









Table Of Contents




Document	Page
Teams and persons: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	1
Symbolic Responsibility: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	2
Symbolic Deadlines: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	3
Palette for Process Flow Diagram: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	4
Palette for Classification: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	5
Notes List: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	6
Info and Summary: P:\Fmea\V60\0010 - R\Data\EN\EXAMPLE.fme	7
Structure Tree: 2 CC 2042 - signal cable constructive design	18
Structure List: 2 CC 2042 - signal cable constructive design	19
Structure (Table): 2 CC 2042 - signal cable constructive design	24
Statistics: Pareto Analysis: 2 CC 2042 - signal cable constructive design	31
Statistics: Difference Analysis: 2 CC 2042 - signal cable constructive design	32
Statistics: Frequency Analysis: 2 CC 2042 - signal cable constructive design	33
Statistics: Responsibility Analysis: 2 CC 2042 - signal cable constructive design	34
Statistics: Risk Matrix: 2 CC 2042 - signal cable constructive design	35
FMEA Form (VDA 96): Signal cable (complete)	36
Function- and Failure Net: 1.2.a transport signals from receiver to control unit without loss	59
Function- and Failure Net: 1.1.a.1 provides no control pulse	60
Cause and Effect Diagram (Failure Net): 1.1.a.1 provides no control pulse	61
Fault Tree: 1.1.a.1 provides no control pulse	62
Process Flow Diagram: Prepare workplace: Prepare workplace	63
Control Plan: CP 001-2.1_000_Electric conductor	66

			Teams and persons P:\Fmeal\60\0010 - R\Data\EN\EXAMPLE.fme						13.07.2009		
Name	First name	Password	Department	Job title	Phone	Fax	E-mail	User Name	Title	Create persons	Team
Supervisor										✓	
Santy	David		ZQS	Qualitätsentwicklung	+49 (0)345 87 92 76	+49 (0)345 87 92 55	da-vid.santy@eltys.com		Herr		Systementwicklung RG 2042
Peach	Marcel		FV-PO	Prozessplanung	+49 (0)345 87 96 47	+49 (0)345 87 96 25	mar-cel.peach@eltys.com		Herr		Systementwicklung RG 2042 Prozessplanung
Kasper	Detlef		RD-S	Systementwicklung	+49 (0)345 87 97 33	+49 (0)345 87 97 55	detlef.kasper@eltys.com		Herr		Systementwicklung RG 2042 Konstruktion
Hehre	Claudia		FV-PO	Prozessplanung	+49 (0)345 87 96 43	+49 (0)345 87 96 25	claudia.hehre@eltys.com		Frau		Prozessplanung
Seetzen	Gudrun		D-PT	Entwicklung	+49 (0)345 87 98 24	+49 (0)345 87 98 55	gudrun.seetzen@eltys.com		Frau		Prozessplanung Konstruktion
Schranz	Franz		D-PT	Entwicklung	+49 (0)345 87 98 38	+49 (0)345 87 98 55	franz.schranz@eltys.com		Herr		Systementwicklung RG 2042 Konstruktion
Bonewski	Hans		D-PT	Entwicklung	+49 (0)345 87 98 35	+49 (0)345 87 98 55	hans.bonewski@eltys.com		Herr		Prozessplanung
Priebke	Claas		D-PT	Entwicklung	+49 (0)345 87 98 01	+49 (0)345 87 98 55	claas.priebke@eltys.com		Herr		Prozessplanung

	Symbolic Responsibility P:\Fmea\V\60\0010 - R\Data\EN\EXAMPLE.fme	13.07.2009
Symbolic Responsible	Concrete Responsible	
Responsible for component: plug	Schranz, Franz, D-PT, Entwicklung	
Supplier of isolation		
Responsible for component: signal cable	Kasper, Detlef, RD-S, Systementwicklung	
Shift supervisor		
Operator soldering station		
Tester in laboratory		
Process validation and qualification		
Trial		

	<p style="text-align: center;">Symbolic Deadlines</p> <p style="text-align: center;">P:\Fmea\V\60\0010 - R\Data\EN\EXAMPLE.fme</p>	13.07.2009
Symbolic Deadline	Concrete Deadline	
Release developed components		
Quality Gate 03		
Quality Gate 02		
Presentation concept study		

		Palette for Process Flow Diagram		13.07.2009
		P:\Fmea\V\60\0010 - R\Data\EN\EXAMPLE.fme		
Control plan relevant	Name	Standard	Internal	Notes
	Fabrication			
	Move			
	Store			
	Inspect			

		Palette for Classification		13.07.2009
		P:\Fmea\V\60\0010 - R\Data\EN\EXAMPLE.fme		
Name	Standard		Notes	
SAFETY/COMPLIANCE				
CRITICAL CHARACTERISTIC				
SIGNIFICANT CHARACTERISTIC	SC			
CRITICAL CHARACTERISTIC	CC			
POTENTIAL SIGNIFICANT CHARACTERISTIC	YS			
POTENTIAL CRITICAL CHARACTERISTIC	YC			

	Notes List Failures	13.07.2009
No data available		

No data available

Project:

[Cruise Control Unit CC 2042](#)

creation date: '07.01.2001 14:06:01' by 'Supervisor'.


last modification: '07.04.2009 13:32:32' by 'Supervisor'.

Structure:

[structure 'CC 2042 - system' of type 'System'](#)

creation date: '27.02.2009 12:04:34' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

last modification within the structure '13.07.2009 16:44:20':  [1.1.a.1 provides no control pulse](#)

Structure:

[structure 'CC 2042 - manufacture signal cable' of type 'Process'](#)

creation date: '10.03.2009 12:08:59' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

last modification within the structure '07.04.2009 13:32:32':  [System Element: 4.8.3 soldering iron](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process').

1. Structure Variant (78 excluded and variantspecific Objects and Values):

[Structure Variant: Signal cable complete - without rework](#)

creation date: '07.01.2001 14:57:25' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

2. Structure Variant (23 excluded and variantspecific Objects and Values):

[Structure Variant: Signal cable complete - with rework](#)

creation date: '16.03.2006 17:15:48' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

Structure:

[structure 'CC 2042 - signal cable constructive design' of type 'Design'](#)

creation date: '27.02.2009 12:06:52' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

last modification within the structure '07.04.2009 13:32:32':  [System Element: 2.1.1.4.1 Constructive design solder](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design').

Structure:

[structure 'Plug - constructive design' of type 'Design'](#)

creation date: '27.02.2009 12:07:42' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

last modification within the structure '07.04.2009 13:32:32':  [System Element: 3.3.1 Constructive design solder](#) (structure 'Plug - constructive design' of type 'Design').

1. Structure Variant (25 excluded and variantspecific Objects and Values):

[Structure Variant: Plug - constructive design with soldering connection](#)

creation date: '08.06.2006 14:48:12' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

2. Structure Variant (31 excluded and variantspecific Objects and Values):

[Structure Variant: Plug - constructive design with clamp connection](#)

creation date: '08.06.2006 14:48:35' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

FMEA Form:


[1.2 Signal cable \(complete\)](#) (Type: System).

creation date: '05.03.2009 12:05:05' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

FMEA Summary:

System Element: 1:

-  [System Element: 1.2 Signal cable \(complete\)](#) (structure 'CC 2042 - system' of type 'System', Form present).

Functions: 7

- with cause-effect-information: 7.

Failure Modes: 6

- with cause-effect-information: 6.

Effects: 6

- Severity 5: 2
- Severity 7: 1
- Severity 9: 3

Causes: 14 (Last rated revision state):

- Occurrence 1: 1
- Occurrence 4: 2
- Occurrence 5: 2
- Occurrence 7: 8
- Detection 1: 1
- Detection 7: 4
- Detection 10: 8
- RPN in the last valued states (maximum): 490

Actions: 5

- with completed state: 1.
- with open state: 4.
- without responsibility: 0.
- Preventive Actions: 1.
- Detection Actions: 4.

Responsible team members:

- Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung: 4

FMEA Form:

 [4.1 Assembly cable to plug](#) (Type: Process).








creation date: '20.03.2009 12:09:20' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

Item Code: 315-81.10, 315-81.20, 315-81.30, 315-81.40, 315-81.50, 315-81.60, 315-81.70, 315-81.80

FMEA Summary:

Process Elements: 8:

-  [Process Element: 4.1 Prepare workplace](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-  [Process Element: 4.2 Insert plug into soldering appliance](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-  [Process Element: 4.3 Solder cable strands on plug pins \(manually\)](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-  [Process Element: 4.4 Solder shielding on plug housing \(one sided; manually\)](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-  [Process Element: 4.5 Put cable into strain-relief](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-  [Process Element: 4.6 Test cable using cable test appliance](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-  [Process Element: 4.7 Attach proof-of-testing label to cable and put cable into transport bin](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).

- **◆ Process Element: 4.8 Corrective soldering of faulty parts** (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-

Functions: 9

Product Characteristics: 11

Failure Modes: 27

- with cause-effect-information: 25.
- with causes-information: 2.

Effects: 43

- Severity 7: 27
- Severity 8: 2
- Severity 9: 14

Causes: 60 (Last rated revision state):

- Occurrence 1: 4
- Occurrence 2: 25
- Occurrence 3: 18
- Occurrence 4: 7
- Occurrence 5: 2
- Occurrence 6: 3
- Detection 1: 3
- Detection 3: 20
- Detection 4: 5
- Detection 5: 3
- Detection 6: 2
- Detection 7: 13
- Detection 8: 9
- Detection 10: 5
- RPN in the last valued states (maximum): 450

Actions: 188

- with completed state: 163.
- with open state: 25.
- without responsibility: 0.
- Preventive Actions: 112.
- Detection Actions: 76.

Responsible team members:

- Bonewski, Hans, D-PT, Entwicklung: 16
 - Hehre, Claudia, FV-PO, Prozessplanung: 4
 - Operator soldering station: 14
 - Priebke, Claas, D-PT, Entwicklung: 3
 - Seetzen, Gudrun, D-PT, Entwicklung: 2
 - Shift supervisor: 20
-

FMEA Form:


 [2.1 Signal cable \(complete\)](#) (Type: Design).

creation date: '05.03.2009 12:07:01' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

FMEA Summary:

System Element: 1:

-  [System Element: 2.1 Electrical connections](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
-

Functions: 3

- with cause-effect-information: 3.

Product Characteristics: 3

- with cause-effect-information: 3.

Failure Modes: 5

- with cause-effect-information: 5.

Effects: 5

- Severity 5: 1
- Severity 7: 1
- Severity 9: 2

Causes: 17 (Last rated revision state):

- Occurrence 1: 1
- Occurrence 5: 1
- Occurrence 7: 6
- Detection 1: 1
- Detection 7: 3
- Detection 10: 4
- RPN in the last valued states (maximum): 630


Actions: 4

- with completed state: 1.
- with open state: 3.
- without responsibility: 0.
- Preventive Actions: 1.
- Detection Actions: 3.

Responsible team members:

- Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung: 3
-

FMEA Form:

 [3.1 Plug](#) (Type: Design).

creation date: '05.03.2009 12:07:48' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

FMEA Summary:

System Elements: 3:

-  [System Element: 3.1 Contact pin](#) (structure 'Plug - constructive design' of type 'Design', Form present).
 -  [System Element: 3.2 Plug body](#) (structure 'Plug - constructive design' of type 'Design', Form present).
 -  [System Element: 3.3 soldering connection between wire and pin](#) (structure 'Plug - constructive design' of type 'Design', Form present).
-

Functions: 13

- with cause-effect-information: 12.

Failure Modes: 21

- with cause-effect-information: 21.

