SYSTEM FOR DETECTION THE PRESENCE OF PAINT LAYERS

The contactless detection hard coatings and hydrophobic treatment

Datasheet

05/2018

atesystem
FOCUSED ON DETAIL

ATEsystem s.r.o.
Studentská 6202/17
708 00 Ostrava-Poruba
Česká republika

M +420 595 172 720
E atesystem@atesystem.cz
W www.atesystem.cz

INFORMATION ABOUT DOCUMENT

No. revision	Author	Date of revision	Description
0	Žárský R.	02. 11. 2016	Datasheet creation
1	Žárský R.	05. 05. 2017	Fix error wiring connector
2	Žárský R.	10. 12. 2017	Applied template for datasheets of products ATEsystem, valid to 15.9.2017
3	Žárský R.	20.5.2018	Add information on specifications

Attachments

Comments

Contact

ATEsystem s.r.o.
Studentská 6202/17
708 00 Ostrava 8 – Poruba
Česká republika

T +420 595 172 720
F +420 595 170 100
E atesystem@atesystem.cz
W www.atesystem.cz

OBSAH

1 KEY FEATURES

- Local detection of transparent coating layers applied to transparent material (based on setting ca. 15 mm^2)
- System solution for a quick change of product / production variant
- Designed for static installation or installation on a replaceable installation jig
- Starting detector by triggering signal on the input
- Indication of detecting hard-coating or antifog layer (active based on probe´s setting)
- Record of last 74 detections with an option of uploading the data to PC (archived in the control unit)
- Configuration via PC or service display (accessories)
- Connection to PC via RS232
- Use of Bluetooth (data transfer) and inductive (contactless) power supply of the detection probe

Fig. 1 – Set of system for detection the presence of paint layers

2 PRODUCT DESCRIPTION

The system is designed to detect the presence of hard coating paint layer (cover paint, HC) and antifog treatment (anti-fogging, AF) on headlight cover glass. The detection is performed in place with full transparency material on a circular area of about 30 mm^2 (in accordance with the thickness and structure of the glass material). The systems consist of the detection probe (smart sensor), control unit and optional wireless power supply system for the probe.

The detection probe contains its own sensor of paint layers and evaluation unit. Transfer or the signal with evaluation results can be achieved either via Bluetooth or cable connection - direct signals from the probe. The probe´s installation method determines the range of the detection system set. Sets for installation on removable installation jigs (i.e. press-heads) allow an automatic change of product production depending on the machine construction. They contain the same number of detection probe and jigs. The active probe is controlled with a control unit which is connected to a machine control system (such as PLC). The probe is supplied with power using the inductive couplers. The system uses a full integration of the paint detection system with the mechanical locking of the headlight position.

Sets for static installation of a detection probe in the working area of a machine (e.g. a robot) allow variable detections – the machine sets the tested glass into the position in front of the probe and performs the detection and its evaluation. Data is wirelessly transmitted to the control unit, from which the states of evaluation are further reported to the control system.

If only one detection probe is used, the control and evaluation signals from the probe can be connected directly to the control system. In this case, the functionality of the system is limited (no option to preview and archive measurements). The cable length should not exceed 5 m.

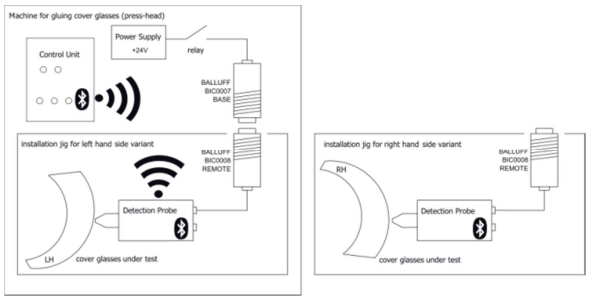


Fig. 2 – Replaceable installation of detection probe on a installation jig using a contactless power supply

