CE MARKING @ HZG

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Technical Department

Lund, 07.11.2018

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

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„CE“ GENERAL COMMENTS

- CE mark is a mark of the European Union
- Indicator of a product´s conformity with valid EU legal requirements
- The aim is to create, distribute or buy safe products

- So it‘s simple:

Everything you supply or place on the market must have a CE mark.

„CE“ GENERAL COMMENTS

- CE mark is a mark of the European Union
- Indicator of a product´s conformi… legal requirements
- The aim is to create … buy safe products
- So it‘…

Only CE-certified products may be procured or created at HZG (business instruction)

…ything you supply or place on the market must have a CE mark.

HOW DO WE ACHIEVE THE CE MARK AT HZG?

Rough process at the HZG technical department

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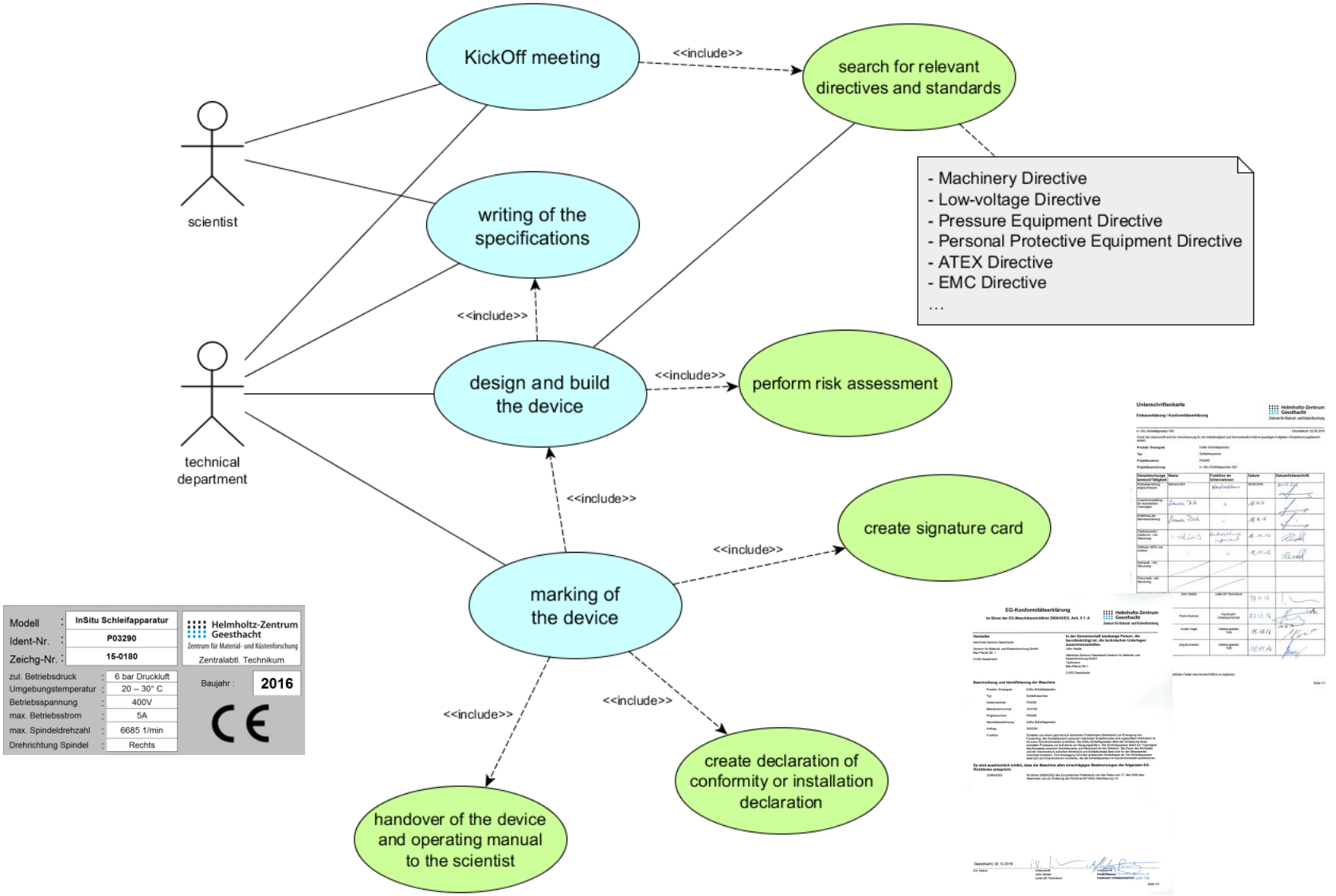
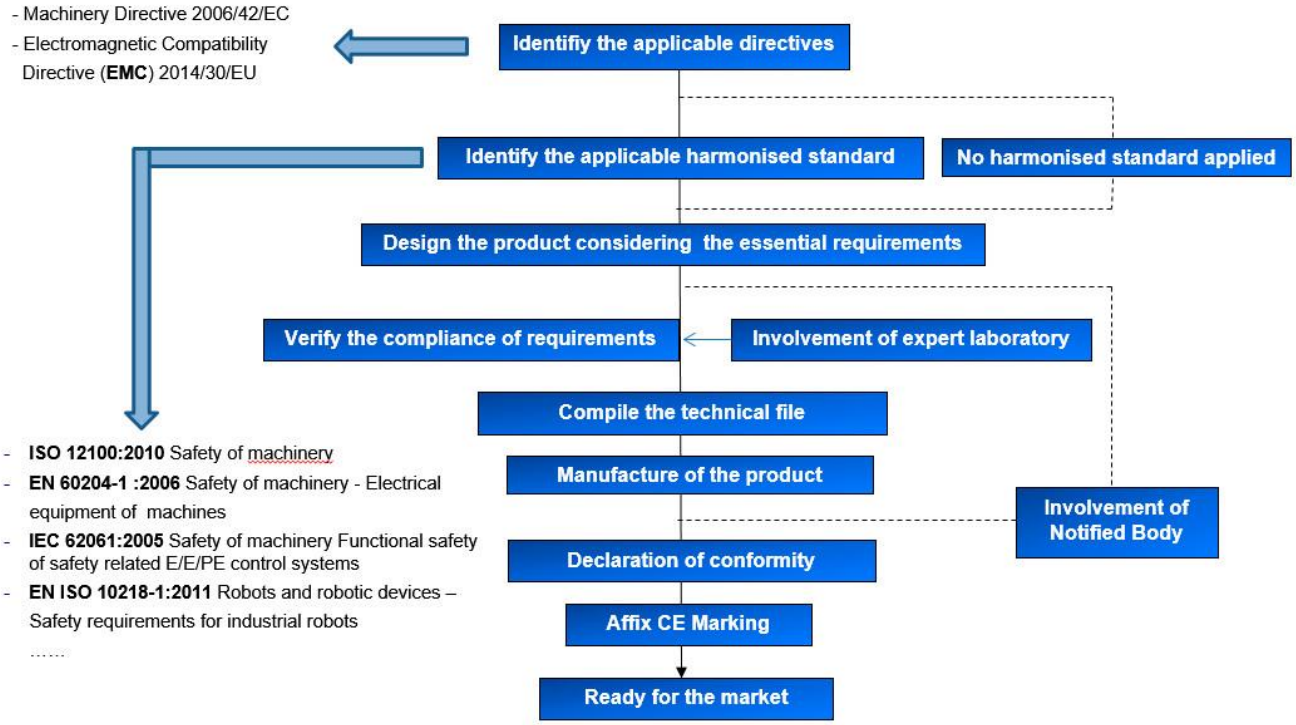


EXAMPLE

- We regularly use the Mashinery Directive (2006/42/EC)
- To get through the process, we use a software tool (Safeexpert -> so nothing is forgotten!)



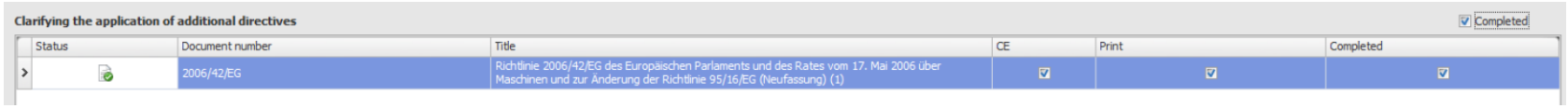
1. Classification of the product

Classification of product

Is the product subject to Machinery Directive 2006/42/EC?	(•) Yes ( ) No
How does the product have to be classified according to the Machinery Directive?	(•) Machinery
	( ) Interchangeable equipment
	( ) Safety component
	( ) Lifting accessories
	( ) Chains, ropes or webbing
	( ) Removable mechanical transmission device
	( ) Partly completed machinery
Does the product fall under Annex IV of the Machinery Directive?	( ) Yes (•) No