Effects: 33

Causes: 51 (Last rated revision state):

- Occurrence 3: 23
- Occurrence 4: 23
- Detection 3: 19
- Detection 4: 22
- Detection 5: 1
- Detection 6: 3
- Detection 7: 2
- RPN in the last valued states (maximum): 288

Actions: 159

- with completed state: 91.
- with open state: 68.
- without responsibility: 0.
- Preventive Actions: 84.
- Detection Actions: 75.

Responsible team members:

- Priebke, Claas, D-PT, Entwicklung: 5
- Process validation and qualification: 3
- Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung: 25
- Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung: 1
- Santy, David, ZQS, Qualitätsentwicklung: 21
- Seetzen, Gudrun, D-PT, Entwicklung: 5
- Trial: 16

FMEA Form:





 [2.1.1.3 Cabel](#) (Type: Design).

creation date: '05.03.2009 12:08:22' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

FMEA Summary:

System Elements: 4:

-  [System Element: 2.1.1.3 Shielding](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
 -  [System Element: 2.1.1.2 Isolation](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
 -  [System Element: 2.1.1.1 conductor](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
 -  [System Element: 2.1.1.4 Soldering connection shielding](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
-

Functions: 4

- with cause-effect-information: 2.

Product Characteristics: 6

- with cause-effect-information: 6.

Failure Modes: 12

- with cause-effect-information: 11.
- with effect-information: 1.

Effects: 18

Causes: 21 (Last rated revision state):

- Occurrence 3: 4
- Occurrence 4: 17
- Detection 2: 3
- Detection 3: 15
- Detection 4: 3
- RPN in the last valued states (maximum): 108

Actions: 85

- with completed state: 42.
- with open state: 43.
- without responsibility: 0.
- Preventive Actions: 43.
- Detection Actions: 42.

Responsible team members:

- Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung: 4
- Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung: 8
- Santy, David, ZQS, Qualitätsentwicklung: 21
- Trial: 10

DRBFM Formsheet:

 [Steckerkontakt](#)

creation date: '27.06.2006 08:58:39' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

System Elements: 2:

-  [System Element: 3.1 Contact pin](#) (structure 'Plug - constructive design' of type 'Design', Form present).
-  [System Element: 3.3 soldering connection between wire and pin](#) (structure 'Plug - constructive design' of type 'Design', Form present).

Missing translations (2): French, Italian

DRBFM Formsheet:

 [Steckerkörper](#)

creation date: '27.06.2006 09:01:42' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

System Element: 1:

- ■ [System Element: 3.2 Plug body](#) (structure 'Plug - constructive design' of type 'Design', Form present).

Missing translations (2): French, Italian

DRBFM Formsheet:

 [elektrischer Leiter](#)

creation date: '27.06.2006 09:03:09' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

System Element: 1:

- ■ [System Element: 2.1.1.1 conductor](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).

Missing translations (2): French, Italian

DRBFM Formsheet:

 [Abschirmung](#)

creation date: '27.06.2006 09:04:06' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

System Elements: 2:

- ■ [System Element: 2.1.1.3 Shielding](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
- ■ [System Element: 2.1.1.4 Soldering connection shielding](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).

Missing translations (2): French, Italian

Control Plan:

 [CP 001-4.0 Assembly signal cable \(complete\)](#)

creation date: '06.03.2006 18:17:50' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

Characteristics: 11.

Actions: 22

- with completed state: 22.
- with open state: 0.
- without responsibility: 0.
- Preventive Actions: 14.
- Detection Actions: 8.

Responsible team members:

- Operator soldering station: 10
- Shift supervisor: 12

Process Elements: 6:

- [◆ Process Element: 4.1 Prepare workplace](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
- [◆ Process Element: 4.3 Solder cable strands on plug pins \(manually\)](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
- [◆ Process Element: 4.4 Solder shielding on plug housing \(one sided; manually\)](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
- [◆ Process Element: 4.5 Put cable into strain-relief](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
- [◆ Process Element: 4.7 Attach proof-of-testing label to cable and put cable into transport bin](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
- [◆ Process Element: 4.8 Corrective soldering of faulty parts](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).

 [soldering workplace #4.3](#)

 [soldering workplace #4.7](#)

 [soldering workplace corrective work #4.12](#)

 [check by shift supervisor](#)

 [visual inspection](#)

 [test appliance: cable function](#)

 [test appliance: pull-off strength](#)

 [ohm meter](#)

Control Plan:







 [CP 001-2.1 Electric conductor](#)

creation date: '17.03.2006 11:58:38' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

Characteristics: 6.

System Elements: 6:

-  [System Element: 2.1.1.1 conductor](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
-  [System Element: 2.1.1.2 Isolation](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
-  [System Element: 2.1.1.3 Shielding](#) (structure 'CC 2042 - signal cable constructive design' of type 'Design', Form present).
-  [System Element: 3.1 Contact pin](#) (structure 'Plug - constructive design' of type 'Design', Form present).
-  [System Element: 3.2 Plug body](#) (structure 'Plug - constructive design' of type 'Design', Form present).
-  [System Element: 3.3 soldering connection between wire and pin](#) (structure 'Plug - constructive design' of type 'Design', Form present).









Process Flow Diagram:

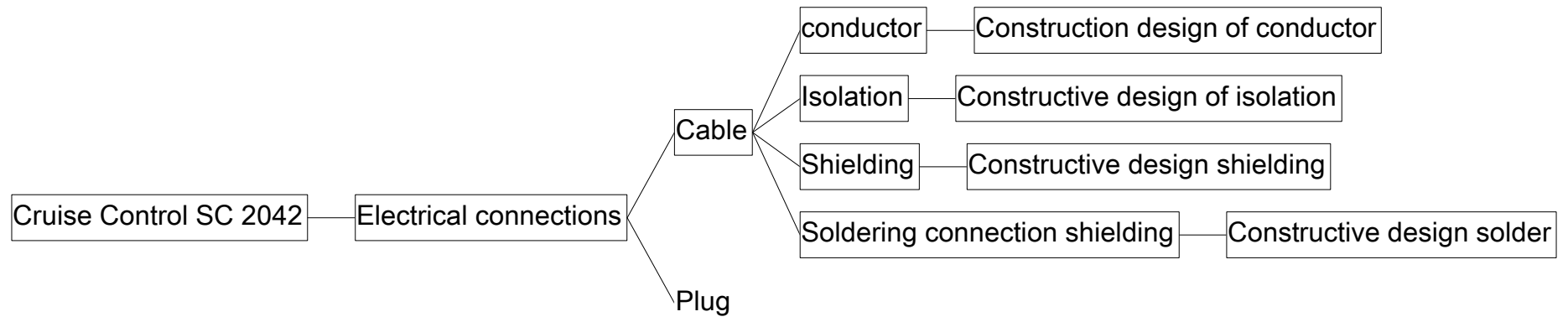
[Prepare workplace](#)

creation date: '06.03.2006 17:56:43' by 'Supervisor'.

last modification: '07.04.2009 13:32:32' by 'Supervisor'.

Process Elements: 8:

-  [Process Element: 4.1 Prepare workplace](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.3 Solder cable strands on plug pins \(manually\)](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.4 Solder shielding on plug housing \(one sided; manually\)](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.5 Put cable into strain-relief](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.7 Attach proof-of-testing label to cable and put cable into transport bin](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.8 Corrective soldering of faulty parts](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.6 Test cable using cable test appliance](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
 -  [Process Element: 4.2 Insert plug into soldering appliance](#) (structure 'CC 2042 - manufacture signal cable' of type 'Process', Form present).
-

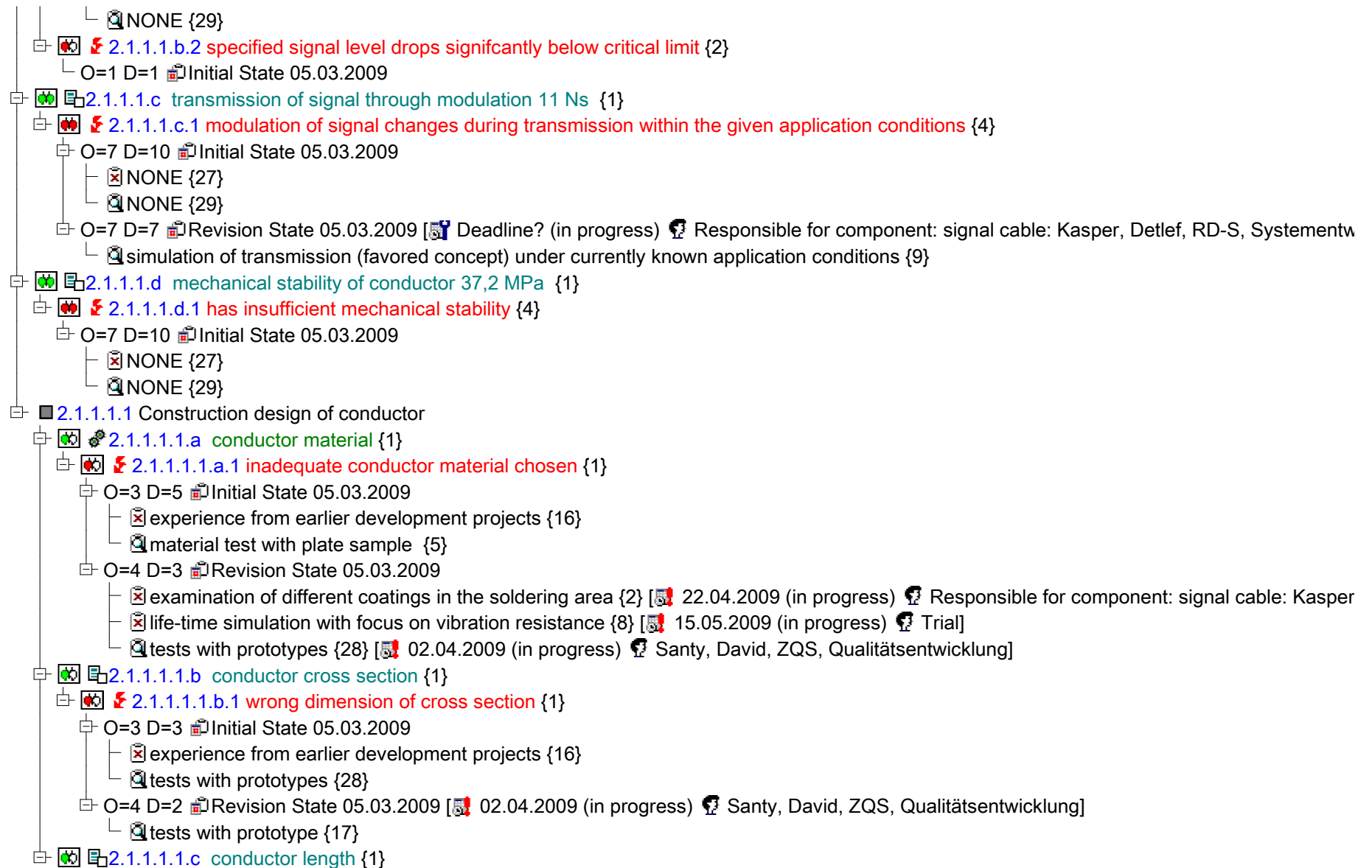


■ 2 Cruise Control SC 2042

- 2.a control propulsion according to specification {2}
 - S=9 2.a.1 drive control is out of specification {2}
 - S=7 2.a.2 drive cannot be controlled {2}
 - 2.a.3 loss of function during life-time {2}
 - 2.a.4 cruise control in failure mode {2}
- 2.b enable emergency shutoff in critical situations {2}
- 2.c signal state of operation {2}
- 2.d meet legal requirements {2}
 - S=9 2.d.1 does not comply with requirements regarding electromagnetic radiation {2}
- 2.e comply with customers assembly requirements {2}
 - S=5 2.e.1 does not comply with customer requirements regarding replaceability of components {2}
- 2.1 Electrical connections
 - 2.1.a transport signals from sensor to control unit without loss {2}
 - 2.1.b transport signals from control unit to speed control without loss {2}
 - 2.1.c resist environmental conditions {2}
 - 2.1.c.1 does not resist environmental conditions over life-time {2}
 - 2.1.d transmission properties of complete cable regarding application conditions {1}
 - 2.1.d.1 no signal {2}
 - 2.1.d.2 signal does not represent the input values correctly {2}
 - 2.1.e properties of cable regarding electromagnetic radiation {1}
 - 2.1.e.1 electromagnetic radiation exceeds specified limit {2}
 - 2.1.f ease of exchange {1}
 - 2.1.f.1 exchange not possible without damaging cable {2}
 - 2.1.1 Cable
 - 2.1.1.a strength durability : $f = ?$ {1}
 - 2.1.1.1 conductor
 - 2.1.1.1.a solderability of conductor {1}
 - 2.1.1.1.a.1 inadequate solderability of conductor {1}
 - 2.1.1.1.b transmission of signal through voltage level $32 \text{ Ns} \pm 1$ {1}
 - 2.1.1.1.b.1 level of signal decreases during transmission within the given application conditions {1}

