■ リスク分析・評価

製品名：Safety Product

モデル名：FSS

適用規格：ISO/TR 14121-2:2012（機械の安全性 – リスクアセスメントの原理）

Reviewed by

Ver.

Date:

STEP1:危険の洗い出し

No.	内　　容	(1) 製造時	(2) 輸送時	(3) 設置時	(4) 使用時	(5) 保守時	(6) 撤去時
	タスク分析：該当製品の各行程における安全上のタスク						
	■考えられる危険、危険な状態、及び事故の発生						
1	**機械的危険**						
	●機械部品、又は加工品が原因で起こる危険 a)形状 b)位置 c)安定性(重量) d)制御安定性(速度) e)機械強度						
	●機械内部の蓄積エネルギーが原因で起こる危険 f)弾力性機械部品(ばね) g)加圧液体及び気体 h)真空						
	1.1 押しつぶし(クラッシュ)危険						
	1.2 裂断(切り裂き)の危険						
	1.3 切り傷、切断の危険						
	1.4 巻き込まれの危険						
	1.5 引き込まれ、落ち込みの危険						
	1.6 衝撃の危険						
	1.7 突き傷、刺し傷の危険						
	1.8 摩擦、擦り傷の危険						
	1.9 高圧液体(気体)の注入、噴出の危険						
2	**電気的危険**						
	2.1 電流の流れている部品に人が接触(直接接触)						
	2.2 故障状態で電流が流れる部品に人が接触(間接接触)						
	2.3 高電圧電流の流れている部品に接近						
	2.4 静電気現象						
	2.5 熱放射、溶融粒子及びショート、過負荷による化学的影響						
3	**熱的危険**						
	3.1 極高温/低温物体、材料接触、火炎、爆発、熱源放射による火傷、湯傷						
	3.2 高温、又は低温作業環境による健康被害						
4	**騒音が起こす危険**						
	4.1 聴取力喪失(聞こえない)、その他の生理的不調(認識力喪失)						
	4.2 会話の妨害、音声連絡の妨害						
5	**振動が起こす危険**						
	5.1 各種の神経、及び血管障害を起こす手持ち式機械の使用						
	5.2 特に劣悪な姿勢と組み合わせたときの全身振動						
6	**放射から生ずる危険**						
	6.1 低周波、高周波放射、マイクロ波						
	6.2 赤外線、可視光線及び紫外線						
	6.3 X線及びγ線						
	6.4 α線、β線、電子、又はイオンビーム、中性子						
	6.5 レーザ						
7	**材料、及び物質が起こす危険**						
	7.1 有害な液体、気体、噴霧、煙霧、及び塵埃との接触又は吸入						
	7.2 火災、又は爆発の危険						
	7.3 生物学的、又は微生物学的(ウイルス又は細菌)危険						
8	**エルゴノミー(人間工学原理)を無視したことから起きる危険**						
	8.1 ムリな姿勢、又は過度な操作						
	8.2 人の手-腕、足-脚を不適切に使用するムリな操作						
	8.3 防護機器、用具の使用を無視した機器の使用						
	8.4 不適切な局部照明						
	8.5 精神的ストレス(過負荷及び過小負荷)						
	8.6 ヒューマンエラー、人の行動						
	8.7 手動制御装置の不適切な設計、配置、又は識別						
	8.8 視覚表示装置の不適切な設計、又は配置						
9	**組合せによる危険**						
	9.1 機器の組合せによって起こる危険						
	9.2 オプション機器の追加によって起こる危険						
	9.3 組合せによって増大する危険						

STEP2:見つけた危険への対処(リスク分析・安全対策)

STEP3:対策後のリスク評価

段階番号、リスク項目は左記危険の洗い出し表よりその記号を記入。重要度、発生頻度、リスク等級の詳細は別紙参照。

リスク項目	段階番号	重大度	発生度	対策前リスク等級	標語	該当する危険部分の内容	該当する危険部分の対応	残存リスクとその対策　（注意表示とユーザーマニュアル）	重大度	発生度	対策後リスク等級	備考

