

TYPE APPROVAL CERTIFICATE

This is to certify:
that the Control Valve

with type designation(s)
ECOTROL® (8C, 6N, 6H series), TRIVENT (200, 220, 230 series), HIGHPRESSVENT (130 series), FORGEVENT (190 series), ANGLEVENT (380 series)

issued to

ARCA Regler GmbH
Tönisvorst, Nordrhein-Westfalen, Germany

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers
DNV rules for classification – Ships Pt.6 Ch.2 Sec.5 Gas fuelled ship installations – Gas fuelled LNG
DNV class programme DNV-CP-0186 – Type approval – Valves

Application:

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Type:	Temperature range:	Max. working press.:	Sizes:
ECOTROL® (8C, 6N, 6H series)	see certificate	see certificate	see certificate
TRIVENT (200, 220, 230 series)	see certificate	see certificate	see certificate
HIGHPRESSVENT (130 series)	see certificate	see certificate	see certificate
FORGEVENT (190 series)	see certificate	see certificate	see certificate
ANGLEVENT (380 series)	see certificate	see certificate	see certificate

Issued at **Hamburg** on **2024-04-03**

This Certificate is valid until **2029-04-02**.

for **DNV**

DNV local unit: **Essen**

Approval Engineer: **Ana Cristina Do Carmo Insfran**

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

The control valves type: ECOTROL, TRIVENT and ANGELVENT for applications in various cryogenic (LNG) and natural gas system installations as well as in machinery piping systems.

The HIGHVENT AND FOREVENT are for installations in piping systems.

Product	Series	Nominal size	Pressure rating
ECOTROL®	8C	DN 15 – 100, 1/2" – 4"	PN 16 – 63, Class 150 – 600
	6N	DN 125 – 700 (800), 5" – 28" (32")	PN 16 – 63, Class 150 – 600
	6H	DN 15 – 400 (500), 1/2" – 16" (20")	PN 100 - 250, Class 900 - 1500
TRIVENT	200	DN 25 – 300 (600), 1" – 12" (24")	PN 10 – 40, Class 150 – 300
	220	DN 25 – 300, 1" – 12"	PN 63 – 160, Class 600 – 900
	230	DN 25 (– 200), 1" (– 8")	PN 250, Class 1500
HIGHPRESSVENT ¹	130	DN 15–200, 1/2"–8"	PN 400, Class 2500
FORGEVENT ¹	190	DN 15 – 65, 1/2" – 2 1/2"	PN 100 – 720, Class 900 – 4500
ANGLEVENT	380	DN 15–800, 1/2" – 32"	PN 16 – 400, Class 150 – 2500

Note¹: the product type designation: HIGHPRESSVENT and FORGEVENT are currently only manufactured from materials (1.0619 / 1.7357 / 1.4470 / 1.0460 / 1.7335 und 1.4462) that are approved down to -29°C

Materials

Materials for valve body/bonnet – castings

EN Material	DIN-EN Standard	Design Temperatures	ANSI Material	UNS No.	Design Temperatures
1.0619 GP240GH	10213	Max. 450°C Min. -29°C	A216 WCB	J03002	Max. 450°C Min. -29°C
1.6220 G20Mn5	10213	Max. 500°C Min. -10°C	A352 LCB	J03003	Max. 345°C Min. -46°C
1.7357 G17CrMo5-5	10213	Max. 530°C Min. -40°C	A217 WC6	J12072	Max. 595°C Min. -29°C
1.4408 G-X5CrNiMo19-11-2	10213	Max. 700°C Min. -196°C	A351 CF8M	J92900	Max. 816°C Min. -196°C
1.4470 GX2CrNiMoN22-5-3	10213	Max. 200°C Min. -10°C	A995 CD3MN	J92205	Max. 315°C Min. -29°C

