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DEVICE OF WIRELESS SHAFT COMMUNICATION

ECHO-PG

TECHNICAL AND OPERATING MANUAL

No. DTR-28PG/2014

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Hazards identification

The cage unit is powered by 12VDC NiMH battery. It should be taken to consider that in a fully charged battery during setting up might be done by accident shorting pins which may cause battery leakage, overheat and in a consequence may cause injuries (such as burns). The battery should be charged only by the original charger LAE-S3. Used batteries should not be thrown away in the trash. The cage unit sends once per minute to the headframe unit control signal, accompanied by a beep. The PAK cable has incorporated connection between pins 4 and 7 for authorization higher speed. This cable should be installed in safe place for raise and lower with high speed.

Headframe unit is supplied from 230 VAC network and should be connected to a wall outlet with a protective pin (this applies to primary and reserve power supply). The casing of headframe unit is made of sheet steel, so it should be grounded. Opening the housing is allowed only after disconnect from the power. The "⚡" sign on the input/output block means that inside can be dangerous voltage from the shaft system. Headframe unit should be installed in safe place i.e. not in EX zone. Power-up sequence is as follows: first main power and second reserve power. In other case there might be occur an electrical arc on contacts of power supply switch relay

1. Use and range of application

Device of wireless shaft communication ECHO-PG version EN1 is intended to use in shaft sinking to communicate between crew in platform and hoist operator in mine shaft. Whole communication system consists of two sets of components named as the headframe unit and the cage unit. Communication between these units is realized by means of hoisting ropes, which are carriers of the electromagnetic wave.

The basic advantages of this system are following:

- two-way semiduplex audio communication,
- sending remote control signals from platform to a hoist machine,
- receiving information signals from a hoist machine to platform.

The cage unit is made as intrinsically safe device group I, category M1.

The principle of working of this device is utilization rope as carrier to move electromagnetic waves. Carrier is created by:

- guiderope and earth,
- additional rope and earth.

Electric continuity of such loop is the main condition of correct work of device.

Electromagnetic wave is generated to the loop and received from it by inductive couplers.

There are fixed two inductive couplers (transmitter and receiver) in headframe in such way, that headrope crosses by their center. Over conveyance there are fixed another pair of couplers. Headframe unit sends signal by inductive coupler (transmitter) to rope and cage unit receive signals from rope by other inductive coupler (receiver). Communication from cage unit to headframe unit is performed in the same way by pair of couplers fixed over conveyance. Only one device can work in one loop, which means that one headframe unit can only communicate with one cage unit. The device has four frequency version:

A, B, C, D thanks to which, it is possible to use four system in one shaft.

2. Marking

MARKING	ABBREVIATED MARKING
Device of wireless shaft communication ECHO-PG -frequency version: A,B,C,D - software version: EN1	ECHO-PG-A,B,C,D-EN1

Example of order: **ECHO-PG-A-EN1**.

The device consists of a cage unit, headframe unit and battery charger.

Cage unit consists of:

MARKING	ABBREVIATED MARKING
Cage device ECHO/AK-PG frequency version: A,B,C,D - software version: EN1	ECHO/AK-PG-A,B,C,D-EN1
Battery BAKS-9	BAKS-9
Manipulator EPG	EPG
Coupler SS-32 (transmitter, frequency version A)	SS-32
Coupler SS-64 (receiver, frequency version A)	SS-64
Coupler SS-48 (transmitter, frequency version B)	SS-48
Coupler SS-80 (receiver, frequency version B)	SS-80
Coupler SS-80 (transmitter, frequency version C)	SS-80
Coupler SS-80 (receiver, frequency version C)	SS-80
Coupler SS-80 (transmitter, frequency version D)	SS-80
Coupler SS-80 (receiver, frequency version D)	SS-80

Headframe unit consists of:

MARKING	ABBREVIATED MARKING
Headframe device ECHO/AS-PG frequency version: A,B,C,D - software version: EN1	ECHO/AS-PG-A,B,C,D-EN1
Microphone unit MNO	MNO
Loudspeaker G	G
Feedback microphone MK	MK
Coupler SK-32 (receiver, frequency version A)	SK-32
Coupler SK-64 (transmitter, frequency version A)	SK-64
Coupler SK-48 (receiver, frequency version B)	SK-48
Coupler SK-80 (transmitter, frequency version B)	SK-80
Coupler SK-80 (receiver, frequency version C)	SK-80
Coupler SK-80 (transmitter, frequency version C)	SK-80
Coupler SK-80 (receiver, frequency version D)	SK-80
Coupler SK-80 (transmitter, frequency version D)	SK-80

MARKING	ABBREVIATED MARKING
Battery charger LAE-S3	LAE-S3

Note:

1. The cage unit does not include additional signaling devices. They should be provided by manufacturer of the whole system, or other competent body.
2. Shall be permitted to replace couplers SS and SK between units as well as using of two pairs of couplers SS. Type of couplers and place of installation is dependent only on the best way of use of couplers.

