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cryo and vacuum technology
Thinking in solutions

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info@DeMaCo.nl
www.DeMaCo.nl
Kvk 37079728
Bank 65.12.13.134

p080364
Max Planck Institut fur Kernphysik
Gerda

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cryo and vacuum technology
Thinking in solutions

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www.DeMaCo.nl
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Bank 65.12.13.134

Index databook

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364*
Revision : *02*

Enclosed and mentioned below are the documents to be delivered by DeMaCo Holland BV.
The documents are according the contractuel agreement and the applicable European directives.

No.	***Documents***	***Rev.***	***Remarks***
01.	*Drawings*	*02*	*None*
02.	*Quality- & work procedures*	*00*	*None*
03.	*Radiographic testing summary*	*00*	*None*
04.	*Welding summary*	*00*	*None*
05.	*Test certificates*	*02*	*None*
06.	*User manuals*	*01*	*None*

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
Signature :

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www.DeMaCo.nl
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Bank 65.12.13.134

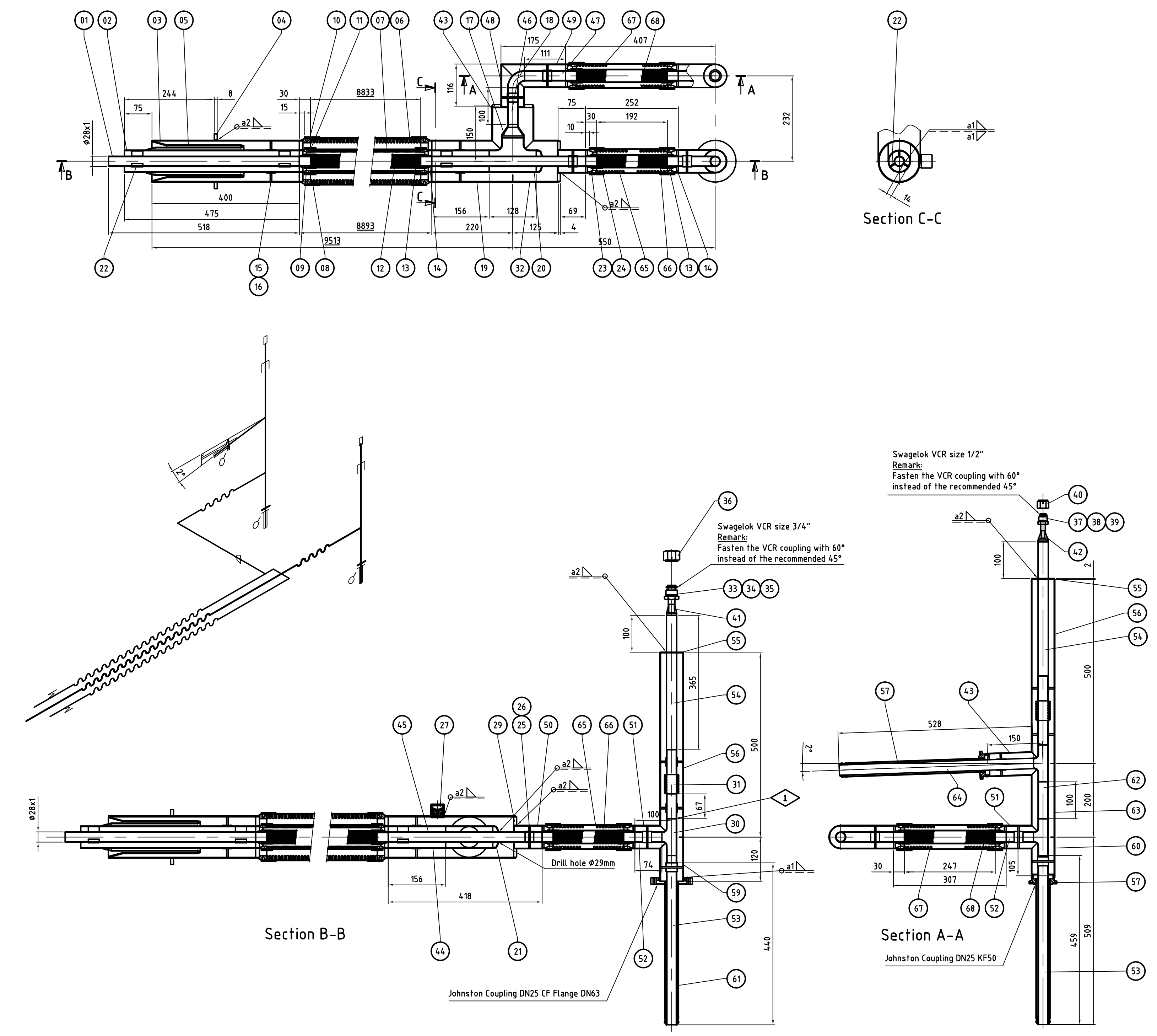
1. Drawings

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364*
Revision : *02*

Enclosed and mentioned below are the documents to be delivered by DeMaCo Holland BV.
The documents are according the contractuel agreement and the applicable European directives.

No.	***Documents***	***Rev.***	***Remarks***
1.	*As-Built drawing nr. 42951*	*D*	*None*
2.	*As-Built drawing nr. 080364-01-05-00*	*B*	*None*
3.	*As-Built drawing nr. 080364-01-00-00*	*I*	*None*
4.	*As-Built drawing nr. 080364-01-04-00*	*B*	*None*
5.	*As-Built drawing nr. 080364-01-06-00*	*A*	*None*
6.	*As-Built drawing nr. 080364-00-00-00*	*G*	*None*
7.	*As-Built drawing nr. 080364 01-02-00*	*A*	*None*
8.	*As-Built drawing nr. 47153*	*A*	

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
Signature :



Attention:
- DN 25= LAR, DN 50= LIN
- Coldshock
- He pressure tests
- X-ray
- Extra cleaning check

ALL DETAILS IN TESTPLAN

DeMaCo Holland BV
As Built
By: K.Özhazinedar
Date: 26-02-2009

B	27-10-2008 DSU
C	26-2-2009 KO

Drawn: DSU	Date: 3-10-2008
Checked: EDV	Am. proj.
Approved:	Scale: 1:5

Tolerances unless stated otherwise acc. ISO 2768 -m K

Edges of undefined shape acc. ISO 13715 -0.5 +0.5

Roughness acc. ISO 4287 Ra in μm

All welding acc. DEN-15 unless stated otherwise

INLET TRIAX FLEX LINE AN001
Spool 1

Project:

Customer:

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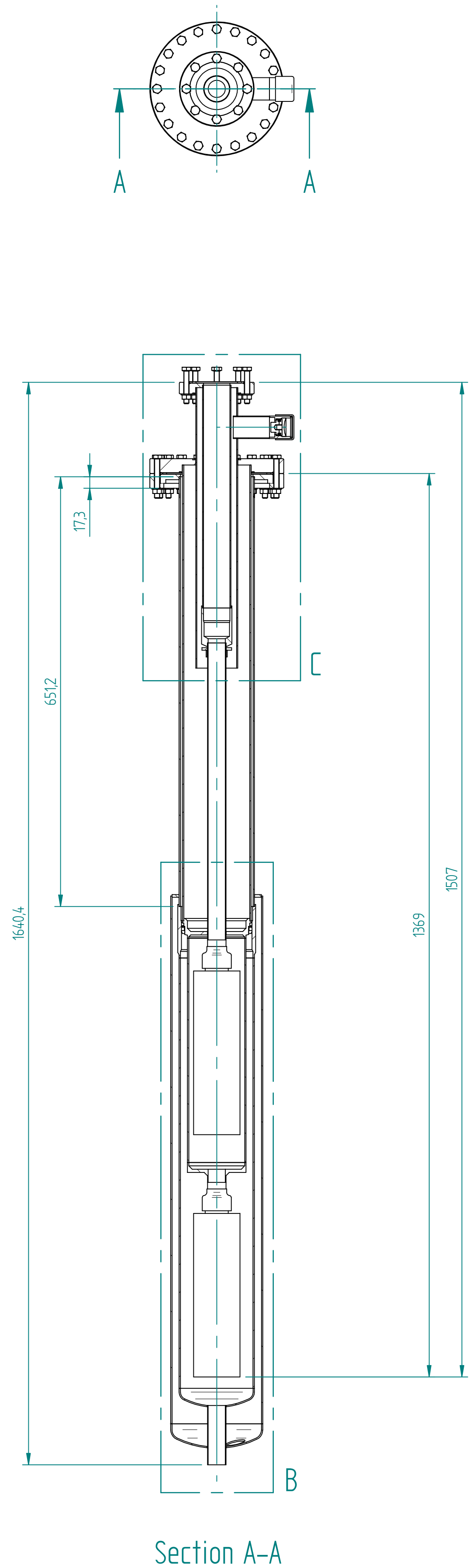
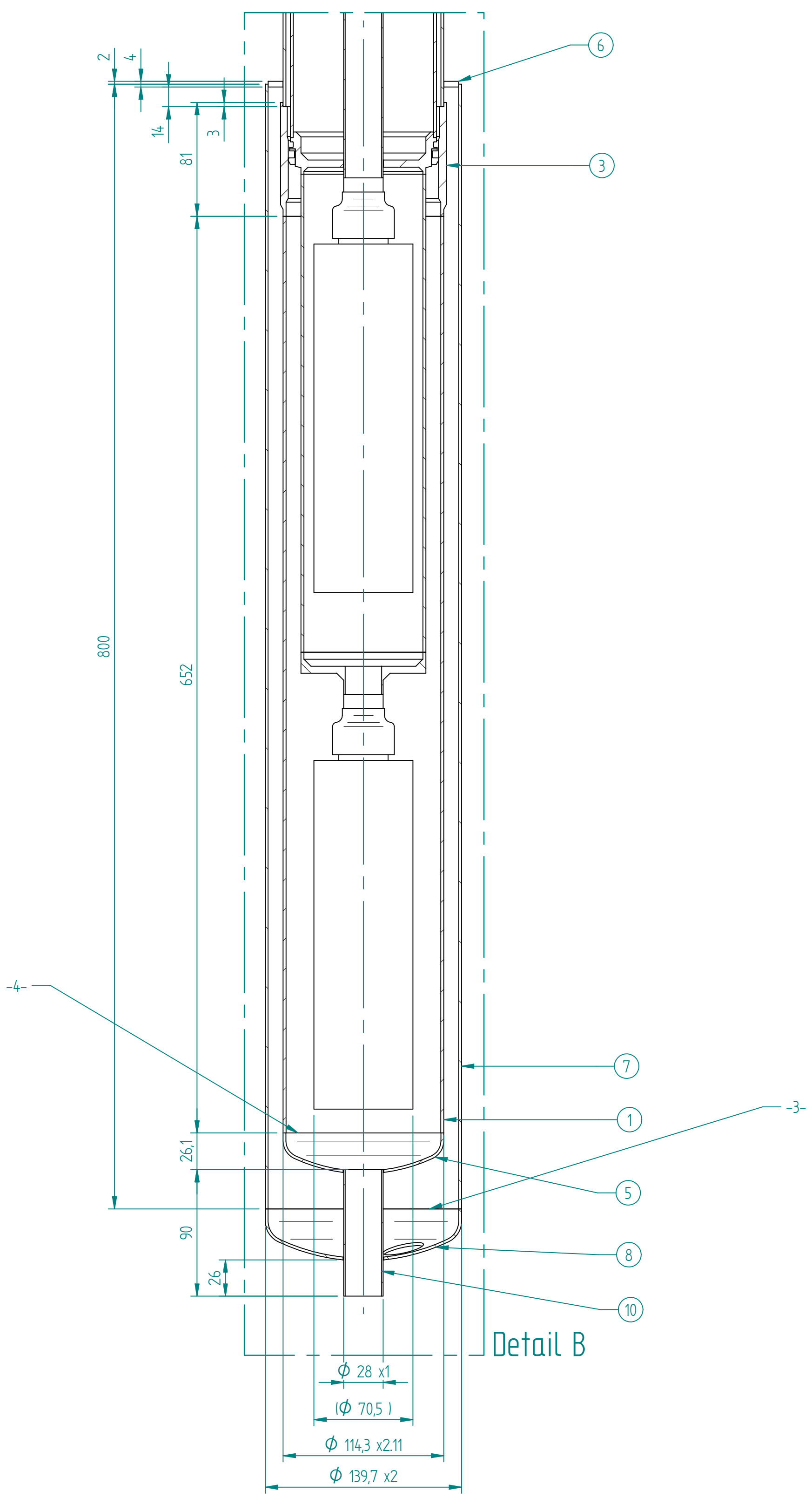
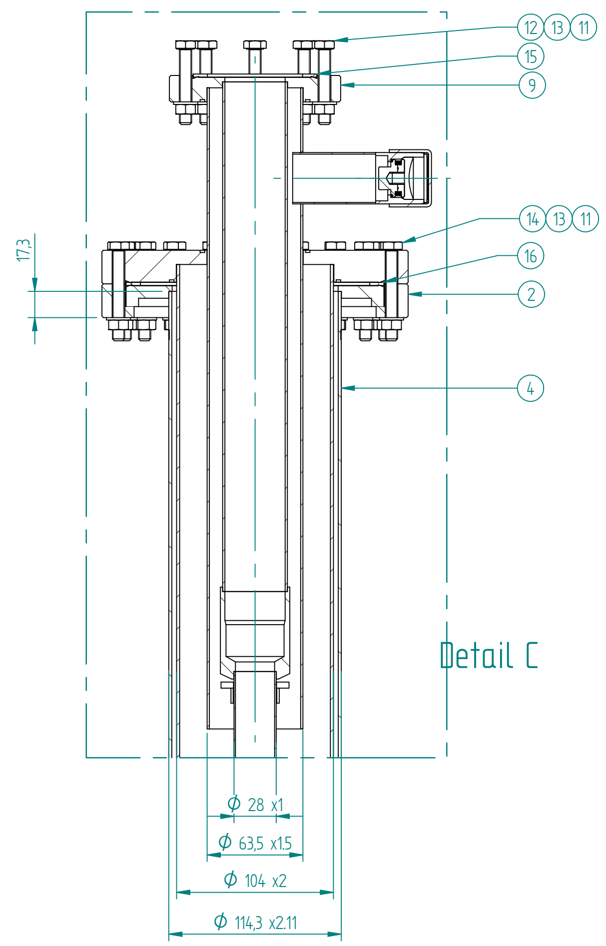
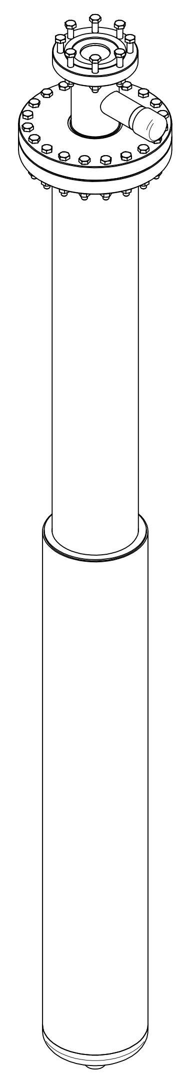
42951 C | Form. 1 | Rev. C

P:\Opdrachtfase\08\080248\42951C10.DWG









DeMaCo Holland BV
As Built

By: EdV
Date: 2009

Drawn: edv	Date: 1-4-2009	Status: Available	Tolerances unless stated otherwise acc. ISO 2768 m K	Edges of undefined shape acc. ISO 13715 -0.5 +0.5	Roughness acc. ISO 4287 Ra in mm	All welding acc. DEN-15 unless stated otherwise
Checked:	Am. proj.	Printed: 1-4-2009				
Approved:	Scale: N.A.	Mass:0,00 kg				

Filter construction AF103 J.C.

–

Project:

Customer: –

Description: Rev. B Date: Drawn: Check:

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080364-01-05-00	Sheet 0	Form A1	Rev. B

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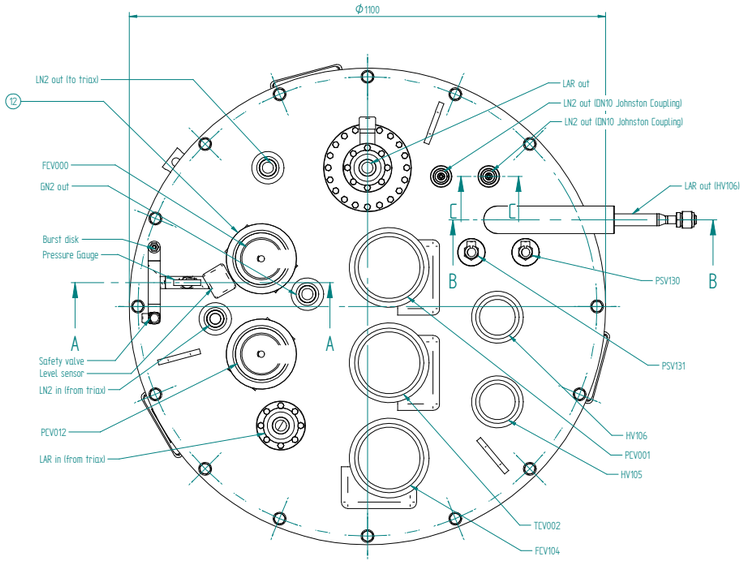
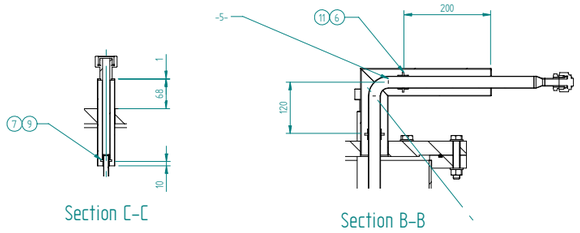
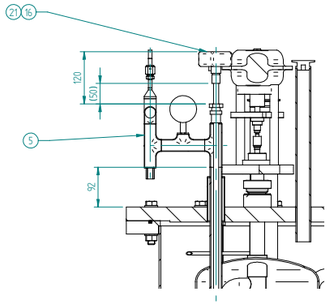




Section C-C

Section B-B



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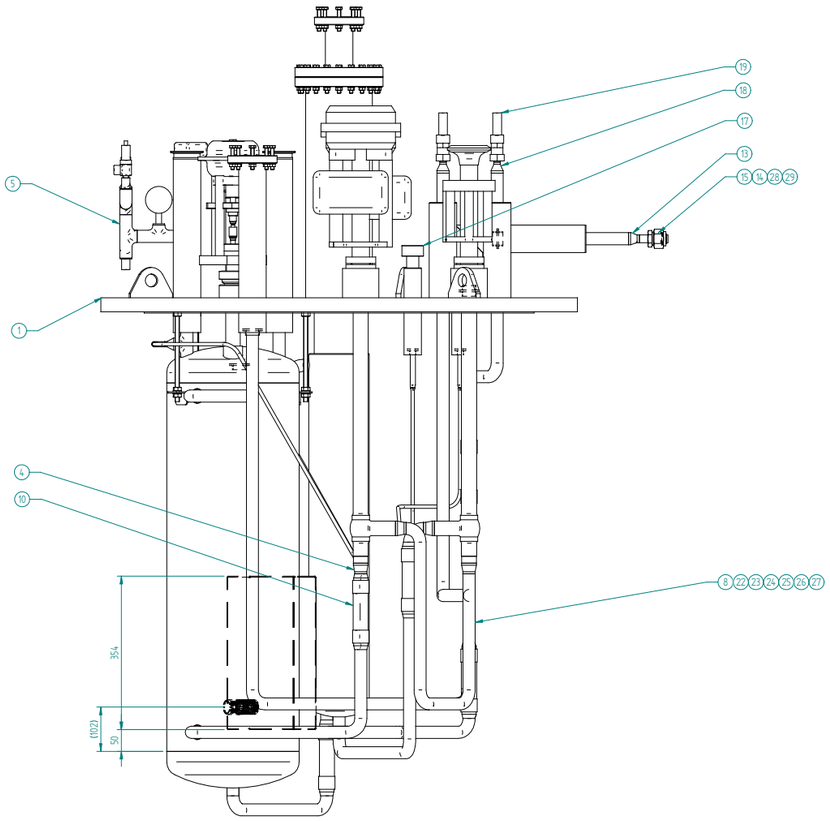

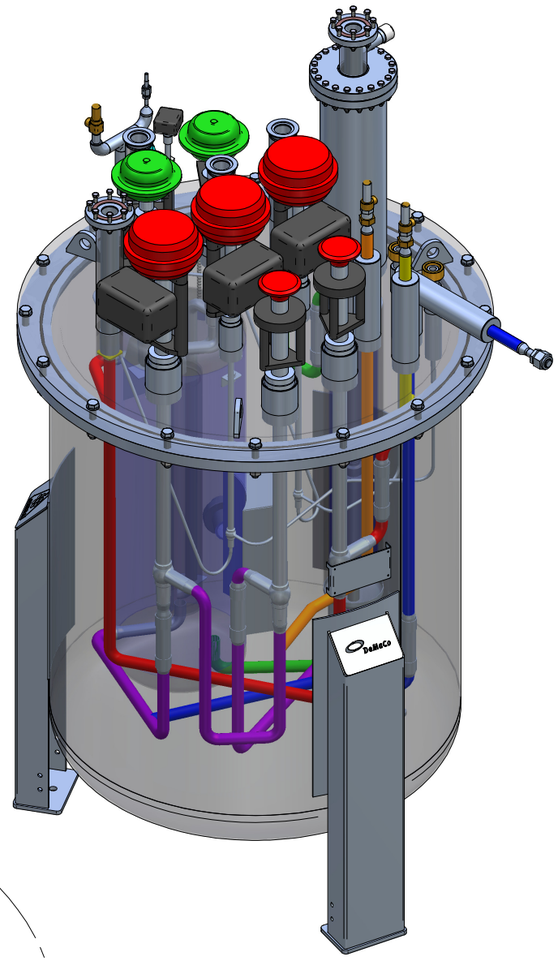

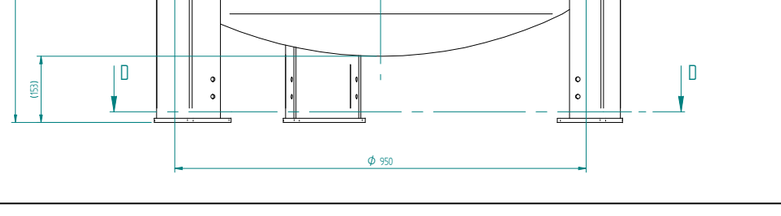

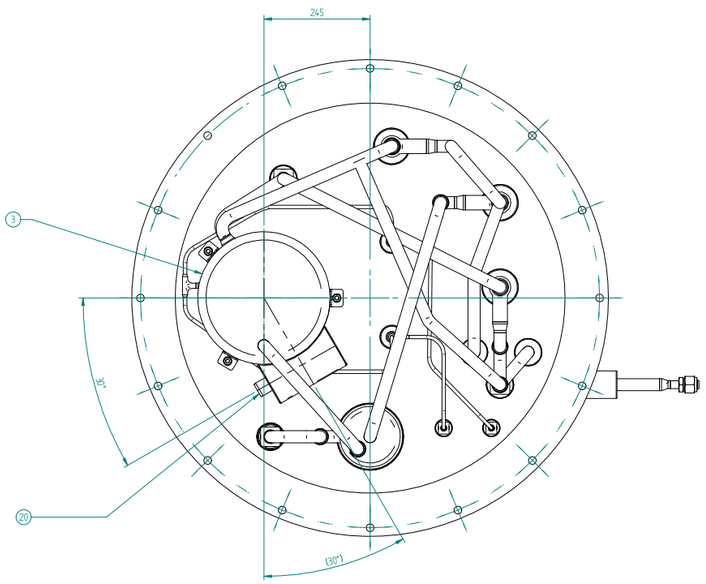

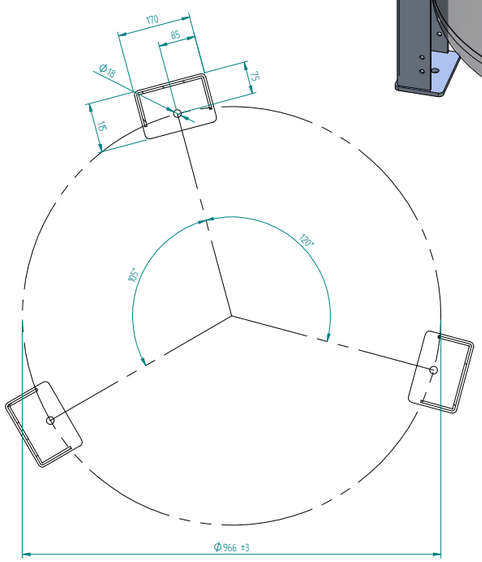

Section D-D

DeMaCo Holland BV
As Built

By: EdV
Date: 2009

Attention:
Medium: LAR and LN2
Pressure: LAR PN16
Pressure: LN2 PN10

Tests:
Cold shock
He pressuretest
X-ray
Extra cleaning check

ALL DETAILS IN TESTPLAN

Drawn: edv	Date: 1-4-2009	Status: Available	Tolerances unless stated otherwise acc. ISO 2768 m K	Edges of undefined shape acc. ISO 13715	Roughness acc. ISO 4287 Ra in mm	All welding acc. DEN-15 unless stated otherwise
Checked: ML	Am. proj.	Printed: 1-4-2009				
Approved:	Scale: N.A.	Mass:719,13 kg				

Valve box

Project: GERDA

Customer: MPI

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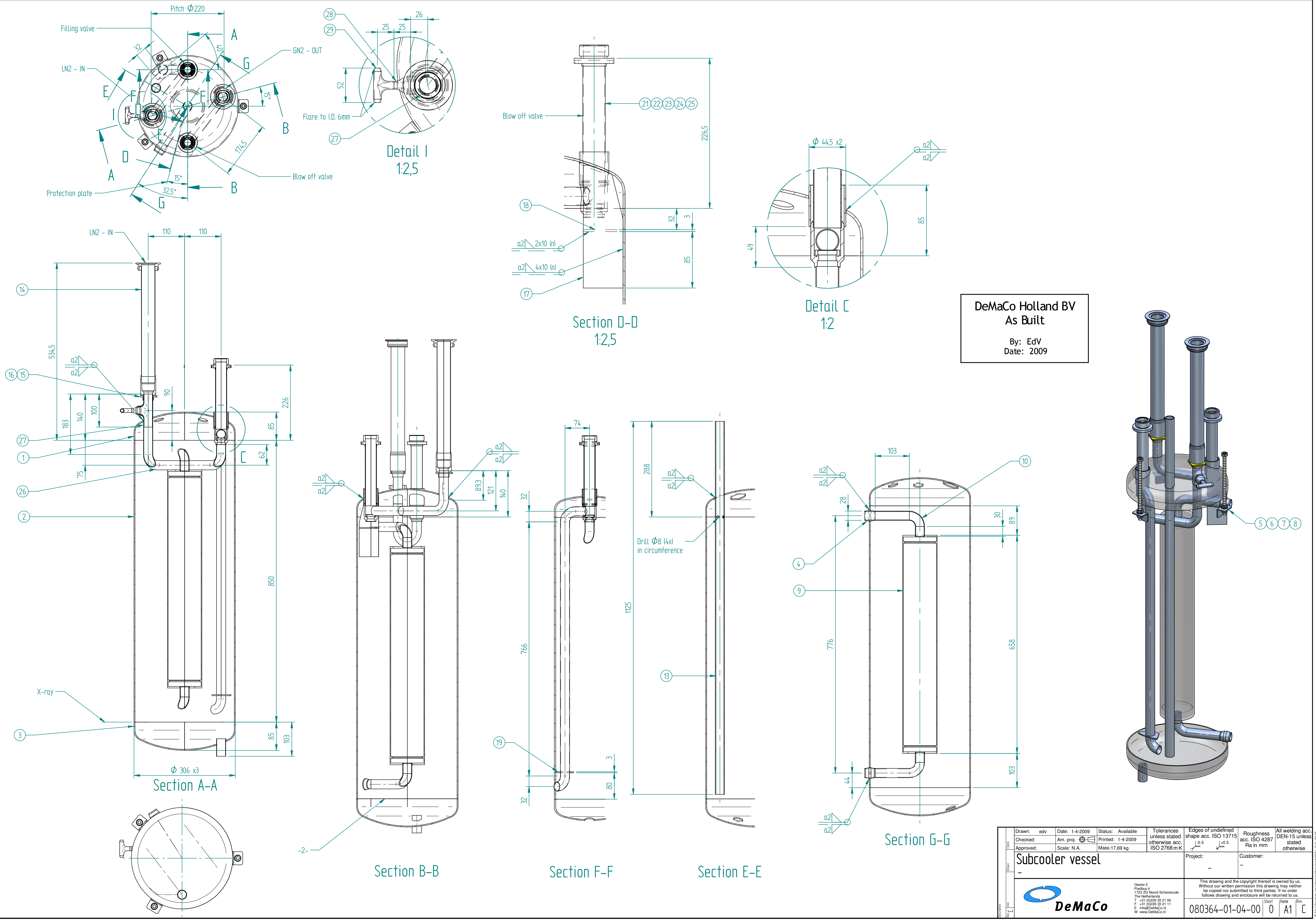
W www.DeMaCo.nl

080364-01-00-00 | Sheet 0 | Form A0 | Rev 1



Drawn: edv	Date: 1-4-2009	Status: Available	Tolerances unless stated otherwise acc. ISO 2768 m K	Edges of undefined shape acc. ISO 13715	Roughness acc. ISO 4287 Ra in mm	All welding acc. DEN-15 unless stated otherwise
Checked:	Am. proj.	Printed: 1-4-2009				
Approved:	Scale: N.A.	Mass:17,69 kg				

Subcooler vessel

–

Project: –

Customer: –

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080364-01-04-00	Sheet 0	Form A1	Rev. C

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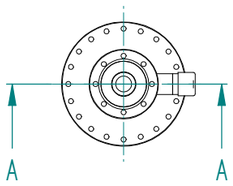

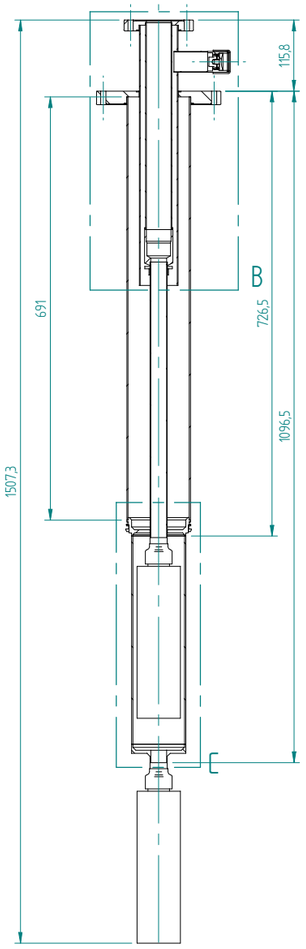

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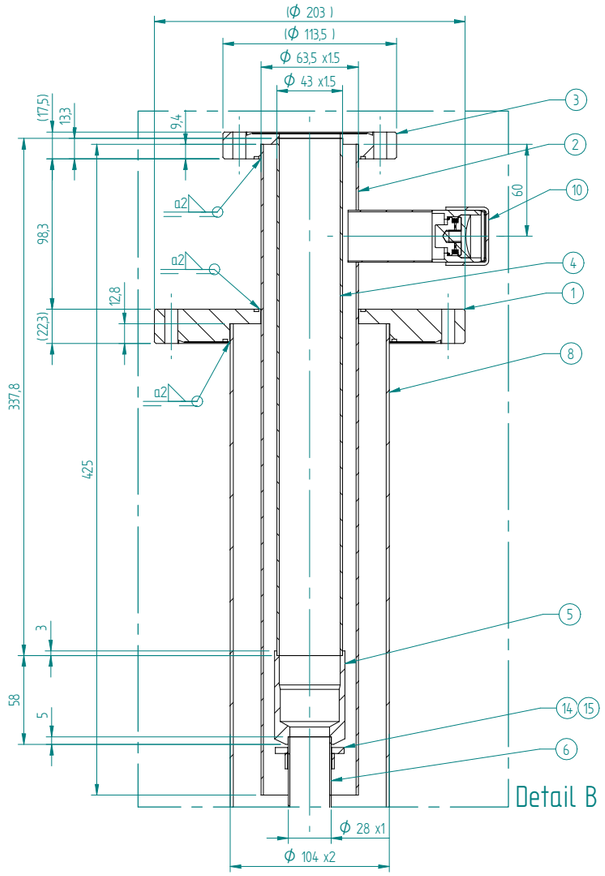

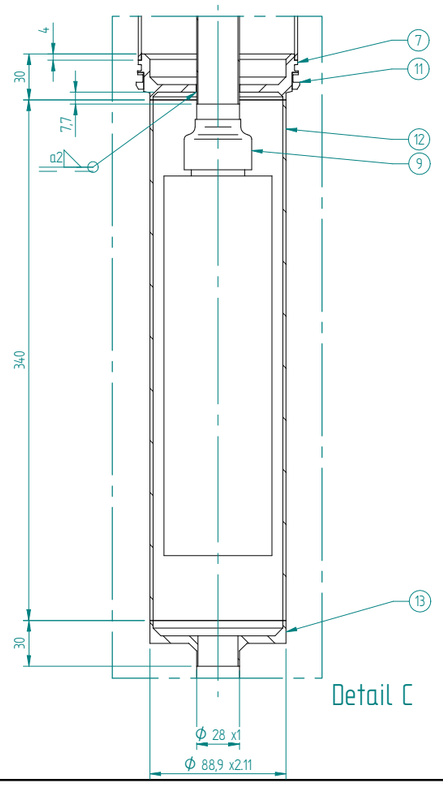

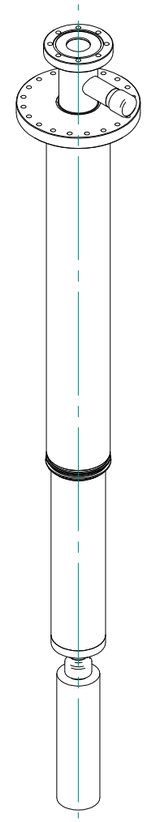

DeMaCo Holland BV
As Built

By: EdV
Date: 2009

Drawn: EDV	Date: 1-4-2009	Status: Available	Tolerances unless stated otherwise acc. ISO 2768 m K	Edges of undefined shape acc. ISO 13715	Roughness acc. ISO 4287 Ra in mm	All welding acc. DEN-15 unless stated otherwise
Checked:	Am. proj.	Printed: 1-4-2009				
Approved:	Scale: N.A.	Mass:0,00 kg				

Filter AF103 3" Male DN25 Female

Project: –

Customer: –

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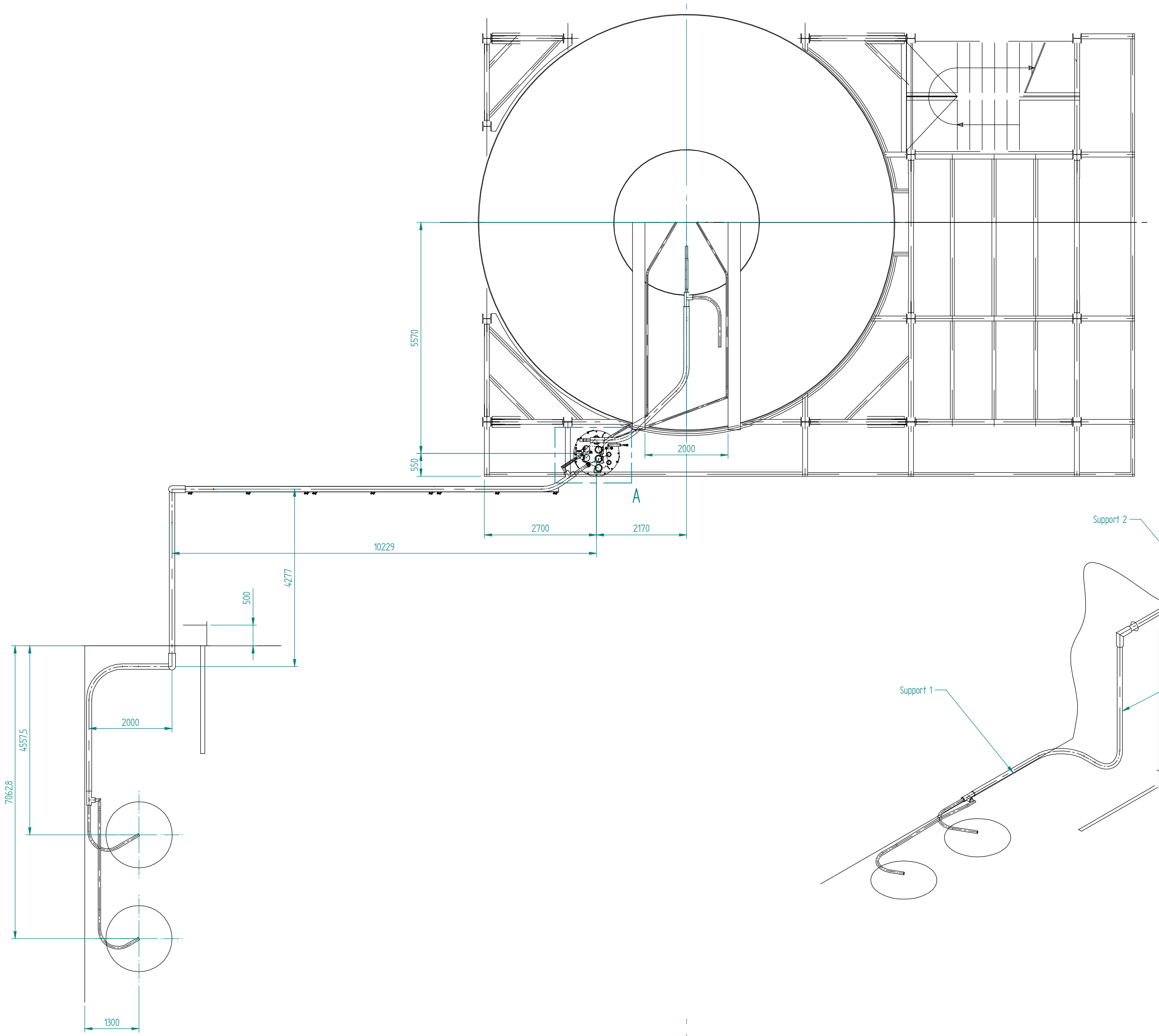
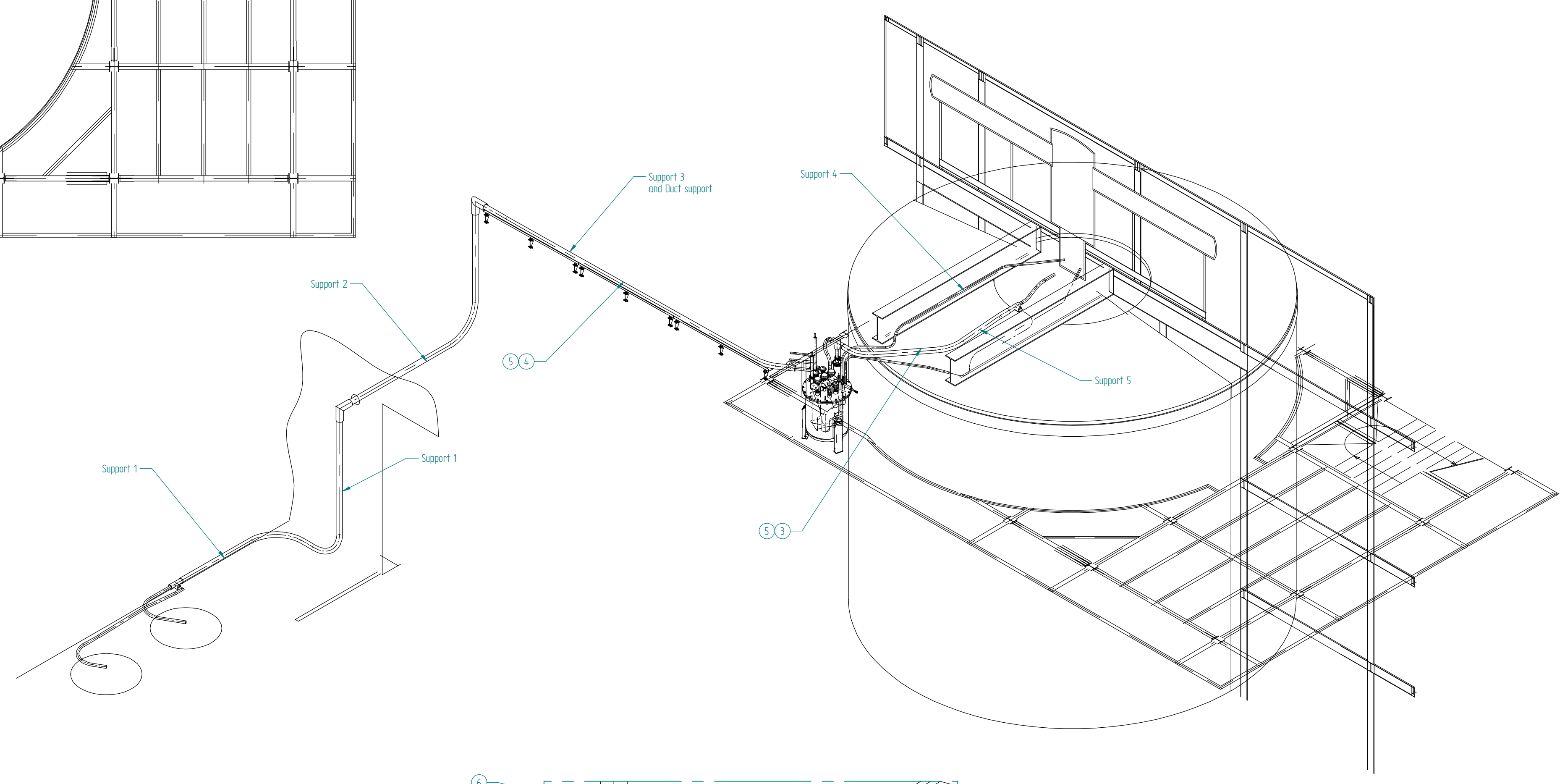
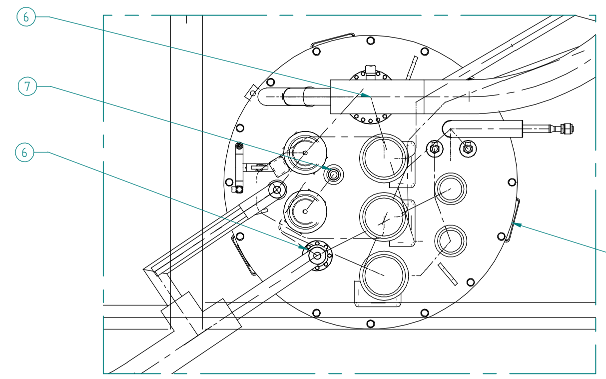
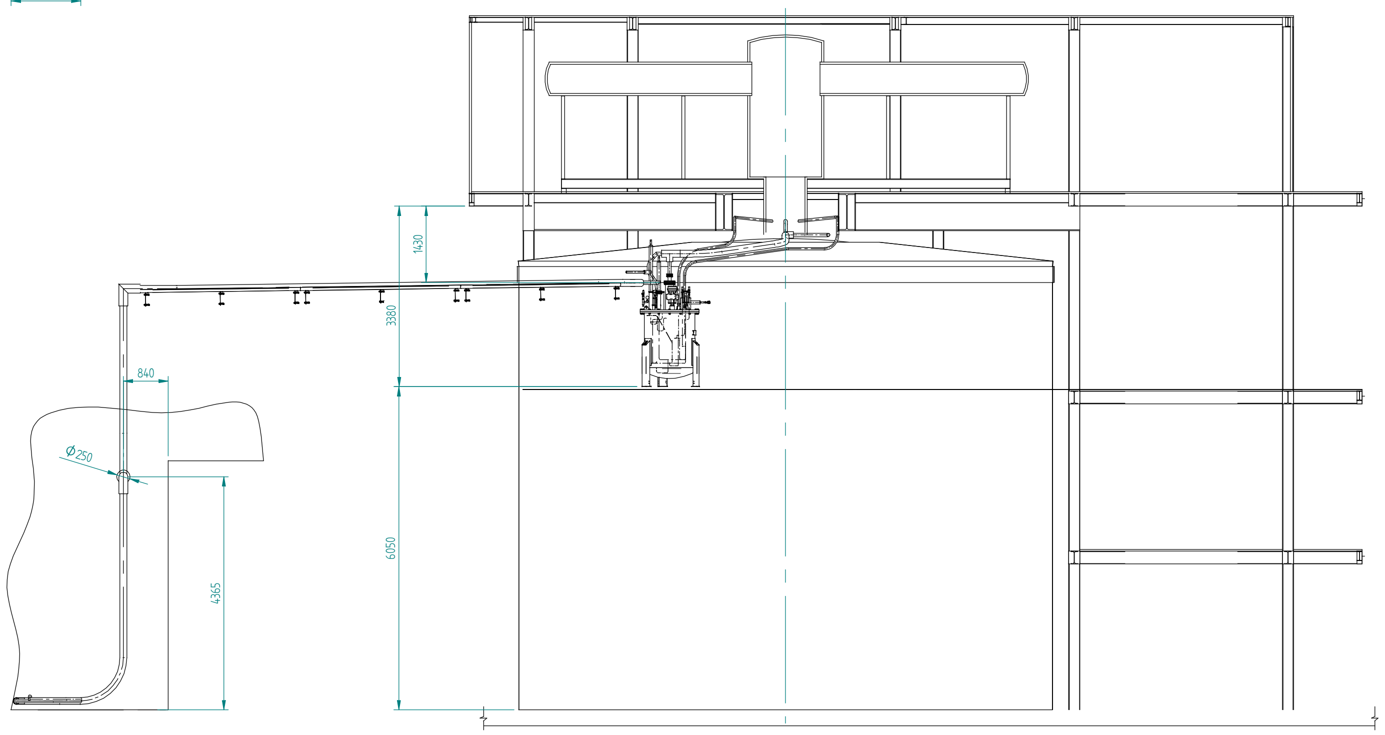
Drawing number	Sheet	Form	Rev.
080364-01-06-00	0	A1	A







Detail A



Attention:
Medium: LARand LN2
Pressure: LAR PN16
Pressure: LN2 PN10

Tests:
Cold shock
He pressuretest
X-ray
Extra cleaning check

ALL DETAILS IN TESTPLAN

DeMaCo Holland BV
As Built

By: EdV
Date: 2009

Drawn: edv	Date: 1-4-2009	Status: Available	Tolerances unless stated otherwise acc. ISO 2768 m K	Edges of undefined shape acc. ISO 13715 -0,5 +0,5	Roughness acc. ISO 4287 Ra in mm	All welding acc. DEN-15 unless stated otherwise
Checked:	Am. proj.	Printed: 1-4-2009				
Approved:	Scale: N.A.	Mass:0,00 kg				

General Arrangement
–

Project:

Customer:
MPI
GERDA

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The Netherlands
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080364-00-00-00 Sheet 0 Form A0 Rev. G

Description: Rev. G Date: Drawn: Check:

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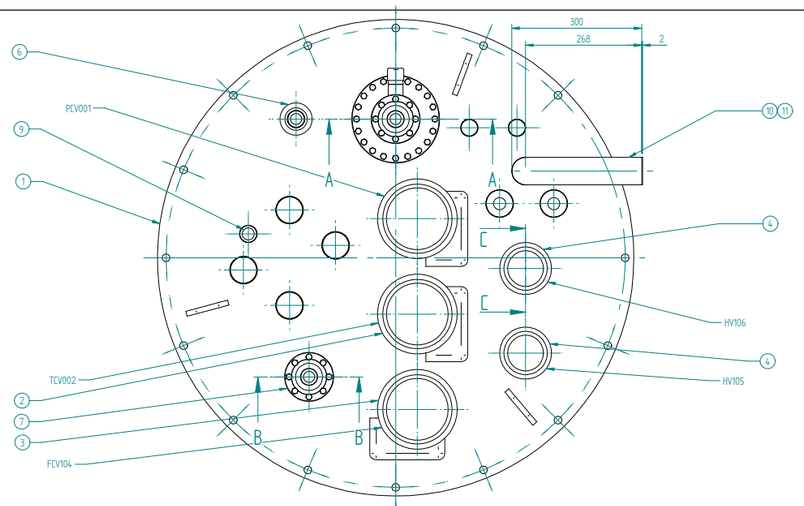