EXAMPLE

2. Apply relevant directives



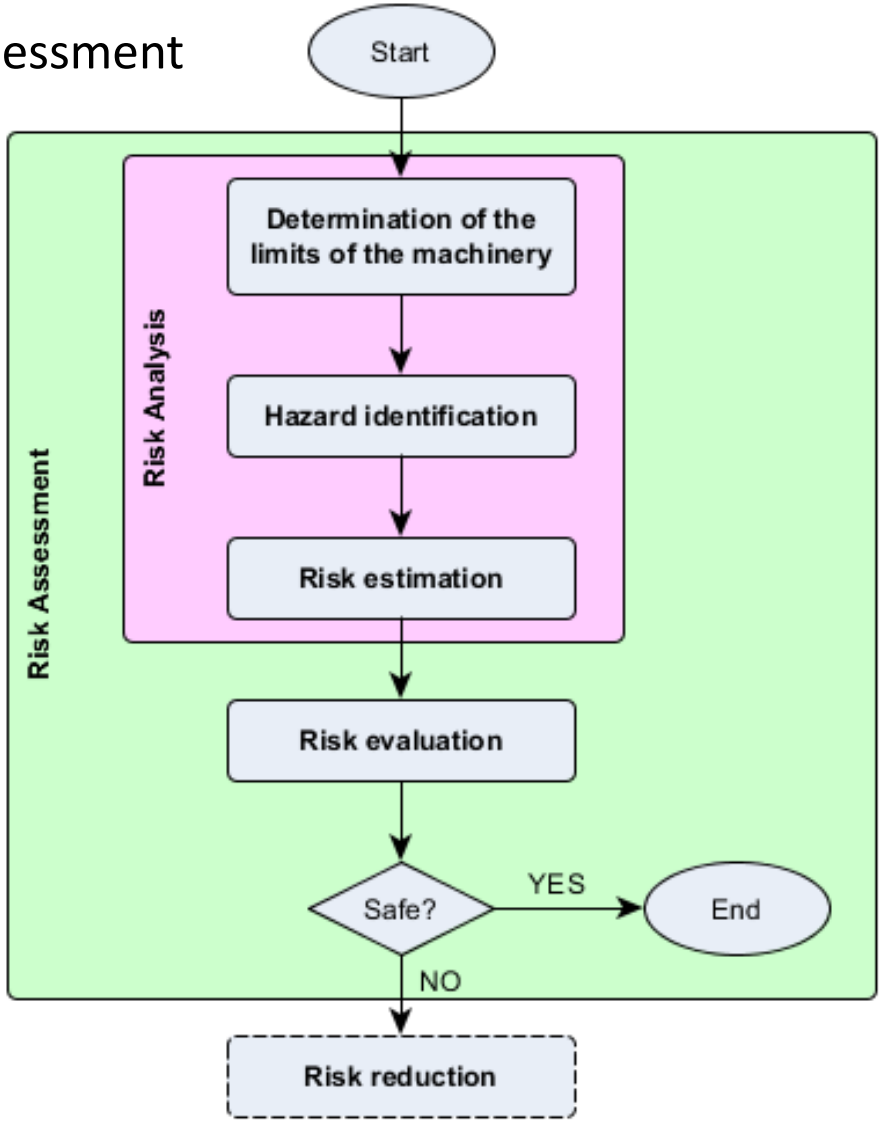
Clarifying the application of additional directives — Completed

Status	Document number	Title	CE	Print	Completed
	2006/42/EG	Richtlinie 2006/42/EG des Europäischen Parlaments und des Rates vom 17. Mai 2006 über Maschinen und zur Änderung der Richtlinie 95/16/EG (Neufassung) (1)	☑	☑	☑

3. Apply relevant standards

- DIN EN ISO 12100 → Typ A standard
- DIN EN ISO 13849 → Typ B standard
- …
- Sometimes Typ C standards

4. Perform risk assessment



EXAMPLE

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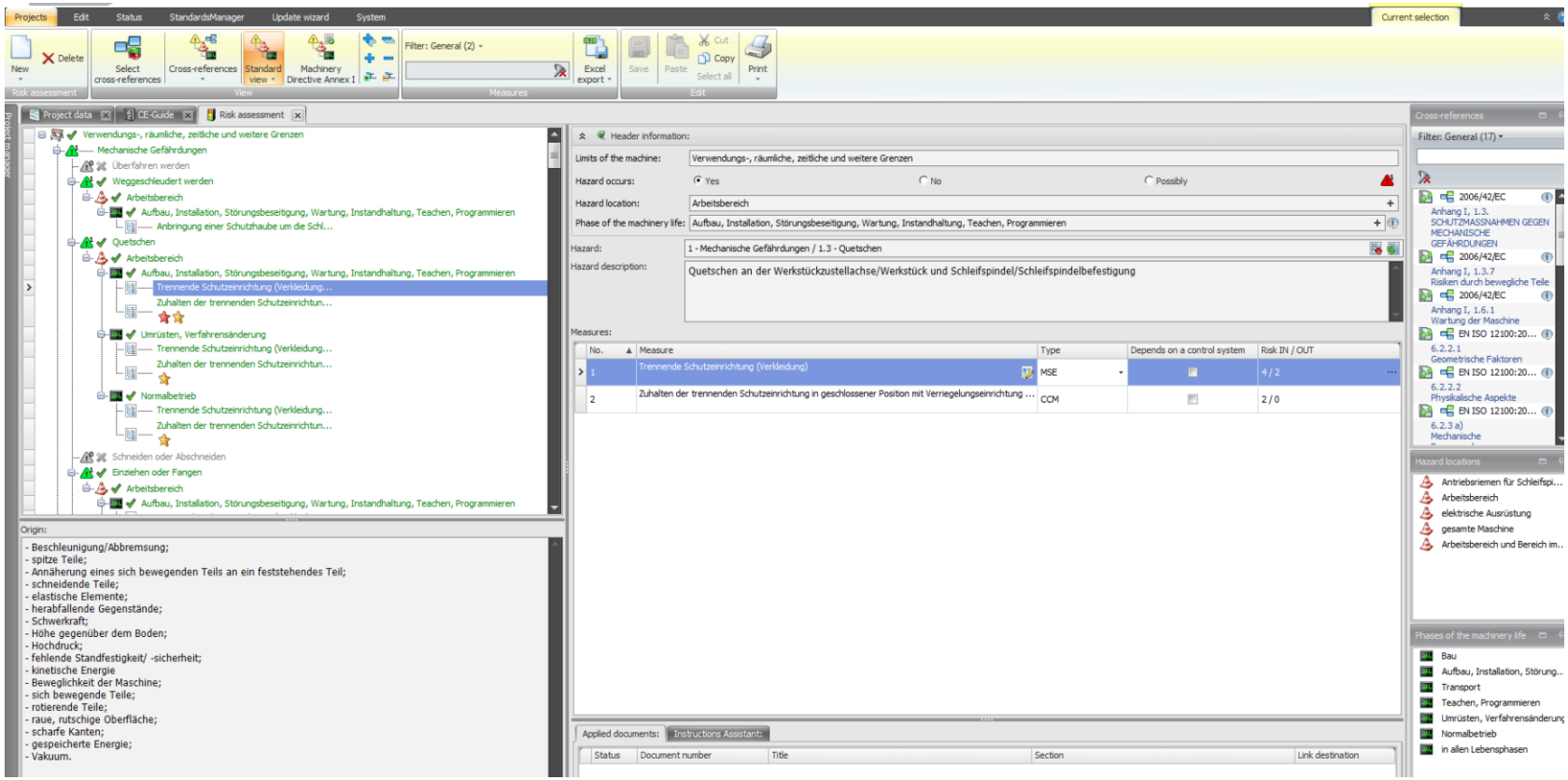
4. Perform risk assessment



EXAMPLE

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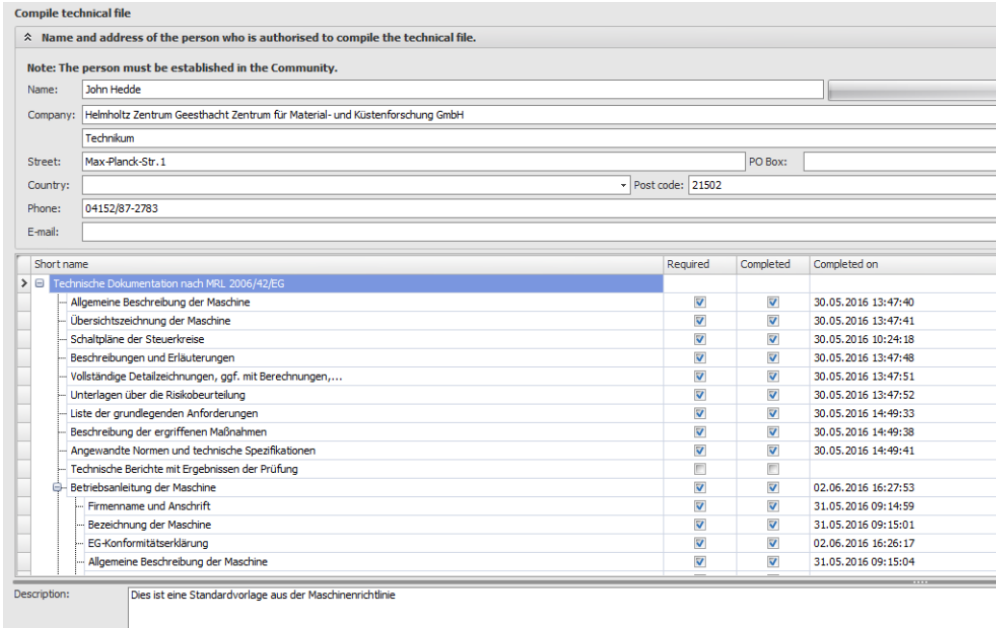
5. Compile technical files and Internal checks



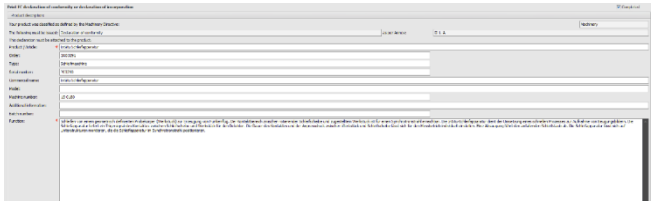
Documentation:

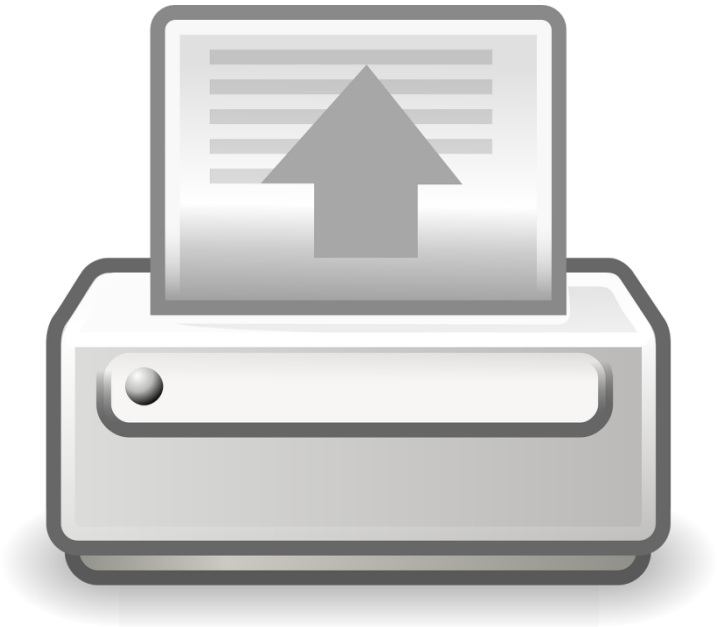
- Drawings
- Calculations
- Manuals
- Technical datasheets
- Risk analysis
- Signature card
- …