O=5 D=10 Initial State 05.03.2009

simulation under known application conditions {3}



2.1.1.1.1.c.1 wrong length of conductor {1}

O=4 D=5 Initial State 05.03.2009

- calculation {6}
- tests with prototypes {28}

O=3 D=3 Revision State 05.03.2009 [02.04.2009 (in progress)]

- review of calculations and tests regarding length with customer {1} [Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung]
- tests with prototype {17} [Santy, David, ZQS, Qualitätsentwicklung]

2.1.1.2 Isolation

2.1.1.2.a dielectric strength {1}

2.1.1.2.a.1 does not isolate conductor electrically against environment {2}

O=7 D=10 Initial State 05.03.2009

- NONE {27}
- NONE {29}

O=7 D=7 Revision State 05.03.2009 [Presentation concept study (in progress) Responsible for component: signal cable: Kasper, Detlef, R

- simulation of transmission (favored concept) under currently known application conditions {9}

2.1.1.2.b long-term stability considering all application conditions {1}

2.1.1.2.b.1 does not protect the conductor from mechanical and chemical influences {2}

O=7 D=10 Initial State 05.03.2009

- NONE {27}
- NONE {29}

2.1.1.2.1 Constructive design of isolation

2.1.1.2.1.a thickness of isolation {1}

2.1.1.2.1.a.1 wrong thickness of isolation chosen {1}

O=3 D=3 Initial State 05.03.2009

- experience from earlier development projects {16}
- tests with prototypes {28}

O=4 D=2 Revision State 05.03.2009 [02.04.2009 (in progress) Santy, David, ZQS, Qualitätsentwicklung]

- tests with prototype {17}

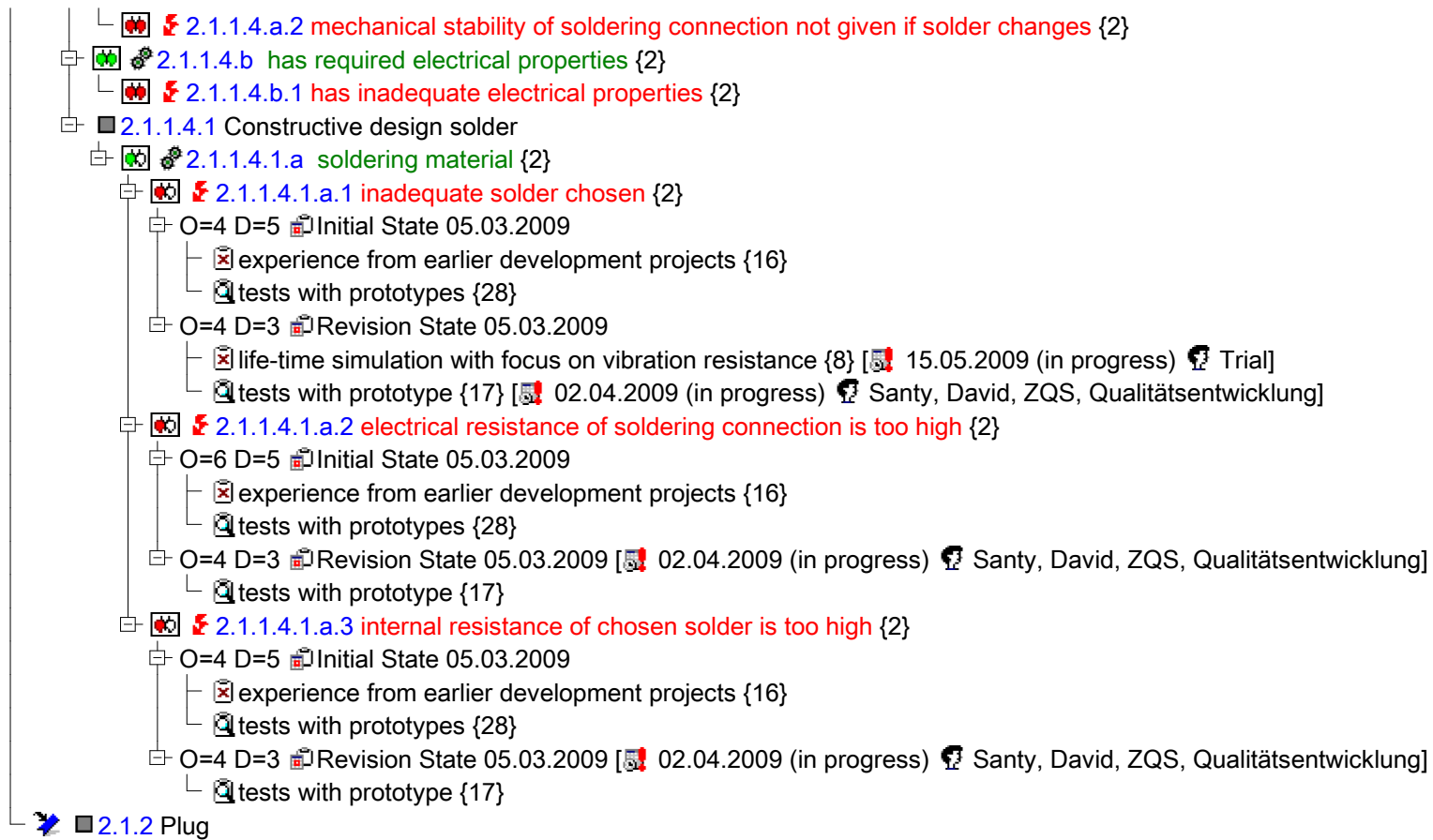
2.1.1.2.1.b isolation material {1}

2.1.1.2.1.b.1 wrong isolation material chosen {1}

O=3 D=5 Initial State 05.03.2009

- experience from earlier development projects {16}
- material test with plate sample {5}





2 CC 2042 - signal cable constructive design	
2 Cruise Control SC 2042	
2.a control propulsion according to specification {2}	S=9 2.a.1 drive control is out of specification {2}
	S=7 2.a.2 drive cannot be controlled {2}
	2.a.3 loss of function during life-time {2}
	2.a.4 cruise control in failure mode {2}
2.b enable emergency shutoff in critical situations {2}	
2.c signal state of operation {2}	
2.d meet legal requirements {2}	S=9 2.d.1 does not comply with requirements regarding electromagnetic radiation {2}
2.e comply with customers assembly requirements {2}	S=5 2.e.1 does not comply with customer requirements regarding replaceability of components {2}
2.1 Electrical connections	
2.1.a transport signals from sensor to control unit without loss {2}	
2.1.b transport signals from control unit to speed control without loss {2}	
2.1.c resist environmental conditions {2}	2.1.c.1 does not resist environmental conditions over life-time {2}
2.1.d transmission properties of complete cable regarding application conditions {1}	2.1.d.1 no signal {2}
	2.1.d.2 signal does not represent the input values correctly {2}
2.1.e properties of cable regarding electromagnetic radiation {1}	2.1.e.1 electromagnetic radiation exceeds specified limit {2}
2.1.f ease of exchange {1}	2.1.f.1 exchange not possible without damaging cable {2}
2.1.1 Cable	
2.1.1.a strength durability : f = ? {1}	
2.1.1.1 conductor	
2.1.1.1.a solderability of conductor {1}	2.1.1.1.a.1 inadequate solderability of conductor {1}

CC 2042 - signal cable constructive design	
2.1.1.1.b transmission of signal through voltage level 32 Ns ±1 {1}	2.1.1.1.b.1 level of signal decreases during transmission within the given application conditions {1}
	O=5 D=10 Initial State 05.03.2009
	simulation under known application conditions {3}
	NONE {29}
2.1.1.1.c transmission of signal through modulation 11 Ns {1}	2.1.1.1.c.1 modulation of signal changes during transmission within the given application conditions {4}
	O=7 D=10 Initial State 05.03.2009
	NONE {27}
	NONE {29}
2.1.1.1.d mechanical stability of conductor 37,2 MPa {1}	2.1.1.1.d.1 has insufficient mechanical stability {4}
	O=7 D=10 Initial State 05.03.2009
	NONE {27}
	NONE {29}
2.1.1.1.1 Construction design of conductor	
2.1.1.1.1.a conductor material {1}	2.1.1.1.1.a.1 inadequate conductor material chosen {1}
	O=3 D=5 Initial State 05.03.2009
	experience from earlier development projects {16}
	material test with plate sample {5}
O=4 D=3 Revision State 05.03.2009	



[^] 	[5] 22.04.2009 (in progress) [👤] Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung]
	[5] 15.05.2009 (in progress) [👤] Trial]
	[5] 02.04.2009 (in progress) [👤] Santy, David, ZQS, Qualitätsentwicklung]
	O=3 D=3
	O=4 D=2 [5] 02.04.2009 (in progress) [👤] Santy, David, ZQS, Qualitätsentwicklung]
	O=4 D=5
	O=3 D=3 [5] 02.04.2009 (in progress)
	[👤] Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung]
	[👤] Santy, David, ZQS, Qualitätsentwicklung]
	O=7 D=10

CC 2042 - signal cable constructive design	
[^] 2.1.1.2.a dielectric strength {1}	O=7 D=7 Revision State 05.03.2009 [Presentation concept study (in progress) Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung]
	simulation of transmission (favored concept) under currently known application conditions {9}
2.1.1.2.b long-term stability considering all application conditions {1}	2.1.1.2.b.1 does not protect the conductor from mechanical and chemical influences {2}
	O=7 D=10 Initial State 05.03.2009
	NONE {27}
	NONE {29}
2.1.1.2.1 Constructive design of isolation	
2.1.1.2.1.a thickness of isolation {1}	2.1.1.2.1.a.1 wrong thickness of isolation chosen {1}
	O=3 D=3 Initial State 05.03.2009
	experience from earlier development projects {16}
	tests with prototypes {28}
	O=4 D=2 Revision State 05.03.2009 [02.04.2009 (in progress) Santy, David, ZQS, Qualitätsentwicklung]
	tests with prototype {17}
2.1.1.2.1.b isolation material {1}	2.1.1.2.1.b.1 wrong isolation material chosen {1}
	O=3 D=5 Initial State 05.03.2009
	experience from earlier development projects {16}
	material test with plate sample {5}
	O=4 D=3 Revision State 05.03.2009 [02.04.2009 (in progress) Santy, David, ZQS, Qualitätsentwicklung]
	tests with prototypes {28}
2.1.1.3 Shielding	
2.1.1.3.a solderability of shielding {1}	2.1.1.3.a.1 inadequate solderability of shielding {1}


