A)	72,9	84,36	91,05	81,0	73,07
La,res	dB(A)	45,51	66,39	80,71	89,73	91,7
La,tot	dB(A)	72,91	84,43	91,43	90,27	91,76
MaDN	-	0,02056	0,06494	0,1199	0,1418	0,1423
u2	m/s	7,154	22,59	41,7	49,33	49,51
cf	m/s					









Hint:

- Approximate value: Density of pipeline - ρP

Notes:

Selected flow coefficient - Cv100

Cv 100 for Butterfly Valve 12 inch Class 900 with LN-Trim

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 09:01:18
Tag No.		**HV-200503**	

Medium selection and state

Medium		**RECYCLE GAS**	
Operating temperature	t1	**55,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**76,7**	bar(a)
Absolute pressure downstream of valve	p2	**72,0**	bar(a)
Flow coefficient	Cv	**244,78**	GPM(US)
○ Mass flow rate	qm	**79.318,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**155.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**42,805**	bar(a)
Critical real pressure difference	ΔpXc	**37,873**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**32,244**	kg/m³
Operating density (t2, p2)	ρ2	**30,268**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,014**	mPa s
Isentropic exponent (t1, p1)	κ	**1,42**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,51173**	kg/m³
○ Specific gas constant	R	**724,89**	J/(kg K)
◉ Molecular weight	M	**11,47**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 1136, 8", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**244,78**	GPM(US)
Selected flow coefficient	Cv100	**1.136,0**	GPM(US)
Selected valve size	DN	**8"**	
Flow velocity	u1	**21,071**	m/s
Flow velocity	u2	**22,446**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-
☒ Function for Fl²			

☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	37,225	%
Valve load	Cv/Cv1...	21,547	%
Valve modifier (operating conditions)	FL²	0,573	-
Valve modifier (operating conditions)	xT	0,55	-
Valve style modifier (operating conditio...	Fd	0,475	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	10"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	10,748	in
Pipe wall thickness upstream of val...	s1	0,59449	in
○ Pipe inside diameter upstream of v...	Di1	9,5591	in
Flow velocity in the pipe	u1R	14,758	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	10"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	10,748	in
Pipe wall thickness downstream of ...	s2	0,59449	in
○ Pipe inside diameter downstream o...	Di2	9,5591	in
Flow velocity in the pipe	u2R	15,722	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,191	dB
Transmission loss	Rr	-62,8	dB
Sound pressure level	Lpi	148,0	dB
Sound power level	Lwi	118,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	90,2	dB(A)
Sound pressure level of valve (A-weight...	LpAa	80,7	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,038622	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,014	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	55,0	55,0		°C
t2	55,0	55,0		°C
p1	76,7	76,7		bar(a)
p2	72,0	72,0		bar(a)
Cv	244,78	199,54		GPM(US)
qm	79.318,0	64.734,0		kg/h

77

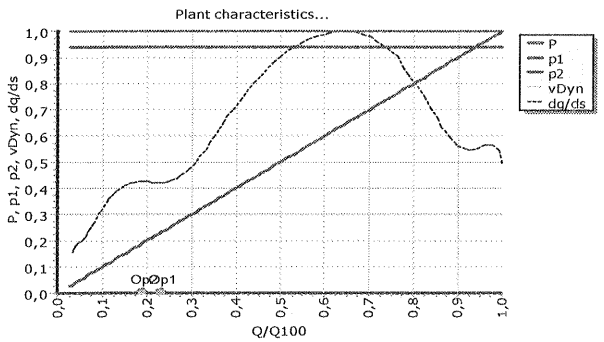
qn	**155.000,0**	**126.500,0**	m³/h
Δpc	**42,805**	**43,697**	bar(a)
cf1	**581,19**	**581,19**	m/s
η1	**0,014**	**0,014**	mPa s
κ	**1,42**	**1,42**	-
ρ1	**32,244**	**32,244**	kg/m³
ρ2	**30,268**	**30,268**	kg/m³
LpAa	**80,7**	**81,1**	dB(A)
u1	**21,071**	**17,197**	m/s
u2	**22,446**	**18,319**	m/s
P	**331,42**	**270,48**	kW
MaDN	**0,038622**	**0,03152**	-
s/s100	**37,225**	**31,488**	%
Cv/Cv1...	**21,547**	**17,565**	%
Fd	**0,475**	**0,443**	-
FL²	**0,573**	**0,579**	-
xT	**0,55**	**0,562**	-
FP	**0,999**	**0,999**	-
	Turbulent flow	**Turbulent flow**	
	Non-critical	**Non-critical**	

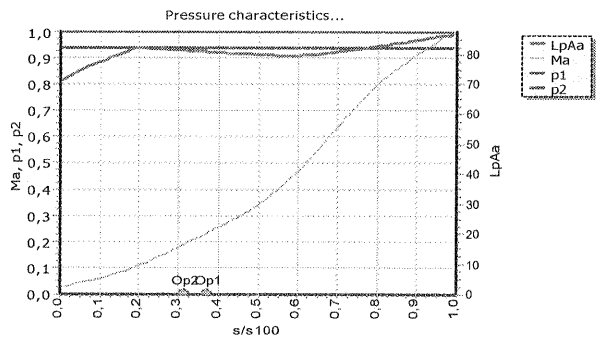
Control optimization

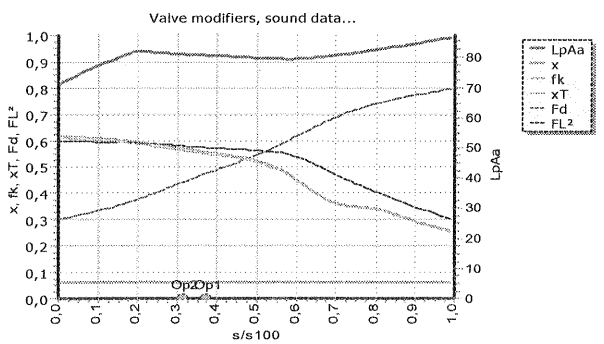
Valve authority (Δp100/Δp0) vDyn **1,0** -

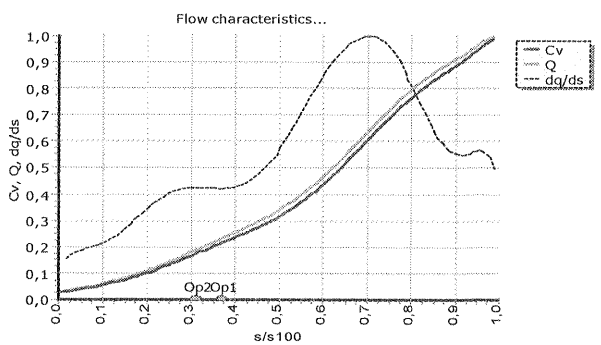
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	99 [%]
s/s100	%	5,001	25,0	50,0	75,0	99,0
t1	°C	55,0	55,0	55,0	55,0	55,0
p1	bar(a)	76,7	76,7	76,7	76,7	76,7
p2	bar(a)	72,0	72,0	72,0	72,0	72,0
Cv	GPM(US)	43,66	148,9	358,4	784,6	1.125,0
qm	kg/h	14.210,0	48.360,0	115.700,0	246.100,0	340.600,0
qn	m³/h	27.780,0	94.510,0	226.100,0	480.900,0	665.600,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	1,0	1,0
pv1	bar(a)					
κ	-	1,42	1,42	1,42	1,42	1,42
LpAa	dB(A)	74,46	81,69	79,89	81,67	86,63
MaDN	-	6,921 E-3	0,02355	0,05634	0,1198	0,1659
u2	m/s	4,022	13,69	32,75	69,64	96,39
cf	m/s					









Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Hint

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	LV100411	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)]***	***51***	***52***	***38***
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	xFz		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]	6,02

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no. LV100416Rev.2 Tag 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)]***	***72***	***80***	***78***
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	xFz		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 ["] 6"
cR [m/s] 5180 rho [kg/m³] 7850 di [mm] 149 s [mm] 7,11

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	Fm req.	[kN]	8,72	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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***78***	***73***	***65***
Flow condition			Critical cavitation	Critical cavitation	
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	xFz		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	["]	2"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	55	s	[mm]	5,54

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***	***75***
Flow condition			Critical cavitation	Critical 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	xFz		0,69	0,69	0,75
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	["]	6"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	159,3	s	[mm]	3,4

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***58***	***54***	***75***
Flow condition					Critical cavitation
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	xFz		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]	54	s	[mm]	5,54

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.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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

Valve coeff. calculated	***Cv***		***15,0***	***10,8***	***3,80***
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)]***	***81***	***79***	***68***
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	xFz		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	s	[mm]	6,02

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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

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)]***	***<30***	***<30***	***<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	xFz		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	["]	2"
cR [m/s]	5180	rho [kg/m³]	7850	di	[inch]	2,1	s	[inch]	5,54

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]	0,94
max. dp on plug	d. pmax	[bar]	9,16	Close safety factor	Fa/Fo (SF)		1,11
req. start bench range	ps0req.	[bar]	0,02	Open safety factor	Ff/Fw		13,69

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***76***	***80***	***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	xFz		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]	4,19

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***53***	***52***	***41***
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	xFz		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	s	[mm]	3,05

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***9,14***	***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)]***	***46***	***42***	***<30***
relative travel	T	[%]	81,7	67,0	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	xFz		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	["]	2"	D2	["]	4"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	107	s	[mm]	6,02

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)] 5,5 p2min [bar(a)] 1,01 t1max [°C] 200)

Actuator results

req. act. force	Fo req.	[kN]	0,58	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)		4,79
req. start bench range	ps0req.	[bar]	0,18	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***57,9***	***52,3***	***20,1***
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)]***	***98***	***97***	***94***
Flow condition			Critical cavitation	Critical cavitation	Critical 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	xFz		0,33	0,33	0,41
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	["]	12"
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	302	s	[mm]	9,53

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	Fm req.	[kN]	1,32	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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***74,4***	***46,4***	***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***	***78***	***66***
relative travel	T	[%]	88,4	76,4	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	xFz		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	["]	6"	D2	["]	6"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	154	s	[mm]	10,97

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)] 73 p2min [bar(a)] 1,01 t1max [°C] 160)

Actuator results

req. act. force	Fo req.	[kN]	36,86	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)		1,52
req. start bench range	ps0req.	[bar]	1,45	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	7,6	7,9	9
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***		***149***	***21,3***	***8,71***
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)]***	***73***	***50***	***47***
relative travel	T	[%]	81,8	32,1	9,16
Different. pressure ratio	xF		0,23	0,29	0,38
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	xFz		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]	0,14	0	-0,13

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***		***300***	***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	s	[mm]	8,18

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)		1,27
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

VETEC
Valve Sizing V2000

03	Pos.-No. :	2 Rev. 3	Process Fluid :	raw methanol 07.06.2005
04	TAG - No. :	LV-300101B	Upstream Conditions :	Liquid

	Process and Medium Data			min	norm	max
06	Flow Rate	[kg/h]	W	30.000	60.000	280.000
07	Inlet Pressure	[bara]	p1	5,50	5,50	5,00
08	Outlet Pressure	[bara]	p2	2,40	2,40	3,80
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 %		28	70	82
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, gaug	Air Set Type	Norgren B74G-4AK-AP3
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. 3	Process Fluid :	stabilized methanol	07.06.2005
04	TAG - No. :	LV-300202	Upstream Conditions :	Liquid	

VETEC
Valve Sizing V2000

05	**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	[%]				

17	**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

19	**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				

28	**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

39	**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

45	**Accessories**				
46	Positioner	Type	FF_3787-100, 4-20 mA, IP 65, gaug	Air Set Type	Norgren B74G-4AK-AP3
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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***53***	***52***	***44***
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	xFz		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	s	[mm]	4,78

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. 3	Process Fluid :	methanol	07.06.2005
04	TAG - No. :	LV-300305	Upstream Conditions :	Liquid	

VETEC
Valve Sizing V2000

05	**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	[%]				

17	**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

19	**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				

28	**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

39	**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

45	**Accessories**				
46	Positioner	Type	FF_3787-100, 4-20 mA, IP 65, gaug	Air Set Type	Norgren B74G-4AK-AP3
47	Limit Switches	Type		Piping	1/2" s.s. / Swagelok
48	Solenoid Valve	Type		Others	Lock Up Relay, 3 bar

