

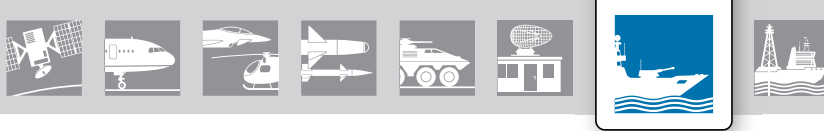


Lightweight Low Fire Hazard Cables according to VG95218 part 28

Marine application profile with cross-reference
to VG95218, parts 61 to 66



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- Products for environmental-controlled conditions within the platform
- Products for hazardous areas

AEROSPACE, DEFENSE & MARINE MAIN PRODUCT GROUPS



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Wire and Cable



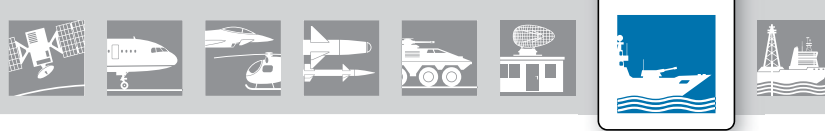
Relays and Contactors



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RELIABLE AND INNOVATIVE PRODUCTS

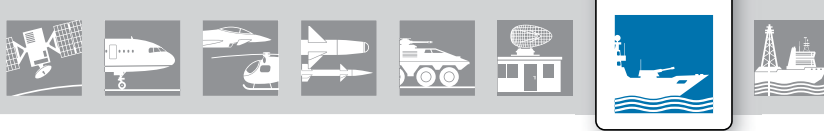
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- Inventory management
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This document is a product presentation, issued by TE Connectivity, a member of the VG Cable Technical Committee of Normenstelle Elektrotechnik (public agency for electrotechnical standards). This document was prepared to the best of our knowledge. In the case of any discrepancy in this brochure, the original VG standard prevails.



Introduction

This document shows the conformity of our products with the standard series VG95218 part 28 the copyright of which is held by Bundesamt für Wehrtechnik und Beschaffung (Federal Office of Defense Technology and Procurement) (BWB).

The VG95218 part 28 type C and E standard series covers halogen-free cables with a low fire hazard. It has been developed in accordance with the state of the art in cabling techniques with thin-wall insulation for primary wires and an optimized cable design process in the interest of minimum weight and diameter.

In the past, cables from the VG95218 part 60 to 66 standard series were used for marine applications. The standard series was drafted many years ago and technical development in the electronics sector led to changes in shipbuilding. State of the art electronics is used in an effort to address the increasing demands on the functionality and tasks of military vessels. The result is an increasingly extensive and complex structure of power supply systems, electronic systems and networks which must be connected by a cabling system that should be as efficient and reliable as possible. Furthermore, the demand for lighter and/or smaller cable diameters is becoming more and more important.

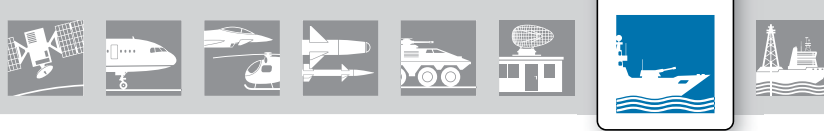
Through technical improvement in the following sectors, a crucial development step was achieved with the VG95218 parts C and E standard series which reflects both new requirements in shipbuilding and empirical values from the past.

- **Significantly increased service life**
- **Long-term resistance to environmental influences**
- **Reduction in weight and diameter**
- **Increased EMC requirements**

This documentation contains technical specifications of cables according to part 28 type C and type E as alternatives to parts 61 to 66 of the VG95218 standard series. The range of tests for cables according to VG95218 part 28 types C and E was adapted to the requirements of modern marine equipment. In addition to electrical and mechanical requirements, it also fulfils the specifications for limiting fire hazards thanks to the following properties:

- halogen free
- flame retarded
- low smoke generation
- low corrosivity of combustion gases
- low toxicity of combustion gases

The VG95218 part 28 standard series was approved for use in marine applications and is additionally also suitable for further military applications.



VG95218 part 28 type C and E cables

The VG95218 part 28 standard generally covers a range of different cable types for various applications.

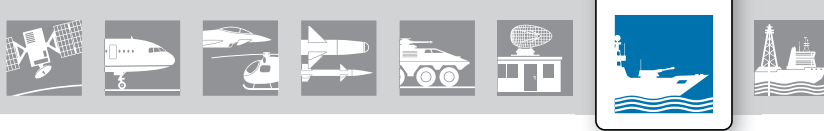
The cables types are classified as types A, B, C, D and E, including relevant test requirements. VG95218 part 2 addresses the standards (national and international standards are referred to, such as DIN, EN, IEC, etc.) which are applied in the individual tests section.

