



AIR BOARD

23 September 2003

NSA(AIR)0735-AA/3820

Air Board Distribution List N° 2

STANAG 3820 AA (EDITION 3) – 27 mm x 145 AMMUNITION AND LINKS FOR AIRCRAFT GUNS

References:

- A. MAS(AIR)74-AA/3820 dated 31 March 1998 (Edition 2).
- B. NSA(AIR)0849-AA/3820 dated 30 August 2002 (Edition 3) (Ratification Draft 1).

1. The enclosed NATO Standardization Agreement, which has been ratified by nations as reflected in the **NATO Standardization Document Database (NSDD)**, is promulgated herewith.
2. The references listed above are to be destroyed in accordance with local document destruction procedures.
3. APP-4 should be amended to reflect the latest status of the STANAG.

ACTION BY NATIONAL STAFFS

4. National staffs are requested to examine their ratification status of the STANAG and, if they have not already done so, advise the Air Board, NSA, through their national delegation as appropriate of their intention regarding its ratification and implementation.

Original signed
Jan H ERIKSEN
Rear Admiral, NONA
Director, NSA

Enclosure:

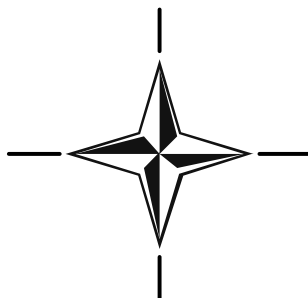
STANAG 3820 (Edition 3)

NATO Standardization Agency – Agence OTAN de Normalisation
B-1110 Brussels, Belgium Internet site: <http://nsa.nato.int>
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STANAG 3820
(Edition 3)

**NORTH ATLANTIC TREATY ORGANIZATION
(NATO)**



**NATO STANDARDIZATION AGENCY
(NSA)**

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: 27 mm x 145 AMMUNITION AND LINKS FOR AIRCRAFT
GUNS

Promulgated on 23 September 2003

Original signed
Jan H ERIKSEN
Rear Admiral, NONA
Director, NSA

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RECORD OF AMENDMENTS

No.	Reference/date of Amendment	Date Entered	Signature
1	NSA(AIR)0842 dated 16 October 2003	16 October 2003	P Yendle

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.
2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.
3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet <http://nsa.nato.int>; NATO Secure WAN <http://nsa.hq.nato.int>).

FEEDBACK

5. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - BE.

NATO STANDARDIZATION AGREEMENT
(STANAG)

27 mm x 145 AMMUNITION AND LINKS FOR AIRCRAFT GUNS

ANNEXES

- A. Ammunition Characteristics.
- B. Link and Belt Characteristic.

RELATED DOCUMENTS

- STANAG 2895 Extreme Climatic Conditions and Derived Conditions for use in Defining Design/Test Criteria for NATO Forces Materiel
- STANAG 4110 Definition of Pressure Terms and their Inter-relationship for use in the Design and Proof of Cannons or Mortars and Ammunition.
- STANAG 4157 Fuzing Systems : Test Requirements for the Assessment of Safety and Suitability for Service
- STANAG 4187 Fuzing Systems - Safety Design Requirements.
- STANAG 4234 Electromagnetic Radiation (Radio Frequency)-200 kHz to 40 GHz Environment-Affecting the Design of Materiel for use by NATO Forces.
- STANAG 4235 Electrostatic Environmental Conditions Affecting the Design of Materiel for use by NATO Forces
- STANAG 4236 Lightning Environmental Conditions Affecting the Design of Materiel for use by the NATO Forces.
- STANAG 4370 Environmental Testing.
- STANAG 4423 Cannon Ammunition (12.7 to 40 mm) Safety and Suitability for Service Evaluation.
- AEP-4 Nuclear Survivability Criteria for Armed Forces Material and Installations
- AOP-2 The Identification of Ammunition

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AOP-15

Guidance on the Assessment of the Safety and Suitability for Service of Non-Nuclear Munitions for NATO Armed Forces

AIM

1. The aim of this agreement is to ensure operational interchangeability through the adoption of a standard 27 mm x 145 ammunition, links and linked ammunition for use in NATO aircraft guns.