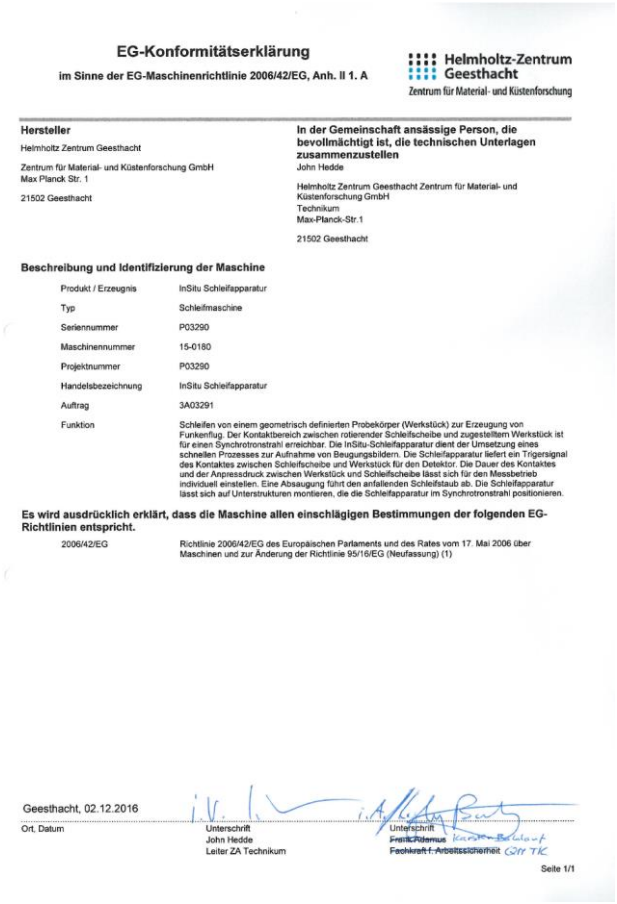
Do I have anything forgotten?

Even in the manual and neccessary documentation.

6. Print declaration of conformity or declaration of incorporation







EG-Konformitätserklärung

im Sinne der EG-Maschinenrichtlinie 2006/42/EG, Anh. II 1. A

Helmholtz-Zentrum Geesthacht
Zentrum für Material- und Küstenforschung

Hersteller

Helmholtz Zentrum Geesthacht

Zentrum für Material- und Küstenforschung GmbH
Max Planck Str. 1

21502 Geesthacht

In der Gemeinschaft ansässige Person, die bevollmächtigt ist, die technischen Unterlagen zusammenzustellen

John Hedde

Helmholtz Zentrum Geesthacht Zentrum für Material- und Küstenforschung GmbH
Technikum
Max-Planck-Str.1

21502 Geesthacht

Beschreibung und Identifizierung der Maschine

Produkt / Erzeugnis	InSitu Schleifapparatur
Typ	Schleifmaschine
Seriennummer	P03290
Maschinennummer	15-0180
Projektnummer	P03290
Handelsbezeichnung	InSitu Schleifapparatur
Auftrag	3A03291
Funktion	Schleifen von einem geometrisch definierten Probekörper (Werkstück) zur Erzeugung von Funkenflug. Der Kontaktbereich zwischen rotierender Schleifscheibe und zugestelltem Werkstück ist für einen Synchrotronstrahl erreichbar. Die InSitu-Schleifapparatur dient der Umsetzung eines schnellen Prozesses zur Aufnahme von Beugungsbildern. Die Schleifapparatur liefert ein Trigersignal des Kontaktes zwischen Schleifscheibe und Werkstück für den Detektor. Die Dauer des Kontaktes und der Anpressdruck zwischen Werkstück und Schleifscheibe lässt sich für den Messbetrieb individuell einstellen. Eine Absaugung führt den anfallenden Schleifstaub ab. Die Schleifapparatur lässt sich auf Unterstrukturen montieren, die die Schleifapparatur im Synchrotronstrahl positionieren.

Es wird ausdrücklich erklärt, dass die Maschine allen einschlägigen Bestimmungen der folgenden EG-Richtlinien entspricht.

2006/42/EG	Richtlinie 2006/42/EG des Europäischen Parlaments und des Rates vom 17. Mai 2006 über Maschinen und zur Änderung der Richtlinie 95/16/EG (Neufassung) (1)

Geesthacht, 02.12.2016

Ort, Datum

Unterschrift
John Hedde
Leiter ZA Technikum

Unterschrift
~~Frank Petersen~~ Hansen-Bollhorst
~~Fachkraft f. Arbeitssicherheit~~ GMT TK

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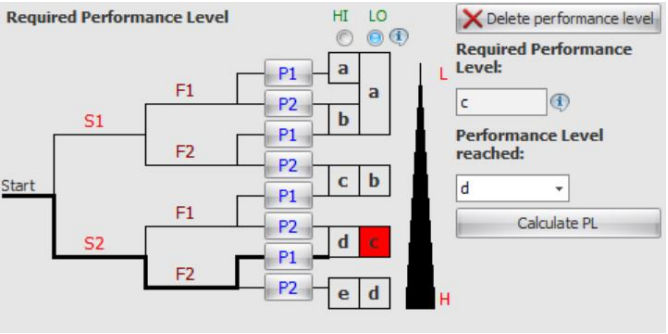
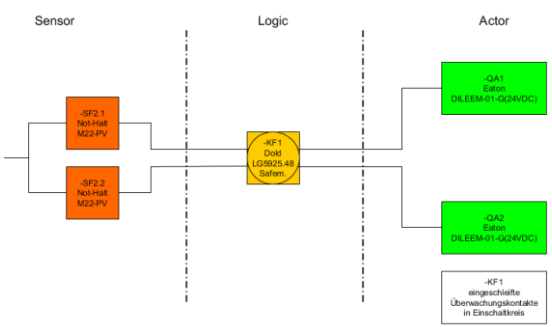
CALCULATING THE PERFORMANCE LEVVEL





Bestimmung des Performance Level nach EN ISO 13849-1:2015

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Zentrum für Material- und Küstenforschung

$$MTTF_{D\,Subsystem1} = \frac{2}{3} * \left[MTTF_{D\,Kanal\,1} + MTTF_{D\,Kanal\,2} - \frac{1}{\frac{1}{MTTF_{D\,Kanal1}} + \frac{1}{MTTF_{D\,Kanal2}}} \right]$$

$$= \frac{2}{3} * \left[2 * MTTF_{D\,Kanal\,1/2} - \frac{1}{\frac{2}{MTTF_{D\,Kanal\,1/2}}} \right]$$

$$= \frac{2}{3} * \left[2 * 44{,}4\ Jahre - \frac{44{,}4\ Jahre}{2} \right]$$

$$MTTF_{D\,Subsystem1} = 44{,}4\ Jahre$$

Oliver Listing

Helmholtz-Zentrum Geesthacht
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CALCULATING THE PERFORMANCE LEVEL

Identify risk sources

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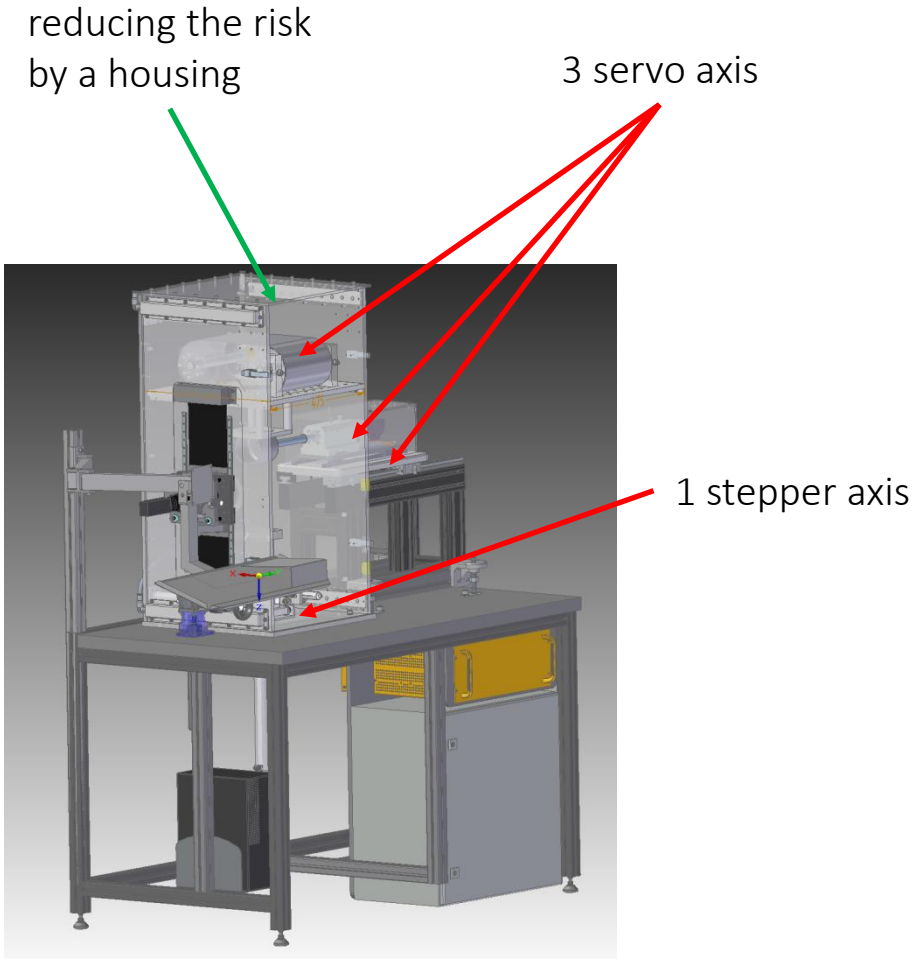
- Use-, space-, time- and other limits
  - Mechanical hazards
  - Electrical hazards
  - Thermal hazards
  - Noise hazards
  - Vibration hazards
  - Radiation hazards
  - Material/ substance hazards
  - Ergonomic hazards
  - Hazards associated with the environment in which the machine is used
  - Combination of hazards
  - other hazards
  - Hazardous events: Shape and/or superficial finishing
  - Hazardous events: Moving parts of the machine
  - Hazardous events: Kinetic energy and/or potential energy (gravity)
  - Hazardous events: Loss of stability
  - Hazardous events: Mechanical strength
  - Hazardous events: Pneumatic, hydraulic equipment
  - Hazardous events: Electrical equipment
  - Hazardous events: Control system
  - Hazardous events: Materials and substances or physical factors
  - Hazardous events: Workstation and/or work process design
  - Other hazardous events



