



Technical Report No.: 120812 – 14 – TAC  
 ECE Regulation No.: 67.01  
 Manufacturer: AMR Manufacturing, Australia  
 Type: M7

**TECHNICAL REPORT  
 No. 120812 – 14 – TAC**

Test according to ECE Regulation No. 67.01  
**Uniform provisions concerning the approval of:**

**I. Approval of specific equipment of vehicles of category M and N  
 using liquefied petroleum gases in their propulsion system**

ECE No. 67.00 – date of entry into force: 1 June 1987  
 including all amendments up to and including  
 ECE No. 67.01, supplement 13 – date of entry into force: 10 June 2014

Objectives: Document for issue of approval certificate

	<u>Specific component</u>	Pressure regulator
<b>I.</b>	<b><u>Technical data</u></b>	
0.1.	Trade name or mark:	AMR Manufacturing
0.2.	Type:	M7
0.2.1.	Variants:	N/A
0.3.	Means of identification of type:	By letters and digits
0.3.1.	Location of that marking:	On the body of pressure regulator
0.5.	Name and address of manufacturer:	AMR Manufacturing PTY. LTD. 20 Burlington Street Oakleigh Victoria 3166 Australia
0.8.	Address of assembly plant:	See item 0.5.
0.9.	Location of the approval mark:	On the body of pressure regulator



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Czech

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**II. Test report**

1. Test conditions The approval tests of submitted samples were conducting in collaboration with Aeronautical Research and Test Institute in Prague.
2. Test results The technical data and the test results are indicated in attachments to this Technical Report.
3. Specimen submitted to test on: 20 May 2014
4. Date of test: 22 May – 18 June 2014

**III. Manufacturer's information folder**

Documentation for type approval of 1 April 2014, 6 pages total

**IV. Attachments**

TECHNICAL REPORT P-ZKL-151/14 9 pages

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Measuring and test equipment and test site meet the requirements of the applicable legislation. This report must never be reproduced incomplete without a written permission of the testing laboratory.

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**V. Final assessment**

The described sample

**complies**

with the requirements of ECE Regulation No. 67.01  
for issue of approval certificate

This technical report consists of pages No. 1 to 2 and 9 pages of attachments.

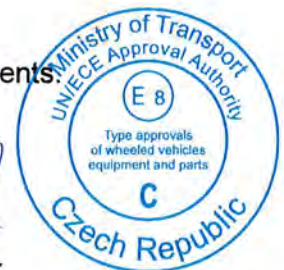
  
Václav Baloun

Officially recognized expert



Vít Dvořák

Head of Group of experts



Prague, 16 July 2014

Výzkumný a zkušební letecký ústav, a.s.  
Beranových 130, 199 05 Praha - Letňany  
**ZHA Laboratory**

<b>Order:</b>	M15506	<b>ECE Regulation 67.01</b>
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## Test Report

### VAPORIZER / PRESSURE REGULATOR WITH SHUT-OFF VALVE

(Annex 6, Annex 7 - para. 1.)

**Mark:** AMR Manufacturing  
**Type:** M7  
**Manufacturer:** AMR Manufacturing  
 20 Burlington Street  
 Oakleigh  
 Victoria - 3166  
 Australia  
**Samples:** 4 - No.: 1,2 ,3,4  
**Date of the tests:** 22.05.2014 - 18.06.2014

**Classification of component:** Class 1      Class 2  
**Classification pressure:** 3000 kPa      450 kPa  
**Design temperatures:** - 40°C to + 120°C