AGREEMENT

2. Participating nations agree when 27 mm aircraft gun systems are developed and introduced in their armed forces, as a basic standard, they will be designed to use the 27 mm x 145 ammunition, links and linked ammunition in accordance with this standard.

DETAILS OF THE AGREEMENT

3. The ammunition and links shall comply with the following requirements:
- a. The principal characteristics of all rounds in the 27 mm series of ammunition including;- TP, TP-T, TP-FRAN, HE, AP, APHE, SAPHE, MP and reference ammunition for test purposes, shall conform to those detailed in Annex A.
 - b. The principal characteristics of the links shall conform to those detailed in Annex B.
 - c. Until STANAG 4423 is promulgated, the ammunition shall be designed, tested and assessed in accordance with national requirements. (e.g. OB Pillar Proc P107). Pressure terms shall be in accordance with STANAG 4110.
 - d. The ammunition containing fuzes shall be designed, tested and assessed in accordance with STANAGs 4187 and 4157.
 - e. The ammunition shall be accepted as safe and suitable for Service by the appropriate National Authority in accordance with AOP- 15.
 - f. The ammunition shall be manufactured in accordance with specifications prepared by national government agencies which as a minimum should reflect the requirements of this agreement.
 - g. Stocks of ammunition shall be periodically inspected in accordance with Surveillance criteria approved by national government agencies. Ammunition lots not meeting the Performance or safety criteria prescribed in this STANAG shall be considered not suitable for use by NATO forces.

4. Ammunition which meets these requirements shall be marked with the NATO Symbol of operational interchangeability in accordance with AOP-2.

IMPLEMENTATION OF THE AGREEMENT

5. This STANAG is implemented when a nation has issued instructions that all future equipment for its forces will be manufactured in accordance with the specifications detailed herein.

AMMUNITION CHARACTERISTICS

Appendices:

1. Standardization Drawing 27 mm x 145 Cartridge.
2. Gun and Cartridge Interface
3. Test Barrel – Values for Evaluation of Barrel Wear.
4. Cook-off Limits.

PHYSICAL CHARACTERISTICS

1. Dimensions See Appendix 1
2. Mass
 - a. Cartridges 516g ± 10g
 - b. Projectiles 260g ± 5g
3. Initiation
Electrical
 - a. Primer Sensitivity.
 - (1) All fire threshold: 18 V DC; 8 ohms resistance.
 - b. Primer Insensitivity. All declarations at 21° C inclusive current intensity.
 - (1) No fire power threshold: 0.18 W (150 mA; 10 sec)
 - (2) No fire energy threshold: 1.8 J (150 mA; 10 sec)
 - c. Electrostatic Safety Threshold: 25 kV, 50OpF; 5000 ohms
4. Bullet Pull. The mean force required to extract the projectile from the cartridge shall be not less than 19 kN. The minimum individual value shall be not less than 16 kN.

PERFORMANCE CHARACTERISTICS

5. General

- a. Test Weapon. The nominated test weapon for this ammunition is the Mauser BK 27 mm aircraft gun.
- b. Test Barrel. All Performance measurements are to be taken using the Mauser Automatic Test Equipment No 4 (MATE 4) and Test barrel with rifling and chamber as defined in Appendices 2 and 3.
- c. Temperatures. Performance measurements are to be taken with ammunition conditioned. On removal from the conditioning chambers the ammunition must be fired as soon as possible and the ammunition should not sit in the chamber for more than 30 seconds.
- d. Operating Temperature Range. The temperature range over which this ammunition is expected to operate is: - 40°C to 70°C. This is in accordance with relevant Climatic Categories A*, B*, C*, as defined in STANAG 2895 and takes into account kinetic heating and gun firing effects. The ammunition is safe to handle and can be fired up to 110° C. Depending on the operation requirements the maximum ammunition load can be adjusted according to the Cook-off curve at Appendix 4.

