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	TECHNICAL DESCRIPTION Ar-163P Pneumatic Current Collector	Technical symbol - EN
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Related Documents:

Assembly drawing	998 6802110-
Current collector installation drawing	991 6802112-
Outline drawing	991 6802111-
Assembly and test specification	PTB 74069
Maintenance manual	PTB 74070
AR 363PK pneumatic hooks tech. spec.	998-6803230-801
AR 363P rope retriever	998-6803190-801

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1. Application

The AR 163P type current collector provides a disconnectable contact between the trolleybus and the overhead with approximately the same line pressure.

The control of the current collector is based on a microprocessor unit with slid-mode control software written in C language. The lifting-up of the rods is provided by springs and the pulling-down by pneumatic cylinders. The vertical positions of the rods are measured by linear distance transducers. If any of the rods leaves the overhead line, the control unit will operate immediately the high speed pneumatic valves and the cylinders will pull-down the current collectors to the safe height very quickly and than move them to the roof for fixing by the hooks operated pneumatically.


2. Construction

The current collector system has six main parts:
the preassembled frames:

- - the base with the holders of the rods and the pneumatic units for moving the roads to the central position (2 pieces)
 - the pneumatic pulling-down unit mounted on the bases (2 pieces)
- - the control box with the electronic and pneumatic control units (1 piece)
- - the rods of the current collector (2 pieces)
- - the slipping heads (2 pieces)
- - the pneumatically controlled hooks for fixing the rods (1 pieces)
- - rope retrievers (2 pieces).

2.1 The preassembled frames and control box

The bases of the rods are mounted to the frame by resin based isolators. The rods are assembled to their direct holders which are fixed to vertical axles for providing the necessary horizontal turning during operation. There are two main springs connected to each of the rods for providing their lifting and the right connecting force to the overhead line. The easy movement of the rods is provided by cylindro-conical bearings. The maximal and minimum height position of the current collector is limited by rubber dumper. The friction

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noise from the overhead line is decreased by the rubber holders assembled between the frame and roof of the vehicle.

The central positioning of the rods of the current collector (in parallel position with the vehicle) in case of the pulling down or after the fast operation is provided by two pneumatic cylinders. One of them is serving for the rough and the other is for fine positioning.


The base of the current collector has a damping device (with rubber).

The task of the pneumatic puller unit is the pulling-down of the rods from the operational heights to the safe height. This movement of the rods can be initiated by the driver or by the control unit automatically in case of unexpected leaving the overhead line. The operational cylinders are built in tandem system with mounted distance transducers.

The electronic and pneumatic control box has roust construction with IP 67 protection. Its task is the proper control and operation of the pneumatic cylinders (lifting up, pooling down, fast pooling, positioning, and fixing). The box contains the hardware of the control electronics and the pneumatic valves. The air connectors are push-in types, and the electric signals are connected by fast connectors, so the opening and closing the connections are quick and reliable. There is a separate connector for diagnostic and controll purposes (RS232, CAN). The frame of the box has to be connected to the body of the vehicle.

2.2 The rods of the current collector

The rod of the current collector made of light metal (aluminium) with fibre glass- polyester isolation covering. It is straight but can be ordered with bended end (15 degree). The heads connect to the rods with flexible wire. The current is conducted by the internal material of the rods and there are studs on the lower parts of the rods that isolated cables are connected to for taken the electric energy. The rods of the current collectors are isolated from the bases. The collector heads can be pull down to 1.45 m from ground (maintenance)

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2.3 The slipping heads

The heads of the current collector are clinched to the end of the rods by screws. Because of their light weight they can follow the overhead line easily.

There are 90 mm (it depends on Customer's request and standards) carbon sliders in the heads.

2.4 The pneumatically controlled hooks

They are independent units from the other parts of the current collector however they are controlled by the same control unit. Their task is the safe fixing of the rods in switched off position.

2.5 Rope retrievers


They are also independent units from the current collector. Their task is to keep the ropes tight and to damp the dynamic movements of the rods.

For the proper operation of the pneumatic parts of the current collector, a min 15 l air tank has to be installed close to (max. 1.5 meters, inside diameter of tube 12 mm) the system with a main-pressure valve for providing the operation of the current collector before connecting to the overhead line. The main-pressure valve can disconnect the current collector from the other parts of air system on the vehicle.

Almost of the binders are made of stainless steel. The covering of the components is polyester based painting for external application. The applied materials can provide long life time and ecstatic appearance.