WORKING METHOD FOR RISK ASSESSMENT

Considering an electrical control system

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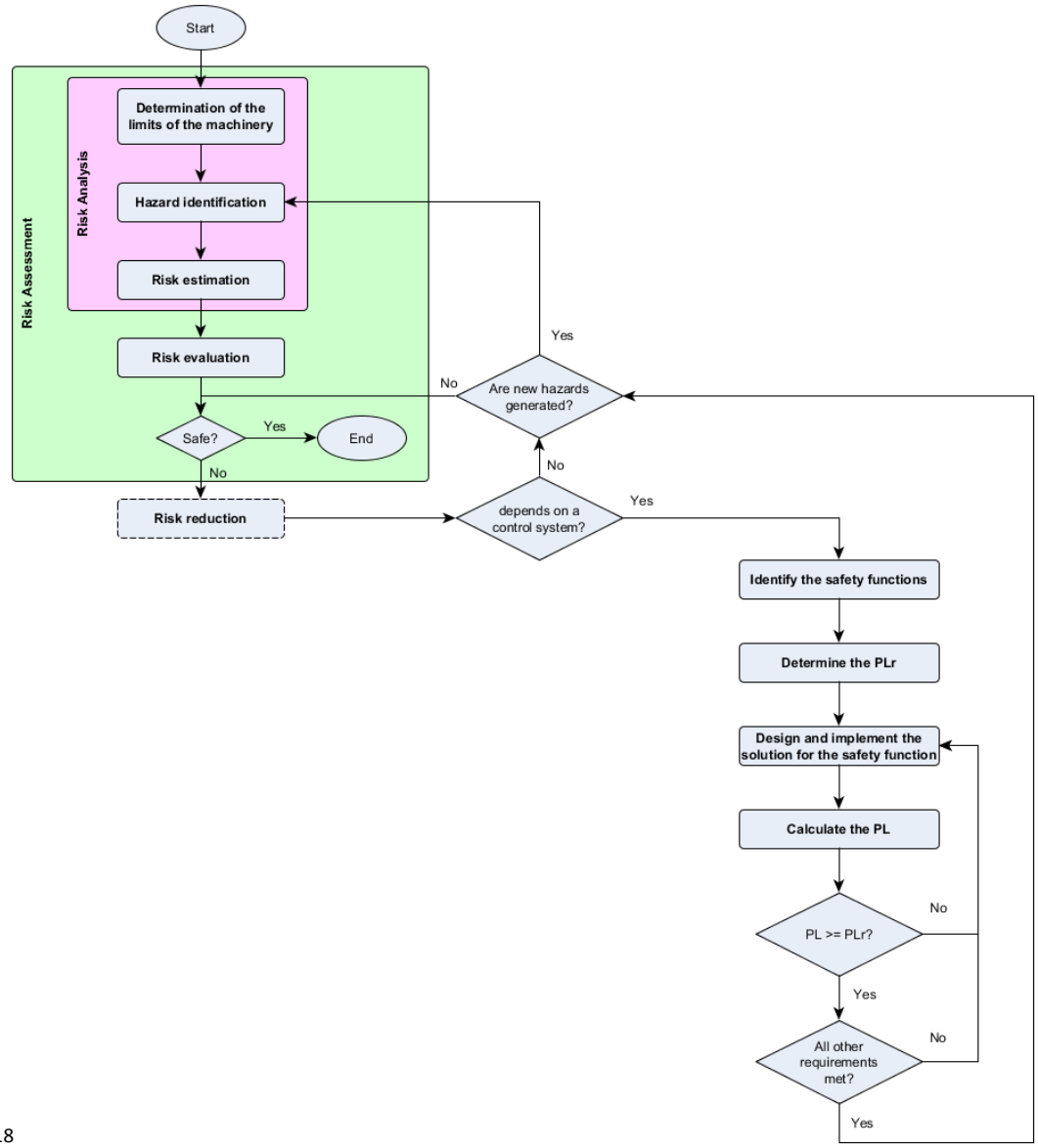

DETERMINATION OF THE REQUIRED PERFORMANCE LEVEL

The measure depends on a control system

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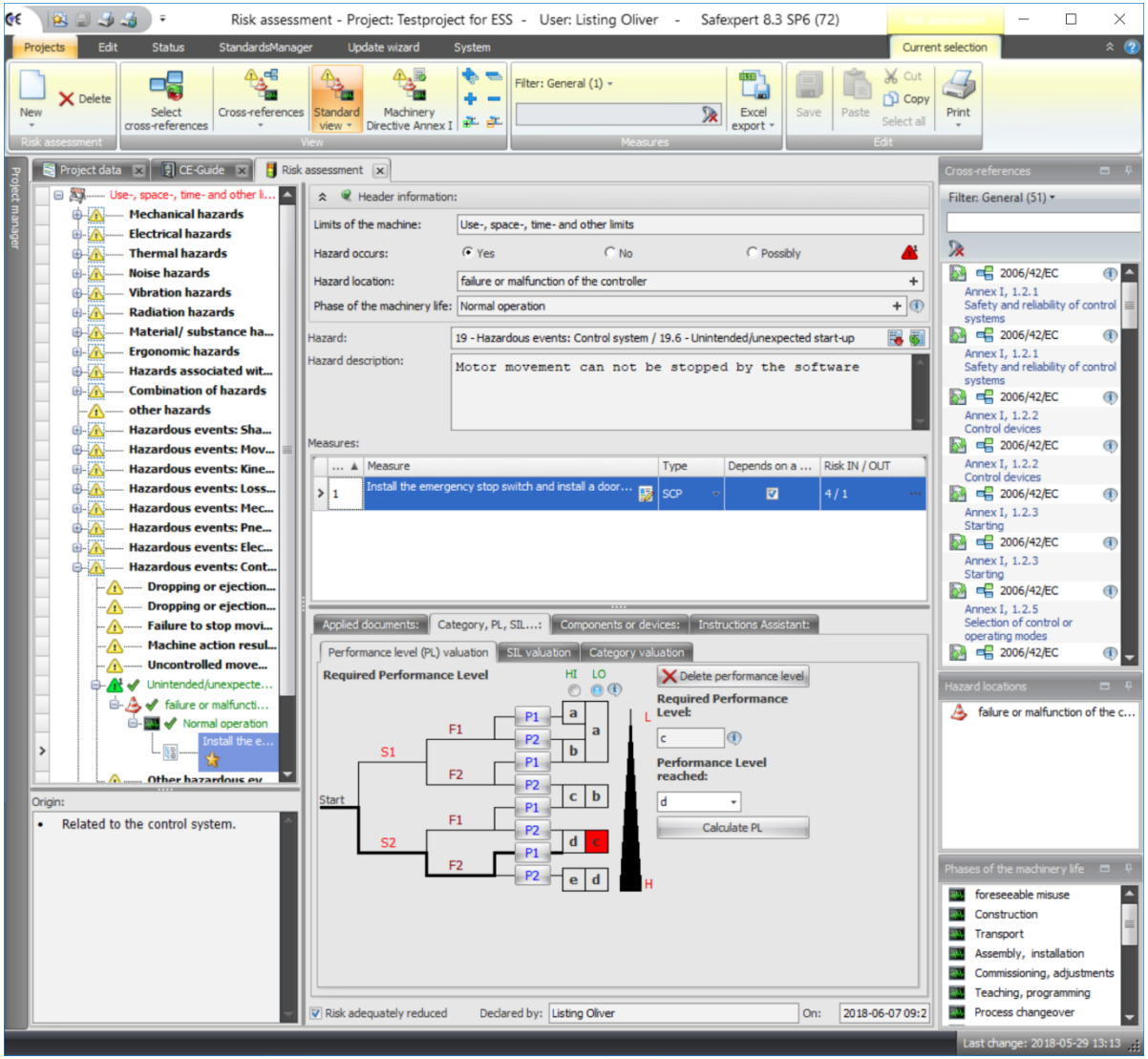

PLr required	performance level
S	**Severity of injury**
S1	slight (normal reversible injury)
S2	serious (normally irreversible injury or death)
F	**Frequency and/or exposure to hazard**
F1	seldom to less often and/or exposure time is short
F2	frequent to continuous and/or exposure time is long
P	**possible of avoiding hazard or limiting harm**

COLLECTING INFORMATION

Identify the system‘s structure and collect all relevant data

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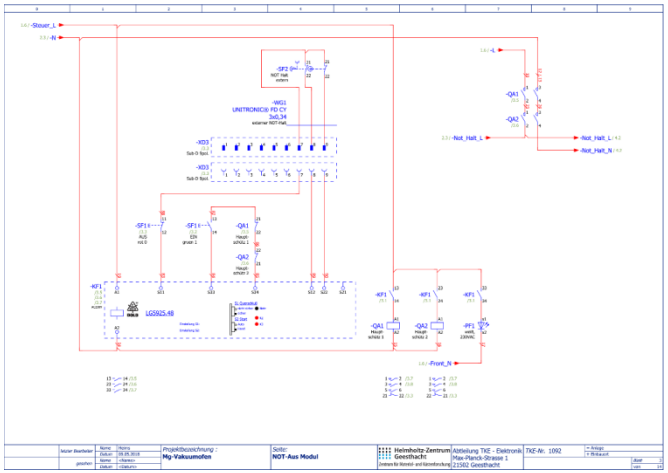
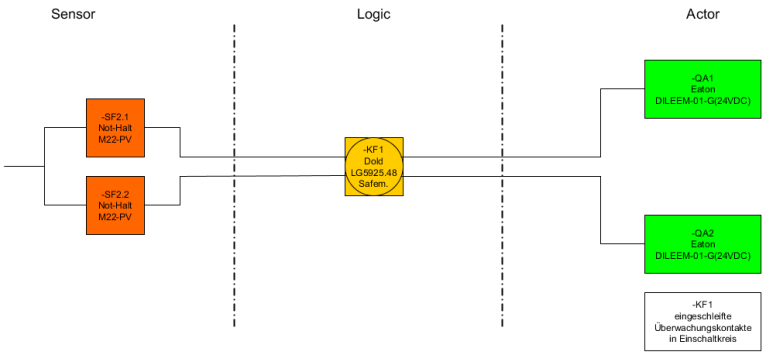
electrical drawings (e.g. with Eplan)