6. Velocity. Muzzle velocity shall be within the following range:

Temperature		Mean Muzzle Velocity	Standard Deviation
Hot	70°C ± 2°C	No requirements	No requirements
Ambient	21°C ± 2°C	1025 m/s ± 10 m/s	< 10 m/s
Cold	-40°C ± 2°C	No requirements	No requirements

7. Pressure. All pressure measurements shall be taken using piezo-electric transducers. All pressure terms shall be in accordance with STANAG 4110.

- a. Chamber Pressure. The Extreme Service Condition Pressure (ESCP) + 3sd at all Points within the operating temperature range shall be less than 530 MPa (the Maximum Operating Pressure (MOP) which shall be less than the System Permissible Maximum Pressure (PMP).
- b. Projectile Permissible Maximum Pressure. The Projectile PMP shall be greater than 530 MPa.

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- c. Muzzle Pressure. At all Points within the operating temperature range, the mean muzzle pressure shall be less than 45MPa. The maximum Single round value shall not exceed 50 MPa at 21°C.

8. Action Time

		Each Cartridge	Test Sample Mean Action Time	Standard Deviation
Hot	70°C ± 2°C	No requirements	No requirements	No requirements
Ambient	21°C ± 2°C	< 4.1 ms	< 4.1 ms	No requirements
Cold	-40°C ± 2°C	No requirements	No requirements	No requirements

9. Accuracy

- a. Dispersion. At 21°C when fired through the test barrel at ranges up to 1000 m the Standard Deviation of the dispersal pattern shall not exceed 1 mil vertically or 1 mil horizontally.
- b. Time of Flight. At 21°C when fired through the test barrel at a range of 1000m the time of flight shall be 1.182 s. The Standard Deviation of the time of flight shall not exceed 2 %. (Corrections may be applied when the atmospheric conditions are not those of the International Standard Atmosphere)
- c. Point of Impact. At 21°C when fired through the test barrel at a range of 1000m the mean point of impact in relation to a reference round shall not exceed ± 1m.

10. Stability. The projectile when fired from a barrel near to the wear limits (4th quarter of its life) must be stable in the operating temperature range out to a range of 200 m. At this Point the longer axis of the ellipse of penetration hole in a yaw screen shall be less than 40 mm.

11. Arming Distance. The arming distance at all temperatures within the operating temperature range shall be:

- a. Minimum. The fuze shall not arm within 15 m of the muzzle.
- b. Maximum. All fuzes shall have armed within 50 m of the muzzle.

12. Tracer Performance. Tracered rounds shall produce a continuous trace visible by day throughout the burning range viewed from Points behind the gun. The tracer must show full brilliance soon after leaving the muzzle and retain it up to a distance of 1500m.

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13. Barrel Wear. The wear of the standard production barrel depends mainly on propellant and firing rhythm. Newly introduced ammunitions with different internal ballistics have to be tested in terms of barrel wear acc. to national regulations and operational requirements.

14. Gun Function. The ammunition and its link when fired in the nominated test weapon, must enable the gun to operate at a rate of fire of 1700 +100/-150 and within the Performance specifications of the test weapon across the operational temperature range.

15. Cook-off. Cartridges shall withstand 120°C for 10 hours without pyrotechnic function or explosive event. See Appendix 3.

OPERATIONAL ENVIRONMENT

16. Climate. The ammunition shall be capable of being:

- a. Stored in climatic categories A2, C1 as defined in STANAG 2895 for A 2 ≥ 60 days depending storage conditions; C 1 ≥ 10 years.
- b. Used in climatic categories A2, C1 as defined in STANAG 2895 for A 2 ≥ 60 days; C 1 ≥ 6 month.

17. Packaged Ammunition. Packaged ammunition shall not allow ingress of:

- a. Water, in conditions of driving rain as defined in STANAG 4370 (AECTP 300, Test 310).
- b. Dust or sand, as defined in STANAG 4370 (AECTP 300, Test 313).