CC 2042 - signal cable constructive design	
2.1.1.3.b sensitivity against interferences of signal transmission (both level and modulation) {1}	2.1.1.3.b.1 does not protect the conductor from interfering signals from environment {2}
	O=7 D=10 Initial State 05.03.2009
	NONE {27}
	NONE {29}
O=7 D=7 Revision State 05.03.2009 [Presentation concept study (in progress) Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung]	
simulation of transmission (favored concept) under currently known application conditions {9}	
2.1.1.3.1 Constructive design shielding	
2.1.1.3.1.a required mesh density {1}	2.1.1.3.1.a.1 mesh-density not suitable for signal frequency {1}
	O=4 D=5 Initial State 05.03.2009
	calculation {6}
	tests with prototypes {28}
O=3 D=4 Revision State 05.03.2009 [02.04.2009 (in progress)]	
change of mesh-density according to prototype tests {1} [Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung]	
tests with prototype {17} [Santy, David, ZQS, Qualitätsentwicklung]	
2.1.1.3.1.b shielding material {1}	2.1.1.3.1.b.1 wrong shielding material chosen {1}
	O=3 D=5 Initial State 05.03.2009
	experience from earlier development projects {16}
	material test with plate sample {5}
O=4 D=3 Revision State 05.03.2009	
examination of different coatings in the soldering area {2} [22.04.2009 (in progress) Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung]	
life-time simulation with focus on vibration resistance {8} [15.05.2009 (in progress) Trial]	



CC 2042 - signal cable constructive design	
^[...]	tests with prototypes {28} [5] 02.04.2009 (in progress) Santy, David, ZQS, Qualitätsentwicklung]
2.1.1.4 Soldering connection shielding	
2.1.1.4.a has specified mechanical stability {3}	2.1.1.4.a.1 has insufficient mechanical stability {4}
	2.1.1.4.a.2 mechanical stability of soldering connection not given if solder changes {2}
2.1.1.4.b has required electrical properties {2}	2.1.1.4.b.1 has inadequate electrical properties {2}
2.1.1.4.1 Constructive design solder	
2.1.1.4.1.a soldering material {2}	2.1.1.4.1.a.1 inadequate solder chosen {2}
	O=4 D=5 Initial State 05.03.2009
	experience from earlier development projects {16}
	tests with prototypes {28}
	O=4 D=3 Revision State 05.03.2009
	life-time simulation with focus on vibration resistance {8} [5] 15.05.2009 (in progress) Trial]
	tests with prototype {17} [5] 02.04.2009 (in progress) Santy, David, ZQS, Qualitätsentwicklung]
	2.1.1.4.1.a.2 electrical resistance of soldering connection is too high {2}
	O=6 D=5 Initial State 05.03.2009
	experience from earlier development projects {16}
	tests with prototypes {28}
	O=4 D=3 Revision State 05.03.2009 [5] 02.04.2009 (in progress) Santy, David, ZQS, Qualitätsentwicklung]
	tests with prototype {17}
	2.1.1.4.1.a.3 internal resistance of chosen solder is too high {2}
	O=4 D=5 Initial State 05.03.2009
	experience from earlier development projects {16}
	tests with prototypes {28}

 2 CC 2042 - signal cable constructive design

^
  2.1.1.4.1.a soldering material {2}

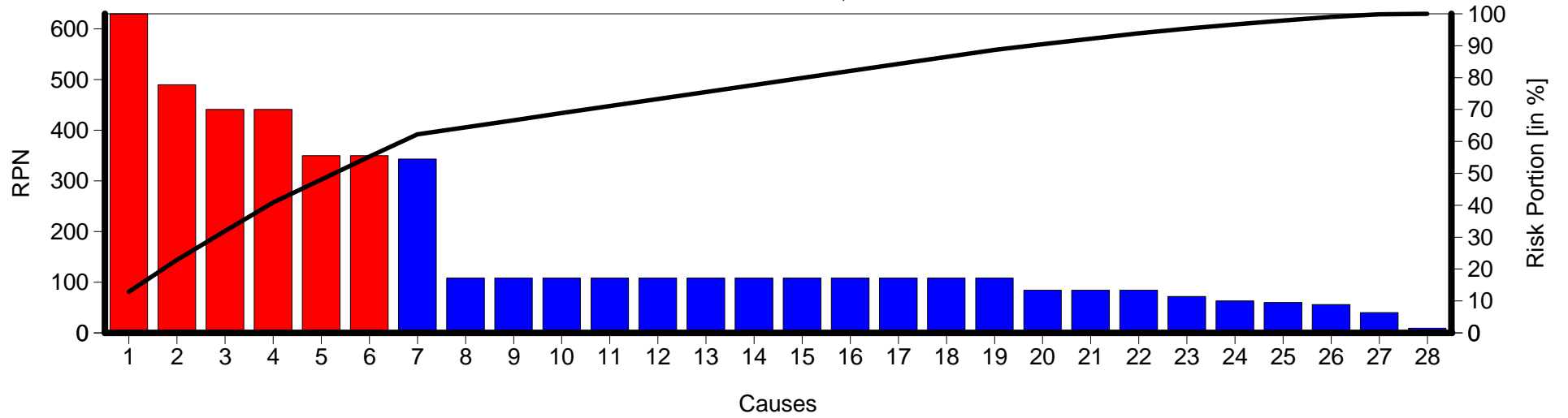
O=4 D=3  Revision State 05.03.2009 [ 02.04.2009 (in progress)  Santy, David, ZQS,
Qualitätsentwicklung]

 tests with prototype {17}

  2.1.2 Plug

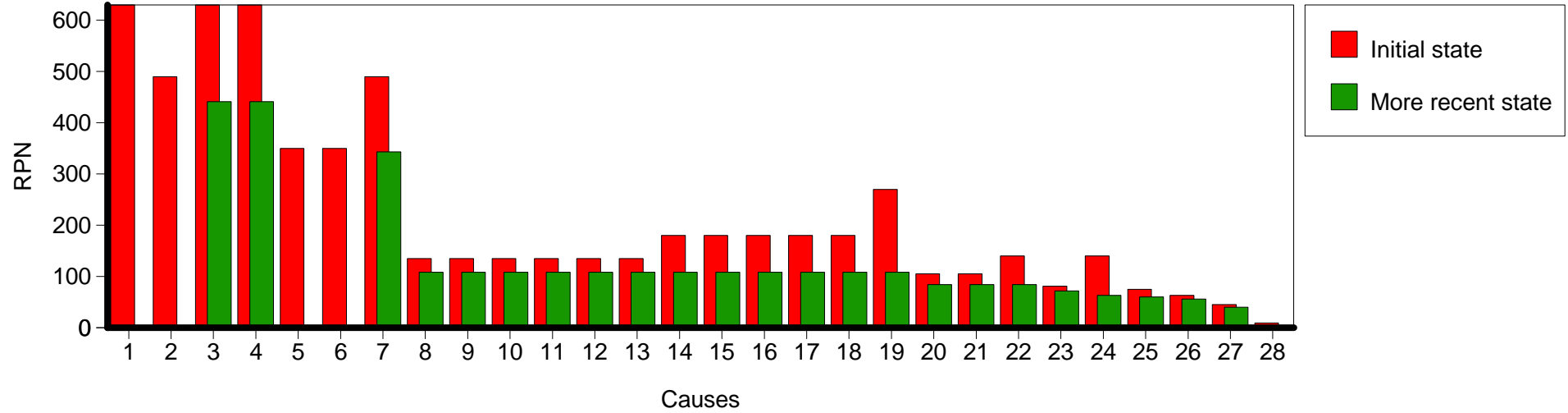
Pareto Analysis

Last revision state; RPN



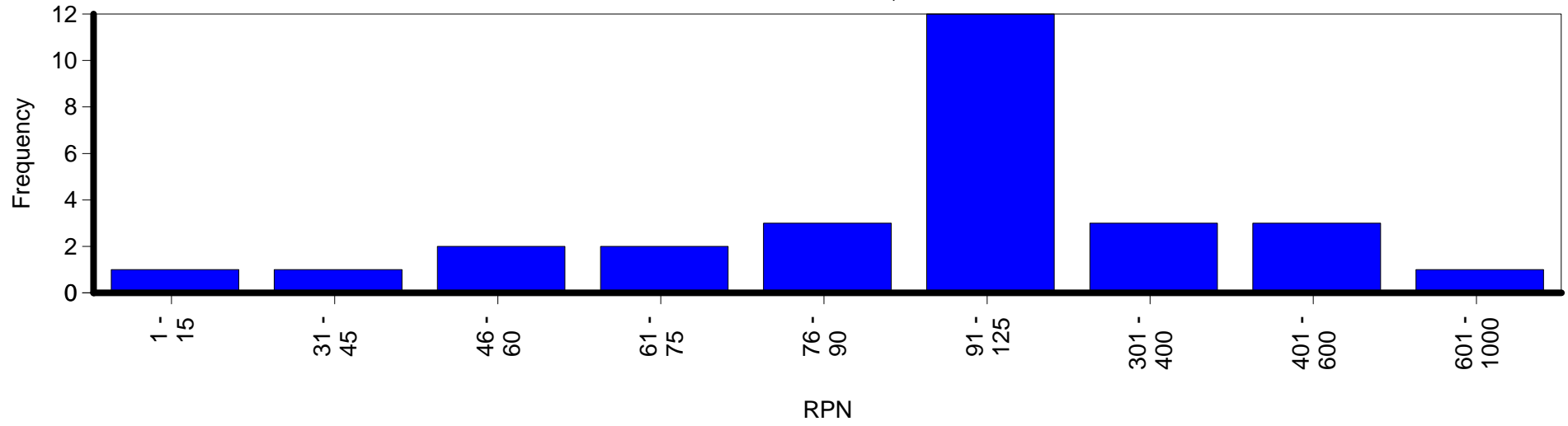
Difference Analysis

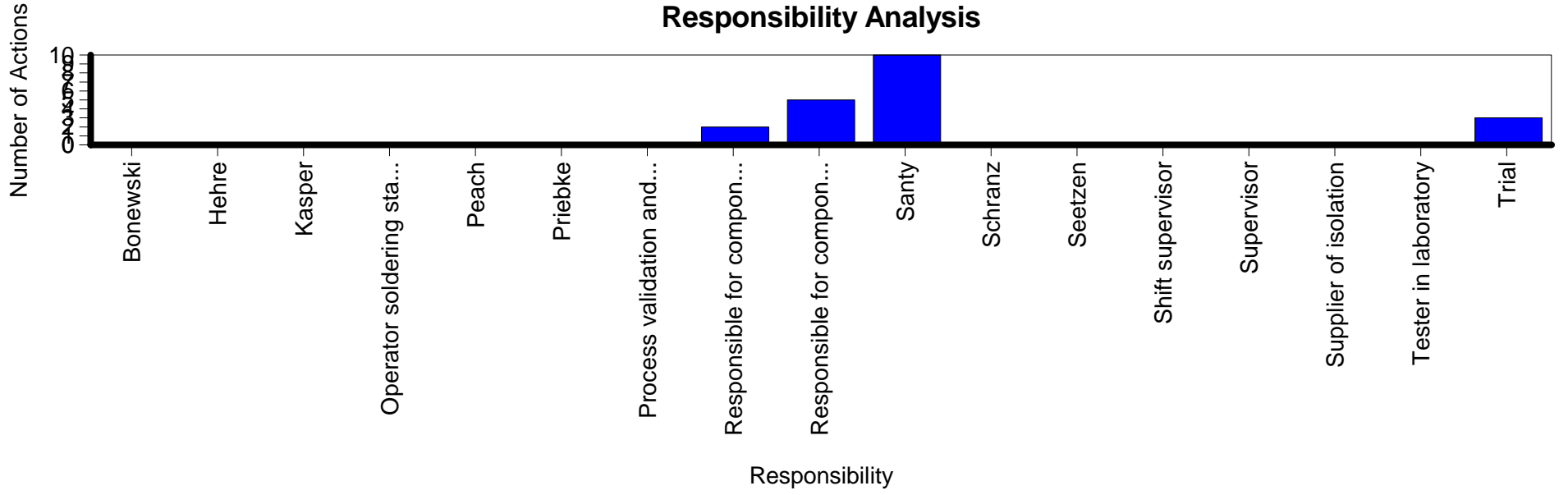
All revision states; RPN; Sort by: New value (after)