#### General design rules:

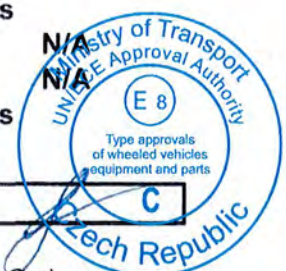
Para. 6.15.2. It must have the electrical system isolated from the body. **yes**  
 Isolation resistance shall be >10 MΩ.  
 Para. 6.15.2.2. It shall comply with insulation class IP 54 (IEC 60529-1989+A1:1999). **yes**  
 Para. 6.15.3.1. The valve shall be in „closed“ position when its power is switched off. **yes**  
 Para. 6.15.4.1. The materials of heat exchanger shall be compatible with that fluid. **yes**  
 The materials of heat exchanger shall withstand a pressure of 200 kPa.  
 Para. 6.15.4.2. The heat exchanger shall be leakage proof at a pressure of 200 kPa. **yes**  
 Para. 6.15.5. V/PR must be so designed to prevent a pressure build up in the low pressure part above 2,25 times the maximum working pressure. **yes**  
 Para. 6.15.6.2. V/PR must be so designed as to prevent any gas flow when V/PR is supplied with LPG at a pressure ≤ 4,5 MPa when V/PR is not operating. **yes**

#### Applicable test procedures according to Annex 15, para.:

4. Overpressure test under hydraulic conditions **yes**  
 5. External leakage test **yes**  
 6. High temperature test **yes**  
 7. Low temperature test **yes**  
 8. Seat leakage test **yes**  
 9.6. Endurance test **yes**  
 11. LPG compatibility test for synthetic materials **yes**  
 12. Corrosion resistance **yes**  
 13. Resistance to dry-heat **yes**  
 14. Ozone ageing **yes**  
 15. Creep **yes**  
 16. Temperature cycle test **yes**  
 17. Compatibility with heat exchange fluid **yes**

Note: N/A = not applicable

**Date:** 18.06.2014      **Worked up by:** Dlouhý      **Signature:**



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### Testing and measuring equipment

Testing equipment Reg. no. 7 – Freezer NZ 350/75

Testing equipment Reg. no. 24 – Furnace HS 122/1

Test equipment Reg. no. 12 – The source of hydraulic pressure with armoured housings.

Pressure gauge 0 - 10 MPa, accuracy 1,0 (serial no. SM 419173)

Pressure gauge 0 – 1,6 MPa, accuracy 2,5 (serial no. MF 777548)

Corrosion chamber Erichsen-Corrotherm 610

### Annex 15, para. 4: Overpressure test under hydraulic conditions

Test pressure 6750 kPa (class 1) and 1015 kPa (class 2) during 1 minute

		Samples			
	Requirement	1	2	3	4
Rupture	no	no	no	no	no
Permanent distortion	no	no	no	no	no

### Annex 15, para. 5: External leakage test

Test pressure 0 to 4500 kPa (class 1) and 0 to 675 kPa (class 2) during 1 minute

		Samples				
	Temperature	Requirement	1	2	3	4
External leakage	+ 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
	- 40°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
	+ 120°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

### Annex 15, para. 6: High temperature test

Test pressure 4500 kPa (class 1) and 675 kPa (class 2) during 1 minute by + 120°C (8 hours of tempering)

		Samples			
	Requirement	1	2	3	4
Leakage	≤ 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

### Annex 15, para. 7: Low temperature test

Test pressure 4500 kPa (class 1) and 675 kPa (class 2) during 1 minute by – 40°C (8 hours of tempering)

		Samples			
	Requirement	1	2	3	4
Leakage	≤ 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

Date: 18.06.2014

Worked up by: Dlouhý

Signature:



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**Annex 15, para. 8: Seat of a shutt-off valve leakage test**

Test pressure 0 to 4500 kPa (Para. 6.15.6.2.) during 1 minute

		Samples			
	Requirement	1	2	3	4
Leakage	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

**Annex 15, para. 9: Endurance test**

6000 cycles of a shutt-off valve opening and closing - Samples No.: 1

Test pressure: 3000 kPa

Rate: 10 cycles/minute

Temperature: + 20°C

Testing medium: n-hexan

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 4500 kPa during 1 minute

			Samples			
	Temperature	Requirement	1			
External leakage	+ 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h			
	- 40°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h			
	+ 120°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h			

Seat of a shutt-off valve leakage test (Annex 15, para. 8) after Endurance test

Test pressure 0 to 4500 kPa during 1 minute

		Samples			
	Requirement	1			
Leakage	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h			

**Date:** 18.06.2014

**Worked up by:** Dlouhý

**Signature:**



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**Annex 15, para. 9.6: Endurance test**