18. Packaged ammunition shall be safe to use following:

- a. Basic Transport and secured cargo vibration as defined in STANAG 4370 (AECTP 400, Test 401, Procedures 1 & 3).
- b. Dropping from a height of 2m as defined in STANAG 4370 (AECTP 400 Ed 2, Test 414, Procedure 1).

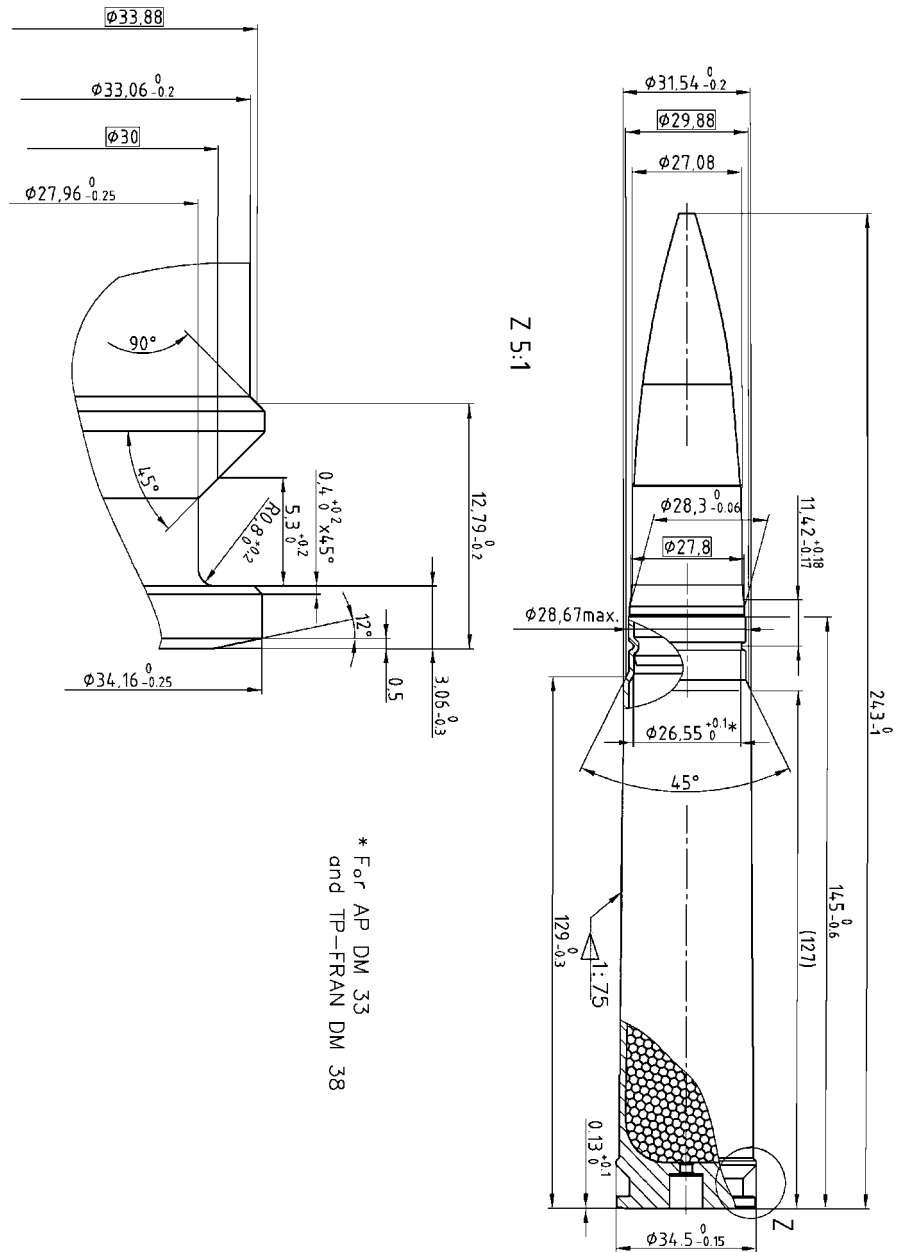
19. Unpackaged Ammunition. Unpackaged ammunition shall continue to function within specification after:

- a. Exposure to salt fog for 24 hours as defined in STANAG 4370 (AECTP 300, Test 309).
- b. Immersion in water for 1 hour. as defined in STANAG 4370 (AECTP 300, Test 307).

