

CARES Technical Approval Report TA1-A&B 5085



Issue 3



LENTON

Product approval held by: ERICO

LENTON ULTIMATE Standard and Positional Splices

Assessment of the
LENTON ULTIMATE
Standard and Positional
Splices Product
and Quality System
for Production



TECHNICAL
APPROVAL
5085



0002



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Product

LENTON ULTIMATE Standard and Positional Splices for reinforcing steel

Product approval held by:

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The Netherlands

1 Product Summary

The products are for the mechanical connection of deformed high-yield carbon steel bars for the reinforcement of concrete complying with the requirements of BS4449 grade B500B and grade B500C. As defined in tables 1 - 2.

1.1 Scope of Application

LENTON ULTIMATE Standard and Positional Splices in the size range 16mm - 40mm, have been evaluated for use as follows:

- Static tension or compression applications in reinforced concrete structures designed in accordance to BS8110 and EC2 using grade B500B and B500C reinforcement with CARES Appendix TA1-A and Class D Fatigue requirements.
- Static tension or compression applications in reinforced concrete structures designed in accordance to BS8110 and EC2 using grade B500B and B500C reinforcement with CARES Appendix TA1-B and Class D Fatigue requirements.

1.2 Design Considerations

BS 8110 Clause 3.12.8.9 Laps and Joints states "Connections transferring stress may be lapped, welded or joined with mechanical devices. They should be placed, if possible, away from points of high stress and should preferably be staggered". However, BS 8110 Clause 3.12.8.16.2 Bars in tension states "The only acceptable form of full-strength butt joint for a bar in tension comprises a mechanical coupler" satisfying specified slip and tensile strength criteria.



Eurocode 2, Clause 8.7 Laps and mechanical couplers 8.7.1 General (1)P “Forces are transmitted from one bar to another by:

- lapping of bars, with or without bends or hooks;
- welding;
- mechanical devices assuring load transfer in tension-compression or in compression only.”

Clause 8.8 Additional rules for large diameter bars goes on to state that “Splitting forces are higher and dowel action is greater with the use of large diameter bars. Such bars should be anchored with mechanical devices.”

The specified cover for fire resistance and durability should be provided to the coupler sleeve. All couplers have been designed with controlled mechanical properties to be compatible with reinforcing bars complying with reinforcement of the relevant Grade in accordance with BS4449.

1.3 Conclusion

It is the opinion of CARES that LENTON ULTIMATE Standard and Positional Splices are satisfactory for use within the stated limits when applied and used in accordance with the manufacturer’s instructions and the requirements of this certificate.

L. Brankley
Chief Executive Officer
October 2024



2 Technical Specification

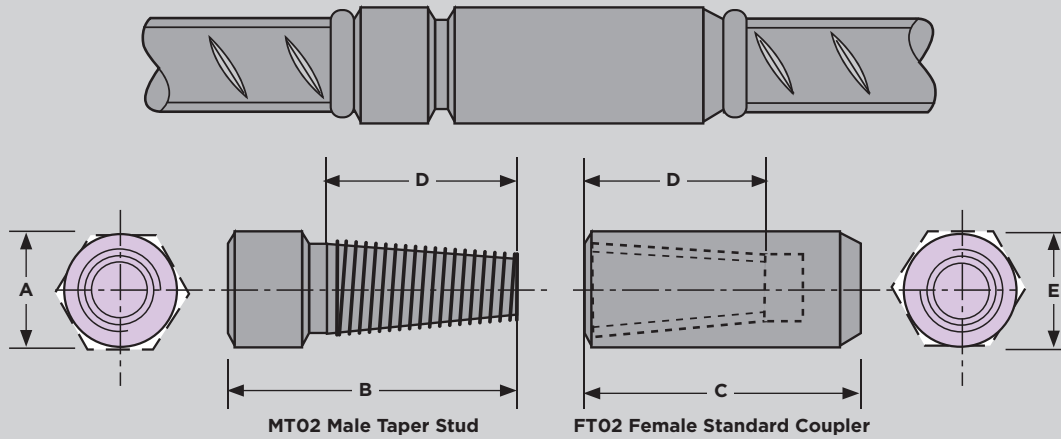
2.1 General

The LENTON ULTIMATE Splice Systems are designed to maximise performance and efficiency as well as minimise installation difficulty in the field. Ultimate products are attached to the reinforcing steel using friction forging technology (commonly called friction welding). Each friction welder is manufactured with state-of-the-art control systems and quality monitoring to ensure every connection is produced as intended. The product design and optimized friction welding parameters maximise the performance of the rebar connections with multiple types and grades of rebar. The Ultimate system is robust, allowing for the inherent variability of rebar while maintaining the highest level of performance.

