

Automatic electrical controls for household and similar use —

Part 2-5: Particular requirements for automatic electrical burner control systems

ICS 97.120

National foreword

This British Standard is the UK implementation of EN 60730-2-5:2002+A2:2010, incorporating amendment A11:2005. It is derived by CENELEC from IEC 60730-2-5:2000, incorporating amendments 1:2004 and 2:2008. It supersedes BS EN 60730-2-5:2002 which will be withdrawn on 1 March 2013.

The start and finish of text introduced or altered by IEC amendment is indicated in the text by tags [A1] <A1>. Tags indicating changes to IEC text carry the number of the amendment. For example, text altered by IEC amendment 1 is indicated by [A1] <A1>.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags [C] <C>. Where a common modification has been introduced by amendment, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC amendment A11 are indicated by [C11] <C11>. Where a common modification to an IEC amendment has been introduced, the tags carry the number of the amendment. For example, the common modifications introduced by CENELEC to IEC amendment 2 are indicated by [C2] <C2>.

The UK participation in its preparation was entrusted to Technical Committee CPL/72, Electrical control devices for household equipment and appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 5 August 2002

© BSI 2010

ISBN 978 0 580 71490 0

Amendments/corrigenda issued since publication

Amd. No.	Date	Comments
15751	14 December 2005	Implementation of IEC amendment 1:2004 with CENELEC endorsement A1:2004
15589	31 August 2006	Implementation of CENELEC amendment A11:2005
	31 May 2010	Implementation of IEC amendment 2:2010 with CENELEC modifications

English version

Automatic electrical controls for household and similar use
Part 2-5: Particular requirements for automatic
electrical burner control systems
(IEC 60730-2-5:2000, modified)

Dispositifs de commande électrique
automatiques à usage domestique
et analogue
Partie 2-5: Règles particulières pour
les systèmes de commande électrique
automatiques des brûleurs
(CEI 60730-2-5:2000, modifiée)

Automatische elektrische Regel- und
Steuergeräte für den Hausgebrauch
und ähnliche Anwendungen
Teil 2-5: Besondere Anforderungen
an automatische elektrische Brenner-
Steuerungs- und Überwachungssysteme
(IEC 60730-2-5:2000, modifiziert)

This European Standard was approved by CENELEC on 2001-12-04. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 60730-2-5:2000, prepared by IEC TC 72, Automatic controls for household use, together with the common modifications prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use, was submitted to the formal vote and was approved by CENELEC as EN 60730-2-5 on 2001-12-04.

This European Standard supersedes EN 60730-2-5:1995 + corrigendum July 1997 + A1:1996 + A1:1996/corrigendum July 1997 + A2:1998 + A2:1998/corrigendum January 1998.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement dop 2002-12-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn dow 2008-12-01

This Part 2-5 is to be used in conjunction with EN 60730-1:1995, Automatic electrical controls for household and similar use - Part 1: General requirements, and its amendments. Consideration may be given to future editions of EN 60730-1.

This Part 2-5 supplements or modifies the corresponding clauses of EN 60730-1 so as to convert it into the European Standard: Particular requirements for automatic electrical burner control systems.

Where a particular clause or subclause of Part 1 is not mentioned in this Part 2-5, that clause or subclause applies as far as is reasonable. Where this Part 2-5 states "addition", "modification" or "replacement", the relevant text of Part 1 is to be adapted accordingly.

Where reference is made to other international or harmonized standards, the edition of that standard quoted in annex ZA (normative) is applicable.

There are no special national conditions (snc) causing a deviation from this European Standard other than those listed in annex ZB of EN 60730-1.

National deviations from this European Standard are listed in annex ZC (informative) and are in addition to those in EN 60730-1:1995.

In this standard:

- 1) The following print types are used:
 - Requirements proper: in roman type;
 - *Test specifications: in italic type;*
 - Explanatory matter: in small roman type.
- 2) Subclauses, notes, tables and figures which are additional to those in Part 1 are numbered starting from 101, additional annexes are lettered AA, BB, etc.

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes H, AA and ZA are normative and annexes BB and ZC informative.

Annexes ZA and ZC have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60730-2-5:2000 was approved by CENELEC as a European Standard with agreed common modifications.

Foreword to amendment A1

The text of document 72/632A/FDIS, future amendment 1 to IEC 60730-2-5:2000, prepared by IEC TC 72, Automatic controls for household use, was submitted to the IEC-CENELEC parallel vote and, together with common modifications prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use, was approved by CENELEC as amendment A1 to EN 60730-2-5:2002 on 2004-10-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2008-12-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directives. See Annex ZZ.