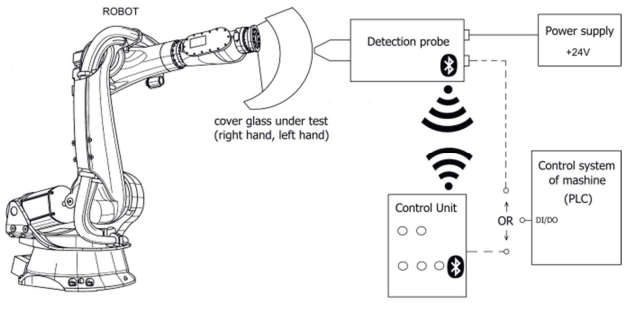


Fig. 3 – Static installation of detection probe in a working in the work space of a robot

3 DETECTION PROBE

Detection probe contains its own sensor for detecting reflectivity of the transparent material layers and evaluation unit. It can either be connected directly with the control system (it behaves as a sensor), or using the control unit with wireless Bluetooth connection which access signals from multiple probes paired in the system. The detection probe is configured with PC software (local connection via "PC Setup" connector) or using a service display connected to the control unit (see below).

Fig. 4 – The Detection probe

Fig. 5 – Description of connectors and LED indications on detection probe

Name	Value
Dimensions (L, W, H)	103 x 53 x 54 mm
Weight	385 g
Working temperature range	10 – 50 °C
Air humidity at 30°C	20 % - 80 %[1]
Mounting holes	4xM4
Thread depth in the probe´s body	4 mm
Nominal supply voltage	24 V ± 10%
Typical consumption of the detection probe	5 W
Max. current - PLC con., output +24VDC	100 mA
Bluetooth specifications	v2.0 EDR

[1] When excluding condensation

Tab. 1 – Parameters of the detection probe

Interface (indicator or connector)	Description
BT CONNECTED	Indication of connection to a paired control unit
HC OK	Indication of the result of the last measurement/detection of hard-coating paint
AF OK	Indication of of the result of the last measurement/detection of antifog coating
PWR 24VDC	Connector for probe power supply
PC SETUP	Connector for PC connection (for configuration)
PLC	Connector for direct connection to PLC (triggering signal of the sensor, HC OK signal, AF OK signal)

Tab. 2 – Description of LED indication and probe´s connectors

LED	State	Meaning
blue (BT)	On	Detection probe is connect to paired control unit
	Flashes slow	Searching for a paired control unit to establish a direct wireless link.
	Flashes quickly	Data transmission
green (HC OK)	On	Last done evaluation detected hard coat paint layer
	Off	By last done evaluation the presence was not detected any hard coat layer or his thickness is out of range the evaluation limit
	Flashes	Alert to high amplitude –it is out of sensor range, the detection probe is too near.
red (AF OK)	On	Last done evaluation detected the antifog paint layer
	Off	By last done evaluation the presence was not detected any antifog layer or his thickness is out of range the evaluation limit
	Flashes slow	Alert to low amplitude of sensor, the detection probe is too so far, detection is not possible.
	Flashes quickly	Boot mode of the detection probe.

Tab. 3 - LEDs status description.