LENTON ULTIMATE Standard and Positional Splices are for joining deformed Grade B500B and Grade B500C steel reinforcing bars complying with BS4449 in tension and compression to TA1-A and TA1-B with Class D Fatigue requirements.

Part numbers detailed in the following tables are stamped on couplers. A further suffix and batch identity is also stamped ensuring traceability to the manufacturing unit and production respectively.

2.2 LENTON ULTIMATE Standard Splice



ULTIMATE Standard Splice

The LENTON ULTIMATE two piece Standard Splices are designed for use where one of the bars to be coupled can be rotated. The male taper studs have a external taper thread. The Female standard couplers have a internal taper thread. 16mm male taper Studs and female standard couplers have a hexagonal section. The 20mm male taper Studs and female standard couplers have a hexagonal section whereas the 20mm female standard couplers have a circular section. 25mm to 40mm diameter male and female couplers have a circular section. The LENTON ULTIMATE Standard Splice is designed to splice bars of the same diameter.

The dimensions for the ULTIMATE Standard Splices are as follows:

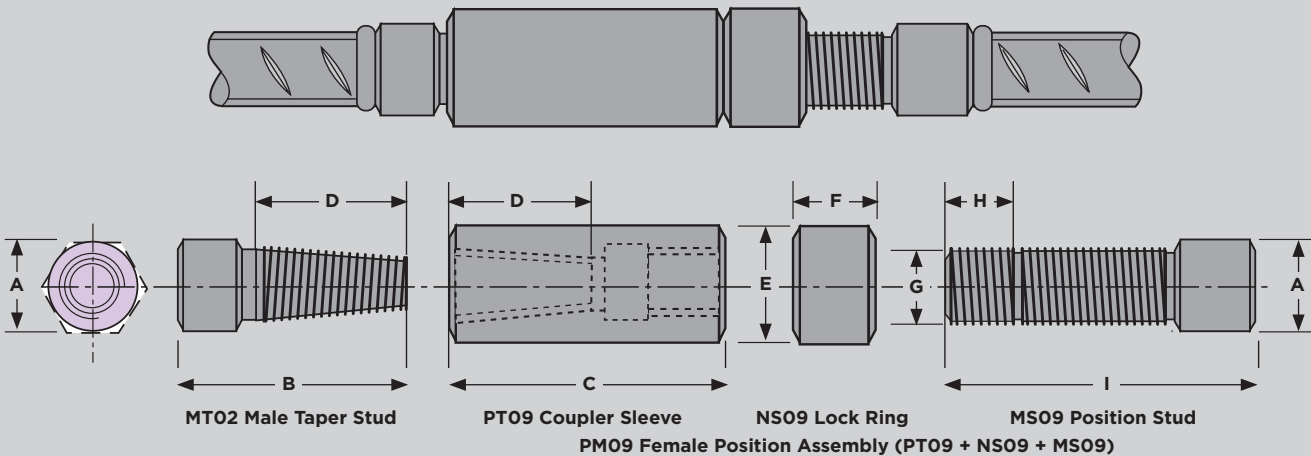
| Size mm | Part No | | "A" | "B" | "C" | "D" | "E" | Weight Kg | | Colour Plug | Installation Torque Nm |
|------------|------------------------|------|-----|-----|-----|-----|-----|--------------|------|----------------|------------------------------|
| | MT02 | FT02 | mm | mm | mm | mm | mm | MT | FT | | |
| 16 | LU16MT02 to LU16FT02 | | 27* | 61 | 63 | 39 | 27* | 0.16 | 0.21 | Yellow | 120 |
| 20 | LU20MT02 to LU20FT02 | | 30* | 71 | 70 | 44 | 35 | 0.28 | 0.34 | Red | 180 |
| 25 | LU25MT02 to LU25FT02 | | 35 | 82 | 77 | 49 | 45 | 0.49 | 0.60 | Yellow | 270 |
| 32 | LU32MT02 to LU32FT02 | | 45 | 100 | 93 | 61 | 55 | 0.93 | 1.06 | Green | 300 |
| 40 | LU40TMT02 to LU40TFT02 | | 60 | 124 | 117 | 77 | 65 | 1.89 | 1.73 | Black | 350 |