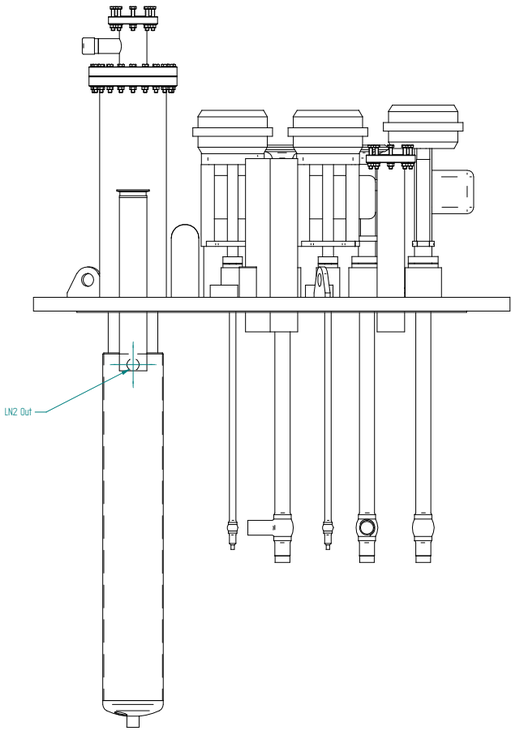

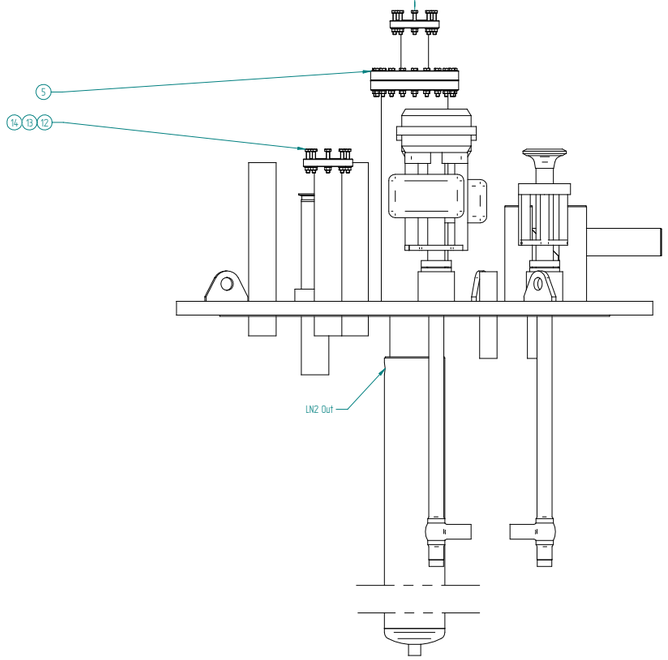

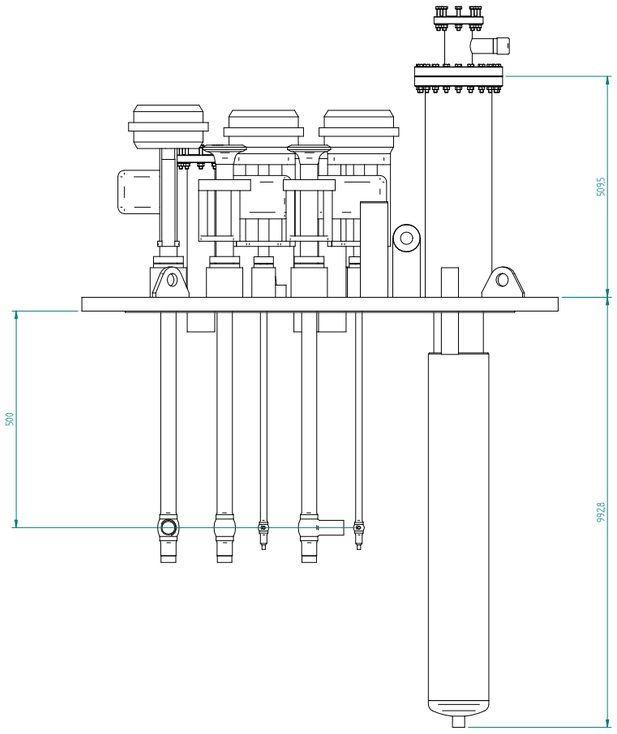

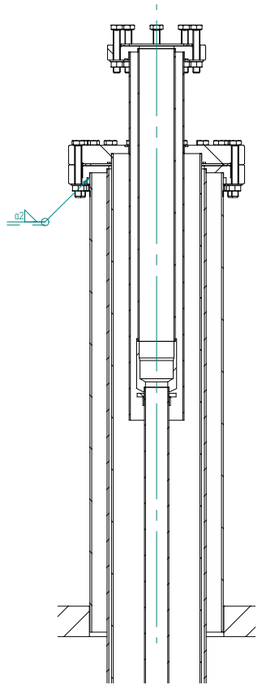

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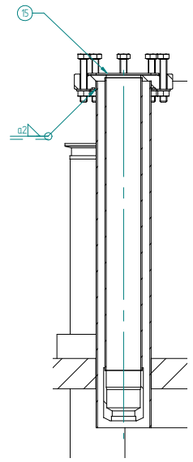
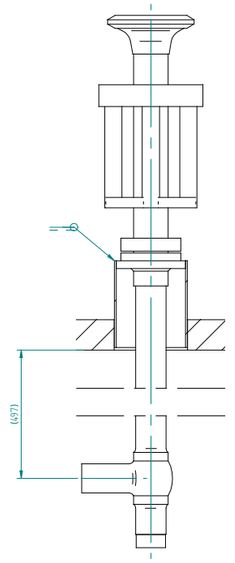
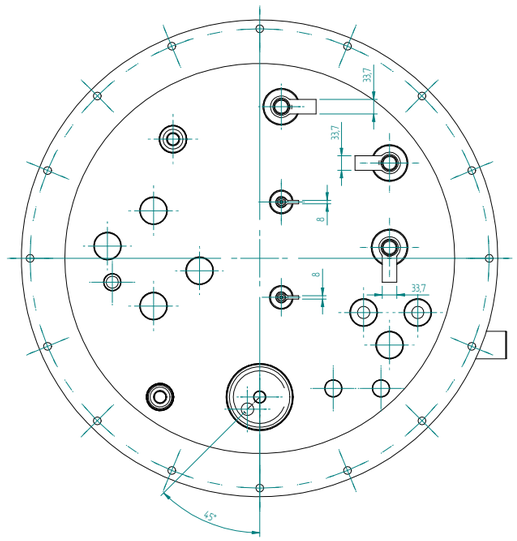
1:2,5



Section B-B
1:2,5



Section C-C (typical for all "Flowserve" valves)



Orientation of valve bodies and Filter construction

DeMaCo Holland BV
As Built

By: EdV
Date: 2009

Drawn: Administrator	Date: 1-4-2009	Status: Available	Tolerances unless stated otherwise acc. ISO 2768 m K	Edges of undefined shape acc. ISO 13715	Roughness acc. ISO 4287 Ra in mm	All welding acc. DEN-15 unless stated otherwise
Checked:	Am. proj.	Printed: 1-4-2009				
Approved:	Scale: N.A.	Mass:0,00 kg				

Lid Total Assembly
–

Project:

Customer:
–

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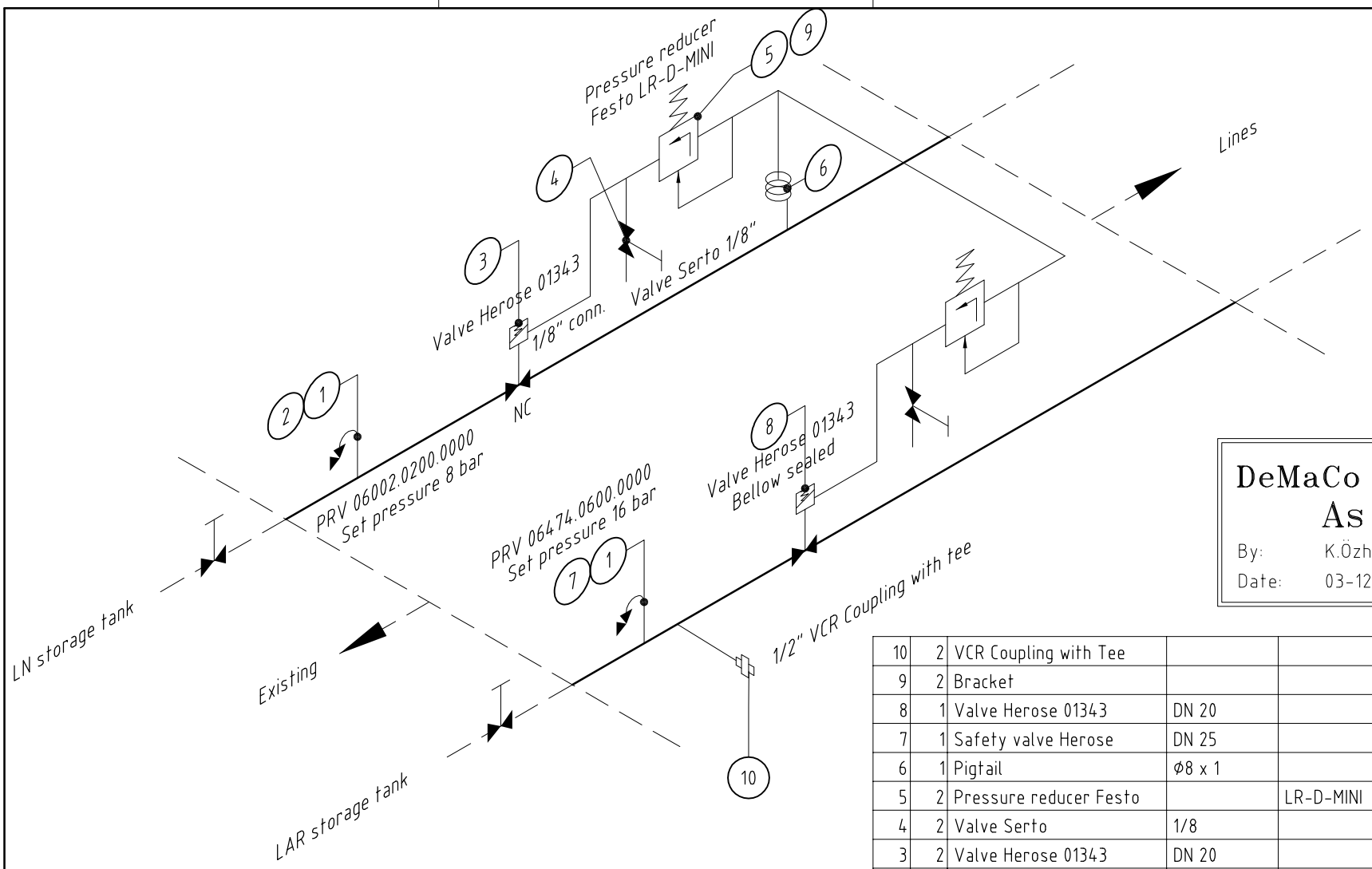
W www.DeMaCo.nl

080364-01-02-00 | Docn 0 | Form A0 | Rev A



DeMaCo Holland BV
As Built

By: K.Özhazinedar
Date: 03-12-2009

10	2	VCR Coupling with Tee				
9	2	Bracket			Art.#. 813.055	
8	1	Valve Herose 01343	DN 20		Bellow sealed	
7	1	Safety valve Herose	DN 25		06474.0600.0000	
6	1	Pigtail	ϕ8 x 1		Determine length in work	
5	2	Pressure reducer Festo		LR-D-MINI	Art.# 813.030	
4	2	Valve Serto	1/8		Art.# 509.014	
3	2	Valve Herose 01343	DN 20		Pneumatic	
2	1	Safety valve Herose	DN 25		06002.02000.0000	
1	2	Bend for SV			Dwg. 09540.C.4	

Welded connection
Johnston coupling
Glas epoxy spacer in innerline
Vacuum pump-out valve
Heatbridge
Begin/end vacuuminsulation
Bellow in innerline
Support number
Section number

Up, Left, Back, Front, Right, Down

Drawn: EDV	Date: 15-12-2008		Tolerances unless stated otherwise acc. ISO 2768 -	Edges of undefined shape acc. ISO 13715	Roughness acc. ISO 4287 Ra in µm	All welding acc. DEN-15 unless stated otherwise
Checked:	Am. proj.					
Approved:	Scale: NTS					

Valves at tank connections LAR / LN2

Project:

Customer:

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47153 C | Form. 3 | Rev. 0

DeMaCo
cryo and vacuum technology
Thinking in solutions

DeMaCo Holland bv
Oester 2
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info@DeMaCo.nl
www.DeMaCo.nl
Kvk 37079728
Bank 65.12.13.134

2. Quality- & work procedures

Customer : *Max Planck Institut fur Kernphysik*
Order no. : *p080364*
Revision : *00*

Enclosed and mentioned below are the documents to be delivered by DeMaCo Holland BV.
The documents are according the contractuel agreement and the applicable European directives.

No.	***Documents***	***Rev.***	***Remarks***
1.	*DEN_33 Vacuum-retentiontest*	*B*	*None*
2.	*DEN_26 Cleaning for oxygen*	*00*	*None*
3.	*DEN_30 Helium-leaktest*	*00*	*None*
4.	*DEN_32 Coldschocktest*	*B*	*None*

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
Signature :

W O R K I N G S P E C . D E N _ 3 3 _ V A C . R E T . T E S T r e v . B 1 6 - 0 1 - 0 7

Vacuum-retention testing
DEN_33

DeMaCo Holland bv
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F +31 (0)226 33 21 11
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www.DeMaCo.nl

W O R K I N G S P E C . D E N _ 3 3 _ V A C . R E T . T E S T r e v . B 1 6 - 0 1 - 0 7

Scope of validity

This specification describes the method and criteria for vacuum retention testing of multi-layer vacuum insulation during manufacturing of vacuum-insulated lines, vessels or other assemblies in the workshop.

Procedure

Both vacuum jacket and the inner line should be at ambient temperature when starting the test. Starting directly after the moment of closing the pump valve, the vacuum level shall be observed at regular intervals of 24 hours for a certain period of time. This period will be 24 hours minimum. After the retention test, the vacuum level will be evacuated to a specified value (see our vacuum procedure DEN24).

Acceptance criteria

An insulating vacuum level will be considered acceptable when it meets the following criteria:

The observations must show a decreasing rise in pressure

The vacuum level after 24 hours must be better than $2x10^{-4}$ mbar

The end vacuum level after the specified period (max. one week) must be better than $1x10^{-3}$ mbar.

Cleaning for Oxygen use
DEN-26

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Working spec.DEN_26_Cleaning for Oxygen Rev.0 12-01-04

Scope of validity

This procedure specifies the method and criteria for cleaning during manufacturing of vacuum-insulated lines, vessels or other workpieces to be used for oxygen in the workshop.

Procedure

1. After sawing and drilling pipes or pipe-pieces will be cleaned in a bath of a mixture of warm water (40 °C) and soap solution. Cleaning has to be done by hand brushing.

2. After cleaning the material has to be dried out, which can be achieved by warm (oil-free and dry) air or nitrogen gas.

3. Openings of pipes or pipe-pieces, which will not be used immediately, have to be plugged off by means of tape, plastic or plugs.

4. Inner pipes have to be cleaned by alcohol on the outside before the insulation will be wounded. This will be done with a clean piece of white paper.

5. After welding, the welds have to be either brushed with a stainless steel brush or pickled and passivated.

6. After assembling of inner and outer pipe or pipe-pieces, all pipes are blown trough by warm (oil-free and dry) air or nitrogen gas.

7. After checking of the surfaces under bright white light all openings have to be sealed. The way of sealing depends on the type of vacuum-insulated line and can be done by:

   - plastic caps
   - blind flanges
   - plastic with tape

Acceptance criteria

First cleaning by solution of water/soap and/or alcohol shall not show any particles of moisture welding residues or other foreign matters like grease or scales by visual inspection.

The final inspection by white bright light shall show no evidence of:

- moisture
- cleaning agents
- residues from welding
- foreign materials like scale, oil, grease, etc.

For reasons where surfaces cannot be inspected visually or where one is in doubt, a check can be carried out by wiping with a clean lint-free cloth. Examination of this cloth under bright white light will confirm that the surfaces would confirm as described above.

All products which are cleaned by DeMaCo Holland bv according to this specification shall be labelled with a sticker: "Process clean". Keep sealed until required for use" and "Oxygen Clean" (see below).

W O R K I N G S P E C . D E N _ 3 0 _ H E . L E A K - T E S T r e v . 0 1 2 - 0 1 - 0 4

Heliumleak-test
DEN-30

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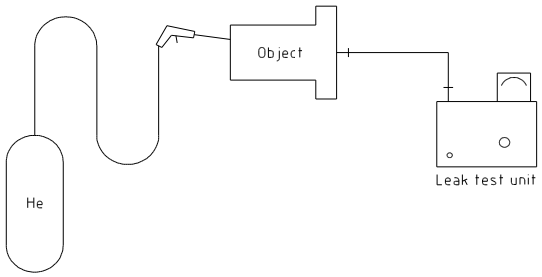
W O R K I N G S P E C . D E N _ 3 0 _ H E . L E A K - T E S T r e v . 0 1 2 - 0 1 - 0 4

Scope of validity
This specification specifies the method and criteria for heliumleak testing during manufacturing of vacuum-insulated lines, vessels or other workpieces in the workshop.

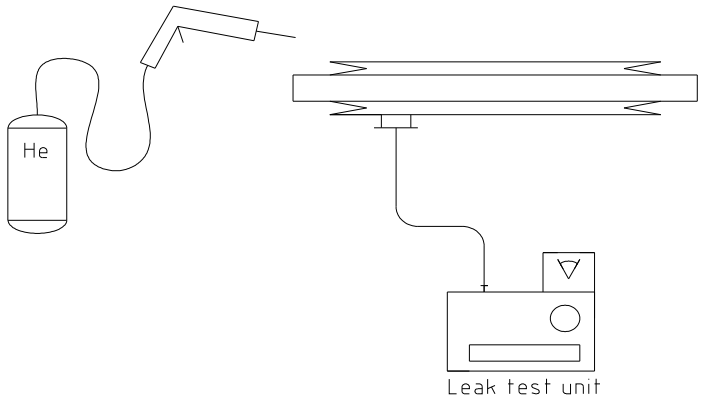
Procedure
The helium leak test is to be performed with an "Alcatel type ASM-180t" leak test unit, which is auto, calibrated every time when it starts up. The helium quality is N45 (< 99,995 %).

All pre-assemblies must be helium leak tested before final assembly. There are two possibilities to perform the test:

Method 1 (for pre assembled parts):
The object to be tested must be connected to the vacuum pump of the leak test unit. After pumping to a minimum level of 10^{-3} mbar and an accuracy of 1.10^{-9} mbar.l/sec., measured at pump-out valve, helium must be sprayed just above the welds and connections.



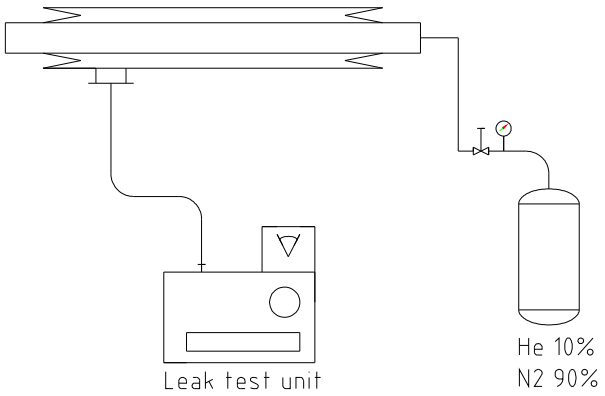
Method 2 (for outer pipes):
The Vacuum space of the object to be tested must be connected to the vacuum pump of the leak test unit. After pumping to a minimum level of 10^{-3} mbar and an accuracy of 1.10^{-9} mbar.l/sec., measured at pump-out valve.
The pipe must be put in a sealed bag filled with atmospheric helium.



Method 3 Helium leak testing combined with the pressure test (for inner pipes)

This helium leak test is combined with an internal pressure test of the process lines at working pressure with 100% gaseous helium. The process lines must be blocked on one side with plugs or caps. The other side must be blocked with caps provided with helium inlets.
The pressure tests shall be performed with calibrated manometers. All necessary protective measures must be taken before any pressurizing. The pressure gauges must be readable from a save distance. The pressure tests will be done with helium at ambient temperature (5 ºC => 50 ºC).

1. Define the testing object and be sure the test pressure is in accordance with the working value on the isometric drawing.



2. The testing object (process lines) inside the vacuum jacket must be connected to the helium cylinder provided with a pressure reducer and the outside (jacket pipe) to the helium leak test unit.

3. Block the test area with red/white tape.

4. After a successful helium leak test of the vacuum jacket, the process lines must be pressure tested. Pressurize step by step (10 %) to the test pressure with gaseous helium and nitrogen. Pressurize for at least 20 minutes.

5. The mass spectrometer with the adjusted accuracy may not give a deflection of $1x10^{-8}$ mbar.l/s. For the leak test accuracy, see the acceptance criteria and the test certificate.

6. Relief the pressure slowly and check the object visually for deformation.

Acceptance criteria
The mass spectrometer with an adjusted accuracy of 1.10^{-9} mbar.l/sec. may give a deflection of $1x10^{-8}$ mbar.l/sec. After satisfying result the object must be marked with "tested". If there is a leak, the object shall be marked with "rejected" and repairing shall be executed at once and the quality inspector shall be informed. All rejected items shall be re-tested according this procedure.

W O R K I N G S P E C . D E N _ 3 2 _ C O L D S H O C K T E S T r e v . B 3 1 - 0 1 - 0 7

Cold shock testing
DEN-32

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All

W O R K I N G S P E C . D E N _ 3 2 _ C O L D S H O C K T E S T r e v . a 3 1 - 0 5 - 0 4

Scope of validity

This specification specifies the method and criteria for cold shock testing during manufacturing of vacuum-insulated lines, vessels or other work pieces in the workshop.

Procedure

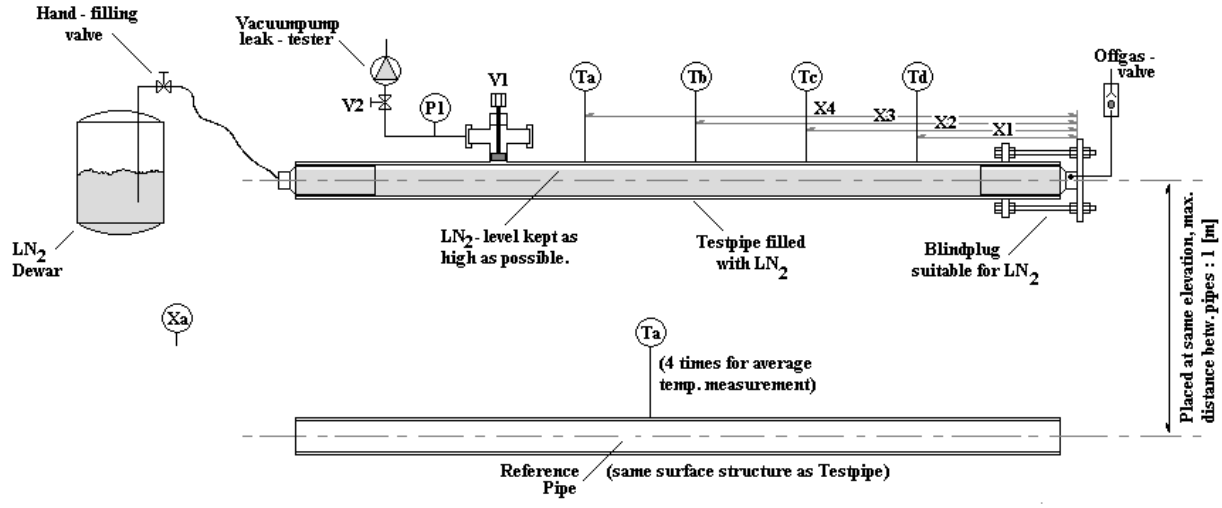
Precautions

The test shall be performed in a clean environment, with a temperature varying between 10 and 30 °C and humidity below 70%.

The surrounding area shall be clearly marked as “dangerous zone” and kept clear of all non-authorized persons.

Provisions should be taken for sufficient ventilation, to avoid suffocation.

Set up the test equipment according to the next sketch.



Xa= hygrometer with accuracy of ± 3%

Ta, Tb, Tc, Td = temperature measure - point for temperature of outer-pipe with accuracy of ± 0,1°C
Ta = temperature sensor for (average) measurement of ambient temperature
P1= vacuum level indicator, 1100-10^{-7}mbar with accuracy of ± 10%
V2= vacuum valve, open/close
V1= Pump out port

Vacuum pump
- End-pressure 10x10^{-7} mbar or better
- Pump-speed 6 L/s or more

The measurement of the temperatures occurs with one sensor.
Furthermore, ambient temperature and humidity are measured (temp. sensor / hygrometer).

W O R K I N G S P E C . D E N _ 3 2 _ C O L D S H O C K T E S T r e v . a 3 1 - 0 5 - 0 4

Precautions must be taken to avoid unequal sunlight and draft over the test and reference pipe.
The pipes must be allowed a rest of 2 hours before starting the test (Making sure that both pipes have the same ambient temperature).

Perform a Helium leak test on all seals. V1 should be closed and V2 should be open.

Measure the vacuum-level as follows:
Pump until P1 reads $1 \cdot 10^{-7}$ mbar or less and then wait at least 15 minutes.
Close V2 and directly open V1
Monitor the vacuum level. As soon as it is stable, record P and open V2

Cool down the inner-pipe using Liquid Nitrogen at atmospheric pressure. Make sure that evaporating Nitrogen can not cause the pressure to rise above atmospheric. Make sure that the complete volume of the test-pipe is filled.

Record all the values of T … and P1 at the following intervals:
Before cooling down at T = 0
Every hour after start cool-down until the temperature has stabilized.
After ending the test, the test pipe should be checked for any condensation on the outer-pipe.

The actual temperature drop caused by heat in leak can be calculated by subtracting a temperature measured on the test-pipe by its corresponding value of the reference pipe.
E.G.: Tar – TA = dTA (this value is probably negative)
This value should be corrected with the difference between those two values measured at T=0 when both pipes are still warm and at equal condition.
E.G.: (TAr(t=0) - TA(t=0)) – dTA = dTA(real)

This method of calculation minimizes external influences and measuring mistakes.

Criteria

At no part of the outer-pipe, the temperature drop shall be greater then 5 degrees, non-insulated zones not taken into account (actual value depending on the specification)

No sweating shall occur on the vacuum jacket at humidity of 70% or less.

The vacuum shall gain at least one order of magnitude by activation of the molecular sieves.

The vacuum shall drop to $1 \cdot 10^{-4}$ mbar or better.

If sweating occurs on a certain position, this should be consulted with the quality inspector and the engineering department.

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03 Radiographic Testing summary

Customer: *Max Planck Institut fur Kernphysik*
Order no.: p080364
Revision: 00

Herewith DeMaCo Holland bv confirms to have executed the NDE according the contractuel agreement and the applicable European directives and applicable codes.

Dwg nr.	***Spool no.***	***X-ray no.`s***	***Welder***	***Report no.***	***Result***
42951/42920	*1*	*1*	*Blom, G*	*679-2008-44-029*	*Acc*
01 05 00	*filter*	*3+4*	*Jonker, P*	*299-2008-51-002*	*Acc*
01 04 00	*subcooler*	*2*	*Jonker, P*	*299-2008-51-002*	*Acc*
01 00 00	*valve box*	*5*	*Blom, G*	*299-2008-51-017*	*Acc*

Name: *Kamil Ozhazinedar*
Date: 18-02-09
Signature:

Radiographic Examination report

RTD branch office	Midden Nederland	**RTD report no**	679-2008-44-029
Telephone number	0251220838	**RTD order no**	20642/203
Fax	0251210405	**F&A-number**	1104
Contact	Dhr. van Kuilenburg	**Examination date**	29-10-2008

Röntgen Technische Dienst bv

Delftweg 144 **Tel. (010) 208 82 08**
Postbus 10065 **Fax (010) 415 80 22**
3004 AB Rotterdam **E-mail rtd@rtd.nl**

Client	Demaco Holland BV	**Carried out at**	Demaco Holland BV	**Exam. standard**	EN 1435 Klasse B	**Film type**	D4
Address	Oester 2	**Address**	Oester 2	**Exam. procedure**	RT 21013 **R** 8	**Screens (f/b)**	Pb0.027
Post code and city	1723HWNoord-Scharwoude	**Post code and city**	1723 HWNoord-Scharwoude	**Accept. standard**	AD Merkbl. HP 5/3	**IQI**	10-FE-EN
Country	Nederland	**Country**	Nederland	**Accept. procedure**	RT 21014 **R** 3	**Pct. exam.**	100
Contact	Dhr. G. J. Blom	**Contractor**	Demaco bv	**Material**	1.4301	**Set no**	797 **Focal spot eff.** 2.8 **mm**
Order no	p080364	**Project**	---	**Weld metal**	1.4301	**Source type**	Röntgen 280 **kV** 6 **mA**
Request no	---	**Drawing no**	42920	**Weld method**	TIG 141		**Ci** **GBq**
Report no client	---	**Object**	28x1	**Heat treated**	☐ Yes ☒ No		

Remarks

Film no		Film Dim. [cmxcm]	Discontinuity type / location Na [cm]	A/Na	IQI/Dens		Welder	Weld prep.	Weld geometry [mm x mm]	[kV]	[mA. min]	Pen. th. [mm]	f [mm]	b [mm]	Setup
F1	1	9x12		A	14/2.7		GJB	V	Ø 28 x 1	150	2	2	542	28	12
	2			A	14/2.7										
	3			A	14/2.7										

Films and reporting	Operators		Filminterpretation	Report checked for RTD
Film quantity 3	**Name** 0143 Diemeer F.	**Name** 0212 Dijkstra K.	**Name** 0448 Klijn J.	**Name**
	Level 2 **Cert. no** 473/1061	**Level** 2 **Cert. no** 473/	**Level** 2 **Cert. no** 473/347	**Date**
Page 1	Applus® RTD ND Testing	Applus® RTD ND Testing	Applus® RTD Filminterpreter J. Klijn	
Total pages 1				

6949rep10

Radiographic Examination report

RTD branch office	Midden Nederland	**RTD report no**	299-2008-51-017
Telephone number	0251220838	**RTD order no**	31848/001
Fax	0251210405	**F&A-number**	1104
Contact	Dhr. van Kuilenburg	**Examination date**	18-12-2008

Röntgen Technische Dienst bv

Delftweg 144 **Tel. (010) 208 82 08**
Postbus 10065 **Fax (010) 415 80 22**
3004 AB Rotterdam **E-mail rtd@rtd.nl**

Client	Demaco Holland BV	**Carried out at**	Demaco Holland BV	**Exam. standard**	EN 1435 Klasse B	**Film type**	D4
Address	Oester 2	**Address**	Oester 2	**Exam. procedure**	RT 21013 **R** 8	**Screens (f/b)**	Pb0.027
Post code and city	1723HWNoord-Scharwoude	**Post code and city**	1723HWNoord-Scharwoude	**Accept. standard**	AD Merkbl. HP 5/3	**IQI**	10-FE-EN
Country	Nederland	**Country**	Nederland	**Accept. procedure**	RT 21014 **R** 3	**Pct. exam.**	100
Contact	Hr. N Sluijter	**Contractor**	Demaco Holland BV.	**Material**	1.4301	**Set no**	1787
Order no	P080364-1	**Project**	P080364-1	**Weld metal**	1.4301	**Source type**	Röntgen
Request no	--	**Drawing no**	See result.	**Weld method**	GTAW		
Report no client		**Object**	Welds.	**Heat treated**	☐ Yes ☒ No		

Focal spot eff.	2.8	**mm**			
280	**kV**	6	**mA**		
	Ci		**GBq**		

Remarks ---

Film no		Film Dim. [cmxcm]	Discontinuity type / location Na [cm]	A/Na	IQI/Dens	Drawing.	Welder	Weld prep.	Weld geometry [mm x mm]	[kV]	[mA. min]	Pen. th. [mm]	f [mm]	b [mm]	Setup
F2RS	1	6x24		A	15/2.7	01-04-00	PJ	V	Ø 306 x 3	175	1,8	6	497	3	13
	2			A	15/2.7	01-04-00									
	3			A	15/2.7	01-04-00									
	4		INTERNAL PIPE IN WELD (60-64	A	15/2.7	01-04-00									
	5			A	15/2.7	01-04-00									
F5RS	1	9x12		A	15/3.5	01-00-00	GJB	V	Ø 28 x 1	150	4	3	800	1	12
	2			A	15/3.5	01-00-00									
	3			A	15/3.5	01-00-00									

Films and reporting	Operators		Filminterpretation	Report checked for RTD
Film quantity 8	**Name** 0040 Beers M.	**Name** 0086 Bosch D.	**Name** 0372 Hoy W.A.	**Name**
	Level 2 **Cert. no** 473/088	**Level** 1 **Cert. no** 473/	**Level** 2 **Cert. no** 473/071	**Date**
	Applus RTD ND Testing		W.A. Hoy Filminterpreter LRO 473/071	
Page 1				
Total pages 1				

6949 rev.

Radiographic Examination report

RTD branch office	Midden Nederland	**RTD report no**	299-2008-51-002
Telephone number	0251220838	**RTD order no**	20642/224
Fax	0251210405	**F&A-number**	1104
Contact	Dhr. van Kuilenburg	**Examination date**	16-12-2008

Röntgen Technische Dienst bv

Delftweg 144 **Tel. (010) 208 82 08**
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3004 AB Rotterdam **E-mail rtd@rtd.nl**

Client	Demaco Holland BV	**Carried out at**	Demaco Holland BV	**Exam. standard**	EN 1435 Klasse B	**Film type**	D4
Address	Oester 2	**Address**	Oester 2	**Exam. procedure**	RT 21013 **R** 8	**Screens (f/b)**	Pb0.027
Post code and city	1723HWNoord-Scharwoude	**Post code and city**	1723HWNoord-Scharwoude	**Accept. standard**	AD Merkbl. HP 5/3	**IQI**	10-FE-EN
Country	Nederland	**Country**	Nederland	**Accept. procedure**	RT 21014 **R** 3	**Pct. exam.**	100
Contact	Hr. N Sluijter	**Contractor**	Demaco Holland BV.	**Material**	1.4301	**Set no**	1787 **Focal spot eff.** 2.8 **mm**
Order no	P080364	**Project**	P080364	**Weld metal**	1.4301	**Source type**	Röntgen 280 **kV** 6 **mA**
Request no	--	**Drawing no**	Seee result.	**Weld method**	GTAW		**Ci** **GBq**
Report no client		**Object**	Welds.	**Heat treated**	☐ Yes ☒ No		

Remarks

Film no		Film Dim. [cmxcm]	Discontinuity type / location Na [cm]	A/Na	IQI/Dens	Drawing.	Welder	Weld prep.	Weld geometry [mm x mm]	[kV]	[mA. min]	Pen. th. [mm]	f [mm]	b [mm]	Setup
F2	1	6x24			1.6reshoot	01-04-00	PJ	V	Ø 306 x 3	175	1,8	6	497	3	13
	2				1.6 RS	01-04-00									
	3		RESHOOT TE LICHT		1.6 RS	01-04-00									
	4				1.5 RS	01-04-00									
	5				1.5 RS	01-04-00									
F3	1	6x16		A	16/2.7	01-05-00	PJ	V	Ø 139 x 2	155	1,2	4	398	2	13
	2			A	16/2.7	01-05-00									
	3			A	16/2.7	01-05-00									
	4			A	16/2.7	01-05-00									
	5			A	16/2.7	01-05-00									
	6			A	16/2.7	01-05-00									

Films and reporting

Film quantity 20

Page 1
Total pages 2

Operators

Name 0448 Klijn J.
Level 2 **Cert. no** 473/347

Applus® RTD ND Testing

Name 0086 Bosch D.
Level 1 **Cert. no** 473/

Filminterpretation

Name 0372 Hoy W.A.
Level 2 **Cert. no** 473/071

RTD W.A. Hoy Filminterpreter LRQ 473/071

Report checked for RTD

Name
Date

6949 rev

Radiographic Examination report

RTD branch office	Midden Nederland	**RTD report no**	299-2008-51-002
Telephone number	0251220838	**RTD order no**	20642/224
Fax	0251210405	**F&A-number**	1104
Contact	Dhr. van Kuilenburg	**Examination date**	16-12-2008
Client	Demaco Holland BV	**Order no**	P080364

Röntgen Technische Dienst bv

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Postbus 10065 **Fax (010) 415 80 22**
3004 AB Rotterdam **E-mail rtd@rtd.nl**

Report no client | **Drawing no** Seee result.

Film no		Film Dim. [cmxcm]	Discontinuity type / location Na [cm]	A/Na	IQI/Dens	Drawing.	Welder	Weld prep.	Weld geometry [mm x mm]	[kV]	[mA. min]	Pen. th. [mm]	f [mm]	b [mm]	Setup
F4	1	6x12		A	15/3.0	01-05-00	PJ	V	Ø 114 x 2	155	1,2	4	398	2	13
	2			A	15/3.0	01-05-00									
	3			A	15/3.0	01-05-00									
	4			A	15/3.0	01-05-00									
	5			A	15/3.0	01-05-00									
	6			A	15/3.0	01-05-00									
F5	1	6x12	KESHOOT TE LICHT		1.7 RS	01-00-00	GJB	V	Ø 28 x 1	150	1	2	542	28	12
	2				1.7 RS	01-00-00									
	3				1.7 RS	01-00-00									

Films and reporting

Film quantity 20

Page 2

Total pages 2

Operators

Name 0448 Klijn J.
Level 2 **Cert. no** 473/347

Applus® RTD
ND Testing

Name 0086 Bosch D.
Level 1 **Cert. no** 473/

Filminterpretation

Name 0372 Hoy W.A.
Level 2 **Cert. no** 473/071

RTD W.A. Hoy Filminterpreter LRQ 473/071

Report checked for RTD

Name
Date

6949 rev

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04 Welding summary

Customer: *Max Planck Institut fur Kernphysik*
Order no.: *p080364*
Revision: *00*

Herewith DeMaCo Holland bv confirms to have executed the welding according the contractuel agreement and the applicable European directives and applicable codes.

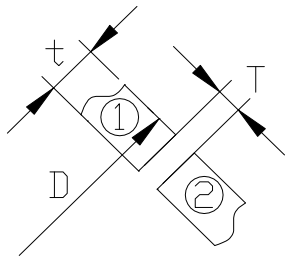
Welder	Specimen size	WPQ no.	WPS no.	PQR no.	Remarks
Blom, G	Ø28x1	Ø40x1	1A4	544/569	None
Jonker, P	Ø306x3	Ø168,3x2,11	1C7	544/596	None
Jonker, P	Ø139x2	Ø114,3x2,11	1C7	544/596	None
Jonker, P	Ø114x2	Ø114,3x2,11	1B5	569/351	None

Name: *Kamil Ozhazinedar*
Date: *18-2-2009*
Signature:

DeMaCo	**Welding Procedure Specification**	WPS no **1A4**	Rev. **0**
		WPS Type **Buttweld**	
		Page 1 of 2	Date **19-10-2006**

Customer + order no	**N.a.**	PQR no (s)	**192781/ CAS3/ 544**	**(valid until -269 ºC)**
Project name + order no	**DeMaCo standard**		**192781/ CAS3/ 569**	**(valid until -269 ºC)**
WPS reference codes	**EN 15614, ASME IX, AD HP 2/1**			

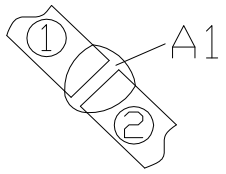
Groove design



Materials, ranges

Base mat. 1	**AISI 304 L/ 1.4307**
Base mat. 2	**AISI 304 L/ 1.4307**
Thickn. range t1	**1 - 2 mm**
Thickn. range t2	**1 - 2 mm**
Diam. range 1	**> 25 mm**
Diam. range 2	**> 25 mm**
T =	NL =
Ad (°) =	Nt =

Welding sequence



Weld-edge preparation	**Sawing/ cleaning (soap/ alcohol)**	Continued preheat temp.(min. ℃)	**10**
Initial / interpass cleaning	**Brushing**	Preheat method	**Burner**
Fit-Up method	**Clamping**	Inspection tool	**Contact thermometer**
Shop, Site weld	**Shop and site welding**	Interpass temp. (max ℃)	**150**
Back-gouging method	**Not used**	Inspection tool	**Contact thermometer**

Welding sequence

Welding layer	***Tack and A1***				
Welding position (EN-ISO / ASME)	**H-L 045/ 6G**				
Welding process (EN-ISO / ASME)	**141/ GTAW**				
Consumable brand	**Oerlikon**	**0**	**0**	**0**	**0**
Consumable type	**Innertfill 19 9 Nc**	**0**	**0**	**0**	**0**
Consumable classification (AWS)	**ER 308 L Si**	**0**	**0**	**0**	**0**
Size filler metal (mm)	**1.0 or 1,2**				
Shielding flux brand	**Not used**				
Shielding flux type	**Not used**				
Shielding-gas type (EN ISO)	**I1**				
Shielding-gas composition (%)	**99,999 % Ar**				
Gas flow rate, min-max (l/min)	**8-12**				
Gas Nozzle-diameter (mm)	**10**				
Plasma gas composition	**Not used**				
Gas flow rate, min-max (l/min)	**Not used**				
Tungsten electrode type (EN ISO / ASME)	**WT20/ EWTh-2**				
Tungsten electrode diameter (mm)	**1,6 or 2,4**				
Backing gas (Yes / No)	**Yes**				
Backinng gas composition (%), (QW 408 / EN 439)	**95%N2/ 5H2 (F2)**				
Backing gas flowrate, min-max (l/min)	**4-10**				
Direct current - Alternating current	**DC EN**				
Current, min-max (A)	**24 / 52**	/	/	/	/
Current, min-max (V)	**12 / 14**	/	/	/	/
Metal-Transfer-mode	**Not used**				
Peak current, voltage (A/V)	**0 / 0**	/	/	/	/
Background current (A)	**0 / 0**	/	/	/	/
Pulse frequency (Hz)	**Not used**				
Balance (%)	**Not used**				
Travel speed, min-max (mm/min)	**25 / 40**	/	/	/	/
Weaving allowed (Yes / No)	**Yes**				
Minimum run out length (mm)	**Not used**				
Thermal efficienty factor k (EN 1011-1 / QW 409 (**0**))	**1**				
Heat-input constant current, min-max (kJ/mm)	**0,7 / 1,1**	**###** / **###**	**###** / **###**	**###** / **###**	**###** / **###**
Heat-input pulsing current, min-max (kJ/mm)	**0,0 0,0**	**###** / **###**	**###** / **###**	**###** / **###**	**###** / **###**

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1A4** Rev. **0** WPS Type **Buttweld** Page 2 of 2 Date **19-10-2006**

Basematerial

No.	Type	Specification	ASME Gr.	ASME P. no.	ASME S. no.	AWS Gr.	EN/ ISO Gr.
1	**AISI 304 L/ 1.4307**	**ASTM-A312 / EN 10217-7**	**1**	**8**			**8.1**
2	**AISI 304 L/ 1.4307**	**ASTM-A312 / EN 10217-7**	**1**	**8**			**8.1**

Consumable

Welding layer	***Tack and A1***	***0***	***0***	***0***	***0***
Solid / flux cored wire	**Solid**				
ASME F. No.	**6**				
ASME A. No.	**8**				
SFA Specification	**5.9**				
AWS Classification	**ER 308 L Si**				
EN ISO code (DIN EN 12072)	**W / G 19 9 L Si**				
Brand	**Oerlikon**				
Type	**Innertfill 19 9 Nc**				
Compareble No. of Materials	**1.4316**				

Technique

Manuel / machine / Semi-auto / automatic	**Manuel**				
Single / Multiple electrode	**Single**				
Wire-feed speed, min-max (mm/min)	**Not used**				
Oscilation (Yes / No)	**No**				
Oscillation width, min-max (mm)	**Not used**				
Oscillation frequency (Hz)	**Not used**				
Single / Double side welding	**Single**				
Single / Multiple pass per side	**Single**				
Deposit weldmetal thickness (max. mm)	**4**				
Stick-out length (± 5 mm)	**5**				
Electrode spacing (mm)	**Not used**				
Peening (Yes / No)	**No**				
Consumable insert	**Not used**				
Backing strip (Yes / No)	**No**				
Type backing strip	**Not used**				
Apply (Yes / No)	**No**				

Heat-treatment

Local or in furnace	**Not used**
PWHT temperature, min-max (°C)	**Not used**
PWHT time, min-max (min)	**Not used**
Heating rate, max (°C/h)	**Not used**
Cooling rate, max (°C/h)	**Not used**
Withdraw temperature, max (°C)	**Not used**
PWHT Ref. No.	**Not used**

Testing, Inspection

PQR testing temperature (ºC)	**20**
Thickness PQR impact testpiece (mm)	**Not used**
Visual examination (ASME IX and ASME V)	**Yes**
Visual examination (ISO 5817 C)	**yes**
Dye penetrant examination	**Not used**
X-ray examination	**Not used**
Ultrasonic examination	**Not used**

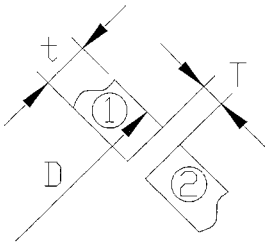
Remarks

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1A4** Rev. **0** WPS Type **Buttweld** Page 1 of 2 Date **19-10-2006**

Customer + order no	**N.a.**	PQR no (s)	**192781/ CAS3/ 544**	**(valid until -269 ºC)**
Project name + order no	**DeMaCo standard**		**192781/ CAS3/ 569**	**(valid until -269 ºC)**
WPS reference codes	**EN 15614, ASME IX, AD HP 2/1**			

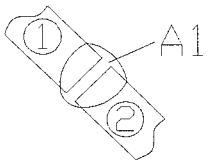
Groove design



Materials, ranges

Base mat. 1	**AISI 304 L/ 1.4307**
Base mat. 2	**AISI 304 L/ 1.4307**
Thickn. range t1	**1 - 2 mm**
Thickn. range t2	**1 - 2 mm**
Diam. range 1	**> 25 mm**
Diam. range 2	**> 25 mm**
T =	NL =
Ad (°) =	Nt =

Welding sequence



Weld-edge preparation	**Sawing/ cleaning (soap/ alcohol)**	Continued preheat temp.(min. ºC)	**10**
Initial / interpass cleaning	**Brushing**	Preheat method	**Burner**
Fit-Up method	**Clamping**	Inspection tool	**Contact thermometer**
Shop, Site weld	**Shop and site welding**	Interpass temp. (max ºC)	**150**
Back-gouging method	**Not used**	Inspection tool	**Contact thermometer**

Welding sequence

Welding layer	***Tack and A1***				
Welding position (EN-ISO / ASME)	**H-L 045/ 6G**				
Welding process (EN-ISO / ASME)	**141/ GTAW**				
Consumable brand	**Oerlikon**	0	0	0	0
Consumable type	**Innertfill 19 9 Nc**	0	0	0	0
Consumable classification (AWS)	**ER 308 L Si**	0	0	0	0
Size filler metal (mm)	**1.0 or 1,2**				
Shielding flux brand	**Not used**				
Shielding flux type	**Not used**				
Shielding-gas type (EN ISO)	**I1**				
Shielding-gas composition (%)	**99,999 % Ar**				
Gas flow rate, min-max (l/min)	**8-12**				
Gas Nozzle-diameter (mm)	**10**				
Plasma gas composition	**Not used**				
Gas flow rate, min-max (l/min)	**Not used**				
Tungsten electrode type (EN ISO / ASME)	**WT20/ EWTh-2**				
Tungsten electrode diameter (mm)	**1,6 or 2,4**				
Backing gas (Yes / No)	**Yes**				
Backinng gas composition (%), (QW 408 / EN 439)	**95%N2/ 5H2 (F2)**				
Backing gas flowrate, min-max (l/min)	**4-10**				
Direct current - Alternating current	**DC EN**				
Current, min-max (A)	**24 / 52**	/	/	/	/
Current, min-max (V)	**12 / 14**	/	/	/	/
Metal-Transfer-mode	**Not used**				
Peak current, voltage (A/V)	**0 / 0**	/	/	/	/
Background current (A)	**0 / 0**	/	/	/	/
Pulse frequency (Hz)	**Not used**				
Balance (%)	**Not used**				
Travel speed, min-max (mm/min)	**25 / 40**	/	/	/	/
Weaving allowed (Yes / No)	**Yes**				
Minimum run out length (mm)	**Not used**				
Thermal efficienty factor k (EN 1011-1 / QW 409 (0))	**1**				
Heat-input constant current, min-max (kJ/mm)	**0,7 / 1,1**	### / ###	### / ###	### / ###	### / ###
Heat-input pulsing current, min-max (kJ/mm)	**0,0 / 0,0**	### / ###	### / ###	### / ###	### / ###

Manufacturer	Customer	Authority
Date	Date	Date

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DeMaCo	**Welding Procedure Specification**	WPS no 1A4	Rev. 0
		WPS Type Buttweld	
		Page 2 of 2	Date 19-10-2006

Basematerial

No.	Type	Specification	ASME Gr.	ASME P. no.	ASME S. no.	AWS Gr.	EN/ ISO Gr.
1	AISI 304 L/ 1.4307	ASTM-A312 / EN 10217-7	1	8			8.1
2	AISI 304 L/ 1.4307	ASTM-A312 / EN 10217-7	1	8			8.1