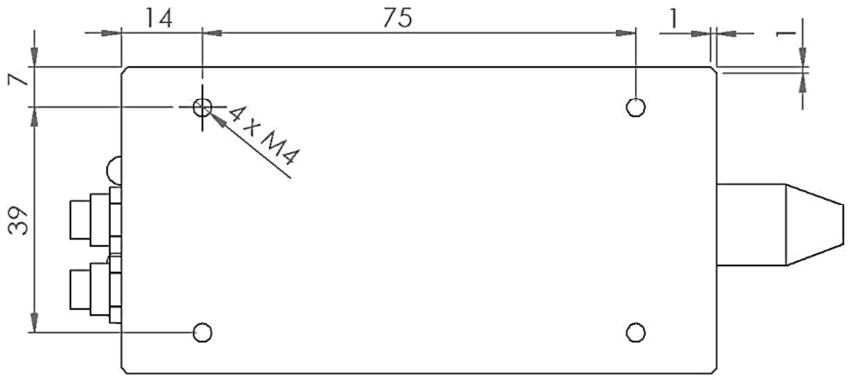


Fig. 6 – Mounting holes of detection probe

3.1 DIRECT CONNECTION OF THE PROBE TO THE CONTROL SYSTEM

To use the detection probe as a smart sensor, the indication from a connector on the Fig. 6. The connector includes following signals:

- input "START" - triggering the detection by a pulse on pin 1 and 8 (differential +24 V DC, not polarity sensitive)
- output "DATA READY" - the completion of layers detection and the validity of measured data
- outputs "AF" and "HC" - the presence of antifog and hard coating paint layers

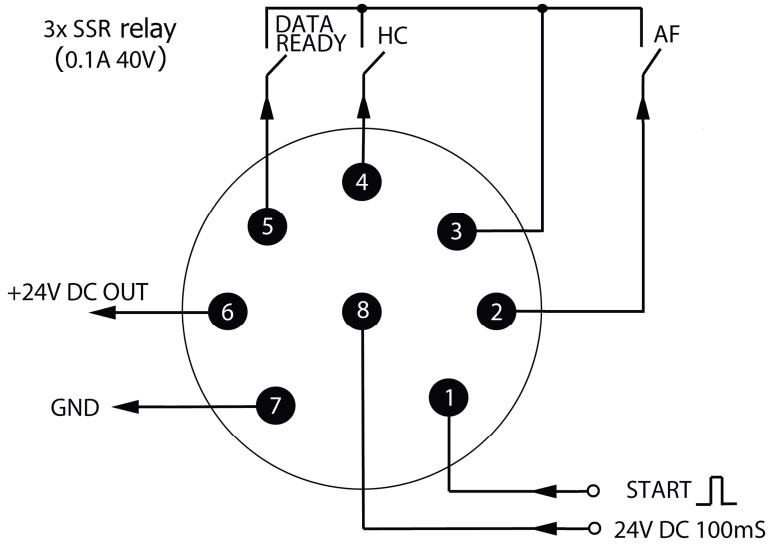


Fig. 7 – Description of PLC conectors (BINDER 8pin)

3.2 CONNECTING THE INTERFACES

The connection is made by connecting marked conductors from a cable directly to the control system (pins 1, 4, 5, 7) and by connecting 24VDC on pin 6. Pin 8 connect with the signal ground of control system (COM).

The signal outputs of PLC connector (pins 4, 5, 7 of Fig. 7) are galvanically isolated via SSD relays. The power supply outputs ("+24VDC OUT" and "GND") do not have a direct use (e.g. be used as a power supply with max. current consumption of 100 mA).

The serial communication interface only supports a fix baud rate the 230400 Bd (Bit/s). PC's serial interface must be able to set this baud rate, otherwise the detection probe or the control unit will not be possible to connect by the app PSKLAK_setup (software application of system).

3.3 MOUNTING

Mounting holes of the detection probe are shown on the Fig. 6. The length of the screws is limited with the profile thickness - do not exceed! The communication interface (e.g. PC SetUp) of the probe are galvanically connected with source GND. If the polarity of the pin signal is marked, it is necessary to maintain it (risk of probe damage). The layout of the probe´s power supply connector and PC SetUp connector is described bellow. The tip of the detection probe must be set perpendicularly and at a distance of 15 mm from the tested glass. We recommended to set position the detection probe by the fixed attachment (see on Fig. 8) After it is properly placed (in terms of perpendicularity and distance), must be set reference in the detection probe. Then follows the process of setting detection for individual kinds of paint layers (samples of layers combinations are required). The steps of setting and referencing the probe are listed in the system manual.