3. Certificates

Device met requirement of electromagnetic compatibility in accordance with the European Union directive no. **89/336/EEC** including the changes **91/263/EEC**, **92/31/EEC** and **93/68/EEC** and standards harmonized with it protocol no. **LKE/043/2004** issued by the Laboratory of Electromagnetic Compatibility, Institute of Telecommunication and Acoustics Wrocław Engineering College. 50-370 Wrocław, ul. Wybrzeże Wyspiańskiego 27. The PCA (Polish Centre for Accreditation) accreditation no **AB 167**.

Cage unit met requirement of the European Union directive no. **94/9/WE (ATEX)** and other standards which are harmonized with them certificate no. **KDB 09ATEX023X** issued by the **Notified Body no. 1453** Central Mining Institute. Experimental Mine „BARBARA” 43-190 Mikołów, ul. Podleska 72. The PCA (Polish Centre for Accreditation) accreditation no. **AC038**.

4. Terms of application

- 4.1. The shaft has to have: tailrope, or there must be two guide ropes, or the conveyance must be suspended on at least two ropes (does not apply to frequency version D).
- 4.2. There should be electrical connection between headrope and tailrope or between two guideropes (does not apply to frequency version D).
- 4.3. Over the conveyance which we want to get communication should be mounted a pair of couplers, and second pair of couplers should be mounted in headframe.
- 4.4. In one shaft there may work only one cage unit in specific frequency version, in the case of using two devices they have to have different frequency version or one of them should be switched off. The same applies to two cage units installed in one conveyance.
- 4.5. Battery BAKS-9 can be charged only by battery charger LAE-S3 made by CARBONEX.
- 4.6. Maintenance may be carried out only by authorized personnel.
- 4.7. It is forbidden to make any change in device and use the device in another way as mentioned in this manual.
- 4.8. Headframe unit should be installed in safe place i.e. not in EX zone.
- 4.9. The EX input parameters for additional signaling devices:
 - contact electrically isolated, dielectric strength 500V,
 - $U_i \geq 15V$, $I_i \geq 2mA$.

5. Technical data

5.1. Normal working conditions

5.1.1. Cage unit	
5.1.1.1. Temperature range	-20°C to + 40°C
5.1.1.2. Humidity	< 98%
5.1.2. Headframe unit	
5.1.2.1. Temperature range	0°C to + 40°C
5.1.2.2. Humidity	< 80%

5.2. General parameters

5.2.1. Type of work	
- audio signal	semiduplex
- remote control signals	duplex
5.2.2. Type of modulation	FM
5.2.3. Frequency performance:	
- A (from cage unit to headframe unit)	32 kHz
- A (from headframe unit to cage unit)	64 kHz
- B (from cage unit to headframe unit)	48 kHz
- B (from headframe unit to cage unit)	80 kHz
- C (from cage unit to headframe unit)	112 kHz
- C (from headframe unit to cage unit)	144 kHz
- D (from cage unit to headframe unit)	128 kHz
- D (from headframe unit to cage unit)	160 kHz
5.2.4. Method of sending signals	serial
5.2.5. Delay of sending signals	< 0,1 s
5.2.6. Range of work	1500 m

5.3. Cage unit

5.3.1. Power supply	battery 12 V (10.5÷15 V)
5.3.2. Indication of low battery	<11,5 V
5.3.3. Current consumption	< 400 mA
5.3.4. Output signal	> 7 Vpp
5.3.5. Receiver sensitivity	1 mV
5.3.6. Operating time without battery replacement	10 h
5.3.7. Number and type of input	2 NO contact
5.3.8. Marking	I M1 Ex ia I Ma
5.3.9. Protection degree	IP65
5.3.10. Dimensions	520 x 300 x 145 mm
5.3.11. Weight	15 kg

5.4. Headframe unit

5.4.1. Main and reserve power supply	230 VAC
5.4.2. Power consumption	< 50 VA
5.4.3. Output signal	> 7 Vpp
5.4.4. Receiver sensitivity	2 mV
5.4.5. Number and type of outputs	9 relays (DPDT 1A, 250VAC)
5.4.6. Number and type of input	9 NO contact
5.4.7. Dimensions	282 x 350 x 240 mm
5.4.8. Weight	10 kg