Consumable

Welding layer	*Tack and A1*	*0*	*0*	*0*	*0*
Solid / flux cored wire	Solid				
ASME F. No.	6				
ASME A. No.	8				
SFA Specification	5.9				
AWS Classification	ER 308 L Si				
EN ISO code (DIN EN 12072)	W / G 19 9 L Si				
Brand	Oerlikon				
Type	Innertfill 19 9 Nc				
Compareble No. of Materials	1.4316				

Technique

Manuel / machine / Semi-auto / automatic	Manuel
Single / Multiple electrode	Single
Wire-feed speed, min-max (mm/min)	Not used
Oscilation (Yes / No)	No
Oscillation width, min-max (mm)	Not used
Oscillation frequency (Hz)	Not used
Single / Double side welding	Single
Single / Multiple pass per side	Single
Deposit weldmetal thickness (max. mm)	4
Stick-out length (± 5 mm)	5
Electrode spacing (mm)	Not used
Peening (Yes / No)	No
Consumable insert	Not used
Backing strip (Yes / No)	No
Type backing strip	Not used
Apply (Yes / No)	No

Heat-treatment

Local or in furnace	Not used
PWHT temperature, min-max (°C)	Not used
PWHT time, min-max (min)	Not used
Heating rate, max (°C/h)	Not used
Cooling rate, max (°C/h)	Not used
Withdraw temperature, max (°C)	Not used
PWHT Ref. No.	Not used

Testing, Inspection

PQR testing temperature (ºC)	20
Thickness PQR impact testpiece (mm)	Not used
Visual examination (ASME IX and ASME V)	Yes
Visual examination (ISO 5817 C)	yes
Dye penetrant examination	Not used
X-ray examination	Not used
Ultrasonic examination	Not used

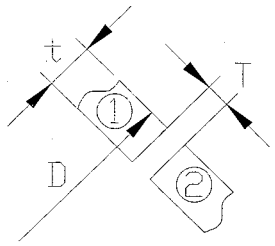
Remarks

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1A5** Rev. **0** WPS Type **Buttweld** Page 1 of 2 Date **19-10-2006**

Customer + order no	**N.a.**	PQR no (s)	**192781/ CAS3/ 569**	**(valid until -269 ºC)**
Project name + order no	**DeMaCo standard**		**192781/ CAS3/ 351**	**(valid until -196 ºC)**
WPS reference codes	**EN 15614, ASME IX, AD HP 2/1**			

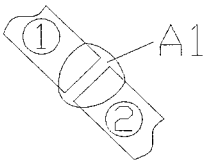
Groove design



Materials, ranges

Base mat. 1	**AISI 304 L/ 1.4307**
Base mat. 2	**AISI 304 L/ 1.4307**
Thickn. range t1	**2,1 - 2,9 mm**
Thickn. range t2	**2,1 - 2,9 mm**
Diam. range 1	**> 85 mm**
Diam. range 2	**> 85 mm**
T =	NL =
Ad (°) =	Nt =

Welding sequence



Weld-edge preparation	**Sawing/ cleaning (soap/ alcohol)**	Continued preheat temp.(min. ºC)	**10**
Initial / interpass cleaning	**Brushing**	Preheat method	**Burner**
Fit-Up method	**Clamping**	Inspection tool	**Contact thermometer**
Shop, Site weld	**Shop and site welding**	Interpass temp. (max ºC)	**150**
Back-gouging method	**Not used**	Inspection tool	**Contact thermometer**

Welding sequence

Welding layer	***Tack and A1***				
Welding position (EN-ISO / ASME)	**H-L 045/ 6G**				
Welding process (EN-ISO / ASME)	**141/ GTAW**				
Consumable brand	**Oerlikon**	**0**	**0**	**0**	**0**
Consumable type	**Innertfill 19 9 Nc**	**0**	**0**	**0**	**0**
Consumable classification (AWS)	**ER 308 L Si**	**0**	**0**	**0**	**0**
Size filler metal (mm)	**1,6 or 2,0**				
Shielding flux brand	**Not used**				
Shielding flux type	**Not used**				
Shielding-gas type (EN ISO)	**I1**				
Shielding-gas composition (%)	**99,999 % Ar**				
Gas flow rate, min-max (l/min)	**8-12**				
Gas Nozzle-diameter (mm)	**10**				
Plasma gas composition	**Not used**				
Gas flow rate, min-max (l/min)	**Not used**				
Tungsten electrode type (EN ISO / ASME)	**WT20/ EWTh-2**				
Tungsten electrode diameter (mm)	**1,6 or 2,4**				
Backing gas (Yes / No)	**Yes**				
Backinng gas composition (%), (QW 408 / EN 439)	**95%N2/ 5H2 (F2)**				
Backing gas flowrate, min-max (l/min)	**4-10**				
Direct current - Alternating current	**DC EN**				
Current, min-max (A)	**42 / 85**	/	/	/	/
Current, min-max (V)	**12 / 14**	/	/	/	/
Metal-Transfer-mode	**Not used**				
Peak current, voltage (A/V)	**0 / 0**	/	/	/	/
Background current (A)	**0 / 0**	/	/	/	/
Pulse frequency (Hz)	**Not used**				
Balance (%)	**Not used**				
Travel speed, min-max (mm/min)	**36 / 48**	/	/	/	/
Weaving allowed (Yes / No)	**Yes**				
Minimum run out length (mm)	**Not used**				
Thermal efficienty factor k (EN 1011-1 / QW 409 (0))	**1**				
Heat-input constant current, min-max (kJ/mm)	**0,8 / 1,5**	### / ###	### / ###	### / ###	### / ###
Heat-input pulsing current, min-max (kJ/mm)	**0,0 / 0,0**	### / ###	### / ###	### / ###	### / ###

Manufacturer	Customer	Authority
Date	Date	Date

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DeMaCo	**Welding Procedure Specification**	WPS no **1A5**	Rev. **0**
		WPS Type **Buttweld**	
		Page 2 of 2	Date **19-10-2006**

Basematerial

No.	Type	Specification	ASME Gr.	ASME P. no.	ASME S. no.	AWS Gr.	EN/ ISO Gr.
1	**AISI 304 L/ 1.4307**	**ASTM-A312 / EN 10217-7**	**1**	**8**			**8.1**
2	**AISI 304 L/ 1.4307**	**ASTM-A312 / EN 10217-7**	**1**	**8**			**8.1**

Consumable

Welding layer	***Tack and A1***	***0***	***0***	***0***	***0***
Solid / flux cored wire	**Solid**				
ASME F. No.	**6**				
ASME A. No.	**8**				
SFA Specification	**5.9**				
AWS Classification	**ER 308 L Si**				
EN ISO code (DIN EN 12072)	**W / G 19 9 L Si**				
Brand	**Oerlikon**				
Type	**Innertfill 19 9 Nc**				
Compareble No. of Materials	**1.4316**				

Technique

Manuel / machine / Semi-auto / automatic	**Manuel**				
Single / Multiple electrode	**Single**				
Wire-feed speed, min-max (mm/min)	**Not used**				
Oscilation (Yes / No)	**No**				
Oscillation width, min-max (mm)	**Not used**				
Oscillation frequency (Hz)	**Not used**				
Single / Double side welding	**Single**				
Single / Multiple pass per side	**Single**				
Deposit weldmetal thickness (max. mm)	**4**				
Stick-out length (± 5 mm)	**5**				
Electrode spacing (mm)	**Not used**				
Peening (Yes / No)	**No**				
Consumable insert	**Not used**				
Backing strip (Yes / No)	**No**				
Type backing strip	**Not used**				
Apply (Yes / No)	**No**				

Heat-treatment

Local or in furnace	**Not used**
PWHT temperature, min-max (°C)	**Not used**
PWHT time, min-max (min)	**Not used**
Heating rate, max (°C/h)	**Not used**
Cooling rate, max (°C/h)	**Not used**
Withdraw temperature, max (°C)	**Not used**
PWHT Ref. No.	**Not used**

Testing, Inspection

PQR testing temperature (°C)	**20**
Thickness PQR impact testpiece (mm)	**Not used**
Visual examination (ASME IX and ASME V)	**Yes**
Visual examination (ISO 5817 C)	**yes**
Dye penetrant examination	**Not used**
X-ray examination	**Not used**
Ultrasonic examination	**Not used**

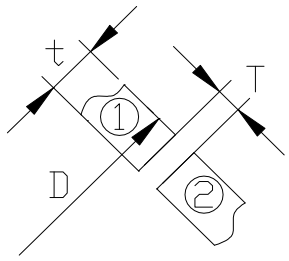
Remarks

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1B5** Rev. **B** WPS Type **Buttweld** Page 1 of 2 Date **5-5-2008**

Customer + order no	**N.a.**	PQR no (s)	**192781/ CAS3/ 569**	**(valid until -269 ºC)**
Project name + order no	**DeMaCo standard**		**187942/ CAS/ 351**	**(valid until -196 ºC)**
WPS reference codes	**EN 15614, ASME IX, AD HP 2/1**			

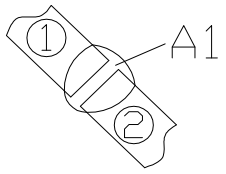
Groove design



Materials, ranges

Base mat. 1	**AISI 316 (L)**
	AISI 304 (L)/ 321
Base mat. 2	**AISI 316 (L)**
	AISI 304 (L)/ 321
Thickn. range t1	**2,1 - 2,9 mm**
Thickn. range t2	**2,1 - 2,9 mm**
Diam. range 1	**> 85 mm**
Diam. range 2	**> 85 mm**
T =	NL =
Ad (°) =	Nt =

Welding sequence



Weld-edge preparation	**Sawing/ cleaning (soap/ alcohol)**	Continued preheat temp.(min. ℃)	**10**
Initial / interpass cleaning	**Brushing**	Preheat method	**Burner**
Fit-Up method	**Clamping**	Inspection tool	**Contact thermometer**
Shop, Site weld	**Shop and site welding**	Interpass temp. (max ℃)	**150**
Back-gouging method	**Not used**	Inspection tool	**Contact thermometer**

Welding sequence

Welding layer	***Tack and A1***				
Welding position (EN-ISO / ASME)	**H-L 045/ 6G**				
Welding process (EN-ISO / ASME)	**141/ GTAW**				
Consumable brand	**Avesta**	**0**	**0**	**0**	**0**
Consumable type	**316 Lsi**	**0**	**0**	**0**	**0**
Consumable classification (AWS)	**ER 316 L Si**	**0**	**0**	**0**	**0**
Size filler metal (mm)	**1,6 or 2,0**				
Shielding flux brand	**Not used**				
Shielding flux type	**Not used**				
Shielding-gas type (EN ISO)	**I1**				
Shielding-gas composition (%)	**99,999 % Ar**				
Gas flow rate, min-max (l/min)	**8-12**				
Gas Nozzle-diameter (mm)	**10**				
Plasma gas composition	**Not used**				
Gas flow rate, min-max (l/min)	**Not used**				
Tungsten electrode type (EN ISO / ASME)	**WT20/ EWTh-2**				
Tungsten electrode diameter (mm)	**1,6 or 2,4**				
Backing gas (Yes / No)	**Yes**				
Backinng gas composition (%), (QW 408 / EN 439)	**95%N2/ 5H2 (F2)**				
Backing gas flowrate, min-max (l/min)	**4-10**				
Direct current - Alternating current	**DC EN**				
Current, min-max (A)	**42 / 85**	/	/	/	/
Current, min-max (V)	**12 / 14**	/	/	/	/
Metal-Transfer-mode	**Not used**				
Peak current, voltage (A/V)	**0 / 0**	/	/	/	/
Background current (A)	**0 / 0**	/	/	/	/
Pulse frequency (Hz)	**Not used**				
Balance (%)	**Not used**				
Travel speed, min-max (mm/min)	**36 / 48**	/	/	/	/
Weaving allowed (Yes / No)	**Yes**				
Minimum run out length (mm)	**Not used**				
Thermal efficienty factor k (EN 1011-1 / QW 409 (**0**))	**1**				
Heat-input constant current, min-max (kJ/mm)	**0,8 / 1,5**	**### / ###**	**### / ###**	**### / ###**	**### / ###**
Heat-input pulsing current, min-max (kJ/mm)	**0,0 / 0,0**	**### / ###**	**### / ###**	**### / ###**	**### / ###**

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1B5**	Rev. **B**
		WPS Type **Buttweld**	
		Page 2 of 2	Date **5-5-2008**

Basematerial

No.	Type	Specification	ASME Gr.	ASME P. no.	ASME S. no.	AWS Gr.	EN/ ISO Gr.
1	**See WPS page 1**	**ASTM / EN / DIN**	**1**	**8**			**8.1**
2	**See WPS page 1**	**ASTM / EN / DIN**	**1**	**8**			**8.1**

Consumable

Welding layer	***Tack and A1***	***0***	***0***	***0***	***0***
Solid / flux cored wire	**Solid**				
ASME F. No.	**6**				
ASME A. No.	**8**				
SFA Specification	**5.9**				
AWS Classification	**ER 316 L Si**				
EN ISO code (DIN EN 12072)	**19 12 3 L Si**				
Brand	**Avesta**				
Type	**316 Lsi**				
Compareble No. of Materials	**x**				

Technique

Manuel / machine / Semi-auto / automatic	**Manuel**				
Single / Multiple electrode	**Single**				
Wire-feed speed, min-max (mm/min)	**Not used**				
Oscilation (Yes / No)	**No**				
Oscillation width, min-max (mm)	**Not used**				
Oscillation frequency (Hz)	**Not used**				
Single / Double side welding	**Single**				
Single / Multiple pass per side	**Single**				
Deposit weldmetal thickness (max. mm)	**4**				
Stick-out length (± 5 mm)	**5**				
Electrode spacing (mm)	**Not used**				
Peening (Yes / No)	**No**				
Consumable insert	**Not used**				
Backing strip (Yes / No)	**No**				
Type backing strip	**Not used**				
Apply (Yes / No)	**No**				

Heat-treatment

Local or in furnace	**Not used**
PWHT temperature, min-max (°C)	**Not used**
PWHT time, min-max (min)	**Not used**
Heating rate, max (°C/h)	**Not used**
Cooling rate, max (°C/h)	**Not used**
Withdraw temperature, max (°C)	**Not used**
PWHT Ref. No.	**Not used**

Testing, Inspection

PQR testing temperature (ºC)	**20**
Thickness PQR impact testpiece (mm)	**Not used**
Visual examination (ASME IX and ASME V)	**Yes**
Visual examination (ISO 5817 C)	**yes**
Dye penetrant examination	**Not used**
X-ray examination	**Not used**
Ultrasonic examination	**Not used**

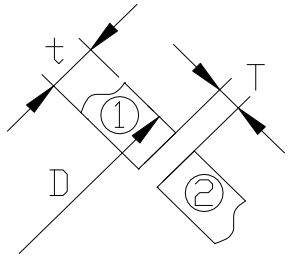
Remarks

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1C7**	Rev. **0**
		WPS Type **Buttweld**	
		Page 1 of 2	Date **12-3-2007**

Customer + order no	**N.a.**	PQR no (s)	**192781/ CAS3/ 544** **(valid until -269 ºC)**
Project name + order no	**DeMaCo standard**		**192781/ CAS3/ 569** **(valid until -269 ºC)**
WPS reference codes	**EN 15614, ASME IX, AD HP 2/1**		

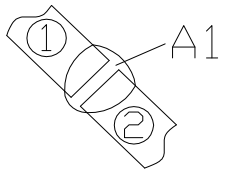
Groove design



Materials, ranges

Base mat. 1	**AISI 316 (L)/ 1.4404**
Base mat. 2	**AISI 304 (L)/ 1.4301**
Base mat. 2	**AISI 316 (L)/ 1.4404**
	AISI 304 (L)/ 1.4301
Thickn. range t1	**1 - 2 mm**
Thickn. range t2	**1 - 2 mm**
Diam. range 1	**≥ 60 mm**
Diam. range 2	**≥ 60 mm**
T =	**0**

Welding sequence



Weld-edge preparation	**Sawing/ cleaning (soap/ alcohol)**	Continued preheat temp.(min. ℃)	**10**
Initial / interpass cleaning	**Brushing**	Preheat method	**Burner**
Fit-Up method	**Clamping**	Inspection tool	**Contact thermometer**
Shop, Site weld	**Shop and site welding**	Interpass temp. (max ℃)	**150**
Back-gouging method	**Not used**	Inspection tool	**Contact thermometer**

Welding sequence

Welding layer	***Tack and A1***				
Welding position (EN-ISO / ASME)	**All positions**				
Welding process (EN-ISO / ASME)	**141/ GTAW**				
Consumable brand	**Avesta**	**0**	**0**	**0**	**0**
Consumable type	**316 Lsi**	**0**	**0**	**0**	**0**
Consumable classification (AWS)	**ER 316 L Si**	**0**	**0**	**0**	**0**
Size filler metal (mm)	**1.0 or 1,2**				
Shielding flux brand	**Not used**				
Shielding flux type	**Not used**				
Shielding-gas type (EN ISO)	**I1**				
Shielding-gas composition (%)	**99,999 % Ar**				
Gas flow rate, min-max (l/min)	**8-12**				
Gas Nozzle-diameter (mm)	**10**				
Plasma gas composition	**Not used**				
Gas flow rate, min-max (l/min)	**Not used**				
Tungsten electrode type (EN ISO / ASME)	**WT20/ EWTh-2**				
Tungsten electrode diameter (mm)	**1,6 or 2,4**				
Backing gas (Yes / No)	**Yes**				
Backinng gas composition (%), (QW 408 / EN 439)	**95%N2/ 5H2 (F2)**				
Backing gas flowrate, min-max (l/min)	**4-10**				
Direct current - Alternating current	**DC EN**				
Current, min-max (A)	**40 / 75**	/	/	/	/
Current, min-max (V)	**12 / 14**	/	/	/	/
Metal-Transfer-mode	**Not used**				
Peak current, voltage (A/V)	**0 / 0**	/	/	/	/
Background current (A)	**0 / 0**	/	/	/	/
Pulse frequency (Hz)	**Not used**				
Balance (%)	**Not used**				
Travel speed, min-max (mm/min)	**25 / 40**	/	/	/	/
Weaving allowed (Yes / No)	**Yes**				
Minimum run out length (mm)	**Not used**				
Thermal efficienty factor k (EN 1011-1 / QW 409 (**0**))	**1**				
Heat-input constant current, min-max (kJ/mm)	**1,2 / 1,6**	**### / ###**	**### / ###**	**### / ###**	**### / ###**
Heat-input pulsing current, min-max (kJ/mm)	**0,0 / 0,0**	**### / ###**	**### / ###**	**### / ###**	**### / ###**

Manufacturer	Customer	Authority
Date	Date	Date

DeMaCo	**Welding Procedure Specification**	WPS no **1C7**	Rev. **0**
		WPS Type **Buttweld**	
		Page 2 of 2	Date **12-3-2007**

Basematerial

No.	Type	Specification	ASME Gr.	ASME P. no.	ASME S. no.	AWS Gr.	EN/ ISO Gr.
1	**See WPS page 1**	**ASTM-A312 / EN 10217-7/ DIN 17457**	**1**	**8**			**8.1**
2	**See WPS page 1**	**ASTM-A312 / EN 10217-7/ DIN 17457**	**1**	**8**			**8.1**

Consumable

Welding layer	***Tack and A1***	***0***	***0***	***0***	***0***
Solid / flux cored wire	**Solid**				
ASME F. No.	**6**				
ASME A. No.	**8**				
SFA Specification	**5.9**				
AWS Classification	**ER 316 L Si**				
EN ISO code (DIN EN 12072)	**19 12 3 L Si**				
Brand	**Avesta**				
Type	**316 Lsi**				
Compareble No. of Materials	**x**				

Technique

Manuel / machine / Semi-auto / automatic	**Manuel**				
Single / Multiple electrode	**Single**				
Wire-feed speed, min-max (mm/min)	**Not used**				
Oscilation (Yes / No)	**No**				
Oscillation width, min-max (mm)	**Not used**				
Oscillation frequency (Hz)	**Not used**				
Single / Double side welding	**Single**				
Single / Multiple pass per side	**Single**				
Deposit weldmetal thickness (max. mm)	**4**				
Stick-out length (± 5 mm)	**5**				
Electrode spacing (mm)	**Not used**				
Peening (Yes / No)	**No**				
Consumable insert	**Not used**				
Backing strip (Yes / No)	**No**				
Type backing strip	**Not used**				
Apply (Yes / No)	**No**				

Heat-treatment

Local or in furnace	**Not used**
PWHT temperature, min-max (°C)	**Not used**
PWHT time, min-max (min)	**Not used**
Heating rate, max (°C/h)	**Not used**
Cooling rate, max (°C/h)	**Not used**
Withdraw temperature, max (°C)	**Not used**
PWHT Ref. No.	**Not used**

PQR Testing, Inspection

PQR testing temperature (ºC)	**20**
Thickness PQR impact testpiece (mm)	**Not used**
Visual examination (ASME IX and ASME V)	**Yes**
Visual examination (ISO 5817 C)	**yes**
Dye penetrant examination	**Yes**
X-ray examination	**Yes**
Ultrasonic examination	**Not used**

Remarks

Manufacturer	Customer	Authority
Date	Date	Date

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EN 287-1
LASSERSKWALIFICATIECERTIFICAAT
WELDERS APPROVAL TEST CERTIFICATE

Kenmerk/*designation* **EN 287-1 141 T BW 8 S t1 D40 H-L045 ss nb sl**

Referentienummer keuringsinstantie / *Inspecting Autority Reference no.*	**192781/ CAS3/528**
Lasmethodebeschrijving van de fabrikant / *Manufacturer's Welding Procedure Specification*	**40x1 Rev. 0**
Referentienummer(indien van toepassing) / *Reference No.(if required)*	**260037**
Naam lasser / *Welder's name*	**P. Jonker 9011296**
Legitimate / *identification*	**ND3014152**
Legitimatiemethode / *Method of identification*	**Paspoort**
Geboortedatum en –plaats / *Date and Place of Birth*	**16-05-1978 Alkmaar**
Werkgever / *Employer*	**Demaco Holland B.V.**
Voorschrift/beoordelingsnorm / *Code/testing standard*	**EN 287-1 / uig.:05-2004**
Lasdatum / *Date of welding*	**06/01/2006**
Vakkennis / *Job knowledge*	**Niet beoordeeld/Not tested**

	Beproevingsgegevens / *weld test detail*	**Geldigheidsgebied** / *range of approval*
lasproces / *welding process*	**141**	**141**
plaat of pijp / *plate or pipe*	**T**	**T P**
soort verbinding / *joint type*	**BW**	**BW FW**
moedermateriaalgroep(en) / *parent material group*	**8 RVS 304L 1.4307**	**8, 9.2+9.3, 10**
type toevoegmateriaal / *filler metal type*	**S Oerlikon Inertfil 19-9-NC**	**S,M**
beschermgassen / *gasflux*	**Argon 99,99%**	**similar**
overige middelen / *auxillaries*	**backing gas 95% N2 / 5% H2**	**similar**
dikte proefstuk(mm) / *material thickness*	**1**	**1-2**
pijpmiddellijn(mm) / *outside diameter pipe*	**40**	**>25**
laspositie / *welding position*	**H-L045**	**H-L045,PA,PB,PC,PD,PE,PF**
een-twee zijdig / *single-double side*	**ss**	**ss bs**
tegenbewerking/ondersteuning / *gouging backing*	**nb**	**nb mb**
aantal laslagen / *multi-single layer*	**sl**	**sl**

Aanvullende informatie wordt gegeven op bijgevoegde bladen en/of lasmethodebeschrijving nr.: **40x1 Rev. 0**
Additional information is available on attached sheet/or welding procedure specification No.:

aard van de beproeving / *type of test*	**uitgevoerd en acceptabel** / *performed and acceptable*	**niet vereist** / not required
visueel / *visual*	**NEN-EN ISO 5817**	
radiografisch / *radiography*	**EN1435/EN12517**	
magnetisch onderzoek / *magnetic particle test*		
penetrant onderzoek / *penetrant test*		
macro / *macro*		
breekproef / *fracture test*		
buigproef / *bendtest*		
trekproef / *tensile test*		
aanvullende proeven / *additional tests* **		

) **aparte bladen toevoegen indien vereist/*appended separate sheets if required*

Opmerkingen / *remarks:* **Zie tevens NDO rapportage RTD rapport 223-2006-03-112**
Tevens zijn beproevingen uitgevoerd volgens ASME IX / B31.3 and AD 2000 merkblatt HP 2/1:08-2004

Naam, datum en handtekening van de inspecteur / *name, date and signature of Surveyor*
Keuringsinstantie / *Inspection Authority*

C.A. Stedelaar
Lloyd's Register Nederland BV
Notified Body No.0345

Lloyd's Register Nederland B.V.
C.A. Stedelaar
Rotterdam Office
☐ Witnessed/ ☐ Reviewed/ ☐ Examined

Datum uitgifte / *date of Issue:* **15/02/2006**
Plaats / *Location* **Shop Noord Scharwoude**
Kwalificatie geldig tot / *Valitidy of approval until:* **06/01/2008**
Zie ook verlengingsblad / *See also prolongationsheet*

versie pf01-2005

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Verlenging volgens EN 287-1 (uitg. 05-2004) van:

Naam : P. Jonker

Kenmerk : 9011296 WPS: 40x1 Rev. 0

Datum uitgave kwalificatie	Verlenging geldig tot	Handtekening	Functie of titel
15-02-2006	15-02-2008		surveyor

Lloyd's Register Nederland B.V.
C.A. Stedelaar
Rotterdam Office
☐ Witnessed/☐ Reviewed/☐ Examined

Bevestiging van de geldigheid door de werkgever/lascoördinator voor de 3 tijdsperiodes van 6 maanden (zie ook par. 9.2)

Datum verlenging	Rapportage [1]	Verlenging geldig tot	Handtekening	Functie of titel
15-08-2006	Welder Logbook	15-02-2007		IWE C298
15-02-2007	Welder Logbook	15-08-2007		IWE C298
15-08-2007	Welder Logbook	15-02-2008		IWE C298

Verlenging van de kwalificatie door de beoordelaar/keuringsinstantie voor de volgende 2 jaar (zie ook par. 9.3)

Datum verlenging	Verlenging geldig tot	Handtekening	Functie of titel
15-02-2008	15-02-2010		

Lloyd's Register Nederland B.V.
D.J. van der Galiën
Groningen Office
☐ Witnessed/☐ Reviewed/☐ Examined

Bevestiging van de geldigheid door de werkgever/lascoördinator voor de 3 tijdsperiodes van 6 maanden (zie ook par. 9.2)

Datum verlenging	Rapportage [1]	Verlenging geldig tot	Handtekening	Functie of titel
15-08-2008	Welder Logbook	15-02-2009		IWE C298
15-02-2009	Welder Logbook	15-08-2009		IWE C298
15-08-2009				

Verlenging van de kwalificatie door de beoordelaar/keuringsinstantie voor de volgende 2 jaar (zie ook par. 9.3)

Datum verlenging	Verlenging geldig tot	Handtekening	Functie of titel

1) Rapportage dient tevens te voldoen aan de voorwaarde van bijlage D van EN 287-1 (uitg. 05-2004)

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EN 287-1
LASSERSKWALIFICATIECERTIFICAAT
WELDERS APPROVAL TEST CERTIFICATE

Kenmerk/*designation* **EN 287-1 141 T BW 8 S t2.11 D88.9 H-L045 ss nb sl**

Referentienummer keuringsinstantie / *Inspecting Autority Reference no.*	**192781/ CAS3/546**
Lasmethodebeschrijving van de fabrikant / *Manufacturer's Welding Procedure Specification*	**88.9x2.11 Rev. 0**
Referentienummer(indien van toepassing) / *Reference No.(if required)*	**260037**
Naam lasser / *Welder's name*	**P. Jonker 9011296**
Legitimate / *identification*	**ND3014152**
Legitimatiemethode / *Method of identification*	**Paspoort**
Geboortedatum en –plaats / *Date and Place of Birth*	**16-05-1978 Alkmaar**
Werkgever / *Employer*	**Demaco Holland B.V.**
Voorschrift/beoordelingsnorm / *Code/testing standard*	**EN 287-1 / uig.:05-2004**
Lasdatum / *Date of welding*	**06/01/2006**
Vakkennis / *Job knowledge*	**Niet beoordeeld/Not tested**

	Beproevingsgegevens / *weld test detail*	**Geldigheidsgebied** / *range of approval*
lasproces / *welding process*	**141**	**141**
plaat of pijp / *plate or pipe*	**T**	**T P**
soort verbinding / *joint type*	**BW**	**BW FW**
moedermateriaalgroep(en) / *parent material group*	**8 RVS 304L 1.4307**	**8, 9.2+9.3, 10**
type toevoegmateriaal / *filler metal type*	**S Oerlikon Inertfil 19-9-NC**	**S,M**
beschermgassen / *gasflux*	**Argon 99,99%**	**similar**
overige middelen / *auxillaries*	**backing gas 95% N2 / 5% H2**	**similar**
dikte proefstuk(mm) / *material thickness*	**2.11**	**2.11-4.22**
pijpmiddellijn(mm) / *outside diameter pipe*	**88.9**	**>44.45**
laspositie / *welding position*	**H-L045**	**H-L045,PA,PB,PC,PD,PE,PF**
een-twee zijdig / *single-double side*	**ss**	**ss bs**
tegenbewerking/ondersteuning / *gouging backing*	**nb**	**nb mb**
aantal laslagen / *multi-single layer*	**sl**	**sl**

Aanvullende informatie wordt gegeven op bijgevoegde bladen en/of lasmethodebeschrijving nr.: **88.9x2.11 Rev. 0**
Additional information is available on attached sheet/or welding procedure specification No.:

aard van de beproeving / *type of test*	**uitgevoerd en acceptabel** / *performed and acceptable*	**niet vereist** / not required
visueel / *visual*	**NEN-EN ISO 5817**	
radiografisch / *radiography*	**EN1435/EN12517**	
magnetisch onderzoek / *magnetic particle test*		
penetrant onderzoek / *penetrant test*		
macro / *macro*		
breekproef / *fracture test*		
buigproef / *bendtest*		
trekproef / *tensile test*		
aanvullende proeven / *additional tests* ***)		

***) **aparte bladen toevoegen indien vereist**/*appended separate sheets if required*

Opmerkingen / *remarks:* **Zie tevens NDO rapportage RTD rapport 223-2006-03-141**
Tevens zijn beproevingen uitgevoerd volgens ASME IX / B31.3 and AD 2000 merkblatt HP 2/1:08-2004

Naam, datum en handtekening van de inspecteur / *name, date and signature of Surveyor*
Keuringsinstantie / *Inspection Authority*

C.A. Stedelaar
Lloyd's Register Nederland BV
Notified Body No.0343

Lloyd's Register Nederland B.V.
C.A. Stedelaar
Rotterdam Office
Witnessed/ Reviewed/ Examined

Datum uitgifte / *date of Issue:* **15/02/2006**
Plaats / *Location* **Shop Noord Scharwoude**
Kwalificatie geldig tot / *Valitidy of approval until:* **06/01/2008**
Zie ook verlengingsblad / *See also prolongationsheet*

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Verlenging volgens EN 287-1 (uitg. 05-2004) van:

Naam : P. Jonker

Kenmerk : 9011296 WPS: 88.9x2.11 Rev. 0

Datum uitgave kwalificatie	Verlenging geldig tot	Handtekening	Functie of titel
15-02-2006	15-02-2008		surveyor

Lloyd's Register Nederland B.V.
C.A. Stedelaar
Rotterdam Office
☐ Witnessed/☐ Reviewed/☐ Examined

Bevestiging van de geldigheid door de werkgever/lascoördinator voor de 3 tijdsperiodes van 6 maanden (zie ook par. 9.2)

Datum verlenging	Rapportage [1]	Verlenging geldig tot	Handtekening	Functie of titel
15-08-2006	Welder Logbook	15-02-2006		IWE C298
15-02-2007	Welder Logbook	15-08-2007		IWE C298
15-08-2007	Welder Logbook	15-02-2008		IWE C298

Verlenging van de kwalificatie door de beoordelaar/keuringsinstantie voor de volgende 2 jaar (zie ook par. 9.3)

Datum verlenging	Verlenging geldig tot	Handtekening	Functie of titel
15-02-2008	02-2010		

Lloyd's Register Nederland B.V.
D.J. van der Galiën
Groningen Office
☐ Witnessed/☐ Reviewed/☐ Examined

Bevestiging van de geldigheid door de werkgever/lascoördinator voor de 3 tijdsperiodes van 6 maanden (zie ook par. 9.2)

Datum verlenging	Rapportage [1]	Verlenging geldig tot	Handtekening	Functie of titel
15-02-2008	Welder Logbook	15-02-2009		IWE C298

Verlenging van de kwalificatie door de beoordelaar/keuringsinstantie voor de volgende 2 jaar (zie ook par. 9.3)

Datum verlenging	Verlenging geldig tot	Handtekening	Functie of titel

1) Rapportage dient tevens te voldoen aan de voorwaarde van bijlage D van EN 287-1 (uitg. 05-2004)

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cryo and vacuum technology
Thinking in solutions

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www.DeMaCo.nl
Kvk 37079728
Bank 65.12.13.134

05 Test certificates

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364*
Revision : *02*

Enclosed and mentioned below are the documents to be delivered by DeMaCo Holland BV.
The documents are according the contractuel agreement and the applicable European directives.

No.	*Documents*	*Rev.*	*Remarks*
1.	*Helium leaktest methode 2 certificate*	*00*	*none*
2.	*Pressure test certificate*	*00*	*none*
3.	*Vacuum retention test certificate*	*00*	*none*
4.	*Cleaning certificate*	*00*	*none*
5.	*Helium leaktest methode 2 certificate Valve box*	*00*	*none*
6.	*Pressure test certificate Valve box*	*00*	*none*
7.	*Vacuum retention test certificate Valve box*	*00*	*none*
8.	*Cleaning certificate Valve box*	*00*	*none*
9.	*Helium leaktest methode 2 (ON SITE)*		

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
Signature :

DeMaCo
cryo and vacuum technology
Thinking in solutions

DeMaCo Holland bv
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Kvk 37079728
Bank 65.12.13.134

Helium leaktest methode 2 certificate

Customer : *Max Planck Institut fur Kernphysik*
Order no. : *p080364*
Revision : *00*

Herewith DeMaCo Holland bv confirms to have executed the He-Leaktest according DeMaCo Working specification DEN 30

Drawing no.	Spool no.	Accuracy (mbar.l/s)	Result	Retest	Date	Remarks
	MALE	<1x10-9 mbar.l/s	Acc	No	11-12-2008	None
42984	01	<1x10-9 mbar.l/s	Acc	No	11-12-2008	None
42983	02	<1x10-9 mbar.l/s	Acc	No	10-12-2008	None
42987	07 LIN	<1x10-9 mbar.l/s	Acc	No	10-12-2008	None
42968	08 LIN	<1x10-9 mbar.l/s	Acc	No	9-12-2008	None
42951	09 LIN	<1x10-9 mbar.l/s	Acc	No	9-12-2008	None
42969	10 LIN	<1x10-9 mbar.l/s	Acc	No	9-12-2008	None
42969	03	<1x10-9 mbar.l/s	Acc	No	2-12-2008	None
42968	04	<1x10-9 mbar.l/s	Acc	No	10-12-2008	None
42987	05	<1x10-9 mbar.l/s	Acc	No	10-12-2008	None
42951	06	<1x10-9 mbar.l/s	Acc	No	10-12-2008	None

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
Signature :

DeMaCo
cryo and vacuum technology
Thinking in solutions

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www.DeMaCo.nl
Kvk 37079728
Bank 65.12.13.134

Helium leaktest methode 2 certificate

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364-02*
Revision : *00*

Herewith DeMaCo Holland bv confirms to have executed the He-Leaktest according DeMaCo Working specification DEN 30

Drawing no.	Spool no.	Accuracy (mbar.l/s)	Result	Retest	Date	Remarks
080364-01-00-	11 LIN	<1x10-9 mbar.l/s	Acc	No	20-1-2009	None
080364-01-04-	12 LIN	<1x10-9 mbar.l/s	Acc	No	20-1-2009	None
080364-01-00-	13 LAR	<1x10-9 mbar.l/s	Acc	No	20-1-2009	None
080364-01-04-	14 LAR	<1x10-9 mbar.l/s	Acc	No	20-1-2009	None

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
Signature :

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Thinking in solutions

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Pressure test certificate

Customer : *Max Planck Institut fur Kernphysik*
Order no. : *p080364*
Revision : *00*

Herewith DeMaCo Holland bv confirms to have executed the Pressure test according DeMaCo Working specification DEN 31

Design pressure: *13 Bar (g)*

Drawing no.	Spool no.	Testpressure in bar(g)	Result	Retest	Date	Remarks
	MALE	13b	Acc	No	11-12-2008	None
42984	01	13b	Acc	No	11-12-2008	None
42983	02	13b	Acc	No	10-12-2008	None
42987	07 LIN	13b	Acc	No	10-12-2008	None
42968	08 LIN	13b	Acc	No	9-12-2008	None
42951	09 LIN	13b	Acc	No	9-12-2008	None
42969	10 LIN	13b	Acc	No	9-12-2008	None
42969	03	25b	Acc	No	2-12-2008	None
42968	04	25b	Acc	No	10-12-2008	None
42987	05	25b	Acc	No	10-12-2008	None
42951	06	25b	Acc	No	10-12-2008	None

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Pressure test certificate

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364-02*
Revision : *00*

Herewith DeMaCo Holland bv confirms to have executed the Pressure test according DeMaCo Working specification DEN 31

Design pressure: *100 Bar (g)*

Drawing no.	Spool no.	Testpressure in bar(g)	Result	Retest	Date	Remarks
080364-01-00-	11 LIN	13	Acc	No	8-1-2009	None
080364-01-04-	12 LIN	13	Acc	No	8-1-2009	None
080364-01-00-	13 LAR	13	Acc	No	8-1-2009	None
080364-01-04-	14 LAR	13	Acc	No	8-1-2009	None

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Vacuum retention test certificate

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364-02*
Revision: : *00*

Herewith DeMaCo Holland bv confirms to have executed the vacuumtest (Retentiontest) according working specification DEN 24 / DEN 33

Drawing no.	Spool no.	Accuracy (mbar.l/s)	0 h value	24 h value	48 h value	72 h value	Date	Remarks
080364-01-	*11 LIN*	*<1x10-9*	<1,5x10-6	*<1x10-4*	N.a.	N.a.	*08-01-09*	*None*
080364-01-	*12 LIN*	*<1x10-9*	<1,5x10-6	*<1x10-4*	N.a.	N.a.	*08-01-09*	*None*
080364-01-	*13 LAR*	*<1x10-9*	<1,5x10-6	*<1x10-4*	N.a.	N.a.	*08-01-09*	*None*
080364-01-	*14 LAR*	*<1x10-9*	<1,5x10-6	*<1x10-4*	N.a.	N.a.	*08-01-09*	*None*

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Vacuum retention test certificate

Customer : *Max Planck Institut fur Kernphysik*
Order no. : *p080364*
Revision: : *00*

Herewith DeMaCo Holland bv confirms to have executed the vacuumtest (Retentiontest) according working specification DEN 24 / DEN 33

Drawing no.	Spool no.	Accuracy (mbar.l/s)	0 h value	24 h value	48 h value	72 h value	Date	Remarks
	MALE	<1x10-9	2.3E-6	2.1E-5	N.a.	N.a.	11-12-08	None
42984	01	<1x10-9	4.3E-6	5.7E-5	N.a.	N.a.	11-12-08	None
42983	02	<1x10-9	2.7E-6	6E-5	N.a.	N.a.	10-12-08	None
42987	07 LIN	<1x10-9			N.a.	N.a.	11-12-08	None
42968	08 LIN	<1x10-9			N.a.	N.a.	12-12-08	None
42951	09 LIN	<1x10-9			N.a.	N.a.	09-12-08	None
42969	10 LIN	<1x10-9			N.a.	N.a.	09-12-08	None
42969	03	<1x10-9	4.1E-6	5.3E-5	N.a.	N.a.	09-12-08	None
42968	04	<1x10-9	3E-6	1.6E-5	N.a.	N.a.	02-12-08	None
42987	05	<1x10-9	3.1E-6	2.5E-5	N.a.	N.a.	10-12-08	None
42951	06	<1x10-9	4.1-6	4.3E-5	N.a.	N.a.	10-12-08	None

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Cleaning certificate

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364-02*
Revision: : *00*

Herewith DeMaCo Holland bv confirms to have executed the cleaning according working specification DEN 26.

Drawing no.	*Spool no.*	*Result*	*Pressurized 0,2 bar N_2*	*Date*	*Remarks*
080364-01-00-	*11 LIN*	*Acc*	*No*	12-1-2009	*Check with UV lamp*
080364-01-04-	*12 LIN*	*Acc*	*No*	12-1-2009	*Check with UV lamp*
080364-01-00-	*13 LAR*	*Acc*	*No*	12-1-2009	*Check with UV lamp*
080364-01-04-	*14 LAR*	*Acc*	*No*	12-1-2009	*Check with UV lamp*

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
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Cleaning certificate

Customer : *Max Planck Institut fur Kernphysik*
Order no. : *p080364*
Revision: : *00*

Herewith DeMaCo Holland bv confirms to have executed the cleaning according working specification DEN 26.

Drawing no.	*Spool no.*	*Result*	*Pressurized 0,2 bar N_2*	*Date*	*Remarks*
	MALE	*Acc*	*No*	8-12-2008	*None*
42984	*01*	*Acc*	*No*	8-12-2008	*None*
42983	*02*	*Acc*	*No*	8-12-2008	*None*
42987	*07 LIN*	*Acc*	*No*	8-12-2008	*None*
42968	*08 LIN*	*Acc*	*No*	8-12-2008	*None*
42951	*09 LIN*	*Acc*	*No*	8-12-2008	*None*
42969	*10 LIN*	*Acc*	*No*	8-12-2008	*None*
42969	*03*	*Acc*	*No*	8-12-2008	*None*
42968	*04*	*Acc*	*No*	8-12-2008	*None*
42987	*05*	*Acc*	*No*	8-12-2008	*None*
42951	*06*	*Acc*	*No*	8-12-2008	*None*

Name : *Kamil Ozhazinedar*
Date : *18-2-2009*
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Pressure test certificate

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364-02*
Revision : *00*

Herewith DeMaCo Holland bv confirms to have executed the Pressure test according DeMaCo Working specification DEN 31

Design pressure: *13 Bar (g)*

Drawing no.	Spool no.	Testpressure in bar(g)	Result	Retest	Date	Remarks
080364-01-00-	11 LIN	5	Acc	No	21-3-2009	None
080364-01-04-	12 LIN	5	Acc	No	21-3-2009	None
080364-01-00-	13 LAR	5	Acc	No	21-3-2009	None
080364-01-04-	14 LAR	5	Acc	No	21-3-2009	None
	MALE	5b	Acc	No	21-3-2009	None
42984	01	5b	Acc	No	21-3-2009	None
42983	02	5b	Acc	No	21-3-2009	None
42987	07 LIN	5b	Acc	No	21-3-2009	None
42968	08 LIN	5b	Acc	No	21-3-2009	None
42951	09 LIN	5b	Acc	No	21-3-2009	None
42969	10 LIN	5b	Acc	No	21-3-2009	None
42969	03	5b	Acc	No	21-3-2009	None
42968	04	5b	Acc	No	21-3-2009	None
42987	05	5b	Acc	No	21-3-2009	None
42951	06	5b	Acc	No	21-3-2009	None

Name : *Kamil Ozhazinedar*
Date : *19-4-2009*
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06 User manuals

Customer : *Max Planck Institut für Kernphysik*
Order no. : *p080364*
Revision: : *01*

Enclosed and mentioned below are the documents to be delivered by DeMaCo Holland BV.
The documents are according the contractuel agreement and the applicable European directives.

No.	***Documents***	***Rev.***	***Remarks***
1.	*Safety guidelines*	*08*	*None*
2.	*User manual VIP*	*08*	*None*
3.	*User manual Johnston couplings*	*03*	*None*
4.	*User manual Vale box*	*00*	*None*
5.	*User manual Phase separator*	*09*	*None*
6.	*User manual Gas vent*	*02*	*None*
7.	*User Manual DC 206*	*07*	*None*
8	*User Manual Safety Valve*	*00*	*None*

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Date : *18-2-2009*
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Safety guidelines for working with cold media

1. Introduction

Working with cold media implies a number of specific safety risks. The products concerned are basically nitrogen, oxygen, argon and helium. By taking into account the characteristics of these products in a cold condition, and to realise what effect they have on humans and their environment, the chances of an accident can be minimized. The information which follows enables you to identify the dangers and shows you how you can protect yourself and others.

2. Coldness

The liquids most frequently used in the industry at low temperatures are liquid oxygen, nitrogen, argon and helium. Oxygen, nitrogen and argon are liquids from approx. 186°C below zero while helium is liquid from 269°C below zero. Exposing the body to products with such a low temperature leads to freezing of tissue and so called cold burns. Cold burns can also occur when touching un-insulated machines and piping through which these extreme cold products are flowing.

2.1 Steps to be taken in case of an accident

1. The frozen tissue must be defrosted as soon as possible. This can be realized by submerging the frozen body part in water with a temperature of 40°C until it has regained its original colour.
2. NOTE: In case clothing is frozen onto the skin, NEVER TRY TO REMOVE THIS CLOTHING! By doing that, also the skin below it will be removed. The skin acts as protective layer, even if frozen!
3. Bandage the burnt part with sterile dressing.
4. Consult a doctor.

Breathing the extremely cold vapours that can be released with liquid products at low temperatures can lead to freezing of the bronchi and the lungs. If one has been exposed to this, a doctor must be contacted immediately.

If one has been exposed to cold during a prolonged period of time, hypothermia can occur. In such a case the victim must be wrapped in a warm blanket before being transported to a hospital.

Should a splash of a cold product end up in the eye, medical assistance must be called immediately.

2.2 Precautions

Many of the problems described above can be prevented by taking the correct precautions such as:

1. Screening off those areas in which work is performed with extremely cold products; and
2. Wearing protective clothing with which the body is covered to a maximum, wearing leather work gloves and safety glasses.

2.3 Influence on materials

Other materials that become extremely cold due to e.g. leaking liquids, can become hard and brittle and break, becoming as sharp as glass. Concrete exposed to low temperatures for a prolonged period of time can disintegrate and turn to powder.
Carbon steel becomes brittle at temperatures lower than 20°C below zero, and applications of these materials must be avoided in such situations as much as possible.
Plastics and rubbers become hard and brittle at lower temperatures and break easily.

2.4 Liquefaction of air

Air becomes liquid at 193°C below zero. Liquid air can occur around non-insulated machines and piping with a temperature lower than 193°C below zero. The surrounding air can condense on the cold material. The liquid air flows off the piping as if it were water and can for example come into contact with persons.

2.5 Vapour clouds

During leakage or blow off of an installation in the case of overpressure, vapour clouds can occur. In these clouds the water is freezing and ice patches can occur on the floor. Also the view is obscured. Entering these clouds can result in danger of suffocation (see next chapter).

3. Suffocation

Suffocation can be described as the loss of life due to lack of oxygen. Normal air consists for 21% of oxygen. For a safe living environment, the oxygen percentage in the ambient air must lie between 19,5% and 22% .

The danger in working with gasses lies in the fact that most gasses are:

- invisible;
- odourless;
- tasteless, and
- not tangible.

Therefore they can not be detected by our senses. Nitrogen, argon and helium are so called inert gasses, i.e. they do not chemically react and therefore do not support oxidation. For that reason they are used for flushing vessels and piping, for high-tech welding and leakage detection. These situations can occur in which piping, vessels etc. are filled with these gasses while they can not be detected.

Machines in which gasses or liquids under pressure are processed are fitted with an overpressure safety. Via this overpressure safety gasses can be blown off in the environment as a result of which situations can occur in which:

- the oxygen concentration no longer meets the norm, and
- during evaporation of liquid argon, nitrogen or helium one part liquid will form about 800 parts of gas. When one of these liquids evaporates in a particular space, then the oxygen concentration can drop to a level whereby a life threatening situation will exist.

3.1 Steps to be taken in case of an accident

If you see someone collapse, do not try to rescue this person, but leave the area or room as soon as possible and alert someone in possession of a breathing apparatus. Many suffocation accidents have two victims; the person that has collapsed and the one who has assisted the victim.

3.2 Preventive measures

1. Ensure there is proper ventilation in all spaces where gas or liquid argon, nitrogen or helium is used.
2. Connect any blow off valves to piping that leads to the outside air. Ensure that this blow off point is sufficiently far away from the inlet point of the ventilation system.
3. In case of doubt, fit oxygen sensors that measure the oxygen in the environment and raise an alarm in case of danger.

4. Fire hazard

Oxygen is necessary for combustion. The higher the oxygen concentration, the lower the energy necessary to realise ignition. The warmth of the discharge sparks of static electric energy, or rapid compression of oxygen gas can be sufficient to start a fire.

