



## **Annex to certificate HAF 1511126 C001**

Project:

Mechanically actuated valves, direct operated solenoid valves,  
pneumatically operated valves and pilot operated solenoid valves

Customer:

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## 1 Purpose and Scope

This document lists the versions of the assessed valves together with their respective failure rates. Normally these are registered on the certificate itself but as this assessment was performed for so many variants, the numbers are maintained in this annex instead.

## 2 Variants

The mechanically actuated valves, direct operated solenoid valves, pneumatically operated valves and pilot operated solenoid valves can be considered to be part of a Type A element with a hardware fault tolerance of 0.

Tables 1 – 16 gives an overview of the different variants that belong to the considered mechanically actuated valves, direct operated solenoid valves, pneumatically operated valves and pilot operated solenoid valves.

For safety applications only the described variants in Tables 1 - 16 of of the mechanically actuated valves, direct operated solenoid valves, pneumatically operated valves and pilot operated solenoid valves working as DTT (De-energize To Trip) devices have been considered.

**Table 1: [V1] Mechanically actuated 3/2-way valves**

Name	Description
BR 311 ...	Mechanically actuated 3/2-way roller lever valves
BR 311 ... VES	Mechanically actuated 3/2-way roller lever valves, stainless steel
BV 311 ...	Mechanically actuated 3/2-way stem valves
BV 311 ... VES	Mechanically actuated 3/2-way stem valves, stainless steel
BV 311 ... TT	Mechanically actuated 3/2-way stem valves for low temperature (with unidirectional sealing)
BL 311 ...	Mechanically actuated 3/2-way roller lever valves with idle return
BG 311 ...	Mechanically actuated 3/2-way stem actuated spool valves
BG 311 ... TT	Mechanically actuated 3/2-way stem actuated spool valves for low temperature (with unidirectional sealing)
BG 311 ... TT AIR	Mechanically actuated 3/2-way stem actuated spool valves for low temperature (with bidirectional sealing)

**Table 2 [V2] Mechanically actuated 5/2-way valves**

Name	Description
BR 511 ...	Mechanically actuated 5/2-way roller lever valves
BR 511 ... VES	Mechanically actuated 5/2-way roller lever valves, stainless steel
BV 511 ...	Mechanically actuated 5/2-way stem valves
BV 511 ... VES	Mechanically actuated 5/2-way stem valves, stainless steel
BV 311 ... TT	Mechanically actuated 3/2-way stem valves for low temperature (with unidirectional sealing)
BL 511 ...	Mechanically actuated 5/2-way roller lever valves with idle return

**Table 3 [V3] Direct operated 2/2-way and 3/2-way solenoid valves**

Name	Description
M... 211 ...	Direct actuated in-line 2/2-way solenoid valves
M... 211 ... VES	Direct actuated in-line 2/2-way solenoid valves, stainless steel
M... 311 ...	Direct actuated in-line 3/2-way solenoid valves
M...311 ... VES	Direct actuated in-line 3/2-way solenoid valves, stainless steel
M... 311 ... TT	Direct actuated in-line 3/2-way solenoid valves for low temperature (with unidirectional sealing)

**Table 4 [V4] Pneumatically operated 2/2-way and 3/2-way valves**

Name	Description
P... 210 ...	Pneumatically actuated 2/2-way spool valves
P... 211 ...	Pneumatically actuated 2/2-way spool valves with mechanical spring return
P... 210 ... VES	Pneumatically actuated 2/2-way spool valves, stainless steel
P... 211 ... VES	Pneumatically actuated 2/2-way spool valves with mechanical spring return stainless steel
P... 210 ... TT	Pneumatically actuated 2/2-way spool valves for low temperature (with unidirectional sealing)
P... 211 ... TT	Pneumatically actuated 2/2-way spool valves with mechanical spring return (with unidirectional sealing)
P... 210 ... VIT	Pneumatically actuated 2/2-way spool valves with FPM/FKM sealings
P... 211 ... VIT	Pneumatically actuated 2/2-way spool valves with mechanical spring return, with FPM/FKM sealings
P... 210 ... NT	Pneumatically actuated 2/2-way spool valves for -20°C
P... 211 ... NT	Pneumatically actuated 2/2-way spool valves with mechanical spring return for -20°C
P... 211 ... SR	Pneumatically actuated 2/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch
P... 211 ... SR VIT	Pneumatically actuated 2/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch with FPM/FKM sealings
P... 211 ... SR NT	Pneumatically actuated 2/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch for -20°C
P... 211 ... SR 02 NTB	Pneumatically actuated 2/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch for -25°C
P... 310 ...	Pneumatically actuated 3/2-way spool valves
P... 311 ...	Pneumatically actuated 3/2-way spool valves with mechanical spring return
P... 310 ... VES	Pneumatically actuated 3/2-way spool valves, stainless steel
P... 311 ... VES	Pneumatically actuated 3/2-way spool valves with mechanical spring return stainless steel
P... 310 ... TT	Pneumatically actuated 3/2-way spool valves for low temperature (with unidirectional sealing)
P... 311 ... TT	Pneumatically actuated 3/2-way spool valves with mechanical spring return (with unidirectional sealing)
P... 310 ... TT AIR	Pneumatically actuated 3/2-way spool valves for low temperature (with bidirectional sealing)