Fig. 8 – Recommended design of the detection probe attachement

3.4 SETTING THE REFERENCE

To ensure its proper operation, we recommend set reference of the detection probe at least once a year. For a valid reference, the probe must be adjusted and positioned for the repeatable detection, and a cover glass without paint made from the same material as the produced product is needed.

If a customer provides the manufacturer of the detection system with cover glasses with required layers combinations for detection (without paint layers, with only top coating, with top coating and Antifog treatment, and others), the equipment will be referenced and adjusted to the provided samples. The system must be readjusted and referenced after install the probe in machine.

3.5 COMMISSIONING OF THE DETECTION PROBE

As a supplier of the detection system for paint inspection, we recommend that the system is put in commission at least once a day, both on the static variant or when it is mounted on the installation jig. We also recommend checking the system after every change of the installation jig or any service work performed on it. The commissioning is performed by testing the reference glass without a paint. The test result must be negative. This test may not affect FPY statistics.

4 CONTROL UNIT

The control unit is used to collect signals from the paired and active detection probe. The signals are transmitted to the unit via Bluetooth wireless connection; in case of set with several detection probes, all probes must be set to the same Bluetooth ID of the control unit (see product manual). Simultaneous connection of multiple probes to one control unit is not possible.

Name	Value
Dimensions (L, W, H)	124 x 64 x 35 mm
Weight	300 g
Working temperature range	10 – 50 °C
Air humidity at 30°C	20% - 80%[2]
Mounting	DIN rail
Nominal supply voltage	24 V ± 10%
Typical consumption of the evaluation unit	4 W

[2] When excluding condensation

Tab. 4 – Specification of control unit

Fig. 9 – Control unit of PSKLAK system

Interface	Description
HC OK	Indication of the result of the last measurement/detection of hard-coating paint (log.1 -> OK status)
AF OK	Indication of the result of the last measurement/detection of antifog treatment (log.1 -> OK status)
DATA READY	Successful data processing
SYSTÉM READY	System is ready for testing (successful start of the system ->log.1)
RADIO OK	Indication of active connection to paired probe (regular verification of successful communication ->log.1)
ERR	Indication (log.1) of general system error: • failure of Bluetooth wireless connection • missing testing glass • probe is out of the position for detection • system error (HW and FW)
24VDC START	Indication of detection start – beginning of measurement and evaluation
PWR 24VDC	Power supply of the system control unit
ANTENA BlueTooth	Antenna or coaxial cable connector
TOUCH MONITOR	Configuration display connector
PC SETUP	Connector for PC connection, with RS232 for configuration

Tab. 5 – Description of inputs/outputs and LED indication (Fig. 9)

4.1 CONNECTION OF OUTPUTS

Recommended connection of digital inputs: one pole of the digital output connect to + 24 V DC, the second pole connect to the clamp of the digital output of the master PLC system. When using other connection, it is recommended to use external pull-up or pull-down resistors. Internal resistors of the digital input have the value of 27 Ω. Closed contact resistivity is 54 Ω.

Connection status of the optocoupler of the digital output	State, the level on the digital input of the PLC system
NO contact	State of high impedance
NC contact	Level High, that is +24 V DC

Tab. 6 – Electric states of control unit outputs

4.1 CONNECTION OF INPUTS

The digital input „START“ reacts on the voltage level of the +24 V DC signal on the input. The polarity of the input „START“ signal does not matter. Connect the contacts to +24 V DC and zero potential (0V) of the control voltage. A pulse at the minimum length of 100 ms will start the test.