49	**Certification/Requirements**		55	**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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***61***	***60***	***51***
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	xFz		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	s	[mm]	7,11

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.: 525 000 Customer LURGI - PIDEC
Project: 4th Methanol Plant Date: 05.07.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.05B

Item no. LV300407 Tag no. LV300407
Process medium stabilized Methanol State 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	137	137
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***	***182***	***52,7***
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)]***	***76***	***76***	***71***
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	xFz		0,52	0,46	0,49
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	["]	16"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	384	s	[mm]	9,53

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				

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***130***	***80,2***	***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)]***	***71***	***82***	***80***
relative travel	T	[%]	90,6	78,3	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	xFz		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	["]	8"	D2	["]	6"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	159	s	[mm]	7,11

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)		1,25
req. start bench range	ps0req.	[bar]	1,84	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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	117	117
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)]***	***44***	***58***	***50***
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	xFz		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 WCC***
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	s	[mm]	8,56

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***74***	***79***	***80***
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	xFz		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	s	[mm]	7,11

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***29,9***	***18,4***	***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***	***75***	***50***
relative travel	T	[%]	88,4	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	xFz		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	["]	4"	D2	["]	4"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	107	s	[mm]	6,02

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	Open safety factor	Ff/Fw		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	5,8	5,8	5,8
Outlet pressure	p2	[bar(a)]	2	3,5	1,2
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

Valve coeff. calculated	***Cv***		***23,2***	***22,6***	***7,03***
Min. req. size	Req. DN	[mm]	57,4	40,7	41,5
Outlet velocity	w	[Mach]	0,169	0,0847	0,0867
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***72***	***68***	***65***
relative travel	T	[%]	84,7	84,1	54,3
Different. pressure ratio	x		0,66	0,40	0,79
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]	8,56

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no. PV100513 Tag no. PV100513
Process medium Natural gas Fuel State 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)]	1,2	1,2	1,1
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***		***264***	***162***	***112***
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)]***	***68***	***66***	***55***
relative travel	T	[%]	109	96,4	86,9
Different. pressure ratio	x		0,17	0,17	0,09
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 ["]	6"	D2 ["]	4"
cR [m/s]	5180	rho [kg/m³]	7850	di [mm]	107	s [mm]	6,02

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: 01.06.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.04

Item no. PV100529 Tag no. PV100529
Process medium Natural Gas Fuel State 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)]	6	6	6
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***		***27,3***	***8,81***	***0,505***
Min. req. size	Req. DN	[mm]	116	67,0	16,1
Outlet velocity	w	[Mach]	1,62	0,235	0,0135
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***127***	***78***	***60***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	93,6	64,8	->0
Different. pressure ratio	x		0,89	0,89	0,89
FL value	FL		0,94	0,97	0,98
xT value	xT		0,75	0,79	0,81
Valve style factor	Fd		0,45	0,41	0,08
Level exponent	G1		-5,25	-5,42	-5,84
Slope exponent	G2		6,43	0,38	0,25

Valve data

Body type			***Globe valve***	***Series***	***250***
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	["]	6"
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	157	s	[mm]	10,97

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]	17,83	req. diff. psu-ps100	d ps	[bar]	0,01
max. act. force	Fmax	[kN]	60,19	Actuator force	Fa	[kN]	22,40
max. dp on plug	d. pmax	[bar]	97,14	Close safety factor	Fa/Fo (SF)		1,26
req. start bench range	ps0req.	[bar]	1,40	Open safety factor	Ff/Fw		-

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 10:07:08
Tag No.		**PV-100801**	

Medium selection and state

Medium		**Natural Gas (Aga8)**	
Gas composition		**Standard**	
Operating temperature	t1	**40,0**	°C
State		**Gaseous**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**54,5**	bar(a)
Absolute pressure downstream of valve	p2	**50,0**	bar(a)
Flow coefficient	Cv	**430,67**	GPM(US)
○ Mass flow rate	qm	**142.810,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**190.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**22,402**	bar(a)
Critical real pressure difference	ΔpXc	**21,449**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**38,244**	kg/m³
Operating density (t2, p2)	ρ2	**34,856**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,012634**	mPa s
Isentropic exponent (t1, p1)	κ	**1,248**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,75163**	kg/m³
○ Specific gas constant	R	**494,81**	J/(kg K)
◉ Molecular weight	M	**16,803**	kg/kmol

Valve selection

Valve manufacturer	**LEUSCH**
Series	**Cage Ball low noise Class 600**
Valve selection	**Cv: 1021, 8", Measured values (eq)**
☒ Valve from database	☒ Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Ball valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (eq)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**430,67**	GPM(US)
Selected flow coefficient	Cv100	**1.021,0**	GPM(US)
Selected valve size	DN	**8"**	
Flow velocity	u1	**31,985**	m/s
Flow velocity	u2	**35,095**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,6**	-

☒ Function for Fl²
☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	77,045	%
Valve load	Cv/Cv1...	42,182	%
Valve modifier (operating conditions)	FL^2	0,546	-
Valve modifier (operating conditions)	xT	0,461	-
Valve style modifier (operating conditio...	Fd	0,434	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	12"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	12,748	in
Pipe wall thickness upstream of val...	s1	0,68898	in
○ Pipe inside diameter upstream of v...	Di1	11,37	in
Flow velocity in the pipe	u1R	15,835	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	12"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	12,748	in
Pipe wall thickness downstream of ...	s2	0,68898	in
○ Pipe inside diameter downstream o...	Di2	11,37	in
Flow velocity in the pipe	u2R	17,374	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (correction)	ΔL,Co	-5,0	dB
Pressure level (mach no.)	ΔL,Ma	0,291	dB
Transmission loss	Rr	-60,7	dB
Sound power level	Lwi	121,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	87,8	dB(A)
Sound pressure level of valve (A-weight...	LpAa	79,0	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,082944	-

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	40,0	40,0	40,0	°C
t2	40,0	40,0	40,0	°C
p1	54,5	54,5	55,0	bar(a)
p2	50,0	48,0	45,9	bar(a)
Cv	430,67	345,39	32,632	GPM(US)
qm	142.810,0	135.070,0	15.033,0	kg/h
qn	190.000,0	179.700,0	20.000,0	m³/h
Δpc	22,402	24,743	29,851	bar(a)
η1	0,012634	0,012634	0,012646	mPa s
κ	1,248	1,248	1,248	-

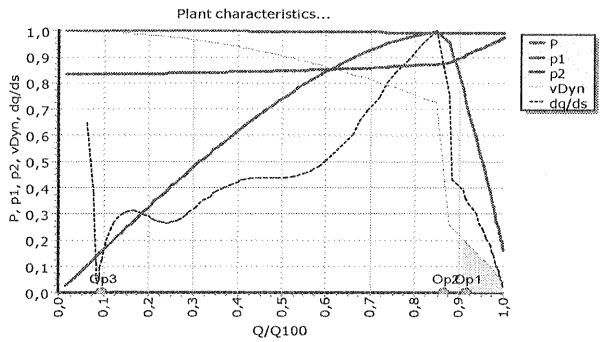
ρ1	**38,244**	**38,244**	**38,623**	kg/m³
ρ2	**34,856**	**33,363**	**31,804**	kg/m³
LpAa	**79,0**	**86,2**	**71,7**	dB(A)
u1	**31,985**	**30,252**	**3,3339**	m/s
u2	**35,095**	**34,678**	**4,0487**	m/s
P	**487,17**	**679,03**	**107,55**	kW
MaDN	**0,082944**	**0,081838**	**9,5399 E -3**	-
s/s100	**77,045**	**72,797**	**11,321**	%
Cv/Cv1...	**42,182**	**33,829**	**3,1961**	%
Fd	**0,434**	**0,422**	**0,346**	-
FL²	**0,546**	**0,562**	**0,597**	-
xT	**0,461**	**0,509**	**0,609**	-
FP	**0,99**	**0,994**	**1,0**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	**Turbulent flow Non-critical**	
h1'	**-18,274**	**-18,274**	**-18,75**	kJ/kg

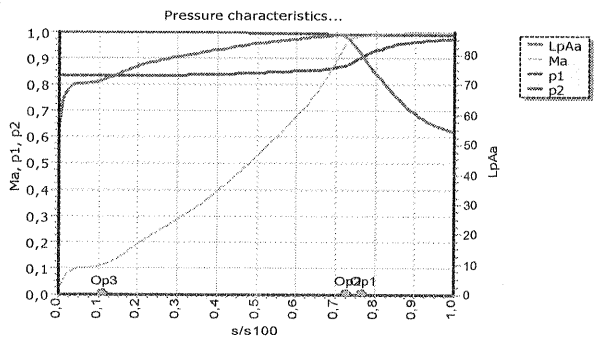
Control optimization

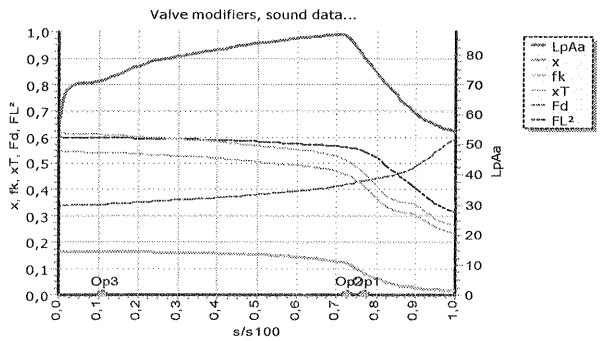
Valve authority (Δp100/Δp0)	vDyn ⚠	**0,04**	-
Calculated short-circuit performance	ax	**1,1123**	-

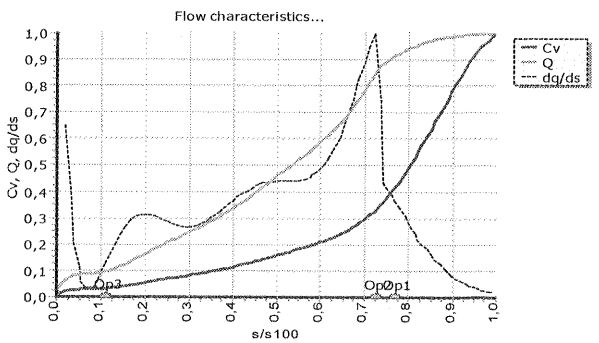
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	4,963	25,0	50,0	74,99	99,57
t1	°C	40,0	40,0	40,0	40,0	40,0
p1	bar(a)	55,0	54,98	54,87	54,5	54,5
p2	bar(a)	45,89	45,99	46,46	49,09	53,54
Cv	GPM(US)	28,4	70,28	161,2	386,2	1.014,0
qm	kg/h	13.090,0	32.130,0	71.210,0	139.300,0	155.600,0
qn	m³/h	17.410,0	42.750,0	94.740,0	185.400,0	207.000,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9973	0,9837	0,9199	0,2307	0,04036
pv1	bar(a)					
ρ1	kg/m³	38,62	38,61	38,52	38,24	38,24
κ	-	1,248	1,248	1,248	1,248	1,248
LpAa	dB(A)	70,45	78,12	83,85	82,52	54,45
MaDN	-	8,308 E-3	0,02035	0,04462	0,08248	0,08416
u2	m/s	3,526	8,635	18,93	34,92	35,52
cf	m/s					
FP	-	1,0	0,9997	0,9986	0,992	0,9494









Warning:

⚠ The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Warning
- Hint

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***48***	***43***	***35***
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]	55	s	[mm]	5,54

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]	43,54	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.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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]	0,177	0,0118	0,00590
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***77***	***64***	***60***
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	["]	2"	D2	["]	2"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	55	s	[mm]	5,54

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2nd Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	PV150101	Tag no.	PV150101
Process medium	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]	2,87	2,87	2,87
Isentropic exponent	gamma		1,31	1,31	1,31
Viscosity	eta	[mPas]	0,0145	0,0145	0,0145

Results and factors

Valve coeff. calculated	***Cv***		***207***	***126***	***16,3***
Min. req. size	Req. DN	[mm]	165	130	47,8
Outlet velocity	w	[Mach]	0,475	0,275	0,0354
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***88***	***80***	***67***
relative travel	T	[%]	92,7	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	0,74	0,80
Valve style factor	Fd		0,44	0,42	0,18
Level exponent	G1		-4,30	-4,38	-4,68
Slope exponent	G2		3,72	1,03	0,75