Air can condensate against very cold surfaces. At this point, extremely high concentrations of liquid oxygen occur. When working on these cold surfaces of for example liquid nitrogen or helium piping the same safety guidelines must be used as with oxygen. Therefore, when oxygen is released, there is a high fire hazard.

4.1 Precautions

1. Fuel, an ignition source and oxygen are required for a fire. In case of uncontrolled release of oxygen one can only control the ignition source. Consider e.g. sparks caused by static electricity generated by clothing and sparks generated by electrical equipment such as switches and phones.
2. Ensure there is maximum ventilation.
3. Keep the working environment free from combustible materials as far as is practically feasible.
4. Let the oxygen vent from your clothing for a period of about 15 minutes when you have worked on locations where high concentrations of oxygen might have been present.
5. Valves in oxygen systems must be opened slowly to ensure the pressure increases slowly.
6. Ensure that all parts are degreased to ensure trouble free use in oxygen.
7. NEVER apply non-approved grease in oxygen environment.

5. Disassembling piping and fittings

The above-described risks, and the measures to be taken in that respect, are also important when working on cryogen systems where piping sections or fittings have to be disassembled.

1. Personal protection means, such as gloves, safety glasses and safety shoes must always be worn.

2. Ensure when disassembling that the system is not pressurized and bear in mind that cold liquids and gasses can escape. Before starting the disassembly, the product supply must be shut off. Usually this will be done by closing the valve to the storage tank. This valve must be locked in such a way that it can not be opened by unauthorised persons during the disassembling.

3. Piping can be under pressure as a result of the still existing system pressure, or by build up of pressure due to evaporation of the medium. The pressure that is created because the liquid evaporates due to heat ingress, can rise considerably. After closing the supply, the piping will have to be depressurized.
   This can be done in various ways:
   a. When a valve is fitted on the end of the piping which is directly venting to the ambient air, it can be opened carefully.
   b. When the pressure in the pipeline system has been released by bleeding the system to the outside air through a valve, the section to be removed must be closed off at both ends with seals. Because there is always a safety valve located between two seals in the pipeline system, this is carefully unscrewed and removed. As a result the pipeline section will remain unpressurized. In couplings where clamps are used, caution must always be exercised because some gas under pressure can be present in the coupling itself. In couplings where flanges are used, the bolts can be loosened slightly so that the gas can escape.

ANNEX 1 of "Safety guidelines for working with cold media"

Safety Guidelines DeMaCo Holland BV Cryogenic Equipment

	DANGER	WARNING
	Cryogenic equipment contains fluids at low temperatures. Touching cold parts leads to severe burns.	Don't expose any part of the body to cold parts and keep a safe distance. Use safety glasses, protective gloves and protective clothing.
	Liquified gasses are colourless and odourless. Leaking gasses may result in reduction of oxygen level. This causes rapid suffocation.	Make sure there is enough natural or mechanical ventilation. In contained areas use oxygen level monitoring. Use independent breathing devices.
	High pressure may be present in the system. Due to evaporation of liquid during heat up pressure may rise quickly. This leads to cold gas releasing through pressure safety devices. Breathing cold gas may lead to frostbite of mouth and lungs.	Before opening the installation make sure no pressure is present. Never prevent the release of gas by the pressure relief valves. Keep a safe distance. Use safety glasses, protective gloves and protective clothing. Prevent breathing cold gas.
	Oxygen and hydrogen are high explosive gasses. Take proper precautions when working with oxygen and hydrogen systems. Make sure the ATEX guidelines are followed.	Keep a safe distance. Don't use open fire or other ignition sources.
	Liquid air may condensate on cold areas. This will flow or drip like water. Touching this fluid leads to severe burns.	Don't expose any part of the body to cold parts and keep a safe distance. Use safety glasses, protective gloves and protective clothing.
	Where air condensates on cold areas liquid oxygen may form. This causes a high risk for fire or explosion.	Keep a safe distance. Don't use open fire or other ignition sources.

- Periodically check the pipes for signs of damage or leakage. Cold spots are usually a clear indication that something may be damaged or leaking.
- Periodically check the proper operation of the pressure relief valves.
- Make sure the pipes and other hardware of the installation are properly protected against collision by foreign objects, as this may damage the hardware resulting in leakage of cryogenic liquid.

Conditions for use of standard DeMaCo Vacuum insulated equipment.

When the equipment is used outside of these conditions please contact DeMaCo. The following figures are based on a distance between supports of max. 3 m:

Conditions of our standard design:

- Ambient temperature -20°C to +38°C.
- Windload Windforce 10 continuous.
- Snow and ice load Not relevant.
- Earthquake Seismic Zone 0 acc. to UBC.
- Max. allowable load at interface (support at interface)
  - Max. force in any direction at interface 100 N, and
  - Max. moment at interface 10 Nm.
- Amount of thermal cycles 1000 cycli according to EJMA.

Remarks:

- When connecting vibrating equipment to the Vacuum Insulated Pipe we advise to use a hose or bellows to prevent damage of the pipe.
- We advise to use a design pressure equal to or higher than the design pressure of the supply system, to prevent unsafe or unwanted conditions, such as relief of the supply system through the pressure safety valves of the application.
- We advise to use exhaust pipes to reroute blow off or exhaust of devices such as phase separators, gas vents and pressure relief valves to a safe place, away from people.
- Our Vacuum Insulated Equipment is made with a stainless steel jacket suitable for a normal to harsh environment. When using the equipment in a very corrosive environment (seawater or aggressive cleaning agents) please contact DeMaCo for a suitable solution.
- Our standard equipment is designed for all cryogenic fluids. Please inform DeMaCo when the equipment is meant for flammable, explosive or poisonous fluids. Special care must be taken during design and production of safety features in this case.
- If liquid Hammer occurs please contact DeMaCo for a proper solution.

Vacuum Insulated Pipelines
VIP PN16 and PN40

June, 2008, rev 07 / ML&RvdP, pag. 1-8

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i Readers guide

The different aspects of the users' instruction of the application are explained in detail in this description. Points of interest are marked as follows throughout the instructions.

 Tip	Offers suggestions and/or advice to the operator to perform specific tasks easier
 Take note	Makes the operator aware of possible problems
 Caution	Indicates damage to the application or immediate adjoining equipment if the operator does not carry the procedures out cautiously
 Warning	Warns the operator of the possibility of injury when the procedures are not followed carefully
 Life threatening Danger	Possible life threatening danger for the operator

Under the operator DeMaCo Holland bv understands:
The person operating the machine supplied by DeMaCo Holland bv

 Warning	The operator is responsible for the safety of an eventual assistant. The operator must ensure that no dangerous situation could arise for the assistant

ii. Safety and health of the operator

Take note	These instructions should be read by the operator as soon as possible to enable him to become familiar with the use of the system

Because of a possibility of injury to the operator, the hazards that could appear with the use of cryogenic media are specifically referred to. The sticker depicted below is applied on the DeMaCo Holland bv equipment where the operator could possibly come into contact with cryogenic media. This warns the operator of the danger of freezing and it indicates the necessity to wear safety glasses and gloves with wrist protection.

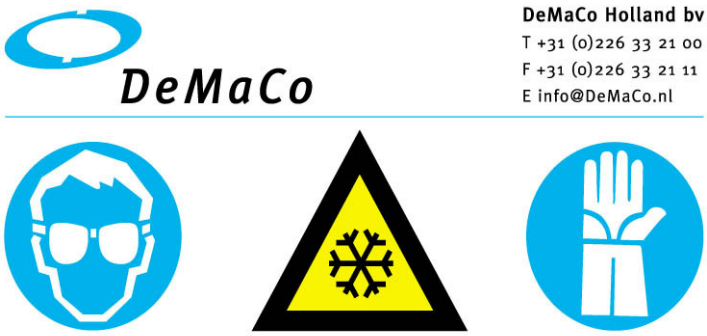


Figure 1: Safety sticker

This manual must at least be available at the supervisor of the department for inspection. Furthermore we recommend the copying of these instructions and to store it in covers or bound in book-form at the work location with the installation.

Furthermore we recommend that you carefully read the DeMaCo safety instructions “Safety directives for working with cold media”. In this instruction, detailed information is given on working with cryogenic liquids. If you require multiple copies of these instructions in order to create a safe working area for the operator(s), you can request more copies from DeMaCo Holland bv.

1 Introduction

NOTE

Inside Holland users of pressure equipment must perform an examination before bringing into use, dutch term; “Keuring Voor Ingebruikname” (KVI), the user must select which equipment must have this examination. The rules are according the dutch “Waren Wet Besluit Drukapparatuur” (WWBD).

1.1 Explaining the function and operation

These assembly instructions apply to vacuum insulated pipelines. Before you start with the installation, use and maintenance, you should read these instructions carefully.
Vacuum insulated pipelines are compounded from pipeline sections that are pre-manufactured, vacuum-packed and tested. Every section is provided with a static vacuum which is equipped with a chemical getter system to increase the standing time of the vacuum and 25 layers of glass and aluminium foil to keep heat radiation on the process tube as low as possible. Every section is also equipped with a pump valve. This valve has 2 functions, access as vacuum pump and as safety valve for the vacuum mantle. The pump valve is normally situated in the centre of a section and must remain reachable for eventual re-vacuuming.

The sections are pre-manufactured and mutually connected using Johnston-links, Welded links or Foam-links. Johnston-links require no welding activities during the installation of the pipeline work. Welding links on the other hand have to be welded and vacuumed during the installation of the pipeline work.
Foam-links must only be welded and equipped with conventional isolation.

A vacuum insulated pipeline consists of a double-walled tube whereby the process medium runs through the inner tube. The outer mantle is necessary to create a vacuum isolation and to ward of external pressures. The thermal crimping as a result of the cryogenic process medium is absorbed by built-in compensators. This results in thermal contraction only as a result of environmental temperature changes. The outer mantle has very limited contact with the process tube so that standard support systems can be used. Here, only the thermal contraction of the outer mantle should be considered. Thermal contraction of the process tube is completely absorbed by the compensators built into the process tube.

Warning

Support by means of welding is normally not possible to the vacuum insulated pipelines because leakages could then originate in the vacuum mantle. Welding for support systems or compounds for isolation mantles for conventional insulated pipelines can only be done on a special double equipped vacuum mantle.

Type and positions of support systems have to be determined from the standards and rules applicable to the location of use. Normal applicable support distances are:

- DN10 - DN25 2m
- 1” 2.5m
- 1.5” – 2.5” 3m
- 3” and 4” 3.5m
- 6” 4.5m
- 8” 6m

For distances between a support and a curve, valve, link or other components, a maximum of 1m must be used. Bends should be prevented on links between different sections.

1.2 Purpose of use and circumstances

Vacuum insulated pipelines are suitable for cryogenic gasses from -269°C to 80°C.
PN16 vacuum insulated pipelines are suitable for maximum 16 bar (g).
PN40 vacuum insulated pipelines are suitable for maximum 40 bar (g).
Vacuum insulated pipelines are according the PED (97/23/EC).
Expected lifespan depends on the number of cold/warm cycles of the compensators that are usually 1000.

2 Assembly instruction

2.1 Receipt

Be careful with the unpacking of vacuum insulated pipelines and be on the lookout for visible damage. Visible damage should be reported to DeMaCo Holland bv or a DeMaCo representative.
Check the pipeline sections based on the isometric drawing. The project number, pipeline and the section number are engraved by DeMaCo Holland bv on every section at the pump valve. The engraved section numbers on the pipelines correspond with the section numbers on the isometric drawing. The pipeline and the section numbers can be read through the packaging. Only remove the packaging at the time of the definite assembly. Hereby dirt and moisture is prevented to enter the pipelines which could disrupt a correct assemblage.
Check if the pumps valve plugs are still present to be sure that the vacuum is still present.
In case of multiple pipelines, we recommend that you first sort the sections per pipeline number before starting with the assemblage.
If the installation activities are not performed immediately and the sections have to be stored, this has to take place in a safe manner to prevent damage.

2.2 Installation

Depending on the pipeline, a starting point can be selected for the assembly.
This does not have to be with section number 1.
Follow the steps below:

1. Install the first supports for the first sections.
2. Then place the first two selected sections loosely in the supports and remove the safety lids. Use safe lifting equipment if the weight of the section requires this to guarantee personal safety and to prevent damage of the pipelines.
3. Repeat the above steps until the entire pipeline is positioned.
4. Minor outline deviations may still be adjusted by changing the support.
5. Implement limited height variances to prevent gas blockages.
6. Use a slope of 1% so that gas bubbles can only escape in the flow direction.
7. When the pipeline is completely positioned according to above directives the supports can be fixed.
8. Finally, connect the pipeline to the tank and the users' end point.

For the assembly of specific links, refer to the manual of this specific link, i.e.:

- Johnston-links
- Welding links
- Foam-links

Warning

Check that a safety valve is installed between every two closures before the liquid medium is pumped into the pipeline. Closed in cryogenic fluids that warm up can create very high pressures, pressures above the allowable pressure of the pipeline. This can result in cracking of the pipeline.

A safety valve can blow of cold medium, this can result in danger for freezing.
This flow of cold gas may not be pointed on the VIP-jacket, because this can lead to condensation and ice on the jacket. Pump valves or Johnston couplings (that contain soft seals) that are placed in the jacket can get cold and they can leak because of this cold temperatures, this results in bad isolation values.

Careful

Every section is vacuum packed in the factory.
Welding to the outer mantle of a section will result in the loss of the vacuum.

2.3 Testing

When you are convinced that you have assembled the entire pipeline correctly, the pipeline can be tested. The following tests can be performed:

1. Pressure test:
    a. Perform this with a gaseous medium at room temperature at a maximum of 1.43 times the design pressure.
    b. Keep the pipeline system under pressure for at least 30 minutes.
    c. Check the pipeline system for leakages.
2. Cold test:
    a. Open the valves on the user end which is the furthest removed from the stock tank and wait until liquid comes out before the valve can be closed.
    b. Repeat this step with all present valves so that the entire system is cooled.
    c. Check the vacuum insulated pipeline visually for condensation and ice. Under specific environmental conditions, condensation formation is possible on links, valves and other less properly insulated parts.
3. Functional test:
    a. Check if all present components are functioning properly.

When all of the above-mentioned tests have been performed with success the vacuum insulated pipeline system is suitable for use. When defects are established these have to be fixed followed by a repetition of the above tests or they have to be reported to DeMaCo Holland bv or DeMaCo representative.

2.4 Disassembly

If a vacuum insulated pipeline system has to be dismantled it is advisable to operate in the opposite sequence as the installation.

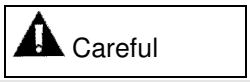
Careful

Before links can be dismantled, the pipeline has to be discharged of the internal pressure by closing the valves at the tank and opening the release valves.

The pipelines should also be warmed up to room temperature. This heating takes place unforced and under normal circumstances 20 hours. This heating process can be accelerated by purging the process pipeline with gas at room temperature.

3 Storage of the vacuum insulated pipelines

Storage of the vacuum insulated pipelines should be dry and in packaging. Make sure that no water and pollution can enter the pipelines. The minimum storage temperature of the pipelines is 18°C.If it is stored at lower temperatures the process pipeline has to be blown with dry gas before use, so that no water or water condensation is present in the process pipeline with commencement of use. Special moisture free packaging is also usable for this.



Ensure that the packaging and protection of the ends of the pipeline sections remain undamaged during transport and storage.

4 Maintenance and use

The maintenance of a vacuum insulated pipeline is subject to periodical visual inspection, once per month. Ice formation on the outer mantle or on the flanges of the links, can indicate:

- A reduction of the vacuum level in the vacuum space. This occurs with normal conditions after some years. With the reduction of the vacuum level the isolation value also decreases. Ice will thus possibly become visible. By vacuuming the pipeline again, the isolation is recovered. DeMaCo Holland bv has all the equipment and knowledge to perform this after vacuuming.
For the proper implementation of the after vacuuming the pipeline should be empty and be brought to room temperature at least.

- Damage to the O-ring in the Johnston-link. We recommend replacement of the O-ring when visible damage has developed. Remove the O-ring and clean the O-ring groove cautiously.
When an O-ring has to be replaced, the link must always be heated to room temperature/area temperature.

To temporarily prevent condensation of ice before after vacuuming can be performed, conventional foam isolation can be used to decrease or prevent condensation drops.

Vacuum insulated pipelines can be classified as pressure equipment and can thus fall under local legislation and regulation. The applicable regulations have to be followed.

Invar Johnston Coupling

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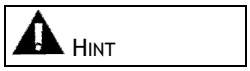
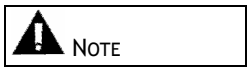
i. Structure of the manual / clarification

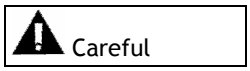
The various aspects of this manual are clearly listed here. Points of attention are marked throughout the entire manual in the following way (the interpretation is also given):



Offers suggestions/advice to the operator in order to perform certain tasks more easily.



Points out possible problems to the operator.



Indicates damage to the equipment or directly linked equipment when the operator does not carefully adhere to the procedures.

Warns the operator of possible injuries if the procedures are not adhered to properly.

The life of the operator is directly threatened.

DeMaCo Holland bv considers the operator to be:
the one who operates the machine or equipment supplied by DeMaCo Holland bv.

The operator is responsible for the safety of any assisting employee. The operator must ensure, before starting the machine or installation, that no dangerous situation can occur for the assisting employee.

ii. Safety and health concerns

NOTE	This user manual must be read by the operator as soon as possible in order for him to become familiar with the operation of this equipment.

From the point of view of injuries to the operator, specific attention is given to the dangers that can occur when using liquid nitrogen. On DeMaCo Holland bv equipment, where the operator may come into contact with liquid nitrogen, you can find the label as shown below. It warns the operator of the presence of coldness and it is indicated that safety glasses and gloves with wrist protection should be worn.

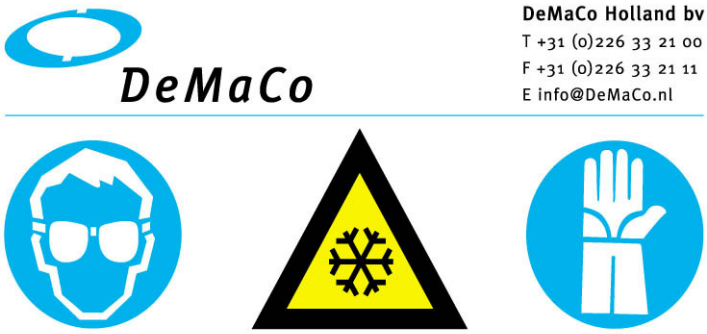


Figure 1; Safety label on DeMaCo Holland bv products

This user manual should at least be available for consultation at the head of the department. We recommend that a copy be made of this manual inserted in plastic folders, or bound, and put on view at location with the equipment.

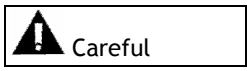
1. General remark

Assembly instructions for vacuum-insulated pipes, which are connected by means of a male-female (Johnston) coupling. Before you begin assembly, first read these instructions and refer to the enclosed drawing number 09408.C.2.

2. Assembly instructions

Check the pipe sections by means of the isometric drawing. On each section next to the pump valve there is an order number engraved by DeMaCo Holland bv. There is also a section number which corresponds to the sections numbers on the isometric drawing. For checking the sections do not remove the packing, as this might cause dirt to enter the pipe, resulting in the possible contamination of the pipe assembly. In case of multiple lines, sort out the sections per line number.

Decide at which point you like to start the assembly. This does not have to be at section number one. Mount two sections on their supports in such a way that both ends of the inner tube are separated with an inter space of about 600 mm.



The male Johnston coupling is provided with a protective cover on the metal seal. This protective cover will protect the metal seal on the front of the coupling. Remove this cover just before you connect the male to the female connector. This to prevent damage to the metal seal.
Damaging the metal seal may result in malfunction of the Johnston coupling.

Remove the packing from the male and female coupling. Watch out for pollution on, and damage to the ends. In a heavily polluted work area use, for example, a tent to screen the area. Normally the male part of the coupling is by horizontal lines in the flow direction. In vertical lines the male is above the female, irrespective of the flow direction.

Check the flanges and sealing area. Clean the couplings, especially the O-ring groove, and the metal seal area, with a dry and clean cloth.

Grease the O-rings lightly with a vacuum grease with silicone. For lines suitable for oxygen, use only grease which is appropriate for this application, by example Fomblin grease.
Place both O-rings. The small O-ring has to be placed in the second groove from the metal seal ring. See drawing 09408.C.2.

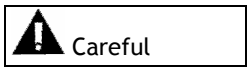
Insert the male into the female. The first part runs smoothly into the female, up until the metal seal of the male reaches the sealing bush of the female. Check the position of the O-ring in the flange of the male and push the two parts, for the last 20 mm together. Considerable force may be required to move the male into the female. Mount, when the flanges are together, the KF 50 clamp or bolts, rings and nuts. In case you use grease on the nuts make sure it is the correct type of grease in the case of an O_2 line. The maximum tightening moment of the KF50 clamp is 2,8 Nm.

Install the remaining VIP-line spools. When you are convinced that the line is installed correctly, you may pressurise the line with gas on room temperature.

Make sure that a safety-relief valve is installed between two shut-off valves.

Check the coupling with a liquid leak detector. Bubble forming on the flanges shows a gas leak. If there is one at the coupling, tighten the clamp or the bolts and nuts. Be careful not to exceed the maximum torque on the clamp. Check the coupling again on leakage after a tightening action.

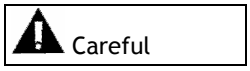
If the leak is still there, release the pressure of the VIP-line and open the coupling. Check and clean the O-ring and groove. If necessary use a new O-ring. It is important to apply grease to the O-ring.



Each section is pre-vacuumed at our factory. Welding at the outer pipe of the section (jacket) will result in the loss of the vacuum. This due to the fact that the hot metal will be sucked into the vacuum space.

3. Storage of the vacuum-insulated pipes

Store the pipes dry and packed. Prevent water and other pollutants from entering the pipes. Minimum storage temperature is 18 °C.



Be careful that the protection cover, on the end of the male Johnston Coupling, remains undamaged during handling and storage.

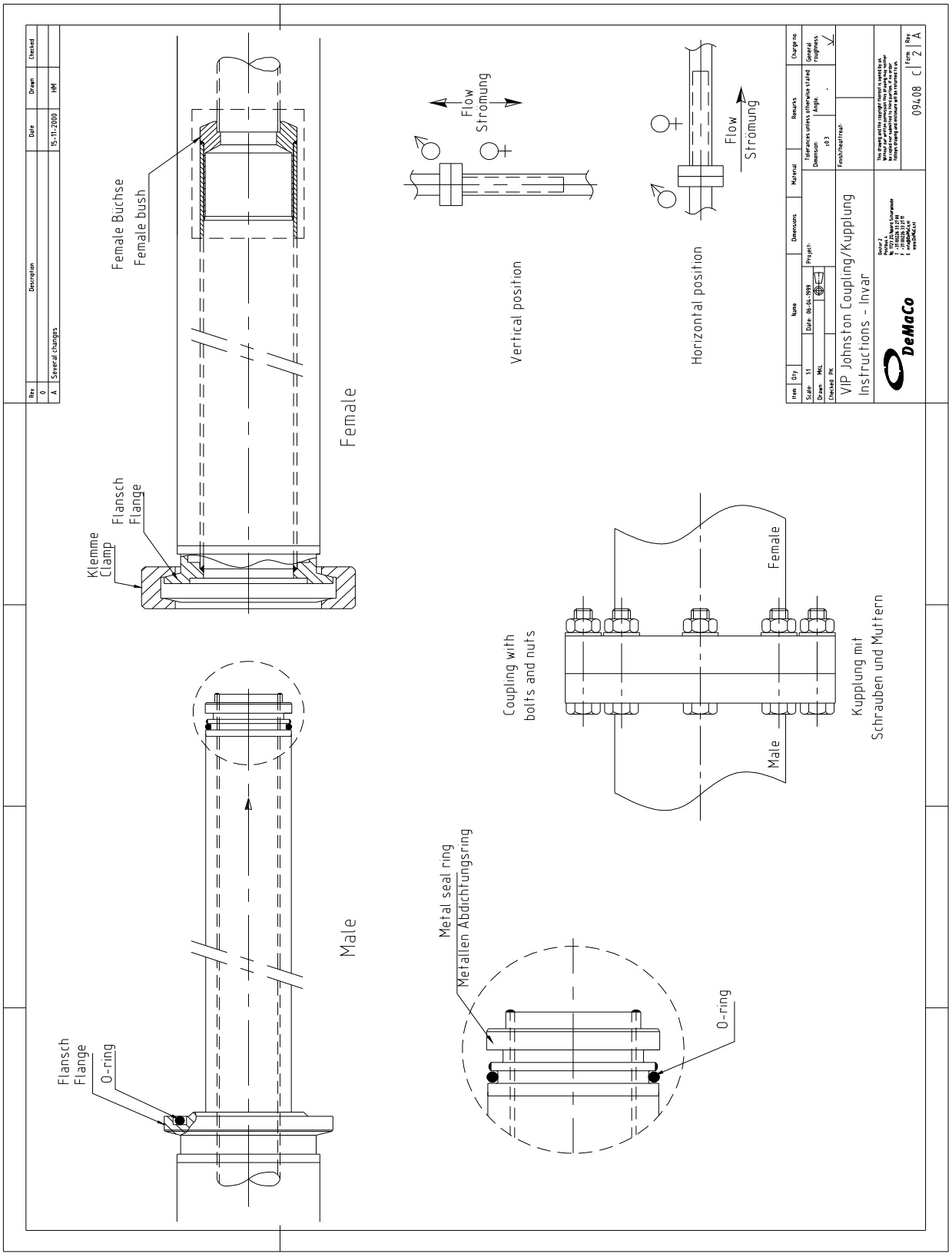
4. Maintenance

The maintenance of the vacuum-insulated pipes requires only a periodical visual control. Ice build-up on the outer pipe and/or flanges of the coupling may be the result of the following matters:

- The vacuum level in the vacuum space is reduced. This normally occurs within a time span of several years. Consequently, the insulation value is also reduced. By simply re-vacuuming the vacuum space, the correct insulation capacity can be re-obtained. Before you pump the pipes to a correct vacuum level, the pipes must be warmed up to at least the surrounding temperature. Preferably up to a higher temperature.

- The O-ring of the coupling is damaged. We advise you to replace the O-ring when any damage to the O-ring can be seen. Remove the damaged O-ring and clean the O-ring grooves.
You always have to warm up the couplings after ice building to ensure an adequate sealing of the O-ring.

5. 09408.C.2.


Female Büchse
Female bush
Flansch
Flange
Klemme
Clamp
Female
Flow
Strömung
Vertical position
Horizontal position
Flow
Strömung
Coupling with
bolts and nuts
Female
Male
Kupplung mit
Schrauben und Muttern
Metal seal ring
Metallen Abdichtungsring
O-ring
Flansch
Flange
O-ring
Male
VIP Johnston Coupling/Kupplung
Instructions - Invar
DeMaCo
09408 C 2 A

DeMaCo
cryo and vacuum technology
Thinking in solutions

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User manual LAR / LN2 Valve box
Project: GERDA
P080364 MPI

i Table of contents

ii Readers guide

The different aspects of the users' instruction of the application are explained in detail in this description. Points of interest are marked as follows throughout the instructions.

 Tip	Offers suggestions and/or advice to the operator to perform specific tasks easier
 Take note	Makes the operator aware of possible problems
 Caution	Indicates damage to the application or immediate adjoining equipment if the operator does not carry the procedures out cautiously.
 Warning	Warns the operator of the possibility of injury when the procedures are not followed carefully.
 Life threatening Danger	Possible life threatening danger for the operator.

Under the operator DeMaCo Holland BV understands:
The person operating the machine supplied by DeMaCo Holland BV

 Warning

The operator is responsible for the safety of everything and everyone. The operator must ensure that no dangerous situation can arise for everything and everyone.

iii. Safety and health of the operator

Warning

These instructions must be read and understood by the operator before operating the equipment. This to make sure he is become familiar with the use of the system, before operating.

Because of a possibility of injury to the operator, the hazards that could appear with the use of cryogenic media are specifically referred to. The sticker depicted below is applied on the DeMaCo Holland BV equipment where the operator could possibly come into contact with cryogenic media. This warns the operator of the danger of freezing and it indicates the necessity to wear safety glasses and gloves with wrist protection.

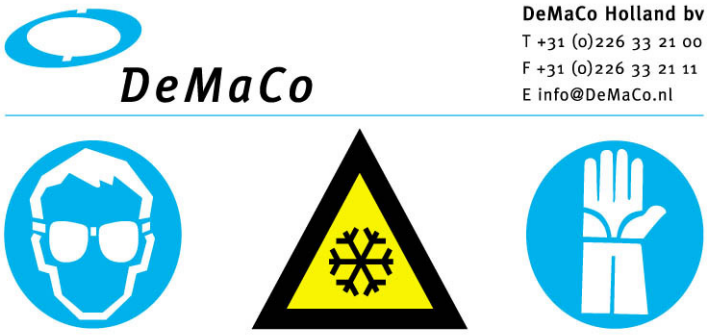


Figure 1: Safety sticker

This manual must at least be available at the supervisor of the department for inspection. Furthermore we recommend the copying of these instructions and to store it in covers or bound in book-form at the work location with the installation.

Warning

Before operating cryogenic equipment. Carefully read the DeMaCo-safety instructions “Safety directives for working with cold media”. In this instruction, detailed information is given on working with cryogenic liquids. If you require multiple copies of these instructions in order to create a safe working area for the operator(s), you can request more copies from DeMaCo Holland BV.

1 Content of operating instructions

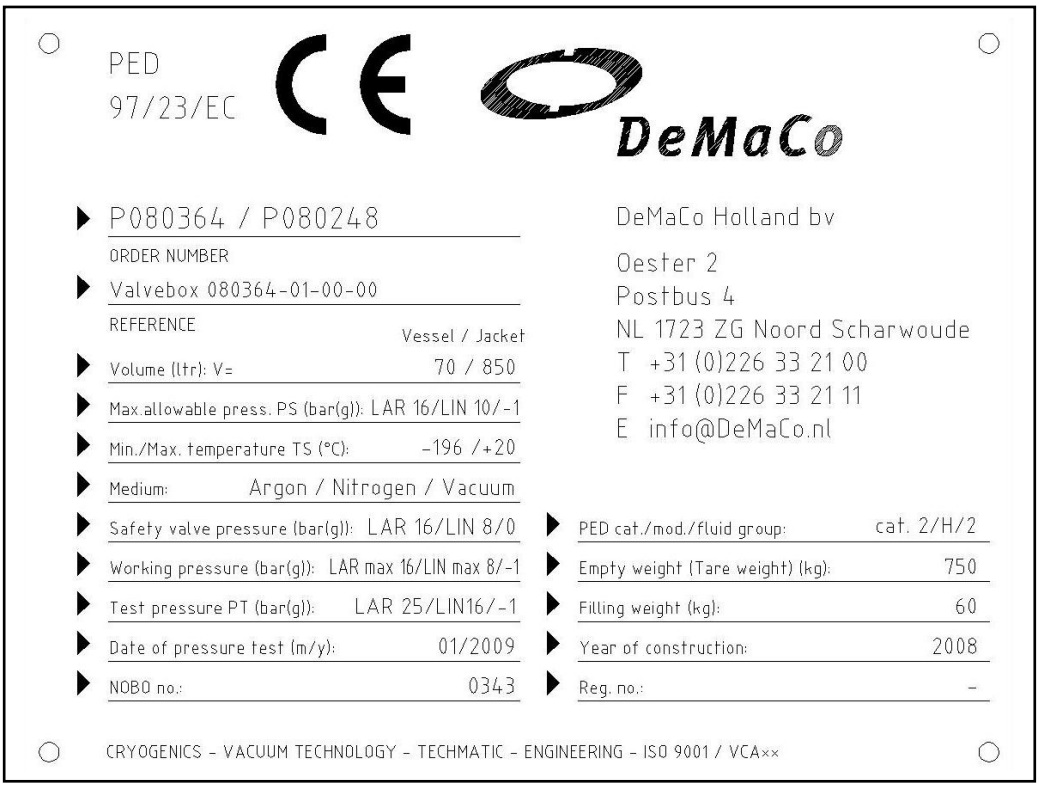
1.1 General

1.1.1 Introduction

NOTE

Inside the country of use the pressure equipment must perform an examination before bringing into use. In Holland; “Keuring Voor Ingebruikname” (KVI), the user must select which equipment must have this examination. The rules are according the dutch “Waren Wet Besluit Drukapparatuur” (WWBD).

1.1.2 Information on the data plates



1.1.3 Information in operating instructions

Take note

General design information:

- This pressure equipment is designed according AD2000 design code.
- Used joint coefficient is 1
- Lifetime 1000 warm/cold/warm cycles
- Technical documents, drawings and diagrams can be found in the data books
- Do not use the pressure equipment above or under the limits stated on the data plates
- The valve box is for indoor use only
- The valve box is according the order confirmation of DeMaCo Holland bv

Gerda is an international collaboration with the aim to reveal the nature of neutrinos by studying the radioactive decay of 76Ge nuclei. Since this decay is extremely rare, shielding against external radioactivity is of paramount importance. For this reason Gerda is constructed underground at the Laboratori Nazionali del Gran Sasso (LNGS) in Assergi, Italy. In the experiment, germanium diodes made out of isotopically enriched material are operated in liquid argon (LAr). The Max-Planck-Institut fur Kernphysik (MPI) is responsible for the cryogenic vessel for LAr and its infrastructure. The liquid serves as coolant for the diodes as well as shielding material against external radiation from the surrounding rock and the cryostat material. The shielding is completed by a 3 m thick layer of water outside the cryostat. Radioactive contaminations in the LAr are mainly due to small admixtures of 222Rn. Radon can be removed from the cryogenic liquid very effectively with a procedure developed at the MPI. After the removal special care has to be undertaken to avoid new contaminations from radon present in the atmosphere or from emanation of radon from construction materials or diffusion of radon through gaskets. Hence metal seals against atmosphere will be used.

Scope of DeMaCo:
The DeMaCo system is according the P&ID (dwg. 42399.C.1). The LN2 and LAR comes from the storage tanks and flows through the lines and valve box to the cryostat. In this process the LN2 has also a function to sub cool the LAR. The quality (liquid / gas combination) of the LAR is adjusted by the lower temperature of the LN2.

Situation on site:
Nearby the cryostat are two storage tanks. One tank is filled with LN2 and the other is filled with LAR. From those tanks a flexible triaxial transfer line leads to the GERDA valve box. The valve box contains valves, a phase separator/subcooler vessel, filters and all the interfaces to the process. From the valve box a flexible triaxial transfer line leads to the cryostat of the GERDA experiment.

1.2 Transportation and erection or installation (mounting)

Take note

DeMaCo Holland bv installed the GERDA valve box and transfer lines at LNGS (Laboratory Nazionali del Gran Sasso) in Assergi, Italy. In case of transport contact DeMaCo Holland bv for detailed instructions.

1.3 Putting into service

Description according the P&ID:

- At the LN2 and LAR storage tanks are normally closed valves welded. The system is according drawing 47153.C.3. This system is there in case of emergency. When the pressure after these valves drops (for example when a line brakes) the valves will close and the LN2 and LAR in the storage tanks will not flow out and will cause no further danger.
- When the process will be started these valves must be opened with compressed air, because there is no pressure to keep the valves open. When the process is working the small valves for the compressed air must be closed and the pressure in the LN2 line will keep the valves open.
- The system contains several safety valves. These valves must have maintenance according the specifications of the manufacturer. See data book.
- In the system are two keep cold devices. These devices will release gas from the lines and will make sure that there is liquid in the lines. The exhausts from the keep cold devices must be at a place so that the cold nitrogen gas can not give a dangerous situation for people. If necessary extend these exhaust lines to a safe location.

  Warning
- The system contains a phase separator. For information about this component see the manual of the phase separator.
- Inside the phase separator is a filter. This filter is a component which is designed and delivered by MPI. DeMaCo only installed this filter. When maintenance of this filter is needed the phase separator must be cut open. Contact DeMaCo when this is needed.
- The valves in the valve box, except the phase separator valves and safety valves, are delivered by MPI. Maintenance is according the manual of these valves.
- The valve box contains Johnston Couplings. See the manual for these couplings. The Johnston Couplings in the LAR lines have ConFlat flanges. These flanges have copper gaskets. When the Johnston Couplings with ConFlat flanges must be dismounted be careful with the cutting edges. Do not scratch or damage these edges.
- At the LAR outlet side of the valve box is a 3” Johnston Coupling. At the nose of the male coupling are two Teflon filters. One filter can be replaced by only dismounting the 3” Johnston Coupling. The second filter is inside the nose of the male coupling. When this filter must be replaced the nose must be cut open. Contact DeMaCo when this is needed.
- At the outlet side of the valve box are two LN2 flexible lines. These lines have DN10 Nut Johnston Couplings. The couplings can, when warm, be dismounted by unscrewing the brass nuts. After that the male coupling can be pulled out of the female. Use some vacuum grease on the o-rings to put the male back again.

1.4 Use/Operation

 Caution

DeMaCo has delivered the transferlines and valve box according specifications mentioned above. The control of the valves in the valvebox is determined by the customer. Incorrect control of valves may lead to undesired functioning of the system. The components which are supplied by the customer are only fitted in by DeMaCo and is not the responsibility of DeMaCo.

 Caution

Use calibration and testing tools to make sure that the instruments in the system are working correctly.

 Warning

The operator is responsible for the safety of an eventual assistant. The operator must ensure that no dangerous situation could arise for the assistant.

1.5 Maintenance and inspection

It is advised to regularly check the transfer lines and valve box:

- The outer jacket of the transfer lines and valve box must be free of condensation and must be at room temperature. When the outer jacket is not free of condensation, it may indicate a high degree of humidity (over 85 %) in the building. When you have checked this, and the humidity is lower, then it could mean that the insulation vacuum is reduced.
- Check the connections of the fittings at the valve box for ice deposits. No ice deposits must be visible.
- The insulation vacuum can be deteriorated in the course of time in a static vacuum situation. The equipment can in this case be re-evacuated.
- There can be a leak in the vacuum jacket, contact DeMaCo Holland bv.
- There can be a leak in the process line, check the process conditions and contact DeMaCo Holland bv. When the situation gets worse it could be wise to shut down the process until the problem is located and solved.
- For taking the system into service make sure that the whole system is at ambient temperature

 Careful

Welding to the outer jacket of a vacuum valve box or transferline section will result in the loss of the vacuum. As a result of the vacuum the weld will be sucked in and a hole will originate in the outer jacket.

1.6 Documentation

Technical documents, drawings and diagrams can be found in the data books

Operating instructions phase separator with levelcontroller

December 2008,rev.9,OL, page 1-10

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i Structure of the manual / clarification

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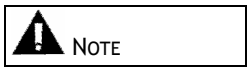
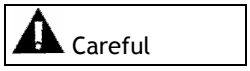
 NOTE	Points out possible problems to the operator.
 Careful	Indicates damage to the phase separator or directly linked equipment when the operator does not carefully adhere to the procedures.
 WARNING	Warns the operator of possible injuries if the procedures are not adhered to properly.
 PERIL TO LIFE	The life of the operator is directly threatened.

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The one who operates the machine or equipment supplied by DeMaCo Holland b.v.

 WARNING

The operator is responsible for the safety of any assisting employee. The operator must ensure, before starting the machine or installation, that no dangerous situation can occur for the assisting employee.

ii. Safety and health concerns

NOTE	This user manual must be read by the operator as soon as possible in order for him to become familiar with the operation of this equipment.

From the point of view of injuries to the operator, specific attention is given to the dangers that can occur when using liquid nitrogen. On DeMaCo Holland bv equipment, where the operator may come into contact with liquid nitrogen, you can find the label as shown below. It warns the operator of the presence of coldness and it is indicated that safety glasses and gloves with wrist protection should be worn.

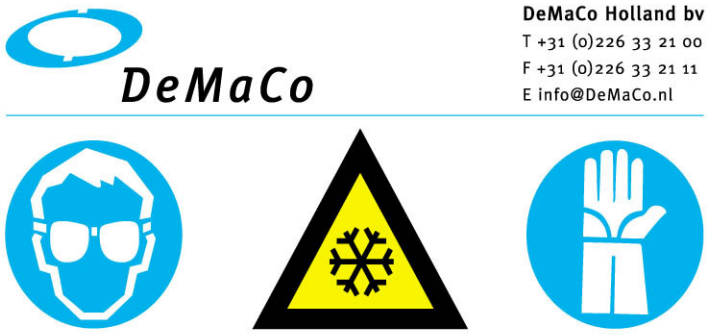


Figure 1; Safety label on DeMaCo Holland bv products

This user manual should at least be available for consultation at the head of the department. We recommend that a copy be made of this manual inserted in plastic folders, or bound, and put on view at location with the equipment.

1 Installation of a phase separator

NOTE

Inside Holland users of pressure equipment must perform an examination before bringing into use, dutch term; “Keuring Voor Ingebruikname” (KVI), the user must select which equipment must have this examination. The rules are according the dutch “Waren Wet Besluit Drukapparatuur” (WWBD).

During the installation of a phase separator, all required connections must be fitted by DeMaCo Holland bv personnel. All supply and discharge VIP piping is connected. The power supply for the level controller and the compressed air for the electrical/pneumatical filling and exhaust valve is connected.

Filling of a phase separator is assumed to be done from a storage tank already filled with liquid nitrogen.

HINT

When filling a phase separator with liquid nitrogen, one has to realise that the phase separator first has to be cooled down from room temperature to – 196 °C. This means that the first quantity of nitrogen will evaporate. Only after a period of time, depending on the contents of the phase separator, the phase separator will start filling with liquid nitrogen.

Verify, after the installation of the phase separator has been completed, that the level controller works properly. Refer to the instructions in the separate user manual of the levelcontroller.
By switching the levelcontroller to manual, it can also be checked that the electric-pneumatic filling valve works. After this functional test the start and stop filling levels of the levelcontroller are set when one wants to use values different from the factory values. Also refer to the separate manual of the levelcontroller.

2 Filling a phase separator

Switch off the level controller. This will cause the filling valve to close.
Open the manual valve at the main tank. It is most likely located outside, below the main tank.

WARNING

When the system is supplied without exhaust piping connected to the exhaust valve, cold nitrogen gas will start flowing from the exhaust valve immediately after switching on the level controller.
Ensure that persons or vulnerable equipment can not be injured/damaged by this cold gas flow.

PERIL OF LIFE

When the phase separator is installed in a confined space, danger of suffocation exists. This being because the amount of nitrogen from the phase separator can displace the air (oxygen) from the space. In this case exhausting the gas to a safe remote atmosphere is necessary.

Immediately after switching on the level controller nitrogen gas will flow from the exhaust valve. This will make some noise. Don't let this frighten you. As soon as the phase separator is cold, the gas flow will reduce, and the noise will cease.

Now switch on the level controller. The phase separator will now start filling itself with the liquid nitrogen up to the "stop filling level". This level has been set by either DeMaCo Holland bv (default setting = 80 %) or by the user.
Once this level has been reached, the filling valve will close automatically. Now the set pressure in the phase separator will stabilise (to be read on the pressure gauge at the top of the phase separator), or in case of a non-pressurised phase separator (no pressure gauge), the pressure will stabilise at the atmospheric pressure.

Some cold nitrogen gas will always escape as exhaust. This gas occurs as a result of the small heat leak into the inner vessel. Therefore this does not indicate leakage.

Now the phase separator is filled and ready to feed the application with pure liquid nitrogen.

3 Safety of a phase separator

Via the exhaust piping each phase separator is connected with the outside world. In case of a non-pressurised phase separator there is a direct (open) connection with the outside world. In the case of a pressurised phase separator, the exhaust valve is fitted in the exhaust piping. The exhaust valve is directly operated by the pressure in the inner vessel of the phase separator. As soon as the pressure becomes too high, the exhaust valve is opened and the pressure is relieved up to the set value.
Apart from this possibility to relief the pressure, a safety valve has been fitted on each phase separator. Should the exhaust piping be blocked, the pressure build-up in the phase separator can be relieved via the safety valve. Therefore a safe situation is always guaranteed.

Once the safety valve has engaged, the system must be verified in order to determine the cause. Only after this problem has been solved, can the phase separator be filled again.

4 Maintenance of a phase separator

A DeMaCo Holland bv phase separator is a maintenance free product. However, we recommend to periodically check a number of points in order to eliminate possible wear in the earliest possible stage.

We recommend thorough checking of the following points monthly:

1. The outer jacket of the phase separator must be free of condensation but is allowed some degrees below room temperature. When the outer jacket is not free of condensation, it may indicate a high degree of humidity (over 85 %) in the building. When you have checked this, and the humidity is lower, then possible the insulation vacuum in the phase separator is reduced. Please contact DeMaCo Holland bv. Uninsulated parts of course always show condensation or ice forming.
2. Check whether the VIP piping of the phase separator is free of condensation and ice. Perform the same inspection as described at point 1 when condensation is visible.
3. Check the connections of the fittings at the top side of the phase separator for ice deposits. No ice deposits must be visible.
4. Check whether the pressure gauge at the top of the phase separator indicates the correct pressure. Refer to the order data for the correct setting. When this deviates, you can set the pressure of the phase separator conform section 5. This does not apply to non-pressurised phase separators.
5. Check whether the glands of the filling valve and exhaust valve are free of ice (see figure 2, position 7). When ice is visible, the gland must be slightly tightened. Turn with an angle of 5 degrees at a time.


WARNING

When these glands are over tightened, the valves could stick in the open position. Therefore act carefully and check the proper function.

5 Setting the pressure of a phase separator

The DeMaCo Holland bv phase separator is supplied in two pressure versions. The non-pressurised version of the phase separator does not need to be checked. The version with exhaust valve must be checked as described above. In case of a deviation of the set pressure, the procedure described below must be followed. Refer to figure 2 for position numbers.

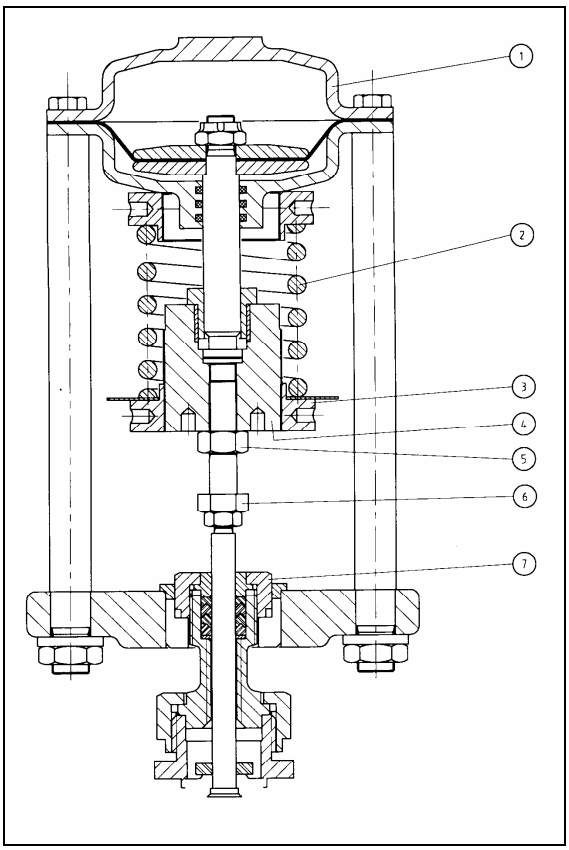


Figure 2; Cross section phase separator valve

5.1 General

The opening pressure of the exhaust valve is determined as follows:

The pneumatic actuator (pos. 1) on the exhaust valve is connected with the internal vessel of the phase separator and the pressure reducer. Thus the valve is lifted of the seat when the force, owing to the pressure in the actuator, is larger than the spring pressure (pos. 2). Thus by varying the setting of the pressure reducer, the opening pressure of the exhaust can be set. Generally it can be said that a higher contra force of the spring realises a higher opening pressure of the exhaust valve. The other way around is also true; the opening can be reduced by reducing the pressure of the pressure reducer.

The opening pressure of the exhaust valve can only be adjusted when the phase separator is in operation (filled with liquid nitrogen).