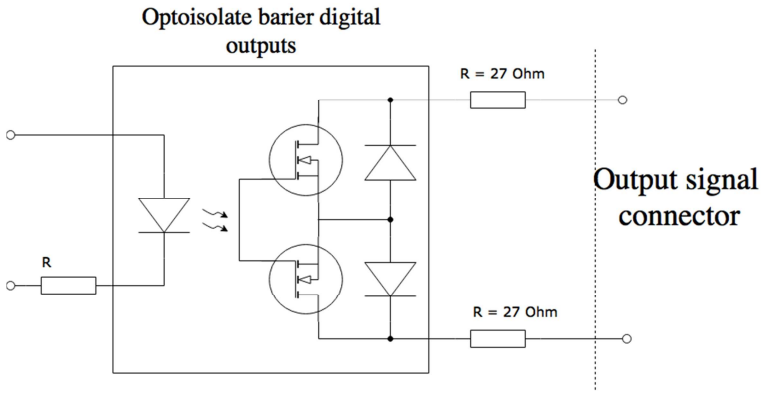


Fig. 10 – Internal connection of digital outputs

4.2 MOUNTING

When mounting the evaluation unit in the electrical cabinet on DIN rail EN 50022, you have to consider the height of the control unit ca. 140 mm and the space for bending radius of connected cables. On the right side of the evaluation unit, there is a connector for coaxial cable or antenna, connector for "touch screen set up" accessories for system configuration and a connector for RS232 interface for connecting with the PC.

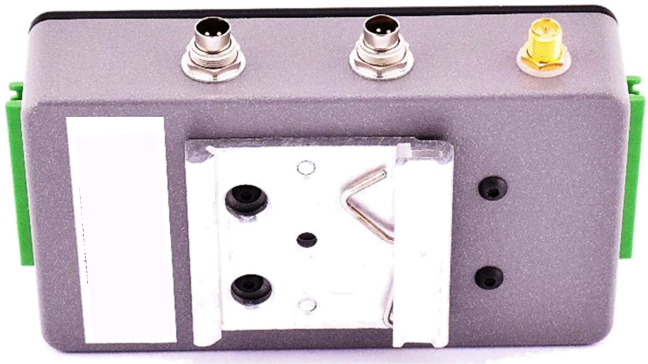


Fig. 11 – Mounting of system control unit to DIN ledge

4.3 ADJUSTMENT OF THE ACTIVE DETECTION PROBE

The setting of individual detection layers can be done at the place of control unit installation using a service display connected to the „Touch Screen SetUp“ input. The adjustment procedure is described in the system manual.

5 INDUCTIVE POWER SUPPLY SYSTEM

To power the probe with a wireless power system (couplers), it is necessary to extend the wiring with a switching relay. It will eliminate the undesirable transients when "REMOTE" approaches the "BASE", which after previous disconnection of the power supply is not active. The "BASE" coupler can be connected to the power supply only when the positioning of the jig with "REMOTE" coupler is completed. We recommend to use relay Finder 34.51.7.024.0010, socket on DIN rail Finder 93.01.7.024. For the proper functioning of the contactless power supply system it is important to precisely adjust coupling elements, especially the distance between them (max. 3 mm).