5.5. Coupler SK

5.5.1. Nominal inductance

SK-32	178 μ H
SK-48	80 μ H
SK-64	40 μ H
SK-80	40 μ H

5.5.2. Protection degree

IP54

5.5.3. Dimensions

265 x 220 x 90 mm

5.5.4. Weight

4,5 kg

5.6. Coupler SS

5.6.1. Nominal inductance

SS-32	178 μ H
SS-48	80 μ H
SS-64	40 μ H
SS-80	40 μ H

5.6.2. Protection degree

IP54

5.6.3. Dimensions

335 x 265 x 40 mm

5.6.4. Weight

4,5 kg

6. Description

Drawing no. 28PG.V1 shows overall structure a communication system in variant 1 with manipulator EPG. Drawing no. 28PG.V2 shows overall structure a communication system in variant 2 with additional signaling devices. System consists of two sets of components: the headframe unit which is shown in drawing no. 28PG.02 and the cage unit drawing no. 28PG.01. There are installed two inductive couplers in headframe in such way that the rope passes through the center of couplers. One of them is transmitter and the second one is receiver. The second pair of couplers is fitted over conveyance. Transmitting coupler sends current signal, which flows through rope to the receiving coupler. The main condition of proper work of system is existence of a closed loop for current flow (does not apply to frequency version D). This loop is formed by headrope and platform. In case of existing guiderope loop may be done by making connection between two such ropes or by connecting to ground ends of guiderope. For frequency version D such loop is formed by headrope and the capacitance headrope-shaft. Blok diagram of cage device is shown in drawing no. 28PG.01.02. Blok diagram of headframe device is shown in drawing no. 28PG.02.02. Transmitters of both devices emit continuously carrier frequencies. There are two carrier frequencies at each system, which depend on version of devices. When both carrier frequencies are present the device is switched to ready mode. Contacts NO or NC of the circuits which will be connected to the headframe device inputs should be connected between proper input and common terminal. Communication from a platform is realized by a cage device. Communication from a bottom is performed by a manipulator EPG drawing no. 28PG.01.V1. In the case where using a manipulator is burdensome instead of it can be use the additional signaling devices, what is shown in drawing no. 28PG.01.V2. If the socket is unconnected there will be emitted a continuous alarm.

6.1. Audio communication is realized in a semiduplex way. Cage device is continuously in the receive mode when the unit is in ready mode and not transmitting. Voice communication is done only from cage device after pressing and hold blue button PTT, platform has priority. In headframe unit broadcast is done after pressing microphone foot switch.

6.2. Signal code is used to transmit the Code of Signals. After pressing yellow button CODE in cage device, output relay P7 is turned on in headframe device if input no. 2 (ACS) and input no. 7 (AP) in headframe device will be closed. After pressing yellow button CODE in manipulator or after using additional signaling device, output relay P8 is turned on in headframe device if input no. 2 (ACS) and input no. 8 (AB) in headframe device will be closed. In cage device we should hear bell if feedback microphone would be fastened near to signal bell as well as we should see green led CCS if input no.1 (CCS) in headframe device will be connected to output of relays P7 and P8.

6.3. Signal alarm is send from cage device after pressing red button ALARM in cage device or red button ALARM in manipulator. It is possible to hear alarm bell in cage device, for this purpose should be closed input no. 3 (CA) in headframe device. This input activates feedback microphone so it should be fastened near to alarm bell.

TABLE OF OUTPUTS OF HEADFRAME UNIT

Relay	Function	Description
P1	Ready RDY	Relay is turned on when cage unit and headframe unit are turned on, both are operational, and there is communication between them.
P2	Impulse control IC	Relay will be turned on for 6 seconds when: - will be closed input no. 2 in headframe device and, - will be closed input no. 5 in headframe device and, - will be closed two or three times input no. 6 or 9 in headframe device. Relay is released: - after 6 seconds or, - after opening input no. 2 or - after opening input no. 5 or, - after closing one time input no. 6 or 9.
P3	Alarm A	In normal operation when headframe unit is in ready mode, relay is turned on. The relay will be turned off when: - red button ALARM in manipulator or cage device would be pressed, - there will be a loss of communication between units.
P4	Blockade B	In normal operation when headframe unit is in ready mode, relay is turned on. The relay will be turned off when: - red switch BLOCKADE in cage unit would be set into right position, - there will be a loss of communication between units.
P5	Button of announcement BA	The general purpose button, in normal operation when headframe unit is in ready mode, relay is turned off. The relay will be turned on when green button BA in cage device would be pressed.
P6	Button of reset BR	The general purpose button, in normal operation when headframe unit is in ready mode, relay is turned off. The relay will be turned on when black button BR in cage device would be pressed.
P7	Code of Signals from platform CSP	Relay is turned on when: - will be closed input no. 2 in headframe device and, - will be closed input no. 7 in headframe device and - yellow button CODE in cage device would be pressed.
P8	Code of Signals from bottom CSB	Relay is turned on when: - will be closed input no. 2 in headframe device and, - will be closed input no. 8 in headframe device and - yellow button CODE in manipulator would be pressed.
P9	Battery control BC	Relay is switched on when the battery is working properly and charged. Relay is switched off when battery voltage drops below 11,5 V.