Samples No.: 1

Total number of cycles: 50 000 cycles

Rate: 6 cycles/minute

Testing medium: air

		Samples	
	Requirement	1	
Failure	no	no	

a) Room temperature cycling

47 500 cycles at temperature + 20°C and at the pressure 700 kPa

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 700 kPa during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	+ 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

b) Room temperature cycling

500 cycles at temperature + 20°C and at the pressure from 700 kPa to 350 kPa

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 700 kPa during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	+ 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

c) High temperature cycling

500 cycles at temperature + 120°C and at the pressure 700 kPa

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 700 kPa during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	+ 120°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

d) High temperature cycling

500 cycles at temperature + 120°C and at the pressure from 700 kPa to 350 kPa

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 700 kPa during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	+ 120°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

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## e) Low temperature cycling

500 cycles at temperature – 40°C and at the pressure 350 kPa

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 350 kPa during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	– 40°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

## f) Low temperature cycling

500 cycles at temperature – 40°C and at the pressure from 350 kPa to 175 kPa

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 350 kPa during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	– 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

External leakage test (Annex 15, para. 5) after Endurance test

Test pressure 0 to 4500 kPa (class 1) and 0 to 675 kPa (class 2) during 1 minute

		Samples	
	Temperature	Requirement	1
External leakage	+ 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
	– 40°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
	+ 120°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

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### Annex 15, para. 11: LPG compatibility test for synthetic materials

Samples:

- 1 - "O" ring  $\varnothing$  4,4 × 1,78 – BS 008 (brown)
- 2 - "O" ring  $\varnothing$  6 × 1,77 – BS 010 (black)
- 3 - "O" ring  $\varnothing$  7,6 × 1,74 – BS 011 NITRILE (brown)
- 4 - "O" ring  $\varnothing$  10,8 × 1,8 – BS 013 NITRILE (brown)
- 5 - "O" ring  $\varnothing$  12,5 × 1,77 – BS 014 NITRILE (black)
- 6 - "O" ring  $\varnothing$  20 × 1,8 – BS 019 NITRILE (brown)
- 7 - Lever seal  $\varnothing$  10 × 2,64 – VCLS 09751 (black)
- 8 - Pressure relief cup seal  $\varnothing$  7,9 × 2,3 – VCLS 09751 (brown)
- 9 - Back gasket – CVSI1357 (black)
- 10 - Front gasket – CVSIF5512 (black)

		Samples		
	Requirement	1	2	3
Maximum change in volume	20 %	+ 0,93 %	+ 1,11 %	+ 0,17 %
Change of mass after air tempering	$\geq - 5 \%$	+ 0,12 %	- 4,59 %	+ 0,11 %

		Samples		
	Requirement	4	5	6
Maximum change in volume	20 %	+ 0,75 %	+ 6,75 %	+ 0,6 %
Change of mass after air tempering	$\geq - 5 \%$	+ 0,17 %	- 4,19 %	+ 0,15 %

		Samples		
	Requirement	7	8	9
Maximum change in volume	20 %	+ 0,97 %	+ 0,87 %	+ 6,64 %
Change of mass after air tempering	$\geq - 5 \%$	+ 0,15 %	+ 0,01 %	- 3,23 %

		Samples		
	Requirement	10		
Maximum change in volume	20 %	+ 6,18 %		
Change of mass after air tempering	$\geq - 5 \%$	- 2,85 %		

Date: 18.06.2014

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Signature:

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### Annex 15, para. 13: Resistance to dry-heat

Samples:

- 1 - "O" ring  $\varnothing$  4,4 × 1,78 – BS 008 (brown)
- 2 - "O" ring  $\varnothing$  7,6 × 1,74 – BS 011 NITRILE (brown)
- 3 - "O" ring  $\varnothing$  10,8 × 1,8 – BS 013 NITRILE (brown)
- 4 - "O" ring  $\varnothing$  20 × 1,8 – BS 019 NITRILE (brown)

	Requirement	Samples	
		1	2
Allowable change in tensile strength	$\leq + 25 \%$	+ 0,06 %	+ 4,35 %
Allowable change in ultimate elongation	$\leq + 10 \%$ $\geq - 30 \%$	+ 0,10 %	+ 8,39 %