Name	Description
P... 311 ... TT AIR	Pneumatically actuated 3/2-way spool valves with mechanical spring return (with bidirectional sealing)
P... 310 ... VIT	Pneumatically actuated 3/2-way spool valves with FPM/FKM sealings
P... 311 ... VIT	Pneumatically actuated 3/2-way spool valves with mechanical spring return, with FPM/FKM sealings
P... 310 ... NT	Pneumatically actuated 3/2-way spool valves for -20°C
P... 311 ... NT	Pneumatically actuated 3/2-way spool valves with mechanical spring return for -20°C
P... 311 ... SR	Pneumatically actuated 3/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch
P... 311 ... SR VIT	Pneumatically actuated 3/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch with FPM/FKM sealings
P... 311 ... SR NT	Pneumatically actuated 3/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch for -20°C
P... 311 ... SR 02 NTB	Pneumatically actuated 3/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch for -25°C
P... 311 ... SR VES	Pneumatically actuated 3/2-way spool valves with mechanical spring return, with adjustable pneumatic pressure switch, stainless steel
P... 311 ... NTB	Pneumatically actuated 3/2-way spool valves with mechanical spring return for -25°C

**Table 5 [V5] Pneumatically operated 4/2-way and 5/2-way valves**

Name	Description
P... 411 ... SR	Pneumatically actuated 4/2-way spool valves, with adjustable pneumatic pressure switch
P... 411 ... SR VIT	Pneumatically actuated 4/2-way spool valves, with adjustable pneumatic pressure switch, with FPM/FKM sealings
P... 411 ... SR NT	Pneumatically actuated 4/2-way spool valves, with adjustable pneumatic pressure switch, for -20°C
PN... 411 ... SR	Pneumatically actuated 4/2-way spool valves, with Namur interface, with adjustable pneumatic pressure switch
PN... 411 ... SR VIT	Pneumatically actuated 4/2-way spool valves, with Namur interface, with adjustable pneumatic pressure switch, with FPM/FKM sealings
PN... 411 ... SR NT	Pneumatically actuated 4/2-way spool valves, with Namur interface, with adjustable pneumatic pressure switch, for -20°C
P... 510 ...	Pneumatically actuated 5/2-way spool valves
P... 511 ...	Pneumatically actuated 5/2-way spool valves with mechanical spring return
P... 510 ... VES	Pneumatically actuated 5/2-way spool valves, stainless steel
P... 511 ... VES	Pneumatically actuated 5/2-way spool valves with mechanical spring return, stainless steel
P... 510 ... TT	Pneumatically actuated 5/2-way spool valves for low temperature (with unidirectional sealing)
P... 511 ... TT	Pneumatically actuated 5/2-way spool valves with mechanical spring return for low temperature (with unidirectional sealing)

Name	Description
P... 510 ... TT AIR	Pneumatically actuated 5/2-way spool valves for low temperature (with bidirectional sealing)
P... 511 ... TT AIR	Pneumatically actuated 5/2-way spool valves with mechanical spring return, for low temperature (with bidirectional sealing)
P... 510 ... VIT	Pneumatically actuated 5/2-way spool valves, with FPM/FKM sealings
P... 511 ... VIT	Pneumatically actuated 5/2-way spool valves with mechanical spring return, with FPM/FKM sealings
P... 510 ... NT	Pneumatically actuated 5/2-way spool valves for -20°C
P... 511 ... NT	Pneumatically actuated 5/2-way spool valves with mechanical spring return for -20°C
P... 511 ... NTB	Pneumatically actuated 5/2-way spool valves with mechanical spring return for -25°C