Table 1

*hexagon (measured across the flats)



2.3 LENTON ULTIMATE Positional Splice



ULTIMATE Positional Splice

The LENTON ULTIMATE four-piece Positional Splices are for use where neither of the bars to be coupled can be rotated. The LENTON ULTIMATE Positional Splice is specifically used when the bar to be coupled are also restricted in their axial movement. The three components of male and female ends with internal taper threads, connected by female and male parallel threads and locknut. The 16mm and 20mm male couplers have a hexagonal section whereas the 16mm and 20mm female have a circular section. Sizes 25mm to 50mm are of circular section for both male and female couplers.

The LENTON ULTIMATE positional splice is designed to splice bars of the same diameter.

The dimensions for the ULTIMATE Positional Splices are as follows:

| Size mm | Part No | | "A" | "B" | "C" | "D" | "E" | "F" | "G" | "H" | "I" | Weight Kg | | Colour Plug | Installation Torque Nm |
|------------|------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|------|----------------|------------------------------|
| | MT02 | PM09 | mm | mm | mm | mm | mm | mm | mm | mm | mm | MT | PM | | |
| 16 | LU16MT02 to LU16PM09 | | 27* | 61 | 95 | 39 | 35 | 16 | M26 | 35 | 85 | 0.16 | 0.82 | Yellow | 120 |
| 20 | LU20MT02 to LU20PM09 | | 30* | 71 | 109 | 44 | 40 | 16 | M29 | 39 | 100 | 0.28 | 1.20 | Red | 180 |
| 25 | LU25MT02 to LU25PM09 | | 35 | 82 | 116 | 49 | 50 | 16 | M34 | 40 | 101 | 0.49 | 1.89 | Yellow | 270 |
| 32 | LU32MT02 to LU32PM09 | | 45 | 100 | 137 | 61 | 60 | 21 | M44 | 49 | 121 | 0.93 | 3.28 | Green | 300 |
| 40 | LU40TMT02 to LU40TPM09 | | 60 | 124 | 162 | 77 | 75 | 26 | M57 | 62 | 147 | 1.89 | 6.24 | Black | 350 |

Table 2

*hexagon (measured across the flats)

3 Product Performance and Characteristics

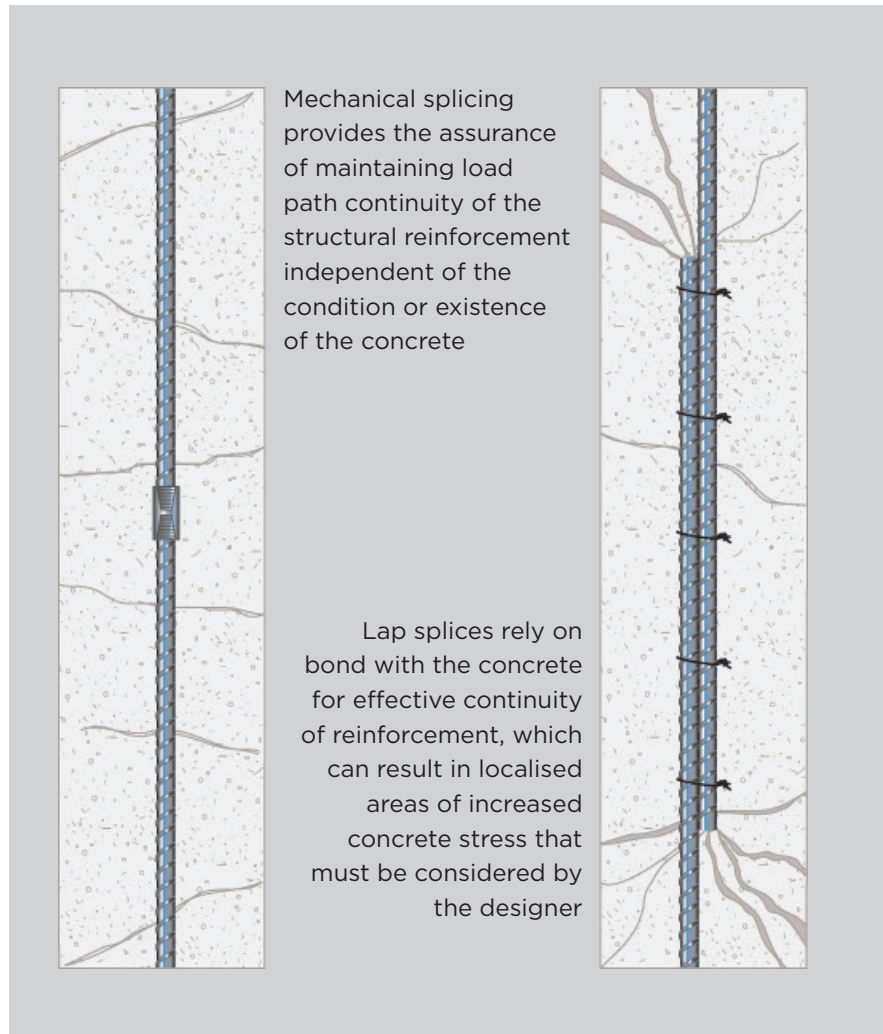
Full destructive tests have been carried out to demonstrate compliance with the performance requirements defined in CARES Appendix TA1-A and TA1-B when used with reinforcing steel BS4449 grade B500B and B500C as appropriate.