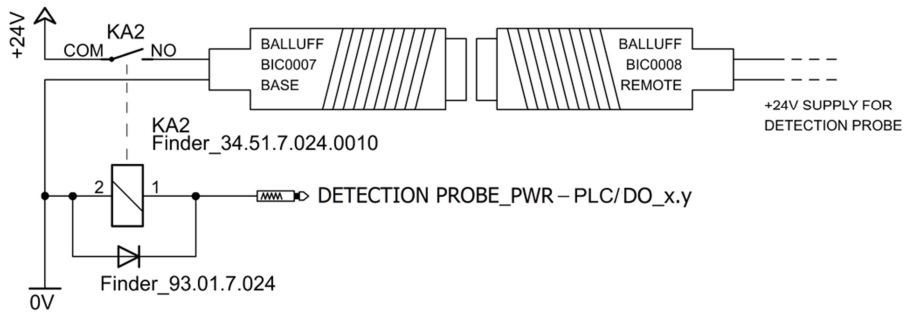


Fig. 12 – Recommended connection of inductive wireless power supply BALLUFF BIC

5.1 POWER CABLE OF THE DETECTION PROBE

Fig. 13 – Power cable of detection probe for direct connection

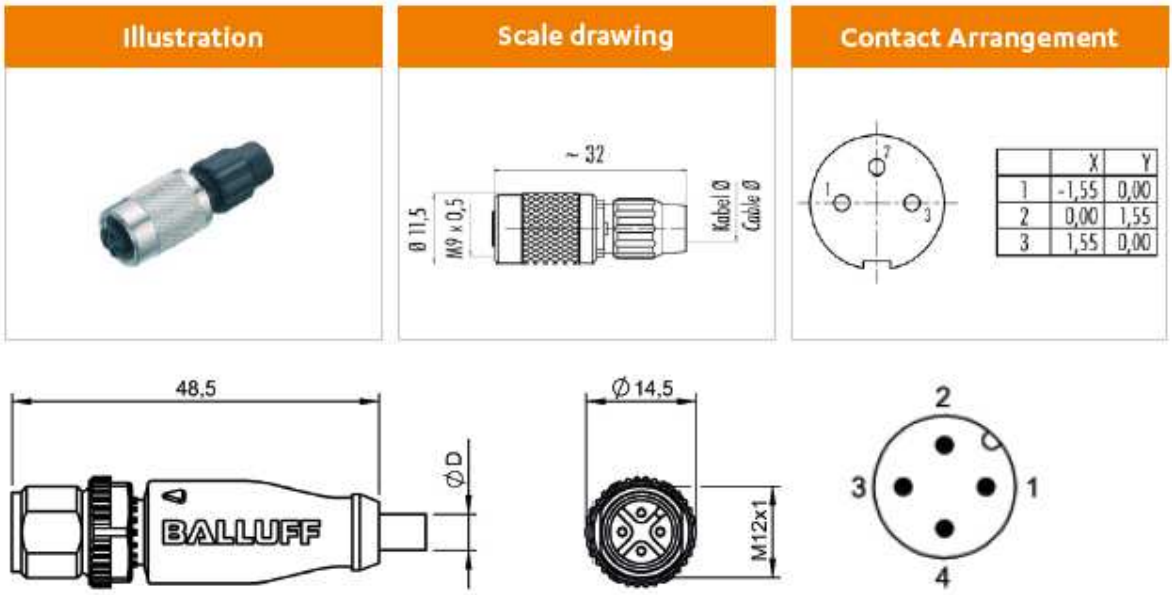


Fig. 14 – Power cable of the detection probe, con. Binder Subminiature-Female-3Pin and Balluff-M12-Male-4Pin/5Pin