Annex ZZ has been added by CENELEC.

NOTE This amendment enables EN 60730-2-5 to be used with EN 60730-1:2000. Consideration may be given to future editions of, or amendments to, EN 60730-1.

Foreword to amendment A11

This amendment to the European Standard EN 60730-2-5:2002 was prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A11 to EN 60730-2-5:2002 on 2004-12-01.

This amendment was prepared in order to make EN 60730-2-1 not applicable for controls covered by this standard. EN 60730-2-1:1997 will be withdrawn at the latest date of withdrawal of the last Part 2 for which it is applicable (i.e. 2009-03-01 applicable to EN 60730-2-2:2002).

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2005-12-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2008-12-01

Foreword to amendment A2

The text of amendment 2:2008 to the International Standard IEC 60730-2-5:2000, prepared by IEC TC 72, Automatic controls for household use, together with the common modifications prepared by the Technical Committee CENELEC TC 72, Automatic controls for household use, was submitted to the CENELEC formal vote and was approved as amendment A2 to the EN 60730-2-5:2002 on 2010-03-01.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- latest date by which the amendment has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2011-03-01
- latest date by which the national standards conflicting
with the amendment have to be withdrawn (dow) 2013-03-01

This amendment to Part 2-5 is to be used in conjunction with EN 60730-1:2000, Automatic electrical controls for household and similar use – Part 1: General requirements and any subsequent amendments.

Endorsement notice

The text of amendment 2:2008 to the International Standard IEC 60730-2-5:2000 was approved by CENELEC as an amendment to the European Standard.

This page deliberately set blank

CONTENTS

Page

Clause

1	Scope and normative references	7
2	Definitions	9
3	General requirements	15
4	General notes on tests	15
5	Rating.....	16
6	Classification	16
7	Information	18
8	Protection against electric shock	21
9	Provision for protective earthing	21
10	Terminals and terminations	22
11	Constructional requirements	22
12	Moisture and dust resistance	27
13	Electric strength and insulation resistance	27
14	Heating.....	28
15	Manufacturing deviation and drift	29
16	Environmental stress	31
17	Endurance	31
18	Mechanical strength.....	34
19	Threaded parts and connections	34
20	Creepage distances, clearances and distances through solid insulation.....	35
21	Resistance to heat, fire and tracking	35
22	Resistance to corrosion	35
23	Electromagnetic compatibility (EMC) requirements – emission.....	35
24	Components	35
25	Normal operation	35
26	Electromagnetic compatibility (EMC) requirements – immunity.....	35
27	Abnormal operation.....	35
28	Guidance on the use of electronic disconnection	35
	Annex H (normative) Requirements for electronics	36
	Annex J (normative) Requirements for controls using thermistors	50
	Annex BB (informative) Functional characteristics of burner control systems to be specified by the relevant appliance standards, as applicable	53
	Annex ZZ (informative) Coverage of Essential Requirements of EC Directives.....	59
	Figure 101	21
	Table 7.2	19
	Table H.101 – Criteria for compliance with voltage dip tests in each operating condition	38

This page deliberately set blank

AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE –

Part 2-5: Particular requirements for automatic electrical burner control systems

1 Scope and normative references

This clause of part 1 is applicable except as follows:

1.1 *Replacement:*

This part of IEC 60730 applies to automatic electrical burner control systems for the automatic control of burners for oil, gas, coal or other combustibles for household and similar use including heating, air conditioning and similar use.

This part 2-5 is applicable to a complete burner control system and to a separate programming unit. This part 2-5 is also applicable to a separate electronic high-voltage ignition source and to a separate flame detector.

Separate ignition devices (electrodes, pilot burners, etc.) are not covered by this part 2-5 unless they are submitted as part of a burner control system.

Requirements for separate ignition transformers are contained in IEC 60989.

Throughout this part 2-5, where it can be used unambiguously, the word "system" means "burner control system" and "systems" means "burner control systems".

Systems utilizing thermoelectric flame supervision are not covered by this part 2-5.

1.1.1 This part 2-5 applies to the inherent safety, to the manufacturer's declared operating values, operating times and operating sequences where such are associated with burner safety and to the testing of automatic electrical burner control systems used in, on, or in association with, burners.

Requirements for specific operating values, operating times and operating sequences are given in the standards for appliances and equipment.