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- c. Resistance against contaminants (oil, lubricants and so on).
 - d. Dropping from a height of 1.5m as defined in STANAG 4370 (AECTP 400 Ed 2, Test 414, Procedure 1).
 - e. Cycling through the weapon system 3 times.
20. Electrical Environment. Packaged and unpackaged ammunition shall not react to the electrical environments specified in STANAGs 4234, 4235, and 4236 and AEP-4.

STANDARDIZATION DRAWING 27 MM x 145 CARTRIDGE



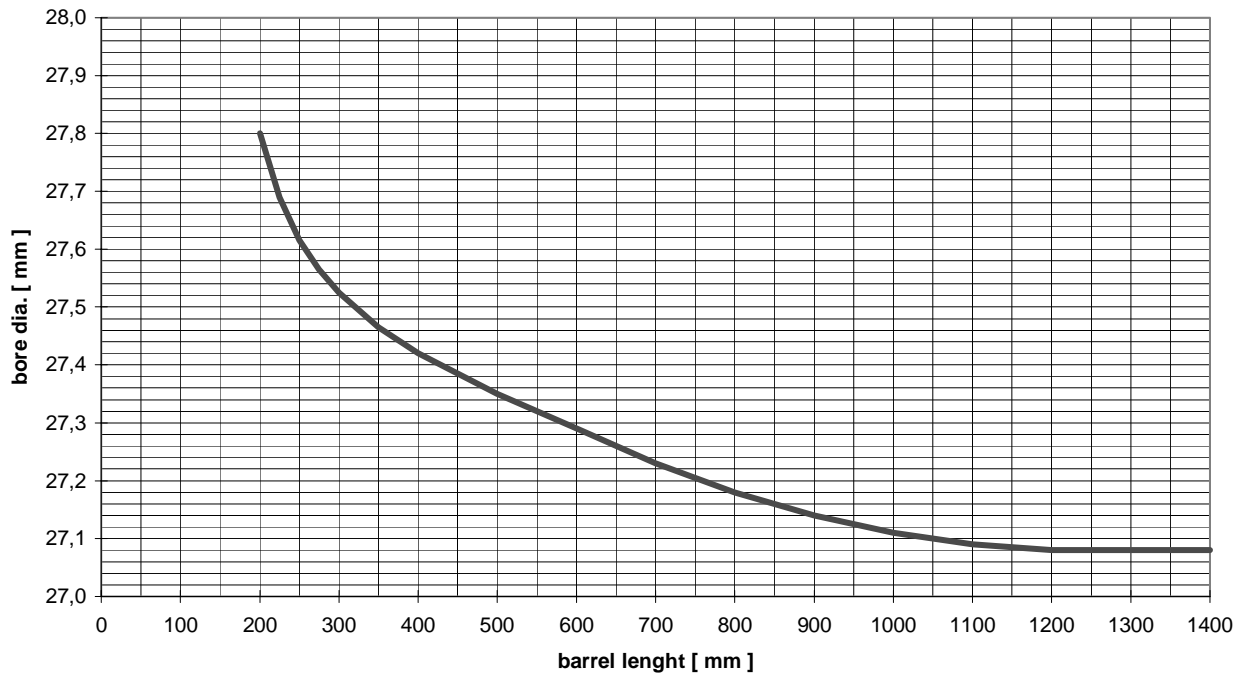
TEST BARREL

Values for evaluation of barrel wear

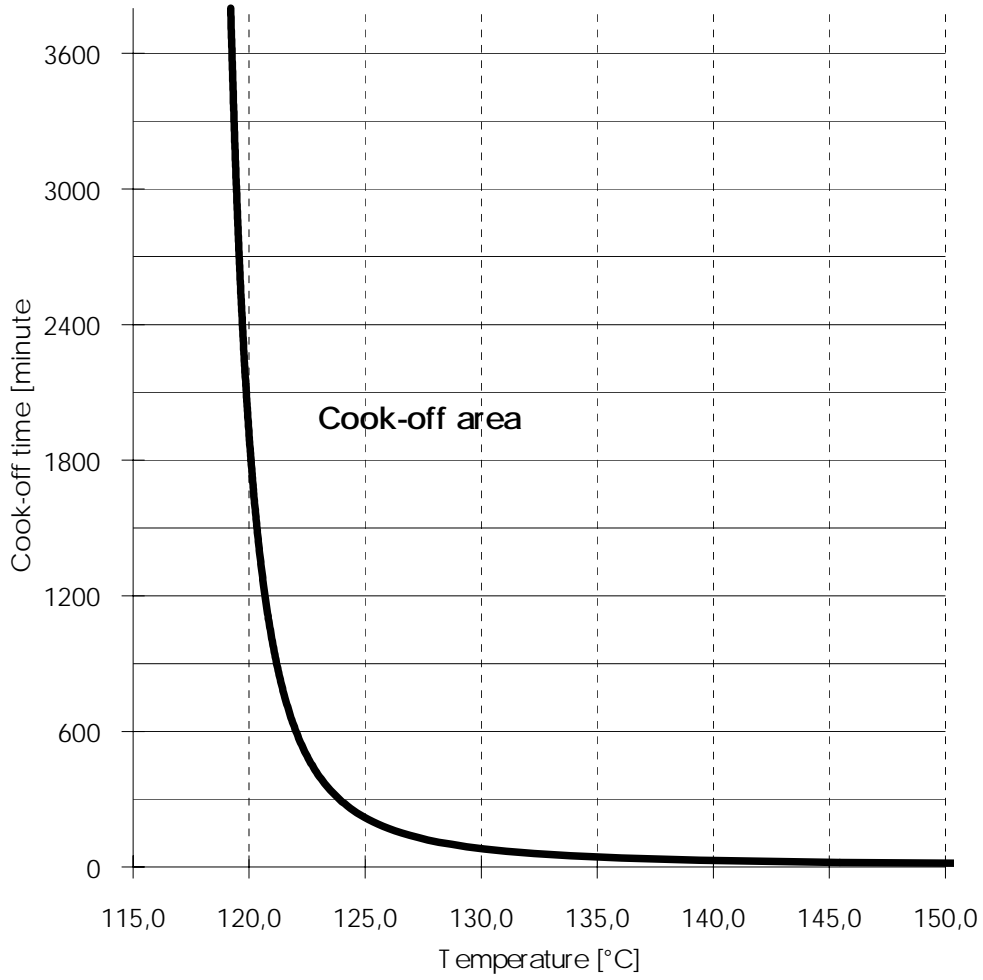
measuring position [mm]	200	225	250	275	300	350	400	500	600
scrap limit / bore dia. [mm]	27,80 0	27,69 0	27,61 5	27,56 5	27,52 5	27,46 5	27,42 0	27,35 0	27,29 0

measuring position [mm]	700	800	900	1000	1100	1200	1300	1400
scrap limit / bore dia. [mm]	27,23 0	27,18 0	27,14 0	27,11 0	27,09 0	27,08 0	27,08 0	27,08 0