Frequency Analysis

Last revision state; RPN





10	Yellow	Red	Red	Red	Red	Red	Red	Red	Red	Red
9	Yellow	Red	Red	Red	Red	Red	Red	Red	Red	Red
8	Yellow	Red	Red	Red	Red	Red	Red	Red	Red	Red
7	Yellow	Red	Red	Red	1	Red	2	Red	3	Red
6	Yellow	Yellow	Red	Red	Red	Red	Red	Red	Red	Red
5	Yellow	Yellow	Red	Red	Red	Red	1	Red	Red	Red
4	Green	Yellow	Yellow	Yellow	2	Yellow	3	Red	11	Red
3	Green	Green	Green	Yellow	Yellow	Yellow	2	Yellow	2	Red
2	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow
1	Green	Green	Green	Green	Green	Green	Green	Green	1	Green
O/S	1	2	3	4	5	6	7	8	9	10

Risk Matrix

Last revision state

Causes

Red Area: 23
 Yellow Area: 4
 Green Area: 1

		F M E A System				Number:	1.2			
						Page:	1/23			
Type/Model/Fabrication/Load: CC 2042 - system		Item Code:		Responsible:		Created: 27.02.2009				
		State:		Company:						
FMEA/System Element: Signal cable (complete)		Item Code:		Responsible:		Created: 05.03.2009				
		State:		Company:		Modified: 07.04.2009				
Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D
System Element: <input type="checkbox"/> Signal cable (complete)										
Function: allow manual assembly {1}										
does not comply with customer requirements regarding assembly force {1}	5 (5)	special tools for assembly required {1}	> force to establish plug connection is too high {1}							
			>> geometry of contact pin and plug contact badly aligned {1}		Initial State: 05.03.2009 calculation {6}	4	tests with prototypes {28}	5	100	
					State: 05.03.2009 coordination regarding geometry of contact pin with developers of plug contact {1} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung	3	tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung	4	(60)	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress
			required force is too high {2}		Initial State: 05.03.2009 NONE {27}	4	NONE {29}	10	200	
			>> snap-in is too tight {1}		Initial State: 05.03.2009 calculation {6}	4	tests with prototypes {28}	7	140	
Function: allow multiple exchange {1}										
does not comply with customer requirements regarding replaceability of components {2}	5 (5)	exchange not possible without damaging cable {2}	> contact force between wire and contact is not sufficient {1}							
			>> cross section too small and/or unsuitable mechanical pin geometry {1}		Initial State: 05.03.2009 FEM simulation {1}	4	tests with prototypes {28}	5	100	
			>> degree of waste is too high {2}		Initial State: 05.03.2009 experience from earlier development projects {16}	4	tests with prototypes {28}	5	100	

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D
^ ! does not comply with customer requirements regarding replaceability of components {2}	5 (5)	^ ! exchange not possible without damaging cable {2}	^ >> ! degree of waste is too high {2}	^	<input type="checkbox"/> State: 05.03.2009 <input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	<input type="checkbox"/> tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung	3	(60)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress
					<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> experience from earlier development projects {16}	4	<input type="checkbox"/> tests with prototypes {28}	5	100	
			>> ! degree of waste is too high {2}		<input type="checkbox"/> State: 05.03.2009 <input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	<input type="checkbox"/> tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung	3	(60)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress
					<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	7	<input type="checkbox"/> NONE {29}	10	350	
			! does not protect the conductor from mechanical and chemical influences {2}		<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	7	<input type="checkbox"/> NONE {29}	10	350	
			> ! has insufficient mechanical stability {4}		<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	7	<input type="checkbox"/> NONE {29}	10	350	
			! has insufficient mechanical stability {4}		<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	7	<input type="checkbox"/> NONE {29}	10	350	
			! holding force is too low {2}		<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	7	<input type="checkbox"/> NONE {29}	10	350	
			>> ! inadequate base material for contact pin chosen {1}		<input type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> experience from earlier development projects {16}	3	<input type="checkbox"/> material test with plate sample {5}	6	90	
			<input type="checkbox"/> examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress		<input type="checkbox"/> life-time simulation with focus on vibration resistance {8}					RPN Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 15.05.2009 - 25.06.2009 in progress

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D				
^ ! does not comply with customer requirements regarding replaceability of components {2}	5 (5)	^ ! exchange not possible without damaging cable {2}	^ >> ! inadequate base material for contact pin chosen {1}	^	Trial 25.06.2009 in progress				^ RPN	^ 15.05.2009 - [...]				
					Initial State: 05.03.2009 ! experience from earlier development projects {16}						3	! material test with plate sample {5}	6	90
			State: 05.03.2009 ! examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress									RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 15.05.2009 - 25.06.2009 in progress	
			! life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress											
			>> ! inadequate coating material for contact pin chosen {1}		Initial State: 05.03.2009 ! NONE {27}						5	! NONE {29}	7	175
State: 05.03.2009 ! coordination regarding coating with manufacturer of pins and socket {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress						3	! test different coatings {2} Priebke, Claas, D-PT, Entwicklung 22.04.2009 in progress	4	(60)	Priebke, Claas, D-PT, Entwicklung, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 22.04.2009 - 25.06.2009 in progress				
! examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress							! test with coated prototype {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress							
! life-time simulation with focus on vibration resistance {8}														

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D								
^ ! does not comply with customer requirements regarding replaceability of components {2}	5 (5)	^ ! exchange not possible without damaging cable {2}	^ >> ! inadequate coating material for contact pin chosen {1}	^ Initial State: 05.03.2009 NONE {27}	Trial 25.06.2009 in progress	3	^ 22.04.2009 in progress	4	^ (60)	^ 22.04.2009 - [...]								
											>> ! inadequate coating material for contact pin chosen {1}	State: 05.03.2009 coordination regarding coating with manufacturer of pins and socket {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress	3 test different coatings {2} Priebke, Claas, D-PT, Entwicklung 22.04.2009 in progress	4	(60)	Priebke, Claas, D-PT, Entwicklung, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 22.04.2009 - 25.06.2009 in progress		
																	examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress	test with coated prototype {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress
>> ! inadequate conductor material chosen {1}	Initial State: 05.03.2009 experience from earlier development projects {16}	3	material test with plate sample {5}	5	75													
			State: 05.03.2009 examination of different coatings in the soldering area {2} Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung 22.04.2009 in progress	4	tests with prototypes {28} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	3	(60)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung, Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 15.05.2009 in progress										

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D		
^ ! does not comply with customer requirements regarding replaceability of components {2}	5 (5)	^ ! exchange not possible without damaging cable {2}	^ >> ! inadequate conductor material chosen {1}	^ >> ! inadequate conductor material chosen {1}	<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 15.05.2009 in progress	4	^ 02.04.2009 in progress	3	^ (60)	^ 02.04.2009 - 15.05.2009 in progress		
			<input checked="" type="checkbox"/> examination of different coatings in the soldering area {2} Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung 22.04.2009 in progress		<input checked="" type="checkbox"/> tests with prototypes {28} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress						3	(60)
			>> ! inadequate geometry of clamping area chosen {1}	>> ! inadequate geometry to clamp wire to contact pin chosen {1}	<input checked="" type="checkbox"/> NONE {27}	<input checked="" type="checkbox"/> tests with prototypes {28}	8	4	160			
			<input checked="" type="checkbox"/> change geometry of clamping area after tests with prototype {1}						RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 12.05.2009 finished		
			<input checked="" type="checkbox"/> tests with prototype {17}			3	RPN	Santy, David, ZQS, Qualitätsentwicklung 12.05.2009 in progress				

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D								
^ ! does not comply with customer requirements regarding replaceability of components {2}	5 (5)	^ ! exchange not possible without damaging cable {2}	^ >> ! inadequate geometry to clamp wire to contact pin chosen {1}	^	<input checked="" type="checkbox"/> calculation {6}	4	<input checked="" type="checkbox"/> tests with prototypes {28}	7	140									
					<input checked="" type="checkbox"/> State: 05.03.2009													
					<input checked="" type="checkbox"/> changing design of clamp after tests with prototype at customer {1}	3		7	105	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 20.02.2009 finished								
					<input checked="" type="checkbox"/> State: 05.03.2009													
						3	<input checked="" type="checkbox"/> tests with prototype {17}	4	(60)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress								
					<input checked="" type="checkbox"/> State: 05.03.2009													
			>> ! inadequate solder chosen {2}	^	^	>> ! inadequate solder chosen {2}	^	<input checked="" type="checkbox"/> Initial State: 05.03.2009										
								<input checked="" type="checkbox"/> experience from earlier development projects {16}	4	<input checked="" type="checkbox"/> tests with prototypes {28}	5	100						
								<input checked="" type="checkbox"/> State: 05.03.2009										
								<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	<input checked="" type="checkbox"/> tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	3	(60)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress					
								<input checked="" type="checkbox"/> State: 05.03.2009										
								<input checked="" type="checkbox"/> State: 05.03.2009										
> ! mechanical stability of soldering connection not given if solder changes {2}	^	^	> ! mechanical stability of soldering connection not given if solder changes {2}	^	<input checked="" type="checkbox"/> Initial State: 05.03.2009													
					<input checked="" type="checkbox"/> experience from earlier development projects {16}	4	<input checked="" type="checkbox"/> tests with prototypes {28}	5	100									
					<input checked="" type="checkbox"/> State: 05.03.2009													
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	<input checked="" type="checkbox"/> tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	3	(60)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress								
					<input checked="" type="checkbox"/> State: 05.03.2009													
					<input checked="" type="checkbox"/> State: 05.03.2009													
! plug is being damaged during disassembly {1}	^	^	! plug is being damaged during disassembly {1}	^	<input checked="" type="checkbox"/> Initial State: 05.03.2009													
					<input checked="" type="checkbox"/> NONE {27}	4	<input checked="" type="checkbox"/> NONE {29}	10	200									

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D
[^] ⚠ does not comply with customer requirements regarding replaceability of components {2}	5 (5)	[^] ⚠ exchange not possible without damaging cable {2}	> ⚠ separation of plug and socket only possible with increased force leading to potential damage {1}							
			>> ⚠ snap-in is too tight {1}		Initial State: 05.03.2009 ⚠ calculation {6}	4	⚠ tests with prototypes {28}	7	140	
			>> ⚠ unsuitable material for plug body chosen {1}		Initial State: 05.03.2009 ⚠ experience from earlier development projects {16}	3	⚠ material test with plate sample {5}	3	45	
			>> ⚠ unsuitable material for plug body chosen {1}		Initial State: 05.03.2009 ⚠ experience from earlier development projects {16}	3	⚠ material test with plate sample {5}	3	45	
Function: ⚠ meet specifications for electromagnetic radiation {1}										
⚠ does not comply with requirements regarding electromagnetic radiation {2}	9 (9)	⚠ electromagnetic radiation exceeds specified limit {2}	⚠ specified signal level drops significantly below critical limit {2}							
						1		1	9	
Function: ⚠ resist environmental conditions {2}										
⚠ loss of function during life-time {2}	9 (9)	⚠ does not resist environmental conditions over life-time {2}	> ⚠ contact pin has inadequate solderability {1}							
			>> ⚠ degree of waste is too high {2}		Initial State: 05.03.2009 ⚠ experience from earlier development projects {16}	4	⚠ tests with prototypes {28}	5	180	
			>> ⚠ inadequate base material for contact pin chosen {1}		State: 05.03.2009 ⚠ life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	⚠ tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung	3	(108)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress
					Initial State: 05.03.2009 ⚠ experience from earlier development projects {16}	3	⚠ material test with plate sample {5}	6	162	
									RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial
					⚠ examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung					