safety block diagram



COLLECTING INFORMATION

Identify the system‘s structure and collect all relevant data

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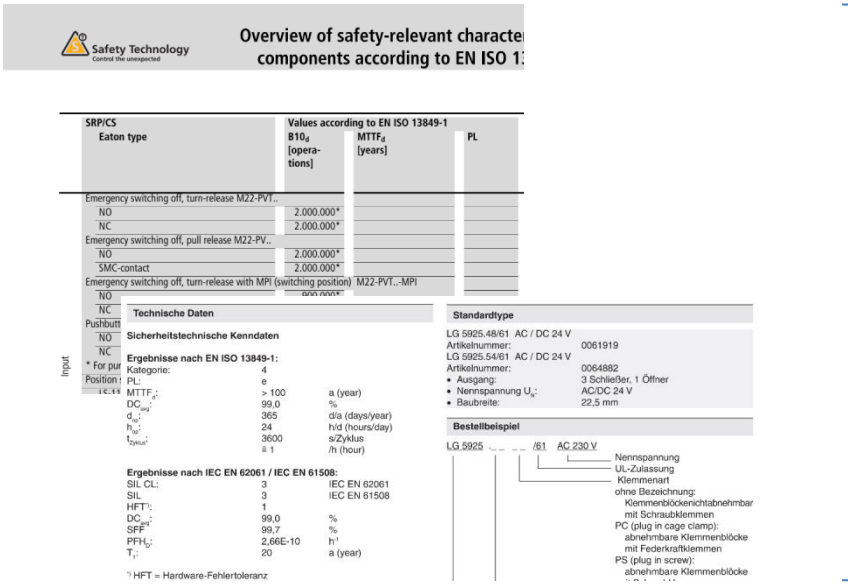
data sheet

relevant data



Safety Technology
Control the unexpected

Overview of safety-relevant characte components according to EN ISO 1

SRP/CS Eaton type	Values according to EN ISO 13849-1 $B10_d$ [operations]	$MTTF_d$ [years]	PL
Emergency switching off, turn-release M22-PVT..			
NO	2.000.000*		
NC	2.000.000*		
Emergency switching off, pull release M22-PV..			
NO	2.000.000*		
SMC-contact	2.000.000*		
Emergency switching off, turn-release with MPI (switching position) M22-PVT..-MPI			
NO	600.000*		
NC			
Pushbutt			
NO			
NC			

* For pur

Position

Input

Technische Daten

Sicherheitstechnische Kenndaten

Ergebnisse nach EN ISO 13849-1:

Kategorie:	4	
PL:	e	
$MTTF_d$:	> 100	a (year)
DC_{avg}:	99,0	%
d_{op}:	365	d/a (days/year)
h_{op}:	24	h/d (hours/day)
t_{Zyklus}:	3600	s/Zyklus
	≙ 1	/h (hour)

Ergebnisse nach IEC EN 62061 / IEC EN 61508:

SIL CL:	3	IEC EN 62061
SIL	3	IEC EN 61508
HFT[1]:	1	
DC_{avg}:	99,0	%
SFF:	99,7	%
PFH_D:	2,66E-10	h^{-1}
T_1:	20	a (year)

[1] HFT = Hardware-Fehlertoleranz

Standardtype

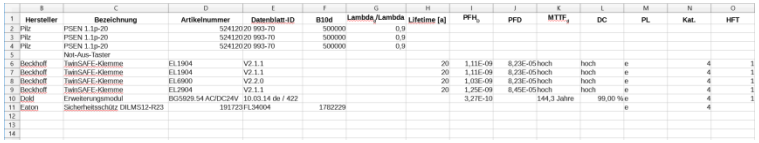
LG 5925.48/61 AC / DC 24 V
Artikelnummer: 0061919
LG 5925.54/61 AC / DC 24 V
Artikelnummer: 0064882

- Ausgang: 3 Schließer, 1 Öffner
- Nennspannung U_s: AC/DC 24 V
- Baubreite: 22,5 mm

Bestellbeispiel

LG 5925 _ _ _ _ /61 AC 230 V

- Nennspannung
- UL-Zulassung
- Klemmenart
  ohne Bezeichnung:
  Klemmenblöckenichtabnehmbar mit Schraubklemmen
  PC (plug in cage clamp):
  abnehmbare Klemmenblöcke mit Federkraftklemmen
  PS (plug in screw):
  abnehmbare Klemmenblöcke



	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Hersteller	Bezeichnung	Artikelnummer	Datenblatt-ID	B10d	Lambda /Lambda	Lifetime [a]	PFH_D	PFD	$MTTF_d$	DC	PL	Kat.	HFT
2	Pilz	PSEN 1.1p-20		52412020 993-70	500000	0,9								
3	Pilz	PSEN 1.1p-20		52412020 993-70	500000	0,9								
4	Pilz	PSEN 1.1p-20		52412020 993-70	500000	0,9								
5		Not-Aus-Taster												
6	Beckhoff	TwinSAFE-Klemme	EL1904	V2.1.1			20	1,11E-09	8,23E-05	hoch	hoch	e	4	1
7	Beckhoff	TwinSAFE-Klemme	EL1904	V2.1.1			20	1,11E-09	8,23E-05	hoch	hoch	e	4	1
8	Beckhoff	TwinSAFE-Klemme	EL6900	V2.2.0			20	1,03E-09	8,23E-05	hoch	hoch	e	4	1
9	Beckhoff	TwinSAFE-Klemme	EL2904	V2.1.1			20	1,25E-09	8,45E-05	hoch	hoch	e	4	1
10	Dold	Erweiterungsmodul	BG5929.54 AC/DC24V	10.03.14 de / 422				3,27E-10		144,3 Jahre	99,00 %	e	4	1
11	Eaton	Sicherheitsschutz DILMS12-R23		191723FL34004	1782229							e	4	
12														
13														
14														

$B10_d$	number of switching cycles after which 10% of the devices have dangerous failure
$MTTF_d$	Mean Time To Failure
DC_{avg}	average Diagnostic Coverage
PFH_d	Probability of dangerous Failure per Hour

CALCULATION OF THE PERFORMANCE LEVEL

By hand…

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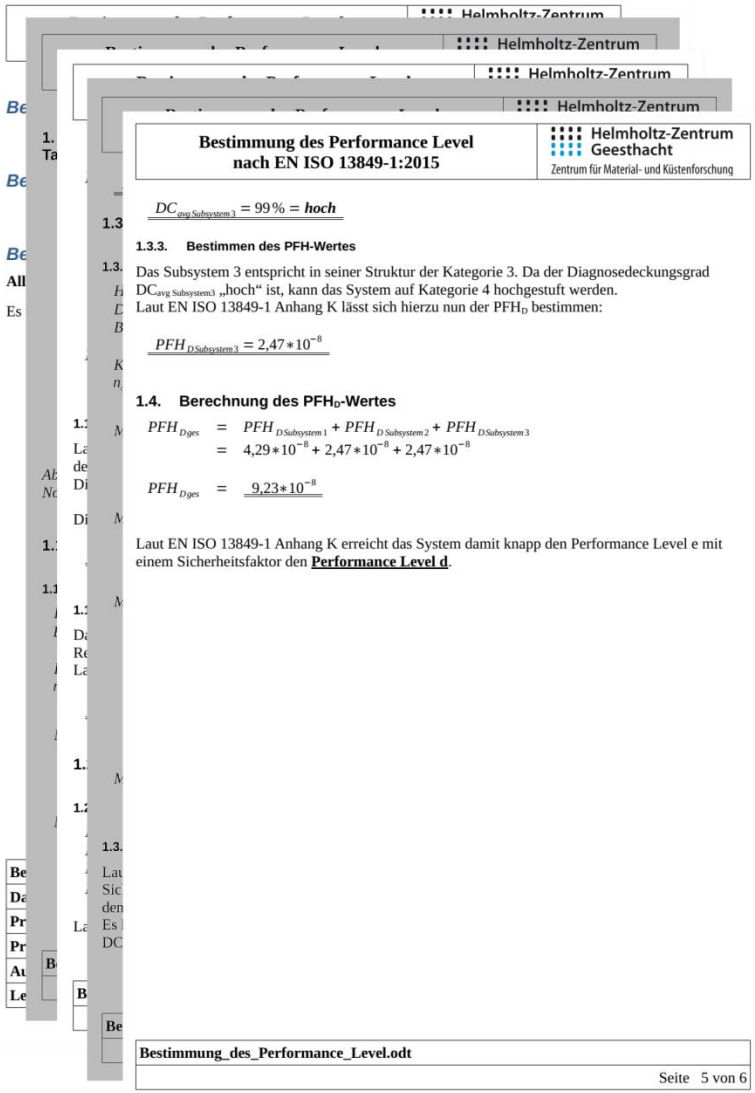

Bestimmung des Performance Level nach EN ISO 13849-1:2015

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Zentrum für Material- und Küstenforschung

$DC_{avg\,Subsystem\,3} = 99\,\% = \textbf{\textit{hoch}}$

1.3.3. Bestimmen des PFH-Wertes

Das Subsystem 3 entspricht in seiner Struktur der Kategorie 3. Da der Diagnosedeckungsgrad $DC_{avg\,Subsystem3}$ „hoch" ist, kann das System auf Kategorie 4 hochgestuft werden.
Laut EN ISO 13849-1 Anhang K lässt sich hierzu nun der PFH_D bestimmen:

$PFH_{D\,Subsystem\,3} = 2{,}47 * 10^{-8}$

1.4. Berechnung des PFH_D-Wertes

$$PFH_{D\,ges} = PFH_{D\,Subsystem\,1} + PFH_{D\,Subsystem\,2} + PFH_{D\,Subsystem\,3}$$
$$= 4{,}29 * 10^{-8} + 2{,}47 * 10^{-8} + 2{,}47 * 10^{-8}$$

$$PFH_{D\,ges} = 9{,}23 * 10^{-8}$$

Laut EN ISO 13849-1 Anhang K erreicht das System damit knapp den Performance Level e mit einem Sicherheitsfaktor den **Performance Level d**.