CARES APPENDIX TA1-A requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension and compression with BS4449 grade B500B and B500C reinforcement.
- 99% characteristic tensile strength is greater than 540MPa with Grade B500B and 575MPa with B500C reinforcement.
- D Class Fatigue requirements.

CARES APPENDIX TA1-B requirements

- Permanent deformation is less than 0.10mm after loading to $0.65f_y$ in tension and compression with BS4449 grade B500B and B500C reinforcement.
- 99% characteristic tensile strength is greater than 540MPa with Grade B500B and 575MPa with B500C reinforcement.



4 Installation

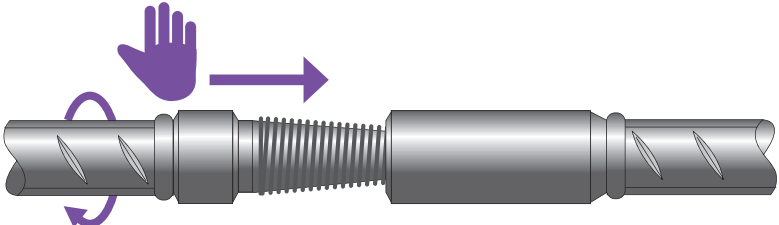
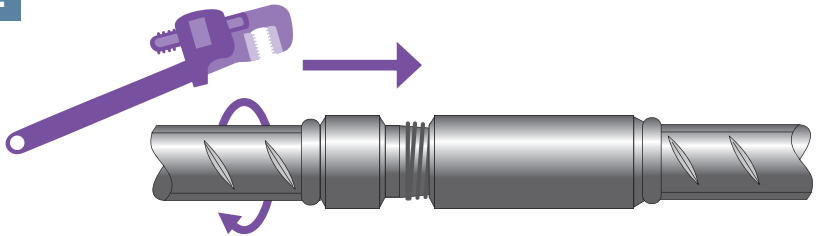

The LENTON ULTIMATE splice components are friction welded to the appropriate reinforcing bar, using LENTON equipment and suitably trained and experienced operatives in accordance with LENTON operating instructions. These operators will have received LENTON equipment training.

The formation of the joint is achieved by screwing the sections together.

4.1 LENTON ULTIMATE Standard Splice

The LENTON Ultimate Standard splices are for connecting same size diameter reinforcing bars where one of the bars forming the splice is free to turn. The Male Taper Stud (MT02), and Female Standard Coupler (FT02) components are friction welded to the appropriate rebar ends, one of which forms the stop end.