Valve data

Body type			***Globe valve***	***Series***	***240***
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	["]	8"	D2	["]	14"
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	384	s	[mm]	9,53

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]	10,21	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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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]	188000	140000	10000
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***		***258***	***204***	***14,6***
Min. req. size	Req. DN	[mm]	155	134	35,7
Outlet velocity	w	[Mach]	0,180	0,134	0,00784
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***107***	***107***	***94***
relative travel	T	[%]	38,5	30,0	0,247
Different. pressure ratio	x		0,53	0,53	0,53
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 ["]	16"
cR [m/s]	5180	rho [kg/m³]	7850	di [mm]	362	s [mm]	21,44

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	Fm req.	[kN]	15,72	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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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	4500	1500
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***	***5,45***	***1,81***
Min. req. size	Req. DN	[mm]	35,7	24,0	13,8
Outlet velocity	w	[Mach]	0,0490	0,0220	0,00735
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***79***	***75***	***69***
relative travel	T	[%]	83,7	63,1	34,9
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***	***A217 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 ["]	8"	D2 ["]	16"
cR [m/s]	5180	rho [kg/m³]	7850	di [mm]	362	s [mm]	21,44

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	5,7	5,7	5,7
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***		***221***	***117***	***26,3***
Min. req. size	Req. DN	[mm]	285	209	100
Outlet velocity	w	[Mach]	0,657	0,329	0,0661
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***109***	***96***	***86***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	86,5	70,2	32,1
Different. pressure ratio	x		0,86	0,86	0,86
FL value	FL		0,94	0,96	0,97
xT value	xT		0,74	0,77	0,80
Valve style factor	Fd		0,43	0,41	0,22
Level exponent	G1		-4,46	-4,56	-4,78
Slope exponent	G2		2,15	0,82	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	s	[mm]	21,44

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)] 41 p2min [bar(a)] 1,01 t1max [°C] 470)

Actuator results

req. act. force	Fm req.	[kN]	12,02	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)		1,63
req. start bench range	ps0req.	[bar]	0,94				

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	20	15	10
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***		***74,5***	***39,4***	***5,55***
Min. req. size	Req. DN	[mm]	140	118	54,8
Outlet velocity	w	[Mach]	0,260	0,187	0,0400
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***89***	***85***	***73***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	70,0	36,2	3,36
Different. pressure ratio	x		0,80	0,85	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		-5,37	-5,40	-5,70
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]	31,75

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
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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	6000
Inlet pressure	p1	[bar(a)]	30	41	41
Outlet pressure	p2	[bar(a)]	6	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***		***541***	***74,7***	***20,7***
Min. req. size	Req. DN	[mm]	338	176	107
Outlet velocity	w	[Mach]	0,382	0,0940	0,0347
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***98***	***92***	***85***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	51,0	5,29	->0
Different. pressure ratio	x		0,80	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		-4,84	-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	["]	20"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	476	s	[mm]	26,19

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	Fm req.	[kN]	12,01	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	PV150635A	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	80000	3750
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***		***601***	***348***	***16,2***
Min. req. size	Req. DN	[mm]	134	103	22,3
Outlet velocity	w	[Mach]	0,153	0,0902	0,00414
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***90***	***81***	***69***
relative travel	T	[%]	98,0	84,1	5,51
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.***	***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	["]	12"	D2	["]	14"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	374	s	[mm]	19,05

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	Fm req.	[kN]	15,72	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***1803***	***117***	***62,2***
Min. req. size	Req. DN	[mm]	399	129	99,9
Outlet velocity	w	[Mach]	0,389	0,0380	0,0228
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***92***	***76***	***74***
relative travel	T	[%]	86,0	3,64	0,998
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	["]	28"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	785	s	[mm]	9,53

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	Fm req.	[kN]	16,21	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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	3,5		
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***		***102***
Min. req. size	Req. DN	[mm]	318
Outlet velocity	w	[Mach]	2,40
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***149***
Flow condition			Choked flow
relative travel	T	[%]	80,3
Different. pressure ratio	x		0,95
FL value	FL		0,94
xT value	xT		0,75
Valve style factor	Fd		0,42
Level exponent	G1		-5,32
Slope exponent	G2		5,61

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]	21,44

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	Fm req.	[kN]	9,18	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		-

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 18:30:47
Tag No.		**PV-200409**	

Medium selection and state

Medium		**Steam**	
Operating temperature	t1	**262,0**	°C
State		**Vapor**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**48,0**	bar(a)
Absolute pressure downstream of valve	p2	**47,5**	bar(a)
Flow coefficient	Cv	**1.751,4**	GPM(US)
◉ Mass flow rate	qm	**165.000,0**	kg/h
○ Volume flow rate (standard conditio...	qn	**205.270,0**	m³/h
Critical flow-related pressure difference	Δpc	**16,403**	bar(a)
Critical real pressure difference	ΔpXc	**16,309**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**24,215**	kg/m³
Operating density (t2, p2)	ρ2	**23,96**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,019**	mPa s
Boiling pressure (t1)	pv1	**48,464**	bar(a)
Boiling temperature (p1)	tv1	**261,4**	°C
Isentropic exponent (t1, p1)	κ	**1,22**	-

Physical constants

Formula		**H2O**	
Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,8038**	kg/m³
○ Specific gas constant	R	**461,53**	J/(kg K)
◉ Molecular weight	M	**18,015**	kg/kmol
Critical temperature	tc	**373,95**	°C
Critical pressure	pc	**220,64**	bar(a)

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 600**
Valve selection		**Cv: 3321, 12", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**1.751,4**	GPM(US)
Selected flow coefficient	Cv100	**3.321,0**	GPM(US)
Selected valve size	DN	**12"**	
Flow velocity	u1	**25,941**	m/s

Flow velocity	u2	26,217	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	0,8	-
☒ Function for Fl²			
☒ Function for xT			

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	65,545	%
Valve load	Cv/Cv1...	52,738	%
Valve modifier (operating conditions)	FL²	0,512	-
Valve modifier (operating conditions)	xT	0,392	-
Valve style modifier (operating conditio...	Fd	0,657	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	12"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	12,748	in
Pipe wall thickness upstream of val...	s1	0,68898	in
○ Pipe inside diameter upstream of v...	Di1	11,37	in
Flow velocity in the pipe	u1R	28,895	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	12"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	12,748	in
Pipe wall thickness downstream of ...	s2	0,68898	in
○ Pipe inside diameter downstream o...	Di2	11,37	in
Flow velocity in the pipe	u2R	29,202	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,425	dB
Transmission loss	Rr	-77,7	dB
Sound power level	Lwi	100,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	54,6	dB(A)
Sound pressure level of valve (A-weight...	LpAa	45,8	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,053308	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,019	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	262,0	262,0	262,0	°C
t2	261,27	260,53	259,04	°C
p1	48,0	48,0	48,0	bar(a)
p2	47,5	47,0	46,0	bar(a)
Cv	1.751,4	1.143,1	107,89	GPM(US)

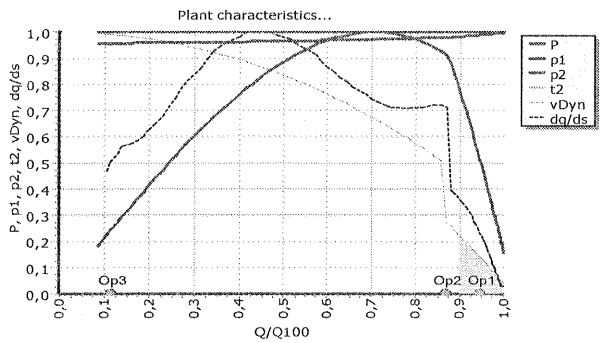
qm	165.000,0	151.440,0	20.000,0	kg/h
qn	205.270,0	188.400,0	24.882,0	m³/h
Δpc	16,403	21,195	25,462	bar(a)
η1	0,019	0,019	0,019	mPa s
κ	1,22	1,22	1,22	-
pv1	48,464	48,464	48,464	bar(a)
ρ1	24,215	24,215	24,215	kg/m³
ρ2	23,96	23,705	23,196	kg/m³
LpAa	45,8	58,8	72,5	dB(A)
u1	25,941	23,808	3,1443	m/s
u2	26,217	24,32	3,2825	m/s
P	95,136	175,56	46,869	kW
MaDN	0,053308	0,049449	6,6734 E -3	-
s/s100	65,545	52,777	3,0207	%
Cv/Cv1...	52,738	34,419	3,2488	%
Fd	0,657	0,563	0,311	-
FL²	0,512	0,563	0,597	-
xT	0,392	0,507	0,609	-
	Turbulent flow Non-critical	Turbulent flow Non-critical	Turbulent flow Non-critical	
h1'	2.798,4	2.798,4	2.798,4	kJ/kg

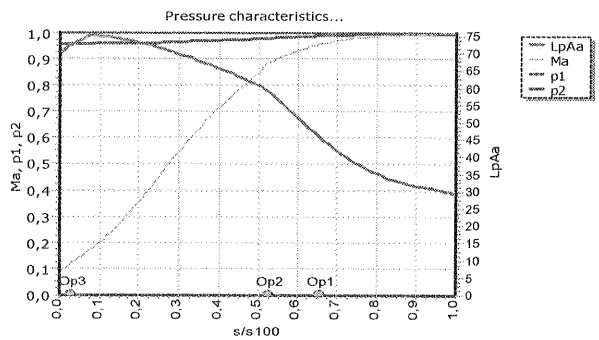
Control optimization

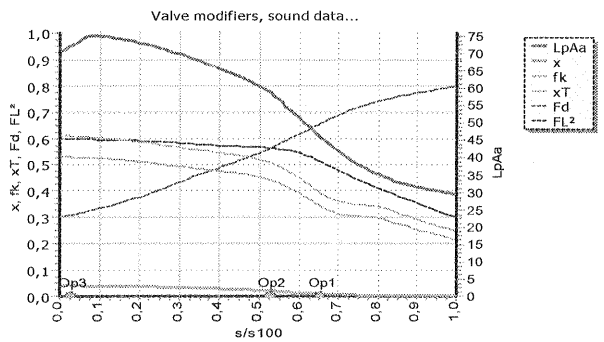
Valve authority (Δp100/Δp0)	vDyn	0,042	-
Calculated short-circuit performance	ax	1,0759	-

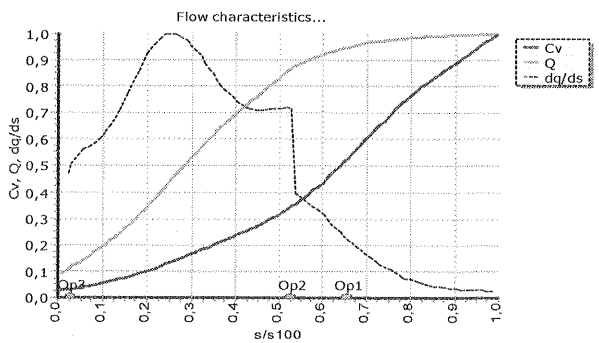
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,0	25,0	50,0	74,98	100,0
t1	°C	262,0	262,0	262,0	262,0	262,0
p1	bar(a)	48,0	48,0	48,0	48,0	48,0
p2	bar(a)	46,01	46,24	46,91	47,69	47,85
Cv	GPM(US)	127,6	435,3	1.048,0	2.293,0	3.321,0
qm	kg/h	23.620,0	75.880,0	144.700,0	169.900,0	173.800,0
qn	m³/h	29.380,0	94.400,0	180.000,0	211.400,0	216.200,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	0,9877	0,8733	0,5395	0,08377	0,04155
ρ1	kg/m³	24,21	24,21	24,21	24,21	24,21
κ	-	1,22	1,22	1,22	1,22	1,22
LpAa	dB(A)	73,76	71,63	60,61	38,01	29,49
MaDN	-	7,879 E-3	0,02519	0,04733	0,05468	0,05574
u2	m/s	3,876	12,39	23,28	26,89	27,41
cf	m/s					









Warning:

⚠ The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

ℹ Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Warning
- Hint

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***	***7,65***
Min. req. size	Req. DN	[mm]	55,0	50,6	25,9
Outlet velocity	w	[Mach]	0,100	0,0841	0,0221
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***84***	***82***	***75***
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	["]	6"
cR [m/s]	5180	rho [kg/m³]	7850	di	[mm]	157	s	[mm]	10,97

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]	2,5	2,5	2,5
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***		***4,02***	***3,35***	***0,662***
Min. req. size	Req. DN	[mm]	53,9	49,2	22,0
Outlet velocity	w	[Mach]	0,348	0,290	0,0580
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***69***	***67***	***56***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	79,4	74,7	33,3
Different. pressure ratio	x		0,93	0,93	0,93
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]	55	s	[mm]	5,54

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)] 36 p2min [bar(a)] 1,01 t1max [°C] 100)

Actuator results

req. act. force	Fo req.	[kN]	1,90	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)		2,59
req. start bench range	ps0req.	[bar]	0,60	Open safety factor	Ff/Fw		-

Propsl./order no.: 525 000 Customer LURGI - PIDEC
Project: 4th Methanol Plant Date: 05.07.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.05B

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)]	2,3	2	1,5
Inlet temperature	t1	[°C]	50	50	50
Strd. density	rhon	[kg/m³(N)]	0,09	0,0900	0,0900
Isentropic exponent	gamma		1,4	1,4	1,4
Real gas factor	Z		1	1	1
Viscosity	eta	[mPas]	0,009	0,009	0,009

Results and factors

Valve coeff. calculated	***Cv***		***13,5***	***11,3***	***3,37***
Min. req. size	Req. DN	[mm]	102	99,8	63,3
Outlet velocity	w	[Mach]	0,643	0,600	0,205
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***94***	***91***	***67***
Flow condition			Choked flow	Choked flow	Choked flow
relative travel	T	[%]	86,5	81,8	50,9
Different. pressure ratio	x		0,93	0,94	0,96
FL value	FL		0,96	0,96	0,97
xT value	xT		0,78	0,79	0,80
Valve style factor	Fd		0,43	0,42	0,34
Level exponent	G1		-5,34	-5,37	-5,55
Slope exponent	G2		3,34	2,94	0,34

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	["]	3"	D2	["]	8"
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	207	s	[mm]	8,18

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)] 35 p2min [bar(a)] 1,01 t1max [°C] 80)

Actuator results

req. act. force	Fo req.	[kN]	7,77	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)		1,44
req. start bench range	ps0req.	[bar]	1,22				

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON

Valve Sizing Version 4.04

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	0,130	0,116
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***67***	***77***	***81***
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]	7,11

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: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	PV300303A	Tag no.	PV300303A
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***		***38,5***	***145***	***197***
Min. req. size	Req. DN	[mm]	56,9	98,7	108
Outlet velocity	w	[Mach]	0,0656	0,201	0,240
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***80***	***82***	***83***
relative travel	T	[%]	10,9	29,0	33,5
Different. pressure ratio	x		0,44	0,35	0,31
FL value	FL		0,94	0,91	0,87
xT value	xT		0,75	0,72	0,65
Valve style factor	Fd		0,23	0,34	0,37
Level exponent	G1		-3,04	-3,16	-3,22
Slope exponent	G2		1,50	1,39	1,18

Valve data

Body type			***Butterfly valve***	***Series***	***14c***
Nominal size	***DN***	***["]***	***6***	***Type***	***14c***
Pressure ratings	***CLASS***		***300***	***Body material***	***A216 WCC***
Valve coefficient	***Cv***		***729***	***Disc***	***Swing through***
Angle of rotation		***[°]***	***70***	***Charact.***	***inherent***
Seat bore	***Sb***	***[mm]***	***152,4***	***Flow direction***	***Standard***
Seat	***metal***			***Packing***	***PTFE***
Leakage rate	***VI***			***Flange actuator***	
Bearing	***Centric***				

Pipe data

Type of pipe	Steel pipe	D1	["]	8	cR	[m/s]	5100	di	[mm] 254,5
Pipe insulation	none	D2	["]	8	rho	[kg/m³]	7800	s	[mm] 8,18

Actuator data

Type	**SRP3000**	**Fail-safe action**	**close**
Nominal size		**Springs**	
		Supply	**psu [bar] 4**

(Defaults: p1max [bar(a)] 4,5 p2min [bar(a)] 1,01 t1max [°C] 150)

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

Item no.	PV300303B	Tag no.	PV300303B
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)]	2	1,8	1,7
Outlet pressure	p2	[bar(a)]	1,3	1,4	1,4
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***		***36,8***	***159***	***225***
Min. req. size	Req. DN	[mm]	49,9	87,5	96,1
Outlet velocity	w	[Mach]	0,0504	0,156	0,187
SPL VDMA 24422 mod.	***LA***	***[dB(A)]***	***78***	***78***	***78***
relative travel	T	[%]	10,2	30,3	36,1
Different. pressure ratio	x		0,35	0,22	0,18
FL value	FL		0,94	0,91	0,87
xT value	xT		0,75	0,72	0,65
Valve style factor	Fd		0,23	0,34	0,37
Level exponent	G1		-3,04	-3,16	-3,22
Slope exponent	G2		1,50	1,39	1,18

Valve data

Body type			***Butterfly valve***	***Series***	***14c***
Nominal size	***DN***	***["]***	***6***	***Type***	***14c***
Pressure ratings	***CLASS***		***300***	***Body material***	***A216 WCC***
Valve coefficient	***Cv***		***729***	***Disc***	***Swing through***
Angle of rotation		***[°]***	***70***	***Charact.***	***inherent***
Seat bore	***Sb***	***[mm]***	***152,4***	***Flow direction***	***Standard***
Seat	***metal***			***Packing***	***PTFE***
Leakage rate	***VI***			***Flange actuator***	
Bearing	***Centric***				

Pipe data

Type of pipe	Steel pipe	D1	['']	8	cR	[m/s]	5100	di	[mm] 254,5
Pipe insulation	none	D2	['']	8	rho	[kg/m³]	7800	s	[mm] 8,18

Actuator data

Type	**SRP3000**	**Fail-safe action**	**close**
Nominal size		**Springs**	
		Supply	**psu [bar] 4**

(Defaults: p1max [bar(a)] 4,5 p2min [bar(a)] 1,01 t1max [°C] 150)

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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		-

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 1th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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)]***	***45***
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	s [mm]	7,11

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]	3,78
max. dp on plug	d. pmax	[bar]	3,86	Close safety factor	Fa/Fo (SF)		1,09
req. start bench range	ps0req.	[bar]	0,02	Open safety factor	Ff/Fw		14,22

Propsl./order no.: 616 100 Customer LURGI - PIDEC
Project: 2th Methanol Plant Date: 01.06.2005 Data entered by: V12/Di

SAMSON
Valve Sizing Version 4.04

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***		***7,67***	***5,65***	***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)]***	***80***	***79***	***72***
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]	83	s	[mm]	5,49

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)		2,48
req. start bench range	ps0req.	[bar]	0,62	Open safety factor	Ff/Fw		-

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 17:25:07
Tag No.		**TV-100904A**	

Medium selection and state

Medium		**Natural - Purge Gas**	
Operating temperature	t1	**330,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**48,0**	bar(a)
Absolute pressure downstream of valve	p2	**47,4**	bar(a)
Flow coefficient	Cv	**1.000,0**	GPM(US)
○ Mass flow rate	qm	**83.673,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**113.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**21,802**	bar(a)
Critical real pressure difference	ΔpXc	**20,329**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**15,886**	kg/m³
Operating density (t2, p2)	ρ2	**15,687**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,02**	mPa s
Isentropic exponent (t1, p1)	κ	**1,191**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,74047**	kg/m³
○ Specific gas constant	R	**500,96**	J/(kg K)
◉ Molecular weight	M	**16,597**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer	**LEUSCH**
Series	**LDE Class 600**
Valve selection	**Cv: 4482, 14", Measured values (lin)**
☒ Valve from database	☒ Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**1.000,0**	GPM(US)
Selected flow coefficient	Cv100	**4.482,0**	GPM(US)
Selected valve size	DN	**14"**	
Flow velocity	u1	**14,732**	m/s
Flow velocity	u2	**14,918**	m/s
Valve modifier (Cv/Cv100 = 0.75)	xT	**0,343**	-
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☒ Function for Fl²
☐ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	38,326	%
Valve load	Cv/Cv1...	22,312	%
Valve modifier (operating conditions)	FL²	0,574	-
Valve modifier (operating conditions)	xT	0,534	-
Valve style modifier (operating conditio...	Fd	0,481	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	14"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	14,0	in
Pipe wall thickness upstream of val...	s1	0,74803	in
○ Pipe inside diameter upstream of v...	Di1	12,504	in
Flow velocity in the pipe	u1R	18,468	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	14"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	14,0	in
Pipe wall thickness downstream of ...	s2	0,74803	in
○ Pipe inside diameter downstream o...	Di2	12,504	in
Flow velocity in the pipe	u2R	18,702	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,22	dB
Transmission loss	Rr	-69,9	dB
Sound power level	Lwi	101,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	60,7	dB(A)
Sound pressure level of valve (A-weight...	LpAa	52,3	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,024869	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,02	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	330,0	330,0		°C
t2	330,0	330,0		°C
p1	48,0	49,5		bar(a)
p2	47,4	48,9		bar(a)
Cv	1.000,0	541,03		GPM(US)
qm	83.673,0	46.031,0		kg/h
qn	113.000,0	62.165,0		m³/h

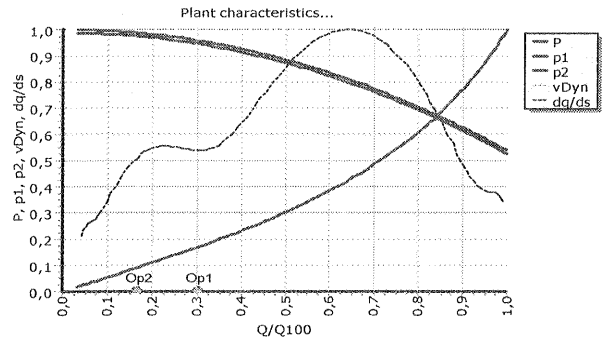
Δpc	**21,802**	**25,406**	bar(a)
η1	**0,02**	**0,02**	mPa s
κ	**1,191**	**1,191**	-
ρ1	**15,886**	**16,382**	kg/m³
ρ2	**15,687**	**16,184**	kg/m³
LpAa	**52,3**	**53,1**	dB(A)
u1	**14,732**	**7,859**	m/s
u2	**14,918**	**7,9554**	m/s
P	**88,34**	**47,117**	kW
MaDN	**0,024869**	**0,013261**	-
s/s100	**38,326**	**23,412**	%
Cv/Cv1...	**22,312**	**12,071**	%
Fd	**0,481**	**0,396**	-
FL²	**0,574**	**0,589**	-
xT	**0,534**	**0,603**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	

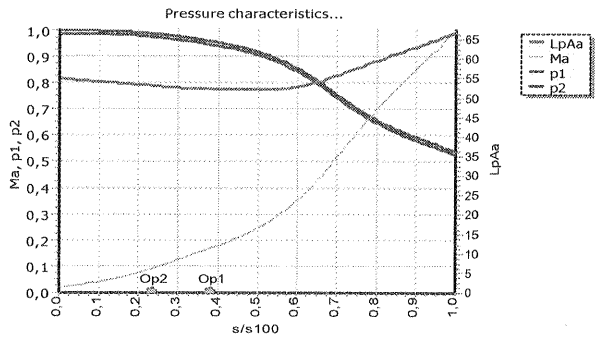
Control optimization

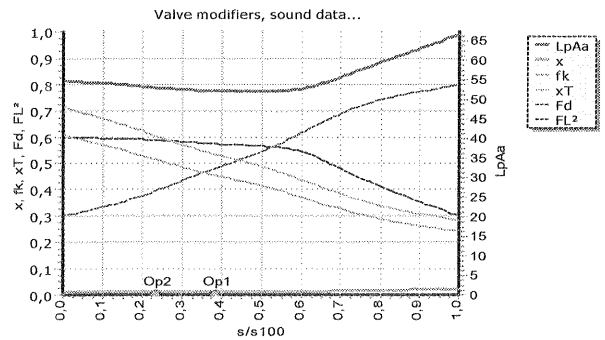
Valve authority (Δp100/Δp0)	vDyn	**1,0**	-
Calculated short-circuit performance	ax	**4,8286**	-