6.6. Description of faceplate of cage device

- „POWER”-power switch on/off, when red led next to the switch lights means that the battery voltage is correct, when led flashes means discharging the battery.
- „FTC”- failure of the transmitting coupler yellow led lights when transmitter coupler is unserviceable not connected or its inductance is too low.
- „FRC”-failure of the receiving coupler yellow led lights when receiver coupler is unserviceable not connected or its inductance is too low.
- „LTS”-lack of a transmitting signal yellow led lights when there is a lack of carrier frequency of the transmitter or its level is too low.
- „LRS”-lack of receiving signal yellow led lights when there is a lack of carrier frequency of the receiver.
- „ACS”-authorization for Code of Signals green led indicates activation the Code of Signals button, lights when input no.2 in headframe device is closed.
- „CCS”-confirmation for Code of Signals green led confirms code, lights when input no.1 in headframe device is closed.
- „RDY”-ready green led indicates when cage unit is in ready mode.
- „AB”-authorization for bottom yellow led indicates activation the Code of Signals button in manipulator, lights when input no.8 in headframe device is closed.
- „AP”-authorization for platform yellow led indicates activation the Code of Signals button in cage device, lights when input no.7 in headframe device is closed.
- „BA”-button of announcement, general purpose button.
- „BR”-button of reset, general purpose button.
- „BLOCKADE”-blockade switch, red led next to switch confirms that blockade is in switch on state, lights when input no.4 in headframe device is closed.
- „ALARM”-alarm button.
- „CODE”-the Code of Signals button.
- „PTT”-push to talk button, pressing this button the microphone is activated.

6.6.1. Description of faceplate of manipulator

- „POWER”-power red led lights when the battery voltage is correct, when led flashes means discharging the battery.
- „RDY”-ready green led indicates when cage unit is in ready mode.
- „AB”-authorization for bottom yellow led indicates activation the Code of Signals button in manipulator, lights when input no.8 in headframe device is closed.
- „CCS”-confirmation for Code of Signals green led confirms code, lights when input no.1 in headframe device is closed.
- „ALARM”-alarm button.
- „CODE”-the Code of Signals button.

6.7. Description of faceplate of headframe device

6.7.1. Power block

There are led indicate the presence of power supply in the power block.

6.7.2. The transmitting block TB

„FTC” failure of the transmitting coupler yellow led not lights when transmitter coupler is unserviceable not connected or its inductance is too low. „LTS” lack of a transmitting signal

yellow led lights when there is proper level of carrier frequency of the transmitter, 10 bar led indicator indicates the level of transmitting wave.

6.7.3. The control block CB

RDY	Ready
CSP	Code of Signals from platform
A	Alarm
B	Blockade
CSB	Code of Signals from bottom
BC	Battery control
BR	Button of reset
BA	Button of announcement

6.7.4. The receiving block RB

„FRC” failure of the receiving coupler yellow led not lights when receiver coupler is unserviceable not connected or its inductance is too low. „LRS” lack of a receiving signal yellow led lights when there is proper level of carrier frequency of the receiver, 10 bar led indicator indicates the level of receiving wave. Knob is used to adjust volume level.

6.7.5. The impulse control block ICB

IC	Impulse control
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6.7.6. The galvanic separation block GSB1

RCS	Not used in this version
CCS	Confirmation for Code of Signals
ACS	Authorization for Code of Signals
CA	Confirmation for alarm
CB	Confirmation for blockade
MR	Machine in rest
ICI	Impulse control input

6.7.7. The galvanic separation block GSB2

AP	Authorization for platform
AB	Authorization for bottom
ICI2	Impulse control input 2

7. Installation

7.1. Unpacking

During unpacking, check completeness of the set according to the proof of delivery. Check if the power switch on cage device was in OFF position during transport and storage. The switch in ON position could cause discharging of battery.