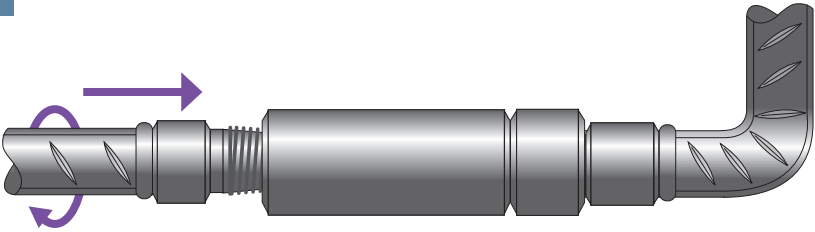
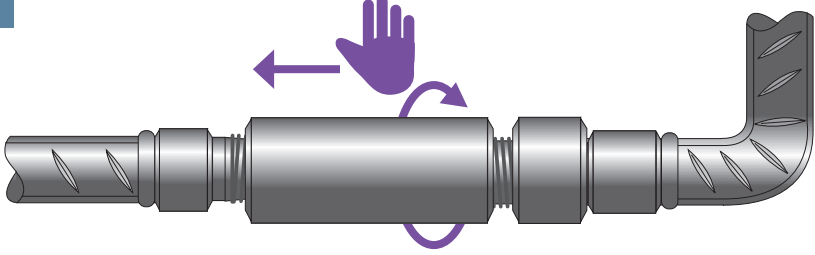
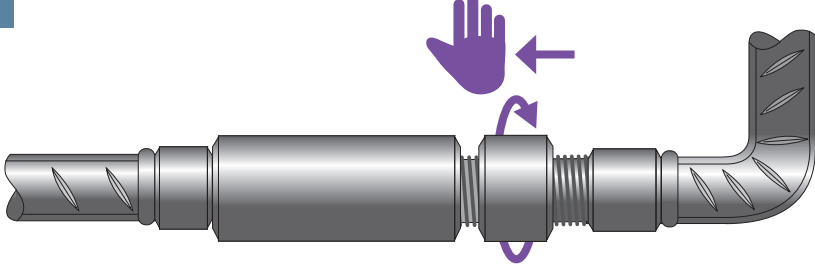
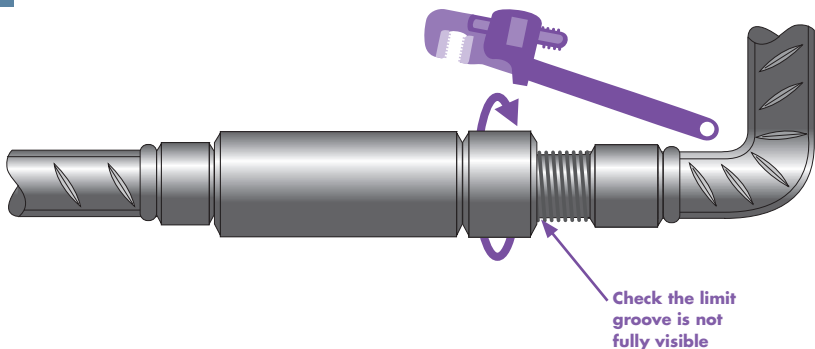
ULTIMATE Standard Splice installation instructions

| | |
|---|--|
| 1  | To make the joint bring the two components together. The continuation bar is screwed onto the stop end by hand. |
| 2  | Tighten the joint with a LENTON wrench to the correct torque as described in the LENTON installation manual and on the wrench itself. |
| 3  | Finished installation. |

4.3 LENTON Ultimate Position Splice

LENTON Ultimate Position splices are for connecting to bent bars or bars that cannot be rotated. The Male Taper Stud (MT02), and Female Position Assembly (PM09) components are friction welded to the appropriate rebar ends. For the PM09, ensure that the Coupler Sleeve is fully screwed onto the Positional Stud.