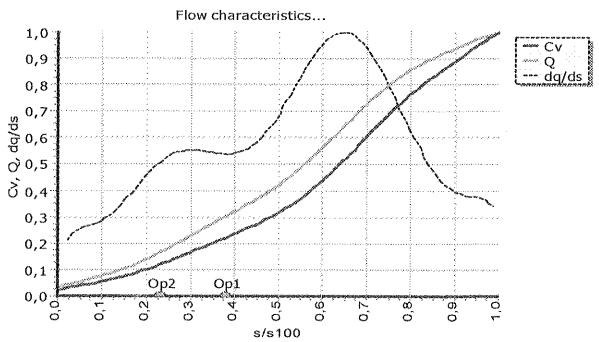
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,001	25,0	50,01	75,0	99,99
t1	°C	330,0	330,0	330,0	330,0	330,0
p1	bar(a)	50,08	49,39	46,04	35,29	26,94
p2	bar(a)	49,48	48,79	45,44	34,69	26,34
Cv	GPM(US)	172,3	587,5	1.414,0	3.095,0	4.481,0
qm	kg/h	14.760,0	49.920,0	115.700,0	220.000,0	274.900,0
qn	m³/h	19.930,0	67.410,0	156.300,0	297.100,0	371.200,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	1,0	1,0
ρ2	kg/m³	16,38	16,15	15,04	11,48	8,718
κ	-	1,191	1,191	1,191	1,191	1,191
LpAa	dB(A)	54,58	52,97	52,12	57,59	66,78
MaDN	-	4,202 E-3	0,01442	0,03588	0,08934	0,147
u2	m/s	2,521	8,647	21,53	53,59	88,18
cf	m/s	1.470,0	1.470,0	1.470,0	1.470,0	1.470,0









Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 17:33:23
Tag No.		**TV-100904B**	

Medium selection and state

Medium		**Natural - Purge Gas**	
Operating temperature	t1	**330,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**49,0**	bar(a)
Absolute pressure downstream of valve	p2	**48,8**	bar(a)
Flow coefficient	Cv	**2.188,0**	GPM(US)
○ Mass flow rate	qm	**107.370,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**145.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**17,332**	bar(a)
Critical real pressure difference	ΔpXc	**17,091**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**16,217**	kg/m³
Operating density (t2, p2)	ρ2	**16,151**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,02**	mPa s
Isentropic exponent (t1, p1)	κ	**1,191**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,74047**	kg/m³
○ Specific gas constant	R	**500,96**	J/(kg K)
◉ Molecular weight	M	**16,597**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer	**LEUSCH**
Series	**LDE Class 600**
Valve selection	**Cv: 4482, 14", Measured values (lin)**
☒ Valve from database	☒ Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**2.188,0**	GPM(US)
Selected flow coefficient	Cv100	**4.482,0**	GPM(US)
Selected valve size	DN	**14"**	
Flow velocity	u1	**18,518**	m/s
Flow velocity	u2	**18,594**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☒ Function for Fl²

☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	63,203	%
Valve load	Cv/Cv1...	48,818	%
Valve modifier (operating conditions)	FL²	0,527	-
Valve modifier (operating conditions)	xT	0,416	-
Valve style modifier (operating conditio...	Fd	0,64	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	14"	
Pressure class upstream of valve	PN1	Schedule 80	
○ Pipe outside diameter upstream of ...	Da1	14,0	in
Pipe wall thickness upstream of val...	s1	0,74803	in
○ Pipe inside diameter upstream of v...	Di1	12,504	in
Flow velocity in the pipe	u1R	23,214	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	14"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	14,0	in
Pipe wall thickness downstream of ...	s2	0,74803	in
○ Pipe inside diameter downstream o...	Di2	12,504	in
Flow velocity in the pipe	u2R	23,31	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,275	dB
Transmission loss	Rr	-80,3	dB
Sound pressure level	Lpi	114,0	dB
Sound power level	Lwi	88,7	dB
Sound pressure (0 m distance, A-weight...	LpAa	38,6	dB(A)
Sound pressure level of valve (A-weight...	LpAa	30,2	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,030996	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,02	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	330,0	326,0		°C
t2	330,0	326,0		°C
p1	49,0	48,0		bar(a)
p2	48,8	47,8		bar(a)
Cv	2.188,0	1.144,0		GPM(US)
qm	107.370,0	55.795,0		kg/h
qn	145.000,0	75.350,0		m³/h

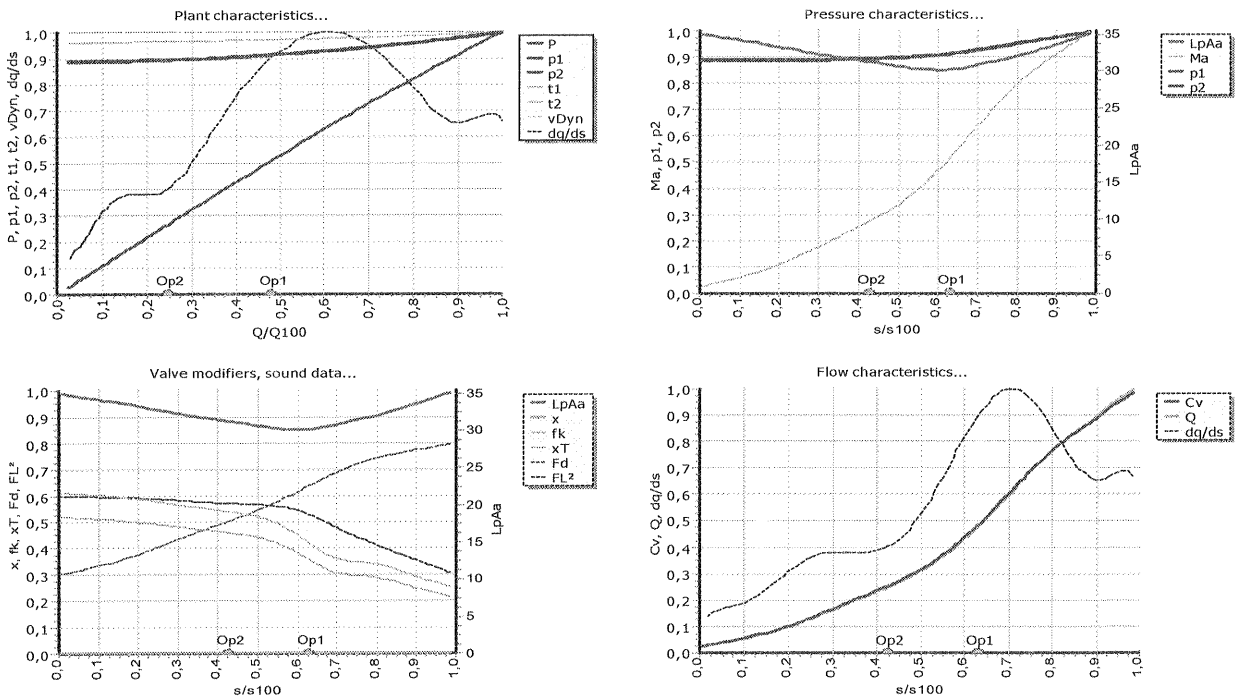
Δpc	**17,332**	**22,07**	bar(a)
η1	**0,02**	**0,02**	mPa s
κ	**1,191**	**1,191**	-
ρ1	**16,217**	**15,992**	kg/m³
ρ2	**16,151**	**15,925**	kg/m³
LpAa	**30,2**	**31,3**	dB(A)
u1	**18,518**	**9,7584**	m/s
u2	**18,594**	**9,7992**	m/s
P	**36,858**	**19,423**	kW
MaDN	**0,030996**	**0,016389**	-
s/s100	**63,203**	**42,824**	%
Cv/Cv1...	**48,818**	**25,525**	%
Fd	**0,64**	**0,504**	-
FL²	**0,527**	**0,571**	-
xT	**0,416**	**0,54**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	

Control optimization

Valve authority (Δp100/Δp0) vDyn **1,0** -

Characteristics values table

Caption	**Unit**	**5 [%]**	**25 [%]**	**50 [%]**	**75 [%]**	**99 [%]**
s/s100	%	5,005	25,0	50,0	75,0	98,64
t1	°C	324,6	324,9	326,8	335,7	348,1
p1	bar(a)	47,64	47,73	48,2	50,42	53,54
p2	bar(a)	47,44	47,53	48,0	50,22	53,34
Cv	GPM(US)	172,3	587,5	1.414,0	3.096,0	4.420,0
qm	kg/h	8.385,0	28.600,0	69.050,0	153.300,0	222.900,0
qn	m³/h	11.320,0	38.620,0	93.250,0	207.000,0	301.100,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	1,0	1,0
pv1	bar(a)					
κ	-	1,191	1,191	1,191	1,191	1,191
LpAa	dB(A)	34,63	32,76	30,7	31,44	35,14
MaDN	-	2,479 E-3	8,442 E-3	0,02021	0,0432	0,05976
u2	m/s	1,48	5,043	12,09	26,04	36,39
cf	m/s	1.470,0	1.470,0	1.470,0	1.470,0	1.470,0



Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 17:46:01
Tag No.		**TV-101204A**	

Medium selection and state

Medium		**Feed Gas**	
Operating temperature	t1	**400,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**45,6**	bar(a)
Absolute pressure downstream of valve	p2	**45,5**	bar(a)
Flow coefficient	Cv	**8.086,5**	GPM(US)
○ Mass flow rate	qm	**261.320,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**340.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**11,974**	bar(a)
Critical real pressure difference	ΔpXc	**12,448**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**14,035**	kg/m³
Operating density (t2, p2)	ρ2	**14,005**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s
Isentropic exponent (t1, p1)	κ	**1,207**	-

Physical constants

Formula		**H2O**	
Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,76858**	kg/m³
○ Specific gas constant	R	**482,64**	J/(kg K)
◉ Molecular weight	M	**17,227**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer	**LEUSCH**
Series	**LDE Class 900**
Valve selection	**Cv: 7395, 20", Measured values (lin)**
☒ Valve from database	☒ Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**8.086,5**	GPM(US)
Selected flow coefficient	Cv100	**8.870,0**	GPM(US)
Selected valve size	DN	**20"**	
Flow velocity	u1	**25,517**	m/s
Flow velocity	u2	**25,573**	m/s
Valve modifier (Cv/Cv100 = 0.75)	FL²	**0,42**	-
Valve modifier (Cv/Cv100 = 0.75)	xT	**0,343**	-

Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-
☐ Function for Fl²			
☐ Function for xT			

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	**92,017**	%
Valve load	Cv/Cv1...	**91,167**	%
Valve modifier (operating conditions)	FL²	**0,386**	-
Valve modifier (operating conditions)	xT	**0,305**	-
Valve style modifier (operating conditio...	Fd	**0,778**	-

Pipe upstream of valve

Flow velocity in the pipe	u1R	**31,724**	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	**20"**	
Pressure class downstream of valve	PN2	**Schedule 80**	
○ Pipe outside diameter downstream ...	Da2	**20,0**	in
Pipe wall thickness downstream of ...	s2	**1,0315**	in
○ Pipe inside diameter downstream o...	Di2	**17,937**	in
Flow velocity in the pipe	u2R	**31,793**	m/s
Material group		**Steel I**	
Density of pipeline	ρP	**7.850,0**	kg/m³
Sound velocity in pipe material	cP	**5.180,0**	m/s

Noise calculation

Calculation standard (noise)		**IEC 60534-8-3:2000**	

Calculated values

Low-noise design		**n.a.**	
Pressure level (mach no.)	ΔL,Ma	**0,362**	dB
Transmission loss	Rr	**-84,4**	dB
Sound power level	Lwi	**87,7**	dB
Sound pressure (0 m distance, A-weight...	LpAa	**30,0**	dB(A)
Sound pressure level of valve (A-weight...	LpAa	**22,9**	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	**0,040837**	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	**400,0**	**410,0**	**435,0**	°C
t2	**400,0**	**410,0**	**435,0**	°C
p1	**45,6**	**45,6**	**45,6**	bar(a)
p2	**45,5**	**45,3**	**45,3**	bar(a)
Cv	**8.086,5**	**2.356,8**	**1.410,7**	GPM(US)
qm	**261.320,0**	**130.660,0**	**76.858,0**	kg/h
qn	**340.000,0**	**170.000,0**	**100.000,0**	m³/h
Δpc	**11,974**	**20,092**	**22,574**	bar(a)
cf1	**626,21**	**630,85**	**642,29**	m/s
η1	**0,023**	**0,023**	**0,023**	mPa s
κ	**1,207**	**1,207**	**1,207**	-