Materials for valve body/bonnet – Forgings / Bar stock

EN Material	DIN-EN Standard	Design Temperatures	ANSI Material	UNS No.	Design Temperatures
1.0460 P250GH	10222-2 10273	Max. 480°C Min. -29°C	A105	K03504	Max. 538°C Min. -29°C
1.7335 13CrMo4-5	10222-2 10273	Max. 570°C Min. -10°C	A182F12Cl2	K11564	Max. 595°C Min. -29°C
1.4571 X6CrNiMoTi 17 12 2	10222-5 10272	Max. 700°C Min. -196°C	/	/	/
1.4404 X2CrNiMo 17 12 2	10222-5 10272	Max. 500°C Min. -196°C	A182 F316L	S31603	Max. 450°C Min. -196°C

1.4462 X2CrNiMoN22-5-3	10222-5 10272	Max. 250°C Min. -10°C	A182 F51	S31803	Max. 315°C Min. -29°C
---------------------------	------------------	--------------------------	----------	--------	--------------------------

Materials for fabrication of pressure retaining valve items such as valve body and bonnet shall be supplied by DNV Approved Material Manufacturers.

All material properties shall comply with requirements specified in DNV Rules Materials & Welding Pt.2 Ch. 1 to Ch. 4. Materials for valve bodies and bonnet to be installed in cryogenic systems, e.g., LNG, as well as in ship's gas fuel systems shall comply with DNV Rules Pt.5 Ch.7 – Liquefied gas tankers, Section 6 – Materials of construction, quality control and marking.

For cryogenic application material certificates shall provide material properties for the relevant minimum design temperature, in particular Charpy impact test results according to DNV Rules Pt. 5 Ch. 7, Table 4.

Application/Limitation

Steel control valves approved for the use in ships piping, machinery piping, fuel systems and cargo handling piping systems. Operating media include flammable gases, nitrogen and cryogenic liquefied gases including LNG.

Minimum design temperature: -196 °C

Maximum design temperature: +700 °C

Design pressures see table overview on page 2.

For maximum allowable working pressure at ambient and elevated temperatures see ASME B16.34 or EN 12516-1 as appropriate.

In seawater applications, used material shall be properly protected. Surface preparation and coating shall be approved by society. Austenitic stainless steels shall not be considered as seawater resistant material.

Valves may not be used for media specified as toxic and/or dangerous fluids.

Tests carried out

Test standards:	DNV Rules Pt. 5 Ch. 7 Liquefied gas tankers DNV Rules Pt. 6 Ch.2 Section 5 Gas fuelled ship installations DNV Rules Pt.4 Ch.6 – Piping systems DNV Class Programme CP 0186 - Valves
Valve test	Purpose
Pressure test	Minimum test pressure = 1,5 times the design pressure Test standard: DNV Rules Pt.4 Ch. 6; DNV - CP 0186 – Valves
Seat tightness	To confirm the capability of the seat with the specified leakage rate Seat tightness test at ambient temperature Test standards: Isolation valves: EN 12266-1 Control valves: EN 1349/IEC 60534-4 Test fluid: Water / air/nitrogen
Seat tightness	Seat tightness test at cryogenic temperature, test temperature -196°C Test standard: Isolation valves: BS6364:1984 Control valves: BS6364:1984 leakage rate according to EN 1349/IEC 60534-4 Test fluid Helium
Functional test	Functional test at cryogenic temperature, test temperature -196°C (20 cycles open/close) Test standard BS6364:1984 Test fluid Helium



Job ID: **262.1-039293-1**
Certificate no.: **TAP00002TU**

Type Approval documentation

Production testing and valve certification

I. Application for Liquefied gas tankers

1. Certification of valves [DN ≥ 100 or Working temperature < -55°C]

For all valves having a nominal diameter DN ≥ 100 or a working temperature below -55°C a Product Certificate (PC) shall be issued by DNV based on the following scope of tests and according to: DNV Rules Part 5, Chapter 7 – Liquefied gas tankers, Section 5, Item 13.1.1 and 13.1.2

Type of test	Test pressure
Shell strength	1,5 times the design pressure
Tightness test of pressure bearing housing	1,1 times the design pressure
Seat tightness test	1,1 times the specific shutoff differential pressure
Functional test	Design / work pressure

DNV Rules Pt. 5 Ch. 7, Section 1, Table 7 – Compliance documents

DN ≥ 100 or Working temperature < -55°C	Type of certificate / Issued by Product Certificate (PC) / DNV
--	---

2. Additional cryogenic testing – 10 % of each type and size of valve

In addition, cryogenic testing consisting of valve operation and leakage verification for a minimum of 10% of each type and size of valve intended to be used at a working temperature below -55°C shall be carried out.