Systems for equipment not intended for normal household use, but which nevertheless may be used by the public, such as equipment intended to be used by laymen in shops, in light industry and on farms, are within the scope of this part 2-5.

This part 2-5 applies to systems using NTC or PTC thermistors, additional requirements for which are contained in annex J.

EN 60730-2-1 is not applicable to burner control systems.

This part 2-5 does not apply to systems designed exclusively for industrial applications.

1.1.2 This part 2-5 applies to manual controls when such are electrically and/or mechanically integral with automatic controls.

Requirements for manual switches not forming part of an automatic control are contained in IEC 61058-1.

Throughout this part 2-5, the word "equipment" means "appliance and equipment".

1.2 Replacement:

This part 2-5 applies to systems with a rated voltage not exceeding 660 V and with a rated current not exceeding 63 A.

1.3 Replacement:

This part 2-5 does not take into account the response value of an automatic action of a control, if such a response value is dependent upon the method of mounting the control in the equipment. Where a response value is of significant purpose for the protection of the user, or surroundings, the value defined in the appropriate household equipment standard or as determined by the manufacturer applies.

This part 2-5 includes systems responsive to flame properties.

1.4 Replacement:

This part 2-5 applies also to systems incorporating electronic devices, requirements for which are contained in annex H.

1.5 Normative references:

This clause of part 1 is applicable except as follows:

Addition:

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

 *Text deleted* 

 IEC 60127-1:2006, *Miniature fuses – Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-5-1:2003, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices* 

IEC 60989:1991, *Separating transformers, autotransformers, variable transformers and reactors*

2 Definitions

This clause of part 1 is applicable except as follows:

2.2 Definitions of types of control according to purpose

Additional definitions:

2.2.101

burner control system

system which monitors the operation of fuel burners. It includes a programming unit, a flame detector and may include an ignition source and/or ignition device

The various functions of the system may be in one or more housings.

2.2.102

flame detector

device which provides the programming unit with a signal indicating the presence or absence of flame

It includes the flame sensor and may include an amplifier and a relay for signal transmission. The amplifier and relay may be in its own housing or combined with the programming unit.

2.2.103

flame sensor

device which senses the flame and provides the input signal to the flame detector amplifier

Examples are optical sensors and flame electrodes (flame rods).

2.2.104

ignition source

electrical or electronic system component which provides energy to an ignition device

It may be separated from or incorporated in the programming unit. Examples are ignition transformers and electronic high-voltage generators.

2.2.105

ignition device

device mounted on or adjacent to a burner for igniting fuel at the burner

Examples are pilot burners, spark electrodes and hot surface igniters.

2.2.106

programming unit

device which controls the burner operation in a declared sequence from start-up to shutdown within declared timings and in response to signals from regulating, limiting and monitoring devices

2.2.107

multitry system

system that allows more than one valve open period during its declared operating sequence

2.3 Definitions relating to the function of controls

2.3.30

$T_{\max}$

Replace "switch head" by "burner control system."

Additional definitions:

2.3.101

automatic recycle

automatic repetition of the start-up procedure, without manual intervention, following loss of the supervised flame and subsequent fuel supply shutoff

2.3.102

controlled shutdown

de-energization of the fuel flow means as a result of the opening of a control loop by a control device such as a thermostat. The system returns to the start position

Controlled shutdown may include additional actions by the system.

2.3.103

flame detector response time

period of time between the loss of the sensed flame and the signal indicating the absence of flame

2.3.104

flame detector operating characteristics

that function of the flame detector which indicates absence or presence of flame as the output signal of the flame detector relating to the input signal

Normally the input signal is provided by a flame sensor.

2.3.104.1

signal for presence of flame (S_1)

minimum signal which indicates the presence of flame when there was previously no flame

2.3.104.2

signal for absence of flame (S_2)

maximum signal which indicates the loss of flame

S_2 is less than S_1 .

2.3.104.3

maximum flame signal ($S_{\max}$)

maximum signal which does not affect the timings or the sequence

2.3.104.4

signal for visible light flame simulation (S_3)

minimum signal which indicates the presence of flame during the visible light flame simulation test

S_3 is less than S_2 .