・重要度(Severity);　"1":軽微(Minor) "2":軽度(Light)　"3":中度(Moderate)　"4":Severe(重度)　"5": 致命的(Catastrophic)

・発生度(Probability); "1":1回以下/10年(Unlikely)"2":1回以下/5年(Rare)"3":1回以下/1年(Posible)"4":5回以下/1年(Likely)"5":5回以上/1年(Frequent)

・リスク等級(Categories)= 重要度(Severity)×発生度(Probability)

標語:　"C":Critical(12ﾎﾟｲﾝﾄ以上)設計見直し "H":High(8～11ﾎﾟｲﾝﾄ)危険低減要　"M":Medium(4～7ﾎﾟｲﾝﾄ)表示等で対処　"L":Low(1～3ﾎﾟｲﾝﾄ)許容範囲

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RISK ASSESSMENT

*Definition; Risk= Severity (Degree of damage)*Probability (Occurrence of an injury or damage)*

Severity; 1:Minor 2:Light 3:Moderate 4: Severe 5:Fatal or Catastrophic
Probability; 1:Unthinkable 2:Unlikely 3:Likely to occur at times 4:Likely to occur sometimes 5:Likely to occur frequently
Total points; The product of severity assessment points by the probability of the occurrence assessments points.
*Rank; L(Low):from 1 to 3 , M(medium):from 4 to 7 , H(High):from 8 to 11 , C(Critical) from 12 *Depending on total points.*

Ver.0 *Date: Day Month, Year*

Product:
Model:
Mfr'er: SAMPLE

PROCESS :
(1)Manufacture (5)Maintenance
(2)Transportation
(3)Installation (6) Service
(4)Operation (7) Disassembly
●: Relevant Process

STEP 1 : Hazardous Identification

Kind of Hazards	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Mechanical Hazards due to:	※Described in STEP 2 and 3.						
- Machine parts or work pieces, e.g.: a) shape b) relative location c) mass and stability d) mass and velocity e) mechanical streng			●	●	●		
- Accumulation of energy inside the machinery e.g.: f) elastic elements g) liquids and gases under pressure h) the effect of vacuum							
1.1 Crushing hazard							
1.2 Shearing hazard							
1.3 Cutting or severing hazard							
1.4 Entanglement hazard							
1.5 Drawing-in or trapping hazard							
1.6 Impact hazard							
1.7 Stabbing puncture hazard							
1.8 Friction or abrasion hazard							
1.9 High pressure fluid injection or ejection hazard							
2. Electrical Hazards due to:							
2.1 Contact of persons with live parts (direct contact)			●	●	●		
2.2 Contact of persons with live parts which have become live under faulty conditions (indirect contact)							
2.3 Approach to live parts under high voltage						●	
2.4 Electrostatic phenomena							
2.5 Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads.							
3. Thermal hazards, resulting in:							
3.1 Burns, scalds and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources.							
3.2 Damage to health by hot or cold working environment							
4. Hazards generated by noise, resulting in:							
4.1 Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)							
4.2 Interference with speech communication, acoustic signals, etc.							
5. Hazards generated by vibration							
5.1 Use of hand-held machines resulting in a variety of neurological and vascular disorders.							
5.2 Whole body vibration, particularly when combined with poor postures.							
6. Hazards generated by radiation							
6.1 Low frequency, radio frequency radiation, microwaves				●	●	●	
6.2 Infrared, visible and ultraviolet light							
6.3 X and gamma rays							
6.4 Alpha, beta rays, electron or ion beams, neutrons							
6.5 Lasers							
7. Hazards generated by materials and substances (and their constituent element) processed or used by the machinery.							
7.1 Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes, and dusts.							
7.2 Fire or explosion hazard							
7.3 Biological or microbiological (viral or bacterial) hazards							
8. Hazards generated by neglecting ergonomic principles in machinery as, e.g. hazards from:							
8.1 Unhealthy postures or excessive effort							
8.2 Inadequate consideration of hand-arm or foot-leg anatomy							
8.3 Neglected use of personal protection equipment							
8.4 Inadequate local lighting							
8.5 Mental overload and underload, stress							
8.6 Human error, human behavior							
8.7 Inadequate design, location or identification of manual controls							
8.8 Inadequate design, location of visual display units							
9. Combination of hazards							
10. Unexpected start-up, unexpected over-run/over-speed (or any similar malfunction) from:							
10.1 Failure/disorder of the control system							
10.2 Restoration of energy supply after an interruption							
10.3 External influences on electrical equipment							
10.4 Other external influences (gravity, wind, etc.)							
10.5 Errors in the software							
10.6 Errors made by the operator (due to mismatch of machinery with characteristics and abilities, see 8.6)							
11. Impossibility of stopping the machine in the best possible conditions							
12. Variations in the rotational speed of tools							
13. Failure of the power supply							
14. Failure of the control unit							
15. Errors of fitting							
16. Break-up during operation							
17. Falling or ejected objects or fluids							
18. Loss of stability / overturning of machinery							
19. Slip, trip and fall of persons (related to machinery)							

