

Inxpect Systems - Cables specifications

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Revision	Author	Date	Notes
v01	B.Treachì	21/06/2018	Initial version
v02	B.Treachì	18/07/2018	Small changes
v03	B.Treachì	22/02/2019	Small changes
v04	B.Treachì	08/03/2019	Added caption to the connector pictures
v05	B.Treachì	01/04/2019	Added new lengths of the cable between sensors
v06	B.Treachì	11/07/2019	Added terminator resistor description
v07	I.Paderno	02/01/2020	Revised cable technical data, modified cable schemes, added chapter "length of cables", added purchase products code
v08	I.Paderno	09/01/2020	Added example of connection with the controller, minor fixing
v09	L. Nava	04/03/2020	Added mandatory cable specifications
v10	B.Treachì	14/08/2020	Added ISC-B01 controller
v11	B.Treachì	12/02/2021	Added SBV System BUS
v12	B.Treachì	08/03/2021	Changed AWG codes and cables material

Revision	Approved by	Date
v01	GS	21/06/2018
v07	B.Treachì	03/01/2020
v08	B.Treachì	09/01/2020
v09	B.Treachì	04/03/2020
v11	L. Nava	04/03/2021

1. Introduction

All the Inxpect systems (LBK System, LBK System BUS and SBV System BUS) require the use of cables with specific features.

The following chapters describe the technical details of these cables.

2. Cables specifications

2.1 Cable technical data

2.1.1 LBK System and LBK System BUS

The minimum requirements for the cables are the following:

- **Number of conductors:** 4 wires and 1 drain wire (or shield)
- **Conductor sections:** 0.25 mm² (AWG24) for data signal and 0.25 mm² (AWG24) for power supply
- **Impedance:** 120 $\Omega \pm 10\%$ (f = 1MHz).

The recommended cable technical data are the following:

- **Signal type/category:** CAN bus, CANopen®, DeviceNet™.
- **Number of conductors:** 4 wires (twisted pair) and 1 drain wire (or shield)
- **Conductor sections:** 0.25 mm² (AWG24) for data signal and 0.34 mm² (AWG22) for power supply
- **Cable Material:** PVC (depending on final site of application)
- **Cable operating temperature:** from -20°C to +80°C
- **Impedance:** 120 $\Omega \pm 10\%$ (f = 1MHz).
- **Others specifications:** cable and connectors totally shielded with copper braid tin plated

2.1.2 SBV System BUS

The minimum and recommended cable technical data are the following:

- **Signal type/category:** CAN bus, CANopen®, DeviceNet™.
- **Number of conductors:** 4 wires (twisted pair) and 1 drain wire (or shield)
- **Conductor sections:** 0.25 mm² (AWG24) for data signal and 0.50 mm² (AWG20) for power supply
- **Cable Material:** TPU (depending on final site of application)
- **Cable operating temperature:** from -20°C to +80°C
- **Impedance:** 120 $\Omega \pm 10\%$ (f = 1MHz).
- **Others specifications:** cable and connectors totally shielded with copper braid tin plated

2.2 Length of the CAN bus cables

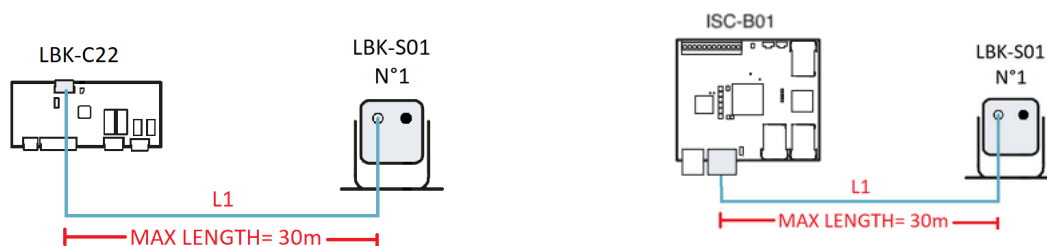
2.2.1 LBK System and LBK System BUS

The maximum cable length allowed is 30 meters for each bus line (maximum two bus lines allowed), regardless of the conductor section of the CAN bus cable.