2.3.105**self-checking flame detector**

flame detector which checks for correct operation of the flame detector and its associated electronic circuitry while the burner is in the running position

2.3.106**flame detector self-checking rate**

frequency of the self-checking function of the flame detector (in number of operations per unit of time)

2.3.107**flame failure lock-out time**

period of time between the signal indicating absence of flame and lock-out

2.3.108**flame failure reignition time (relight time)**

period of time between the signal indicating absence of flame and the signal to energize the ignition device. During this time period the fuel supply is not shut off

2.3.109**flame signal**

output signal of the flame detector

2.3.110**flame simulation**

condition which occurs when the flame detector indicates the presence of flame when in reality no flame is present

2.3.111**ignition time**

period of time during which the ignition device is energized

**2.3.112****lock-out**

process in which the system goes into one of the following lock-out conditions, following safety shutdown

2.3.112.1**non-volatile lock-out**

condition such that a restart can only be accomplished by a manual reset of the system and by no other cause

2.3.112.2**volatile lock-out**

condition such that a restart can be accomplished by either a manual reset of the system or by an interruption of the power supply and its subsequent restoration 

2.3.113**main flame establishing period**

period of time between the signal to energize the main fuel flow means and the signal indicating presence of the main burner flame

2.3.114

pilot flame establishing period

period of time between the signal to energize the pilot fuel flow means and the signal indicating presence of the pilot flame

2.3.115

post-ignition time

period of the ignition time between the signal indicating presence of flame and the signal to de-energize the ignition device

2.3.116

pre-ignition time

period of the ignition time between the signal to ignite and the signal to energize the fuel flow means

2.3.117

proved igniter

system in which the fuel flow means is energized only after the availability of sufficient energy to ignite the fuel has been verified

Examples are systems using spark supervision and those using proved hot surface igniters.

2.3.117.1

proved igniter operating value

signal which indicates that the proved igniter has the energy to ignite the fuel

2.3.117.2

igniter proving time

period of time between the signal to energize the proved igniter and the signal to energize the fuel flow means

2.3.117.3

igniter failure response time

period of time between loss of the supervised proved igniter and the signal to de-energize the fuel flow means

2.3.118

purge time

period during which air is introduced to displace any remaining air/fuel mixtures or products of combustion from the combustion zone and flue ways

No fuel is admitted during this period.

2.3.118.1

post-purge time

purge time that takes place immediately following the shutting off of the fuel supply

2.3.118.2

pre-purge time

purge time that takes place between initiation of a burner control sequence and the admission of fuel to the burner

2.3.119

re-ignition (relight)

process by which, following loss of the flame signal, the ignition device will be re-energized without interruption of the fuel flow means

2.3.120**recycle time**

period of time between the signal to de-energize the fuel flow means following the loss of flame and the signal to begin a new start-up procedure

2.3.121**running position**

this position denotes that the main burner flame is established and supervised

2.3.122**safety shutdown**

de-energization of the main fuel flow means as the result of the action of a limiter, a cut-out or the detection of an internal fault of the system

Safety shutdown may include additional actions by the system.

2.3.123**start position**

position which denotes that the system is not in the lock-out condition and has not yet received the start signal, but can proceed with the start-up sequence if required

2.3.124**start signal**

a signal, for example, from a thermostat, which releases the system from its start position

2.3.125**start-up lock-out time**

period of time between the signal to energize the fuel flow means and lock-out

For systems which control two separate fuel flow means, two different start-up lock-out times are possible (first and second start-up lock-out times).

2.3.126**waiting time**

period between the start signal and the signal to energize the ignition device. For burners without fans, natural ventilation of the combustion chamber and the flue passages normally takes place during this time

2.3.127**valve open period**

for multitry systems, the period of time between the signal to energize the fuel flow means, and the signal to de-energize the fuel flow means, if proof of the supervised burner flame is not established

C1 Text deleted C1

2.3.128**valve sequence period**

for multitry systems, the sum of all valve opening periods prior to lock-out, if proof of the supervised burner flame is not established

A1 **2.3.129****system restart**

process by which, after a safety shutdown, a full start-up procedure is automatically repeated A1

2.5 Definitions of types of control according to construction

Additional definitions:

2.5.101

system for permanent operation

system which is intended to remain in the running position for longer than 24 h without interruption

2.5.102

system for non-permanent operation

system which is intended to remain in the running position for less than 24 h

Additional definitions:

2.101 Definitions relating to the type of burner (see 6.101)

2.101.1

continuous ignition

a type of ignition which, once placed in operation, is intended to remain energized continuously until it is manually interrupted

2.101.2

continuous pilot

a pilot which, once placed in operation, is intended to remain ignited continuously until it is manually interrupted

2.101.3

direct ignition

a type of ignition which is applied directly to the main burner, without the use of a pilot