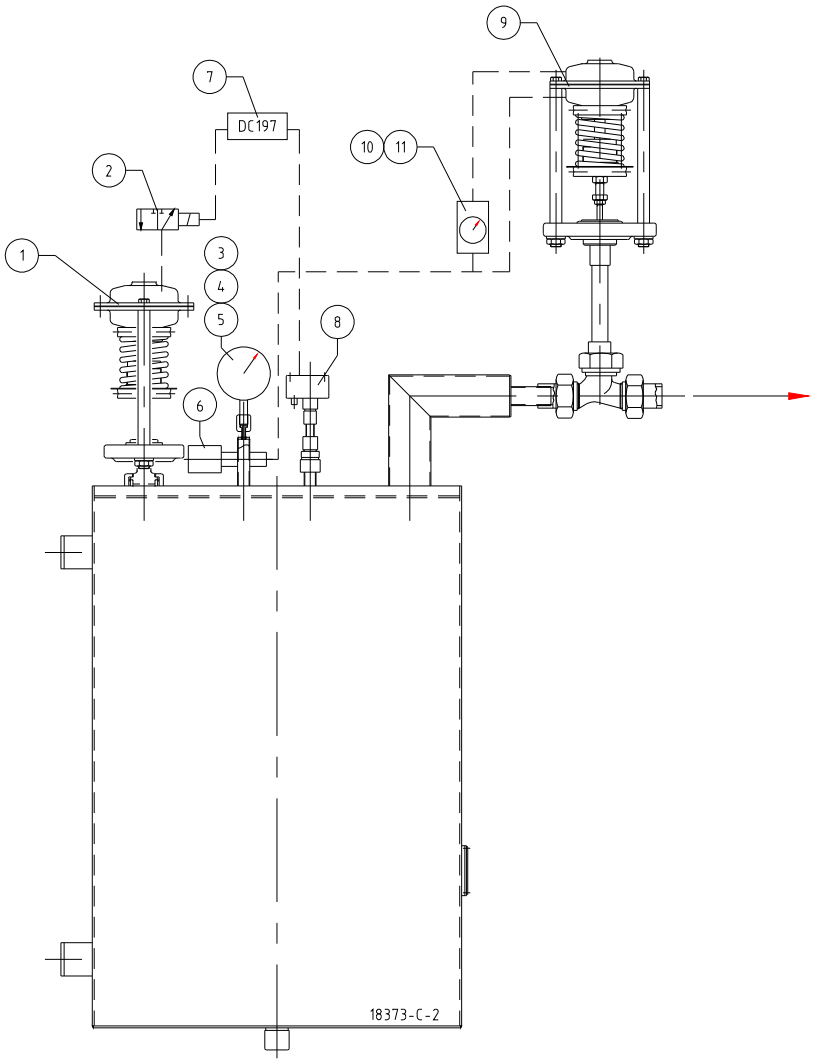
5.2 Procedure for setting the opening pressure of the exhaust valve

1. Check on the pressure gauge on top of the phase separator what the current pressure of the phase separator is. When the indicated pressure is lower than the required pressure, the pressure on the pressure reducer will have to be increased. When the indicated pressure is higher than the required pressure, the pressure on the pressure reducer will have to be decreased.

2. After making the adjustment, wait about 15 minutes in order to give the phase separator time to adjust to the new pressure.

3. Repeat adjustment of the pressure as many times as required to obtain the required pressure setting.

6 Survey Spare Parts



1. Filling valve
2. Solenoid valve
3. Gauge connection
4. Seal for gauge
5. Gauge 0-6 bar
6. Safety relief valve
7. Levelcontroller
8. Levelsensor (DS 197)
9. Exhaust valve
10. Pressure reducer
11. Gauge

Operating Manual
Mechanical automatic
Gas vent

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i Structure of the manual / clarification

The various aspects of this manual are clearly listed here. Points of attention are marked throughout the entire manual in the following way (the interpretation is also given):

 HINT	Offers suggestions/advice to the operator in order to perform certain tasks more easily.
 NOTE	Points out possible problems to the operator.
 Careful	Indicates damage to the phase separator or directly linked equipment when the operator does not carefully adhere to the procedures.
 WARNING	Warns the operator of possible injuries if the procedures are not adhered to properly.
 PERIL TO LIFE	The life of the operator is directly threatened.

DeMaCo Holland bv considers the operator to be:
The one who operates the machine or equipment supplied by DeMaCo Holland b.v.

 WARNING

The operator is responsible for the safety of any assisting employee. The operator must ensure, before starting the machine or installation, that no dangerous situation can occur for the assisting employee.

ii. Safety and health concerns

NOTE

This user manual must be read by the operator as soon as possible in order for him to become familiar with the operation of this equipment.

From the point of view of injuries to the operator, specific attention is given to the dangers that can occur when using liquid nitrogen. On DeMaCo Holland bv equipment, where the operator may come into contact with liquid nitrogen, you can find the label as shown below. It warns the operator of the presence of coldness and it is indicated that safety glasses and gloves with wrist protection should be worn.

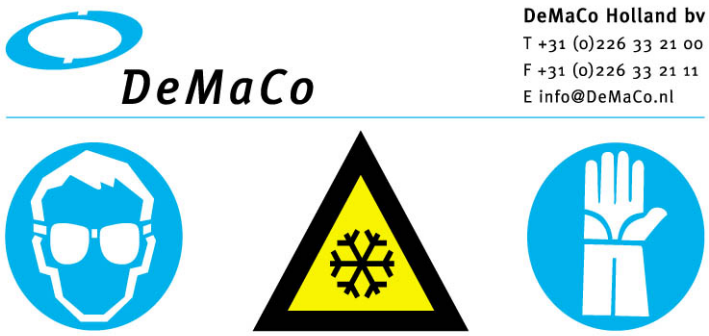


Figure 1; Safety label on DeMaCo Holland bv products

This user manual should at least be available for consultation at the head of the department. We recommend that a copy be made of this manual inserted in plastic folders, or bound, and put on view at location with the phase separator.

1 Introduction

The mechanical automatic gas vent is used to release gas from a cryogen line containing a mixture of liquid and gas. This gas may be formed by heat leak from the environment, or pressure losses by friction or increased static height. Using a gas vent prevents a cryogenic line from running dry and warming up in case no liquid is used for some time. As a result, liquid cryogen will be immediately available for use.

Please note that the gas inside a high velocity two phase flow may not always be completely vented. In this case, a phase separator may be required.

Inside the gas vent a float valve will open and close the vent line. When gas is formed the liquid level inside the gas vent will descend and the float valve opens, gas will be vented. The liquid level will rise again and the float valve closes. The liquid level at which the float valve will close is fixed and can not be adjusted.

2 Installation - Mechanical

2.1 inlet connection

WARNING

Always make sure that a safety-relief valve is installed between two shut-off valves, otherwise it can result in the inclusion of cryogenic liquid, which is a dangerous situation. The automatic gas vent is on no sense a replacement of a safety-relief valve.

The Gas Vent should be vertically installed on a DN25 female or horizontal DN25 male DeMaCo Johnston Coupling, see Appendix A Drawing 09189.C.2 and Appendix B Drawing 09190.C.2,respectively.
Before installation, check the o-rings and the sealing surfaces for damage. For details about installing DeMaCo Johnston couplings, please refer to the instruction manual 'Invar Johnston Coupling'.

2.2 outlet connection

On the outlet of the gas vent, a non-return valve is mounted as a standard. This non-return valve prevents atmospheric moisture entering into the ball valve and should not be removed.

A gas line may be installed to release the gas. This line may be connected onto the non-return valve, or directly onto the ball valve, if the gas line is longer than 5 meters. In this case, the non-return valve may be omitted.
For the installation of the gas line a reducing nipple ½" – 1" (art. # 212.120) and a swage coupling (art. # 516.047) is needed.

WARNING

The temperature of the gas coming out of the gas vent may be as low as -200°C. The position of the outlet and the direction of the gas flow should be chosen in such a way that there is no danger for people or delicate equipment.

WARNING

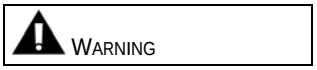
When the outlet of the gas vent is exhausting in a confined space, danger of suffocation exists, if Nitrogen gas from the exhaust displaces the air (Oxygen) from this space. It is in all situations preferable to exhaust the gas outside.

2.3 Pumpvalve.

On the front side of the gas vent, a pump valve is located. This is used for evacuation and safety device for the vacuum jacket. It is sealed by a plug and protected from dust by a plastic cap. A security pin prevents the plug from causing danger or damage. Do not remove the cap, the safety pin or the plug, except for re-evacuation. For this, a dedicated pump-out tool is required and the re-evacuation should be carried out by authorized personnel. It is not used in any way for operation of the gas vent.

3 Start up / Shut down

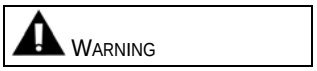
After installation the gas vent is immediately ready for use. When the ball valve is opened gas will be blown off until the float valve will close the venting line due to a rising liquid level.
Please note that during the first filling of the line, this may take some time, because a considerable amount may be formed by cooling down the pipes. The gas vent may simply be closed by closing the ball valve.



When the ball valve is opened gas with a temperature as low as -200oC can come out of the gas vent. Make sure that the position of the operator and other employees is such that nobody will be in the path of the out coming gas.

When the gas vent is equipped with a solenoid valve instead of a standard ball valve then it can be controlled from a distance. (Appendix C Drawing 09187.C.2)

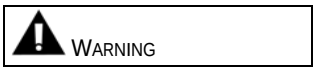
4 Disconnecting the gas vent



When disconnecting the gas vent, always make sure that there is no liquid left inside and that the pressure in the line is shut off.

5 Storage

Store the gas vent dry and packed. Prevent water and other pollutants from entering the pipes. Minimum storage temperature is 5ºC. Maximum storage humidity is 70%.



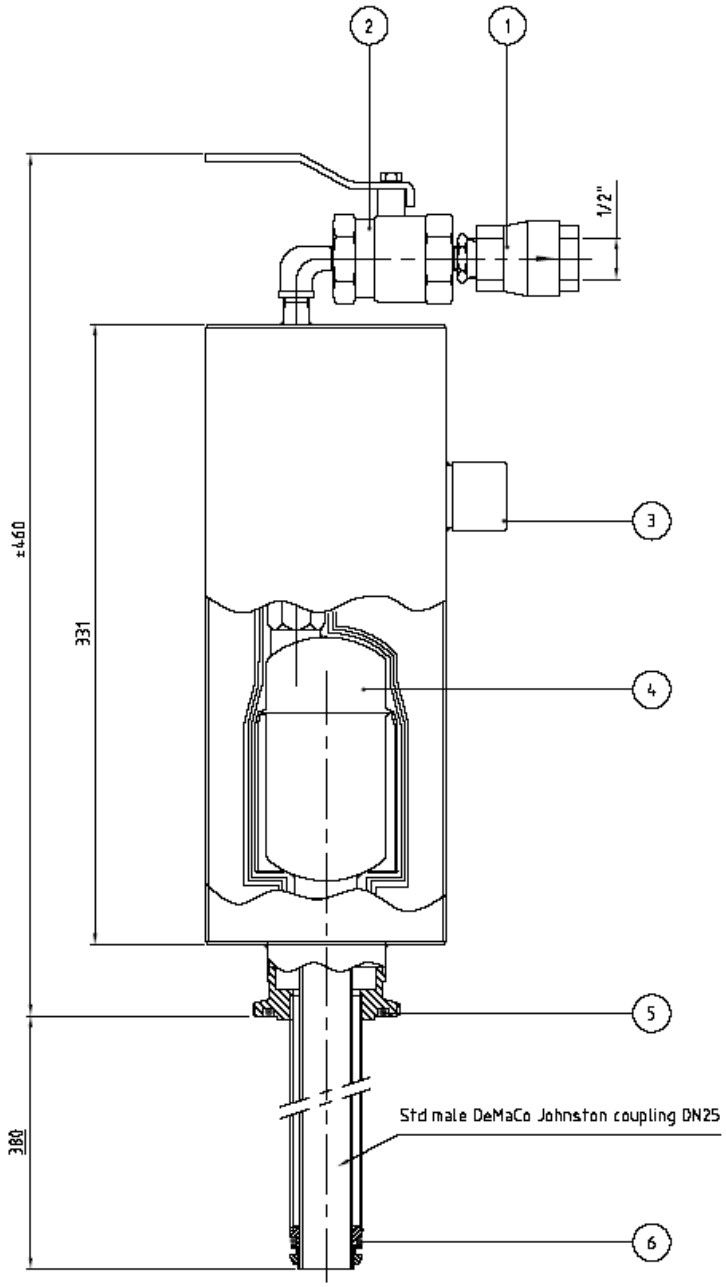
Be careful that the protection cover, on the end of the Johnston Coupling, remains undamaged during handling and storage.

6 Maintenance

The gas vent requires only a periodical visual control. Ice build-up on the outlet may be considerate after some time of operation, but does not represent a problem. The body itself, however, should be free of icing.

Heavy moisture or ice on the body of the unit may be an indication that the vacuum is reduced. This normally occurs within a time span of several years. Consequently, the insulation is also reduced. By evacuating the vacuum space, the correct insulation capacity can be re-obtained. Before evacuation, the gas vent must be warmed up to at least atmospheric temperature, preferably higher. Contact DeMaCo Holland bv for more information regarding re-evacuation.

APPENDIX A: Drawing 09189.C.2

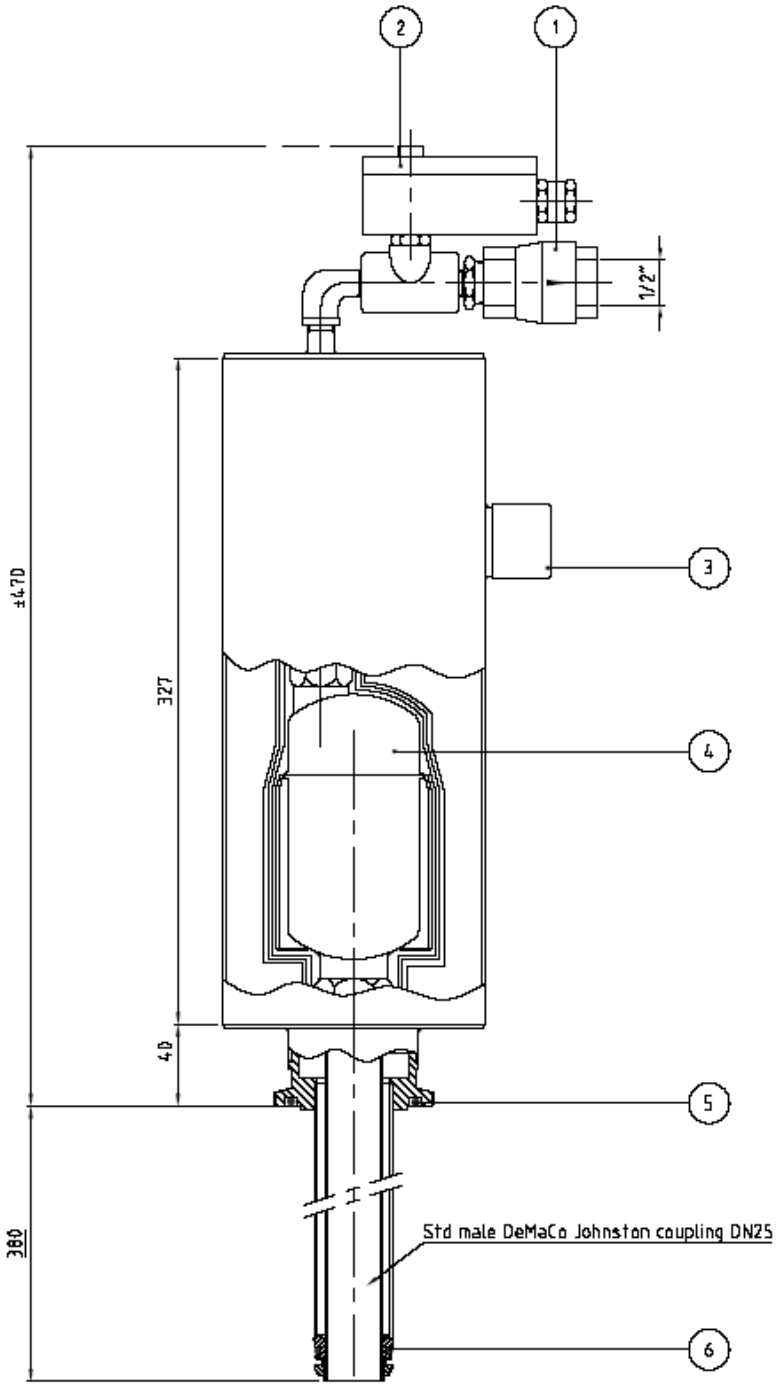


Drawing 09189.C.2

6	1	O-ring		512.032
5	1	O-ring		512.048
4	1	De-aerator		516.050
3	1	Protective Cap		516.102
2	1	Ball valve	¼"	507.003
1	1	Check valve	½"	516.049
Item	Qty.	Name	Dimensions	DeMaCo art. no.

Table A.1. Parts list

APPENDIX B: Drawing 09190.C.2

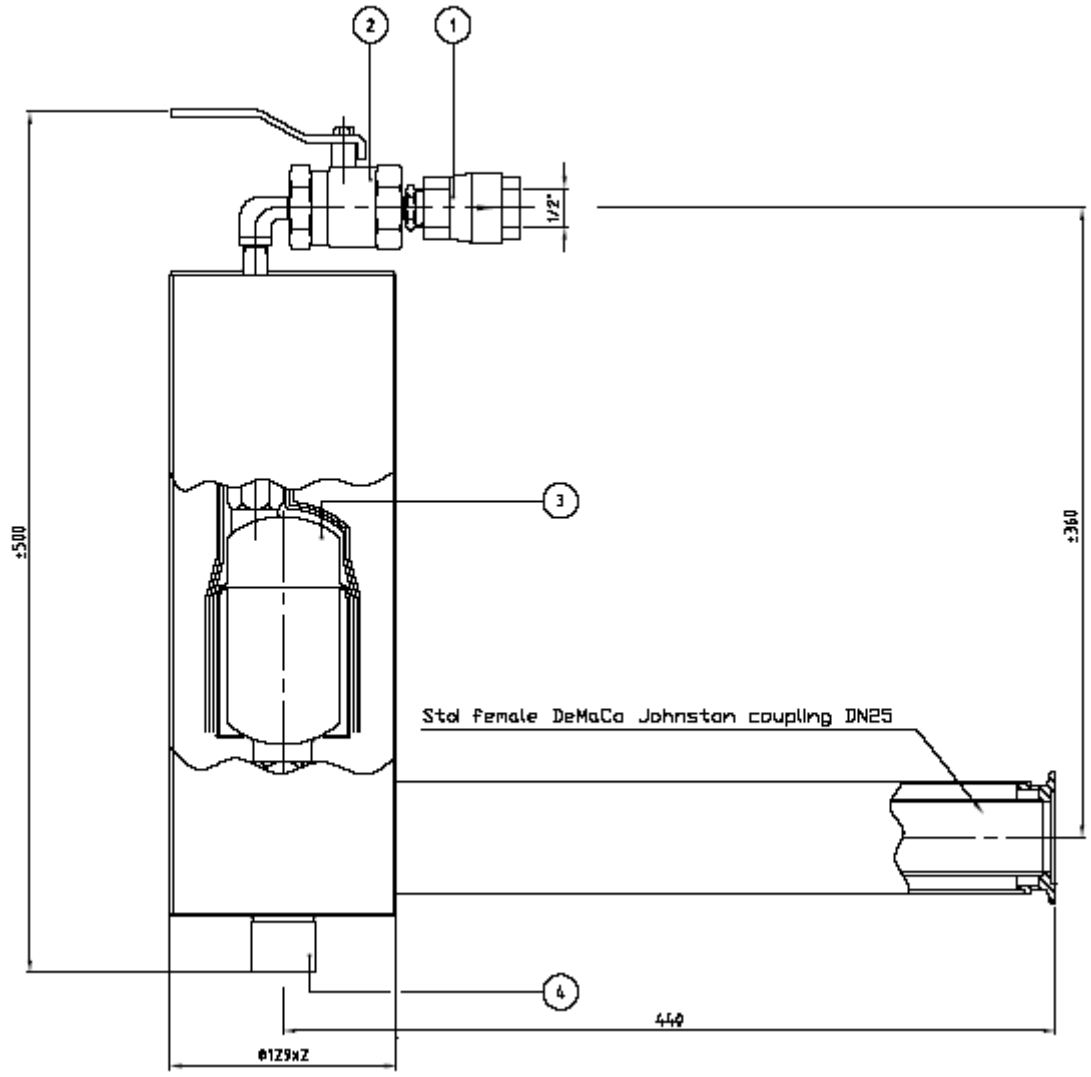


Drawing 09190.C.2

Item	Qty.	Name	Dimensions	DeMaCo art. no.
6	1	O-ring		512.032
5	1	O-ring		512.048
4	1	De-aerator		516.050
3	1	Protective Cap		516.102
2	1	Solenoid valve 24VAC	¼"	507.147
1	1	Check valve	½"	516.049

Table B.1. Parts list

APPENDIX C: Drawing 09187.C.2



Drawing 09187.C.2

Item	Qty.	Name	Dimensions	DeMaCo art. no.
4	1	Protective Cap		516.102
3	1	De aerator		516.050
2	1	Solenoid valve 24VAC	¼"	507.147
1	1	Check valve	½"	516.049

Table C.1. Parts list

User's Manual
Level Controller
Type DC206

Oct. 2008,rev.7,SvdP, pag.1-33

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Contents

1. Operator's safety and wellbeing

This user's manual applies to the DeMaCo Holland bv Level Controller, type DC206 for liquids. The manual applies to both the standard model of the DC206 as well as to models with custom software.

Remarks
The operator should read these instructions as soon as possible in order to understand how to operate the level controller correctly.

With respect to injury to the operator, the dangers that may occur when using cryogenic media are emphatically indicated. The sticker shown below is affixed to the areas on DeMaCo Holland bv equipment where the operator comes into contact with cryogenic media. The symbols on the sticker warn the operator for extreme cold and indicates that safety goggles and gloves with wrist protection must be worn.

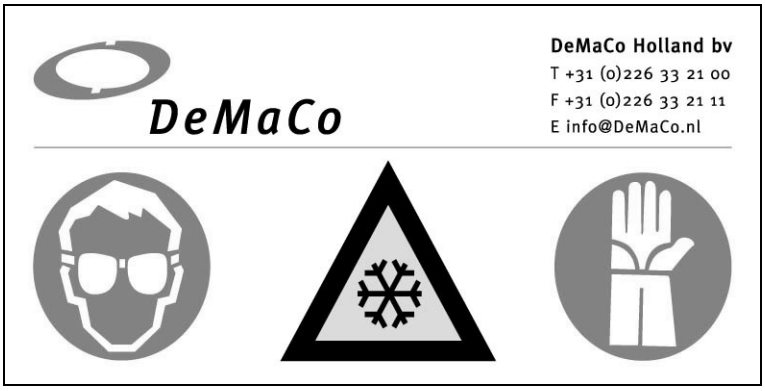


Figure 1.1 Safety sticker


Wearing safety goggles is compulsory.


Warning: low temperatures.


Wearing safety gloves is compulsory.

This manual should at least be available for inspection at the department manager's office. We also recommend that this manual is copied, and kept at the workplace next to level controller in a binder or insert folders.

We also advise you to read the DeMaCo safety instructions "Safety Guidelines for working with low temperature media" thoroughly. These instructions give detailed information on working with cryogenic liquids. If several copies of these instructions are required in order to create a safe workplace for the operator(s), you can make more copies.

2. Description

The DC206 level controller is a level regulator to which various types of sensors can be connected. The DC206 has a display that indicates the liquid level in percentages. The DC206 is available with an open/close valve and a proportional valve. The open / close valve model of the DC206 has a potential free relay contact to activate a digital valve so that the DC206 operates as a two-point regulator. The DC206 has a proportional output for a proportional valve, which sends out a current between 4 and 20 mA so that the DC206 operates as a single point regulator.

The controller can also be set such that the fill valve can be operated manually. In addition to an upper and lower limit for the fill level, a low and high alarm level can also be set. If one of these levels is exceeded (in automatic mode), an acoustic signal will be triggered and the fill valve will be closed. This situation will remain unchanged until reset. An adjustable digital input filter filters the signal from the level sensor in order to achieve steady control behaviour. Together with a number of ancillary functions, this makes it possible to adjust the regulator in combination with the sensor for various applications. DC stands for Digital Controller, 206 stands for the custom type.

2.1 Type specification

A type plate has been affixed to the housing of the DC206 Level Controller, which specifies the type and options. The supply voltage, project number, and software version are also specified. The abovementioned data is listed in two lines on the type plate. Part of this data is recorded in code. An example of a type plate is given in figure 2.1.

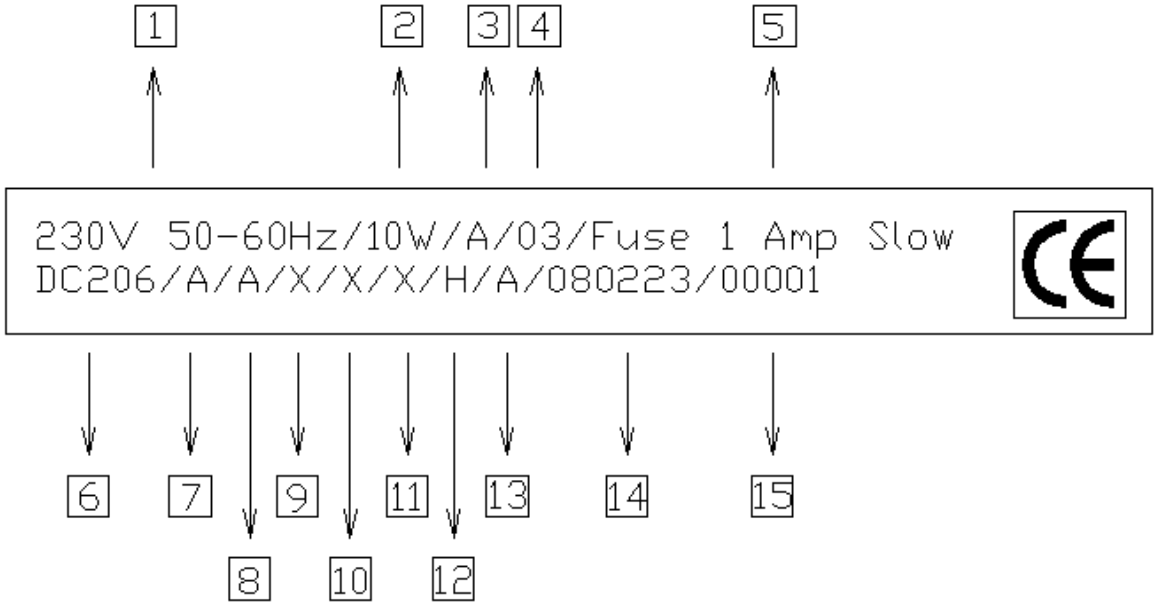


Figure 2.1. DC206 type plate

The first line on the type plate specifies the DC206 settings. The second line contains coded information about the supplied configuration.

► *Line 1. DC206 settings*

1. *Supply voltage*
   The supply voltage is specified on the type plate. Possible supply voltages:
   ▷ 230 VAC 50 - 60 Hz
   ▷ 24 VDC

2. *Input power*
   The maximum input power is 10 Watt from the mains, excluding switched elements.

3. *Sensor input setting.*	Code on type plate
▷ 4 - 20 mA	A

4. Valve output voltage	Code
▷ 230 VAC 50-60 Hz	01
▷ 24 VDC	03

5. *Fuse type*	
The type of fuse is specified on the type plate.	Value:
▷ 230 VAC model	1 A (slow)
▷ 24 VDC model	4 A (slow)

► *Line 2. DC206 configuration*

6. *Type indication*
   The type is directly specified on the type plate.
   ▷ DC206 stands for Digital Controller

7. Model	Code on type plate
▷ Stand alone	A

8. *Sensor input*	
This value indicates the connected sensor type:	Code on type plate
▷ DS197 (DeMaCo capacitive sensor)	A
▷ Pressure converter	B
▷ Other sensors	O

9. *PT100 input mA*	Code on type plate
▷ Not applied	X
▷ PT100 applied	1

10. *Valve output*	Code on type plate
Fill valve type	
▷ No fill valve connected ex factory	X
▷ Open/Close valve	E
▷ Proportional valve	P
▷ Other type	O

11. *Analogue output signal*	Code on type plate
▷ Analogue output signal not connected	X

▷ Analogue output signal connected	1
12. *Parameter setting*	Code on type plate
▷ Start-up mode "Manual operation"	H
▷ Start-up mode "Automatic"	A
13. *Software release*	Code on type plate
▷ Software version DC206	A..Z
14. *Identification*	
▷ Order number	i.e. 080223
15. *Serial number*	
▷ Serial number	DC00000..99999

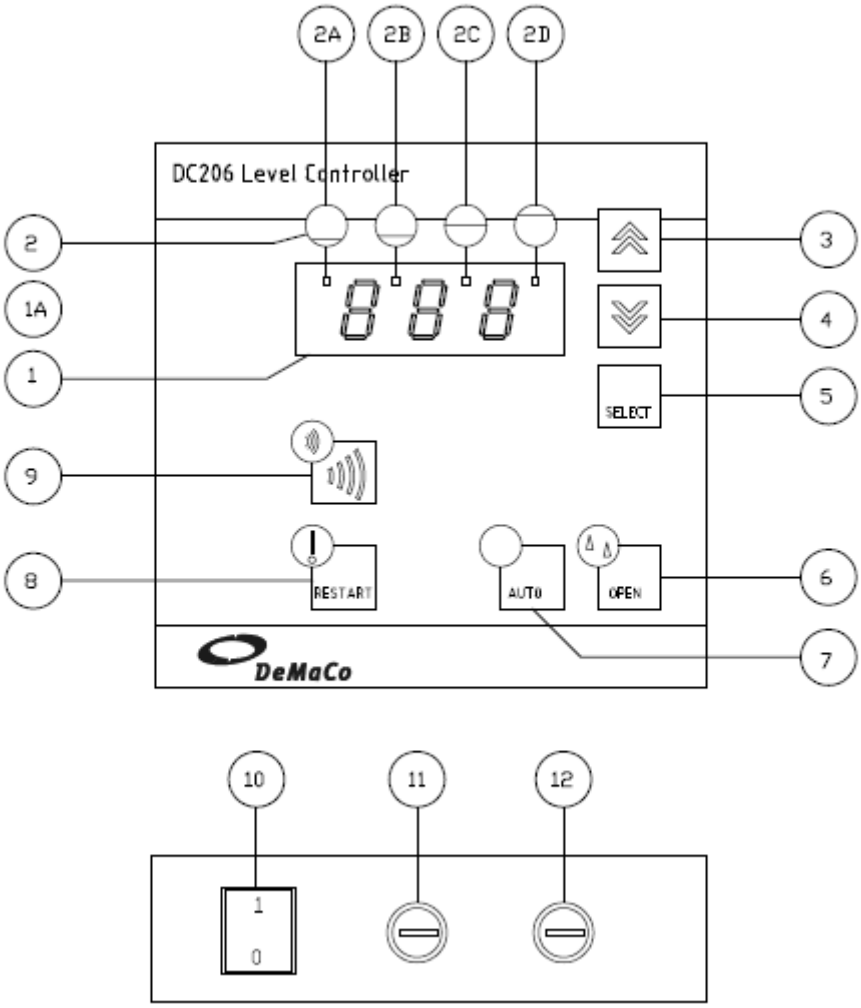


Figure 2.2. Overview of the DC206 operating elements

2.2 Display and operating elements

The following elements can be found on the control panel:

1. Display with three positions.
   Displays the instantaneous value, set values, error messages and other process values.
   * Flashing digits indicate that the PT100 is active.

1A. The level values are given in percentages; 0 – 100%.

2. Symbolic representation of the various level settings in the form of four bullet points.
   The corresponding indicators in the display indicate which level is being shown in the display.

2A. Low alarm level.
   Low Alarm is activated by a level below this value.

2B. Start fill level (Lower limit)
   The fill valve is opened.

2C. Stop fill level (Upper limit)
   The fill valve is closed.

2D High alarm level
   High Alarm is activated by a level above this value.

3. **[**Value up**]** key**.** For increasing the values to be set.

4. **[**Value down**]** key. For lowering the values to be set.

5. **[**Select] key. This is used to select the parameter changes.

6. **[**Open] key. This key is used for operating the fill valve in "manual operation mode". The key is equipped with a green LED, which lights up when the fill valve is open. *PT100 can close the valve if necessary.

7. **[**Auto**]** key. Switches between "manual operation mode" and "automatic mode". The key is equipped with a green LED, which lights up when the DC206 is in automatic mode.

8. **[**Restart**]** key. This is used to restart the DC206 after an alarm state has been triggered. The key is equipped with an orange LED, which lights up when restart has to be initiated.

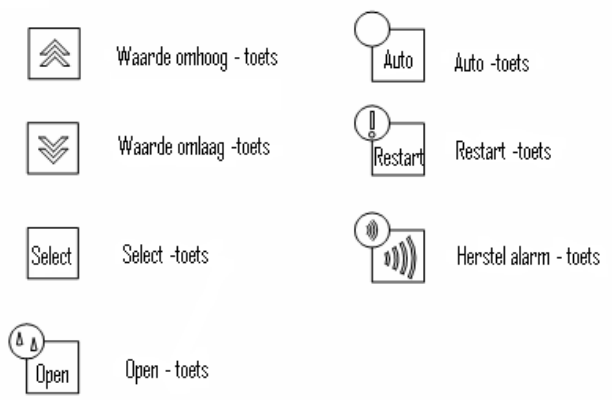
9. **[**Reset**]** key. The acoustic alarm signal is accepted (switched off) with this key. The key is equipped with an orange LED, which lights up if an alarm state has been triggered.

10. Main switch

11. Fuse holder 1

12. Fuse holder 2

Waarde omhoog	**- Value up**
Auto	**- Automatic**
Waarde omlaag	**- Value down**
Restart	**- Restart**
Select	**- Select**
Herstel alarm	**- Reset Alarm**
Open	**- Open**



3. Technical details

General functionality description

- Digital controller, two point regulator for level control.
- Proportional control
- Two alarm points for low and high level
- Easy to set and operate by means of the key pad (2.2)
- Read out level in 0-100% of the application
- Level free programmable
- Alarm points free programmable
- Main switch, two-pole design
- Double fused
- Connection for extra measuring sensor PT100 (Overflow)

Measuring inputs

Level sensor Input signal 4-20mA (Loop).

PT100 input switch point is adjustable between -150% ° C and –199 ° C.

Outputs

Open/Close valve control	Voltage free changeover contact: NO/NC, Max 230 VAC - 1A or 24 VDC – 3A
PT100 output	24 VDC, max 125mA
Low alarm	Linked to low-level setting. Voltage free changeover contact: NO/NC, Max 24 VDC, 1 A
High alarm	Linked to high-level setting. Voltage free changeover contact: NO/NC, Max 24 VDC, 1A
Automatic Current controller mode:	
	Automatic or manual operation. Voltage free changeover contact: NO/NC, Max 24 VDC, 1A
Working range	Level between Upper Limit and Lower Limit. Voltage free changeover contact: NO/NC, Max 24 VDC, 1A
Failure	General controller or sensor failure. See 8. Failures. Voltage free changeover contact: NO/NC, Max 24 VDC, 1 A
Buzzer	Acoustic signal: 87 dB, at a distance of 1 metre

Power supply

The DC206 depends on the model to supply via the mains, 230 VAC 50/60 Hz, or via an external stabilised power supply that 24 VDC >3A delivers.

Note: When the DC206 is supplied with a 24 VDC source, the supply cable may not be any longer than 30 metres.

Accuracy
+/- 1% of the maximum value (100%).

Ambient conditions
The DC206 controller comes under class II (EN 6101, IEC 664).

Declaration of Conformity
See chapter 10 CE – declaration of the DC206 level controller.

Ambient temperatures
- 15 ºC to 50 ºC.

Climate resistance
When using the DC206 for applications in the open air, it is recommended to place it in a metal case to protect it against direct sunlight and other weather influences. The maximum permissible relative humidity is 95%.

Height
The DC2006 may be applied at a maximum height of 2000m.

Ventilation
No specific requirements apply to the ventilation of the area in which the product is placed.

Cleaning
The outer part of the device can be cleaned with a damp cloth and non-caustic cleaning agent.

Housing
The DC206 has a plastic housing with a lockable lid and transparent polycarbonate window. Model IP 65.

Fuses
The DC206 is double fused.

Fuse type	:	Glass fuse 4 x 20 mm, slow.	
Fuse value	:	230 VAC model	: 1 A
		24 VDC model	: 4 A

4. Settings

The DC206 contains a number of settings. These can be changed by means of the front panel. The internal settings are:

4.1 Level settings

For changing the level settings, the [Select] key has to be held down for 1 second.

The indicator for the selected level will then light up (position 1A, Figure 2.2). The level value can be adjusted with the [**Up**] (position 1A, Figure 2.2) 3) and [**Down**] (position 4) keys. Press the [**Select**] key again to switch to the next value that has to be set. Once the settings have been changed, these will be automatically taken over and saved. After approximately 10 seconds, the regulator will revert to the control mode.

Table 4.1. gives a list of the possible settings that are displayed.

Description	**Display indicator**	**Position number**	**Maximum values**	**DeMaCo setting**	**Unit**
	•				
Low alarm	i.e. 10	2A	1 .. 99	2	%
	•				
Lower limit	i.e. 40	2B	1 .. 99	--	%
	•				
Upper limit	i.e. 60	2C	1 .. 99	--	%
	•				
High alarm	i.e. 85	2D	1 .. 99	98	%

Table 4.1 List of the values that can be set for the four DC206 switch levels

Functions

Low alarm	Indicates the low level at which the DC206 sends off an alarm after the set delay time.
Lower limit	Indicates the level at which the DC206 starts filling the system.
Upper limit	Indicates the level at which the DC206 stops filling the system.

High level indicates the high level at which the DC206 triggers an alarm after the set delay time.

Recommendation

We recommend that you do not place the various levels too closely together and maintain a minimum variance of 10% between the levels.

4.2 Installation settings

To change the installation setting, the DC206 has to be set to the change mode. Press the [**Select**] and [**Open**] keys simultaneously for 2 seconds. The left position of the display then indicates the code (A – N) for the parameter to be changed. The two right positions indicate the current value of this parameter again. The parameter value can be adjusted with the [**Up**] (position 3) and [**Down**] (position 4) keys. Press the [**Select**] key again to switch to the next parameter to be set.

Once the settings have been changed, these will be automatically taken over and saved.
After approximately 10 seconds, the regulator will revert to the control mode.

Table 4.2. gives a list of the possible settings displayed.

Description	**Display indicator**	**Range**	**DeMaCo setting**	**Unit**
Valve response time	A	1 .. 99	1	Second
Start-up mode	B	0 .. 1	1	0: manual operation 1: automatic
Max. fill time	C	1 .. 99	30	Minutes
Low alarm output	D	0 .. 1	0	0: make 2: break
High alarm output	E	0 .. 1	0	0: make 2: break [activate / deactivate
Auto output	F	0 .. 1	0	0: make 2: break
Input filter	G	1 .. 10	1	Second
Working range	H	0 .. 1	0	0: make 2: break [activate / deactivate
PT100 input A	I	0 .. 1	0	0: < Low active T measurement < T set 1: > High active T measurement > T set
PT100 reference	J	50 .. 99	73	Limit value for overflow alarm
Fill valve function in the event of a low alarm output	L	0 .. 1	0	0: Failsafe, fill valve closes 1: Normal, remains open (alarm remains at high level)
PT100/Restart Input function	N	0 .. 1	0	0: PT100 input 1: Restart function (alarm reset to higher level)

Table 4.2 List of the values that can be set for the DCDC206 installation settings

Functions:

Valve response time (A) To prevent oscillation, the valve will be controlled at a level for the duration of the set time the value exceeds. See 4.1 Level settings, Upper limit and Lower limit values.

Start-up mode (B) Start-up after switching the controller on in “Automatic mode” or “Manual operation mode".

Max. Fill time (C) If, when starting up the system in “Automatic mode”, the level in the application is below the low level, filling will have begun during start-up. During this Maximum Fill Time, no alarm signal will be triggered. When the set time has elapsed, and the level has not yet reached the Minimum level value, a minimum alarm will be triggered. This time only applies for the initial start-up when switching on the system. See 5.2.1 Starting up in “Automatic mode”.

Low output (D) Active when a low alarm state is triggered. Choice between a make or break contact.

High output (E) Active when a high alarm state is triggered. Choose between a make or break contact [circuit?].

Auto output (F) Active in automatic mode. Choose between a make or break contact [circuit?].

Input filter (G) During the set time, the input signal is filtered, which can create steadier control behaviour.

Working range (H) This signal indicates whether the level is between the Upper Limit and Lower Limit. Choose between a make or break contact [circuit?].

PT100 output (I) PT100 temperature is below the set value. Switch contact. Remarks: See 4.4 If the PT100 option has not been applied, set the parameter to “0”.

PT100 reference (J) When the value of the PT100 element exceeds this value, the Overflow Alarm will be activated. This reference value is a temperature that falls between -150º and -199º C. Since the display does not have enough characters, a value of 50 to 99 will be displayed.

Valve function (L) This defines the behaviour of the valve output during Low Alarm Failsafe: The valve closes when a low alarm state is triggered, reset via the Restart key. Normal: The valve remains open during when a low alarm state is triggered. If the setting = “0”, then the valve will close in the event of a low alarm (the alarm is still maintained at a higher level). If the setting = “1”, then the valve will remain open in the event of a low alarm (the alarm is reset at a higher level).

PT100/Restart (N) This defines the function of the PT100 input. If no PT100 has been connected, the input function can be restarted externally via this controller input after an alarm state has been triggered.

4.3 Factory settings

To change the factory settings, the DC206 has to be set to the change mode. Press the [**Select**] and [**Restart**] keys simultaneously for 3 seconds.
The left position of the display will then indicate the code for the parameter to be changed. The two right positions indicate the current value of this parameter. The value on the display flashes.
The parameter value can be adjusted with the [**Up**] (position 3) and [**Down**] (position 4) keys. Press the [**Select**] key again to switch to the next parameter to be set.
Once the settings have been changed, these will be automatically taken over and saved.
After approximately 10 seconds, the regulator will revert to the control mode.

Table 4.3. gives a list of the possible settings displayed.

Description	**Display Display**		**Range**	**DeMaCo setting**	**Unit**
High alarm delay time	I	i.e.10 A	1 .. 99	10	s
Low alarm delay time	I	i.e. 10	1 .. 99	10	s
Repeat time High alarm	I	i.e. 30	1 .. 99	30	0.5 minute
Repeat time Low alarm	I	i.e. 30	1 .. 99	30	0.5 minute

Table 4.3 List of the possible settings for the DC206 factory settings.

Functions

High alarm delay time	By entering a greater value, activation of the high alarm signal will be delayed. This can be applied for damping oscillations in the control loop.
Low alarm delay time	By entering a greater value, activation of the low alarm signal will be delayed. This can be applied for damping oscillations in the control loop.
Repeat time High alarm	Repeats the high alarm signal after the set time (value x 0.5 minutes) after this has been accepted (switched off) by the operator.
Repeat time Low alarm	Repeats the minimum alarm signal after the set time (value x 0.5 minutes) after this has been accepted (switched off) by the operator.

4.4 Extra alarm

If the DC206 comes with an "extra alarm" option, it will have a special temperature sensor, type PT100, connected to it. The PT100 only serves as an extra alarm. This option is separate from the normal level control and is intended as an additional safety signal by means of a temperature measurement.

Example: Extra High alarm
Place the PT100 in the top part of the storage tank (above the Max Level of the level sensor) or in the flue gas duct. If the liquid in the storage tank rises above the permissible level, the PT100 will cool down and, depending on the set temperature, switch a relay. This signal can be relayed externally as an extra alarm signal to warn the operator or to disable an application.

4.5 General Alarm output

As an option, the DC206 can be equipped with a potential free contact that indicates when the measured level of the DS197 has reached a value outside the working range. Based on the relay contact, it is unclear whether the measured level is too low or is indeed too high. The maximum contact rating is 24 VDC; the maximum switching current is 1A. This relay is only suitable for ohmic loads.

5. Operation

The DC206 is operated by means of the touch controls on the front panel.

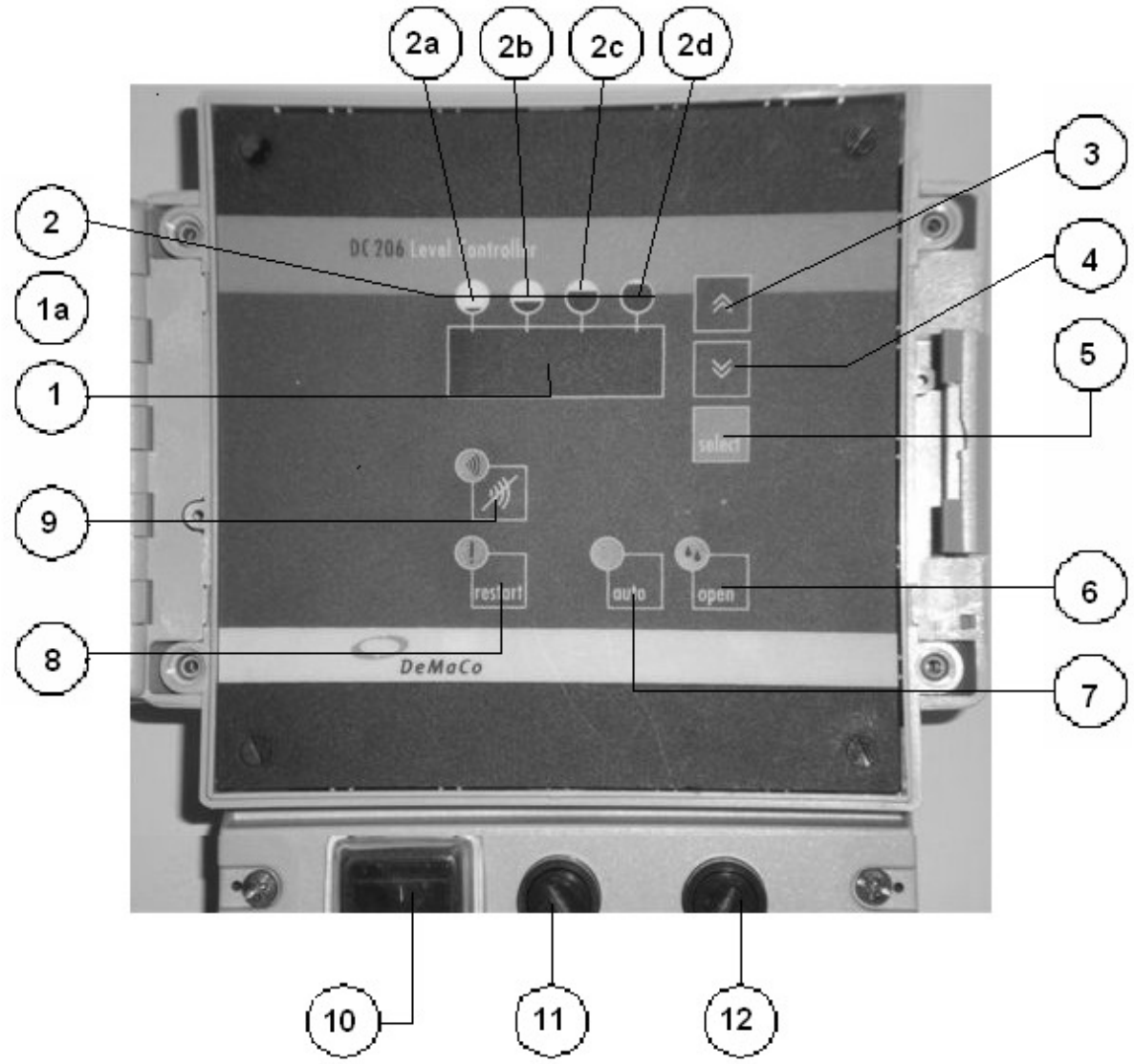


Figure 5.1. Overview of the DC206 operating elements

5.1 Operation mode

[Select] (5) Hold down for 1 second. This allows the operator to change the level settings. When this key is pressed again, the next parameter appears.

After approximately 10 seconds, it returns to control mode.

[Select] [Open] (5-6) Hold down simultaneously for 2 seconds. This allows the operator to change the installation settings. After approximately 10 seconds, it returns to control mode.

[Select] [Restart]	(5-8) Hold down simultaneously for 3 seconds. This allows the operator to change the factory settings. After approximately 10 seconds, it returns to control mode.
[Value up]	(3) Increases the set value by 1. If this key is held down longer than 2 seconds, this value will automatically increase.
[Value down]	(4) Decrease the set value by 1. If this key is held down longer than 2 seconds, the value will automatically decrease.
[Auto]	(7) Touch control: Switches between “manual operation mode” and “automatic mode”. The key is equipped with a green LED, which lights up when the DC206 is in automatic mode.
[Open]	(6) Touch control: This key is used for activating the fill valve in “manual operation mode”. The key is equipped with a green LED, which lights up when the fill valve is open.
[Reset alarm]	() The acoustic alarm signal is accepted (switched off) with this. The key is equipped with an orange LED, which lights up if an alarm state has been triggered.
[Restart]	(8) This is used to restart the DC206 after an alarm state has been triggered. The key is equipped with an orange LED, which lights up when restart has to. be initiated.

5.2 Start-up

Switch on the main switch (10). The DC206 performs a self-test whereby the display "flashes” for the duration of the self-test. When the self-test is completed, the display will indicate the current level value. The controller will perform further actions depending on the mode it was started up in and the measured level.