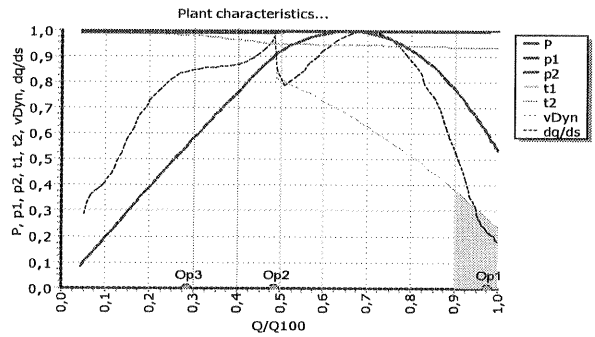
ρ1	**14,035**	**13,83**	**13,342**	kg/m³
ρ2	**14,005**	**13,739**	**13,254**	kg/m³
LpAa	**22,9**	**41,4**	**41,6**	dB(A)
u1	**25,517**	**12,948**	**7,8951**	m/s
u2	**25,573**	**13,034**	**7,9474**	m/s
P	**51,774**	**78,989**	**48,165**	kW
MaDN	**0,040837**	**0,02066**	**0,012374**	-
s/s100	**92,017**	**44,207**	**29,102**	%
Cv/Cv1...	**91,167**	**26,571**	**15,905**	%
Fd	**0,778**	**0,511**	**0,429**	-
FL²	**0,386**	**0,568**	**0,624**	-
xT	**0,305**	**0,511**	**0,574**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	**Turbulent flow Non-critical**	

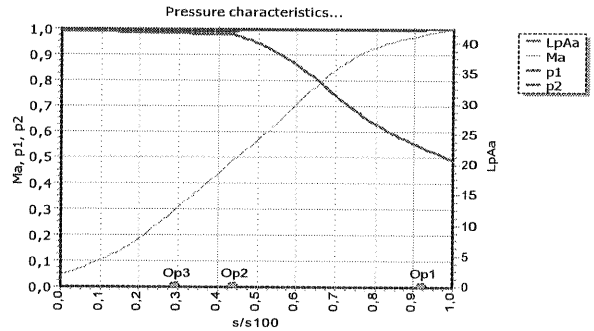
Control optimization

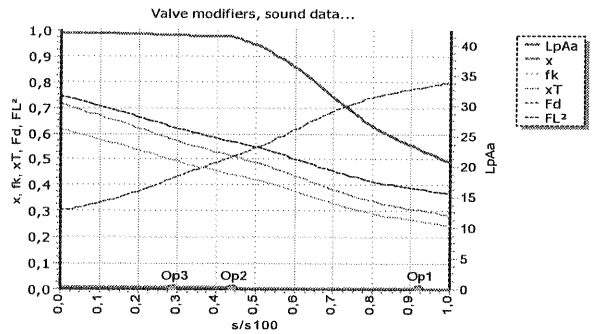
Valve authority (Δp100/Δp0)	vDyn ⚠	**0,237**	-
Calculated short-circuit performance	ax	**1,1726**	-

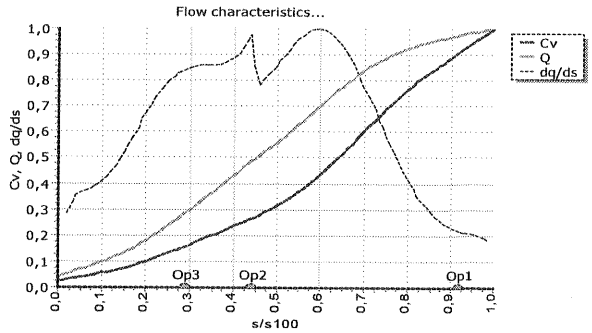
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,003	25,0	50,0	75,0	100,0
t1	°C	447,5	439,3	409,0	402,3	399,4
p1	bar(a)	45,6	45,6	45,6	45,6	45,6
p2	bar(a)	45,3	45,3	45,32	45,45	45,51
Cv	GPM(US)	341,0	1.163,0	2.798,0	6.126,0	8.870,0
qm	kg/h	18.430,0	63.170,0	149.800,0	238.100,0	267.600,0
qn	m³/h	23.980,0	82.180,0	194.800,0	309.800,0	348.200,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	0,7611	0,3963	0,2373
κ	-	1,207	1,207	1,207	1,207	1,207
LpAa	dB(A)	42,01	41,72	40,07	28,89	20,72
MaDN	-	2,993 E-3	0,0102	0,02365	0,03731	0,04179
u2	m/s	1,939	6,571	14,91	23,4	26,15
cf	m/s	1.470,0	1.470,0	1.470,0	1.470,0	1.470,0









Warning:

⚠ The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

ℹ Approximate value: Density of pipeline - ρP

Notes:

Selected flow coefficient - Cv100

CV 100 for Butterfly Valve Type WVTB 20 inch Class 900

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- ⚠ Warning
- ℹ Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	20.06.2005 17:52:22
Tag No.		**TV-101204B**	

Medium selection and state

Medium		**Feed Gas**	
Operating temperature	t1	**400,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**45,8**	bar(a)
Absolute pressure downstream of valve	p2	**45,7**	bar(a)
Flow coefficient	Cv	**4.983,3**	GPM(US)
○ Mass flow rate	qm	**161.400,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**210.000,0**	m³/h
Critical flow-related pressure difference	Δpc	**12,291**	bar(a)
Critical real pressure difference	ΔpXc	**12,735**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**14,097**	kg/m³
Operating density (t2, p2)	ρ2	**14,066**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,023**	mPa s
Isentropic exponent (t1, p1)	κ	**1,207**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,76858**	kg/m³
○ Specific gas constant	R	**482,64**	J/(kg K)
◉ Molecular weight	M	**17,227**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,0**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 4707, 16", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**4.983,3**	GPM(US)
Selected flow coefficient	Cv100	**5.650,0**	GPM(US)
Selected valve size	DN	**16"**	
Flow velocity	u1	**24,518**	m/s
Flow velocity	u2	**24,571**	m/s
Valve modifier (Cv/Cv100 = 0.75)	FL²	**0,42**	-
Valve modifier (Cv/Cv100 = 0.75)	xT	**0,343**	-
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-

☐ Function for Fl²
☐ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	89,317	%
Valve load	Cv/Cv1...	88,2	%
Valve modifier (operating conditions)	FL²	0,391	-
Valve modifier (operating conditions)	xT	0,311	-
Valve style modifier (operating conditio...	Fd	0,771	-

Pipe downstream of valve

◉ Size class downstream of valve	DN2	16"	
Pressure class downstream of valve	PN2	Schedule 80	
○ Pipe outside diameter downstream ...	Da2	16,0	in
Pipe wall thickness downstream of ...	s2	0,84252	in
○ Pipe inside diameter downstream o...	Di2	14,315	in
Flow velocity in the pipe	u2R	30,697	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise) **IEC 60534-8-3:2000**

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,349	dB
Transmission loss	Rr	-84,5	dB
Sound power level	Lwi	85,4	dB
Sound pressure (0 m distance, A-weight...	LpAa	29,6	dB(A)
Sound pressure level of valve (A-weight...	LpAa	21,7	dB(A)

Minor noise prediction data

Mach number (valve outlet) MaDN 0,039238 -

Viscosity and laminar flow

Dynamic viscosity (t1,p1) η1 0,023 mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	400,0	370,0	380,0	°C
t2	400,0	370,0	380,0	°C
p1	45,8	45,8	45,8	bar(a)
p2	45,7	45,5	45,5	bar(a)
Cv	4.983,3	2.014,2	1.081,7	GPM(US)
qm	161.400,0	115.290,0	61.486,0	kg/h
qn	210.000,0	150.000,0	80.000,0	m³/h
Δpc	12,291	18,531	21,827	bar(a)
cf1	626,21	612,1	616,84	m/s
η1	0,023	0,023	0,023	mPa s
κ	1,207	1,207	1,207	-
ρ1	14,097	14,755	14,529	kg/m³
ρ2	14,066	14,658	14,433	kg/m³
LpAa	21,7	40,2	40,2	dB(A)
u1	24,518	16,732	9,0626	m/s

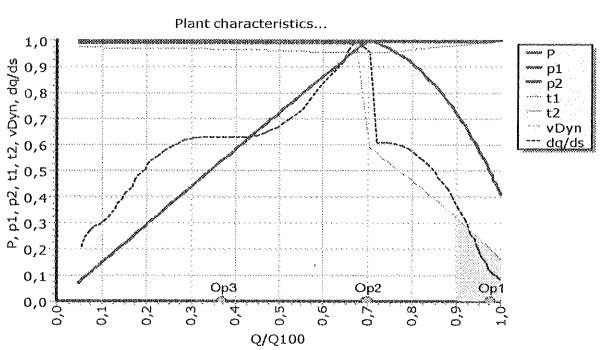
u2	**24,571**	**16,843**	**9,1224**	m/s
P	**31,839**	**65,328**	**35,383**	kW
MaDN	**0,039238**	**0,027516**	**0,014789**	-
s/s100	**89,317**	**53,863**	**33,758**	%
Cv/Cv1...	**88,2**	**35,649**	**19,145**	%
Fd	**0,771**	**0,57**	**0,456**	-
FL²	**0,391**	**0,531**	**0,605**	-
xT	**0,311**	**0,469**	**0,553**	-
	Turbulent flow Non-critical	**Turbulent flow Non-critical**	**Turbulent flow Non-critical**	

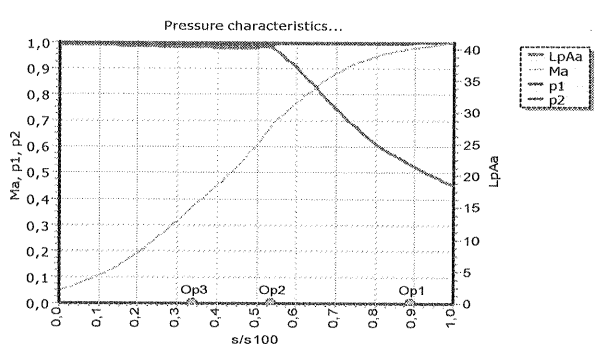
Control optimization

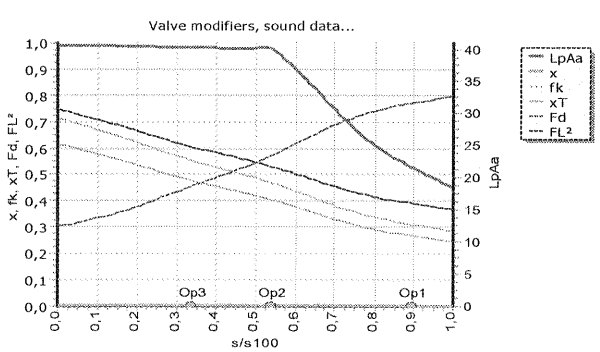
Valve authority (Δp100/Δp0)	vDyn	**0,16**	-
Calculated short-circuit performance	ax	**1,1157**	-