Bestimmung_des_Performance_Level.odt
Seite 5 von 6

- app. 4 pages for only one safety path
- every machine has different structures
  -> less copy&paste
- calculate each iteration

CALCULATION OF THE PERFORMANCE LEVEL

By a tool…

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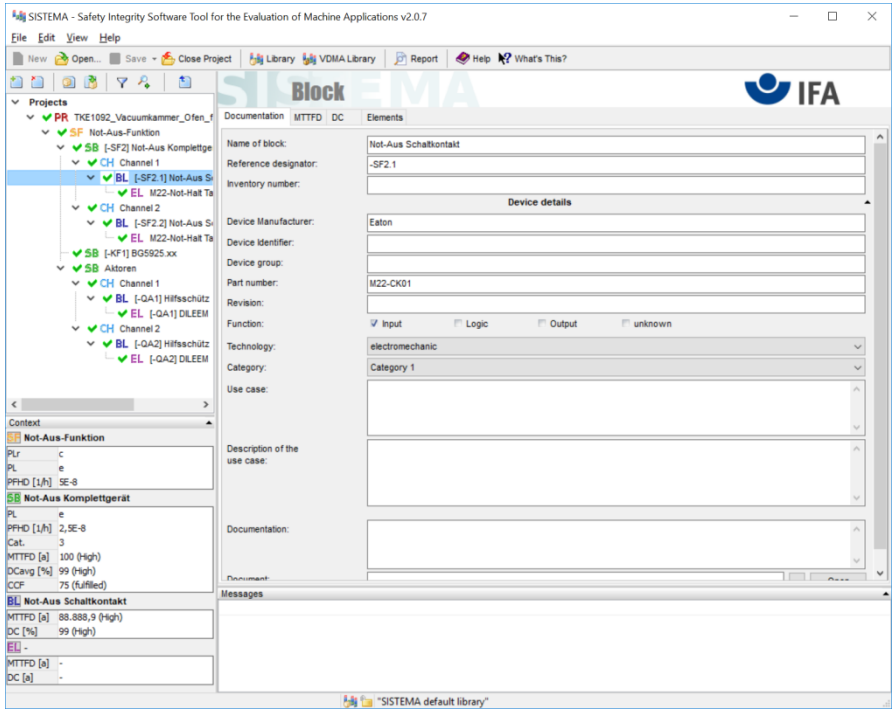
- lots of tools by different manufactures
- we use SISTEMA at HZG
- generate detailed report



SISTEMA - Safety Integrity Software Tool for the Evaluation of Machine

Project name: TKE1092_Vacuumkammer_Ofen_f_Magnesiumproben

File date: 31.05.2018 14:59:42 Report date: 07.06.2018 Checksum: c0796185cc591b829eb9d9891186b406

PR Project name: TKE1092_Vacuumkammer_Ofen_f_Magnesiumproben

Project file name:	C:\workspace\TKE1092_Vacuumkammer_Ofen_f_Magnesiumproben\5_Gefahrenanalyse_Normenliste\Sistema-Projekt\TKE1092_Vacuumkammer_Ofen_f_Magnesiumproben.ssm
Creation date:	31.05.2018 13:13:11
Project status:	In Bearbeitung
Project number:	TKE1092
Project version:	v1.0
Authors:	D. Heims; O. Listing
Project managers:	D. Heims
Inspectors:	O. Listing
Dangerous point/machine:	
Documentation:	
Document:	
Version of software:	2.0.7 build 2
Version of standard:	ISO 13849-1:2015, ISO 13849-2:2012
Checksum:	c0796185cc591b829eb9d9891186b406
Options:	☑ Use DC intermediate levels for calculation of PFHD (more precise) ☐ MTTFD capping for category 4 lower from 2500 to 100 years.
Status:	green
Note:	There are no warnings listed for this project (or it's subordinate basic elements).

Print options

☑ Show device details
☑ Show requirements on PL and Category
☑ Show documentations on SF, SB, BL and EL
☑ Show parameter documentations on PLr, PL, Category, CCF, MTTFD and DC
☑ Show CCF and DC measures in detail
☑ Show messages

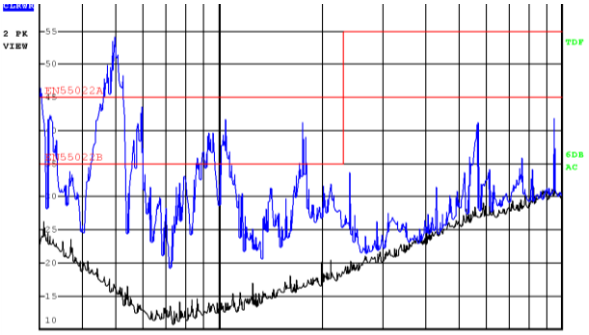
Contained safety functions

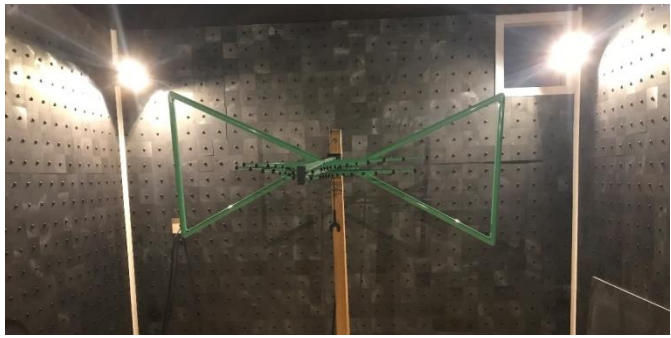
SF Name: Not-Aus-Funktion
Required: PLr c Reached: PL e PFHD [1/h]: 5E-8 Status: green

SISTEMA a free of charge tool from IFA Page 1 / 16

https://www.dguv.de/ifa/praxishilfen/praxishilfen-maschinenschutz/software-sistema/index.jsp

ELECTRICAL SAFETY AND EMC FOR CE CONFORMITY





Jörg Burmester

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

TESTS AND MEASUREMENTS

Initial commissioning

DIN EN 60204-1 (VDE 0113-1)/ VDE 0100 600

Essential safety control

Measurements :

- PE-connection and resistance
  - all connections
  - Extra PE connections not over mechanical structure
  - No loose connection
- Earth leakage current
  - Usage of the right main filter
  - EMI should be considered
- isolation resistance
  - Special requirements 2kV test voltage
    - offshore equipment
    - ATEX equipment
  - Disconnected and individual test of all connections (e.g. motor cable)

Fluke6500

Metra machine (2kV)

TESTS AND MEASUREMENTS

Initial commissioning

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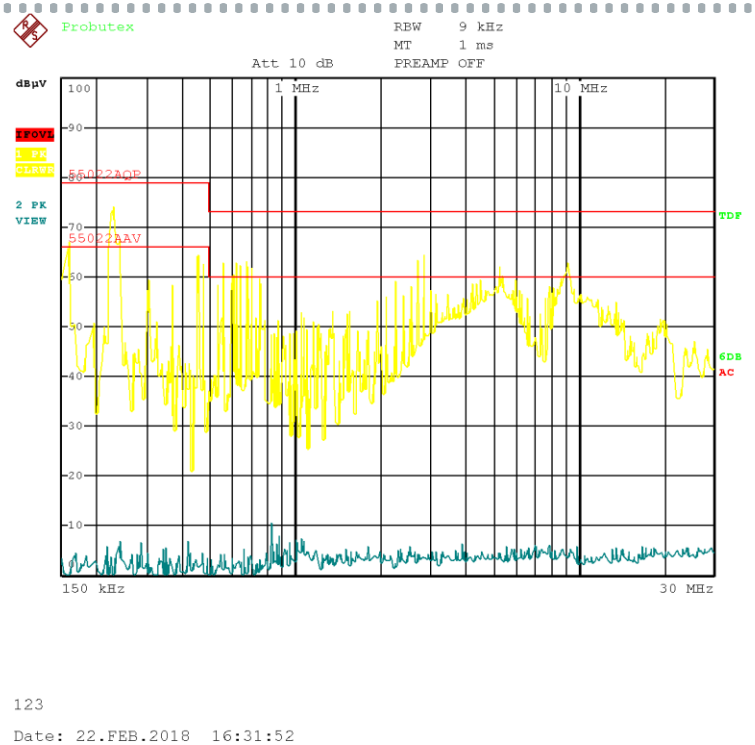
Test of conducted disturbances



- Measuring L1, L2, L3 and N
- Frequency range from 150kHz – 30 MHz

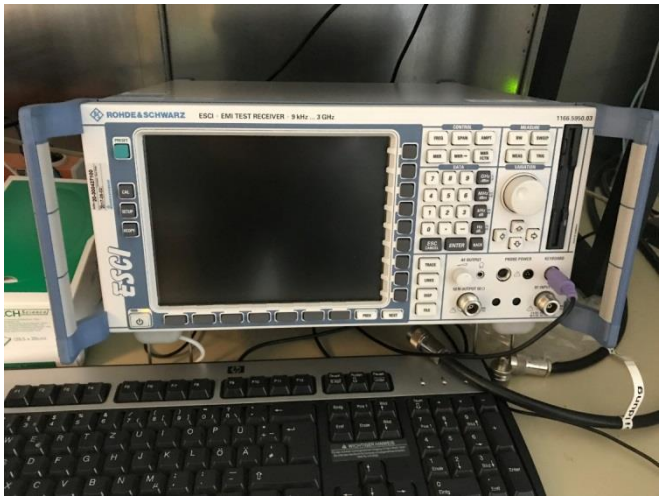
150kHz-30MHz

TESTS AND MEASUREMENTS

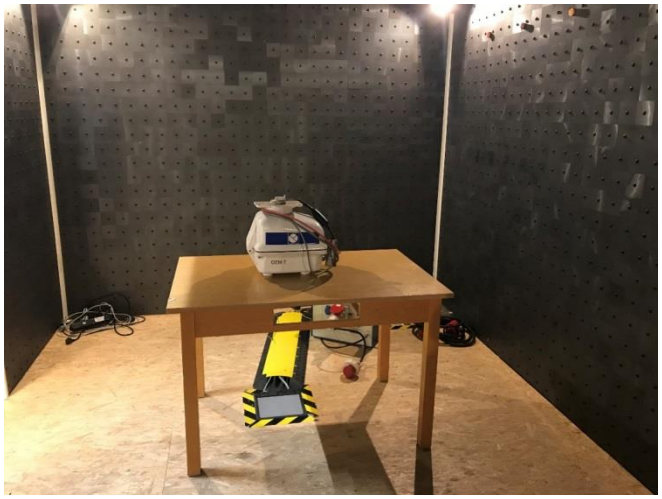
Initial commissioning

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Test of electro magnetic radiation (from all sides)



9kHz-3GHz



0Hz-30MHz Magnetic field

TESTS AND MEASUREMENTS

Some measurements (example)