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D
^ ! loss of function during life-time {2}	9 (9)	^ ! does not resist environmental conditions over life-time {2}	^ >> ! inadequate base material for contact pin chosen {1}	^	15.05.2009 in progress				^ RPN	15.05.2009 - 25.06.2009 in progress
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress					
			>> ! inadequate coating material for contact pin chosen {1}		<input checked="" type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	5	<input checked="" type="checkbox"/> NONE {29}	7	315	
			>> ! inadequate conductor material chosen {1}		<input checked="" type="checkbox"/> State: 05.03.2009 <input checked="" type="checkbox"/> coordination regarding coating with manufacturer of pins and socket {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress	3	<input checked="" type="checkbox"/> test different coatings {2} Priebke, Claas, D-PT, Entwicklung 22.04.2009 in progress	4	(108)	Priebke, Claas, D-PT, Entwicklung, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 22.04.2009 - 25.06.2009 in progress
					<input checked="" type="checkbox"/> examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress	3	<input checked="" type="checkbox"/> test with coated prototype {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress			
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress					
					<input checked="" type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> experience from earlier development projects {16}	3	<input checked="" type="checkbox"/> material test with plate sample {5}	5	135	
					<input checked="" type="checkbox"/> State: 05.03.2009					

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D			
^ ! loss of function during life-time {2}	9 (9)	^ ! does not resist environmental conditions over life-time {2}	^ >> ! inadequate conductor material chosen {1}	^	<input checked="" type="checkbox"/> examination of different coatings in the soldering area {2} Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung 22.04.2009 in progress	4	<input checked="" type="checkbox"/> tests with prototypes {28} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	3	(108)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung, Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 15.05.2009 in progress			
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 15.05.2009 in progress								
			>> ! inadequate solder chosen {2}				<input checked="" type="checkbox"/> Initial State: 05.03.2009						
							<input checked="" type="checkbox"/> experience from earlier development projects {16}						
							<input checked="" type="checkbox"/> State: 05.03.2009						
							<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress						
				<input checked="" type="checkbox"/> tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress									
				> ! inadequate solderability of conductor {1}									
				> ! mechanical stability of soldering connection not given if solder changes {2}									
				! soldering connection breaks during life-time {2}									
Function: ! transport signals from control unit to speed control without loss {2}													
Function: ! transport signals from receiver to control unit without loss {1}													
! drive cannot be controlled {2}	7 (7)	! no signal {2}	> ! cable detaches from plug {1}										
					>> ! chosen material not suitable for increased soldering temperature {1}				<input checked="" type="checkbox"/> Initial State: 05.03.2009				
									<input checked="" type="checkbox"/> NONE {27}			RPN	
				<input checked="" type="checkbox"/> State: 05.03.2009									

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D			
^ ! drive cannot be controlled {2}	7 (7)	^ ^ ! no signal {2}	^ >> ! chosen material not suitable for increased soldering temperature {1}	^	<input checked="" type="checkbox"/> examine possibilities to isolate plug body from temperature during soldering process considering spatial requirements {1} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress				RPN Process validation and qualification, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 15.05.2009 - 22.09.2009 in progress				
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress								
					<input checked="" type="checkbox"/> soldering test to determine safe process parameters {2} Process validation and qualification 22.09.2009 in progress								
					<input checked="" type="checkbox"/> use a more temperature resistant material {1} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress								
			>> ! cross section too small and/or unsuitable mechanical pin geometry {1}		<input checked="" type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> FEM simulation {1}	4	<input checked="" type="checkbox"/> tests with prototypes {28}	5	140				
			>> ! degree of waste is too high {2}		<input checked="" type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> experience from earlier development projects {16}	4	<input checked="" type="checkbox"/> tests with prototypes {28}	5	140				
					<input checked="" type="checkbox"/> State: 05.03.2009								

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D		
^ ! drive cannot be controlled {2}	7 (7)	^ no signal {2}	^ >> ! degree of waste is too high {2}	^	☒ life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	☒ tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	3	(84)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress		
					☒ Initial State: 05.03.2009							
			>> ! degree of waste is too high {2}		☒ experience from earlier development projects {16}	4	☒ tests with prototypes {28}	5	140			
				☒ State: 05.03.2009								
			> ! does not appropriately seal towards cable isolation {1}		☒ life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress	4	☒ tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	3	(84)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 - 25.06.2009 in progress		
				☒ State: 05.03.2009								
			> ! does not isolate contact pins from one another {1}									
				☒ Initial State: 05.03.2009								
			! does not protect the conductor from mechanical and chemical influences {2}		☒ NONE {27}	7	☒ NONE {29}	10	490			
				☒ State: 05.03.2009								
>> ! electrical resistance of soldering connection is too high {2}		☒ Initial State: 05.03.2009		☒ experience from earlier development projects {16}	6	☒ tests with prototypes {28}	5	210				
			4	☒ tests with prototype {17}	3	(84)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress					
>> ! geometrical fixation design may not allow increased soldering temperature {1}		☒ Initial State: 05.03.2009										
		☒ NONE {27}								RPN		
☒ State: 05.03.2009												
		☒ assembly tests after changing geometry {1}		Process validation and qualification 22.09.2009 in progress					RPN	Process validation and qualification, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial		

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D
^ ! drive cannot be controlled {2}	7 (7)	^ ! no signal {2}	^ >> ! geometrical fixation design may not allow increased soldering temperature {1}	^	<input checked="" type="checkbox"/> change fixation geometry concerning soldering temperature {1} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress				^ RPN	15.05.2009 - 22.09.2009 in progress
					<input checked="" type="checkbox"/> life-time simulation with focus on effects of vibration after changing geometry {1} Trial 25.06.2009 in progress					
					<input checked="" type="checkbox"/> soldering test to determine safe process parameters {2} Process validation and qualification 22.09.2009 in progress					
			>> ! geometry of contact pin and plug contact badly aligned {1}		<input checked="" type="checkbox"/> calculation {6}	4	<input checked="" type="checkbox"/> tests with prototypes {28}	5	140	
			> ! has inadequate electrical properties {2}		<input checked="" type="checkbox"/> coordination regarding geometry of contact pin with developers of plug contact {1} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung	3	<input checked="" type="checkbox"/> tests with prototype {17} Santy, David, ZQS, Qualitätsentwicklung	4	(84)	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress
> ! has insufficient mechanical stability {4}		>> ! inadequate base material for contact pin chosen {1}		<input checked="" type="checkbox"/> experience from earlier development projects {16}	3	<input checked="" type="checkbox"/> material test with plate sample {5}	6	126		

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D
^ ! drive cannot be controlled {2}	7 (7)	^ ^ no signal {2}	^ >> ! inadequate base material for contact pin chosen {1}	^	<input checked="" type="checkbox"/> examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress				RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 15.05.2009 - 25.06.2009 in progress
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress					
			>> ! inadequate coating material for contact pin chosen {1}	<input checked="" type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	5	<input checked="" type="checkbox"/> NONE {29}	7	245		
			>> ! inadequate geometry for shielding of plug {1}	<input checked="" type="checkbox"/> State: 05.03.2009	<input checked="" type="checkbox"/> coordination regarding coating with manufacturer of pins and socket {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress	3	<input checked="" type="checkbox"/> test different coatings {2} Priebke, Claas, D-PT, Entwicklung 22.04.2009 in progress	4	(84)	Priebke, Claas, D-PT, Entwicklung, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 22.04.2009 - 25.06.2009 in progress
				<input checked="" type="checkbox"/> examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress			<input checked="" type="checkbox"/> test with coated prototype {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress			
				<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress						
				<input checked="" type="checkbox"/> Initial State: 05.03.2009 <input checked="" type="checkbox"/> NONE {27}	5	<input checked="" type="checkbox"/> tests with prototypes {28}	7	245		
				<input checked="" type="checkbox"/> State: 05.03.2009						

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D							
^ ! drive cannot be controlled {2}	7 (7)	^ ^ no signal {2}	^ >> inadequate geometry for shielding of plug {1}	^	<input checked="" type="checkbox"/> change shielding of plug after tests {2}	3		7	147	Seetzen, Gudrun, D-PT, Entwicklung 20.02.2009 finished							
					<input type="checkbox"/> State: 05.03.2009												
						3	<input type="checkbox"/> tests with prototype {17}	4	(84)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress							
					<input type="checkbox"/> Initial State: 05.03.2009												
			>> inadequate geometry for strain-relief of cable chosen {1}					<input checked="" type="checkbox"/> reuse geometry from previous/similar products {3}	4	<input type="checkbox"/> tests with prototypes {28}	4	112					
								<input type="checkbox"/> Initial State: 05.03.2009									
								<input checked="" type="checkbox"/> NONE {27}	8	<input type="checkbox"/> tests with prototypes {28}	4	224					
								<input type="checkbox"/> State: 05.03.2009									
			>> inadequate geometry of clamping area chosen {1}					<input checked="" type="checkbox"/> change geometry of clamping area after tests with prototype {1}	4			RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 12.05.2009 finished				
								<input type="checkbox"/> State: 05.03.2009									
										<input type="checkbox"/> tests with prototype {17}	3	RPN	Santy, David, ZQS, Qualitätsentwicklung 12.05.2009 in progress				
								<input type="checkbox"/> Initial State: 05.03.2009									
>> inadequate geometry of clamping area chosen {1}					<input checked="" type="checkbox"/> NONE {27}	8	<input type="checkbox"/> tests with prototypes {28}	4	224								
					<input type="checkbox"/> State: 05.03.2009												
					<input checked="" type="checkbox"/> change geometry of clamping area after tests with prototype {1}	4			RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 12.05.2009 finished							
					<input type="checkbox"/> State: 05.03.2009												
						<input type="checkbox"/> tests with prototype {17}	3	RPN	Santy, David, ZQS, Qualitätsentwicklung								

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D					
^ ! drive cannot be controlled {2}	7 (7)	^ ^ no signal {2}	^ [...] >> ! inadequate geometry to clamp wire to contact pin chosen {1}	^	Initial State: 05.03.2009							12.05.2009 in progress			
					calculation {6}	4	tests with prototypes {28}	7	196						
					State: 05.03.2009										
					A changing design of clamp after tests with prototype at customer {1}	3		7	147	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 20.02.2009 finished					
					State: 05.03.2009										
						3	tests with prototype {17}	4	(84)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress					
			>> ! inadequate geometry to clamp wire to contact pin chosen {1}	^	^	>> ! inadequate geometry to clamp wire to contact pin chosen {1}	^	Initial State: 05.03.2009							12.05.2009 in progress
								calculation {6}	4	tests with prototypes {28}	7	196			
								State: 05.03.2009							
								A changing design of clamp after tests with prototype at customer {1}	3		7	147	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 20.02.2009 finished		
								State: 05.03.2009							
									3	tests with prototype {17}	4	(84)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress		
>> ! inadequate geometry to connect isolation chosen {1}	^	^	>> ! inadequate geometry to connect isolation chosen {1}	^	Initial State: 05.03.2009							12.05.2009 in progress			
					reuse geometry from previous/similar products {3}	4	tests with prototypes {28}	4	112						
					State: 05.03.2009										
>> ! inadequate geometry to connect shielding chosen {1}	^	^	>> ! inadequate geometry to connect shielding chosen {1}	^	Initial State: 05.03.2009							12.05.2009 in progress			
					NONE {27}	6	tests with prototypes {28}	4	168						
					State: 05.03.2009										