3. Operation

In the basic position of the current collector, the rods are fixed by the hooks over the roof. When connecting to the overhead line, the fixing hooks are turning 90degree vertically and the rods can move up forced by the springs

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but with pneumatic damping by the cylinders. The slipping heads can connect to the overhead line manually or automatically.

After connected to the overhead line, the springs provide the proper connecting force. In this case there is no over-pressure in the cylinders so they do not influence the operation or movement of the heads.

At the end of the service of the trolleybus, the driver can initiate the pull-down operation of the current collector from the driver cabin. The rods will be moved to the central position and fixed by the hooks.

If any of the heads jump out and leaves the overhead line, the control unit detects the un-proper movement and pull down the rods very quickly under the minimal operational height level, as well as, turn them to the central position and put them under the hooks. From this position, the heads can be connected to the overhead line as described above.

3.1 Lifting up

IF the driver pushes the control button (up) for a short time (> 0.1 s), the followings will happen:


- the rods will move down,
- the hooks will open (turn),
- the rods will move up till the minimal height (it is 170-200 mm between the rods and the hooks).

The total time of the lifted actions is 10-12 s.

After that, any of the rods (no specified order) has to be pulled down a bit till the height of the hooks and than the rods will start to go up slowly. They can be controlled manually to the overhead line easily. The total time of the lifting up procedure is 10-15 s.

If there mechanical limiters for directing the rods to the overhead line, than the driver has to push the control (down) push button for min 0,1 s. In this case the procedure will be the following:

- the rods will move down,
- the hooks will open (turn),

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- the rods will move up slowly and the mechanical limiters will direct the heads to the overhead line.

The total time of the procedure is 10 – 20 s depending on the actual height of the overhead line.

3.2 Lifting down, pulling down and fast operation

The process can be initiated by the driver or by the control unit automatically.

- the rods move down to the minimal height and stop on different,
- the hooks will open,
- after 5-6 s, the rods move under the hooks
- the hooks will close,
- the rods will move up for touching the hooks.

The duration of the process is approx. 10-12 s.

In wintertime in the morning (bellow -15 °C), the first lifting up is proposed to execute manually for protecting the sealing in the valves. In case of the next operations, the remote control of the current collector can be applied from the drivers cabin because of the heating in the control box provides the necessary temperature.

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TECHNICAL DATA

Rated voltage:	max. 1000VDC
Rated current:	400 A
Maximum starting current:	600 A

Main circuit cable (wiring from vehicle):	95 mm ²
Collector shoe operating contact pressure:	80 – 150 N

Maximum deviation of the trolleybus from the axis of the wire:	> 4500 mm*
Maximum angular displacement of the current collector:	≈±55°***
Minimum operating height:	420 mm**
Maximum operating height (from the ground):	7200 mm
First lowering (dewirement) level:	300 mm**

Maximum speed:	90 km/h
Maximum reverse speed:	15 km/h

Current collector head vertical angle of deviation:	±20°
Current collector head horizontal angle of deviation:	±55°

Operating ambient temperature:	-40 ... +75 °C
Maximum operating above the sea level:	2000 m
Maximum relative humidity (at 20 °C):	95 %

Weight of the current collector system:	227 kg
Weight of the control unit:	20 kg

Operating voltage of the control unit:	15 – 38 VDC
Operating current of the control unit:	< 2 A
Control unit insulation level:	IP 67

Pneumatic-system input air pressure range:	5,5 – 12 bar
Pneumatic-system operating pressure (optimal):	7,4 bar

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Compressed air quality (inlet):	ISO 8573-1:1994
- dirt particle size:	15 µm
- dirt particle concentration:	5 mg/m ³
- oil aerosol and vapour:	25 mg/m ³
- water vapour pressure dewpoint:	-40 °C
 Pneumatic inlet pipe:	 PUSH-IN, ø12x1
 Shock and vibration:	 EN 61373 1/Class B
EMC testing:	EN 61000-4-2. 8.3.1 EN 50155-10.2.7, 10.2.6.3
 Main circuit: (overvoltage category) (pollution degree)	 OV4 (EN 50124-1) PD4 (EN 50124-1)
 Control unit: (overvoltage category) (pollution degree)	 OV2 (EN 50124-1) PD3 (EN 50124-1)
 Main circuit enclosure:	 IP 00
Control unit enclosure:	IP 67
 MTBF value:	 135.000 h (>15 years)
Type of Quality Certificate:	3.1 - EN 10204:2005
 Standards:	 IEC 60077 IEC 61373 IEC 60529 CLC/TS 50502 CEI 9-49 ECE 66 EN 50155 EN 61000

* with the trolley wire at a height of 5750 mm

** dimension relative to the current collector base plate

*** it depends on the rod length