	Requirement	Samples	
		3	4
Allowable change in tensile strength	$\leq + 25 \%$	- 7,84 %	- 6,25 %
Allowable change in ultimate elongation	$\leq + 10 \%$ $\geq - 30 \%$	+ 9,38 %	+ 2,07 %

### Annex 15, para. 14: Ozone ageing

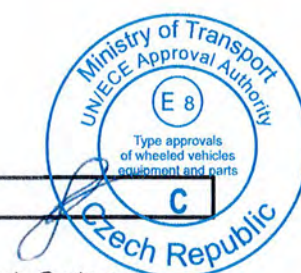
Samples:

- 1 - "O" ring  $\varnothing$  4,4 × 1,78 – BS 008 (brown)
- 2 - "O" ring  $\varnothing$  7,6 × 1,74 – BS 011 NITRILE (brown)
- 3 - "O" ring  $\varnothing$  10,8 × 1,8 – BS 013 NITRILE (brown)
- 4 - "O" ring  $\varnothing$  20 × 1,8 – BS 019 NITRILE (brown)

	Requirement	Samples	
		1	2
Cracking of test piece	no	no	no

	Requirement	Samples	
		3	4
Cracking of test piece	no	no	no

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**Annex 15, para. 12: Corrosion resistance**

Salt spray (144 hours) according to ISO 9227 - Sample No.: 2

Immersion in Ammonia (24 hours) according to ISO 6957 - Sample No.: 3

Overpressure hydrostatic test (Annex 15, para. 4) after Corrosion resistance test

Test pressure 6750 kPa (class 1) a 1015 kPa (class 2) during 1 minute

		Samples	
	Requirement	2	3
Rupture	no	no	no
Permanent distortion	no	no	no

External leakage test (Annex 15, para. 5) after Corrosion resistance test

Test pressure 0 to 4500 kPa (class 1) and 0 to 675 kPa (class 2) during 1 minute

			Samples	
	Temperature	Requirement	2	3
External leakage	+ 20°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
	- 40°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h
	+ 120°C	< 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

High temperature test (Annex 15, para. 6) after Corrosion resistance test

Test pressure 4500 kPa (class 1) and 675 kPa (class 2) during 1 minute by + 120°C (8 hours of tempering)

		Samples	
	Requirement	2	3
Leakage	≤ 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

Low temperature test (Annex 15, para. 7) after Corrosion resistance test

Test pressure 4500 kPa (class 1) and 675 kPa (class 2) during 1 minute by - 40°C (8 hours of tempering)

		Samples	
	Requirement	2	3
Leakage	≤ 15 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h	0 cm <sup>3</sup> /h

<b>Date:</b> 18.06.2014	<b>Worked up by:</b> Dlouhý	<b>Signature:</b>
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**Annex 15, para. 17: Compatibility with heat exchange fluids of non metallic parts**

Samples:

1 - "O" ring  $\varnothing$  12,5 × 1,77 NITRILE

2 - Back gasket – CVSI1357 (black)

	Requirement	Samples	
		1	2
Maximum change in volume	20 %	+ 10,3 %	+ 4,71 %
Change of mass after air tempering	$\geq - 5$ %	- 0,56 %	- 2,37 %
Allowable change in tensile strength	$\geq - 25$ %	+ 2,08 %	-----
Allowable change in ultimate elongation	$\leq + 10$ % $\geq - 30$ %	+ 11,84 %	-----

Presented results are only applicable to samples, which have been tested.

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**The tests results and examinations according to ECE Regulation No. 67.01 were handed over to the TÜV SÜD Czech s.r.o., Novodvorská 994/138, 142 21 Praha 4.**

**This Institute has authorised the ZHA Laboratory of Výzkumný a zkušební letecký ústav, a.s. to carry out approval tests under the Contract of Agreement.**



Prague, 18 June 2014

*Ždánky*

Dipl. Ing. Jindřich Ždánský  
Head of ZHA laboratory

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*Miroslav Vařeš*

Dipl. Ing. Miroslav Vařeš  
Head of Testing Laboratories



Date: 18.06.2014	Worked up by: Dlouhý	Signature:
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