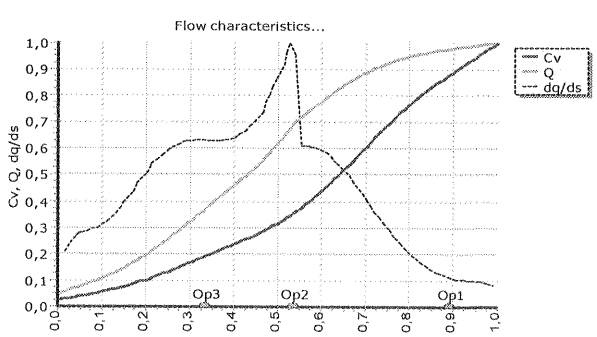
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,001	25,0	50,01	74,99	100,0
t1	°C	383,8	382,1	373,1	393,4	402,8
p1	bar(a)	45,8	45,8	45,8	45,8	45,8
p2	bar(a)	45,5	45,5	45,5	45,66	45,72
Cv	GPM(US)	217,1	740,6	1.783,0	3.902,0	5.650,0
qm	kg/h	12.320,0	42.040,0	101.800,0	152.400,0	165.000,0
qn	m³/h	16.030,0	54.700,0	132.500,0	198.300,0	214.700,0
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	0,2837	0,1605
pv1	bar(a)					
κ	-	1,207	1,207	1,207	1,207	1,207
LpAa	dB(A)	40,62	40,36	40,18	27,63	18,45
MaDN	-	2,972 E-3	0,01013	0,02436	0,0369	0,04018
u2	m/s	1,838	6,258	14,95	23,0	25,21
cf	m/s	1.470,0	1.470,0	1.470,0	1.470,0	1.470,0









Warning:

The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

Approximate value: Density of pipeline - ρP

Notes:

Selected flow coefficient - Cv100

CV 100 for Butterfly Valve Type WVTB 16 inch Class 900

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Warning
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 08:44:51
Tag No.		**TV-200521A**	

Medium selection and state

Medium		**Recycle Gas**	
Operating temperature	t1	**120,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**77,0**	bar(a)
Absolute pressure downstream of valve	p2	**76,9**	bar(a)
Flow coefficient	Cv	**15.770,0**	GPM(US)
○ Mass flow rate	qm	**708.900,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**1,3955 E 6**	m³/h
Critical flow-related pressure difference	Δpc	**22,795**	bar(a)
Critical real pressure difference	ΔpXc	**23,343**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**27,089**	kg/m³
Operating density (t2, p2)	ρ2	**27,054**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,014**	mPa s
Isentropic exponent (t1, p1)	κ	**1,35**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,50799**	kg/m³
○ Specific gas constant	R	**723,0**	J/(kg K)
◉ Molecular weight	M	**11,5**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,01**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 10809, 24", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**15.770,0**	GPM(US)
Selected flow coefficient	Cv100	**17.505,0**	GPM(US)
Selected valve size	DN	**24"**	
Flow velocity	u1	**24,906**	m/s
Flow velocity	u2	**24,939**	m/s
Valve modifier (Cv/Cv100 = 0.75)	FL^2	**0,42**	-
Valve modifier (Cv/Cv100 = 0.75)	xT	**0,343**	-

Valve style modifier (Cv/Cv100 = 1)	Fd	0,8	-
☐ Function for Fl²			
☐ Function for xT			

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	91,035	%
Valve load	Cv/Cv1...	90,086	%
Valve modifier (operating conditions)	FL²	0,388	-
Valve modifier (operating conditions)	xT	0,307	-
Valve style modifier (operating conditio...	Fd	0,776	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	24"	
Pressure class upstream of valve	PN1	Schedule 60	
○ Pipe outside diameter upstream of ...	Da1	24,0	in
Pipe wall thickness upstream of val...	s1	0,9685	in
○ Pipe inside diameter upstream of v...	Di1	22,063	in
Flow velocity in the pipe	u1R	29,472	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	24"	
Pressure class downstream of valve	PN2	Schedule 60	
○ Pipe outside diameter downstream ...	Da2	24,0	in
Pipe wall thickness downstream of ...	s2	0,9685	in
○ Pipe inside diameter downstream o...	Di2	22,063	in
Flow velocity in the pipe	u2R	29,51	m/s
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,339	dB
Transmission loss	Rr	-88,6	dB
Sound pressure level	Lpi	106,0	dB
Sound power level	Lwi	84,1	dB
Sound pressure (0 m distance, A-weight...	LpAa	23,2	dB(A)
Sound pressure level of valve (A-weight...	LpAa	16,7	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,040259	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,014	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	120,0	120,0	120,0	°C
t2	120,0	120,0	120,0	°C
p1	77,0	77,0	77,0	bar(a)
p2	76,9	76,9	76,9	bar(a)
Cv	15.770,0	14.297,0	677,46	GPM(US)

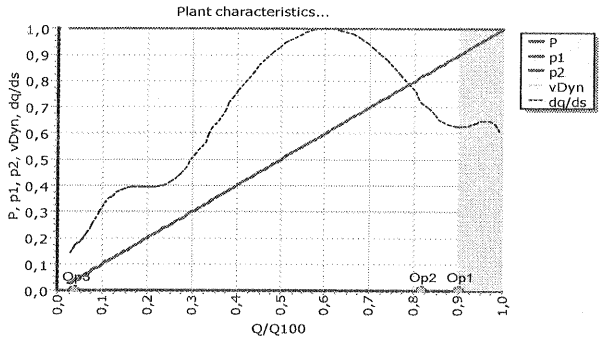
qm	708.900,0		642.780,0		30.479,0			kg/h
qn	1,3955	E 6	1,2653	E 6	60.000,0			m³/h
Δpc	22,795		24,247		51,382			bar(a)
cf1	619,46		619,46		619,46			m/s
η1	0,014		0,014		0,014			mPa s
κ	1,35		1,35		1,35			-
ρ1	27,089		27,089		27,089			kg/m³
ρ2	27,054		27,054		27,054			kg/m³
LpAa	16,7		16,3		15,1			dB(A)
u1	24,906		22,583		1,0709			m/s
u2	24,939		22,613		1,0722			m/s
P	72,74		65,955		3,1275			kW
MaDN	0,040259		0,036504		1,7309	E -3		-
s/s100	91,035		83,675		5,0872			%
Cv/Cv1...	90,086		81,676		3,8701			%
Fd	0,776		0,755		0,318			-
FL²	0,388		0,405		0,728			-
xT	0,307		0,327		0,692			-
	Turbulent flow Non-critical		Turbulent flow Non-critical		Turbulent flow Non-critical			

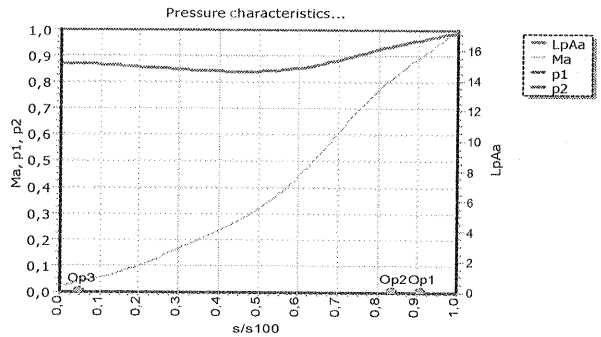
Control optimization

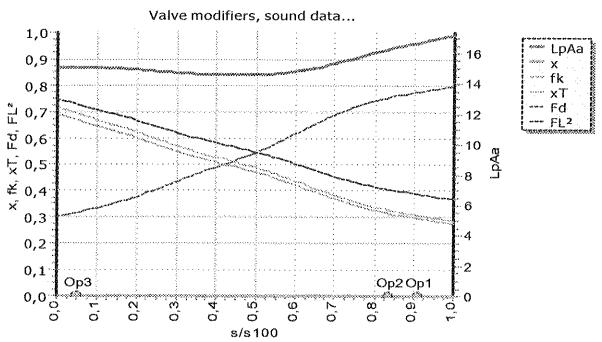
Valve authority (Δp100/Δp0) vDyn ⚠ **1,0** -

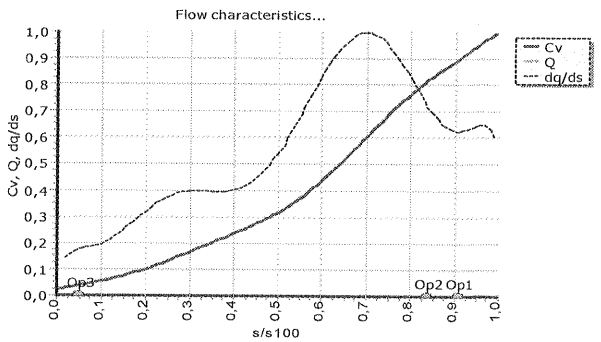
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	100 [%]
s/s100	%	5,004	25,0	50,01	75,0	99,91
t1	°C	120,0	120,0	120,0	120,0	120,0
p1	bar(a)	77,0	77,0	77,0	77,0	77,0
p2	bar(a)	76,9	76,9	76,9	76,9	76,9
Cv	GPM(US)	672,9	2.294,0	5.523,0	12.090,0	17.490,0
qm	kg/h	30.280,0	103.200,0	248.400,0	543.600,0	786.100,0
qn	m³/h	59.600,0	203.200,0	489.100,0	1,07 E6	1,548 E6
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	1,0	1,0
κ	-	1,35	1,35	1,35	1,35	1,35
LpAa	dB(A)	15,11	14,83	14,63	15,71	17,22
MaDN	-	1,719 E-3	5,862 E-3	0,01411	0,03087	0,04465
u2	m/s	1,065	3,631	8,74	19,12	27,66
cf	m/s					









Warning:

⚠ The flow reserve to control Q,max is too low. Therefore the control quality is limited.

Hint:

ℹ Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Modified database value
- Warning
- Hint

Calculation header

Identifier		**2004-63047 Methanol ZAGROS**	
Author		**uwinkel**	20.06.2005 13:09:47
Editor		**uwinkel**	21.06.2005 08:43:12
Tag No.		**TV-200521B**	

Medium selection and state

Medium		**Recycle Gas**	
Operating temperature	t1	**56,0**	°C
State		**Gaseous (Standard conditions)**	
Gas		**Gas, dry**	

First operating point (max. flow)

Calculation		**Kv/Cv**	
Absolute pressure upstream of valve	p1	**77,5**	bar(a)
Absolute pressure downstream of valve	p2	**76,9**	bar(a)
Flow coefficient	Cv	**5.910,8**	GPM(US)
○ Mass flow rate	qm	**708.900,0**	kg/h
◉ Volume flow rate (standard conditio...	qn	**1,3955 E 6**	m³/h
Critical flow-related pressure difference	Δpc	**24,748**	bar(a)
Critical real pressure difference	ΔpXc	**25,008**	bar(a)
Type of flow		**Non-critical**	
State of flow		**Turbulent flow**	

Properties at first operating point

Operating density (t1, p1)	ρ1	**32,566**	kg/m³
Operating density (t2, p2)	ρ2	**32,314**	kg/m³
◉ Dynamic viscosity (t1,p1)	η1	**0,016**	mPa s
Isentropic exponent (t1, p1)	κ	**1,35**	-

Physical constants

Standard conditions		**0°C, 1013 mbar**	
○ Density (standard conditions, dry g...	ρn	**0,50799**	kg/m³
○ Specific gas constant	R	**723,0**	J/(kg K)
◉ Molecular weight	M	**11,5**	kg/kmol
Real gas factor (standard conditions)	Zn	**1,01**	-

Valve selection

Valve manufacturer		**LEUSCH**
Series		**LDE Class 900**
Valve selection		**Cv: 7395, 20", Measured values (lin)**
☒ Valve from database	☒	Valve data can be modified

Valve data

Size and pressure class according to		**ANSI**	
Valve type		**Butterfly valve**	
Basic characteristic (IEC 60534-2-4)		**Measured values (lin)**	
Flow direction		**FTO**	
Flow coefficient	Cv	**5.910,8**	GPM(US)
Selected flow coefficient	Cv100	**7.395,0**	GPM(US)
Selected valve size	DN	**20"**	
Flow velocity	u1	**29,833**	m/s
Flow velocity	u2	**30,066**	m/s
Valve style modifier (Cv/Cv100 = 1)	Fd	**0,8**	-
☒ Function for Fl²			

☒ Function for xT

Load-dependent auxiliary values

Stroke/angle-of-rotation ratio	s/s100	82,308	%
Valve load	Cv/Cv1...	79,929	%
Valve modifier (operating conditions)	FL^2	0,398	-
Valve modifier (operating conditions)	xT	0,331	-
Valve style modifier (operating conditio...	Fd	0,75	-

Pipe upstream of valve

◉ Size class upstream of valve	DN1	20"	
Pressure class upstream of valve	PN1	Schedule 60	
○ Pipe outside diameter upstream of ...	Da1	20,0	in
Pipe wall thickness upstream of val...	s1	0,81102	in
○ Pipe inside diameter upstream of v...	Di1	18,378	in
Flow velocity in the pipe	u1R	35,331	m/s