Helmholtz-Zentrum Geesthacht
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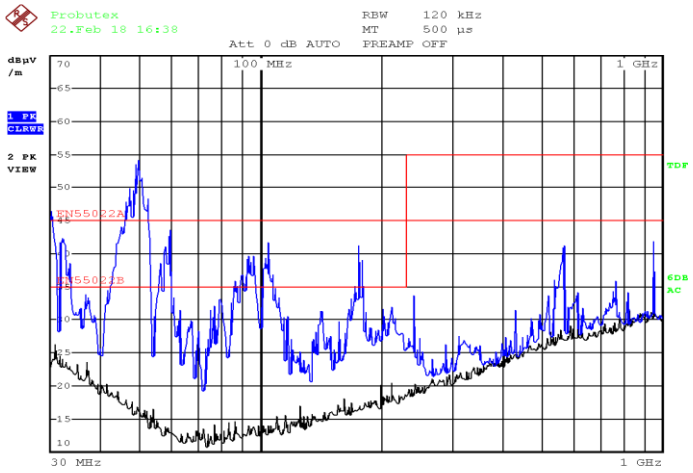
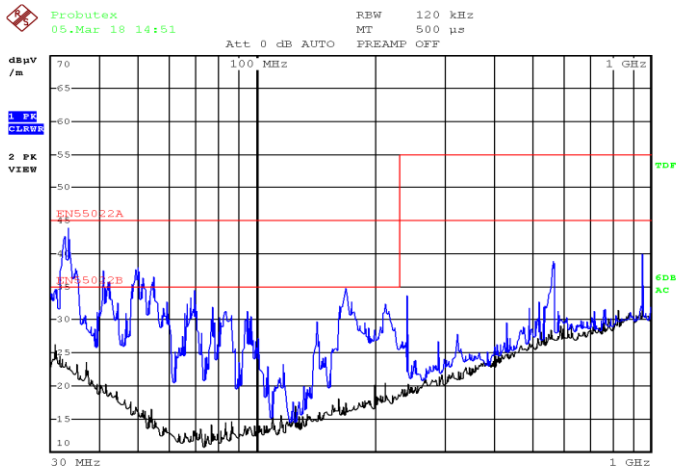
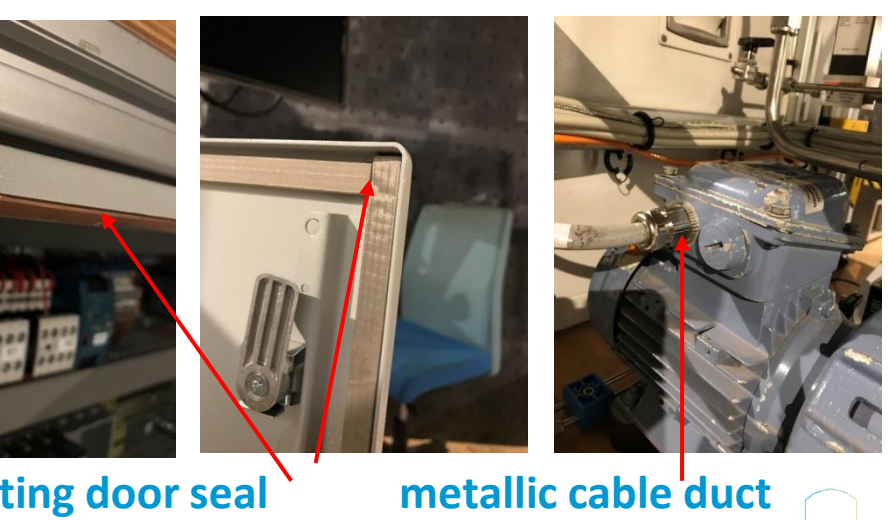
Before



After EMV-improvement



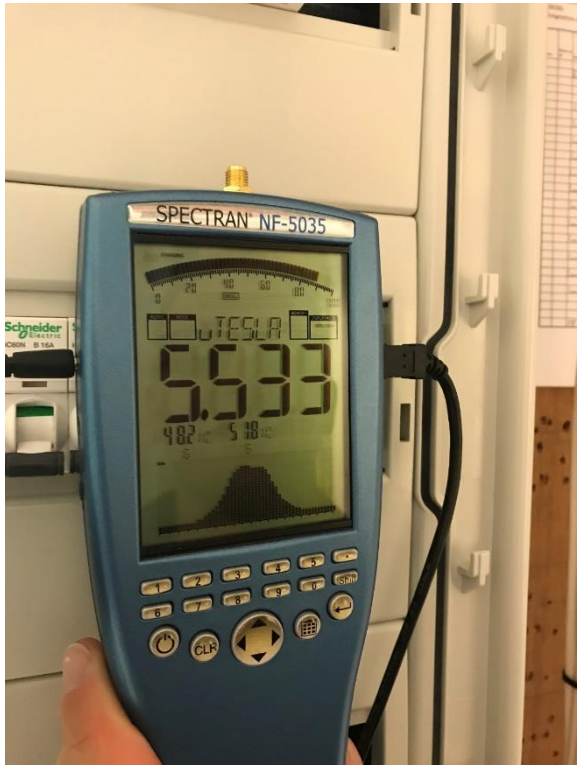


TESTS AND MEASUREMENTS

Some measurements (example)

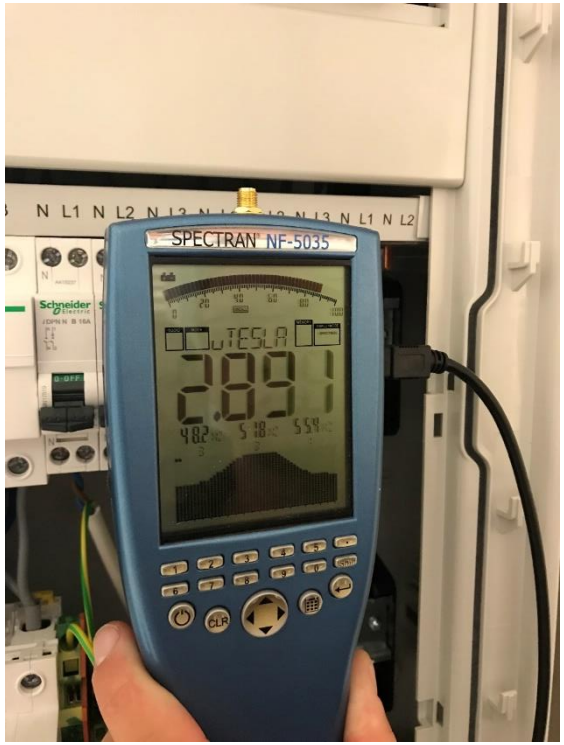
Magnetic field 50Hz

Separate N



Magnetic field 50Hz

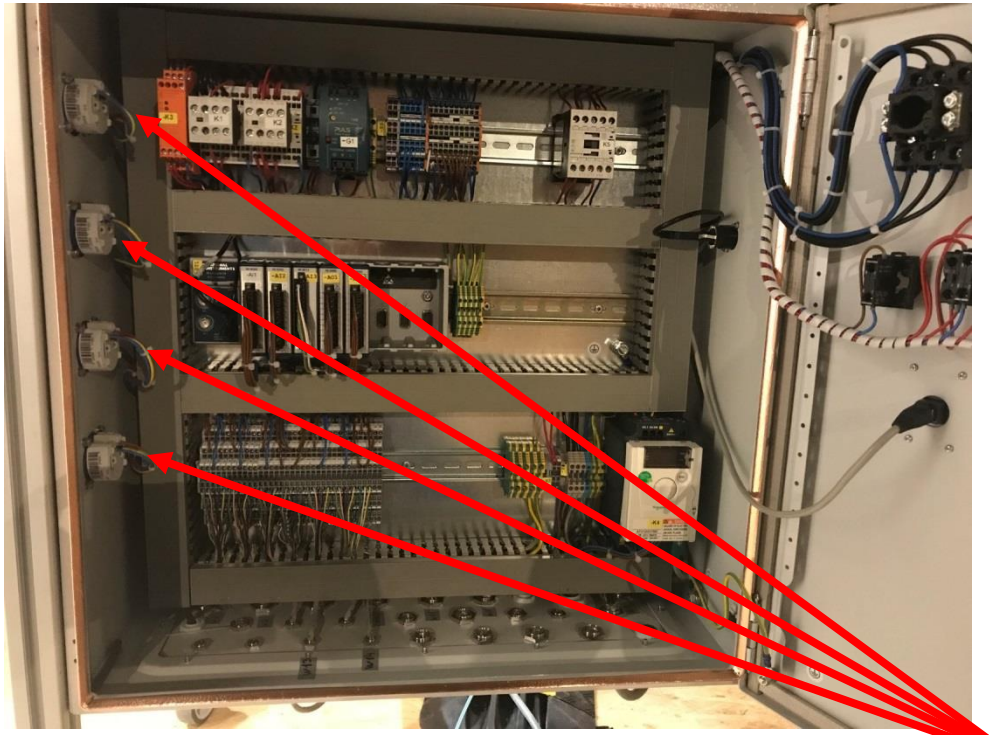
Combined L and N

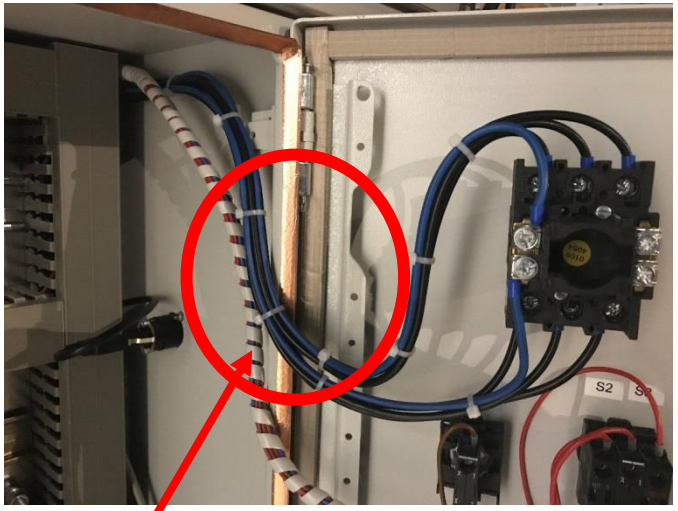


Comparism of Schneider 3L+N and 3L and separate N

If there is interest more interesting measurement results available

Additional safety improvement





- Protect fraying
- Not the right cable cross section

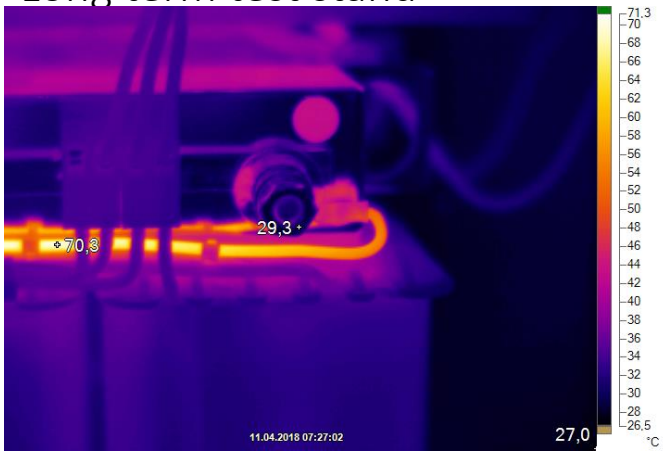
TEST OF ELECTRONICAL EQUIPMENT

Initial commissioning

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Test of functionality and heating up