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D								
^ ! drive cannot be controlled {2}	7 (7)	^ ^ no signal {2}	^ >> inadequate geometry to connect shielding chosen {1}	^	<input checked="" type="checkbox"/> change shielding of plug after tests {2}	3		7	147	Seetzen, Gudrun, D-PT, Entwicklung 20.02.2009 finished								
					<input type="checkbox"/> State: 05.03.2009													
			>> inadequate geometry to fixate contact pins {1}					3	<input type="checkbox"/> tests with prototype {17}	3	(63)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress						
								<input type="checkbox"/> Initial State: 05.03.2009										
			>> inadequate solder chosen {2}					4	<input checked="" type="checkbox"/> reuse geometry from previous/similar products {3}	4	112							
								<input type="checkbox"/> Initial State: 05.03.2009										
			>> inadequate solder chosen {2}					4	<input checked="" type="checkbox"/> experience from earlier development projects {16}	5	140							
								<input type="checkbox"/> State: 05.03.2009										
								4	<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8}	4	<input type="checkbox"/> tests with prototype {17}	3	(84)	Santy, David, ZQS, Qualitätsentwicklung, Trial 25.06.2009 in progress				
			>> internal resistance of chosen solder is too high {2}					4	<input checked="" type="checkbox"/> experience from earlier development projects {16}	5	140							
								<input type="checkbox"/> State: 05.03.2009										
			>> internal resistance of chosen solder is too high {2}					4	<input type="checkbox"/> tests with prototype {17}	3	(84)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress						
<input type="checkbox"/> State: 05.03.2009																		
> isolation detaches from plug {1}																		
loss of signal level through the interface between cable and plug {2}					<input type="checkbox"/> Initial State: 05.03.2009													
					5	<input checked="" type="checkbox"/> simulation under known application conditions {3}	5	<input type="checkbox"/> NONE {29}	10	350								
>> mechanical layout of contacts does not correspond with electrical layout {1}					<input type="checkbox"/> Initial State: 05.03.2009													
					4	<input checked="" type="checkbox"/> verify measurements in CAD layout {2}	4	<input type="checkbox"/> tests with prototypes {28}	4	112								

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D	
^ ! drive cannot be controlled {2}	7 (7)	^ no signal {2}	! no or no safe electrical connection between cable and plug {2}		Initial State: 05.03.2009 NONE {27}	5	NONE {29}	10	350		
			> ! plug-connection unintentionally falls apart {1}								
			> ! reduced fixation after soldering with increased temperature {1}								
			> ! shielding detaches from plug {1}								
			> ! shielding is interrupted between plug and socket {1}								
			> ! single wires detach from plug {1}								
			>> ! snap-in is too weak {1}		Initial State: 05.03.2009 calculation {6}	4	tests with prototypes {28}	7	196		
					State: 05.03.2009 ! changing snap-in after tests with prototype at customer {1}	3		7	147	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 20.02.2009 finished	
					State: 05.03.2009	3	tests with prototype {17}	4	(84)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	
			> ! insufficient mechanical fixation of contact pins {1}								
>> ! unsuitable material for plug body chosen {1}		Initial State: 05.03.2009 experience from earlier development projects {16}	3	material test with plate sample {5}	3	63					
>> ! unsuitable material for plug body chosen {1}		Initial State: 05.03.2009 experience from earlier development projects {16}	3	material test with plate sample {5}	3	63					
>> ! unsuitable material for shielding of plug chosen {1}		Initial State: 05.03.2009 experience from earlier development projects {16}	3	tests with prototypes {28}	6	126					
! drive control is out of specification {2}	9 (9)	! signal does not represent the input values correctly {2}	> ! ambiguous pluggable connection {1}								

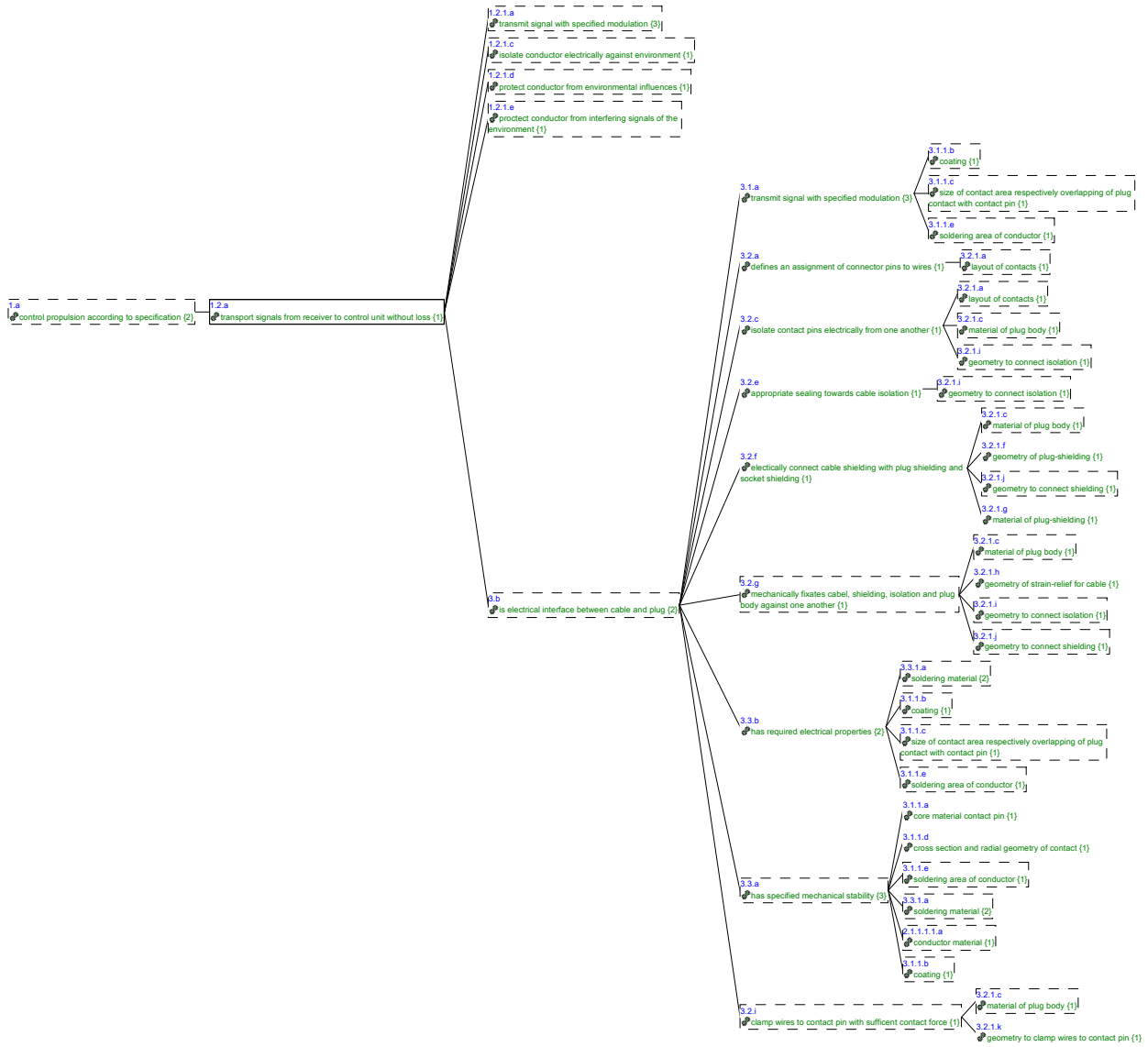
Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D		
^ ! drive control is out of specification {2}	9 (9)	^ ! signal does not represent the input values correctly {2}	>> ! coating material not suitable for core material of pin and plug contact {1}		Initial State: 05.03.2009							
					! experience from earlier development projects {16}	7	! NONE {29}	10	630			
						State: 05.03.2009						
			! coordination regarding coating with manufacturer of pins and socket {2}	3	! test different coatings {2}	4	(108)	Priebke, Claas, D-PT, Entwicklung, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress				
			Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung		! test with coated prototype {2}							
						Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung						
			>> ! coding of plug is missing or does not fit into socket {1}			Initial State: 05.03.2009						
						! verify measurements in CAD layout {2}	4	! tests with prototypes {28}	4	144		
			> ! contact force between wire and contact is not sufficient {1}									
			>> ! degree of waste is too high {2}			Initial State: 05.03.2009						
			! experience from earlier development projects {16}	4	! tests with prototypes {28}	5	180					
			State: 05.03.2009									
			! life-time simulation with focus on vibration resistance {8}	4	! tests with prototype {17}	3	(108)	Santy, David, ZQS, Qualitätsentwicklung, Trial 02.04.2009 in progress				
			Trial 25.06.2009 in progress		Santy, David, ZQS, Qualitätsentwicklung			02.04.2009 - 25.06.2009 in progress				
			! distortion of signal through the interface between cable and plug {2}		Initial State: 05.03.2009							
					! NONE {27}	7	! NONE {29}	10	630			
					State: 05.03.2009							
						7	! simulation of transmission (favored concept) under currently known application conditions {9}	7	(441)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung 22.09.2009 in progress		
			> ! does not appropriately seal towards cable isolation {1}									

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D		
^ ! drive control is out of specification {2}	9 (9)	^ ! signal does not represent the input values correctly {2}	! does not isolate conductor electrically against environment {2}		Initial State: 05.03.2009							
					! NONE {27}	7	! NONE {29}	10	630			
					State: 05.03.2009							
						7	! simulation of transmission (favored concept) under currently known application conditions {9}	7	(441)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung Presentation concept study in progress		
					> ! does not isolate contact pins from one another {1}							
			! does not protect the conductor from interfering signals from environment {2}				Initial State: 05.03.2009					
							! NONE {27}	7	! NONE {29}	10	630	
							State: 05.03.2009					
								7	! simulation of transmission (favored concept) under currently known application conditions {9}	7	(441)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung Presentation concept study in progress
			>> ! geometry of contact pin and plug contact badly aligned {1}				Initial State: 05.03.2009					
							! calculation {6}	4	! tests with prototypes {28}	5	180	
							State: 05.03.2009					
! coordination regarding geometry of contact pin with developers of plug contact {1}	3	! tests with prototype {17}					4	(108)	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress			
>> ! inadequate coating material for contact pin chosen {1}				Initial State: 05.03.2009								
				! NONE {27}	5	! NONE {29}	7	315				
				State: 05.03.2009								

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D			
^ ! drive control is out of specification {2}	9 (9)	^ ! signal does not represent the input values correctly {2}	^ >> ! inadequate coating material for contact pin chosen {1}	^	<input checked="" type="checkbox"/> coordination regarding coating with manufacturer of pins and socket {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress	3	<input checked="" type="checkbox"/> test different coatings {2} Priebke, Claas, D-PT, Entwicklung 22.04.2009 in progress	4	(108)	Priebke, Claas, D-PT, Entwicklung, Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung, Trial 22.04.2009 - 25.06.2009 in progress			
					<input checked="" type="checkbox"/> examination of potential coatings {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 15.05.2009 in progress		<input checked="" type="checkbox"/> test with coated prototype {2} Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 22.04.2009 in progress						
					<input checked="" type="checkbox"/> life-time simulation with focus on vibration resistance {8} Trial 25.06.2009 in progress								
			>> ! inadequate geometry for shielding of plug {1}				<input checked="" type="checkbox"/> Initial State: 05.03.2009						
							<input checked="" type="checkbox"/> NONE {27}	5	<input checked="" type="checkbox"/> tests with prototypes {28}	7	315		
							<input checked="" type="checkbox"/> State: 05.03.2009						
			>> ! inadequate geometry for strain-relief of cable chosen {1}				<input checked="" type="checkbox"/> change shielding of plug after tests {2}	3			7	189	Seetzen, Gudrun, D-PT, Entwicklung 20.02.2009 finished
							<input checked="" type="checkbox"/> State: 05.03.2009						
								3	<input checked="" type="checkbox"/> tests with prototype {17}	4	(108)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress	
			>> ! inadequate geometry of clamping area chosen {1}				<input checked="" type="checkbox"/> Initial State: 05.03.2009						
<input checked="" type="checkbox"/> reuse geometry from previous/similar products {3}	4	<input checked="" type="checkbox"/> tests with prototypes {28}					4	144					
				<input checked="" type="checkbox"/> Initial State: 05.03.2009									
				<input checked="" type="checkbox"/> NONE {27}	8	<input checked="" type="checkbox"/> tests with prototypes {28}	4	288					

