



HANDBOOK
SOLENOID VALVES



Ed. 2017



CHAPTER 10 ■ ATEX-CERTIFIED COILS AND CONNECTORS



APPLICATION

For the normally-closed solenoid valves manufactured in compliance with the ATEX Directive (valves with an “EX” suffix presented in Chapter 5), Castel provides its customers with the following types of coils:

- Series 9100EX (coils type HM2)
- Series 9110EX (coils type CM2)

These coils are classified as Group II, Category 3 equipment according to the ATEX Directive (2014/34/EU). This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” potentially explosive environments according to the definitions in Annex I of Directive 1999/92/EC.

Coils in series 9100EX must be used only with connector type 9150EX/R02. The protection rating of the coil + connector system is IP65 according to the EN 60529 standard.

CONSTRUCTION

The coils in series 9100EX and 9120EX are produced in compliance with European standards EN 60079-0:2009 and 60079-18:2009, which ensure their compliance to the Essential Health and Safety Requirements of Directive 2014/34/EU. The two series of coils are Class F encapsulated and have Class H enamelled copper wire windings, in compliance with IEC standard 85. The outer casing is made of waterproof, dielectric resins that guarantee reinforced insulation and allow any type of assembly.

All coils have Class I protection ratings against electric contacts. Consequently, their safety requires an efficient ground system. Rubber gaskets assembled on the upper and lower ends of the coils complete the protection of the windings from humidity.

The terminals of the coils in series 9100EX consist of two Faston connectors plus a Faston ground connector. Coils in series 9110EX are equipped with a 1 m long power supply cable incorporated in the encapsulated section. The cable has a polyurethane sheath with operating temperature of up to 125 °C and cable insulation in special PVC with an operating temperature of up to 125 °C. All coils in this chapter are suitable for continuous operation. The solid

construction of these coils makes them suitable for use in refrigeration systems operating in heavy-duty environments

APPROVALS

Compliance of the coils in series 9100EX to Directive 2014/34/EU is certified by the Italian notified body IMQ, with certificate No. IMQ 13 ATEX 002X (Certified Type Test). Protection type of the coils in series 9100EX: Ex mc IIC T5 Gc / Ex mc IIIC T100°C Dc IP65.

Compliance of the coils in series 9110EX to Directive 2014/34/EU is certified by the Italian notified body IMQ, with certificate No. IMQ 13 ATEX 001X (Certified Type Test).

Protection type of the coils in series 9110EX: Ex mc IIC T4 Gc / Ex mc IIIC T135°C Dc IP65.

Coils in series 9100EX and 9110EX with 110 VAC, 220/230 VAC and 240 VAC voltages are produced in accordance with the Low Voltage Directive (2006/95/EC). All coils in series 9100EX and 9110EX comply with the Electromagnetic Compatibility (EMC) Directive (2004/108/EC).

CONNECTOR

Connector 9150EX/R02 is classified as Group II, Category 3 equipment according to the ATEX Directive (2014/34/EU). This equipment is suitable for use on refrigeration systems located in areas classified as “Zone 2” potentially explosive environments according to the definitions in Annex I of Directive 1999/92/EC.

The DIN 43650 standardized connector 9150EX/R02 represents an effective system for the connection of the coil to the power system, thus ensuring safety also in the presence of moisture. Based on the assembly requirements, this connector allows you to choose the orientation of the outer casing with respect to the inner terminal block. The gland nut of the outer casing is suitable for receiving cables with an external diameter of 6 to 9 mm and is equipped with a self-locking device. Three-pole cables with a cross-section greater than or equal to 0.75 mm² are recommended.

As long as it is used with the gaskets provided, connector 9150EX/R02 ensures IP65 protection rating according to the EN 60529 standard.



N.B.: PRODUCT SUITABLE FOR HYDROCARBON REFRIGERANTS

The products in this chapter can be used with HC refrigerants classified as flammable fluids and that are in Safety Group A3 according to Standard EN 378-1:2016.

These products must be used exclusively in refrigeration systems that comply with the current regulations for flammable refrigerant fluids (series EN 60335).

Installation, maintenance and repair operations must be performed only by authorized personnel, qualified to work on flammable refrigeration systems.

N.B.: The personnel must carefully follow the operating instructions provided in the packaging of said valves.

TABLE 33: General characteristics of coils ATEX compliance for use in EX Zone 2

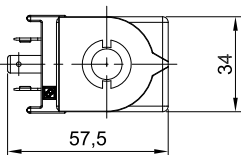
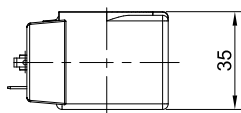
| Catalogue Number | Coil Type | Voltage [V] | Voltage tolerance [%] | Frequency [Hz] | Insulation class EN 60730 | TA [°C] | | Connection | Connectors | Protection Degree |
|------------------|-----------|--------------|-----------------------|----------------|---------------------------|---------|------|--------------------------------|------------|------------------------|
| | | | | | | min. | max. | | | |
| 9100EX/RA2 | HM2 | 24 A.C. | +10 / -10 | 50 / 60 | H | -20 | +50 | Terminal block for DIN 43650/A | 9150EX/R02 | IP 65 (with connector) |
| 9100EX/RA4 | | 110 A.C. | | | | | | | | |
| 9100EX/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9100EX/RA7 | | 240 A.C. | | | | | | | | |
| 9110EX/RA2 | CM2 | 24 A.C. | +10 / -10 | 50 / 60 | H | -20 | +50 | Three wires cable | - | IP 66 |
| 9110EX/RA4 | | 110 A.C. | | | | | | | | |
| 9110EX/RA6 | | 220/230 A.C. | +6 / -10 | | | | | | | |
| 9110EX/RA7 | | 240 A.C. | | | | | | | | |

TABLE 34: Coils consumptions and weights

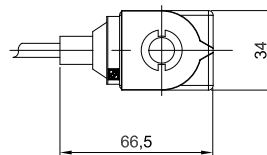
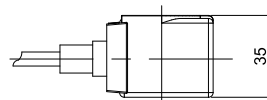
| Catalogue Number | Coil Type | Voltage [V] | Power [W] | Consumption at 20 °C [mA] | | | | | | Weight [g] |
|------------------|-----------|--------------|-----------|---------------------------|---------|------|---------|---------|------|------------|
| | | | | Start | | | Working | | | |
| | | | | 50 [Hz] | 60 [Hz] | D.C. | 50 [Hz] | 60 [Hz] | D.C. | |
| 9100EX/RA2 | HM2 | 24 A.C. | 8 | 920 | 825 | - | 527 | 420 | - | 230 |
| 9100EX/RA4 | | 110 A.C. | | 230 | 205 | | 128 | 114 | | |
| 9100EX/RA6 | | 220/230 A.C. | | 120 | 105 | | 68 | 58 | | |
| 9100EX/RA7 | | 240 A.C. | | 100 | 87 | | 54 | 43 | | |
| 9110EX/RA2 | CM2 | 24 A.C. | 8 | 920 | 825 | - | 527 | 420 | - | 230 |
| 9110EX/RA4 | | 110 A.C. | | 230 | 205 | | 128 | 114 | | |
| 9110EX/RA6 | | 220/230 A.C. | | 120 | 105 | | 68 | 58 | | |
| 9110EX/RA7 | | 240 A.C. | | 100 | 87 | | 54 | 43 | | |

TABLE 35: General characteristics of connectors

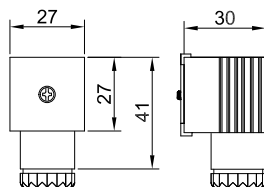
| Catalogue Number | Standard | Degree of protection | Class of insulation | Approval |
|------------------|-----------|----------------------|-------------------------|--------------------------------------|
| 9150EX/R02 | DIN 43650 | IP65 EN 60529 | Group C VDE 0110-1 / 89 | ATEX compliance for use in EX Zone 2 |



9100EX (Type HM2)



9120EX (Type CM2)



9150EX/R02

CHAPTER 11 ■

COILS AND CONNECTORS

CERTIFIED BY UNDERWRITERS LABORATORIES INC.



APPLICATION

For normally-closed solenoid valves approved by the American certification authority Underwriters Laboratories Inc. (valves with an “UL” suffix presented in Chapter 7), Castel provides its customers with the following types of coils:

- **Series 9105** (coil type HM2), with connection type DIN 43650
- **Series 9125** (coil type HM3), with connection type DIN 43650
- **Series 9115** (coil type CM2-N2), with connection type “Junction Box NEMA 2”.
- **Series 9116** (coil type CM2-N4), with connection type “Conduit Hub NEMA 4”.
- **Series 9185** (coil type CM3-N2), with connection type “Junction Box NEMA 2”.
- **Series 9186** (coil type CM3-N4), with connection type “Conduit Hub NEMA 4”.

Coils in series 9105 and 9125 must be coupled with connector type 9150UL/R02. The protection rating of the coil + connector system is IP65 according to the EN 60529 standard.

The coils in series 9115 and 9185 are complete with a connection system and a metal sheath. The protection rating guaranteed by the “Junction Box” connection system is similar to IP12-32 according to the EN 60529 standard.

The coils in series 9116 and 9186 are complete with a connection system and a metal sheath. The protection rating guaranteed by the “Conduit Hub” connection system is similar to IP54 according to the EN 60529 standard.

CONSTRUCTION

In compliance with IEC standard 85, the coils in series 9105, 9125, 9115, 9116, 9185 and 9186 have Class F encapsulation and their production is compliant with standards EN 60730-1 and EN 60730-2-8. The windings are made of copper wire, with insulation class H (155°C), in

compliance with IEC standard 85. The outer casing is made of waterproof, dielectric resins that guarantee reinforced insulation and allow any type of assembly.

All coils have Class I protection ratings against electric contacts. Consequently, their safety requires an efficient ground system. Rubber gaskets assembled on the upper and lower ends of the coils complete the protection of the windings from humidity.

The coils in series 9105 and 9125 are equipped with three flat terminals, two Faston connections in line plus a Faston ground connection.

The coils in series 9115 and 9185 are equipped with two cables, at least 153 mm long, and ground screws incorporated in the body of the metal casing. The body of the casing is screwed onto the metal reinforcement of the coil and there are two semi-sheared slots to screw on a metal sheath. A metal cover screwed on the body closes the casing and encloses the joints between the power cable and the coil wires.

Coils in series 9116 and 9186 are equipped with two wires, at least 457 mm long. The flange of the inlet plug is screwed to the metal reinforcement of the coil. The inlet plug is threaded in order to screw on a metal sheath.

All coils in this chapter are designed for continuous use. The solid construction of these coils makes them suitable for use in refrigeration systems operating in heavy-duty environments

APPROVALS

Coils in series 9105, 9125, 9115, 9116, 9185, and 9186 have been approved by the American certification authority Underwriters Laboratories Inc. These coils are certified UL-CSA Recognized for the USA and Canada with file E243604, in compliance with American standard UL 429 and Canadian standard C22.2 No. 139-13.

Only when a coil in series 9115, 9116, 9185 or 9186 is used with a coil-less valve in Chapter 7 (valve with a “UL” suffix) is a solenoid valve obtained that is UL Listed

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