5.2 POWER CABLE FOR BALLUFF BIC007 BASE

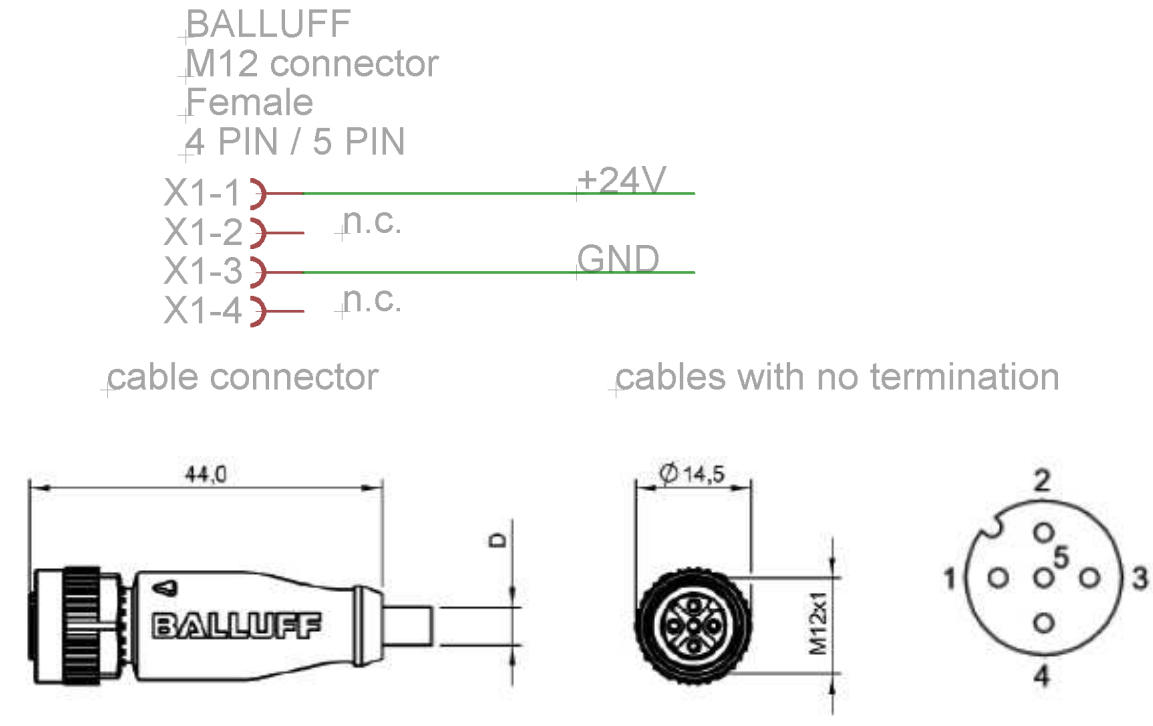
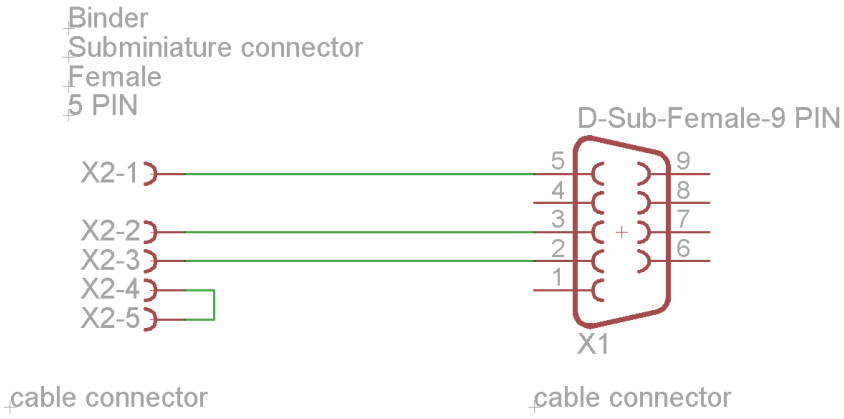