2.101.4

expanding pilot

form of continuous pilot where the pilot flame is increased or expanded when required to ignite the main burner and reduced either immediately after main burner ignition, or after the main flame is shut off

2.101.5

full rate start

condition in which the main burner ignition and subsequent flame supervision occur at full fuel rate

2.101.6

intermittent ignition

a type of ignition which is energized when an appliance is called on to operate and which remains continuously energized during each period of main burner operation. The ignition is de-energized when the main burner operating cycle is completed

2.101.7

intermittent pilot

a pilot which is automatically ignited when an appliance is called on to operate and which remains continuously ignited during each period of main burner operation. The pilot is automatically extinguished when each main burner operating cycle is completed

2.101.8**interrupted ignition**

a type of ignition which is energized prior to the admission of fuel to the main burner and which is de-energized when the main flame is established

2.101.9**interrupted pilot**

a pilot which is automatically ignited prior to the admission of fuel to the main burner and which is automatically extinguished when the main flame is established

2.101.10**low rate start**

condition in which main burner ignition occurs at low fuel rate. Once ignition at low fuel rate occurs and the flame is proved, full main burner fuel rate may be admitted

2.101.11**pilot**

flame, smaller than the main flame, which is utilized to ignite the main burner or burners

3 General requirements

This clause of part 1 is applicable.

4 General notes on tests

This clause of part 1 is applicable except as follows:

4.1 Conditions of test**4.1.1 Replacement:**

 Unless otherwise specified, the system and each system component are tested as delivered, having been mounted as declared in table 7.2, requirement 31, in the most unfavourable position when there is more than one position.

When a separate system component is submitted, the manufacturer shall provide those other system components which may be necessary to perform the relevant tests. 

4.1.7 Not applicable.

4.2 Samples required**4.2.1 Replacement:**

Unless otherwise specified, one sample shall be used for the tests of clauses 5 to 14 inclusive. A different sample(s) shall be used for the tests of clauses 15 to 17. At the option of the manufacturer, the tests of clauses 18 to 26 inclusive may be conducted on a new sample or on the sample(s) used for the tests of clauses 5 to 14 inclusive. The tests of clause 27 shall be conducted on a new sample.

4.3 Instructions for test

4.3.2.1 Modification:

Delete "and those for a.c./d.c. at the more unfavourable supply."

4.3.2.4 Not applicable.

4.3.2.6 Replacement:

For systems marked or declared for more than one rated voltage or rated current, the tests of clause 17 are made at the rated voltage and associated current (or vice versa) which produces the most unfavourable combination.

5 Rating

This clause of part 1 is applicable.

6 Classification

This clause of part 1 is applicable except as follows:

6.1 According to nature of supply

6.1.1 Systems for a.c. only

Replace explanatory matter as follows:

Systems intended for use on a.c. supply may only be used on a.c. supplies.

6.1.3 Not applicable.

6.3 According to their purpose

Additional subclauses:

- 6.3.101** – burner control system;
- 6.3.102** – flame detector;
- 6.3.103** – programming unit;
- 6.3.104** – ignition device;
- 6.3.105** – electronic high-voltage ignition source;
- 6.3.106** – flame sensor.

6.4 According to features of automatic action

6.4.1 Not applicable.

6.4.3 Addition:

Burner control systems are classified as having Type 2 action.

6.4.3.12 Not applicable.

Additional subclauses:

- 6.4.3.101** – non-volatile lock-out (Type 2.V);
- 6.4.3.102** – volatile lock-out (Type 2.W);
- 6.4.3.103** – non-permanent operation (Type 2.AC);
- 6.4.3.104** – permanent operation (Type 2.AD);
- 6.4.3.105** – spark supervision (Type 2.AE);
- 6.4.3.106** – air/pressure flow supervision (Type 2.AF);
- 6.4.3.107** – position-checked external devices (Type 2.AG);
- 6.4.3.108** – visible light flame simulation check (Type 2.AH);
- 6.4.3.109** – proved hot surface igniter (Type 2.AI).

6.7 According to ambient temperature limits of the switch head

A₂ Text deleted **A₂**

6.7.1 Modification:

Replace "Control with a switch head" by "System and system components".

6.7.2 Modification:

Replace "Control with a switch head" by "System and system components".

6.10 According to number of cycles of actuation (M) of each manual action

6.10.5 to 6.10.7 Not applicable.

6.11 According to number of automatic cycles (A) of each automatic action

C₁ Text deleted **C₁**