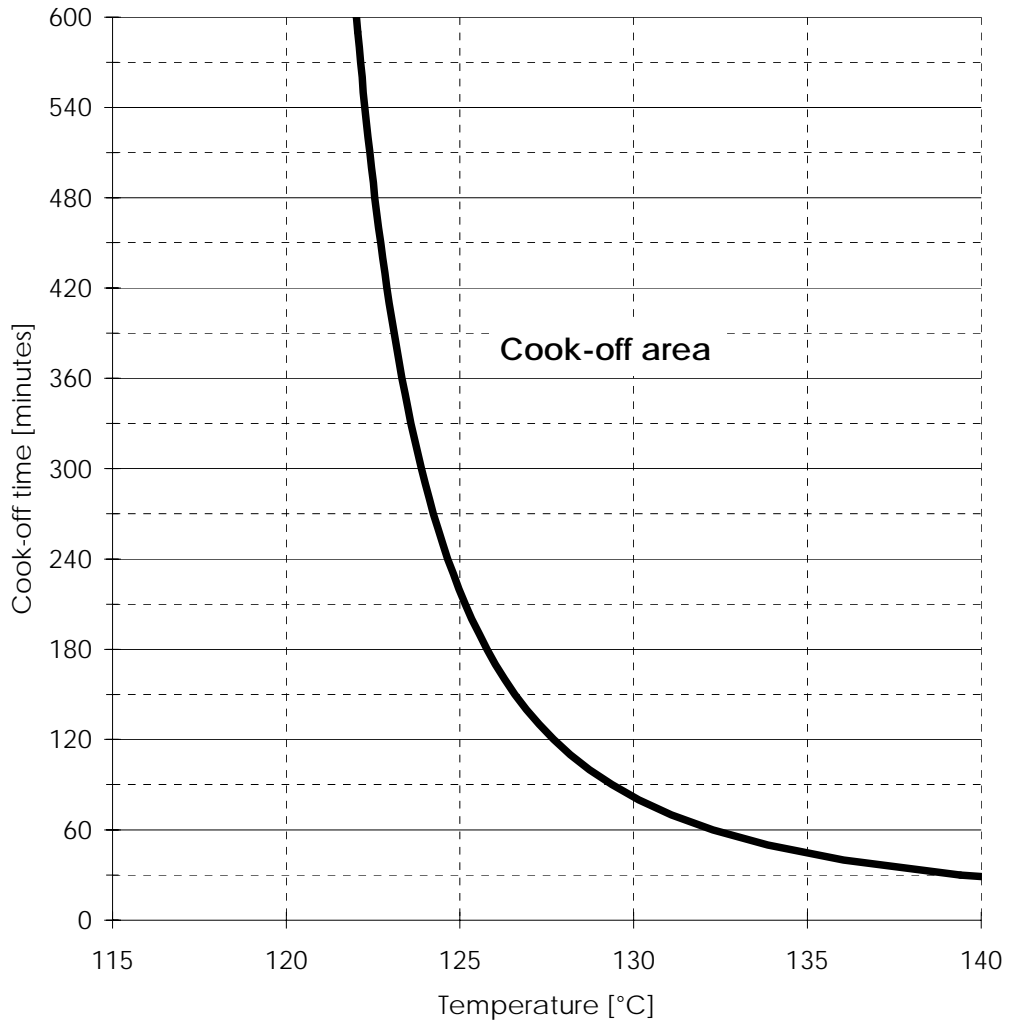
Barrel wear graph



Cook-off Limits



Cook-off Limits part 2



LINKS AND BELT CHARACTERISTICS

Appendix

1. Standardization Drawing 27 mm x 145 Link BWB 13000 77-01 (a.)

LINK CHARACTERISTICS

1. Dimensions

see Appendix 1

2. Mass per link 69 g ± ** g

BELT CHARACTERISTICS

1. Belt Twist with 16 rounds $\geq 180^\circ$
2. Link Stripping Force:
 - a. Forward Stripping > 700 N
3. Tensile Strength $\delta B \leq 540$ N/mm²
4. Belt Base Fan Radius 320 mm maximum
5. Belt Nose Fan Radius 120 mm maximum

STANDARDIZATION DRAWING 27 mm x 145 LINK