Pipe downstream of valve

◉ Size class downstream of valve	DN2	20"	
Pressure class downstream of valve	PN2	Schedule 60	
○ Pipe outside diameter downstream ...	Da2	20,0	in
Pipe wall thickness downstream of ...	s2	0,81102	in
○ Pipe inside diameter downstream o...	Di2	18,378	in
Flow velocity in the pipe	u2R	35,607	m/s
Material number		1.0038 R St 37-2	
Material group		Steel I	
Density of pipeline	ρP	7.850,0	kg/m³
Sound velocity in pipe material	cP	5.180,0	m/s

Noise calculation

Calculation standard (noise)		IEC 60534-8-3:2000	

Calculated values

Low-noise design		n.a.	
Pressure level (mach no.)	ΔL,Ma	0,451	dB
Transmission loss	Rr	-78,7	dB
Sound power level	Lwi	105,0	dB
Sound pressure (0 m distance, A-weight...	LpAa	56,0	dB(A)
Sound pressure level of valve (A-weight...	LpAa	48,9	dB(A)

Minor noise prediction data

Mach number (valve outlet)	MaDN	0,053044	-

Viscosity and laminar flow

Dynamic viscosity (t1,p1)	η1	0,016	mPa s

Further operating points

	Maximum flow	Mean flow	Minimum flow	
t1	56,0	56,0	56,0	°C
t2	56,0	56,0	56,0	°C
p1	77,5	77,5	77,5	bar(a)
p2	76,9	76,9	76,9	bar(a)
Cv	5.910,8	5.357,5	253,2	GPM(US)
qm	708.900,0	642.780,0	30.479,0	kg/h
qn	1,3955 E 6	1,2653 E 6	60.000,0	m³/h

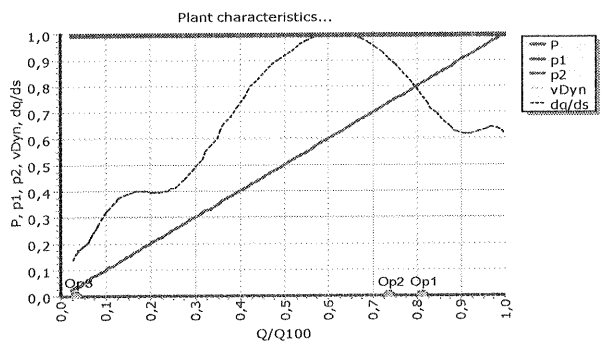
Δpc	24,748	25,886	45,453	bar(a)
cf1	566,8	566,8	566,8	m/s
η1	0,016	0,016	0,016	mPa s
κ	1,35	1,35	1,35	-
ρ1	32,566	32,566	32,566	kg/m³
ρ2	32,314	32,314	32,314	kg/m³
LpAa	48,9	48,0	50,2	dB(A)
u1	29,833	27,05	1,2827	m/s
u2	30,066	27,261	1,2927	m/s
P	364,21	330,24	15,659	kW
MaDN	0,053044	0,048097	2,2807 E -3	-
s/s100	82,308	77,102	3,6208	%
Cv/Cv1...	79,929	72,448	3,4239	%
Fd	0,75	0,729	0,313	-
FL²	0,398	0,43	0,597	-
xT	0,331	0,346	0,608	-
	Turbulent flow Non-critical	Turbulent flow Non-critical	Turbulent flow Non-critical	

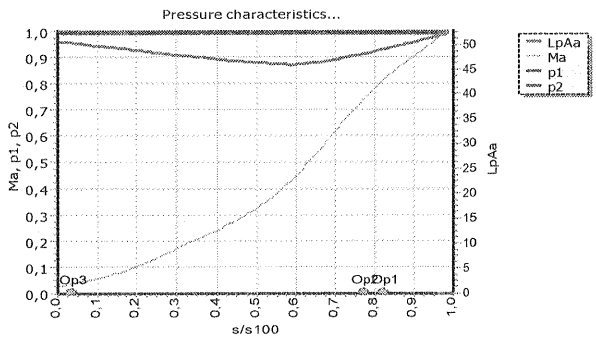
Control optimization

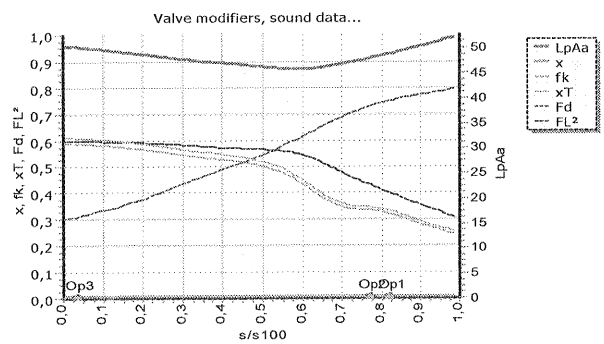
Valve authority (Δp100/Δp0) vDyn **1,0** -

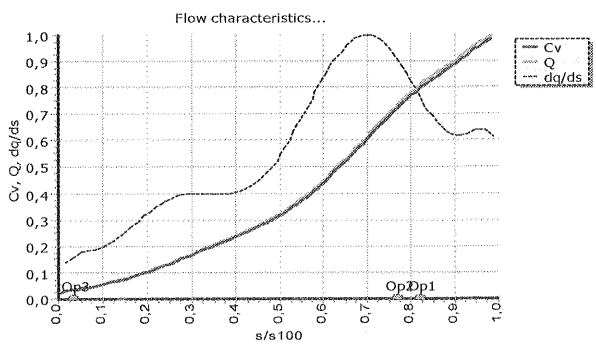
Characteristics values table

Caption	Unit	5 [%]	25 [%]	50 [%]	75 [%]	99 [%]
s/s100	%	5,0	25,0	50,0	75,0	98,56
t1	°C	56,0	56,0	56,0	56,0	56,0
p1	bar(a)	77,5	77,5	77,5	77,5	77,5
p2	bar(a)	76,9	76,9	76,9	76,9	76,9
Cv	GPM(US)	284,2	969,4	2.333,0	5.108,0	7.286,0
qm	kg/h	34.210,0	116.700,0	280.700,0	612.800,0	871.600,0
qn	m³/h	67.350,0	229.700,0	552.500,0	1,206 E6	1,716 E6
Type of flow	-	Non-critical	Non-critical	Non-critical	Non-critical	Non-critical
vDyn	-	1,0	1,0	1,0	1,0	1,0
pv1	bar(a)					
κ	-	1,35	1,35	1,35	1,35	1,35
LpAa	dB(A)	50,11	48,26	46,32	47,67	52,18
MaDN	-	2,56 E-3	8,73 E-3	0,021	0,04586	0,06522
u2	m/s	1,451	4,948	11,9	25,99	36,97
cf	m/s					









Hint:

- Approximate value: Density of pipeline - ρP

Legend

- Calculated value
- Modified calculated value
- Lookup value
- Hint

Quote/order no.:	525 000	Customer:	LURGI - PIDEC
Project:	4th Methanol Plant	Date:	05.07.2005

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

SAMSON
Valve Sizing Specialist Version 1.16

Process and medium data

			Case 1	Case 2	Case 3
Flow	W	[kg/h]	17984.38	11648.74	
Inlet pressure	p1	[bar(a)]	67.9	67.9	
Outlet pressure	p2	[bar(a)]	3.5	3.5	
Inlet temperature	T1	[°C]	40	40	
Normal density	rhoN	[kg/m³]	0.51	0.51	
Real gas factor	Z	[-]	1	1	
Isentropic coefficient	gamma	[-]	1.4	1.4	
Inlet viscosity	ny1	[cSt]	0.47	0.47	

Total results

Flow coeff. calculated	**Cv**	**[gpm]**	**24.5**	**15.9**
Different. pressure ratio	x	[-]	0.95	0.95
Outlet velocity	w	[Ma]	0.18	0.12
SPL (VDMA 24422 mod.)	**LA**	**[dB(A)]**	**86.9**	**80.9**

Valve results

Flow coeff. calculated	**Cv**	**[gpm]**	**25.1**	**16**
Min req. size	Req. DN	[mm]	77.3	76.3
Outlet velocity	w	[Ma]	0.28	0.27
relative travel	T	[%]	91.86	80.4
Different. pressure ratio	x	[-]	0.79	0.86

Valve and attenuation plates data

Body type	*Globe Valve*			*Series*	*3250*
Flow coeff. with att. plates	*Cv*		*33*	*Type*	*3251*
Flow coeff. without att. plates	*Cv*		*35*	*Body material*	*A216 WCB*
Nominal size		*[inch]*	*3*	*Trim material*	*4571 / 316Ti*
Pressure ratings	*Class*		*600*	*Noise reduction*	*Flow div. III with p2-att.*
Travel	*S*	*[mm]*	*30*	*Number of att. plates*	*3*
Seat bore	*SB*	*[mm]*	*50*	*Charcteristic*	*Equal percent. 50:1*
Stem diameter	*Sd*	*[mm]*	*16*	*Flow direction*	*FTO*
Packing	*PTFE (3,2)*			*Balanced*	*Without (0)*
Sealing	*Lapped-in (20)*			*Leakage rate*	*V*
Bonnet	*Standard*				

Pipe data

Type of pipe	Steel	Pipe insulation	none	D1	[inch]	3	D2	[inch]	8
cR [m/s]	5100	rho [kg/m³]	7800	di	[mm]	193.7	s	[mm]	12.7

Actuator data

Type			**3271**	**Fail safe act.**	**stem extends**		
Diaphr. area	**A**	**[cm²]**	**1400**	**Bench range**	**psO**	**[bar]**	**1.6 ... 2.4**
				Supply	**psu**	**[bar]**	**2.6**

(Defaults: p1max [bar(a)] 68 p2min [bar(a)] 1.01 t1max [°C] 100)

Actuator results

req. act. force	Fa req.	[kN]	16.46	req. diff. psu-ps100	d ps	[bar]	0.01
max. act. force	Fmax.	[kN]	57.41	Actuator force	Fa	[kN]	22.4
max. dp on plug	d pmax	[bar]	97.14	Close safety factor	Fa/Fa req. (SF)		1.36
req. start bench range	ps0req.	[bar]	1.29				

Quote/order no.:	525 000	Customer:	LURGI - PIDEC
Project:	4th Methanol Plant	Date:	05.07.2005

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

SAMSON
Valve Sizing Specialist Version 1.16

More calculation data

More attenuation plates data

Type	3381-3				
Diameter of att. plates	D	[inch]	8		
Diameter of bores	d	[mm]	5		
			1. att. plate	2. att. plate	3. att. plate
Code			DN200-016A	DN200-018A	DN200-023A
Max. differential pressure	dp	[bar]	7		
Body	yes				

More valve results

			Case 1	Case 2
Flow	W	[kg/h]	17984.38	11648.74
Inlet pressure	p1	[bar(a)]	67.9	67.9
Outlet pressure	p2	[bar(a)]	14.25	9.48
SPL (VDMA 24422 1989)	LA	[dB(A)]	76.8	73.3
FL value	FL	[-]	0.94	0.96
xT value	xT	[-]	0.76	0.78
Valve style factor	Fd	[-]	0.44	0.42
Level exponent	G1	[-]	-5.26	-5.32
Slope exponent	G2	[-]	1.03	0.7

More actuator results

req. act. force	Fa req.	[kN]	16	16
Actuator force	Fa	[kN]	22.4	22.4
max. act. force	Fmax.	[kN]	64.07	64.07
req. diff. psu-ps100	d ps	[bar]	0.01	0.01
max. dp on plug	d pmax	[bar]	97.14	97.14
req. start bench range	ps0req.	[bar]	1.26	1.26
Close safety factor	Fa/Fa req. (SF)		1.4	1.4
Open safety factor	Ff/Fw		16.93	16.93

Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority by Lurgi. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

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**		**FIRST ISSUE**
01	**159**	**V12/sro**	**2005-06-20**	**V12/lf**	**V12/di**	**2005-06-27**		**SECOND ISSUE**
02	**161**	**V12/sro**	**2005-07-01**	**V12/lf**	**V12/di**	**2005-07-05**	**FINAL**	**FINAL ISSUE**