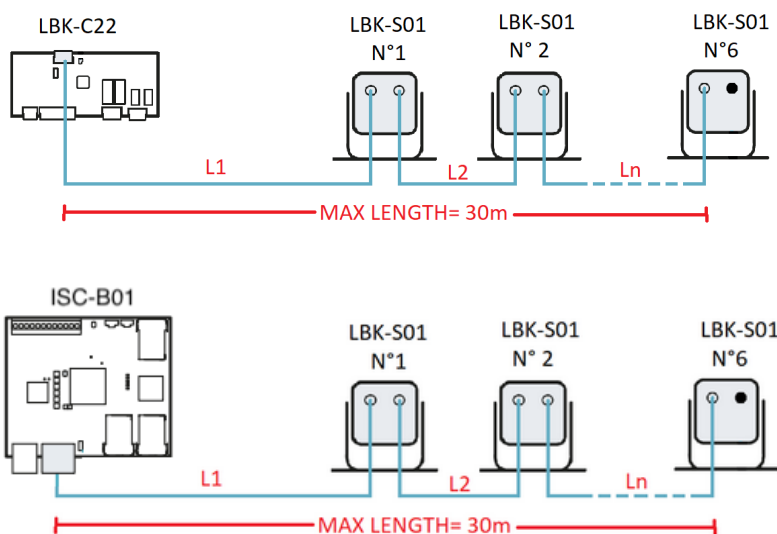
This value can be reached with a cable only or with multiple cables in case of multiple sensors installed (chain of sensors). In other words the sum of all the cables used in a single bus line does not have to exceed the maximum length allowed.

Examples:

- Only a sensor installed

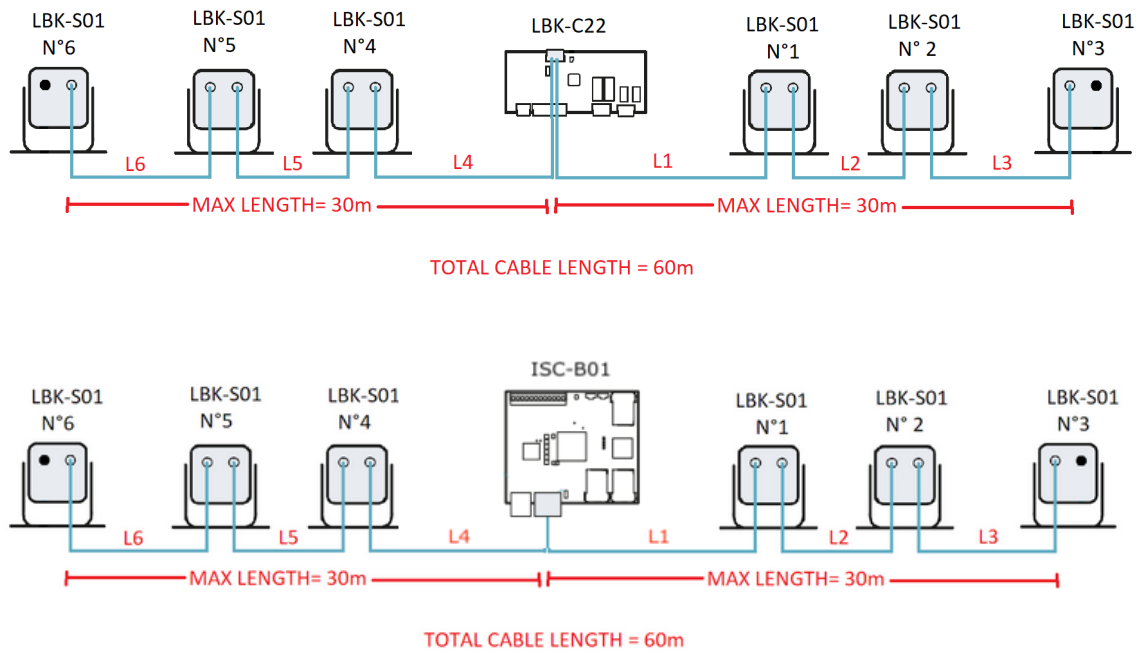


- Multiple sensors on the same bus line (chain of sensors)