**Table 6 [V6] Pneumatically operated 5/3-way valves**

Name	Description
P... 53. ...	Pneumatically actuated 5/3-way spool valves
P... 53. ... VES	Pneumatically actuated 5/3-way spool valves, stainless steel
P... 53. ... TT	Pneumatically actuated 5/3-way spool valves for low temperature (with unidirectional sealing)
P... 53. ... TT AIR	Pneumatically actuated 5/3-way spool valves for low temperature (with bidirectional sealing)
P... 53. ... VIT	Pneumatically actuated 5/3-way spool valves, with FPM/FKM sealings
P... 53. ... NT	Pneumatically actuated 5/3-way spool valves for -25°C

**Table 7 [V7] Pneumatically operated 6/2-way valves**

Name	Description
P 611 ... SR	Pneumatically actuated 6/2-way spool valves, with adjustable pneumatic pressure switch
PN 611 ... SR	Pneumatically actuated 6/2-way spool valves, with Namur interface, with adjustable pneumatic pressure switch
PN 611 ... SR VIT	Pneumatically actuated 6/2-way spool valves, with Namur interface, with adjustable pneumatic pressure switch, with FPM/FKM sealings
PN 611 ... SR NT	Pneumatically actuated 6/2-way spool valves, with Namur interface, with adjustable pneumatic pressure switch for -20°C

**Table 8 [V8] Pneumatically operated 6/2-way valves type PN 611 121 SR and its versions**

Name	Description
PN 611 121 SR	Pneumatically actuated 6/2-way spool valves, G1/2", with Namur interface, with adjustable pneumatic pressure switch
PN 611 121 SR VIT	Pneumatically actuated 6/2-way spool valves, G1/2", with Namur interface, with adjustable pneumatic pressure switch, with FPM/FKM sealings
PN 611 121 SR NT	Pneumatically actuated 6/2-way spool valves, G1/2", with Namur interface, with adjustable pneumatic pressure switch for -20°C

**Table 9 [V9] Pilot operated 2/2-way solenoid valves**

Placeholder “\_\_” for 24VDC, 110 VAC, 230 VAC.

<b>Name</b>	<b>Description</b>
M... 210 ...	Pilot operated 2/2-way solenoid valves
M... 210 ... VES	Pilot operated 2/2-way solenoid valves, stainless steel
M... 210 ... TT	Pilot operated 2/2-way solenoid valves for low temperature (with unidirectional sealing)
M... 210 ... HT	Pilot operated 2/2-way solenoid valves for high temperature
M... 210 ... NT	Pilot operated 2/2-way solenoid valves for -20°C
M...C 210 ...	Pilot operated 2/2-way solenoid valves with CNOMO interface
M...C 210 ... VES	Pilot operated 2/2-way solenoid valves with CNOMO interface, stainless steel
M...C 210 ... TT	Pilot operated 2/2-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing)
M...C 210 ... NT	Pilot operated 2/2-way solenoid valves with CNOMO interface, for -20°C
M... 210 ... __ Ex d	Pilot operated 2/2-way solenoid valves with Ex d magnet system
M... 210 ... VES __ Ex d	Pilot operated 2/2-way solenoid valves, stainless steel, with Ex d magnet system
M...C 210 ... TT __ Ex d	Pilot operated 2/2-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 210 ... NT __ Ex d	Pilot operated 2/2-way solenoid valves with CNOMO interface, for -20°C, with Ex d magnet system
M... 211 ...	Pilot operated 2/2-way solenoid valves, with combined spring return
M... 211 ... VES	Pilot operated 2/2-way solenoid valves, with combined spring return, stainless steel
M... 211 ... TT	Pilot operated 2/2-way solenoid valves, with combined spring return, for low temperature (with unidirectional sealing)
M... 211 ... HT	Pilot operated 2/2-way solenoid valves, with combined spring return, for high temperature
M... 211 ... NT	Pilot operated 2/2-way solenoid valves, with combined spring return, for -20°C
M...C 211 ...	Pilot operated 2/2-way solenoid valves with CNOMO interface, with combined spring return
M...C 211 ... VES	Pilot operated 2/2-way solenoid valves with CNOMO interface, with combined spring return, stainless steel
M...C 211 ... TT	Pilot operated 2/2-way solenoid valves with CNOMO interface, with combined spring return, for low temperature (with unidirectional sealing)
M...C 211 ... NT	Pilot operated 2/2-way solenoid valves with CNOMO interface, with combined spring return, for -20°C
M... 211 ... __ Ex d	Pilot operated 2/2-way solenoid valves, with combined spring return, with Ex d magnet system
M... 211 ... VES __ Ex d	Pilot operated 2/2-way solenoid valves, with combined spring return, stainless steel, with Ex d magnet system
M...C 211 ... TT __ Ex d	Pilot operated 2/2-way solenoid valves, with combined spring return, with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 211 ... NT __ Ex d	Pilot operated 2/2-way solenoid valves, with combined spring