ULTIMATE Position Splice installation instructions

| | |
|--|--|
| 1  | <p>To make the joint bring the two components together.</p> <p>The MT02 Male Taper Stud is screwed as far as possible into the PM09 Female Position Assembly.</p> |
| 2  | <p>The Coupler Sleeve is then screwed out by hand to engage the Male Taper Stud threads and is tightened to the correct torque as described in the LENTON installation manual.</p> |
| 3  | <p>Set the bent bar to the required position then screw the Lock Ring by hand towards the coupler body.</p> |
| 4  <p>Check the limit groove is not fully visible</p> | <p>Tighten the Lock Ring fully against the coupler body with a LENTON wrench to the correct torque as mentioned in the installation manual and on the wrench itself.</p> <p>Ensure the limit groove on the MS09 Position Stud is not fully visible beyond the lock ring.</p> <p>Finished Installation.</p> |

5 Safety Considerations

Care must be taken in handling and installing couplers. Splices are supplied in containers that have a maximum weight of 25kg. Protective gloves should be worn when handling the containers, threaded bars and installing the couplers.

6 Product Testing and Evaluation

LENTON ULTIMATE Standard and Positional Splices have been tested to satisfy the requirements of BS8110 and EC2, when used with reinforcing bars to BS4449. The testing comprised the following elements:

- Tensile Strength
- Permanent deformation in tension and compression
- Low cycle fatigue

The products are subject to a programme of periodic testing to ensure that they remain within the performance limits of this technical approval.

7 Quality Assurance

LENTON ULTIMATE Standard and Positional Splices are produced under an ISO9001 quality management system certified by an independent certification body. The quality assurance scheme monitors the production of the product and ensures that materials and geometry remain within the limits of this technical approval.

8 Building Regulations

8.1 The Building Regulations (England and Wales)

Structure, Approved Document A

LENTON ULTIMATE Standard and Positional Splices, when used in EC2 based designs using the data contained within this technical approval, satisfy the relevant requirements of The Building Regulations (England and Wales), Approved Document A.

Materials and Workmanship, Approved Document

This technical approval gives assurance that the LENTON ULTIMATE Standard and Positional Splices comply with the material requirements of EC2.

8.2 The Building Regulations (Northern Ireland)

Materials and Workmanship

This technical approval gives assurance that LENTON ULTIMATE Standard and Positional Splices comply with the material requirements of EC2 by virtue of regulation 23, *Deemed to satisfy provisions regarding the fitness of materials and workmanship*.

8.3 The Building Standards (Scotland)

Fitness of Materials

This technical approval gives assurance that LENTON ULTIMATE Standard and Positional Splices comply with the material requirements of EC2 by virtue of *Clause 0.8*.

Structure

LENTON ULTIMATE Standard and Positional Splices, when used in EC2 based designs using the data contained within this technical approval, satisfy the requirements of *The Building Standards (Scotland) clause 1*.



9 References

- BS 4449: 2005: Steel for the reinforcement of concrete - Weldable reinforcing steel - Bar, coil and decoiled product - Specification
- BS 8110: Part 1: 1997 (Revised 2005): Structural Use of Concrete, Code of Practice for Design and Construction
- BS EN 1992-1-1: 2004 Eurocode 2 Design of concrete structures - General rules for buildings
- BS EN ISO 9001: Quality management systems - Requirements
- CARES Appendix TA1-A; Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel for use in Structures and Structural elements Designed in accordance with the Fatigue Requirements of Structural Eurocodes.
- CARES Appendix TA1-B; Quality and Operations Schedule for the Technical Approval of Couplers for Reinforcing Steel for use in Structures and Structural elements Designed in accordance with the Fatigue Requirements of Structural Eurocodes.

10 Conditions

1. The quality of the materials and method of manufacture have been examined by CARES and found to be satisfactory. This technical approval will remain valid provided that:
 - a The product design and specification is unchanged.
 - b The materials, method of manufacture and location are unchanged.
 - c The manufacturer complies with CARES regulations for technical approvals.
 - d The manufacturer holds a valid CARES Certificate of Product Assessment.
 - e The product is installed and used as described in this report.
2. CARES make no representation as to the presence or absence of patent rights subsisting in the product and/or the legal right of ERICO to market the product.
3. Any references to standards, codes or legislation are those which are in force at the date of this certificate.
4. Any recommendations relating to the safe use of this product are the minimum standards required when the product is used. These requirements do not purport to satisfy the requirements of the Health and Safety at Work act 1974 or any other relevant safety legislation.
5. CARES does not accept any responsibility for any loss or injury arising as a direct or indirect result of the use of this product.
6. This Technical Approval Report should be read in conjunction with CARES Certificate of Product Assessment No 5085. Confirmation that this technical approval is current can be obtained from CARES.





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