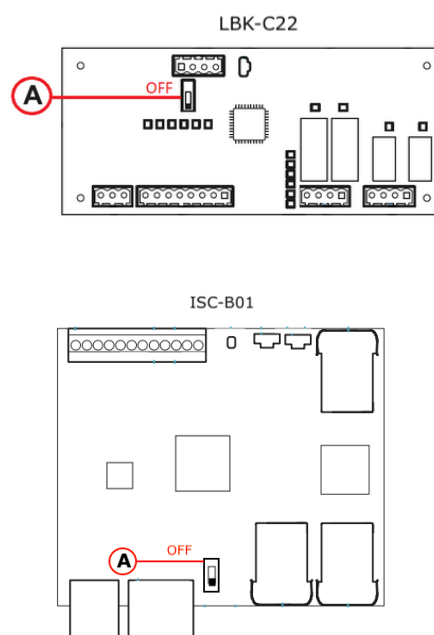
The sum of the length of each cable must be equal or lower than 30 meters. $\sum_{i=1}^6 L_n \leq 30m$

- Multiple sensors in two different bus lines with the controller inside of the chain (*)



The sum of each cable's length on the same bus line must be equal or lower than 30 meters, and the overall length must be at maximum 60 meters. $(\sum_{1}^n L_n \leq 30m \text{ and } \sum_{1}^6 L_n \leq 30m, \text{ where } n < 6)$. Each bus line may have between 1 and 5 sensors. The maximum number of sensors LBK-S01 managed by an LBK-C22 controller (or by an ISC-B01 controller) is 6.

(*) When the controller is inside of the chain, it is necessary to exclude the termination resistance on the controller itself using the DIP Switch "A".



2.2.2 SBV System BUS

2.2.2.1 Cables with conductor section of 0.50 mm² for power supply

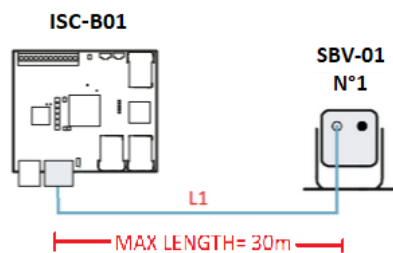
The maximum cable length allowed is 30 meters for each CAN bus line (maximum two bus lines allowed).

2.2.2.2 Custom cables with a bigger conductor section for power supply

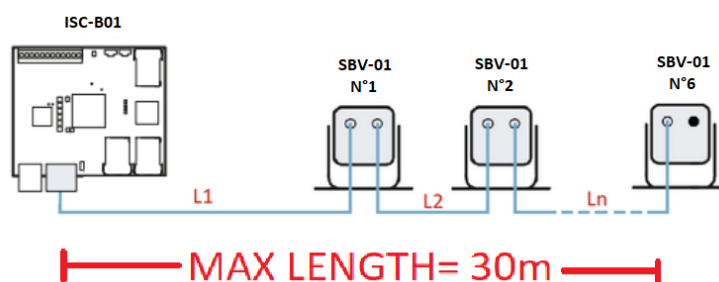
The maximum length for the CAN bus cables could reach distances longer than 30 meters. Check the voltage drop on the line.