Name	Description
	return, with CNOMO interface, for -20°C, with Ex d magnet system

**Table 10 [V10] Pilot operated 3/2-way solenoid valves**

Placeholder “\_” for 24VDC, 110 VAC, 230 VAC.

Name	Description
M... 310 ...	Pilot operated 3/2-way solenoid valves
M... 310 ... VES	Pilot operated 3/2-way solenoid valves, stainless steel
M... 310 ... TT	Pilot operated 3/2-way solenoid valves for low temperature (with unidirectional sealing)
M... 310 ... TT AIR	Pilot operated 3/2-way solenoid valves for low temperature (with bidirectional sealing)
M... 310 ... HT	Pilot operated 3/2-way solenoid valves for high temperature
M... 310 ... NT	Pilot operated 3/2-way solenoid valves for -20°C
M...C 310 ...	Pilot operated 3/2-way solenoid valves with CNOMO interface
M...C 310 ... VES	Pilot operated 3/2-way solenoid valves with CNOMO interface, stainless steel
M...C 310 ... TT	Pilot operated 3/2-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing)
M...C 310 ... TT AIR	Pilot operated 3/2-way solenoid valves with CNOMO interface, for low temperature (with bidirectional sealing)
M...C 310 ... NT	Pilot operated 3/2-way solenoid valves with CNOMO interface, for -20°C
M... 310 ... _ Ex d	Pilot operated 3/2-way solenoid valves with Ex d magnet system
M... 310 ... VES _ Ex d	Pilot operated 3/2-way solenoid valves, stainless steel, with Ex d magnet system
M...C 310 ... TT _ Ex d	Pilot operated 3/2-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 310 ... TT AIR _ Ex d	Pilot operated 3/2-way solenoid valves with CNOMO interface, for low temperature (with bidirectional sealing), with Ex d magnet system
M...C 310 ... NT _ Ex d	Pilot operated 3/2-way solenoid valves with CNOMO interface, for -20°C, with Ex d magnet system
M... 311 ...	Pilot operated 3/2-way solenoid valves, with combined spring return
M... 311 ... VES	Pilot operated 3/2-way solenoid valves, with combined spring return, stainless steel
M... 311 ... TT	Pilot operated 3/2-way solenoid valves, with combined spring return, for low temperature (with unidirectional sealing)
M... 311 ... TT AIR	Pilot operated 3/2-way solenoid valves, with combined spring return, for low temperature (with bidirectional sealing)
M... 311 ... HT	Pilot operated 3/2-way solenoid valves, with combined spring return, for high temperature
M... 311 ... NT	Pilot operated 3/2-way solenoid valves, with combined spring return, for -20°C
M... 311 ... NTB	Pilot operated 3/2-way solenoid valves, with combined spring return, for -25°C
M...C 311 ...	Pilot operated 3/2-way solenoid valves with CNOMO interface, with combined spring return