Halogen-free cables with improved performance under fire conditions are specified for marine applications. Cables fulfilling these requirements belong to types C and E. More than 100 different cable designs are currently available as type C (single outer screen) cables (C001 to C122). Type E (double outer screen) currently includes a range of 88 designs numbered from E001 to E011.

The types of cables which can be directly compared with parts 61 - 66 are specified in part 28 under part nos. C033 to 122 and E004 to E011.

Only these designs are described in this document.

Although all other designs of types C and E fulfill similar requirements, they differ significantly in terms of cable layout, number of wires, conductor cross-sections and combination of primary wires because they were customized to reflect a specific application.



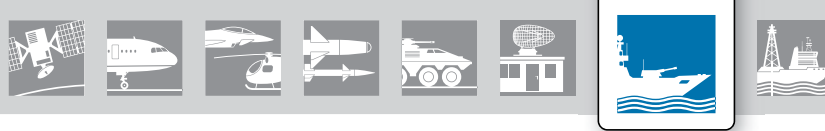
VG95218 part 28 type C and E cables

Cables approved according to VG95218 part 28 types C and E include primary wires, components and sheath materials which were approved and licensed individually and independent of each other according to the applicable design standards. Every design standard contains test requirements for electrical and mechanical parameters, as well as criteria concerning resistance to fluids and improved performance in the case of fire.

VG95218 part 28 C and E cables include:

- **Primary wires**, specified in component standard **VG95218 part 20 type E**. Available in cross-sections of 0.15 mm² to 3.0 mm² in 11 different colors, including green/yellow. The primary wires can be used as components in cables and for wiring units or cabinets.
- **Unscreened cable components - in pairs, triples and quads** as specified in the component standard **VG95218 part 21 type C**. Part 21 type E elements include part 20 type E primary wires and additionally define different color combinations of primary wires.
- **Screened cable components - in pairs, triples and quads** as specified in component standard **VG95218 part 23 type C** component standard. Part 23 type G elements include part 21 type C elements. Elements defined in color are screened and protected by a wrap. These elements can only be used as components in cables.
- **The sheath material** and the complete cable are specified in component standard **VG95218 part 28 types C and E** which includes both the cable design specifications as well as the complete test specifications for the complete cable and cable sheath.

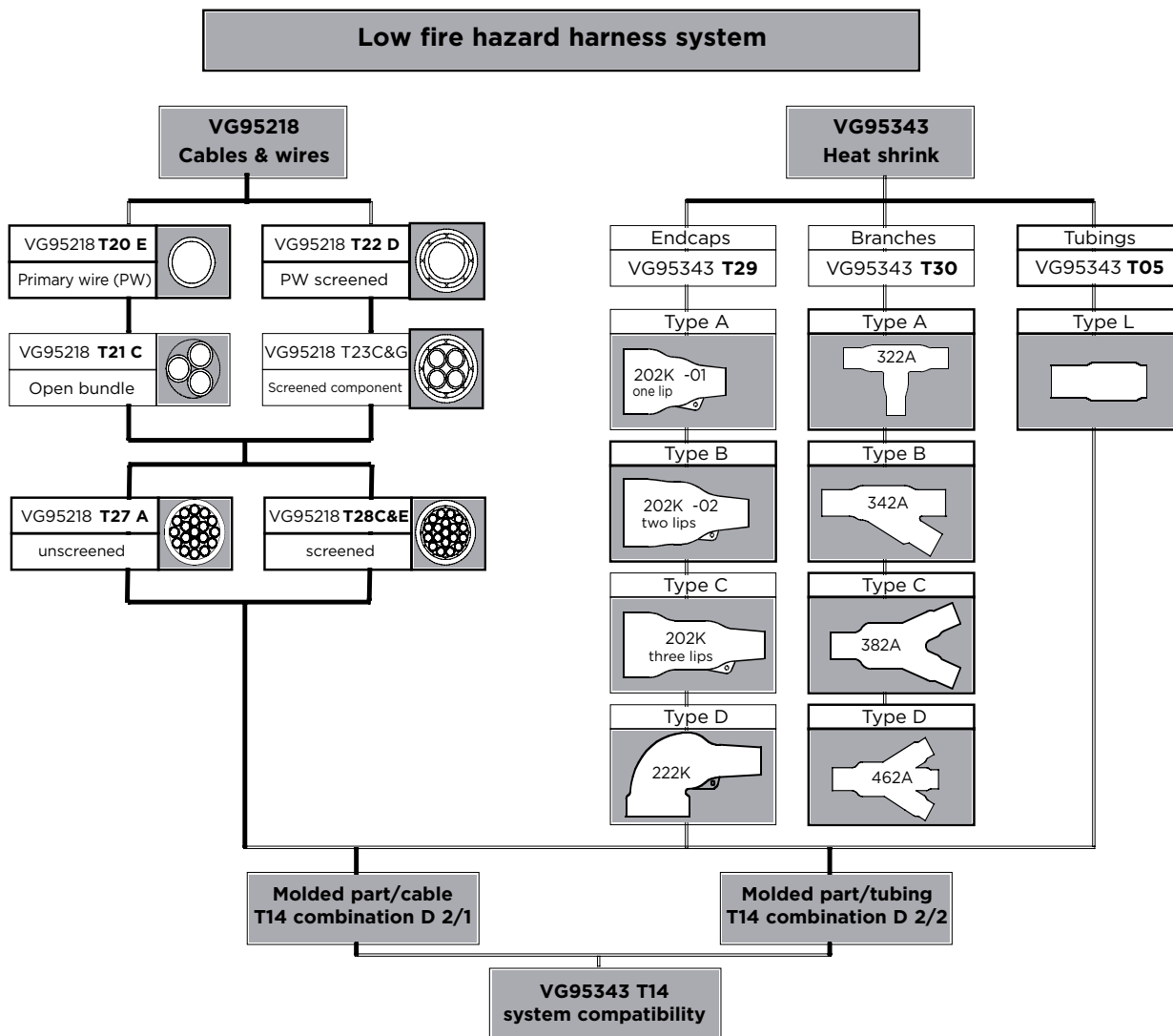
The VG95218 part 28 standard series features a modular approach which enables the free design and definition of a cable configuration according to the user's requirements using tested and approved cable elements according to parts 20 to 23.