2.2.2.3 Example - single CAN bus line

- Only a sensor installed



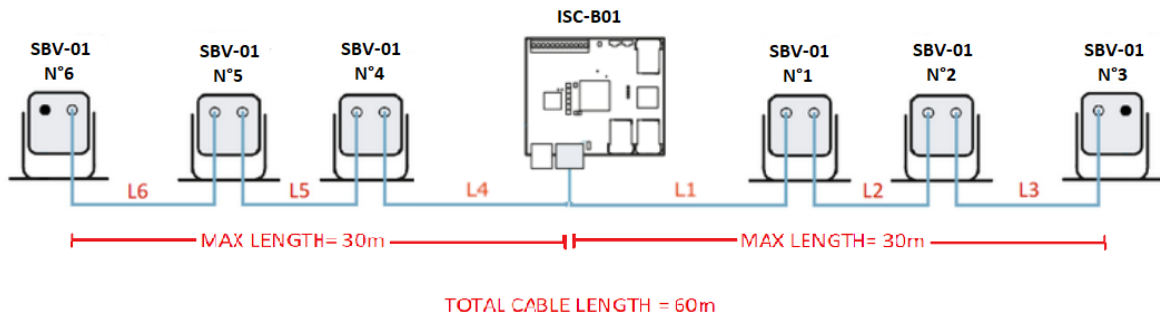
- Multiple sensors on the same bus line (chain of sensors)



The sum of the length of each cable must be equal or lower than 30 meters. ($\sum_{1}^{6} L_n \leq 30m$)

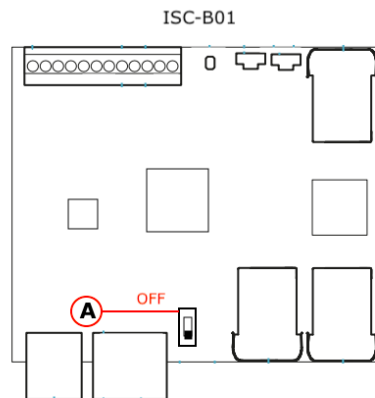
2.2.2.4 Example - two CAN bus lines

- Multiple sensors in two different bus lines with the controller inside of the chain (*)



The sum of each cable's length on the same bus line must be equal or lower than 30 meters, and the overall length must be at maximum 60 meters. $(\sum_{1}^n L_n \leq 30m \text{ and } \sum_{n}^6 L_n \leq 30m, \text{ where } n < 6)$. Each bus line may have between 1 and 5 sensors. The maximum number of sensors SBV-01 managed by an ISC-B01 controller is 6.

(*) When the controller is inside of the chain, it is necessary to exclude the termination resistance on the controller itself using the DIP Switch "A".



3. Cable between the controller and the first sensor

The cable between the controller (LBK-C22 or ISC-B01) and the first sensor (LBK-S01 or SBV-01) is identified in the previous examples by the acronym L1 and L4.

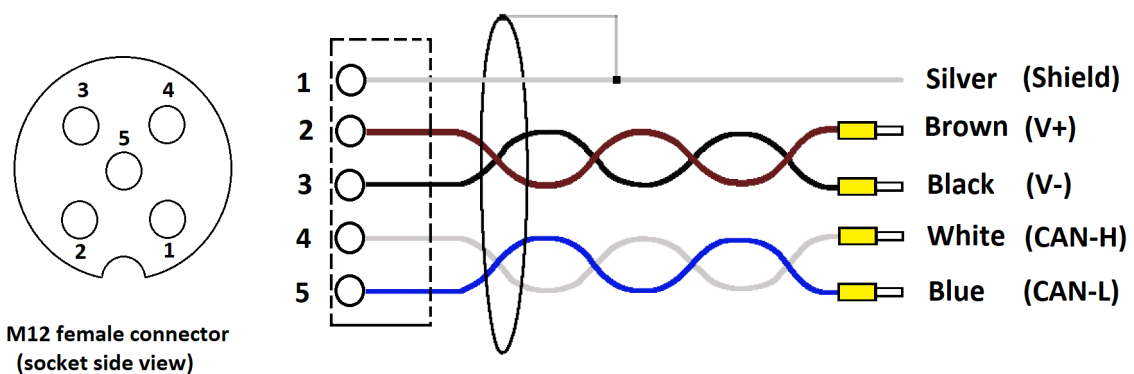
This cable must have an M12 female connector "A-coded" to plug into the first sensor, and free wires to plug in the controller screw terminal.