Fig. 15 – Power cable for Balluff Base, con. Balluff M12-Female-4Pin/5Pin

5.3 CABLE FOR PC CONNECTION



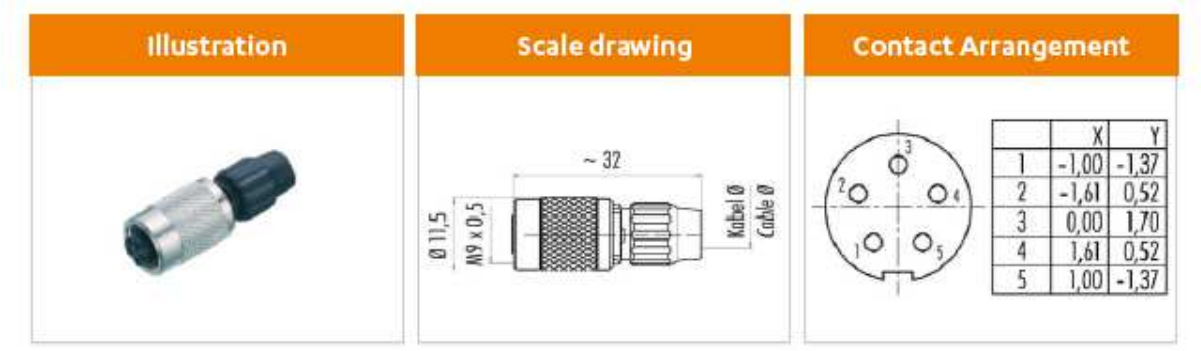


Fig. 16 – Cable to settings the detection probe (PSKLAK9200), connector Binder Subminiature-Female-5Pin and D-Sub-Female-9Pin

Fig. 17 – Cable for connecting PC to the control unit (PSKLAK9300), extension cable with BINDER connectors (4 pins) and with reduction to RS232 serial interface (CANNON 9pin)

6 IDENTIFICATION OF PRODUCT

Sets (number of pieces of individual parts)	PSKLAK01xx	PSKLAK02xx	PSKLAK03xx	PSKLAK04xx	PSKLAK05xx	PSKLAK06xx	PSKLAK07xx	PSKLAK90xx	PSKLAK91xx	PSKLAK92xx	PSKLAK93xx	PSKLAK94xx	PSKLAK95xx	PSKLAK96xx
PSKLAK1000 Probe for direct control	1							1		1				1
PSKLAK1100 Cable power supply of the probe with control unit	1	1				1		1	1	1	1			
PSKLAK1200 Contactless power supply of the probe with control unit	1	1		1	1	1			1	1	1	1	1	
PSKLAK2100 Cable power supply of the probe with control unit	2	1				1		2	1	1	1			
PSKLAK2200 Contactless power supply of the probe with control unit	2	1		1	2	1			1	1	1	1	2	
PSKLAK3100 Cable power supply of the probe with control unit	3	1				1		3	1	1	1			
PSKLAK3200 Contactless power supply of the probe with control unit	3	1		1	3	1			1	1	1	1	3	

Tab. 7 – Number of pieces of individual parts

Parts and accessories	
PSKLAK01xx	Detection probe PVD-X002; xx - probe revision mark
PSKLAK02xx	Control unit PVD-Y002; xx - unit revision mark
PSKLAK03xx	Unit display; xx - indicates revision
PSKLAK04xx	BALLUFF BIC0007 BASE
PSKLAK05xx	BALLUFF BIC0008 REMOTE
PSKLAK06xx	Bluetooth antenna, 5dbBi
PSKLAK07xx	Bluetooth adapter – USB dongle, BT revision 2.0, class 1 - EDR
PSKLAK08xx	Power supply 24VDC, 30W; mounted on DIN rail; size 1U

Tab. 8 – Parts and accessories

Cables	
PSKLAK90XX	Power cable of the detection probe, terminated by BINDER-3p/ferrules
PSKLAK91XX	Bluetooth coaxial cable, Z=50Ω, terminated SMA (F/M) connectors
PSKLAK92XX	Cable for PC connection (serial communication RS232), terminated by Cannon-9p/BINDER-5p
PSKLAK93XX	Display cable, terminated by BINDER-4p/BINDER-4p
PSKLAK94XX	Power supply cable PSKLAK04xx, terminated by BALLUFF-5p/ferrules
PSKLAK95XX	Connection cable of the power supply PSKLAK01xx with PSKLAK05xx, terminated by BINDER-5p/BALLUFF-5p
PSKLAK96XX	Signal cable for connecting PSKLAK01xx with the control system, terminated by BINDER-8p/ferrules

Tab. 9 – Cables

Fig. 18 – Transport package and cables of system for detection the presence of paint layers

Each packaging contains a CD with software applications and operating manual for the system for detecting the presence of paint layers.

Note: If you need a system which is not included in our product offer, let us know the desired composition of individual product parts, accessories and cabling.