

DIN EN 12409:2011-12 (E)

Plastics and rubber machines - Thermoforming machines - Safety requirements

Contents		Page
Foreword		4
Introduction		5
1	Scope	6
2	Normative references	7
3	Terms and definitions	8
4	List of significant hazards	11
4.1	General	11
4.2	Hazards relating to all units	11
4.2.1	Mechanical hazards	11
4.2.2	Hazards due to electrical energy	11
4.2.3	Hazards due to failure/malfunction of the control system	11
4.2.4	Hazards resulting from failure of an energy supply	11
4.2.5	Hazards due to failure/malfunction of pneumatic equipment	11
4.2.6	Hazards resulting from failure/malfunction of hydraulic equipment	12
4.2.7	Hazards resulting from inadequate emergency precautions	12
4.2.8	Hazards resulting from noise	12
4.2.9	Hazards resulting from inhalation of hazardous dusts, fumes or gases during normal operation	12
4.2.10	Hazards due to hot surfaces	12
4.2.11	Hazards due to unsuitable ergonomics	12
4.2.12	Hazards due to unexpected start up	12
4.2.13	Hazards arising when setting the machine	12
4.2.14	Hazards arising from access to finishing area during production	13
4.2.15	Hazards due to permanent means of access	13
4.2.16	Hazards due to laser devices	13
4.3	Specific hazards and danger zones relating to individual units	13
4.3.1	Continuous sheet unwind unit	13
4.3.2	Single sheet feed unit	14
4.3.3	Material intake	14
4.3.4	Conveying equipment	14
4.3.5	Heating, pre-heating and edge heating	15
4.3.6	Forming station	16
4.3.7	Finishing station	16
4.3.8	Stacking station	16
4.3.9	Discharge station	17
4.3.10	Residual sheet winding unit	17
4.3.11	Sheet cutting unit	18
5	Safety requirements and/or protective measures	18
5.1	General	18
5.2	General safety requirements and/or protective measures relating to all units	18
5.2.1	Access to danger zones	18
5.2.2	Electrical equipment	19
5.2.3	"Unintended gravity fall of raised elements"	20
5.2.4	Pneumatic equipment	22
5.2.5	Hydraulic equipment	22
5.2.6	Precautions for emergencies	22

5.2.7	Noise	22
5.2.8	Inhalation of hazardous dusts, fumes and gases	23
5.2.9	Hot surfaces	23
5.2.10	Ergonomics	24
5.2.11	Unexpected start up	24
5.2.12	Setting mode	24
5.2.13	Access during production	24
5.2.14	Laser devices	25
5.2.15	Permanent means of access	25
5.2.16	Common safeguarding system	25
5.2.17	Fixing systems of fixed guards	25
5.3	Specific safety requirements and/or protective measures relating to individual units	25
5.3.1	Continuous sheet unwind unit	25
5.3.2	Single sheet feed unit	26
5.3.3	Material intake	27
5.3.4	Conveying equipment	28
5.3.5	Heating, pre-heating and edge heating	29
5.3.6	Forming station	31
5.3.7	Finishing station	32
5.3.8	Stacking zone	33
5.3.9	Discharge station	34
5.3.10	Residual sheet winding unit	34
5.3.11	Sheet cutting unit	35
6	Verification of safety requirements and/or protective measures	36
7	Information for use	39
7.1	Marking on the machine	39
7.1.1	Minimum marking	39
7.1.2	Additional markings	40
7.2	Instruction manual	40
7.2.1	General requirements	40
7.2.2	Hot surfaces	40
7.2.3	Use of personal protective equipment	40
7.2.4	Noise declaration	40
7.2.5	Extraction of dusts, fumes or gases	41
7.2.6	Electrostatic phenomena	41
7.2.7	Manual handling	42
7.2.8	Fire prevention	42
7.2.9	Manual intervention at the stacking zone	42
7.2.10	Safe cleaning	42
7.2.11	Use of acknowledge switch	42
7.2.12	"!Inspection of electrical drives"	42
7.2.13	Single sheet feed malfunction	42
7.2.14	"!Static holding load"	42
Annex A (informative)	Single sheet machine (alternatively material feed from single sheet magazine or continuous sheet roll)	43
Annex B (informative)	Continuous sheet machine (combined forming and finishing)	44
Annex C (informative)	Continuous sheet machine (separate forming and finishing)	45
Annex ZA (informative)	Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	47
Bibliography	48