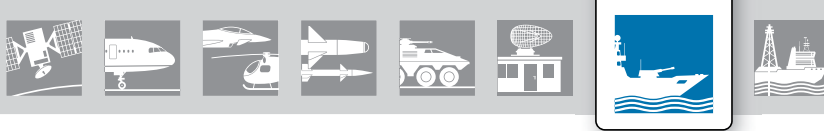


System compatibility

Cables according to VG95218 part 28 types C and E fulfill the requirements of the VG95214 part 14 standard where the individual VG-approved sheath materials are tested for “system compatibility” as an integrated system. This means that the cable sheath is tested together with halogen-free heat-shrinkable endcaps of all VG-approved manufacturers and the appropriate glue. This reflects gluing capability with halogen-free, heat-shrinkable endcaps, VG95343 part 5 type L and halogen-free molded parts according to VG95343 part 29 (connector housings) and part 30 (branches).

This is illustrated by the diagram below:





Primary wire – technical description

Primary wires, specified in VG95218 part 20 type E

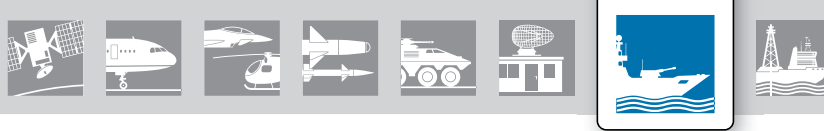
Part number VG95218-T20	Conductor cross-section mm ²	Qty./diameter of primary wires mm	Conductor diameter, max. mm	Cable diameter, nom. mm	Conductor resistance, max. Ohm/km
12*	0.15	19/0.10	0.55	1.03	135
01*	0.25	19/0.13	0.66	1.14	84.4
02*	0.4	19/0.16	0.84	1.33	50.5
03*	0.5	19/0.18	0.94	1.4	40.1
04*	0.6	19/0.20	1.04	1.52	31.1
05*	0.75	19/0.23	1.2	1.6	26.7
06*	1	19/0.25	1.32	1.75	20
07*	1.2	19/0.29	1.47	1.93	15.3
08*	1.5	37/0.23	1.68	2.08	13.7
09*	2	37/0.25	1.87	2.36	10.5
10*	2.5	37/0.29	2.14	2.55	8.21
11*	3	37/0.32	2.29	2.78	6.58

The asterisk symbol* in the part number (e.g. VG95218-T20-E01*) is replaced by the insulation color code as follows:

- 0 = black;
- 1 = brown;
- 6 = blue;
- 8 = grey;
- 9 = white;
- G = green/yellow.

These are the standard colors used in marine cables.

Further colors are available and defined in the VG95217-T20 type E component standard.



Cable color coding

Depending on the given standard, the individual components shown in the cable designs, are either given consecutive numbers or color codes according to the following standard pattern:

- 0 = black**
- 1 = brown**
- 2 = red**
- 3 = orange**
- 4 = yellow**
- 45 = yellow/green**
- 5 = green**
- 6 = blue**
- 7 = violet**
- 8 = grey**
- 9 = white**

Cable sheath marking

According to VG requirements, the cable sheath must show the manufacturer's name, the VG number, the VDE registration number and the manufacturer code for identification and packaging purposes.

Additional information may be printed which is useful in determining the cable configuration:

Example:

- L - Lightweight cable**
- F - Telecommunications cable**
- M - Marine cable**
- G - Insulation or sheath**
- S - Screen**
- O - No defined functional integrity in the case of fire**

Cable marking example:

Raychem - VG95218-T28-C050 - VDE Reg. Nr. 7095 - K1010 - FMGSGO (4 x 2 x 0.75)