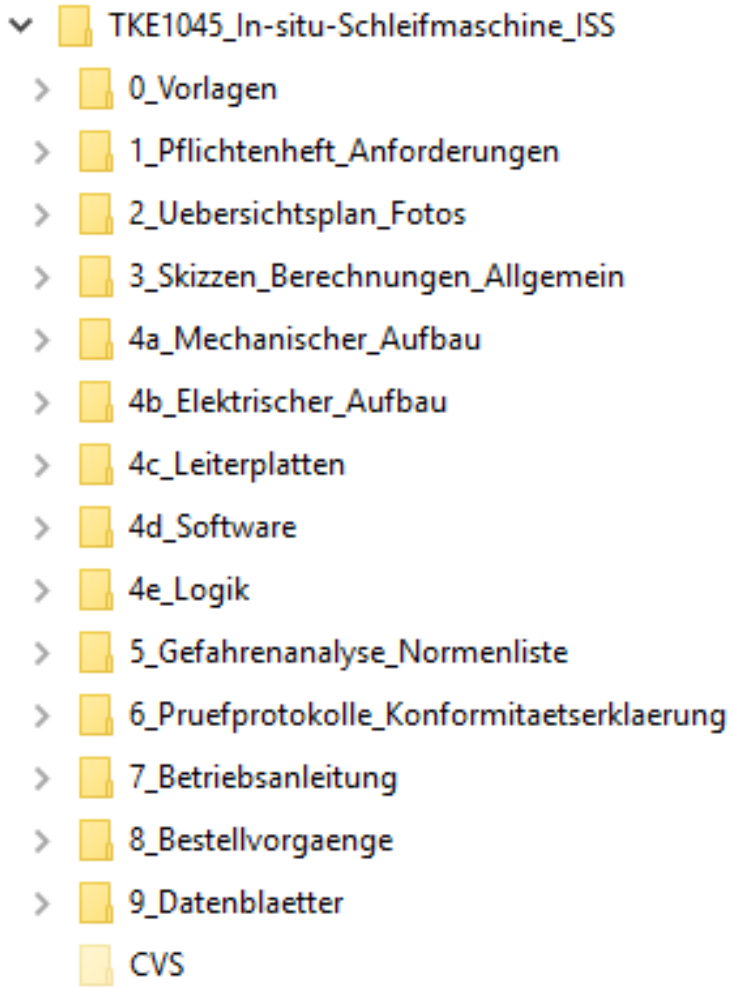
- Measuring all currents
- Voltages
- Phase
- Harmonics
- Power consumption
- Temperature
- Long term test stand



TKE Test Stand

Infrared camera

Project folder



- Folder for **all** documents
  - sketches
  - orders
  - CE-documents
  - Manuals
  - datasheets
  - Electrical drawings
  - Mechanical drawings
  - Protocols
  - PCBs
  - Software
  - …

TEST OF ELECTRONICAL EQUIPMENT

Electrical safety Protocol

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Prüfprotokoll gemäß BetrSichV

Auftraggeber: T. Lippman, Abtl. WPN

Auftragnehmer: Helmholtz-Zentrum Geesthacht, Zentrum für Material- und Küstenforschung

Gerätename: In Situ Schleifmaschine

Hersteller: TK

Typ / Geräteklasse:

Ident.-Nr. (TKE-Nummer, Typ Ser): TKE 1045

Prüf-Barcode: 501553

Heizleistung: W

Prüfung nach:
- [x] VDE0100 Teil 600 Erstprüfung elektrischer Anlagen
- [ ] VDE 0701/0702 Reparatur, Instandsetzung, Wiederholungsprüfung

EMV-Prüfung
- [x] Ja
- [ ] Nein

Besichtigung:
- Schutzleiter
- Gehäuse und mechanische Teile
- Isolierteile
- Geräte-Anschlussleitung & Steckvorrichtungen
- Netzfilter

EMV
- [x] EN55022A/B Abstrahlung Industrie-, Wohnumgebung
- [x] EN550022AQP/AAV Netzrückwirkung Industrieumgebung

Vertikale Abstahlung: Durchsuchen... Keine Datei ausgewählt.

Horizontale Abstahlung: Durchsuchen... Keine Datei ausgewählt.

Prüfgerät
- [ ] Fluke 1
- [x] Fluke 2

Schutzklasse:
- [x] SK1
- [ ] SK2
- [ ] SK3

Prüfablauf

Messung bestanden

- [x] Schutzleiterwiderstand: 0,16 Ω Stromauswahl: 200mA / 10A
- [x] Isolationswiderstand LN-PE (SK1/SK3): > 299 MΩ
- [ ] Isolationswiderstand LN-leitfähige Teile (SK2/SK3): 299 MΩ
- [ ] Ersatz-Ableitstrom: mA
- [x] Berührungsstrom: 0,01 mA
- [ ] Schutzleiterstrom: mA
- [ ] Differenzstrom : 0,27 mA
- [x] Funktionsprüfung

Bemerkung zur Prüfung:
Messung ohne Netzfilter und Servoverstärker
Isolationswiderstand mit Netzfilter und Servoverstärker 0,68 M Ohm

- [ ] Gesamtprüfung bestanden

Empfohlener nächster Prüftermin:

Zweitprüfer
- [ ] CVS / REDMINE vorhanden
- [ ] Sichtprüfung
- [ ] Vollständige Dokumentation
- [ ] Funktion gemäß Auftrag.

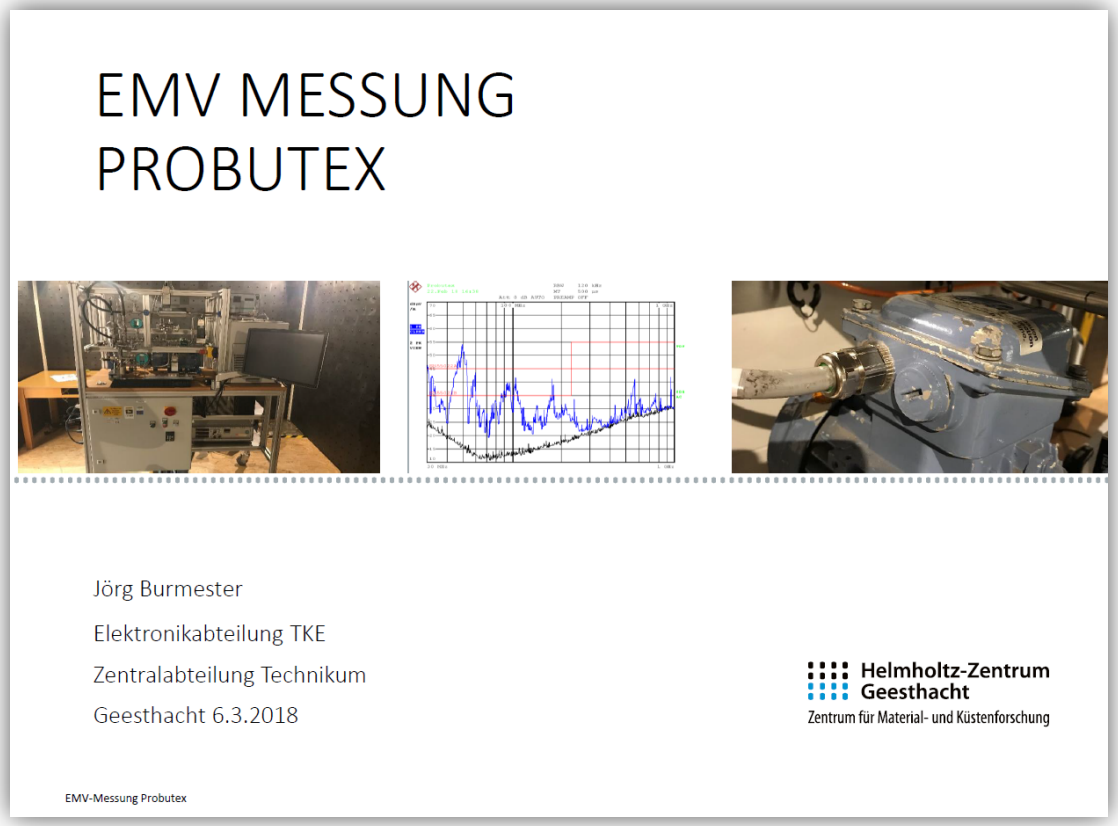
Unterschriften

Prüfer:	Zweitprüfer:	Empfänger:
Ort: Geesthacht	Ort: Geesthacht	Ort:
Datum: 02.12.16	Datum: 5.12.16	Datum:

Senden

Documented electrical measurements

Short report of all EMI measurments



- Comments on measurment results
- What has to be done to fullfill the EMC-requirements
- Comments on leakage current
- Safety issues (fraying)
- Shielding
- Cabling
- irradiating unit under test
  - Prove of beeing not disturbed by electromagnetic iradiation (not suitable/necassary for normal measurment equipment
- What has been changed to reach EMC-requirements

TEST OF ELECTRONICAL EQUIPMENT

At last Delivery report

Helmholtz-Zentrum Geesthacht
Centre for Materials and Coastal Research

Test and final commissioning (customer)

- Short Protocol
  - Software check
  - Functionality check
  - All documents present
  - Hazard analsis
  - Risks
  - Labeling
  - Test of all safety installations (emergency stop, light curtains…)
- Type plate
- CE- conformity declaration
- Signatures

mission accomplished


QUESTIONS?