STEP 2 : Action against Hazardous items

STEP 3 : Assessment

After countermeasures

*Applicable Standard; ISO/TR 14121-2:2012

Risk items	Process	Severity	Probability	Total points	Rank	Hazardous contents and Countermeasures: Contents	Hazardous contents and Countermeasures: Countermeasures Design)	Residual risk and Countermeasures	Severity	Probability	Total points	Rank	Remarks
2.1	(3)(4)(5)	4	2	8	H	**ELECTRIC HAZARD** ·Risk of electric shock by touching the power cable.	·Employ an approved power cable.	·Describe caution and set-up method in the installation manual to prevent electric shock.	-	-	-	L	Described in the instructions as follows. [WARNING] To reduce risk of electric shock, connect the power cord to a grounded AC outlet.
2.3	(6)	4	2	8	H	·Risk of electric shock by accessing high voltage area when opening the top enclosure of control unit.	·Make construction with screws by using a tool when removing the enclosure.	·Describe cautions in the instruction manual.	-	-	-	L	Described in precautions in the manual. (1)Do not disassemble the unit or attempt internal alterations. (2)in case of malfunction, do not attempt any repairs. Note the condition of the unit clearly and contact the supplier.
2.3	(6)	4	2	8	H	·Risk of electric shock and relevant hazard in the cause of avoiding the shock by touching high voltage parts.	·Insulate the energized parts in the enclosure.						
2.1	(3)(4)(5)	3	2	6	M	·Burning hazard of flammable parts or fire hazard spreading intensive burned parts.	·Employ inflammable materials such as UL approved.						
1-a)	(3)(4)(5)	2	3	6	M	**MECHANICAL HAZARD** ·Risk of injury on control panel by touching sharp edge.	·Remove sharp edges around mechanical parts.	-	-	-	-	L	
ALL	(3)(4)(5)(6)	3	3	9	H	**PRODUCT SAFETY** It could occur malfunction to the equipment, and make bad influence to human and property due to not enough for safety measures.	Meet the Low Voltage Directive according to the applicable standard, IEC/EN 61010-1.	-	-	-	-	L	Refer to the Technical Documentation and the safety Test Report.
6.1	(4)(5)(6)	2	3	6	M	**EMC (Electro Magnetic Compatibility)** Electro magnetic wave from the equipment interferes other equipments, and it could become in malfunction. At the same time, the equipment will receive interference from other equipments, and it could become in malfunction.	Take measures to the EMC, and in conformity with the applicable standard, EN 61326-1.	-	-	-	-	L	Refer to the Technical Documentation and the EMC Test Report.