5.2.1 Starting up in “Automatic mode”.

When the DC206 is started up in “automatic mode”, the fill valve is automatically opened after the self-test and the filling of the application starts. The filling is done according to the set values. On the initial start-up, the DC206 follows the set maximum filling time (see installation setting C) until the Upper limit level has been reached. After a brief waiting time, the DC206 then switches over to the normal operation mode and is within its working range (working range output is switched) and follows the set alarm delays (see factory settings).

5.2.2 Starting up in “Manual operation mode”

When the DC206 is started up in “manual operation mode”, after the self-test, the fill valve can be opened or closed by operating the [Open] key (6). Filling is now effected as the fill valve is being opened by the operator. The display indicates the current value and no acoustic alarm will be given for the set alarms.

In the event of a High Alarm, the LED in the [Open] key (6) will flash and the display will alternately read "100" and “---“.

Attention: all settings and alarms will be ignored! Operation can now be switched over to automatic mode.

6. Connection Overview

6.1 230 VAC model with 230 VAC open/close valve

The minimum requirements for putting the DC206 into operation are:

- DC206
- 230 VAC solenoid for open/close valve
- DS197 sensor

The DC206 is powered directly from the mains.

The following figure gives a schematic overview:

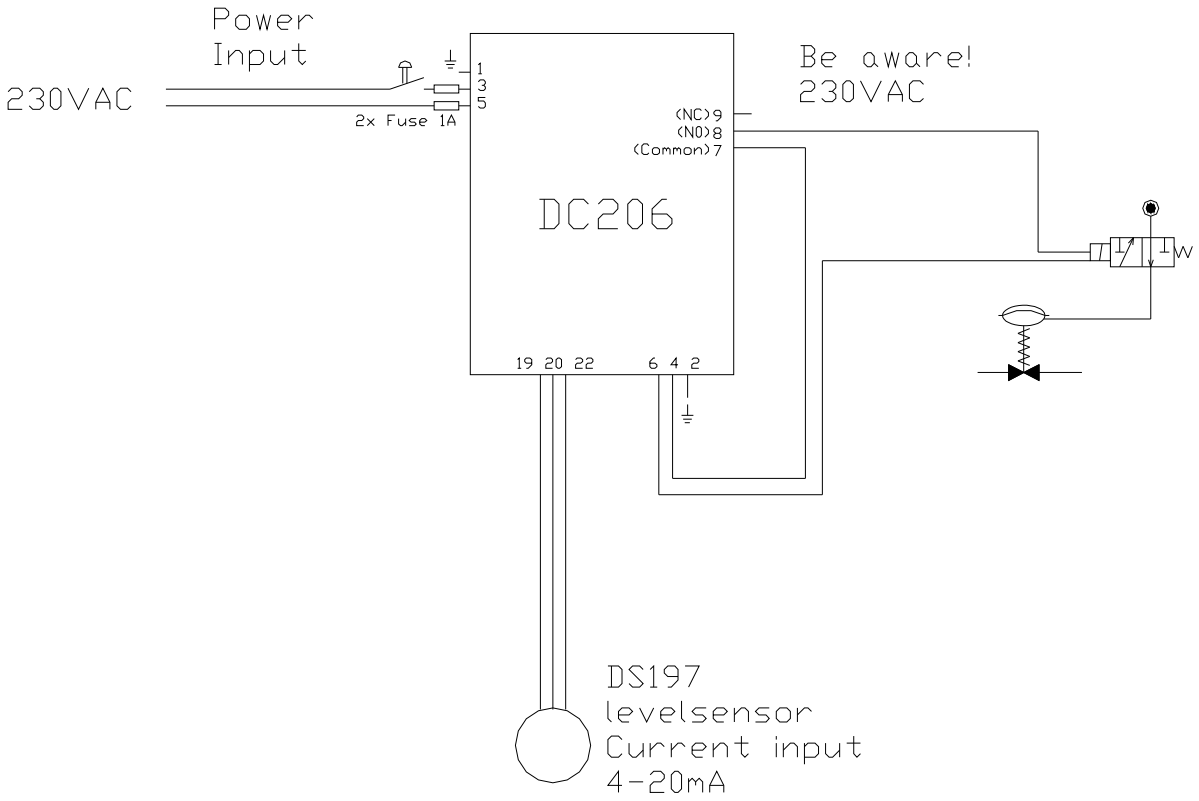


Figure 6.1 230 VAC model with open/close valve

Putting into operation

To put the DC206 into operation, the following steps have to be taken:

Caution: before opening up, the device must be switched off and the power supply disconnected!

- Installation: Assemble the DC206 according to the abovementioned diagram.
- Configuration: Set the limit values with the aid of the DC206 display. The various settings are explained in the chapter 'User settings'.

6.2 230 VAC model with 230 VAC open/close valve and overflow safety device

The minimum requirements for putting the DC206 into operation in the abovementioned situation are:

- DC206
- 230 VAC solenoid for open/close valve
- DS197 sensor
- PT100

The DC206 is powered directly from the mains.

The following figure gives a schematic overview:

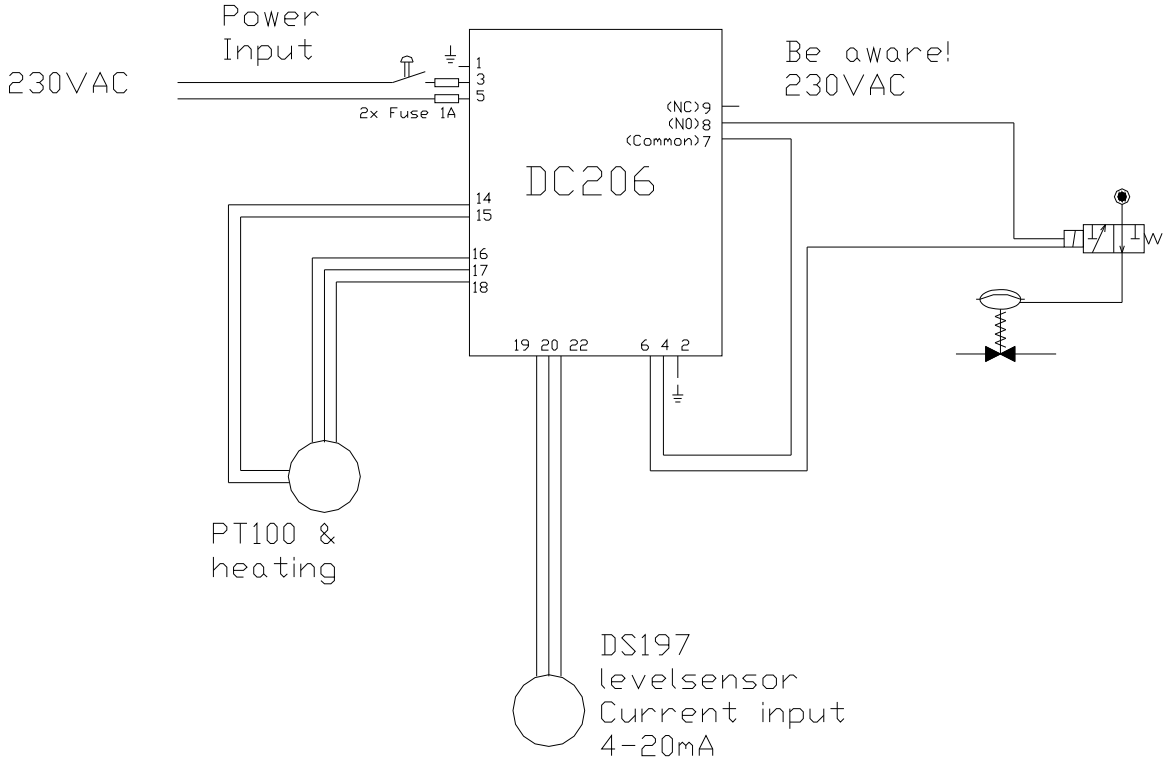


Figure 6.2 230 VAC model with open/close valve and overflow safety device

Putting into operation

To put the DC206 into operation, the following steps have to be taken:

Caution: Before opening up, the device must be switched off and the power supply disconnected!

- Installation: Assemble the DC206 according to the abovementioned diagram.
  Make sure that the jumper is internally switched to position A.
  
- Configuration: Set the limit values with the aid of the DC206 display. The various settings are explained in the chapter 'User settings'.

6.3 Other 230 VAC models

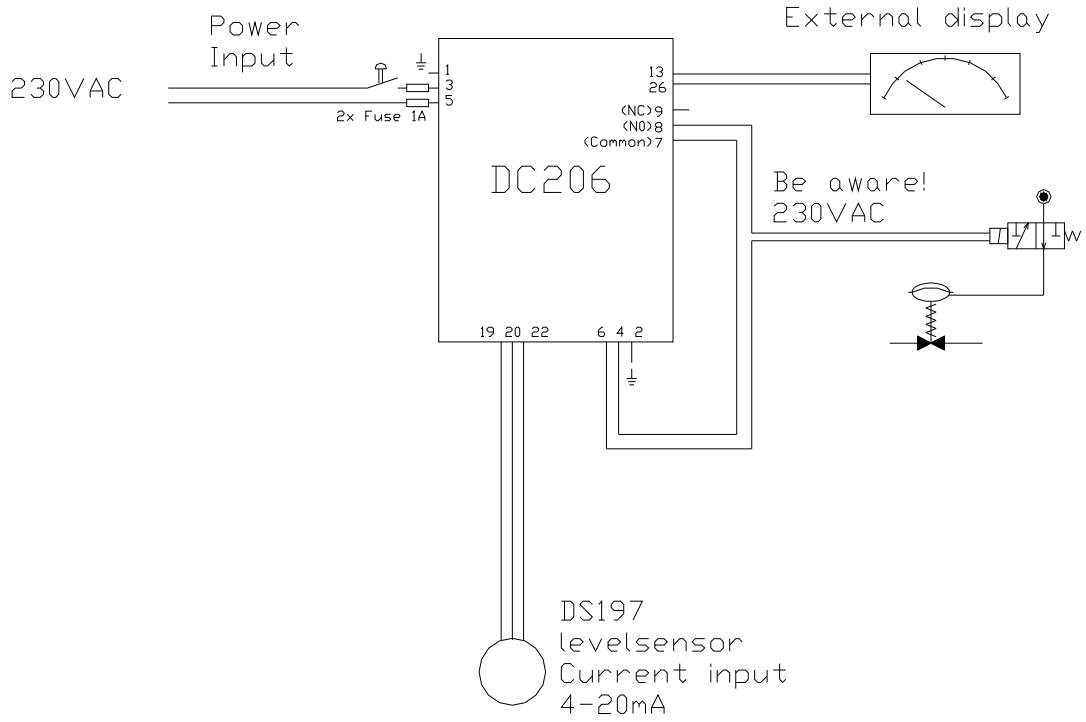


Figure 6.3.1 230 VAC model with open/close valve and external display

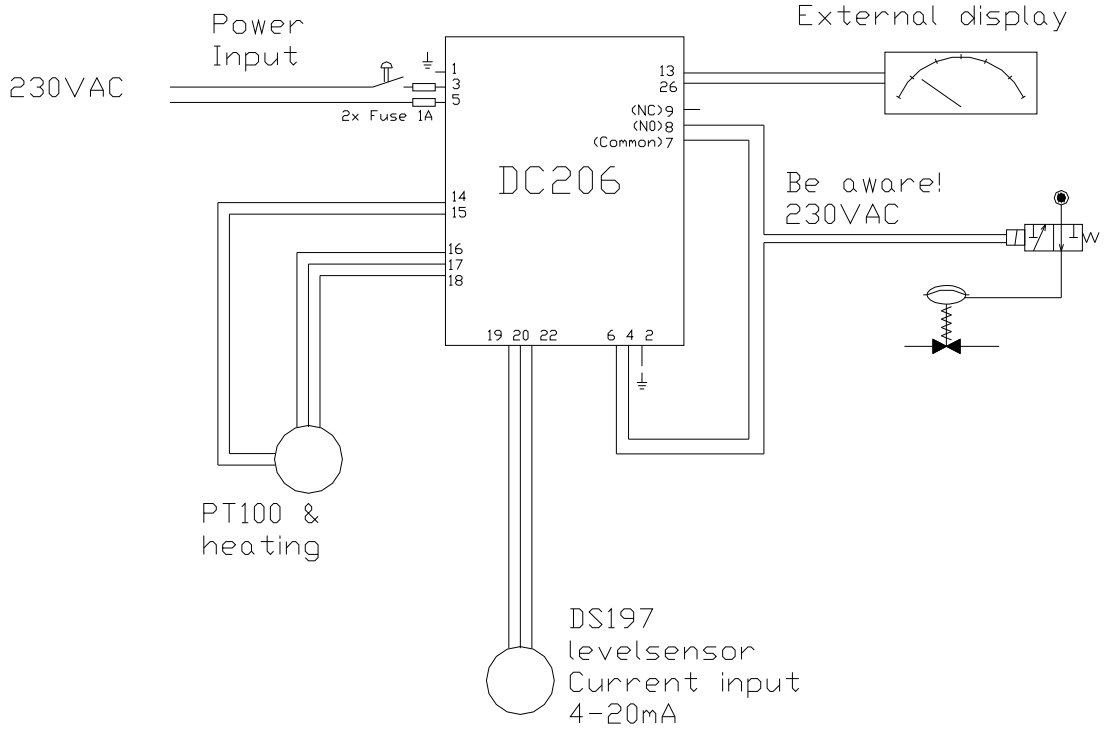


Figure 6.3.2 230 VAC model with open/close valve and external display

6.4 24 VDC model with open/close valve

The minimum requirements for putting the DC206 into operation are:

- External 24 VDC source
- DC206
- DS197 sensor
- 24 VDC open/close valve

The DC206 is powered from the 24 VDC voltage source. The open/close valve is powered via the DC206.

The following figure gives a schematic overview:

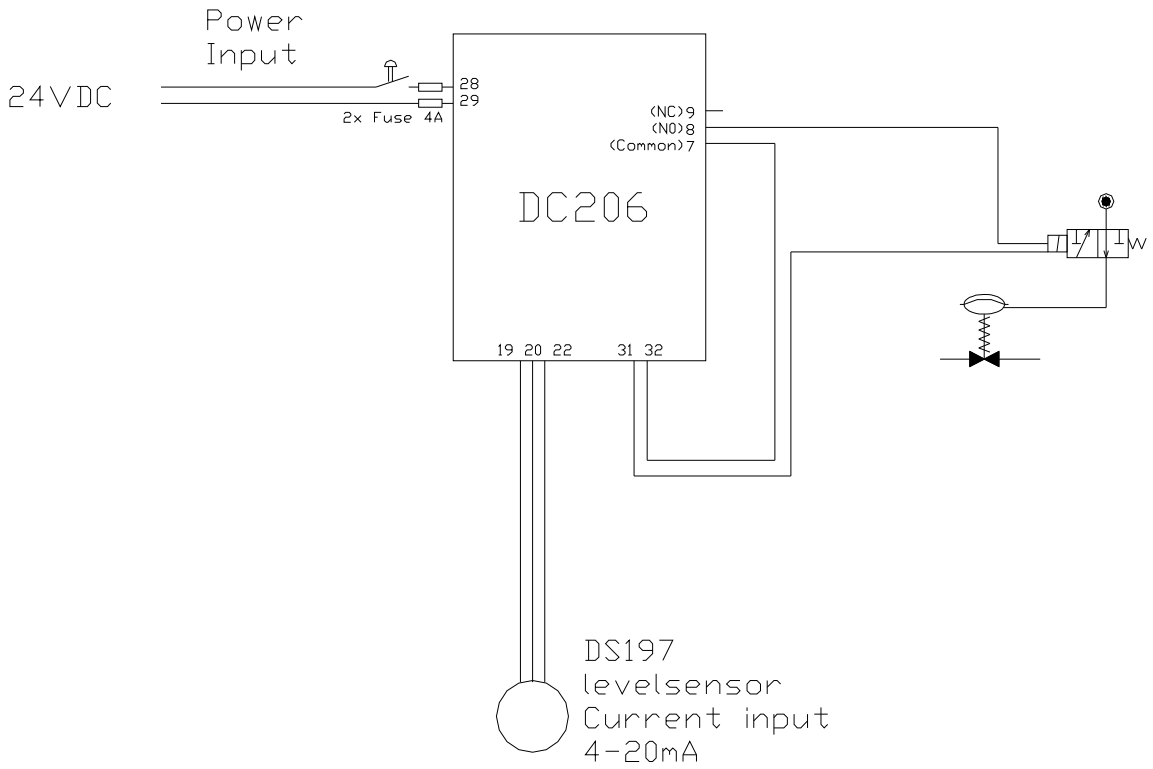


Figure 6.4 24 VAC model with open/close valve

Putting into operation

To put the DC206 into operation, the following steps have to be taken:

Caution: Before opening up, the device should be switched off and the power supply disconnected!

- Installation: Assemble the DC206 according to the abovementioned diagram.
- Configuration: Set the limit values with the aid of the DC206 display. The various settings are explained in the chapter 'User settings'.

6.5 24 VDC model with open/close valve and overflow safety device.

The minimum requirements for putting the DC206 into operation are:

- External 24 VDC source
- DC206
- DS197 sensor
- PT100

The DC206 is powered from the 24 VDC voltage source. The open/close valve is powered via the 206.

The following figure gives a schematic overview:

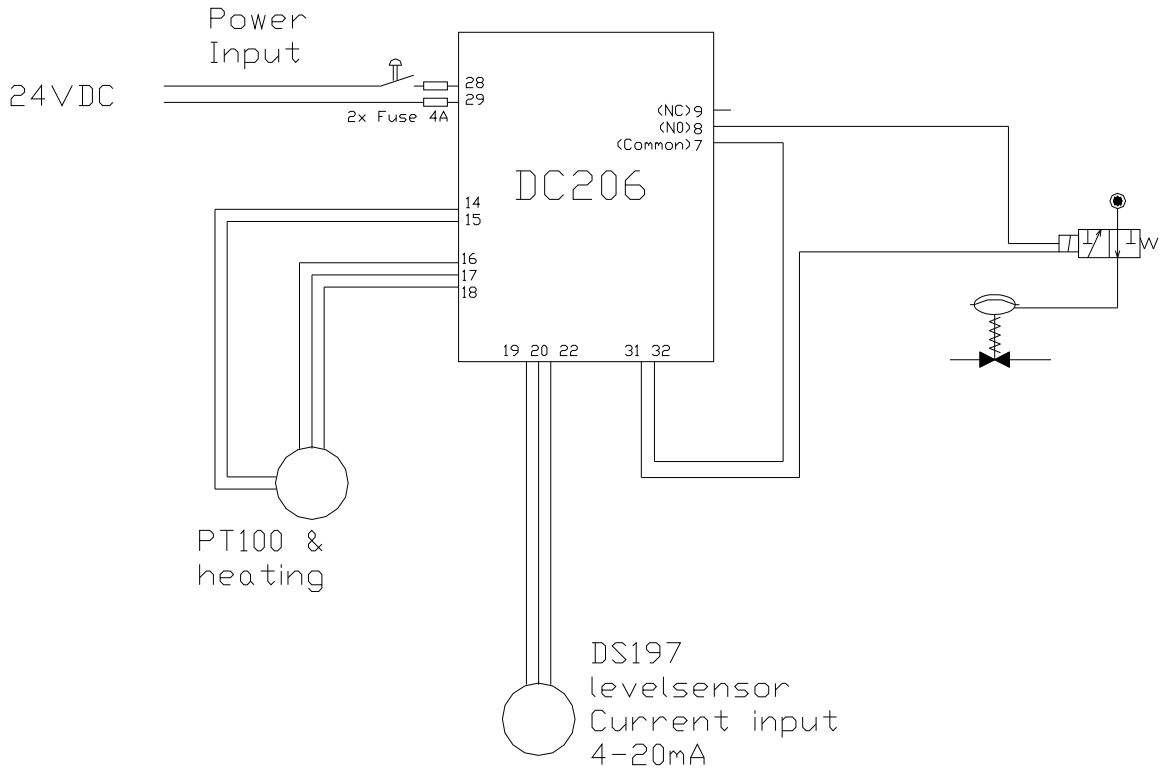


Figure 6.5 24 VAC model with open/close valve and overflow safety device

Putting into operation

To put the DC206 into operation, the following steps have to be taken:

Caution: Before opening up, the device must be switched off and the power supply disconnected!

- Installation: Assemble the DC206 according to the abovementioned diagram.
  Make sure that the jumper is internally switched to position B.
  
- Configuration: Set the limit values with the aid of the DC206 display. The various settings are explained in the chapter 'User settings'.

6.6 24 VDC model with proportional valve.

The minimum requirements for putting the DC206 into operation are:

- External 24 VDC source
- DC206
- DS197 sensor
- Proportional adjustable valve

The DC206 is powered by an external 24 VDC source. The proportional valve is powered via the DC206.

The following figure gives a schematic overview:

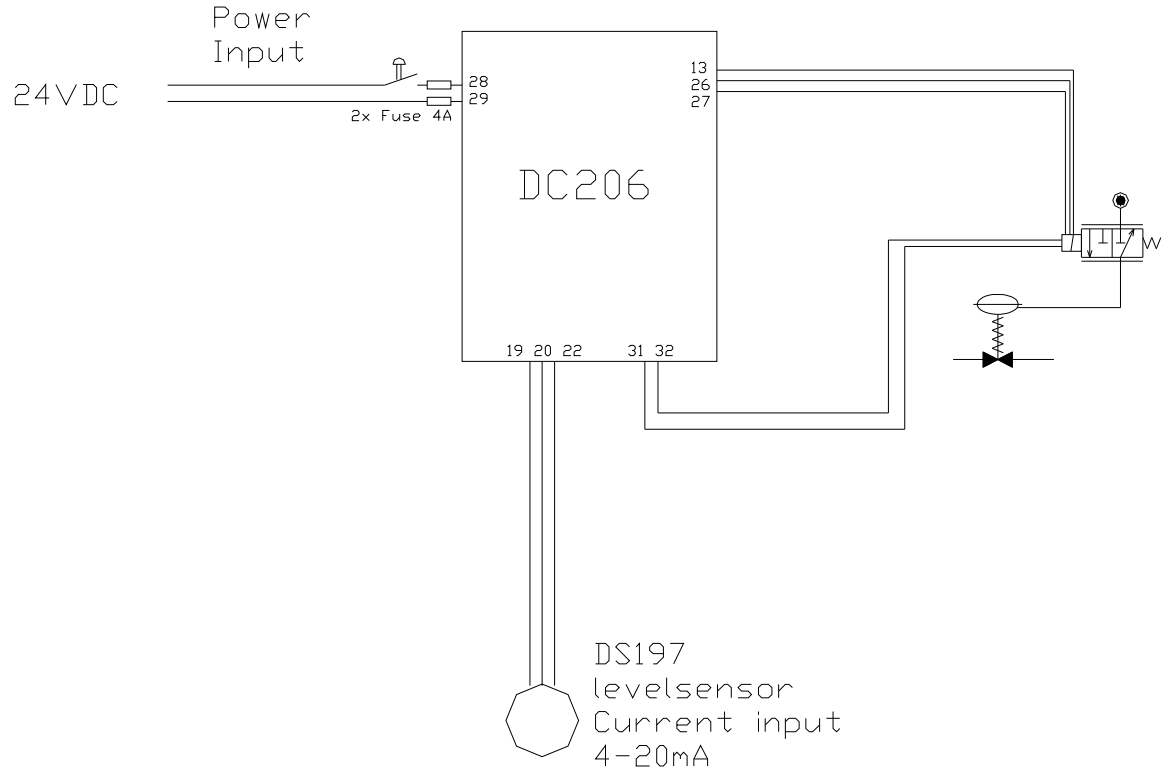


Figure 6.6 24 VAC model with proportional valve

Putting into operation

To put the DC206 into operation, the following steps have to be taken:

Caution: Before opening up, the device must be switched off and the power supply disconnected!

- Installation: Assemble the DC206 according to the abovementioned diagram.
- Configuration: Set the limit values with the aid of the DC206 display. The various settings are explained in the chapter 'User settings'.

6.7 Other 24 VDC models

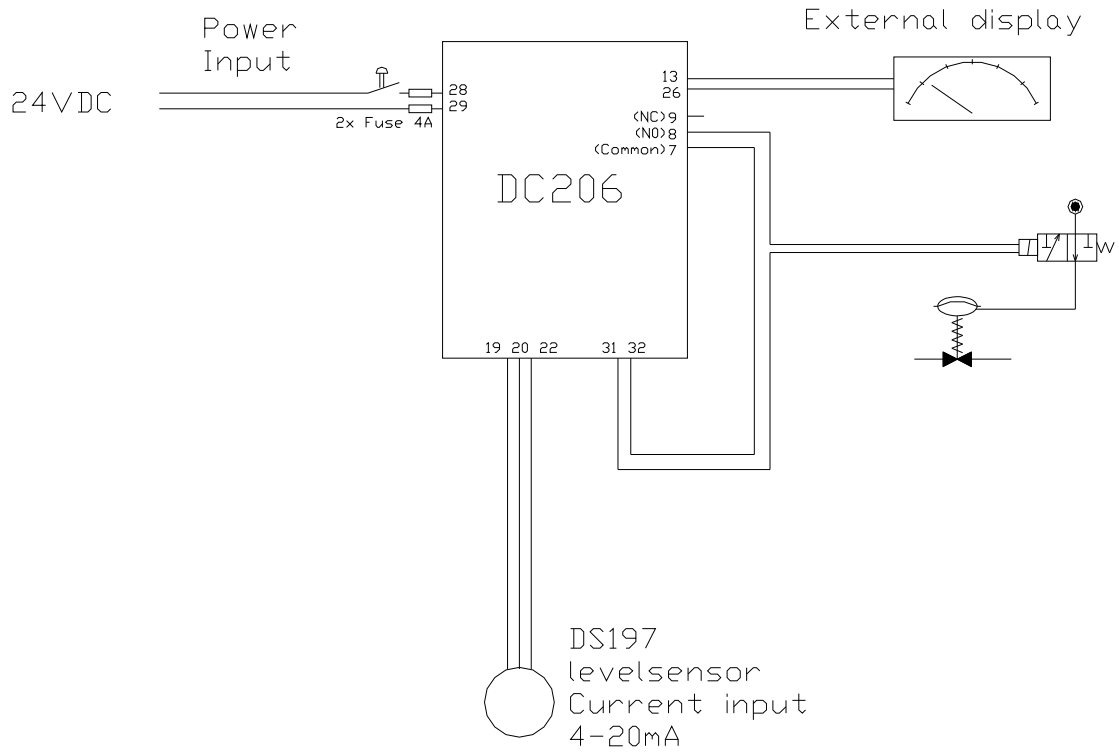


Figure 6.7.1 24 VAC model with open/close valve and external display

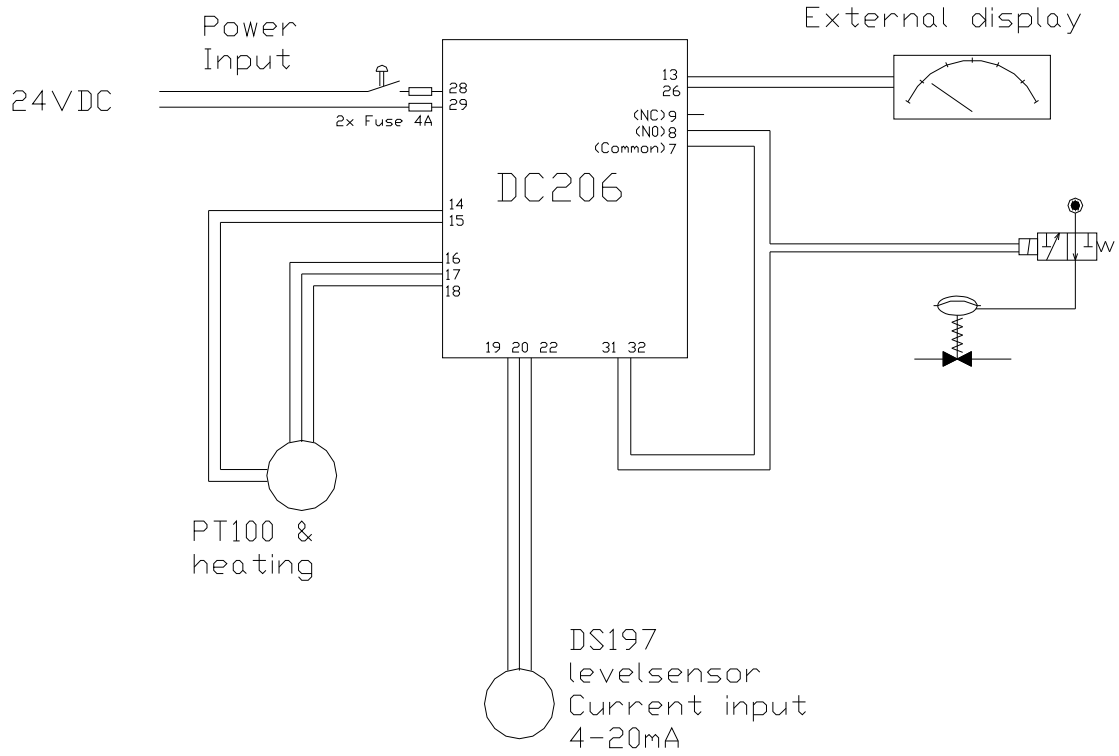


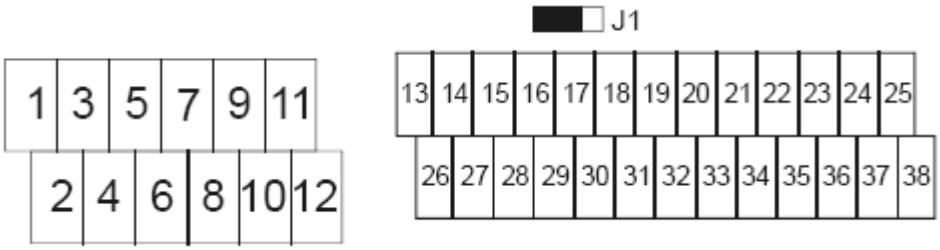
Figure 6.7.1 24 VAC model with open/close valve and external display

6.8 Terminal blocks

The following table gives the function of the connections:

Connection	Name	PIN	Wire colour
1	Safety ground (PE)		
2	Safety ground (PE)		
3	230 VAC L		
4	230 VAC L		
5	230 VAC N		
6	230 VAC N		
7	Open / close valve (Common)		
8	Open / close valve (Normally Open)		
9	Open / close valve (Normally Closed)		
10	Overflow safety device (Common)		
11	Overflow safety device (Normally Open)		
12	Overflow safety device (Normally Closed)		
13	Proportional valve +	4	(Yellow)
14	PT100-H 24 VDC +	4	(Black)
15	PT100-H 24 VDC -	5	(Yellow/green)
16	PT100-1 (together with PT100-2 – 0-points compensation in connection to wire resistance)	1	(Brown)
17	PT100-2 (together with PT100-1 – 0-points compensation in connection to wire resistance)	2	(White)
18	PT100-3 (measuring signal via 1-3 or 2-3)	3	(Blue)
19	Sensor loop +	1	(Brown)
20	Ground	3	(Yellow/green)
21	Ground		
22	Sensor loop -	2	(Green)
23	CAN ground		
24	CANL out		
25	CANH out		
26	Proportional valve -	2	(Brown)
27	Ground		
28	24 VDC in		
29	0 VDC in		
30	Ground		
31	24 VDC out	7	(Red)
32	0 VDC out	3	(Green)
33	Alarm		
34	Alarm		
35	Ground		
36	CAN ground		
37	CANL in		
38	CANH in		

The following figure systematically shows the composition of the connectors as visible to the user:



The following table gives the jumper setting: This only applies to the PT100 power supply. If a PT100 is not being used as an external alarm, then the position is not relevant.

Omschrijving	*A*	*B*
J1: Voedingsselectie.	230VAC	24VDC

The DC206 is delivered with the jumper set to the position A.

6.9 Cable information

Ref.	Description	Cable diameter	Vein diameter	Remarks
1	Power	6.0-8.0	0.75 mm2 PUR-CY	3 veins
2	Valve	6.0-8.0	0.75 mm2 PUR-CY	3 veins
3	Sensor	4.0-6.0	0.34 mm2 PUR-CY	3 veins + shielding
4	PT100 + H	4.0-6.0	0.34 mm2 PUR-CY	5 veins
5	External	8.0-11.0	0.5 mm2 PUR-CY	Max. 10 veins + shielding

For the first 3 references, the standard cable length is 5 meters.

7. Assembly

7.1 DC206 assembly location

The DC206 should be assembled in a location such that it is:

- ► easy to access
- ► easy to read (not in direct sunlight)
- ► does not protrude in passages or driveways
- ► not exposed to vibrations and shocks
- ► does not heat up through external irradiation

7.2 DC206 assembly

The DC206 should be mounted in accordance with the hole pattern as illustrated on the back of the housing (see Figure 7.1). For the wiring connection, please refer to chapter 6, figures 6.1 up to and including 6.3. Optionally, the DC206 can be secured to a DIN rail.

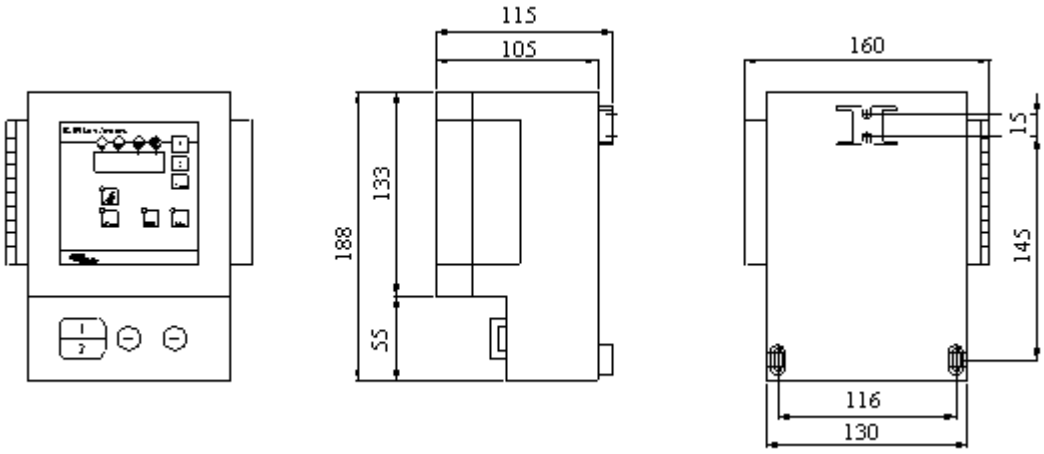


Figure 7.2 Dimensional characteristics

8. Programme diagram

Definitions of the levels in the application.

---------- High alarm

---------- Upper limit

Controlled level

---------- Lower limit

---------- Low alarm

9. DC206 failures

The most common failures that occur with the DC206 are incorporated into the failure overview below. The key references refer to Figure 5.1. If you experience a failure that is not listed in the table, we recommend that you contact DeMaCo Holland bv. Before you call, note the information on the DC206 and senor type plates.

This will enable our service department to help you quickly.

9.1 DC206 level controller, Failure Overview

Failure description	Possible cause	Action	Key
DC206 does not give any readout	▸ No power supply ▸ Cable cut ▸ Loose plug connection ▸ Fuses are burnt out	▸ Check the power supply ▸ Check the cable ▸ Restore connection ▸ Check the voltage and then replace the fuses	On / Out switch (10) (11)and (12)
DC206 gives an alarm signal and display indicates “0”	▸ Low alarm ▸ Too much fluid drainage ▸ Filling pressure is too low ▸ Tank is empty ▸ Valve does not open	▸ Reset acoustic signal ▸ Check liquid supply ▸ Check liquid drainage (i.e. leakage) ▸ Start up DC206 after performing the checks	[Reset alarm] [Restart]
DC206 gives an alarm signal and display indicates “100” (flashing)	▸ High alarm ▸ Fill valve does not close properly ▸ Filling pressure is too high ▸ Valve response time is to long ▸ Max. filling level is too high	▸ Reset acoustic signal ▸ Check liquid supply ▸ Reduce response time ▸ Reduce max. filling level ▸ Start up DC206 after performing the checks	[Reset alarm] See 4.2 [Restart]
DC206 gives an alarm signal and display indicates “--- ” (flashing)	▸ There is a kink in the sensor cable ▸ Sensor is defect ▸ Central processor is defect ▸ Sensor is damp	▸ Check the cable ▸ Check the signal (4 – 20 mA) ▸ Call DeMaCo Holland bv ▸ Dry the sensor, observance	On / Out switch (10) [Restart]

	▸ PT100 has been activated	of the safety standards. ▸ Check / correct level and the PT100 sensor (if present)	
Level measurement is inaccurate	A failure source is present in the vicinity of the system, which is emitting electromagnetic radiation	▸ Remove radiation source	

Table 9.1 DC206 Level Controller Failure Overview

9.2 Low alarm failure

Setting parameter L valve function when there is a low alarm.

Failsafe mode:
The Failsafe function is applied to prevent the application from continuous overflow and demand for more liquid due to unknown causes.
This function blocks the fill valve when a low alarm is present in order to prevent the application from continuous filling when no operational personnel are present.
When this function has been activated and a low alarm is indicated, the controller should be restarted to release the fill valve for automatic level control.

Normal mode:
This mode can be selected if a low alarm is indicated frequently and there is no danger of overflow. The low alarm and corresponding contact will be reset if the level increases. In this mode, the fill valve remains open and the application continues to fill. This can occur with longer supply lines and lower filling pressures. The acoustic signal will be triggered and should be reset to acknowledge that an alarm has been triggered.

9.3 High alarm failure

In the event of a High alarm, the controller triggers an acoustic signal to announce this.
After the acoustic signal has been reset, the fill valve is released for automatic level control, the alarm output will be reset.

If there is a high alarm, take the appropriate measures. If in doubt, always shut off the LN2 supply first.

Note: all alarms and level settings are ignored during manual operation mode.

10. CE – DC206 level controller declaration

Manufacturer
DeMaCo Holland bv
Oester 2
NL-1723 HW Noord-Scharwoude

DeMaCo reference
DC206 Level Controller

Customer reference
Serial number / order number

The manufacturer hereby declares that the DC206 Level Controller complies with the stipulations of the following directive(s):
EMC 2004/108/EC
Low Voltage Directive 2006/95/EC

and conforms with the following standard(s) or other normative documents:

Emission

Conducted emission:		EN 55011 (1998) + A1 (1999) + A2 (2002) (precedence)
	and	EN 55016-2-1 (2004)
Radiated emission:		EN 55011 (1998) + A1 (1999) + A2 (2002)
	and	EN 55016-2-3 (2004)
	and	EN 55011 (1998) + A1 (1999) +A2 (2002)
	and	EN55016-2-3 (2004)
Harmonics:		EN 61000-3-2 (2000)
Flicker:		EN 6100-3-3 (1995) + A1 (2001)

Immunity

Electro Static Discharges (ESD)		EN 61326 (1997) + A1 (1998) + A2 (2001) + A3 (2003) (precedence)
	and	EN 61000-4-2 (1995) + A1 (1998) + A2 (2001)
Radiated immunity:		EN 61326 (1997) + A1 (1998) + A2 (2001) + A3 (2003) (precedence)
	and	EN 61000-4-3 (2006)
Electrical Fast Transience (EFT)		EN 61326 (1997) + A1 (1998) + A2 (2001) + A3 (2003) (precedence)
	and	EN 61000-4-4 (1995) + A1 (2001) + A2 (2001)
Surges:		EN 61326 (1997) + A1 (1998) + A2 (2001) + A3 (2003) (precedence)
	and	EN 61000-4-5 (2007)
Conducted immunity:		EN 61326 (1997) + A1 (1998) + A2 (2001) + A3 (2003) (precedence)
	and	EN 61000-4-6 (1997) + A1 (2001)

Power supply

Voltage dips and variations	EN 61326 (1997) + A1 (1998) + A2 (2001) + A3 (2003) (precedence) and EN 61000-4-11 (1994) + A1 (2001)
Safety:	EN 61010-1 : 2001
Place:	Noord-Scharwoude, the Netherlands
Date:	……
Name and function	…… ……
Signature	……

Operating Instructions for WITT safety valve SV 805 / 808 / 809 / 810

1. Purpose of the Operating Instructions

These Operating Instructions provide important information relating to the safe and intended utilisation of the product. Please study the Instructions thoroughly before fitting and using the device. Improper handling and improper utilisation may be dangerous for the operator and third parties, and may result in damage to the plant.

2. Model

- directly acting, spring loaded, normal safety valve
- TÜV-tested and certified response pressure
- with or without condensate borehole
- Type approval (Module B) with acceptance in accordance with Module F (Pressurised Equipment Directive 97/23/EC)
- AD-2000 Data Sheet A 2, DIN 3381, DIN 3840
- VdTÜV Data Sheet 100

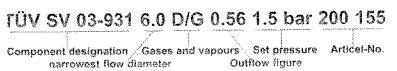
3. Function

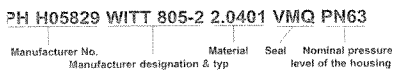
The SV is designed to prevent excess pressures in canister and pipe systems. When the set pressure (embossed on the housing) is reached, it opens and drains the medium off. When the pressure falls, the SV automatically closes within 10 % below the response pressure. Its specified flow rate is achieved at a pressure of approx. 10 % above the response pressure. At response pressures of below 3 bar, it closes within 0.3 bar below the response pressure (only SV 805 / 808).

Markings

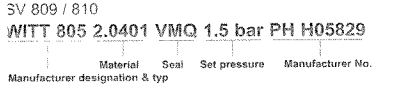
The safety valves have markings embossed on the housing. A typical example is explained in the following section:

SV 805 / 808





SV 809 / 810



5. Utilisation

Safety valves must be capable of preventing the development of overpressure even if all upstream control, regulation and monitoring devices fail. For this purpose, the specified flow rate of the safety valve must be at least as large as the flow rate which would be required in the event of a malfunction. This is in order to prevent the development of inadmissible overpressure in the system (see marking "Blow-out volume flow" – if necessary, see Appendix).

Note

The normal system pressure should lie at least 10% below the response pressure of the SV.

The SV may be used only for gasses and vapours (liquid gases in liquid form are also deemed to be gases). Check that the materials are compatible with the media which may need blowing out.
Do not use the SV as a control unit, in order e.g. to establish a desired operating pressure. If the SVs are frequently triggered, check your process.
Do not use in heating equipment and systems for processing warm water.
Do not use the SV for gases or vapours for which they are not suitable. Furthermore, deploy the SV only in the permitted temperature range (see sealant materials). In case of doubt, ask the manufacturer.

6. Technical data

Housing materials / valve piston materials:
1.4541 (stainless steel X10CrNiTi 18 9)
2.0401 (brass CuZn39Pb3)
2.0402 (brass CuZn40Pb2)
Spring material:
1.4310 (stainless steel X12CrNi 17 7)
Seal materials / permitted temperature range:

FPM	fluoric rubber -20 °C to +150 °C
EPDM	ethylene-propylene-diene rubber -40 °C to +80 °C
CR	chlorbutadiene rubber -30 °C to +100 °C
FFKM	perfluoro rubber -30 °C to +150 °C
HNBR	acrylonitrile-butadiene rubber -30 °C to +100 °C
VMQ	silicon rubber -60 °C to +150 °C
PTFE	Hostaflon (only SV 809 / 810) -196 °C to +150 °C.

7. Installation and fitting

The SVs may only be fitted by qualified personnel to connections designed for the purpose.
They may be installed at any position. However they may not be made ineffective by shut-off units, and may not be exposed to any inpermissible structural, dynamic and thermal loads.
Before fitting the SV, the performance characteristics must be compared with the deployment conditions.
The loss of pressure in the feed pipe may not exceed 3% of the SV's response pressure when subjected to the maximum blow-off pressure.
In the case of SVs which could directly or indirectly endanger persons or the environment in the event of the escape of the medium (e.g. as the result of blow-off noises, toxic, inflammable gases), blow-off pipes or other protective devices must be installed.
In the case of SVs without condensate boreholes, steps must be taken to ensure that any possible escape of condensate is not able to impair the function of the SV. In the event of the possible formation of condensate, it may be necessary to provide SVs without condensate boreholes with a condensate-removing device which cannot be shut off. In this event, the SV may not represent the lowest point of the blow-off pipe. Furthermore, this must be fitted in a position which prevents the accumulation of condensate within the SV.
The blow-off pipes must be adequately dimensioned for the flow rate which needs to be discharged. In the event of a blow-off through the valve, the pressure loss may not exceed 15% of the response pressure.
The reaction forces resulting from the valve blow-off must be safely absorbed through the suitable attachment of the pipe.
A WITT adapter must be installed between the SV and the blow-off pipe.
The SVs should be removed from their packaging only immediately prior to their installation.
Before installation and removal, the system must be pressure-free (if necessary, rinse).
The SVs may only be fitted – using the matching standard key (SW 27) – to the hexagon immediately above the connection thread.

Note

Never fit the valves above the hexagon in the vicinity of the outlet screw joint, as they may be damaged by the torsion loads. Use this hexagon only for screwing with one blow-off pipe.

In the case of valves with a conical (NPT) connection thread, the use of a suitable thread sealant (e.g. PTFE band) is recommended. In this respect it is important to ensure that no trace of the sealant is permitted to penetrate the valve, as this could lead to a permanent seal loss following the activation of this valve.
Valves with cylindrical connection threads may only be sealed with suitable seal elements.
Following fitting, check that the connections are gas-tight. When using liquids (e.g. leak detector sprays) for the purpose of identifying leaks, steps must be taken to ensure that these do not penetrate the valve, as this could impair the subsequent functional capability of the valve.
If the SVs are given a coating of paint, sliding parts may not come into contact with the paint.
In the case of SVs with condensate boreholes, these may not be blocked. Dirt within the valve may lead to functional unreliability. For this reason, it is important to prevent dirt penetrating the valve during installation or operation.

8. Servicing

Servicing may be performed only by qualified personnel.
Check the SVs at regular intervals (approx. every 6 months) to verify that these are still sealed. When used in conjunction with corrosive media, this check must be performed at more frequent intervals. Once the SV has been activated, this seal check must be performed immediately, as it cannot be ruled out that the SV is no longer able to close entirely due to the penetration of a foreign body or another cause. During the function test, it is important to ensure that nobody can be injured by the escaping medium. In particular, the valve should not be subjected to a close visual inspection during the performance of the test.
Remember that the opening of the valve can produce a loud noise.

9. Repair

Repairs may be performed only by the manufacturer. Any repairs or alterations performed independently by the user or a third party (adjustment of the response pressure) shall cause the manufacturer's liability with respect to the resulting consequences to be rescinded.

All specified pressures are overpressures above atmospheric pressure (1.0133 bar abs)
Technical alterations remain reserved.

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Fax: + 49 (0 23 02) 8 90 13
mail@wittgas.com
www.wittgas.com

SV 805 / 808		Blow-off volume flow for air at 23 °C (only valid with atmospheric counterpressure)											
Opening pressure	[bar]	0.5	1	2	3	4	5	6	7	8	9	10	11
Volume flow	[m³/h]	15.7	23.5	35.9	48.3	60.6	73	85.4	97.7	110.1	122.3	134.7	147
Opening pressure	[bar]	12	13	14	15	16	17	18	19	20	21	22	23
Volume flow	[m³/h]	159.4	171.7	184.1	196.5	209.8	260.6	275.1	289.7	304.3	318.9	333.4	348
Opening pressure	[bar]	24	25	26	27	28	29	30	31	32	33	34	35
Volume flow	[m³/h]	362.5	375.5	390	404.5	419	433.4	448	462.4	476.9	491.5	505.9	520.4
Opening pressure	[bar]	36	37	38	39	40	41	42	43	44	45		
Volume flow	[m³/h]	534.9	549.4	563.9	578.4	592.9	607.4	621.9	636.3	650.9	665.3		
Opening pressures are overpressures above atmospheric pressure, volume flows are standard volume flows, relative to standard state 23 °C, 1013.3 mbar													

SV 809 / 810		Blow-off volume flow for air at 23 °C (only valid with atmospheric counterpressure)											
Opening pressure	[bar]	46	47	48	49	50	51	52	53	54	55	56	57
Volume flow	[m³/h]	12.6	13.2	13.9	14.8	15.9	17.1	18.5	20.1	21.8	23.7	25.7	27.8
Opening pressure	[bar]	58	59	60	61	62	63	64	65	66	67	68	69
Volume flow	[m³/h]	30.0	32.4	34.9	37.5	40.2	43.0	45.9	48.8	51.9	55.0	58.2	61.4
Opening pressure	[bar]	70	71	72	73	74	75	76	77	78	79	80	81
Volume flow	[m³/h]	64.7	68.1	71.4	74.9	78.3	81.8	85.3	88.8	92.3	95.8	99.3	102.8
Opening pressure	[bar]	82	83	84	85	86	87	88	89	90	91	92	93
Volume flow	[m³/h]	106.3	109.7	113.1	116.5	119.9	123.1	126.4	129.6	132.7	135.7	138.7	141.5
Opening pressure	[bar]	94	95	96	97	98	99	100					
Volume flow	[m³/h]	144.3	147.0	149.6	152.1	154.5	156.7	158.8					
Opening pressures are overpressures above atmospheric pressure, volume flows are standard volume flows, relative to standard state 23 °C, 1013.3 mbar													

perating Instructions for
'ITT safety valve
V 805 / 808 / 809 / 810

Purpose of the Operating
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. Model

directly acting, spring loaded, normal safety valve

TÜV-tested and certified response pressure

with or without condensate borehole

Type approval (Module B) with acceptance in accordance with Module F (Pressurised Equipment Directive 97/23/EC)

AD-2000 Data Sheet A 2, DIN 3381, DIN 3840

VdTÜV Data Sheet 100

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The SV is designed to prevent excess pressures in canister and pipe systems. When the set pressure (embossed on the housing) is reached, it opens and drains the medium off. When the pressure falls, the SV automatically closes within 10 % below the response pressure. Its specified flow rate is achieved at a pressure of approx. 10 % above the response pressure. At response pressures of below 3 bar, it closes within 0.3 bar below the response pressure (only SV 805 / 808).