3. Material certification of valves

DNV Rules Part 5, Chapter 7 – Liquefied gas tankers

Pt. 5 Ch. 7, Section 1, Table 8 – Compliance documents for material quality and testing
Material certificates of valve bodies

Valve nominal diameter	Type of Certificate / Issued by
DN > 100, design temperature < -55°C	Material Certificate (MC) / DNV
DN > 100, design temperature ≥ -55°C	Material Declaration (MD) / Manufacturer
DN ≤ 100	Material Declaration (MD) / Manufacturer

4. Certification of valves [DN < 100 and working temperature ≥ -55°C]

For all valves having a nominal diameter DN < 100 intended for use at a working temperature ≥ -55°C a Product Declaration (PD) shall be issued based on the tests listed above and according to DNV Rules Part 5, Chapter 7 – Liquefied gas tankers, Section 1, Table 7 – Compliance documents

Valve nominal size DN < 100	Type of certificate / Issued by Product Declaration (PD) / Manufacturer
--------------------------------	--

Production testing and valve certification - continuation

II. Application in Gas as fuel systems

For each valve intended to be installed in ship's gas fuel supply systems a Product Certificate (PC) shall be issued based on the following scope of tests and according to
 DNV Rules Part 6, Chapter 2, Section 5 – Gas fuelled ship installations

1.	Type of test	Test pressure
	Shell strength	1,5 times the design pressure
	Tightness test of pressure bearing housing	1,1 times the design pressure
	Functional test	1,1 times the specific shutoff differential pressure Design / work pressure

2. Valves in LNG / Gas fuel system – Table 3 Certification required

Valve design conditions - Test and certification	Type of certificate / Issued by
Design temperature < 0°C / DNV Pt.5 Ch.7 irrespective of size	Product Certificate (PC) / DNV
Design pressure > 10 bar/ DNV Pt.5 Ch.7 irrespective of size	Product Certificate (PC) / DNV
Design pressure ≤ 10 bar Design temperature ≥ 0°C	Product Declaration (PD) / Manufacturer

3. Material certificates DNV Pt. 6 Ch.2 Section 5 – Gas fuelled ship installations Table 4 Certification of material quality and testing

Design temperature	Type of certificate / Issued by
< 0°C	Material Certificate (MC) / DNV
≥ 0°C	Material Declaration (MD) / Manufacturer

III. Application in machinery piping systems

Valves intended to be installed in piping systems listed in DNV Rules Pt.4 Ch.6 – Section 1 shall be certified according to
 DNV Rules Pt.4 Ch.6 – Piping systems, Section 1, Table 3 Compliance documents – piping components

Valve nominal size / Pressure rating	Type of certificate / Issued by
DN > 100 mm / PN > 16 bar	Product Certificate (PC) / DNV
DN ≤ 100 mm / PN ≤ 16 bar	Product Declaration (PD) / Manufacturer

Material certificates (valve bodies)

In accordance with DNV Rules Pt.4 Ch.6 – Piping systems, Section 2, Table 3 – Material certificates

Marking of product

Each valve shall be clearly marked for identification. The identification marking may be performed on the body or on a plate of non-corrosive material. When a metallic plate is used, the plate shall be permanently fixed to the body.

Identification marking on the body shall be located to non-stressed areas and shall be clearly legible.

The identification marking shall as a minimum include the following:

- Manufacturer's name or trademark
- Valve type designation
- Size
- Maximum design pressure and temperature
- Arrow to indicate direction of flow on one-way flow valves

Production Places

ARCA Regler GmbH

1. Kempener Straße 18
D-47918 – Tönisvorst , Germany

2. Hontheimer Straße 50
D-54552 – Strotzbüsch, Germany

Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with Refer to DNV-CP-0338, Sec.4.

The certificate is only valid if required periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

END OF CERTIFICATE