The connector may be straight or 90° angled. In case of installation with the sensor anchored to a vertical plane the 90° angled version is suggested (example: wall installation).

Example picture:

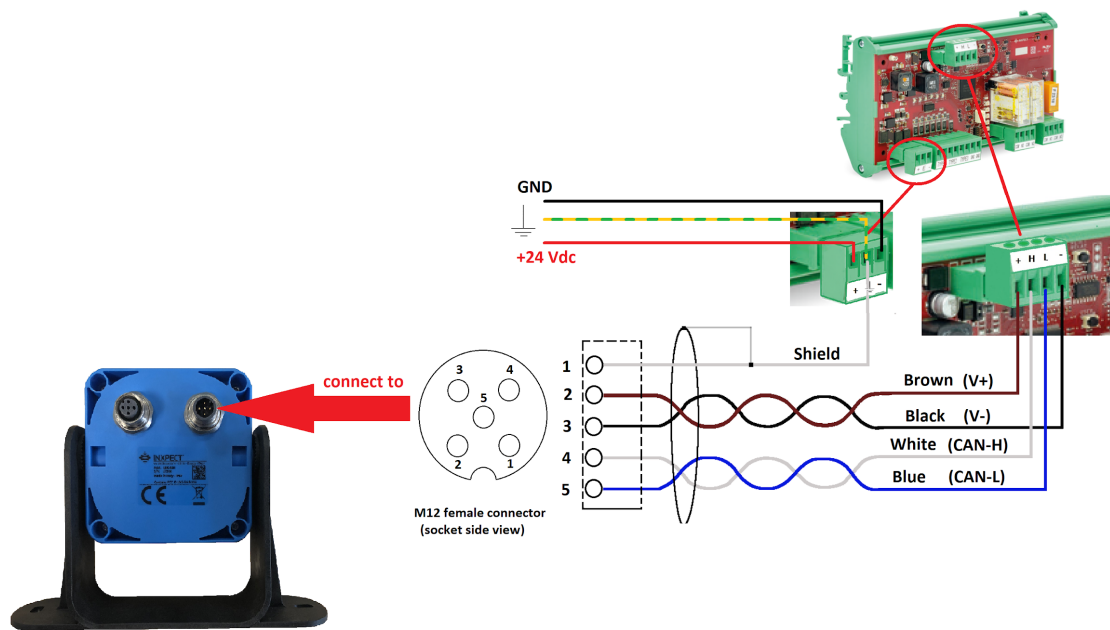


In the case of purchased cable from Inxpect the cable schematics and color association is the following:

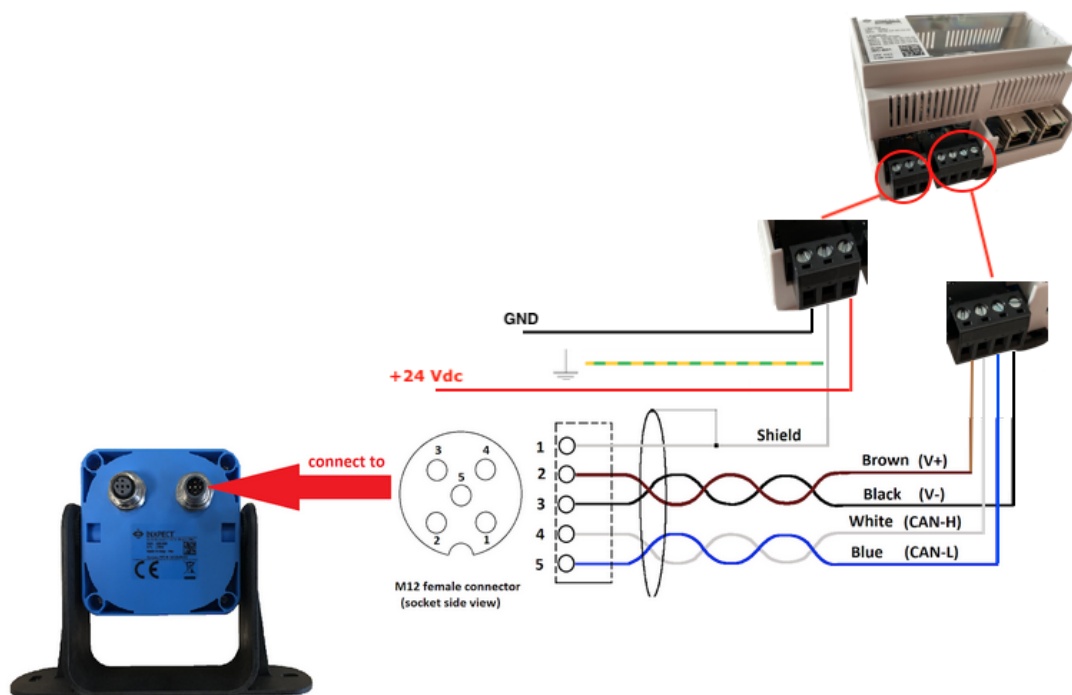


NOTE: the shield wire must be connected to EARTH in the electrical cabinet.

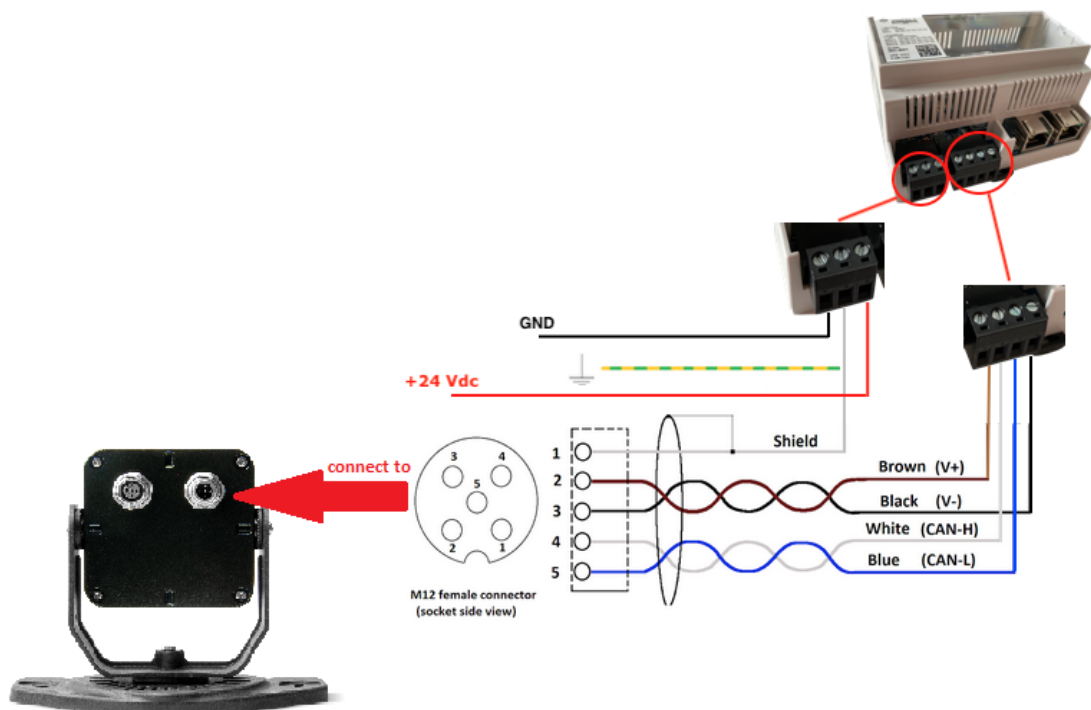
Example of connection of LBK-C22 controller with an LBK-S01 sensor:



Example of connection of ISC-B01 controller with an LBK-S01 sensor:




Example of connection of ISC-B01 controller with an SBV-01 sensor:



3.1 Product purchase code for the cable between controller and first sensor


3.1.1 LBK-S01 sensor

It is possible to order the following lengths of cable from Inxpect:

Image	Purchase Code	Length	Description
	08000003	5 meters	cable between sensor and controller, PVC, connector M12 90° angled, A-coded
	08000004	10 meters	
	08000006	15 meters	

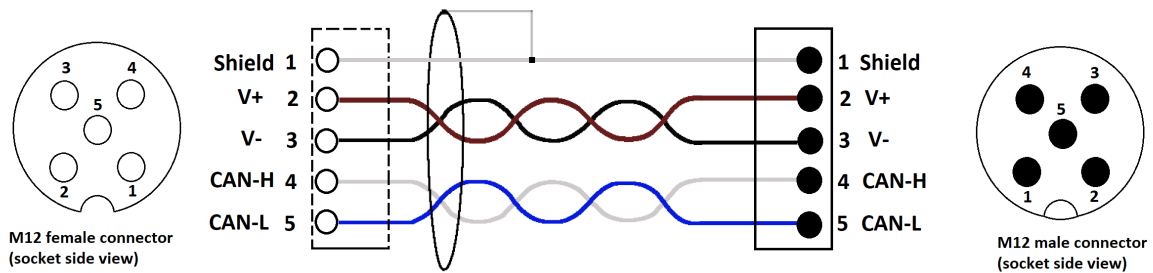
3.1.2 SBV-01 sensor

It is possible to order the following lengths of cable from Inxpect:

Image	Purchase Code	Length	Description
	08000110	5 meters	cable between sensor and controller, TPU, connector M12 90° angled, A-coded
	08000111	10 meters	
	08000112	15 meters	

4. Cable between two sensors

The cable between two sensors (both LBK-S01 or both SBV-01) has the following schematic




Example picture



4.1 Product purchase code for the cable between two sensors


4.1.1 LBK-S01 sensor

It is possible to order the following lengths of cable from Inxpect:

Image	Purchase Code	Length	Description
	08000007	3 meters	cable between a sensor and another sensor, PVC, connectors M12 90° angled, A-coded
	08000013	5 meters	
	08000014	10 meters	
	08000016	15 meters	

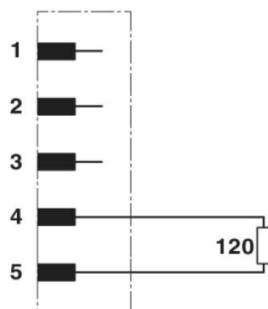
4.1.2 SBV-01 sensor

It is possible to order the following lengths of cable from Inxpect:


Image	Purchase Code	Length	Description
	08000120	3 meters	cable between a sensor and another sensor, TPU, connectors M12 90° angled, A-coded
	08000121	5 meters	
	08000122	10 meters	
	08000123	15 meters	

5. Bus terminator

For the last sensor in the CAN bus a termination resistor of 120 Ω must be installed between the signals CAN_H and CAN_L, as indicated in the following picture.



It is possible to order an M12 male connector A-coded including the bus terminator resistor.

Image	Purchase Code	Description
	07000003	Bus terminator M12, straight 180°, male, 5 poles, A-coded. 1 resistance of 120 Ω 1/2W between pole 4 and 5.