4. Markings

The safety valves have markings embossed on the housing. A typical example is explained in the following section:

SV 805 / 808

TÜV SV 03-931 6.0 D/G 0.56 1.5 bar 200 155

Component designation / narrowest flow diameter — Gases and vapours / Outflow figure — Set pressure — Article-No.

PH H05829 WITT 805-2 2.0401 VMQ PN63

Manufacturer No. — Manufacturer designation & typ — Material — Seal — Nominal pressure level of the housing

CE 0045

Notified body

SV 809 / 810

WITT 805 2.0401 VMQ 1.5 bar PH H05829

Manufacturer designation & typ — Material — Seal — Set pressure — Manufacturer No.

200 155 159m³/h CE 0045

Article-No. — Blow off volume flow — Notified body

5. Utilisation

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Do not use in heating equipment and systems for processing warm water.
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Housing materials / valve piston materials:
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www.wittgas.com

SV 805 / 808 — Blow-off volume flow for air at 23 °C (only valid with atmospheric counterpressure)

Opening pressure	[bar]	0.5	1	2	3	4	5	6	7	8	9	10	11
Volume flow	[m³/h]	15.7	23.5	35.9	48.3	60.6	73	85.4	97.7	110.1	122.3	134.7	147
Opening pressure	[bar]	12	13	14	15	16	17	18	19	20	21	22	23
Volume flow	[m³/h]	159.4	171.7	184.1	196.5	209.8	260.6	275.1	289.7	304.3	318.9	333.4	348
Opening pressure	[bar]	24	25	26	27	28	29	30	31	32	33	34	35
Volume flow	[m³/h]	362.5	375.5	390	404.5	419	433.4	448	462.4	476.9	491.5	505.9	520.4
Opening pressure	[bar]	36	37	38	39	40	41	42	43	44	45		
Volume flow	[m³/h]	534.9	549.4	563.9	578.4	592.9	607.4	621.9	636.3	650.9	665.3		

Opening pressures are overpressures above atmospheric pressure, volume flows are standard volume flows, relative to standard state 23 °C, 1013.3 mbar

SV 809 / 810 — Blow-off volume flow for air at 23 °C (only valid with atmospheric counterpressure)

Opening pressure	[bar]	46	47	48	49	50	51	52	53	54	55	56	57
Volume flow	[m³/h]	12.6	13.2	13.9	14.8	15.9	17.1	18.5	20.1	21.8	23.7	25.7	27.8
Opening pressure	[bar]	58	59	60	61	62	63	64	65	66	67	68	69
Volume flow	[m³/h]	30.0	32.4	34.9	37.5	40.2	43.0	45.9	48.8	51.9	55.0	58.2	61.4
Opening pressure	[bar]	70	71	72	73	74	75	76	77	78	79	80	81
Volume flow	[m³/h]	64.7	68.1	71.4	74.9	78.3	81.8	85.3	88.8	92.3	95.8	99.3	102.8
Opening pressure	[bar]	82	83	84	85	86	87	88	89	90	91	92	93
Volume flow	[m³/h]	106.3	109.7	113.1	116.5	119.9	123.1	126.4	129.6	132.7	135.7	138.7	141.5
Opening pressure	[bar]	94	95	96	97	98	99	100					
Volume flow	[m³/h]	144.3	147.0	149.6	152.1	154.5	156.7	158.8					

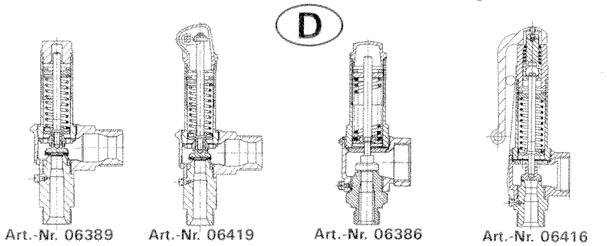
Opening pressures are overpressures above atmospheric pressure, volume flows are standard volume flows, relative to standard state 23 °C, 1013.3 mbar

Betriebs- und Montageanleitung

Sicherheitsventil mit Federbelastung, bauteilgeprüft, gemäß AD 2000 - A2, TÜV - SV 100, ohne/mit Anlüftevorrichtung

HEROSE

D



Inhaltsverzeichnis

Betriebs- und Montageanleitung

4.0 Beschreibung

4.1 Anwendungsbereich
Sicherheitsventile sind Sicherheitseinrichtungen für Druckbehälter, durch die eine unzulässige Drucküberschreitung verhindert wird.

Artikel	Druckbereich	Temperatur	Medium
06386/06416 06387/06417	0,2 bar-40 bar	-196°C-+185°C	Dämpfe und Gase einschließlich tiefkaltem Sauerstoff
06388/06418 06430/06435	d_0 = 7,0 3,3 bar-40 bar d_0 = 10,5 &15,0 3,0 bar-40 bar d_0 = 23,0 2,0 bar-40 bar	-196°C-+185°C	tiefkalte nichtbrennbare Dämpfe und Gase nach TRG 101
06470/06475	2,0 bar-5,0 bar	-196°C-+120°C	tiefkalte nichtbrennbare Dämpfe und Gase nach TRG 101
06389/06419	3,3 bar-40 bar	-196°C-+185°C	tiefkalte nichtbrennbare Dämpfe und Gase nach TRG 101
06472/06477	0,5 bar-6,0 bar	-196°C-+150°C	Dämpfe und Gase einschließlich tiefkaltem Sauerstoff
06474/06478	6,0 bar-40 bar	-196°C-+150°C	Dämpfe und Gase einschließlich tiefkaltem Sauerstoff

HINWEIS: Die Medien dürfen die mediumberührten Teile des Sicherheitsventils nicht angreifen. Im Zweifelsfall ist mit dem Hersteller Rücksprache zu führen.

4.2 Begriffe

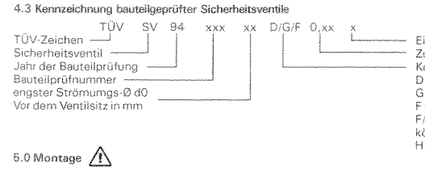
Ansprechdruck: Der Ansprechdruck ist der Überdruck, bei dem unter Betriebsbedingungen direkt belastete Sicherheitsventile zu öffnen beginnen.

Einstelldruck: Der Einstelldruck ist der Überdruck, bei dem unter Prüfstandbedingungen (atmosphärischer Gegendruck) direkt belastete Sicherheitsventile zu öffnen beginnen.

Öffnungsdruck: Der Öffnungsdruck ist der Überdruck, bei dem das Sicherheitsventil den für den abzuführenden Massenstrom erforderlichen Hub erreicht; er ist gleich dem Ansprechdruck plus der Öffnungsdifferenz.

Schließdruck: Der Schließdruck ist der Überdruck, bei dem das Sicherheitsventil wieder geschlossen ist. Ausführliche Angaben siehe DIN 3320.

4.3 Kennzeichnung bauteilgeprüfter Sicherheitsventile



5.0 Montage ⚠

5.1 **Grundsätzliche Montagevorschrift**
Federbelastete Sicherheitsventile sind grundsätzlich aufrecht, unter Berücksichtigung der Strömungsrichtung, einzubauen. Der kleinste Querschnitt vor dem Sicherheitsventil muß mindestens dem d_0 des Sicherheitsventils entsprechen. Die Ventile müssen so montiert werden, daß beim Ansprechen keine Personen oder Sachen durch das austretende Betriebsmedium zu Schaden kommen. Um eine einwandfreie Funktion zu gewährleisten, dürfen keine unzulässigen statischen, thermischen und dynamischen Beanspruchungen auf das Ventil übertragen werden, Reaktionskräfte sind zu berücksichtigen. Zwischen dem Sicherheitsventil und der Druckanlage darf keine Absperrung montiert sein. Ausblaseleitungen dürfen weder verengt, noch negativen Einfluß auf die Funktion und die Leistung des Ventils haben und müssen gefahrlos ausmünden. Im Ausblasesystem darf sich keine Flüssigkeit sammeln. (siehe auch AD-Merkblatt A 2).

Operating and Installation Instructions

Direct Loaded Safety Valves, permitted acc. to AD 2000 - A2, TÜV - SV 100, with/without lifting device

HEROSE

GB

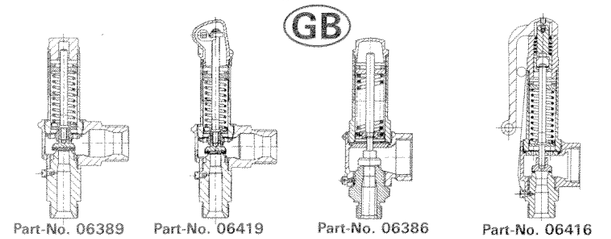


Table of Contents

Operating and Installation Instructions

4.0 Description

4.1 Scope of Application
Safety valves are safety devices on pressure vessels for protection against excessive pressure.

Type	Pressure range	Temperature	Medium
06386/06416 06387/06417	0,2 bar-40 bar	-196°C-+185°C	Vapours and gases inclusive cryogenic oxygen
06388/06418 06430/06435	d_0 = 7,0 3,3 bar-40 bar d_0 = 10,5 &15,0 3,0 bar-40 bar d_0 = 23,0 2,0 bar-40 bar	-196°C-+185°C	Cryogenic non-inflammable vapours and gases acc. to TRG 101
06389/06419	3,3 bar-40 bar	-196°C-+185°C	Cryogenic non-inflammable vapours and gases acc. to TRG 101
06472/06477	0,5 bar-6,0 bar	-196°C-+150°C	Vapours and gases inclusive cryogenic oxygen
06474/06478	6,0 bar-40 bar	-196°C-+150°C	Vapours and gases inclusive cryogenic oxygen

NOTE: The medium will not damage the wetted parts of the safety valve. If in doubt contact the manufacturer.

4.2 Definitions

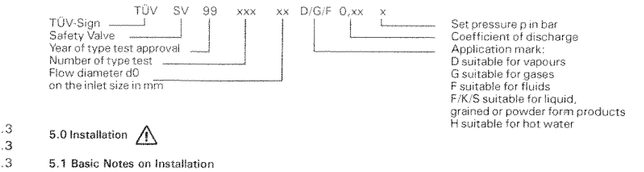
Set Pressure: The set pressure is the gauge pressure at which under operating conditions direct loaded safety valves commence to lift.

Test Pressure: The test pressure is the gauge pressure at which under test stand conditions (atmospheric back pressure) direct loaded safety valves commence to lift.

Opening Pressure: The opening pressure is the gauge pressure at which the lift is sufficient to discharge the predetermined flowing capacity; it is equal to the set pressure plus opening pressure difference.

Reseating Pressure: The reseating pressure is the gauge pressure at which the direct loaded safety valve re-seats.
For detailed definitions see DIN 3320.

4.3 Marking of Permitted Safety Valves



5.0 Installation ⚠

5.1 **Basic Notes on Installation**
Spring loaded safety valves should be installed with the bonnet vertically upwards, considering the direction of flow. The minimum diameter of the pipe prior to the safety valve must be a minimum of the d_0 of the safety valve. Safety valves must be installed so that the vented medium can not injure people or damage properties. Safety valves should be installed in such a way that no inadmissible static, dynamic or thermal loads can be transmitted to the valve, if this is the case then these factors must be catered for in the installation. Between the safety valve and the pressure equipment no valve or fitting should be installed. Should the relief valve outlet be fitted with a discharge pipe this must not be less than the relief valve outlet diameter or be fitted with any other components that can restrict the discharge flow. The relief valve outlet or discharge pipe must be located in a safe area. The discharge pipes must not be installed where it will allow any of the venting medium to collect.
(see also AD-Merkblatt A 2).

Betriebs- und Montageanleitung

1.0 **Allgemeines zur Betriebsanleitung**

Diese Betriebsanleitung beinhaltet die Anweisungen, die Armatur sicher, in der vorgeschriebenen Weise, einbauen und betreiben zu können. Sollten dabei Schwierigkeiten auftreten, die nicht mit Hilfe dieser Betriebsanleitung gelöst werden können, so sind weitere Informationen beim Lieferanten/Hersteller zu ertragen.
Diese Betriebsanleitung entspricht den relevanten gültigen EN-Sicherheitsnormen sowie den gültigen Vorschriften und Regelwerken der Bundesrepublik Deutschland. Bei Einsatz der Armatur außerhalb der Bundesrepublik Deutschland hat der Betreiber beziehungsweise der für die Auslegung der Anlage Verantwortliche dafür zu sorgen, daß gültige nationale Regelwerke eingehalten werden. Der Hersteller behält sich alle Rechte der technischen Änderungen und Verbesserungen jederzeit vor. Der Gebrauch dieser Betriebsanleitung setzt die Qualifikation des Benutzers wie unter Punkt 2.3 "Qualifiziertes Personal" beschrieben voraus. Das Bedienungspersonal ist entsprechend der Betriebsanweisung zu unterweisen.

2.0 **Gefahrenhinweise**

2.1 **Bedeutung der Symbole**

⚠ Warnung vor einer allgemeinen Gefahr

2.2 **Sicherheitsrelevante Begriffe**

Die Signalbegriffe GEFAHR, WARNUNG, VORSICHT und HINWEIS werden in dieser Betriebsanleitung angewandt bei Hinweisen zu besonderen Gefahren oder für außergewöhnliche Informationen, die besondere Kennzeichnung erfordern.

GEFAHR bedeutet, daß bei Nichtbeachtung Lebensgefahr besteht und / oder erheblicher Sachschaden auftreten kann.

WARNUNG bedeutet, daß bei Nichtbeachtung schwere Verletzungsgefahr besteht und / oder Sachschaden auftreten kann.

VORSICHT bedeutet, daß bei Nichtbeachtung Verletzungsgefahr besteht und / oder Sachschaden auftreten kann.

HINWEIS bedeutet, daß auf technische Zusammenhänge besonders aufmerksam gemacht wird.

Die Beachtung der nicht besonders hervorgehobenen anderen Transport-, Montage-, Betriebs- und Wartungshinweise sowie technische Daten (in den Betriebsanleitungen, den Produktionsdokumentationen und am Gerät selbst) ist jedoch gleichermaßen unerläßlich, um Störungen zu vermeiden, die ihrerseits mittelbar oder unmittelbar Personen- oder Sachschäden bewirken können.

2.3 **Qualifiziertes Personal**

Das sind Personen, die mit Aufstellung, Montage, Inbetriebnahme und Betrieb des Produktes vertraut sind und über die ihrer Tätigkeiten und Funktionen entsprechenden Qualifikationen verfügen, wie z.B.: Unterweisung und Verpflichtung zur Einhaltung aller einsatzbedingten, regionalen und innerbetrieblichen Vorschriften und Erfordernissen; Ausbildung oder Unterweisung gemäß den Standards der Sicherheitstechnik in Pflege und Gebrauch angemessener Sicherheits- und Arbeitsschutzausrüstung; Schulung in Erster Hilfe; usw. (siehe auch TRB 700)

3.0 **Handhabung**

3.1 **Lagerung**
Lagertemperatur -20°C bis +65°C, trocken und schmutzfrei.
In feuchten Räumen ist Trockenmittel beziehungsweise Heizung gegen Kondenswasserbildung erforderlich

3.2 **Transport**
Transporttemperatur -20°C bis +65°C
Gegen äußere Gewalt (Stoß, Schlag, Vibration) schützen

3.3 **Handhabung vor der Montage**
Bei Ausführung mit Schutzkappen, diese direkt vor der Montage entfernen!
Vor Schmutz- und Witterungseinflüssen wie z.B. Nässe schützen!
Sachgemäßes Behandeln schützt vor Beschädigungen.

Betriebs- und Montageanleitung

5.2 **Allgemeine Montagevorschrift**
Neben den grundsätzlichen Montagerichtlinien sind folgende Punkte zu beachten

- Sichtprüfung der Kennzeichnung (siehe 4.3) hinsichtlich der Einsatzbedingung und des Ansprechdruckes
- Sichtprüfung auf äußere Beschädigung, beschädigte Ventile nicht einbauen
- Gewindeschutzkappe, falls vorhanden, entfernen
- Der Innenraum der Armatur und des Druckbehälters muß frei von Fremdpartikeln sein
- bei hohen Oberflächentemperaturen ist ein entsprechender Schutz vorzunehmen, bzw. das Bedienungspersonal zu unterweisen
- Eindichten der Armatur unter Verwendung geeigneter Dichtringe nach DIN 7603 aus Metall oder Kunststoff

HINWEIS: Bei Verwendung von Dichtband oder flüssiger Dichtmitteln besteht die Gefahr, daß Teile davon in das Ventil gelangen und Funktion bzw. Dichtheit beeinträchtigen.

- Nur passendes Werkzeug wie Gabel- oder Ringschlüssel verwenden

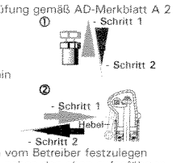
HINWEIS: Anzugsmoment so einstellen, daß eine Beschädigung vermieden wird.

6.0 **Anlüftbarkeit**
Anlüftbare Sicherheitsventile müssen im Bereich ≥ 85% des Ansprechdruckes ohne Hilfsmittel zum Öffnen gebracht werden können. Die anlüftbaren Sicherheitsventile sind daher mit einer entsprechenden Vorrichtung, oberhalb der Federhaube, ausgestattet.

6.1 **Funktionsprüfung der Anlüftevorrichtung** ⚠
Bei der Erstinbetriebnahme, nach Betriebsunterbrechungen und zur Funktionsprüfung gemäß AD-Merkblatt A 2 Abs. 4.7 ist wie folgt vorzugehen (siehe Abb. 1 & Abb. 2):

Abb.1 Schritt 1: Anlüftknopf soweit nach oben ziehen, bis ein deutliches Ausblasen des Betriebsmediums hörbar ist.
Schritt 2: Anlüftknopf wieder loslassen

Abb.2 Schritt 1: Anlüftehebel soweit in Richtung Federhaube drücken, bis ein deutliches Ausblasen des Betriebsmediums hörbar ist.
Schritt 2: Anlüftehebel wieder loslassen



Das Ventil ist damit wieder **betriebsbereit.**

7.0 **Wartung**
Die Wartung und Wartungsintervalle sind entsprechend den Einsatzbedingungen vom Betreiber festzulegen (siehe TRB 600 und AD-Merkblatt A 2). Die Funktionsprüfung gemäß 6.1 sollte neben den oben aufgeführten Gründen mindestens monatlich durchgeführt werden.

8.0 **Demontage der Armatur** ⚠
Zusätzlich zu den allgemeingültigen Montagerichtlinien und der TRB 700 sind folgende Punkte zu beachten:

- druckloses Rohrleitungssystem
- abgekühltes Medium
- entleerte Anlage
- bei ätzenden und aggressiven Medien Rohrleitungssystem belüften
- Montagearbeiten nur von qualifiziertem Personal (siehe Punkt 2.3) ausführen lassen

9.0 **Reparaturen** ⚠
Reparaturen an Sicherheitsventilen dürfen nur von der Firma HEROSE oder durch diese autorisierte, von den Zulassungsbehörden überprüfte, Fachwerkstätten, unter ausschließlicher Verwendung von Originalersatzteilen, durchgeführt werden.

10.0 **Garantie**
Umfang und Zeitraum der Gewährleistung ist in der zum Zeitpunkt der Lieferung gültigen Ausgabe der "Allgemeinen Geschäftsbedingungen der HEROSE GMBH" oder abweichend davon im Kaufvertrag selbst angegeben. Es gilt jedoch mindestens die gesetzliche Gewährleistungsfrist von 6 Monaten.

Für Schäden, die durch unsachgemäße Behandlung oder Nichtbeachtung dieser Betriebs- und Montageanleitung, der Unfallverhütungsvorschriften, der Normen EN, DIN, VDE und anderen Regelwerken entstehen, können keine Gewährleistungsansprüche geltend gemacht werden.

Ausgabe 05/2001-D

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ARMATUREN UND METALLE
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Fax 04531/509120

Operating and Installation Instructions

1.0 General Information on Operating Instructions

These operating instructions contain the necessary information to install and operate the valve both safely and effectively.
If problems arise which cannot be solved with the aid of these operating instructions, please contact the supplier/manufacturer for further information. These operating instructions comply with the applicable EN safety standards as well as regulations and codes of practice applicable in the Federal Republic of Germany. If the valve is used outside the Federal Republic of Germany, the operator or the person responsible for the system design must ensure that valid national codes of practice are complied with. The manufacturer reserves all rights to implement technical modifications and improvements at any time. The use of these operating instructions assumes the user is qualified as described under Section 2.3 "Qualified Personnel".
The operating personnel must be instructed in accordance with the operating instructions.

2.0 Notes on Possible Dangers

2.1 Significance of Symbols

⚠ Warning of general danger

2.2 Safety Related Definitions

The signal definitions DANGER, WARNING, CAUTION and NOTE are used in these operating instructions as indications for particular hazards or for information requiring special signs.

DANGER means that if the relevant information is disregarded, there is a danger of fatal injury and / or considerable damage to property can occur.

WARNING means that if the relevant information is disregarded, there is a danger of serious injury and / or damage to property can occur.

CAUTION means that if the relevant information is disregarded, there is a danger of serious injury and / or damage to property can occur.

NOTE means that particular attention must be paid to certain technical aspects.

All other information not specifically emphasised such as transport, installation, operating and maintenance instructions as well as technical data (in the operating instructions, product documentation and on the device itself) must also be complied with to the fullest extent in order to avoid faults which in turn can cause serious injury to persons or damage property.

2.3 Qualified Personnel
The term "qualified personnel" relates to persons who are familiar with the installation, assembly, start up and operation of the product and have the qualification corresponding to their responsibilities. Such as:
Instruction and awareness to comply with all operational, regional and in-company regulations and requirements; Training or instruction in accordance with safety technology standards with regard to the upkeep and use of appropriate safety and work protection equipment; First aid training, etc.
(see TRB 700)

3.0 Handling

3.1 Storage
- Storage temperature -20°C to +65°C dry, free of dirt.
- A desiccant or heating to prevent condensation is necessary in damp rooms.

3.2 Transport
- Transport temperature -20°C to +65°C.
- Protect against external force (impact, vibration etc.).

3.3 Handling before Installation
- If flange covers are fitted, remove shortly before installation.
- Protect against atmospheric conditions e.g. wetness (use a desiccant)!
- Correct handling protects against damage.

Operating and Installation Instructions

5.2 General Notes on Installation
The following points should be taken into account besides the basic notes on installation:

- Visual checking of marking (see 4.3) concerning application and set pressure
- Visual checking concerning outer damage. Damaged valves should be not installed
- Remove protecting cap if present
- Care must be taken should the components become hot during the installation of the valve. Operating personnel must be instructed
- The space inside the valve and the pressure vessel must be free of any foreign products.
- When installing safety valves with threaded connections, use metal or plastic seal washers only acc. to DIN 7603

CAUTION: Seal materials such as seal tape or liquid seal material should not be used as this type of material can break off and enter the valve causing it to leak.

- Only use suitable tools for installing of safety valves

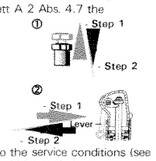
CAUTION: The torque must be correct to avoid any damages.

6.0 Lifting Device
It shall be possible to lift safety valves with lifting device at a pressure ≥ 85% of set pressure. All liftable safety valves are provided with a respective device, placed at the top of the bonnet.

6.1 Operation testing of Lifting Device ⚠
On the first insallation or after interruptions or for operation testing acc. to AD-Merkblatt A 2 Abs. 4.7 the following steps are to be carried out (see Illustr. 1 & 2):

Illustr.1 Step 1: Pull up the lifting device until a clear discharge of the medium is audible.
Step 2: Let go the lifting device.

Illustr.2 Step 1: Push the lifting lever in direction of the bonnet until a clear discharge of the medium is audible.
Step 2: Let go the lifting lever.



Now the valve is **ready for operation.**

7.0 Maintenance
Maintenance and maintenance-intervals have to be defined by the operator according to the service conditions (see TRB 600 und AD-Merkblatt A 2). The operation testing of lifting device acc. to 6.1 should be carried out at least monthly in addition to the above mentioned reasons.

8.0 Dismantling the Valve ⚠
The following points must be observed beside the general principal rules and TRB 700 govering the assembly work:

- pressureless pipe system
- medium must be cool
- plant must be drained
- purge piping system in case of aggressive or caustic media
- have assembly work performed only by qualified personnel (see point 2.3)

9.0 Repairs ⚠
Repairs on safety valves can only be carried out by company HEROSE or authorized HEROSE workshops, revied by official licenced authorities.

10.0 Gaurantee
The extent and period of warranty cover are specified in the "sales conditions of HEROSE GMBH" valid at the time of delivery or, by notice in supplied documentation, in the contract of sale itself. In any case, however, the legally stipulated warranty period of 6 months shall apply.
No warranty claims can be made for any damage caused as the result of incorrect handling, disregard of operating and installation instructions, accident prevention regulations, EN, DIN, VDE standards and other applicable codes of practice.

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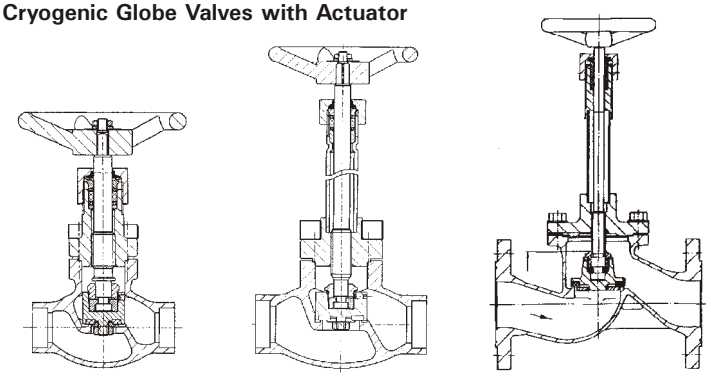
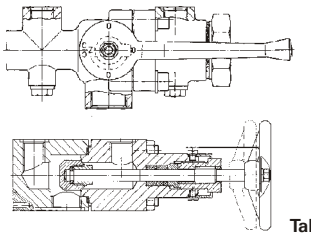
Operating and Installation Instructions

GB

Cryogenic Globe Valves with Gland Packing
Cryogenic Globe Valves with Actuator



Changeover Valves, Divertors



Check Valves, Strainer

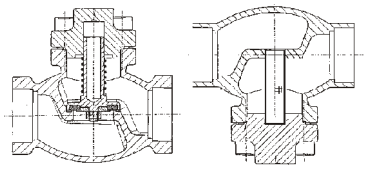


Table of Contents

Operating and Installation Instructions

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The operating personnel must be instructed in accordance with the operating instructions.

2.0 Notes on Possible Dangers

2.1 Significance of Symbols

⚠ Warning of general danger

2.2 Safety Related Definitions

The signal definitions DANGER, WARNING, CAUTION and NOTE are used in these operating instructions as indications for particular hazards or for information requiring special signs.

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CAUTION means that if the relevant information is disregarded, there is a danger of serious injury and / or damage to property can occur.

NOTE means that particular attention must be paid to certain technical aspects.

All other information not specifically emphasised such as transport, installation, operating and maintenance instructions as well as technical data (in the operating instructions, product documentation and on the device itself) must also be complied with to the fullest extent in order to avoid faults which in turn can cause serious injury to persons or damage property.

2.3 Qualified Personnel

The term "qualified personnel" relates to persons who are familiar with the installation, assembly, start up and operation of the product and have the qualification corresponding to their responsibilities. Such as:
Instruction and awareness to comply with all operational, regional and in-company regulations and requirements;
Training or instruction in accordance with safety technology standards with regard to the upkeep and use of appropriate safety and work protection equipment; First aid training, etc.
(see TRB 700)

3.0 Handling

3.1 Storage
- Storage temperature -20°C to +65°C dry, free of dirt.
- A desiccant or heating to prevent condensation is necessary in damp rooms.

3.2 Transport
- Transport temperature -20°C to +65°C.
- Protect against external force (impact, vibration etc.).

3.3 Handling before Installation
- If flange covers are fitted, remove shortly before installation.
- Protect against atmospheric conditions e.g. wetness (use a desiccant)!
- Correct handling protects against damage.

The Valves are cleaned and degreased for oxygen. Please keep sealed int the plastic bag until use. All tools are to clean before starting the installation or work.

Operating and Installation Instructions

4.0 Description

4.1 Scope of Application
Globe Valves are suitable to "shut or reduce the flow of Medium". Changeover Valves will be used for the installation of equipement for protection against excessive pressure acc. to BetrSichV §17 Anhang 5 Nr. 12. The operational field of the valve is under the responsibility of the qualified engineer. Pay attention to special markings of the Valve like:
- permitted medium: oxygen, nitrogen, argon, krypton, carbon dioxide, dinitrogen monoxide, chlorine trifluormethan, trifluormethan, carbon oxide, methan, ethan and ethylen
- Valves for oxygen (O_2) are durable marked with "O_2".
- **please contact the manufacturer for valves for special medium, which require or exclude specific materials** ⚠

4.2 Operation
The Globe Valves will be closed by turning the handwheel right (clockwise), the typical disc/seat function. Tools to increase the torque of the handwheel are not allowed. Detailled installation and operation instructions for Globe Valves with pneumatic or electric actuators are included to the valve. Changeover Valves will be operated by turning the handwheel/lever. At the end positions one outlet (right or left) is open. A simultaneous closing of both outlets is not possible.

4.3 Technical Data
· Main dimensions of the valve - see data sheet of catalogue
· Pressure-Temperature-rates - see data sheet of catalogue
· Valves with welding or brazing end connections - see data sheet of catalogue

4.4 Marking

CE - Marking of Valves **only valid for valves greater then size DN 25!**	
CE	CE - mark
0045	notified body
PN 50	maximum working pressure
08/01	Year of Manufacturing
XXXX	Serial Number of the Valve
◇	Trademark of Manufacturer

Marking of Valves **equal or smaller size DN 25.**	
Label Sound Engineering Practice acc. to	
art. 3.3 of PED 97/23/EC	
PN 50	maximum working pressure
08/01	Year of Manufacturing
XXXX	Serial Number of the Valve
◇	Trademark of Manufacturer

5.0 Installation

5.1 Basic Notes on Installation
- Attention to the fitting position concerning flow direction
- fitting position concerning stem direction for cryogenic valves not more then 65° to the vertical line Priority position: Stem vertical
- **Dismantling of Topwork for Valves with welding or soldering end connection** before the welding or soldering process starts, Instructions for reassembling of the Topwork and replacement bonnet gaskets (2 pieces) are attached to the Valve
- Seals between flanges must be centered, flanges must be correct dimensioned
- installation in such a way that no inadmissible static, dynamic or thermal loads can be transmitted to the valve
- The valve is no fixing point and must be supported by the piping construction
- Valves must be protected against soiling, especially during construction work - Note: cleaned for oxygen (O_2)
- thermal expansion of the piping must be balanced by compensators
- No paintwork is allowed
- fitting position of Globe/Check Valves is general vertical and the medium flow must be from under the disc. Should the valves be installed in another fitting position a closing spring must be inside the valve.
- installation of Check Valves acc. to the flow direction marking on the body that the medium flow come from under the disc
- installation of Strainer Valves acc. to the flow direction marking on the body that contaminations of the medium will be collected inside the mesh

5.2 General Notes on Installation
The following points should be taken into account besides the basic notes on installation:
- Visual checking of marking (see 4.3) concerning application and set pressure
- Visual checking concerning outer damage. Damaged valves should be not installed
- Remove protecting cap if present
- The space inside the valve and the pressure vessel must be free of any foreign products.
- Care must be taken should the components become hot or cold during the installation of the valve Operating personnel must be instructed

Operating and Installation Instructions

- When installing valves with threaded connections, use metal or plastic seal washers only acc. to DIN 7603 **(O_2 - suitability is to notice!)**

CAUTION: Seal materials such as seal tape or liquid seal material should not be used as this type of material can break off and enter the valve causing it to leak.

- Only use suitable tools **(O_2 - suitability is to notice!)**

CAUTION: The torque must be correct to avoid any damages.

6.0 Notes om danger during Installation, Operation and Maintenance ⚠

A safe operation of the valve is only guaranteed, if the installation, first operation and maintenance will be carried out by qualified personnel (see point 2.3) in compliance with these operating and installation instructions. Furthermore pay attention to the general installation and safety rules and standards for piping resp. facility construction. A professional use of tools and safety equipement must be guaranteed during installation. During all work on and with the valve follow the operating and installation instructions of the valve. A non-compliance with these instructions can be followed by fatal injury and / or considerable damage.

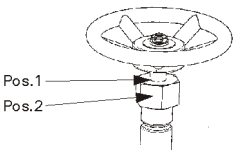
7.0 Operation ⚠

- before first operation the information of material, pressure, temperature and flow direction must be checked acc. to the installation plan of the piping system.
- the TRB 700 must be observed
- Residues in the piping and in Valves (dirt, bead of perspiration, etc.) conduct inevitable to leakage

Before first operation of a new constructed facility or a refurbished facility the following must be checked and examinated:
- the installation work must be completely finished!
- Starting of operation can only be carried out by qualified personnel (see point 2.3)
- the correct function and operation position of the valve
- Installation resp. re-operation of exisiting safety equipement

8.0 Maintanance ⚠

Maintenance and maintenance-intervals have to be defined by the operator according to the service conditions, see TRB 700.
If valves with Gland packing are leaking on the gland packing (Pos.1), please torque the gland screw (2) untill tightness.



Repairs on valves can only be carried out by company HEROSE or authorized HEROSE workshops, revied by official licenced authorities.

9.0 Dismantling the Valve ⚠

The following points must be observed beside the general principal rules and TRB 700 govering the assembly work:
- pressureless pipe system
- medium and valve must be cool at ambient temperature
- plant must be drained
- purge piping system in case of aggressive or caustic media
- have assembly work performed only by qualified personnel (see point 2.3)

10.0 Warranty

The extent and period of warranty cover are specified in the "sales conditions of HEROSE GMBH" valid at the time of delivery or, by notice in supplied documentation, in the contract of sale itself. No warranty claims can be made for any damage caused as the result of incorrect handling, disregard of operating and installation instructions, accident prevention regulations, EN, DIN, VDE standards and other applicable codes of practice.
No warranty claims can be made for any damage caused as the result wrong installation or disregard of datasheet informations. Maintenance, Installation of foreign components in valves and modifications of design are excluded of period of warranty.

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Einbau- und Betriebsanleitung
Installation and Operating instructions
Instructions de montage et de service

Pneumatische Stellantriebe
Pneumatic actuators
Servomoteurs pneumatiques

6100-8010

Baureihe / Series / Séries
ST 6115/6135/6160/6141

Inhaltsverzeichnis

D

Content

GB

Sommaire

FR

Anhang / Appendix / Annexes

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Alle Arbeiten dürfen nur von geschultem und qualifizierten Personal unter der Verantwortung einer Aufsichtsperson ausgeführt werden.

1 Produktkennzeichnung

Bei jedem Schriftwechsel sind der Typ und möglichst auch die Werksnummer des Gerätes anzugeben. Jedes Gerät ist mit einem Typenschild versehen. Siehe Typenschild:

2 Demontage des Stellantriebes

WICHTIG: Vor allen Arbeiten am Stellantrieb ist dieser vom Ventil zu trennen.

Diese Maßnahme ist nur für den Wechsel folgender Teile relevant:
- der Membran (Pos. 401), einschließlich Kolbenstange (Pos. 203) und Membranteller (Pos. 202)
- einer (oder mehrerer) Feder(n) (Pos. 501)

2.1 Wechsel der Membran

- Alle kurzen Schraubenbolzen entfernen, die langen Schraubenbolzen an ihrer Stelle belassen.
- Federn vollständig entspannen. Dazu die langen Schraubenbolzen nacheinander langsam lockern.
  ACHTUNG: Durch das Zusammendrücken der Federn wird eine beträchtliche Spannung auf die Schraubenbolzen ausgeübt. Gefahr des Abwurfs des oberen Gehäuseteils.
- Nach Entfernung der langen Schraubenbolzen oberes Gehäuseteil (Pos.101) abnehmen.
- Mutter (Pos. 304) und Parallelführung (Pos. 302) demontieren.
- Membran (Pos.401)einschließlich Kolbenstange(Pos.203) und Membranteller (Pos.202) nach oben herausziehen und komplette Einheit ersetzen.
  ACHTUNG: Es ist zu prüfen, ob die Federn nach dem Zusammendrücken gerade sind. Vor Beginn des Zusammendrückens Membran so positionieren, dass deren Öffnungen senkrecht zu den Bohrungen des unteren Gehäuseteils stehen und die Federn gerade sind.
- Mutter (Pos. 304) wieder festziehen und kleben (Kleber Typ Loctite 242). Dabei sind folgende Anziehmomente zu beachten:

- Größe der Membranmutter	M10	M12	M16
- Anziehmoment in Nm	43	74	160

  ACHTUNG: Beim Festziehen Drehung der Membran vermeiden, um diese nicht zu zerstören.
- Oberes Gehäuseteil (Pos. 101)wieder montieren.
- Bei Einsatz der langen Schraubenbolzen Federn (Pos. 501) soweit zusammendrücken, bis Membran zwischen den beiden Gehäuseteilen vollständig eingespannt ist.
- Kurze Schraubenbolzen wieder einsetzen und alle Schraubenbolzen mit folgenden Anziehmomenten festziehen:

Schraubenbolzenmaterial	Anziehmoment in Nm	
	Größe M6	Größe M8
Stahl	12	26
Inox	9	21

2.2 Wechsel einer (oder mehrerer) Feder(n)

- Alle kurzen Schraubenbolzen entfernen, die langen Schraubenbolzen an ihrer Stelle belassen.
- Federn vollständig entspannen. Dazu die langen Schraubenbolzen gleichmäßig lockern.
  ACHTUNG: Durch das Zusammendrücken der Federn wird eine beträchtliche Spannung auf die Schraubenbolzen ausgeübt. Gefahr des Abwurfs des oberen Gehäuseteils.
- Nach Entfernung der langen Schraubenbolzen oberes Gehäuseteil (Pos.101) abnehmen.
- Mutter (Pos.304) und Parallelführung (Pos.302) demontieren
- Gesamte Gruppe, bestehend aus Kolbenstange (Pos. 203) / Membran (Pos. 401)/ Membranteller (Pos. 202) abnehmen.
- Feder(n) (Pos. 501) wechseln. Der Windungsanfang muss zur Außenseite des Gehäuses hin gerichtet sein, (Positionierung siehe Anhang 2)
- Oberes Gehäuseteil (Pos. 101) wieder montieren.
- Bei Einsatz der langen Schraubenbolzen Federn soweit zusammendrücken, bis Membran zwischen den beiden Gehäuseteilen vollständig eingespannt ist.
- Kurze Schraubenbolzen wieder einsetzen und alle Schraubenbolzen mit folgenden Anziehmomenten festziehen:

Schraubenbolzenmaterial	Anziehmoment in Nm	
	Größe M6	Größe M8
Stahl	12	26
Inox	9	21

- Stellantrieb über Kupplungshälfte (Pos. 302) wieder mit dem Ventil verbinden.

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3 Funktionskontrolle

3.1 Dichtheitskontrolle

Druckluftversorgung anschließen und Druck erhöhen, bis die auf dem Typenschild angegebene max. Drucklufteinspeisung erreicht ist. Die Kolbenstange muss sich in die äußerste Position bewegen. Kommt die Kolbenstange in dieser Position nicht zum Stehen, liegt dies am Druckverlust. In diesem Falle ist die Dichtheit an der Durchführung der Kolbenstange, an der Membran, am Dichtring (Pos. 104) an der Stangedichtung (Pos. 405) und am Eintritt der Druckluft zu prüfen.

3.2 Kontrolle des Arbeitsbereichs der Federn

Dieser ist mittels Druckkontrolle am Anfang und am Ende der Wegstrecke zu überprüfen. Die Werte müssen mit den Angaben auf dem Typenschild übereinstimmen.

3.3 Einstellung der Kupplungshälfte

Die an der Antriebs-Seite befindliche Kupplungshälfte gestattet durch deren Drehung die Einstellung des Ventilhubes.

4 Ersatzteilbestellung

Bitte nehmen Sie zur Vorbereitung der in Abschn. 1 genannten Informationen zur Produktkennzeichnung Kontakt zu uns auf.
Der Nutzer verpflichtet sich bei jeder Wartungsarbeit, die eine Rückführung der Ausrüstung in unseren Betrieb erforderlich macht, zur Reinigung und Dekontaminierung der Ausrüstung, um die Sicherheit unseres mit der Wartung beschäftigten Personals zu gewährleisten.

5 Sauerstoff-Betrieb

ACHTUNG: Bei Sauerstoffbetrieb ist den nachgenannten Empfehlungen aufgrund der Explosionsgefahr unbedingt Folge zu leisten.

5.1 Vorbereitung

Die Montagewerkzeuge sind mit Azeton zu entfetten. Die Arbeitsumgebung ist einer Reinigung, Entfettung und Trocknung zu unterziehen.

5.2 Handhabung der Teile und Werkzeuge

- Alle mit Sauerstoff in Kontakt stehenden Teile und Flächen sind mit Azeton zu entfetten.
- Die Trocknung erfolgt einfach durch Verdunsten an der Umgebungsluft.
- Nach der Entfettung und Trocknung, sind die Teile und Flächen mit trockener Druckluft abzublasen.
- Es wird daran erinnert, dass die Werkzeuge mit Azeton zu entfetten sind.
- Zur Vermeidung erneuten Einfettens der Teile während deren Handhabung hat der Bediener saubere und trockene Baumwollhandschuhe zu tragen.

5.3 Fettsorte

Als Fettsorte darf einzig und allein Spezialfett für Sauerstoffbetrieb (Typ VOLTALEF 901) zum Einsatz gelangen.

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Installation and handling shall only be carried out by competent, trained and qualified personnel under the responsibility of a person of authority.

1 Product identification

The type and serial number must be mentioned in all correspondence concerning the said equipment. Each instrument is labelled by a type plate and the order no., position within the series and type:

Pneum. Stellantrieb ST 6135 B6 6G Po

Feder	: Feder schliesst Zuluftdruck max. 6 bar
Membranfläche	: 280 cm²
Federbereich	: 0,8 ... 3,0 bar
Stellweg	: 35 mm
WE-Nummer	: 8062000-010
TYP	: PXDEADGXXXX CE II 2 G/D T6

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2 Dismantling the casing of the actuator

IMPORTANT: Before carrying out any operations the actuator must be dissociated from the valve.
This operation should only be carried out to change:

- the diaphragm (Pos. 401), incl. rod (Pos. 203) and the diaphragm plate (Pos. 202),
- one (or several) spring(s) (Pos. 501)

2.1 Changing the diaphragm

- Remove all the short bolts and leave the long ones.
- Ensure full spring decompression by loosening the long bolts little by little and one after the other.
  WARNING: Spring compression creates a great deal of tension on the bolting. There is a danger of the upper casing ejecting.
- After you have removed the long bolts, remove the upper casing (Pos. 101).
- Dissasemble the nut (Pos. 304) and parallel motion (Pos. 302)
- diaphragm (Pos. 401) incl. rod (Pos.203) and diaphragm plate (Pos.202) pull out und exchange the complete unit
  WARNING: It is absolutely essential to make sure that the springs will be perfectly upright after compression. Before starting compression, the diaphragm should be placed in such a way that the holes are perpendicular to the lower carter holes and that the springs are perfectly upright.
- Block and glue (Loctite 242 type glue) the nut again (Pos. 304) according to the following tightening torques:

- Diaphragm nut size	M10	M12	M16
- Tightening torque in Nm	43	74	160

  WARNING: To avoid damaging the diaphragm, make sure that it does not rotate during tightening.
- Re-assemble the upper casing (Pos. 101)
- Using the long bolts, compress the springs (Pos. 501) until the diaphragm is completely clamped between the 2 casings.
- Put all the short bolts back in position and tighten all the bolts according to the following tightening torque:

Bolting material	Tightening torque in Nm	
	M6 Dimension	M8 Dimension
Steel	12	26
Stainless steel	9	21

2.2 Change of one (or several) spring(s)

- Remove all the short bolts and leave the long ones.
- Ensure full spring decompression by loosening the long bolts little by little and one after the other.
  WARNING: Spring compression creates a great deal of tension on the bolting. There is a danger of the upper casing ejecting.
- After you have removed the long bolts, remove the upper casing (Pos. 101).
- Dissasemble Nut (Pos. 304) and parallel motion (Pos. 302)
- remove the complete unit of rod (Pos. 203) / Diaphragm (Pos. 401)/diaphragm plate (Pos. 202)
- Change the spring(s) (Pos. 501). The beginning of the spiral should be directed towards the outside of the casing. (For the position, refer to appendix 2)
- Re-assemble the upper casing (Pos. 101)
- Using the long bolts, compress the springs until the diaphragm is completely clamped between the 2 casings.
- Put all the short bolts back in position and tighten all the bolts according to the following tightening torque:

Bolting material	Tightening torque in Nm	
	M6 Dimension	M8 Dimension
Steel	12	26
Stainless steel	9	21

- Couple the actuator again on the valve via the half coupling (Pos. 302)

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3 Operating control

3.1 Tightness check

Connect the air supply and increase the pressure until it reaches the maximum supply indicated on the plate. The rod should move and come to a halt at the extreme position. If the rod does not come to a halt, this means that the pressure is dropping. In this case it is necessary to check tightness at the passage of the stem, diaphragm, diaphragm O-ring (Pos. 104) and the sealing of the (Pos. 405) and at the inlet of the air supply.

3.2 Spring scale control

Check the scale of the springs by checking the pressure at the beginning and at the end of a stroke. The values must comply with the data on the identification plate.

3.3 Half-coupling setting

The rotation of the half-coupling on the actuator side makes it possible to set the stroke of the valve.

4 Ordering spare parts

Contact us after having prepared all the information necessary for identification as stipulated in paragraph 1. In the event of any maintenance work which requires the material to be returned to our premises, the consignor undertakes to clean and decontaminate the entire apparatus in order to guarantee the safety of our personnel.

5 OXYGEN service

WARNING: During oxygen operation, it is absolutely essential to follow the recommendations below as there is potential explosion hazard.

5.1 Preparation instructions

The grease on assembly tools must be removed with acetone. The working environment must be clean, free of grease and dried.

5.2 Handling operations

- All the parts and surfaces in contact with oxygen must be degreased with acetone.
- Drying is carried out simply through evaporation in the ambient air.
- After degreasing and drying, the parts and surfaces must be blown with dry compressed air.
- We remind you that grease should be removed from the tooling with acetone.
- To avoid greasing parts during handling, the operator should wear clean and dry cotton gloves.

5.3 Type of grease

The one and only type of grease to be used is a special oxygen service grease (VOLTALEF 901 type grease).

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Toutes les manipulations doivent être réalisées par du personnel compétent, formé et qualifié sous la responsabilité d'une personne faisant autorité.

1 Identification du produit

La codification et le numéro de fabrication sont à mentionner lors de toute correspondance concernant l'équipement. Chaque équipement est référencé par une plaque d'identification.