Name	Description
M...C 311 ... VES	Pilot operated 3/2-way solenoid valves with CNOMO interface, with combined spring return, stainless steel
M...C 311 ... TT	Pilot operated 3/2-way solenoid valves with CNOMO interface, with combined spring return, for low temperature (with unidirectional sealing)
M...C 311 ... TT AIR	Pilot operated 3/2-way solenoid valves with CNOMO interface, with combined spring return, for low temperature (with bidirectional sealing)
M...C 311 ... NT	Pilot operated 3/2-way solenoid valves with CNOMO interface, with combined spring return, for -20°C
M... 311 ... __ Ex d	Pilot operated 3/2-way solenoid valves, with combined spring return, with Ex d magnet system
M... 311 ... VES __ Ex d	Pilot operated 3/2-way solenoid valves, with combined spring return, stainless steel, with Ex d magnet system
M...C 311 ... TT __ Ex d	Pilot operated 3/2-way solenoid valves, with combined spring return, with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 311 ... TT AIR __ Ex d	Pilot operated 3/2-way solenoid valves, with combined spring return, with CNOMO interface, for low temperature (with bidirectional sealing), with Ex d magnet system
M...C 311 ... NT __ Ex d	Pilot operated 3/2-way solenoid valves, with combined spring return, with CNOMO interface, for -20°C, with Ex d magnet system

**Table 11 [V11] Pilot operated 5/2-way solenoid valves**

Placeholder “\_\_” for 24VDC, 110 VAC, 230 VAC.

Name	Description
M... 510 ...	Pilot operated 5/2-way solenoid valves
M... 510 ... VES	Pilot operated 5/2-way solenoid valves, stainless steel
M... 510 ... TT	Pilot operated 5/2-way solenoid valves for low temperature (with unidirectional sealing)
M... 510 ... TT AIR	Pilot operated 5/2-way solenoid valves for low temperature (with bidirectional sealing)
M... 510 ... HT	Pilot operated 5/2-way solenoid valves for high temperature
M... 510 ... NT	Pilot operated 5/2-way solenoid valves for -20°C
M...C 510 ...	Pilot operated 5/2-way solenoid valves with CNOMO interface
M...C 510 ... VES	Pilot operated 5/2-way solenoid valves with CNOMO interface, stainless steel
M...C 510 ... TT	Pilot operated 5/2-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing)
M...C 510 ... TT AIR	Pilot operated 5/2-way solenoid valves with CNOMO interface, for low temperature (with bidirectional sealing)
M...C 510 ... NT	Pilot operated 5/2-way solenoid valves with CNOMO interface, for -20°C
M... 510 ... __ Ex d	Pilot operated 5/2-way solenoid valves with Ex d magnet system
M... 510 ... VES __ Ex d	Pilot operated 5/2-way solenoid valves, stainless steel, with Ex d magnet system

Name	Description
M...C 510 ... TT __ Ex d	Pilot operated 5/2-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 510 ... TT AIR __ Ex d	Pilot operated 5/2-way solenoid valves with CNOMO interface, for low temperature (with bidirectional sealing), with Ex d magnet system
M...C 510 ... NT __ Ex d	Pilot operated 5/2-way solenoid valves with CNOMO interface, for -20°C, with Ex d magnet system
M... 511 ...	Pilot operated 5/2-way solenoid valves, with combined spring return
M... 511 ... VES	Pilot operated 5/2-way solenoid valves, with combined spring return, stainless steel
M... 511 ... TT	Pilot operated 5/2-way solenoid valves, with combined spring return, for low temperature (with unidirectional sealing)
M... 511 ... TT AIR	Pilot operated 5/2-way solenoid valves, with combined spring return, for low temperature (with bidirectional sealing)
M... 511 ... HT	Pilot operated 5/2-way solenoid valves, with combined spring return, for high temperature
M... 511 ... NT	Pilot operated 5/2-way solenoid valves, with combined spring return, for -20°C
M... 511 ... NTB	Pilot operated 5/2-way solenoid valves, with combined spring return, for -25°C
M...C 511 ...	Pilot operated 5/2-way solenoid valves with CNOMO interface, with combined spring return
M...C 511 ... VES	Pilot operated 5/2-way solenoid valves with CNOMO interface, with combined spring return, stainless steel
M...C 511 ... TT	Pilot operated 5/2-way solenoid valves with CNOMO interface, with combined spring return, for low temperature (with unidirectional sealing)
M...C 511 ... TT AIR	Pilot operated 5/2-way solenoid valves with CNOMO interface, with combined spring return, for low temperature (with bidirectional sealing)
M...C 511 ... NT	Pilot operated 5/2-way solenoid valves with CNOMO interface, with combined spring return, for -20°C
M... 511 ... __ Ex d	Pilot operated 5/2-way solenoid valves, with combined spring return, with Ex d magnet system
M... 511 ... VES __ Ex d	Pilot operated 5/2-way solenoid valves, with combined spring return, stainless steel, with Ex d magnet system
M...C 511 ... TT __ Ex d	Pilot operated 5/2-way solenoid valves, with combined spring return, with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 511 ... TT AIR __ Ex d	Pilot operated 5/2-way solenoid valves, with combined spring return, with CNOMO interface, for low temperature (with bidirectional sealing), with Ex d magnet system
M...C 511 ... NT __ Ex d	Pilot operated 5/2-way solenoid valves, with combined spring return, with CNOMO interface, for -20°C, with Ex d magnet system

**Table 12 [V12] Pilot operated 5/3-way solenoid valves**

Placeholder “\_” for 24VDC, 110 VAC, 230 VAC.

Name	Description
M... 53. ...	Pilot operated 5/3-way solenoid valves
M... 53. ... VES	Pilot operated 5/3-way solenoid valves, stainless steel
M... 53. ... TT	Pilot operated 5/3-way solenoid valves for low temperature (with unidirectional sealing)
M... 53. ... TT AIR	Pilot operated 5/3-way solenoid valves for low temperature (with bidirectional sealing)
M... 53. ... HT	Pilot operated 5/3-way solenoid valves for high temperature
M... 53. ... NT	Pilot operated 5/3-way solenoid valves for -20°C
M...C 53. ...	Pilot operated 5/3-way solenoid valves with CNOMO interface
M...C 53. ... VES	Pilot operated 5/3-way solenoid valves with CNOMO interface, stainless steel
M...C 53. ... TT	Pilot operated 5/3-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing)
M...C 53. ... TT AIR	Pilot operated 5/3-way solenoid valves with CNOMO interface, for low temperature (with bidirectional sealing)
M...C 53. ... NT	Pilot operated 5/3-way solenoid valves with CNOMO interface, for -20°C
M... 53. ... _ Ex d	Pilot operated 5/3-way solenoid valves with Ex d magnet system
M... 53. ... VES _ Ex d	Pilot operated 5/3-way solenoid valves, stainless steel, with Ex d magnet system
M...C 53. ... TT _ Ex d	Pilot operated 5/3-way solenoid valves with CNOMO interface, for low temperature (with unidirectional sealing), with Ex d magnet system
M...C 53. ... TT AIR _ Ex d	Pilot operated 5/3-way solenoid valves with CNOMO interface, for low temperature (with bidirectional sealing), with Ex d magnet system
M...C 53. ... NT _ Ex d	Pilot operated 5/3-way solenoid valves with CNOMO interface, for -20°C, with Ex d magnet system

**Table 13 [V13] Pilot operated 2/2-way solenoid valves with auxiliary control air**

Name	Description
MEH 211 ...	Pilot operated 2/2-way solenoid valves with auxiliary control air
MEH 211 ... VES	Pilot operated 2/2-way solenoid valves with auxiliary control air, stainless steel
MEH 211 ... TT	Pilot operated 2/2-way solenoid valves with auxiliary control air, for low temperature (with unidirectional sealing)
MEH 211 ... HT	Pilot operated 2/2-way solenoid valves with auxiliary control air, for high temperature
MEH 211 ... NT	Pilot operated 2/2-way solenoid valves, with auxiliary control air for -20°C

**Table 14 [V14] Pilot operated 3/2-way solenoid valves with auxiliary control air**

Name	Description
M...EH 311 ...	Pilot operated 3/2-way solenoid valves with auxiliary control air
M...EH 311 ... VES	Pilot operated 3/2-way solenoid valves with auxiliary control air, stainless steel
M...EH 311 ... TT	Pilot operated 3/2-way solenoid valves with auxiliary control air, for low temperature (with unidirectional sealing)
M...EH 311...TT AIR	Pilot operated 3/2-way solenoid valves with auxiliary control air, for low temperature (with bidirectional sealing)
M...EH 311 ... HT	Pilot operated 3/2-way solenoid valves with auxiliary control air, for high temperature
M...EH 311 ... NT	Pilot operated 3/2-way solenoid valves, with auxiliary control air for -20°C

**Table 15 [V15] Pilot operated 5/2-way solenoid valves with auxiliary control air**

Name	Description
M...EH 511 ...	Pilot operated 5/2-way solenoid valves with auxiliary control air
M...EH 511 ... VES	Pilot operated 5/2-way solenoid valves with auxiliary control air, stainless steel
M...EH 511 ... TT	Pilot operated 5/2-way solenoid valves with auxiliary control air, for low temperature (with unidirectional sealing)
M...EH 511 ... TT AIR	Pilot operated 5/2-way solenoid valves with auxiliary control air, for low temperature (with bidirectional sealing)
M...EH 511 ... HT	Pilot operated 5/2-way solenoid valves with auxiliary control air, for high temperature
M...EH 511 ... NT	Pilot operated 5/2-way solenoid valves, with auxiliary control air for -20°C

**Table 16 [V16] Pilot operated 5/3-way solenoid valves with auxiliary control air**

Name	Description
M...EH 53. ...	Pilot operated 5/3-way solenoid valves with auxiliary control air
M...EH 53. ... VES	Pilot operated 5/3-way solenoid valves with auxiliary control air, stainless steel
M...EH 53. ... TT	Pilot operated 5/3-way solenoid valves with auxiliary control air, for low temperature (with unidirectional sealing)
M...EH 53. ... TT AIR	Pilot operated 5/3-way solenoid valves with auxiliary control air, for low temperature (with bidirectional sealing)
M...EH 53. ... HT	Pilot operated 5/3-way solenoid valves with auxiliary control air, for high temperature
M...EH 53. ... NT	Pilot operated 5/3-way solenoid valves, with auxiliary control air for -20°C

A number of logic-elements, bi-stable and quick-exhaust variants were also subject of the assessment for Systematic Capability. As they share the same development process, verification and testing as the Variants listed above in Tables 1 - 16, the Logic-elements, bi-stable and quick-exhaust variants meet the same requirements for Systematic Capability as the variants. However, these Logic-elements, bi-stable and quick-exhaust variants are not generally suitable for safety applications, so no FMEDA analysis was done for these variants.

## 2.1 Failure rates

The table below lists the failure rates in FIT (failures / 10<sup>9</sup> hours) for the variants listed above.

**Table 17: Failure rates per IEC 61508:2010**

Variant	Profile	<i>exida</i> Profile		
		Failure rates (in FIT)		
		$\lambda_{SD}$	$\lambda_{DD}$	$\lambda_{DU}$
[V1]	5	3	0	377
[V2]	5	3	0	545
[V3]	5	75	0	7
[V4]	5	55	0	330
[V5]	5	55	0	470
[V6]	5	96	0	502
[V7]	5	55	0	540
[V8]	5	111	0	870
[V9]	5	159	0	206
[V10]	5	150	0	230
[V11]	5	150	0	470
[V12]	5	280	0	504
[V13]	5	159	0	280
[V14]	5	145	0	331
[V15]	5	145	0	471
[V16]	5	269	0	504

### 3 Status of the Document

#### 3.1 Liability

*exida* prepares reports based on methods advocated in International standards. *exida* accepts no liability whatsoever for the use of this annex or for the correctness of the standards on which the general calculation methods are based.

#### 3.2 Releases

Contract Number	Report Number	Revision Notes
Q23/04-151-C	1511-126-C R003 V3, R1	Naming corrected for M... and P...
Q23/04-151-C	1511-126-C R004 V3, R0	Surveillance audit 2023 New grouping structure implemented.
Q19/02-018-C	1511-126-C R004 V2, R0	Surveillance audit and new versions added: MEH, TT AIR and MH 311
Q15/11-126-C	1511-126-C R004 V1, R0	Review comments implemented
Q15/11-126-C	1511-126-C R004 V0, R1	Draft; Waiting for review

Author: Peter Söderblom

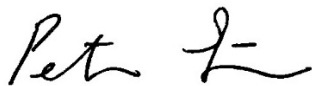
Review: Steven Close V2 R0  
Jürgen Hochhaus V3 R0

Release status: Released 09-Jan-2020, V2 R0  
24-Jan-2024, V3 R0  
30-Jan-2024, V3 R1

#### 3.3 Future Enhancements

At request of client.

#### 3.4 Release Signatures



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Peter Söderblom, Senior Safety Engineer



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Jürgen Hochhaus, Senior Safety Engineer