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D				
^ ! drive control is out of specification {2}	9 (9)	^ ! signal does not represent the input values correctly {2}	^ >> ! inadequate geometry of clamping area chosen {1}	^	State: 05.03.2009							RPN	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 12.05.2009 finished	
					! change geometry of clamping area after tests with prototype {1}	4								
					State: 05.03.2009							RPN	Santy, David, ZQS, Qualitätsentwicklung 12.05.2009 in progress	
						! tests with prototype {17}		3						
					Initial State: 05.03.2009							RPN	252	
					! calculation {6}	4	! tests with prototypes {28}		7					
			State: 05.03.2009							RPN	189	Responsible for component: plug: Schranz, Franz, D-PT, Entwicklung 20.02.2009 finished		
			! changing design of clamp after tests with prototype at customer {1}	3			7							
			State: 05.03.2009							RPN	(108)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress		
				3	! tests with prototype {17}		4							
			Initial State: 05.03.2009							RPN	144			
			! reuse geometry from previous/similar products {3}	4	! tests with prototypes {28}		4							
			Initial State: 05.03.2009							RPN	216			
			! NONE {27}	6	! tests with prototypes {28}		4							
State: 05.03.2009							RPN	189	Seetzen, Gudrun, D-PT, Entwicklung 20.02.2009 finished					
! change shielding of plug after tests {2}	3			7										
State: 05.03.2009														
>> ! inadequate geometry to clamp wire to contact pin chosen {1}														
>> ! inadequate geometry to connect isolation chosen {1}														
>> ! inadequate geometry to connect shielding chosen {1}														

Effects	S	Failure Modes	Causes	C	Preventive Action	O	Detection Action	D	RPN	R/D		
^ ! drive control is out of specification {2}	9 (9)	^ ! signal does not represent the input values correctly {2}	^ >> ! inadequate geometry to connect shielding chosen {1}	^		3	! tests with prototype {17}	3	(81)	Santy, David, ZQS, Qualitätsentwicklung 02.04.2009 in progress		
			>> ! inadequate solder chosen {2}		Initial State: 05.03.2009							
					! experience from earlier development projects {16}	4	! tests with prototypes {28}	5	180			
				State: 05.03.2009								
				! life-time simulation with focus on vibration resistance {8}	4	! tests with prototype {17}	3	(108)	Santy, David, ZQS, Qualitätsentwicklung, Trial 25.06.2009 in progress	02.04.2009 in progress	02.04.2009 - 25.06.2009 in progress	
			> ! incomplete assignment of wires to contact pins {1}									
			> ! isolation detaches from plug {1}									
			>> ! mechanical layout of contacts does not correspond with electrical layout {1}		Initial State: 05.03.2009							
				! verify measurements in CAD layout {2}	4	! tests with prototypes {28}	4	144				
				State: 17.01.2006								
			> ! modulation of signal changes during transmission within the given application conditions {4}		Initial State: 17.01.2006							
	NONE {27}	7	! NONE {29}	10	630							
	State: 17.01.2006											
	! simulation of transmission (favored concept) under currently known application conditions {9}	7	(441)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung 22.09.2009 in progress								
! modulation of signal changes during transmission within the given application conditions {4}		Initial State: 05.03.2009										
	NONE {27}	7	! NONE {29}	10	630							
	State: 05.03.2009											
	! simulation of transmission (favored concept) under currently known application conditions {9}	7	(441)	Responsible for component: signal cable: Kasper, Detlef, RD-S, Systementwicklung								

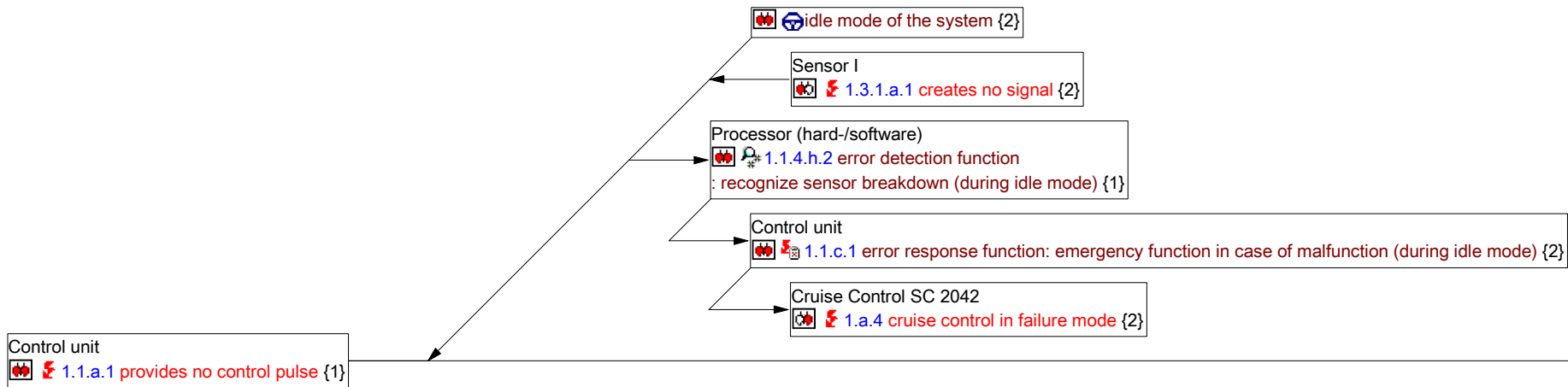


S=7
1.a.2
drive cannot be controlled {2}

1.1.a.1
provides no control pulse {1}

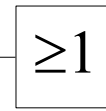
idle mode of the system {2}

1.3.1.a.1
creates no signal {2}



1.1.a.1

 provides no control pulse {1}
































1.3.1.a.1

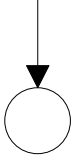





 creates no signal {2}

Process Flow Diagram

Program: Assembly signal cable (complete)	Revision Level: Version 1.2 a	Created: 06.03.2006
Part number/Latest Change Level: 315-81.10, 315-81.30, 315-81.40, 315-81.50, 315-81.70, 315-81.80, 315-81.60, 315-81.20	Revised by: Priebke, Claas, D-PT; Hehre, Claudia, FV-PO; Peach, Marcel, FV-PO	Modified: 07.04.2009
Part Description: soldering process - cable to plug		Page: 1/3

Symbol	Reference	Symbol	Reference	Symbol	Reference	Part/P- rocess Num- ber	Process Na- me/Operation Description	No.	Product Characte- ristics	Clas- s.	No.	Process Charac- teristics	Clas- s.
	4.1		Prepare workplace			4.1	   Prepare workplace	4.1.a	  type of cable				
	4.1.b							  type of plug					
	4.2		Insert plug into soldering appliance			4.2	  Insert plug into soldering appliance						
	4.3		Solder cable strands on plug pins (ma- nually)		4.4	Solder shiel- ding on plug housing (one sided; ma- nually)	    Solder cable strands on plug pins (manually)	4.3.b	  assignment of pins to cable strands	CC	4.3.1.- a	 soldering temperature	CC
								4.3.c	  pull-off strength		4.3.2.c	 color coding in soldering appliance	
								4.3.d	  volume resistance	CC	4.3.3.- a	 temperature of soldering iron tip	

Symbol	Reference	Symbol	Reference	Symbol	Reference	Part/Process Number	Process Name/Operation Description	No.	Product Characteristics	Class.	No.	Process Characteristics	Class.
<pre> graph TD Start([^]) --> P1[4.3 Solder cable strands on [...]] P1 --> P2[4.4 Solder shielding on plug [...]] P2 --> P3[4.5 Put cable into strain-relief] P3 --> D1{4.6 Test cable using cable test appliance} D1 --> P4[4.8 Corrective soldering of faulty parts] P4 --> D1 </pre>	4.3 Solder cable strands on [...]	4.4 Solder shielding on plug [...]	4.5 Put cable into strain-relief	4.6 Test cable using cable test appliance	4.8 Corrective soldering of faulty parts	4.4	 Solder shielding on plug housing (one sided; manually)	4.4.c	 pull-off strength		4.4.1.-a	 soldering temperature	CC
						4.5	 Put cable into strain-relief	4.5.b	 pull-off strength				
						4.6	 Test cable using cable test appliance				4.6.1.-b	 start test-sequence, withdraw cable and sort out faulty cables	
											4.6.2.-b	 perform test-cycle according to test description, write test protocol	
						4.8	 Corrective soldering of faulty parts	4.8.b	 assignment of pins to cable strands		4.8.1.-a	 soldering temperature	CC
								4.8.c	 pull-off strength		4.8.2.-b	 color coding in soldering appliance	
								4.8.d	 volume resistance	CC	4.8.3.-a	 temperature of soldering iron tip	

Symbol	Reference	Symbol	Reference	Symbol	Reference	Part/P- rocess Num- ber	Process Na- me/Operation Description	No.	Product Characte- ristics	Clas- s.	No.	Process Charac- teristics	Clas- s.
			4.7 Attach proof-of-te- sting label to cable and put cable into transport bin			4.7	   Attach proof-of-testing label to cable and put cable into transport bin	4.7.a	  proof-of- testing label attached to good cables				

Control Plan												
Prototype:		Prelaunch:		Production: X		Key Contact/Phone: Seetzen, Gudrun, D-PT, Entwicklung			Created: 17.03.2006		Modified: 07.04.2009	
Control Plan Number: CP 001-2.1				Core Team: Seetzen, Gudrun, D-PT, Entwicklung; Schranz, Franz, D-PT, Entwicklung; Santy, David, ZQS, Qualitätsentwicklung				Customer Engineering Approval/Date (if req'd): Nicht erforderlich				
Part number/Latest Change Level: 2.1, 3.				Supplier/Plant Approval/Date: APS, KGW				Customer Quality Approval/Date (if req'd): Nicht erforderlich				
Part Name/Description: Electric conductor				Date/Other Approval (if req'd): 31.11.2006				Date/Other Approval (if req'd): Nicht erforderlich				
Supplier/Plant: APS		Supplier Code: 123-654-890										
Part/Process Number	Process Name/Operation Description	Machine, Device, Jig, Tools for Mfg.	Characteristics			Classification	Methods				Reaction Plan	
			No.	Product Characteristics	Process Characteristics		Specification	Inspection Equipment/Measurement Technique	Sample Size Freq.			Control Method
2.1.1.1	conductor Change of soldering material from Pb60Sn40 to SnCu99C by requirements of RoHS since 07/2006. Increased soldering temperature (> 220 °C) with changed soldering material!		2.1.1.-1.b	transmission of signal through voltage level			32 Ns ±1				simulation under known application conditions	
			2.1.1.-1.c	transmission of signal through modulation			11 Ns				NONE	NONE
			2.1.1.-1.d	mechanical stability of conductor			37,2 MPa				NONE	NONE
2.1.1.2	Isolation		2.1.1.-2.a	dielectric strength							NONE	NONE
			2.1.1.-2.b	long-term stability considering all application conditions							NONE	NONE
2.1.1.3	Shielding		2.1.1.-3.b	sensitivity against interferences of signal transmission (both level and modulation)							NONE	NONE