2 Démontage du carter du servomoteur

IMPORTANT : Avant toutes manipulations, le servomoteur doit être démonté de la vanne.
Cette opération n'est valable que pour le changement :
- de la membrane (Pos. 401), de la tige due piston (Pos. 203) et du plateau à membrane (Pos. 202)
- d'un (ou plusieurs) ressort(s) (Pos. 501)

2.1 Changement de la membrane

- Retirer la totalité des boulons courts, laisser les boulons longs.
- Assurer la décompression complète des ressorts en desserrant peu à peu et l'un après l'autre les boulons longs.
  ATTENTION : La compression des ressorts crée une tension importante sur la boulonnerie. Il y a un risque d'éjection du carter supérieur.
- Après avoir enlevé les boulons longs, enlever le carter supérieur (Pos. 101)
- démonter l'écrou (Pos. 304) et le guidage parallèle (Pos. 302)
- Retirer la membrane (Pos. 401) inclus la tige du piston (Pos. 203) et le plateau à membrane et remplacer l'unité complète
  ATTENTION : Il est impératif de s'assurer que les ressorts sont bien droit après leur compression. Avant de commencer avec la compression de la membrane, celle-ci doit être positionnée de telle sorte que ces trous soient à l'aplomb des trous du carter inférieur et que les ressorts soient droits.
- Bloquer et coller (colle type Loctite 242) à nouveau l'écrou (Pos. 304) selon les couples de serrage suivant :

- Taille de l'écrou de membrane	M10	M12	M16
- Couple de serrage en Nm	43	74	160

  ATTENTION : Lors du serrage, il faut éviter la rotation de la membrane afin de ne pas la détériorer.
- Remonter le carter supérieur (Pos. 101).
- En utilisant les boulons longs, comprimer les ressorts (Pos. 501) jusqu'à serrage total de la membrane entre les 2 carters.
- Remettre en place l'ensemble des boulons courts et serrer l'ensemble des boulons selon le couple de serrage suivant :

Matière de la boulonnerie	Couple de serrage en Nm	
	Dimension M6	Dimension M8
Acier	12	26
Inox	9	21

2.2 Changement d'un (ou plusieurs) ressort(s)

- Retirer la totalité des boulons courts, laisser les boulons longs.
- Assurer la décompression complète des ressorts en desserrant peu à peu et l'un après l'autre les boulons longs.
  ATTENTION : La compression des ressorts crée une tension importante sur la boulonnerie. Il y a un risque d'éjection du carter supérieur.
- Après avoir enlevé les boulons longs, enlever le carter supérieur (Pos. 101).
- Enlever l'écrou (Pos. 304) et le guidage parallèle (Pos. 302)
- Retirer l'ensemble : tige (Pos. 203) / membrane (Pos. 401) / plateau à membrane (Pos. 202)
- Changer le(s) ressort(s) (Pos. 501). Le début de spire doit être orienté vers l'extérieur du carter. Pour la position, veuillez consulter *l'annexe 2*.
- Remonter le carter supérieur (Pos. 101).
- En utilisant les boulons longs, comprimer les ressorts jusqu'à serrage total de la membrane entre les 2 carters.
- Remettre en place l'ensemble des boulons courts et serrer l'ensemble des boulons selon le couple de serrage suivant :

Matière de la boulonnerie	Couple de serrage en Nm	
	Dimension M6	Dimension M8
Acier	12	26
Inox	9	21

- Accoupler à nouveau le servomoteur sur la vanne par l'intermédiaire du demi accouplement (Pos. 302).

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3 Contrôle du fonctionnement

3.1 Contrôle de l'étanchéité

Brancher l'alimentation d'air et faire croître la pression jusqu'à l'alimentation maxi indiquée sur la plaquette. La tige doit bouger et s'immobiliser en position extrême. Si la tige ne s'immobilise pas, c'est que la pression chute. Dans ce cas, il faut vérifier l'étanchéité au niveau du passage de tige, de la membrane, du joint torique de la membrane (Pos. 104) au joint de la tige (Pos. 405) et des points d'alimentation.

3.2 Contrôle de l'échelle des ressorts

Vérifier l'échelle des ressorts en contrôlant la pression de début de course et de fin de course. Les valeurs doivent être conformes aux données de la plaque d'identification.

3.3 Réglage du demi-accouplement

Le demi-accouplement côté servomoteur permet par sa rotation de régler la course de la vanne.

4 Commande de pièces détachées

Veuillez nous contacter en préparant les informations d'identification citées au paragraphe 1.
Pour toute opération de maintenance nécessitant un retour du matériel en nos locaux, l'utilisateur s'engage à effectuer le nettoyage et la décontamination de l'appareil afin de garantir la sécurité de notre personnel intervenant.

5 Service OXYGENE

ATTENTION : En fonctionnement oxygène, il est impératif de suivre les recommandations ci-dessous car il y a un risque d'explosion.

5.1 Préparation

Les outils de montage doivent être dégraissés à l'acétone. L'environnement de travail doit être nettoyé, dégraissé et sèché.

5.2 Manipulation

- Toutes les pièces et surfaces en contact avec l'oxygène doivent être dégraissées à l'acétone.
- Le séchage s'effectue par simple évaporation à l'air ambiant.
- Après dégraissage et séchage, les pièces et surfaces doivent être soufflées avec de l'air comprimé sec.
- Il est rappelé que l'outillage doit être dégraissé à l'acétone.
- Pour ne pas graisser les pièces lors de leurs manipulations, l'opérateur doit porter des gants en coton propres et secs.

5.3 Type de graisse

La seule et unique graisse à utiliser est une graisse spéciale service oxygène (graisse type VOLTALEF 901).

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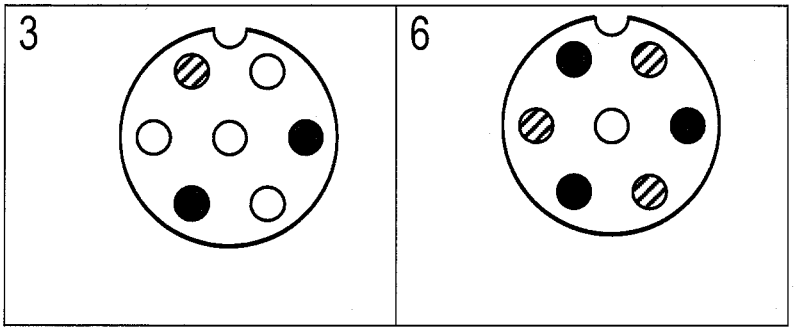
2 Federanordnung / Springs position / Position des ressorts

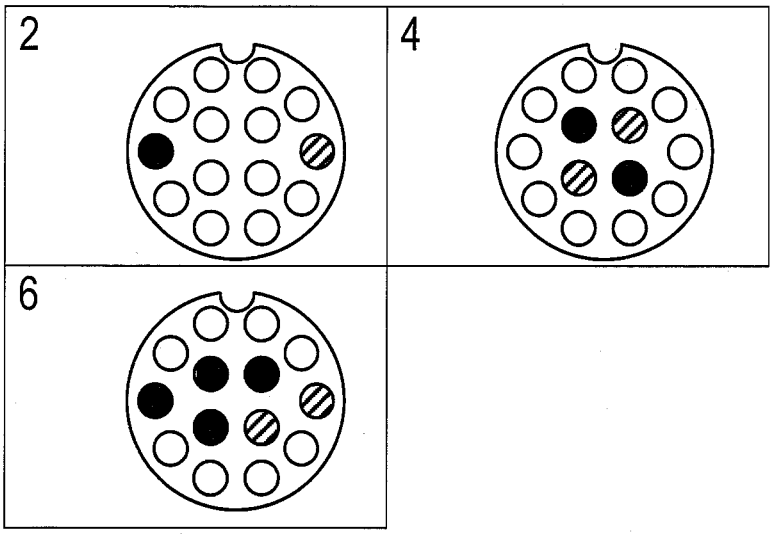
2.1 7 Positionen / 7 positions / 7 Positions ST6115 - ST6135 - ST6160

Mit Federn G oder S	- Windungsrichtung rechts	- Windungsrichtung links
With spring type G or S	- spire to right	- spire to left
Avec les ressorts type G ou S	- spire à droite ●	- spire à gauche ◍



2.2. 14 Positionen / 14 positions / 14 emplacements ST6141

Mit Federn G oder S	- Windungsrichtung rechts	- Windungsrichtung links
With spring type G or S	- spire to right	- spire to left
Avec les ressorts type G ou S	- *spire à droite* ●	- *spire à gauche* ◍



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3..Ersatzteilliste / Spare parts list / Liste des pièces de rechange

Rep.	D	GB	FR
	Ersatzteilliste	Spare parts	Pièces de rechanges
501	Druckfeder	Spring	Ressort
405	Stangendichtung	Seal	Joint
402	Dichtring	Seal ring	joint
401	Membrane	Diaphragm	Membrane
304	Sechskantmutter	Nut	Écrou six pans
302	Parallelführung	Parallel motion	Guidage parallèle
301	Säule	Column	Pilier
203	Kolbenstange	Rod	Tige du piston
202	Membranteller	Diaphragm plate	Plateau à membrane
209	Membranblech	Diaphragm ring	Fond de membrane
108	Verschlussstopfen	Drain plug	Alimentation en air
107	Sechskantmutter	Nut	Écrou six pans
106	Federring	Locking washer	Rondell élastique
105	Sechskantschraube	Bolt	Vis tête hexagonale
104	Flansch	Flange	bride
103	Gehäuse-Unterteil	Lower casing	Carter supérieur
101	Gehäuse-Oberteil	Upper casing	Carter inférieur

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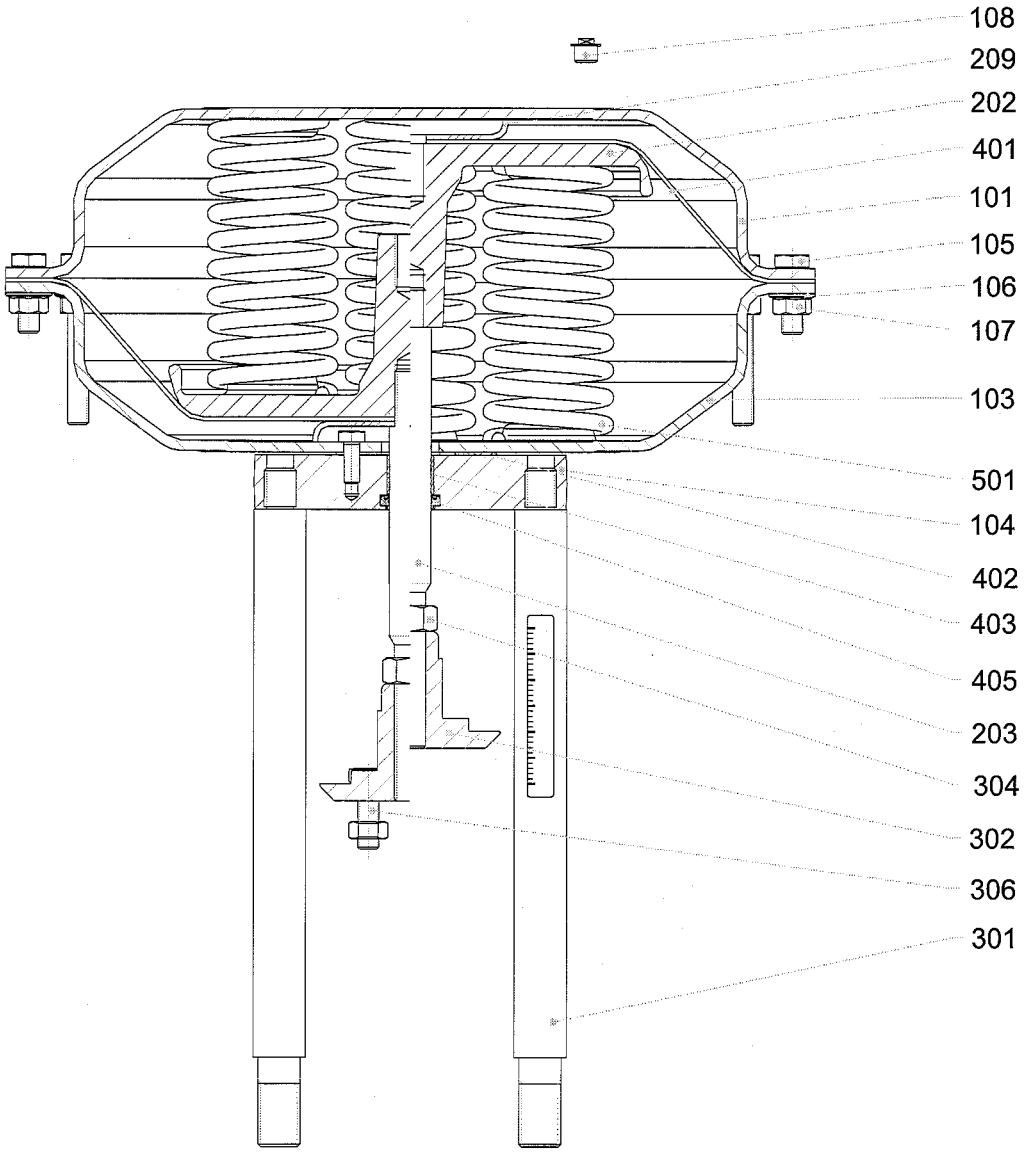
4. Ersatzteilliste / Spare parts list / Liste des pièces de rechange

Po **Ps**



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Installation, Operation, Maintenance Instructions

Cryogenic-Valves
041000 Angle Valves

1 GENERAL INFORMATION

These instructions are designed to support you when unpacking, installing and performing maintenance work on the valves. Users and maintenance personnel should carefully read these instructions before installing, operating or performing maintenance work. There is a separate set of instructions for accessories (special seat/plug fittings, diaphragm actuators, handwheels, special seats, etc.).

These instructions do not contain any information on Kammer positioners. For this, see corresponding instructions for the installation, maintenance, troubleshooting, adjustment and operation of Kammer positioners.

To avoid damage or injury to personnel or equipment, always heed all warnings and instructions. Unprofessional reconditioning, the use of foreign replacement parts or the performance of other maintenance steps than those described here, may cause a loss of efficiency or lead to personnel injury or damage to parts, and render the warranty void

1.1 UNPACKING

1.1.1 Each delivery includes a packing slip. When unpacking, check all delivered valves and accessories using this packing slip.

1.1.2 Larger valves can be lifted using slings on the yoke rods or, if present, on the lugs provided for this purpose. If slings are used, attach them so that the outer tubing or attaching parts are not damaged.

Important: If slings are used, be aware that the centre of gravity of the valve may be above the lifting point. In this case, secure or support the valve against rotating, to prevent damage or personnel injury.

1.1.3 Report transport damage to the carrier immediately.

1.1.4 In case of discrepancies, contact your nearest dealer.

1.2 INSTALLATION

1.2.1 Clean tubing prior to installing.

1.2.2 Install the valve in a position 15° to 90° from the vertical (actuator on top). This position is important with low-temperature applications, in order to keep the distance between the packing material and the medium as large as possible. The packing material then retains the ambient temperature as much as possible.

Important: Do not insulate extension bonnets that are provided for hot or cold services

1.2.3 Make sure that sufficient overhead clearance above the actuator is maintained, to allow for disassembly of actuator from the valve body (see following table).

Actuator size	Clearance (mm)	Actuator size	Clearance (mm)
37/47	95	P2	140
38/48	140	P3	140
39/49	140	P4	140
39D/49D	140	P5	140

1.2.4 After installing, check direction of flow again. The direction of flow is shown by the arrow on the housing.

1.2.5 If the valve is to be welded into the line, make sure that the valve is shielded from excessive heat.

1.2.6 Connect supply pressure and signal lines. Control valves can be supplied with a positioner. The end connections for supply pressure and signal are clearly marked. Series 4 actuator and integral positioner are suitable for max. 4.2 bar (60 psi) supply pressure. For series 2 actuators the supply pressure depends on the positioner used but is max. 6 bar. If the supply pressure exceeds the pressure specified on the nameplate, a pressure reducing station is required. If instrument air is not available, install an oil separator/air filter in the air inlet line. All connections must be free of leaks. For further Information also refer to the maintenance instructions for I/P actuators.

1.3 QUICK CHECK:

Before operating, check the valve as follows:

1.3.1 Open and close the valve, and observe the movement of the actuator stem. The movement must be smooth and linear.

1.3.2 Check for maximum stroke through change of signal (for pneumatic positioners, 0.2 - 1.0 bar or corresponding split-range values; for IP positioners, 4-20 or 0-20 mA).

1.3.3 Check all air connections for leaks.

1.3.4 The packing gland nut must always be tightened slightly more than finger-tight.

IMPORTANT: An excessively tightened gland nut can cause excessive packing wear and can hinder the free movement of the plug stem.

1.3.5 Check fail-safe position. To do this, close supply pressure and observe whether the valve opens or closes as prescribed.

1.3.6 After use at fluctuating temperatures, re-tighten all bolt connections and check for leaks.

2 MAINTENANCE

Check valves for correct functioning at regular intervals (at least once every 6 months) as follows. This check can be made when installed and in many cases without interrupting production. If internal defects are suspected, see section on „Disassembly and Assembly of Valve".

2.1 Examine gaskets for leaks and if necessary re-tighten bolts (see Fig. 1).

2.2 Check bellows seal and test connection - if present - for external leaks.

2.3 Check actuator for damage caused by corrosive residues or corrosive vapours.

2.4 Clean actuator and if necessary repaint.

2.5 Check packing gland nut for correct tightness. Gland nuts on packing may only be tightened slightly more

than finger-tight, or only tight enough to ensure a proper seal.

IMPORTANT: An excessively tightened gland nut can cause excessive packing wear and can hinder the free movement of the plug stem. To ensure that all packing rings are evenly compressed tighten the gland nut only when the valve is not under pressure.

2.6 If possible, open and close valve and check for maximum stroke and smooth movement of the plug stem. Irregular movement of the plug stem may indicate internal defects.

Note: With graphite packing, irregular movement of the plug stem is normal.

IMPORTANT: Keep hands, hair, clothing, etc. away from all moving parts. Failure to do so can lead to serious injury.

2.7 Check all accessories for firm seating.

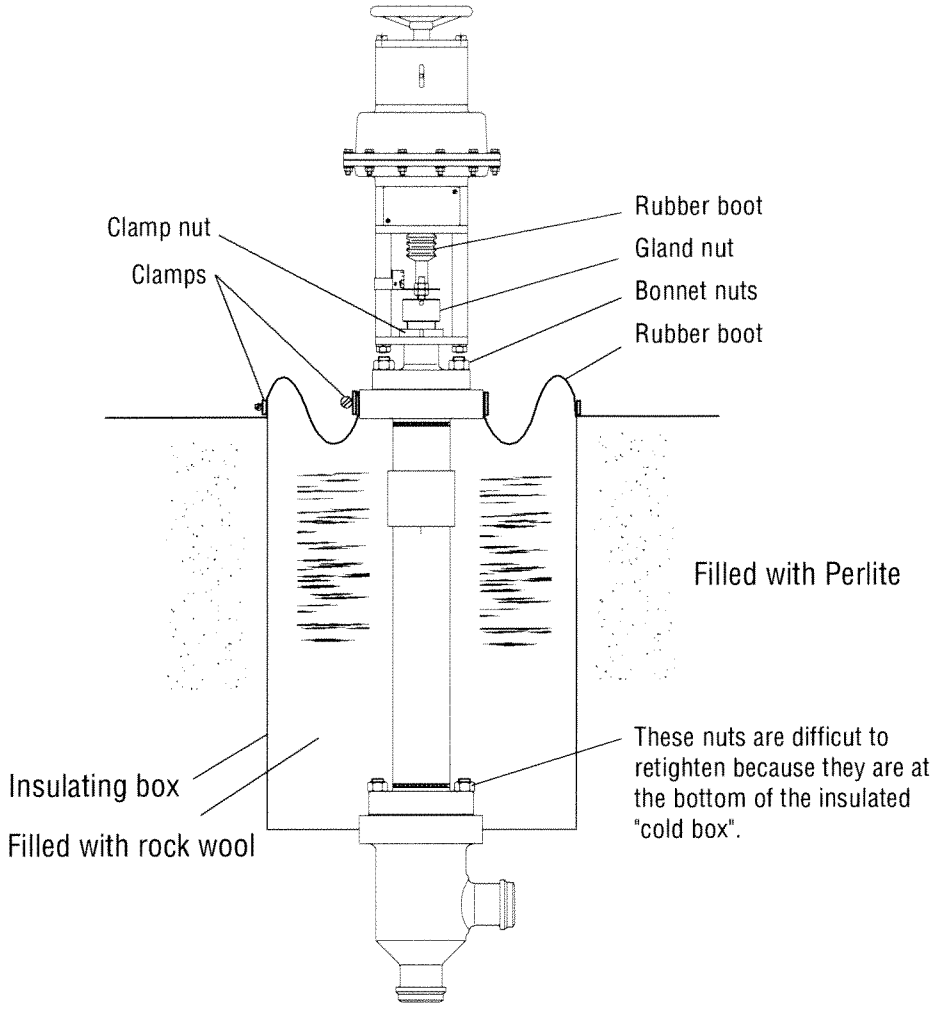
2.8 If possible, close supply pressure and check the fail-safe position.

2.10 Check stem boot for wear.

2.11 Check actuator for leaks. To do this, spray housing, air connections and plug stem guide with leak spray and note any bubble formation.

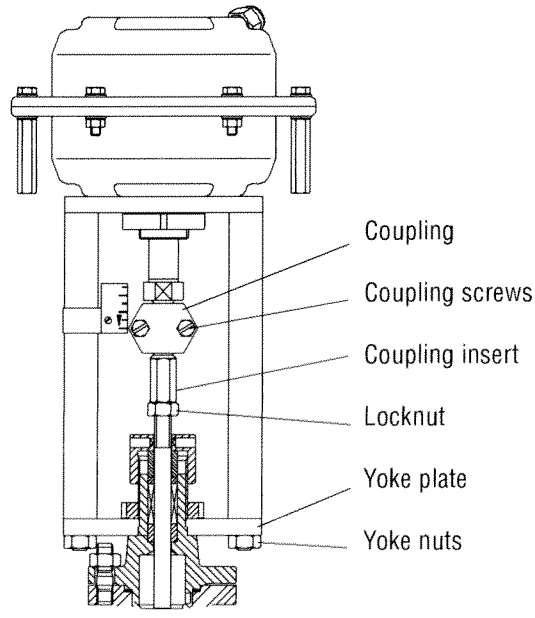
2.12 Clean plug stem.

2.13 Check air filter, if present, and if necessary replace insert.



Typical "Cold-Box" arrangment
Valve with series 4 actuator

Fig. 1



Serie 2 actuator
Fig. 1a

REMOVE AND INSTALL ACTUATOR

General Information
We recommend separating the actuator from the valve during all repair work. However, many maintenance and adjusting operations can be carried out in an installed condition.

3.1 Remove series 4 actuator
(see Fig 1 + 2)
For series 2 actuator see 3.3

For actuators with spring-to-close, go to 3.1.1
For actuators with spring-to-open, go to 3.1.2

3.1.1 Remove cap and nameplate. Tighten zero adjusting nut until it just touches the surface of the spring housing. This relieves the plug from actuator spring pressure. If the actuator is fitted with a handwheel this can be used to relieve the plug from actuator spring pressure.

3.1.2 Using a wrench, secure the actuator stem against turning and using a second wrench loosen the stem locknuts. If the actuator is fitted with a coupling refer to the procedure described in the maintenance instructions for the I/P actuator.

IMPORTANT: The actuator stem must not be rotated, as this will cause damage to the diaphragm.

3.1.3 Loosen gland and clamp nuts.

3.1.4 Secure plug stem against turning and unscrew actuator from plug stem by rotating counter-clockwise.

IMPORTANT: Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces.

3.1.5 Remove actuator and remove at the same time locknut, travel indicator disc, gland nut and clamp nut.

3.2 Install series 3 actuator

Information:

- Before the actuator is installed, it must be calibrated according to section 3 of the instructions „Pneumatic and Electro-pneumatic Actuators".
- All worn or damaged parts must be replaced. Reusable parts must be clean.

3.2.1 Position actuator with clamp nut, gland nut, locknuts and travel indicator disc on the valve.

3.2.2 Only for „spring-to-close" actuators:
Screw actuator onto plug stem by rotating clockwise, until the yoke plate just touches the valve housing and the actuator is aligned forward. If the actuator is fitted with a coupling refer to the procedure described in the maintenance instructions for the I/P actuator.

IMPORTANT: Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces.

Only for „spring-to-open" actuators:
Lift plug stem and screw it into the lower coupling half until the distance between „plug in seat" and „plug raised" approximately corresponds to the specified stroke.

3.2.3 Tighten clamp nut and gland nut.

3.2.4 Adjust seat tightness by screwing/unscrewing the plug stem in/out of the actuator stem.

Important: Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces. Open valve, make adjustment, close valve and check for leaks. If the valve is fitted with a bellows seal the plug stem may NOT be rotated at all. In the case of a bellows seal adjustments are made with the coupling.

3.2.5 After adjusting, secure the locknuts and the travel indicator disc lying between them against actuator stem and align the travel indicator on the yoke rod.

3.3 Remove series 2 actuator
(see Fig. 1a)
For series 4 actuator see 3.1

3.3.1 Shut off air supply.

WARNING: Depressurise the line to atmospheric pressure and drain all fluids from the valve before working on the actuator. Failure to do so can cause serious injury.

3.3.2 Disconnect all tubing.

3.3.3 Remove 2 screws and remove coupling.

3.3.4 Remove yoke rod retaining nuts and lift actuator assembly from the valve.

3.3.5 Remove coupling insert and it's locknut from plug stem.

Attention: Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces.

3.4 Install series 2 actuator

(see Fig. 1a)
The actuator stem must be fully extended:
Actuators with air-to-open action must be fully vented. Actuators with air-to-close action apply supply pressure.
Manually depress the plug stem to ensure the plug is fully seated.

3.4.1 Screw coupling insert locknut and coupling insert as far as possible onto plug stem.

3.4.2 Place the actuator assembly on the valve engaging the yoke rod threads in the lower yoke plate and ensuring the actuator faces in the correct direction.

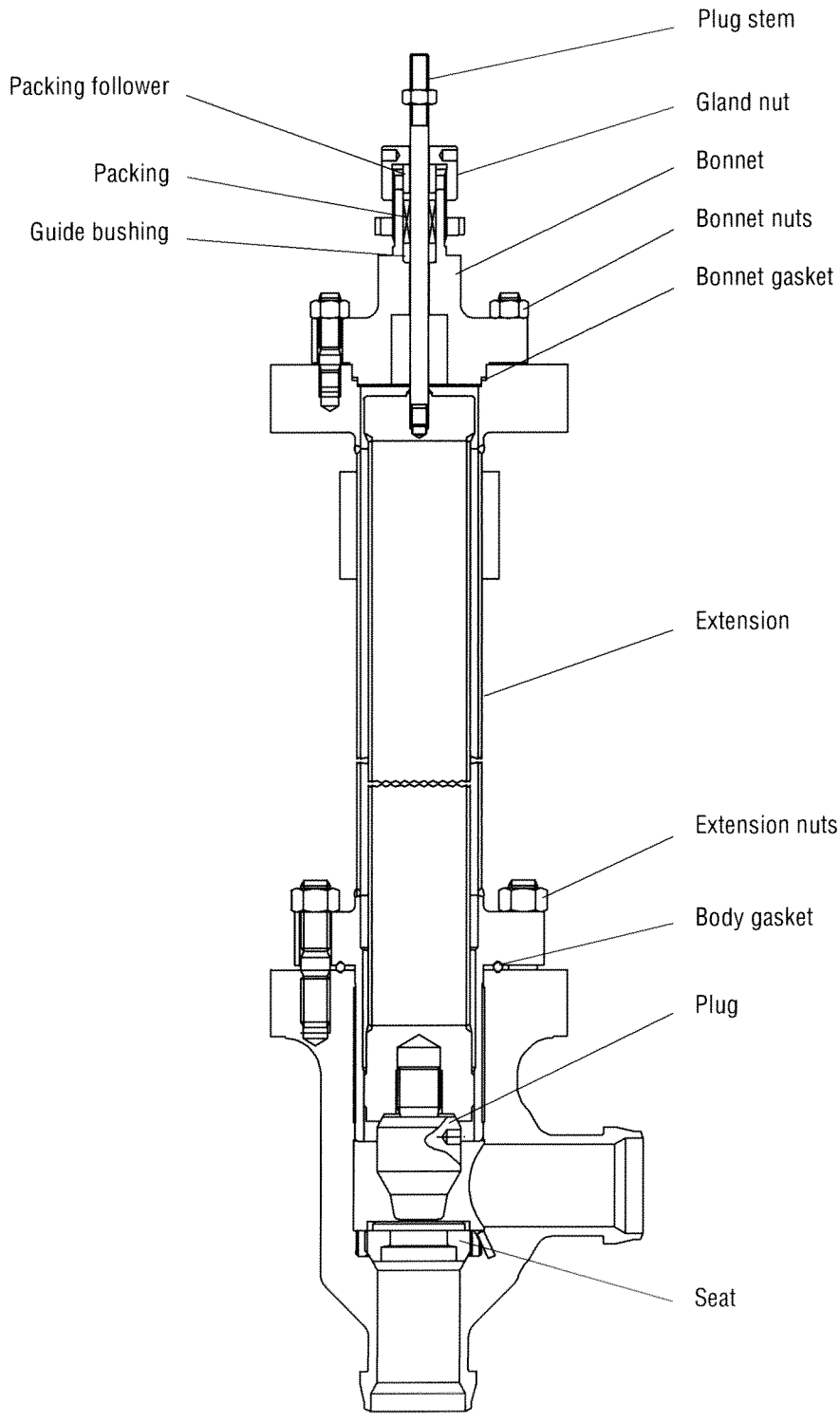
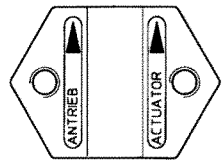

Plug stem
Packing follower
Gland nut
Packing
Bonnet
Guide bushing
Bonnet nuts
Bonnet gasket
Extension
Extension nuts
Body gasket
Plug
Seat

Fig. 2

3.4.3 Unscrew the coupling insert until the yoke rods are raised from the lower yoke plate by around 2 mm.

Attention: Ensure that the plug assembly is not rotated with the plug seated. This may cause irreparable damage to the seating faces.

3.4.4 Refit the coupling, ensuring that the arrows, embossed on the coupling halves, point upward towards the actuator, and secure with 2 retaining screws.



3.4.5 Apply supply pressure resp. vent actuator to half stroke and refit and tighten yoke rod retaining nuts (15).

3.4.6 Connect all tubing.

4 DISASSEMBLE AND ASSEMBLE VALVE

4.1 Disassemble Valve

(see Fig. 2)

IMPORTANT: As poisonous or hazardous materials may be present, the system must be depressurized and all processing materials must be drained. If necessary, decontaminate the valve. Valves that have been used in cryogenic applications must be allowed to warm-up to ambient temperature. Keep hands, hair, clothing, etc. away from all moving parts. Wear face, eye and hand protection. Failure to do so can lead to serious injury.

4.1.1 Remove nuts from bonnet and remove the bonnet.

4.1.2 Carefully remove the plug from the extension. On valves up to DN 100 (4") it is usually not necessary to remove the extension. On larger valves it is not possible to extract the plug through the extension because the plug diameter is larger than the internal diameter of the extension. In these cases remove the rubber boot and rock wool insulation (see Fig. 1). Loosen and remove the extension nuts. The extension and plug can now be removed from the "cold box".

4.1.3 Remove gland nut and packing follower from the bonnet and press out the guide and packing from below using a drift (the drift must have a slightly larger diameter than the plug stem).

4.1.4 With soft seat version, loosen plug tip with appropriate tool and remove soft seat gasket.

IMPORTANT: When the tip of the plug is loosened, medium residue may be released, which has diffused through the gasket.

4.1.5 Unscrew seat ring with a special seat ring tool.

4.1.6 Check seal faces of seat ring and plug for damage. Gasket surfaces must be clean and free of damage.

IMPORTANT: To prevent damage to the seat, plug or plug stem, follow the above instructions precisely.

4.1.9 If a seating surface needs re-machining , seat **and** plug seating surfaces must be reworked. The seat angle on the plug is 30°, on the seat ring 25°. If the valve is correctly assembled, lapping is not required.

IMPORTANT: When re-machining the plug, protect plug stem and bellows from damage and support upper part of bellows towards plug stem. The seat surface must be concentric to the plug stem. When re-machining the seat, the seat surface must be concentric to the seat outer diameter.

4.2 Assemble Valve

(see Fig. 2)

Important: All valves are to be reassembled oil and grease free. This is all the more important for oxygen applications because of the danger of an explosion

4.2.1 All worn or damaged parts must be replaced. Reusable parts must be clean. Expendable parts such as gaskets, packing and O-rings should always be replaced. If the extension is removed always replace the sealing ring.

4.2.2 Insert seat ring and tighten. For torques, see following table.

Size	Thread	Material	Torque
DN 25	M40x1,5	1.4571	130 Nm
DN 40/50	M60x2	1.4571	220 Nm
DN 80	M80x2	1.4571	240 Nm
DN 100	M100x2	1.4571	450 Nm
DN 150	M148x2	1.4571	540 Nm
DN 200	M182x2	1.4571	650 Nm

4.2.3 With soft seat version screw on plug tip using new soft seat.

4.2.4 Position plug slowly and upright into the extension.

4.2.5 Insert new bonnet gasket.

4.2.6 Position bonnet (test connection forwards) and uniformly tighten nuts hand-tight, alternating crosswise.

4.2.7 Using a torque wrench, gradually tighten all nuts to the prescribed torques (see following table), alternating crosswise.

Thread	Studs DIN 939
M 8	20 Nm
M 10	35 Nm
M 12	60 Nm
M 16	145 Nm
M 20	280 Nm

4.2.8 Replace packing by inserting packing rings one at a time tapping each one down with a suitable bushing.

IMPORTANT: ensure that the gaps in the packing rings are distibuted evenly around the circumferance in the packing box (gaps **not** in line).

Note: *different packings and fitting sequences are shown in the spare parts list.*

4.2.9 Insert packing follower. Fit gland nut for transport purposes only. Gland nut to be fitted correctly and tightened down when actuator is mounted.

4.2.10 Refit and adjust the actuator as described in **3.2** or **3.3**.

Fault	Possible Cause	Remedy
Stem motion impeded	1. Packing excessively tightened 2. Supply pressure inadiquate 3. Positioner defective	1. Tighten gland nut slightly more than „finger-tight" 2. Check system for leaks in the supply pressure or signal lines. Re-tighten the connections, if necessary replace leaky lines 3. See operating instructions for positioner
Excessive leakage	1. Bonnet loose 2. Worn or damaged seat ring/plug 3. Gaskets damaged 4. Inadiquate actuator thrust 5. Plug incorrectly adjusted 6. Incorrect direction of flow 7. Handwheel incorrectly adjusted (acts like end stop)	1. See step 4.2.7 for correct tightening of bonnet. 2. Re-machine or replace seat ring/plug. 3. Replace gaskets 4. Check air feed. If air feed is OK, contact dealer. 5. Correctly adjust plug according to step 3.2.4 6. Check specification. Contact dealer 7. Adjust handwheel
Inadiquate flow	1. Plug incorrectly adjusted (short stroke) 2. Positioner defective 3. Operating requirements too high 4. Handwheel incorrectly adjusted (acts like end stop)	1. Correctly adjust plug according to step 3.2.4 2. See operating instructions for positioner 3. Check operating data. Contact dealer 4. Adjust handwheel
Plug slams	1. Plug adjustment incorrect 2. Inadiquate supply pressure 3. Trim too large for flow rate	1. Correctly adjust plug according to step 3.2.4 2. Check supply pressure, seal leaks, remove blockage 3. Replace trim

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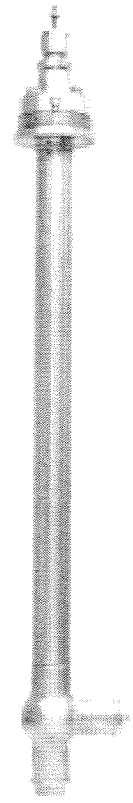
Tieftemperatur-Ventile

Serie 241000 Eckventile aus Edelstahl

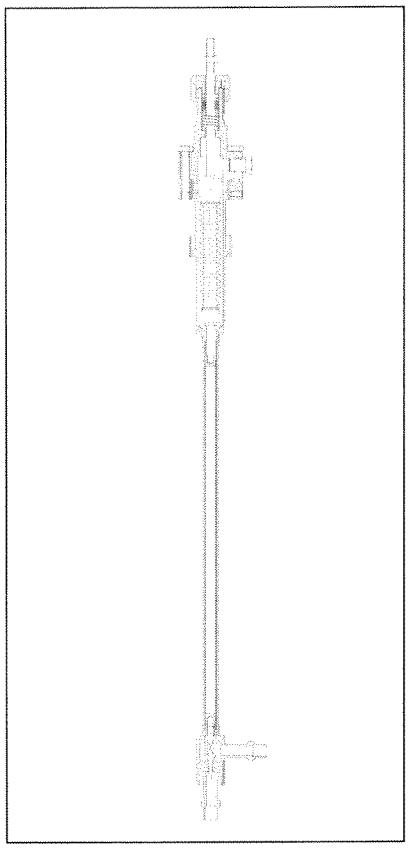


Beschreibung

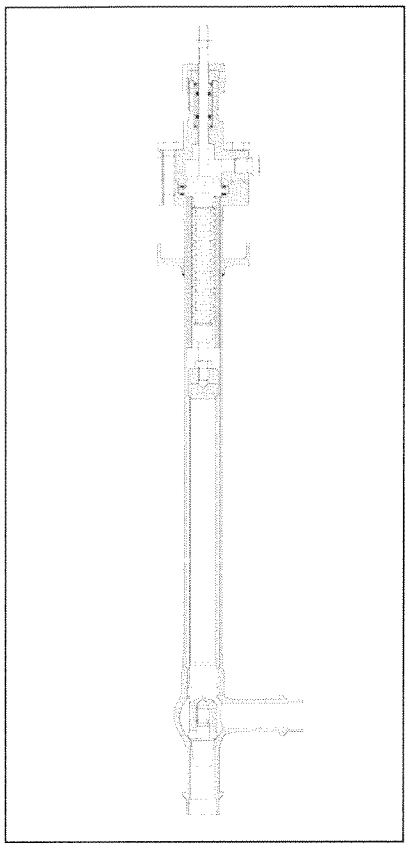
Tieftemperaturventile aus Edelstahl für die Heliumverflüssigung, sowie für sonstige Luftzerlegungsanlagen. Gehäuse und Verlängerung vorbereitet für Vakuumisolierung. Arbeitstemperatur bis -271 °C (2 K).

Technische Daten

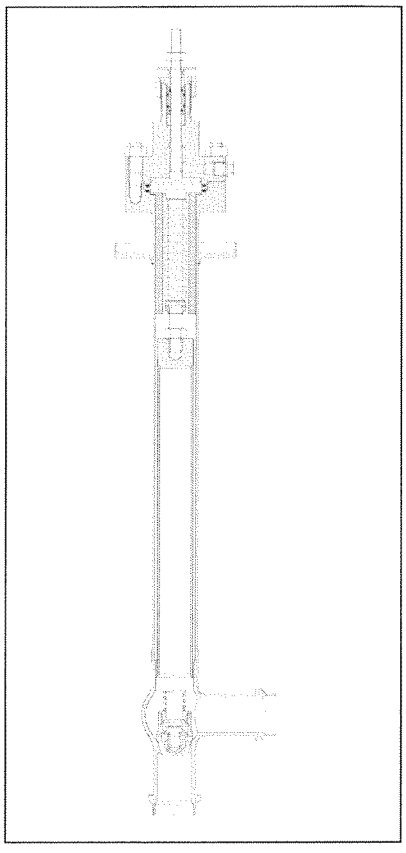
Ventilform	Eckventil, Sonderbau wie Z - Durchgang, 3 - Wege auf Anfrage
Kennlinien	Gleichprozentig, Linear, Auf - Zu
Sitzdichtheit, standard	< 0,01% des k_{vs}-Wertes, andere Anforderungen auf Anfrage
Gehäuse	1.4404 / 1.4435, alternativ 1.4541
Werkstoffe für Ventilkegel / Sitzring	WNR 1.4404 oder 1.4541, wahlweise Alloy 6, weitere Materialien auf Anfrage
Weichsitz	Ventilkegel mit PCTFE-Einsatz ab k_{vs} 0,1. Für höhere Dichtheitsanforderungen, wahlweise Vespel
Stopfbuchspackung	O-Ringe, PTFE Sauerstoffpackung, V-Ringe
Gehäusedichtungen	O-Ringe oder PTFE zwischen Verlängerung und Stopfbuchsenaufsatz
Gehäuseverlängerung	Verlängerungen werden in jeder gewünschten Länge hergestellt
Gehäuseanschlüsse	Schweißenden
k_{vs}-Werte	Siehe Tabelle Seite 3
Balgabdichtung	Alle Ventile sind mit Balgabdichtungen aus lieferbar
Abdeckplatte	Abdeckplatten für Vakuumisolier-Einbau sind in allen erforderlichen Abmessungen lieferbar



DN 4 / 6 / 8



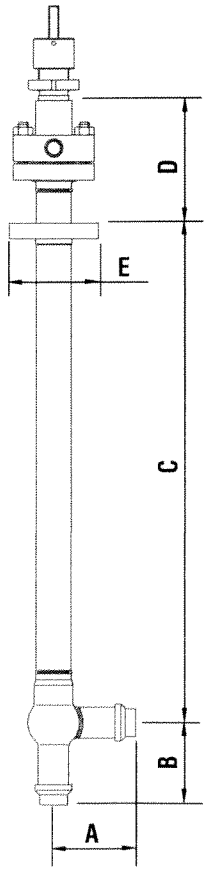
DN 8 – 15



DN 20 – 150

Abmessungen [mm] und Gewichte (kg)

Ventile mit Gehäuse aus Edelstahl, PN 10 - 40 / ANSI Class 150 - 300



DN	ANSI	A	B	C	D	E	Schweißenden	Gewicht
4	1/32″	40	50	600	80	30	Nach Kundenwunsch	0,8
6	1/4″	40	50	600	80	30		0,9
8	5/16″	50	50	600	80	47		1,0
10	3/8″	50	50	600	80	47		2,00
15	1/2″	65	65	600	80	60		2,50
20	3/4″	80	80	600	120	80		5,50
25	1″	80	80	600	120	80		6,00
32	1 1/4″	100	100	600	120	100		9,00
40	1 1/2″	100	100	600	120	100		10,50
50	2″	120	120	600	129	110		16,00
65	2 1/2″	130	130	600	129	127		22,50
80	3″	155	155	600	139	150		34,00
100	4″	175	175	600	139	170		46,50
125	5″	220	220	600	139	216		79,50
150	6″	250	250	600	162	251		109,00
150*	6″ *	250	250	600	173	251		115,00

* Mit Anschlußgewinde M 24

Standard K_{VS}-Werte

Nennweite DIN	4	6	8	10	15	20	25	32	40	50	65	80	100	125	150	K_{VS}-Werte*	Sitzdurchmesser (mm)	Stellverhältnis**
ANSI	1/32"	1/4"	5/16"	3/8"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"			
Hub (mm)	10	10	10	10	10	20	20	20	20	40	40	40	60	60	60			
Spindeldurchmesser (mm)	6	6	6	6	6	10	10	10	10	16	16	16	16	16	16/24			
																0,0010	2	25:1
																0,0016	2	25:1
																0,0025	2	25:1
																0,004	2	25:1
																0,0063	2	25:1
																0,010	3	50:1
																0,016	3	50:1
																0,025	3	50:1
																0,04	3	50:1
																0,063	3	50:1
																0,10	3	50:1
																0,16	3	50:1
																0,25	3	50:1
																0,4	4,5	50:1
																0,63	4,5	50:1
																1,0	7,0	50:1
																1,6	7,0	50:1
																2,5/1,6	10	50:1
																6,3/4	15	50:1
																10/6,3	20	50:1
																16/10	25	50:1
																25/16	32	50:1
																40/25	40	50:1
																63/40	50	50:1
																100/63	63	50:1
																160/100	80	50:1
																250/160	100	50:1
																400/250	125	50:1
																560/400	150	50:1

* $K_{VS} \leq 0{,}25 = K_V \times F_R$ nach IEC 534 (mehr Information auf Anfrage)
Bei Weichsitz K_{VS} = 0,1 bis 1,6 ist die Sitzdurchmesser 10 mm.
Weitere K_{VS}-Werte als Sonderkonstruktion auf Anfrage.

**Für Kalibrierbedinungen

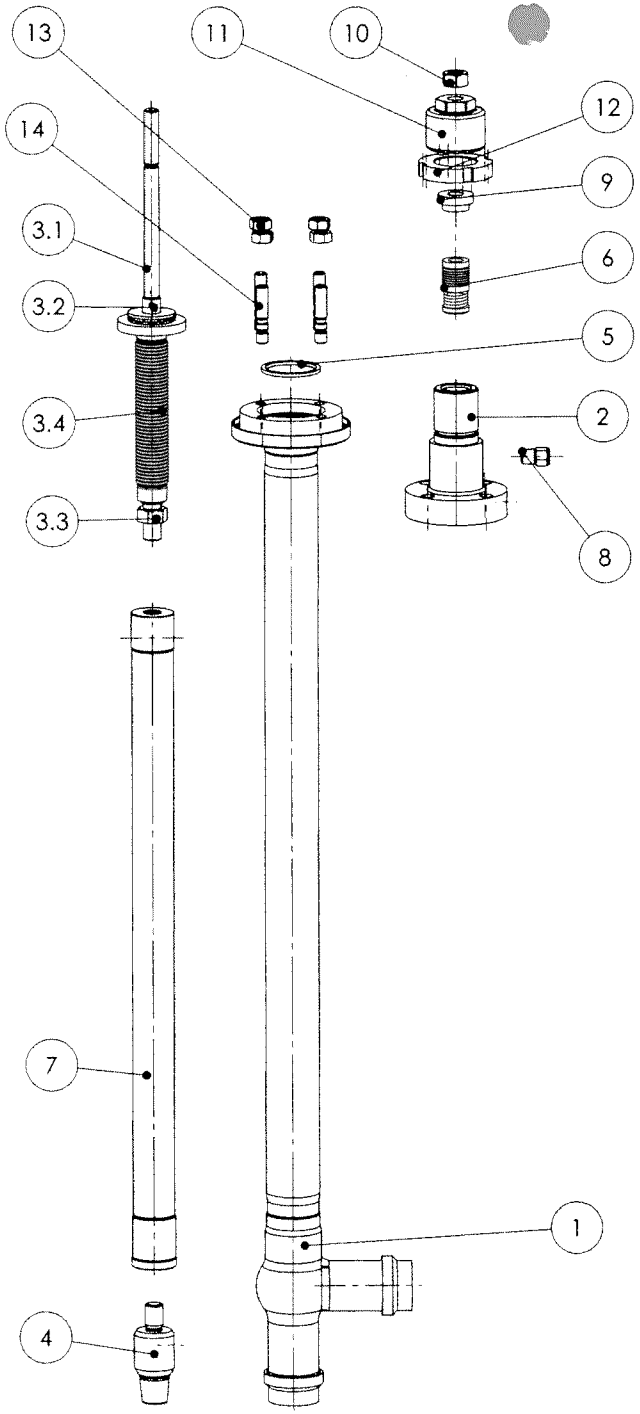
Typenschlüssel

2 4 1 5 P 3

Ventilform		
241	Tieftemperaturventil	Serie 241 000

Stopfbuchse / Verlängerung	
5	Tieftemperaturverlängerung mit Balg

Stellantrieb	
H2 - H4	Handantrieb
P2, P3 P4, P5	Pneumatisch, Serie 2
37, 38 39, 3D	Pneumatisch, Serie 4
E2, E3 E4, E5	Elektrisch



POS-NR.	MENGE	BENENNUNG	Material	BESCHREIBUNG
14		BR002731	A2-70	M8x30 DIN939
13	4	0100335A2	A2-70	M8 DIN934
12	1	0100387A2	A2-70	Nutmutter M30x1,5 DIN1804
11	1	025530605	1.4305	Überwurfmutter M30x1,5
10	1	0100336A2	A2-70	Sechskantmutter M10 DIN934
9	1	025602900	1.4571	Druckring
8	1	0100097A2	A2-70	Verschlußstopfen 1/8"NPT
7	1	1063696	BOM	Balgkegelrohr
6	1	025602500	PTFE	Federb- V-Ringpackung
5	1	1057647	Kupfer	CU-Dichtung
4	1	1063698	1.4541/St	Kegelspitz ø20 - stellitiert -
3.4	1	1057652	1.4571	Balg komplett
3.3	1	0100337A2	A2-70	Sechskantmutter M12 DIN934
3.2	1	0100002A2	A2-70	Stift
3.1	1	1057653	1.4571	Spindel für 90er Balg Hub 20mm
3	1	1057654	Stückliste	Balgspindel ø12 M10
2	1	1063726	1.4541	Balgaufsatz
1	1	1063692	1.4541	Kugelgehäuse TT.-Verlängerung

FLOWSERVE
Kämmer Ventile

Gewicht (g): 4775,16
Maße ohne Toleranzangabe nach: ISO 2768 T1 mittel
Oberfläche: ISO1302

	Datum	Name
Bearb.	25.08.2008	Erich
Gepr.	01.09.2008	MM
gefert. aus:		
Alte Nr.:		
Artikel Nr.		

Rev.	Änderungs-Nr.	Datum	Name

Order/KW		Sn.-Nr.	
Stück		Werkstoff	BOM
DN_Size	25	PN_Class	16

Kugelventil A=600
TT.-Verlängeung A=600
Schweißende ø33,7x2
Einschweißflansch ø80

DIN A		Maßstab
3	1063693	1:3.5

Ersetzt: | Ersetzt durch: