ALICAT SCIENTIFIC

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CABLE SPECIFICATIONS AND INSTALLATION GUIDE

FOR IS-PRO AND IS-MAX INSTRUMENTS

Thank you for purchasing cables for your Alicat IS-Pro/ IS-Max instruments.

If you have any questions, or if something is not working as expected, please contact us. We are eager to help you in any way possible.

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Legal and Safety

This guide is intended as a companion to DOC-MANUAL-IS-SAFEINSTALLATION. It contains information which can assist in evaluating and planning a cable system for IS-MAX or IS-PRO intrinsically safe devices and verifying that an installation is compliant with EN 60079-14, IEC 60079-14, ANSI/ISA RP12.6, CSA c22.1, and local electrical codes.

No part of this guide overrides or replaces any part of DOC-MANUAL-IS-SAFEINSTALLATION.

Any configuration of cables and Alicat IS devices must be assessed by competent personnel to verify that the installation meets the requirements of the local jurisdiction and that the system's combined entity parameters do not exceed the limits of any connected piece of equipment.

Specifications and Installation

This document applies to Alicat-supplied DB-15 cable assemblies and raw cables for use with intrinsically safe (IS) Alicat “IS-Max” and “IS-Pro” series flow and pressure control instruments. These cables can be identified by their sky-blue color and by specific markings on the cable.

Alicat provides two varieties of cable assemblies for IS instruments:

- Single-ended, 15-conductor cable assemblies with straight or right-angle (90°) DB-15 connectors are intended for connecting Alicat instruments to individual barriers.
- “Daisy-chain” 7-conductor cable assemblies extend the power and serial communication conductors from a 15-conductor cable to many instruments. This arrangement creates “bus-style” wiring where many instruments are supplied from common barriers. These cables do not support analog signals.

Alicat IS Cables, Assemblies, and Accessory Part Numbers

Part Number	Description
IS-DB15-10M1	IS Cable Assembly – DB-15 female, Straight, 10 Meters, 15-Conductor, IP66
IS-DB15RT-10M1	IS Cable Assembly – DB-15 female, 90°, 10 Meters, 15-Conductor, IP66
IS-DB15RT-0.5M3	IS Cable Assembly – Daisy-Chain 90° DB15 (Male to 2x Female). 0.5 meters, 7-Conductor, IP66
IS-DB15RT-1M3	IS Cable Assembly – Daisy-Chain 90° DB15 (Male to 2x Female). 1 meter, 7-Conductor, IP66
310950	IS 7-conductor cable, no connectors, by the meter
310960	Replacement IS Cable Gasket, Red (for cable-cable seals)
310961	Replacement IS Cable Gasket, Black (for cable-device seals)

Cable Specifications

Connector Parameters for All Cables

Connector Configuration	15 Pin Female D-SUB connector
Overmold Material	Thermoplastic polyurethane
Jackscrew Material	Nickel-plated brass
Contact Material	Gold-plated Brass
Number of Mating Cycles	150 cycles
Maximum connector torque	2.5 lb-in (0.28 Nm)
Maximum Contact Resistance	20 mΩ

Entity Parameters and derived parameters for all cable and assemblies

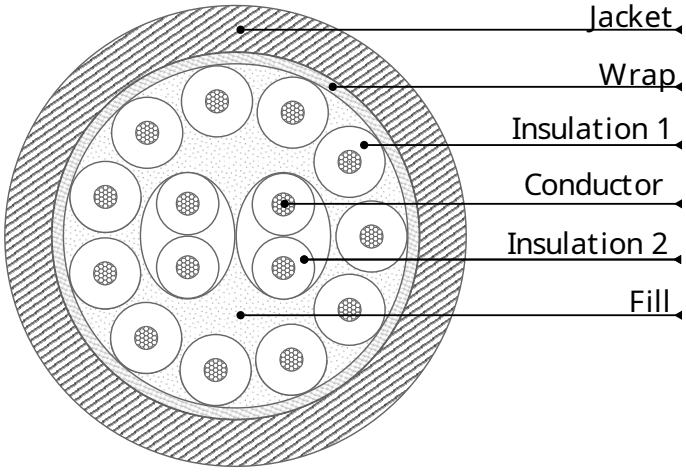
L_{CABLE} (Twisted Pairs Only) **L_{CABLE} (All other conductors) †**	805 nH·m^{-1} 1µH·m^{-1}
C_{CABLE}	550 pF·m^{-1}
Maximum Twisted Pair L/R ratio	5.3 µH·Ω^{-1}
Conductor Resistance	73-76 mΩ·m^{-1}
Minimum insulation between conductors and environment. ‡	1.0 mm
Minimum insulation between conductors. ‡	0.51 mm

† Twisted Pair L/R ratio is tested on all cable lots. L_{cable} inductance values are calculated given the limits of the allowable resistance range of the conductors and the maximum allowable L/R ratio.

‡ Minimum thickness values account for concentricity, extrusion tolerance, and 15% thinning due to cable stretch.

IS-DB15-10M1 and IS-DB15RT-10M1

The following mechanical cable specifications cover IS-DB15-10M1 and IS-DB15RT-10M1 straight and 90° single-ended cables.

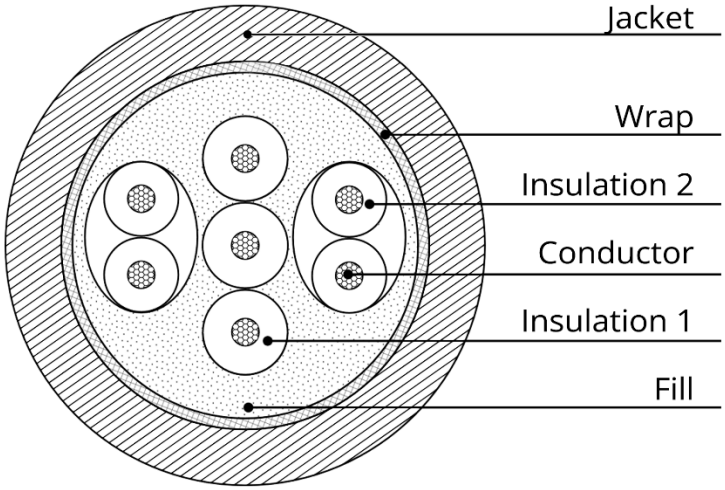


Cable used in IS-DB15-10M1 and IS-DB15RT-10M1 straight and 90° assemblies.

Cable Configuration	15 conductor, 11C + 2 twisted pairs
Jacket Material	Thermoplastic polyurethane
Jacket Thickness	0.90 – 1.10 mm
Wrap Material	Non-Woven Polymer
Insulation material	Cross-linked polyethylene
Insulation 1 thickness	0.43-0.61 mm (0.53 nominal)
Insulation 2 thickness (for twisted pairs)	0.30-0.53 mm (0.38 nominal)
Conductor Construction	19/36 (19/0.127 mm) tinned copper concentric strand wire, 0.24 mm^2
Cable O.D.	10.9 ± 0.3 mm (0.43 ± 0.01 in)
Minimum Bend Radius	50 mm (2 in)
Temperature Rating	-20°C to 105°C
Flammability Rating	FT-2
Rated Cable Voltage	600V
UV Resistance (UL1581-1200)	Xenon-arc, 300 hours: Tensile strength & elongation ≥ 85%
Marking	ALICAT FLEXIBLE IS CABLE R1 FT-2 600V -20°C TO 105°C XXXXXXX MMYY | 00M XXXXXXX = Lot Number, MMYY = Date Code, 00M = Continuous Meter Marking from 1 meter to 10 meters

IS-DB15RT-0.5M3, IS-DB15RT-1M3, and 310950

The following mechanical cable specifications cover IS-DB15RT-0.5M3 and 310950 Daisy-Chain Cables.



Cable used in IS-DB15RT-0.5M3, IS-DB15RT-1M3, and 310950 Daisy-Chain Cable assemblies.

Cable Configuration	7 conductor, 3C + 2 twisted pairs
Jacket Material	Thermoplastic polyurethane
Jacket Thickness	0.90 – 1.10 mm
Wrap Material	Non-Woven Polymer (negligible thickness)
Insulation material	Cross-linked polyethylene
Insulation 1 thickness	0.43-0.61 mm (0.53 nominal)
Insulation 2 thickness (for twisted pairs)	0.30-0.53 mm (0.38 nominal)
Conductor Construction	19/36 (19/0.127mm) tinned copper concentric strand wire, 0.24 mm^2
Cable O.D.	9.2 ± 0.3 mm (0.4 in)
Minimum Bend Radius	38 mm (1.5 in)
Temperature Rating	-20 °C to 105 °C
Flammability Rating	FT-2
Rated Cable Voltage	600 V
UV Resistance (UL1581-1200)	Xenon-arc, 300 hours: Tensile strength & elongation ≥ 85%
Marking	ALICAT DAISY CABLE R0 FT-2 600 V -20 °C TO 105 °C XXXXXXX MMYY XXXXXXX = Lot Number, MMYY = Date Code

General installation and usage

Alicat IS cable assemblies are dimensioned and designed to maintain an IP66 rating when mated with Alicat IS-Max and IS-Pro instruments or with each other, and to isolate all separate intrinsically safe circuits in the connector when fully mated and secured. Other cable assemblies may not seal or separate circuits correctly. **Alicat instruments are not certifiable as intrinsically safe when used with other cable assemblies.**

Single-ended Alicat cables and terminal blocks can be used to interconnect instruments and create complex wiring arrangements, provided safe clearance and creepage distances are maintained and all local electrical codes and installation standards are observed. Alicat can provide lengths of un-connectorized, daisy-chain cable for creating wiring harnesses between terminal blocks that maintain the same defined entity parameter properties.

Single-ended cable assemblies can be cut to length. Daisy-chain cables require assembly as described below.

Daisy-Chain cable installation instructions and notes

Alicat provides a “daisy-chain” cable that can be used to supply several instruments from a single barrier or barriers. Sharing power or communication between barriers requires special instructions and considerations described in this section.

When to use daisy-chain cables

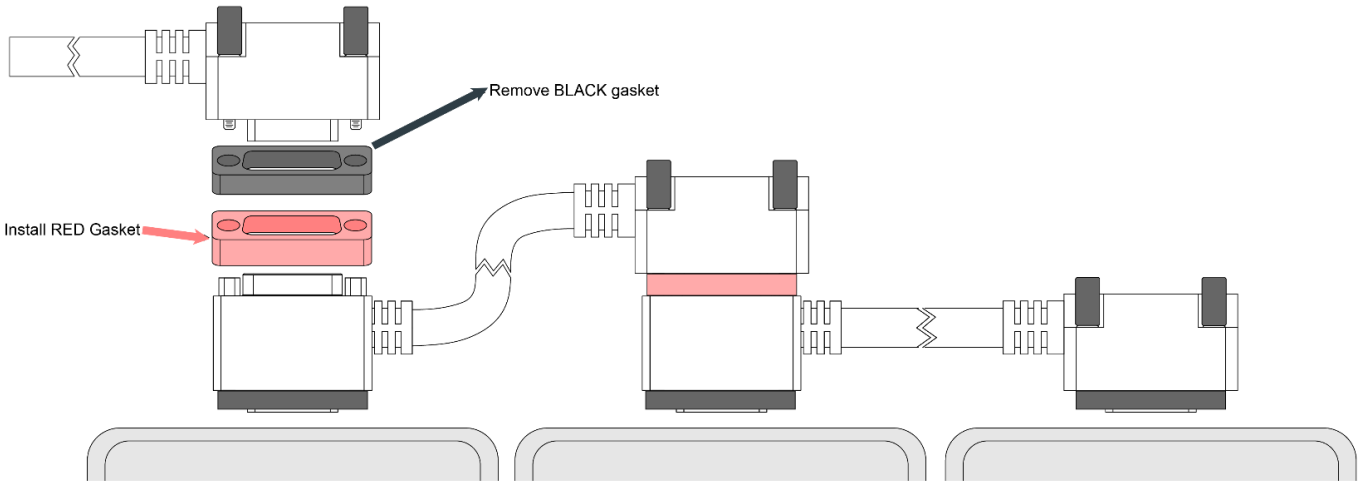
Alicat daisy-chain cables are short (1 meter or less) cables with a reduced conductor count, containing only conductors for main power, valve power, and serial communications. All analog signals are excluded from this cable because analog signals cannot share conductors. This configuration is intended to allow multiple Alicat instruments in a hazardous location to connect to one or more barriers through a single cable “Bus.”

An arrangement with a single power barrier to multiple instruments is most useful for flow *meters* and pressure *gauges*. Flow and pressure *controllers* require specific design and planning considerations when used with daisy-chain cables as each valve interface must operate at reduced power. Please contact an Alicat applications engineer for details on how to daisy-chain controllers.

Installation instructions for daisy-chain cables

Daisy-chain cables are supplied with an additional red gasket that must be installed to maintain the IP66 rating when instruments are chained together. These gaskets are 7 mm thick and are intended to seal a stacked male-to-female daisy-chain cable. These should be applied to the male connector of the daisy-chain cable.

Black gaskets that come pre-installed on all female connectors are 5.5 mm thick and are intended to seal a connection between a cable and an Alicat device. These black gaskets should be removed when mating with an Alicat daisy-chain cable, per the image below.



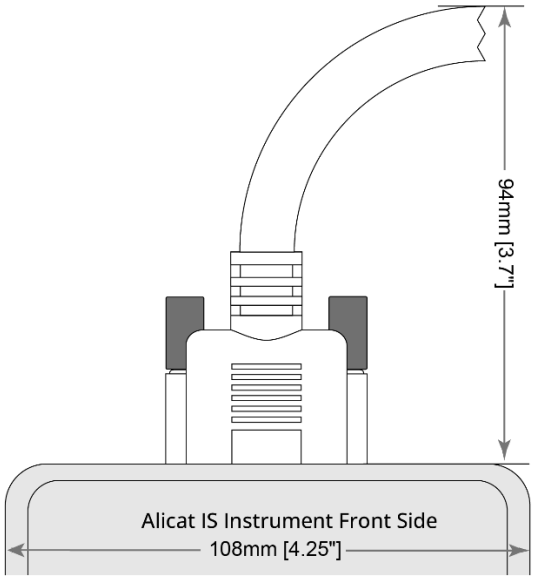
Daisy-chain cable gasket configuration.

WARNING: ***Do not stack daisy-chain connectors three-high, as this can increase the bending force on device connectors and degrade serial signals.***

Cable assembly dimensions and required clearance

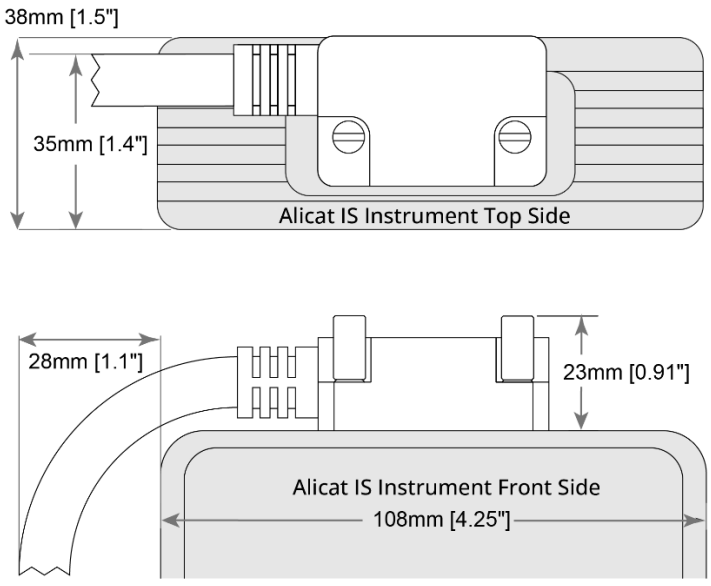
This section shows the mated dimensions and the required clearance for cable assemblies, accounting for their minimum bend radius. The “XX” in the part number designates the overall cable length, in meters, from the cable tip to the end of the connector. Cables can be cut to their required length as needed.

IS-DB15-XXM1



IS-DB15-XXM1 mated dimensions and the required clearance for cable assemblies.

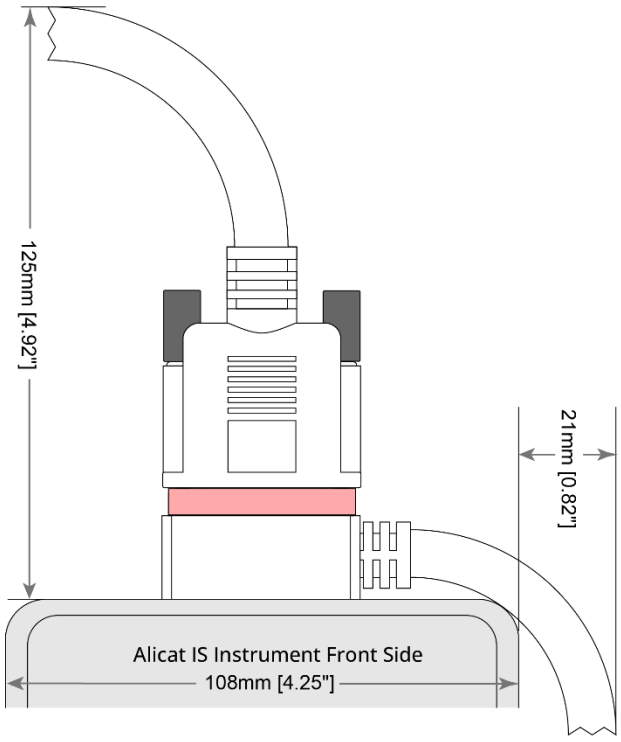
IS-DB15RT-XXM1



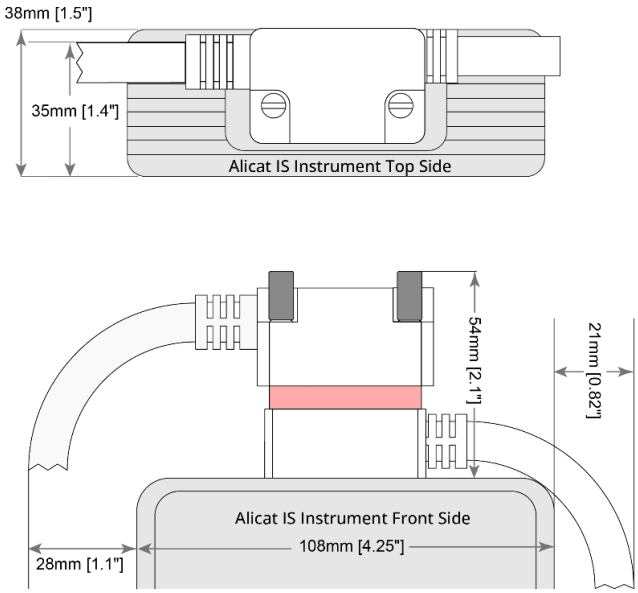
IS-DB15RT-XXM1 mated dimensions and the required clearance for cable assemblies.

IS-DB15RT-XXM3

The single-ended side of the connector has the same dimensions as the IS-DB15RT-XXM1 above. The following diagrams show the mated dimensions for this cable with both straight and right-angle cable assemblies.



IS-DB15RT-XXM1 mated dimensions with IS-DB15-XXM11 straight connector.



IS-DB15RT-XXM3 mated dimensions with IS-DB15RT connectors.