7.2. Cage device

Cage device is shown in drawing no.28PG.01.01. Housing is divided into two parts. At the bottom there are placed electronics board, buttons and switches, at the top socket battery BAKS. The walls of the housing are made of stainless steel sheet. In the bottom side of the housing there are sockets for connecting: sensors and couplers. In the right side there is socket to charge battery BAKS without removing it out of housing. Access to battery and electronics board is possible after unscrewing proper cover. Device is designed for mounting on crosshead by means of 4 screws M8.

7.3. Coupler SK

Coupler SK is shown in drawing no.28PG.03. Coupler consists of two parts, to allow his assembly around rope. There is a ferromagnetic core with coil inside housing of device. Core and coil are encapsulated by chemical compound. There is shown in drawings no.28PG.03.01.

7.4. Manipulator EPG

Manipulator EPG is shown in drawing no.28PG.01.04. It is designed to communication with headframe device. If you want to use additional signaling device instead of manipulator to the socket should be connected additional plug kit, otherwise will be emitted a continuous alarm.

7.5. Headframe device

Headframe device is shown in drawing no.28PG.02.01. Housing consists of three parts: power supply unit from the left side, main unit in the center and input/output circuits unit at the right side. Center unit consist of mainboard and subrack for 7 eurocards. Headframe device is designed for mounting in the winding engine room using 4 screws M8. Method of connecting headframe unit is shown in drawing no.28PG.02.04.

7.7. Coupler SS

Coupler SS is shown in drawing no.28PG.04. Coupler consists of two parts, to allow his assembly around rope. There is a ferromagnetic core with coil inside housing of device. Core and coil are encapsulated by chemical compound. There is shown in drawings no.28PG.04.01. The couplers SK and SS differ only way of fixing.

8. Maintenance

Before using any cage device it is recommended to charge the battery, using a charger LAE-S3 CARBONEX company production. To do this, connect the plug of charger into the battery socket in cage device or remove the battery from the cage device housing and put it on the charger basket and then turn on the power of charger. Charging may take place only in room without any danger vapours. Battery, on which there are traces of leakage should be withdrawn by person of service and returned to the manufacturer. The battery may not have dents. In the headframe device power-up sequence is as follows: first main power and second reserve power. In other case there might be occur an electrical arc on contacts of power supply switch relay. Cage device should not be at the same time, use the audio and control. After pressing simultaneously two control buttons only one of them will be send. The foot switch should be pushed only in time of audio transmission. Measurements of the installation should be performed at least once a year.

Inductance of coupler SK should be measured in disconnected plug of cage unit. During the measurements the headframe unit must be turned off.

Type	Value (Required)	Version	Pin
SK-32	178 μ H (150-240) μ H	A	3-6
SK-64	40 μ H (30-60) μ H	A	2-5
SK-48	80 μ H (65-120) μ H	B	3-6
SK-80	40 μ H (30-60) μ H	B,C,D	2-5, 3-6

Insulation resistance of coupler SK should be measured in disconnected plug of cage unit. Measurement voltage 500 V. Measurement performed in safe zone between conveyance and pin in accordance with the table.

Type	Value	Version	Pin
SK-32	> 100 k Ω	A	3
SK-64	> 100 k Ω	A	2
SK-48	> 100 k Ω	B	3
SK-80	> 100 k Ω	B,C,D	2, 3

Inductance of coupler type SS should be measured in disconnected plug of cage unit. During the measurements the cage unit must be turned off.

Type	Value (Required)	Version	Pin
SS-32	178 μ H (150-240) μ H	A	3-6
SS-64	40 μ H (30-60) μ H	A	2-5
SS-48	80 μ H (65-120) μ H	B	3-6
SS-80	40 μ H (30-60) μ H	B,C,D	2-5, 3-6

Insulation resistance of coupler type SS should be measured in disconnected plug of headframe unit. Measurement voltage 60 V. Measurement performed between ground and pin in accordance with the table.

Type	Value	Version	Pin
SS-32	> 100 k Ω	A	4
SS-64	> 100 k Ω	A	4
SS-48	> 100 k Ω	B	4
SS-80	> 100 k Ω	B,C,D	4

9. Transport and storage

The device can be transported by any means of transport. During transport, equipment shall be protected against rain and strong mechanical shock. The temperature during transport should be in the range of -25°C to +60°C. The device will be ready for use after keeping it in the room temperature for 6 hours. The device shall be stored in a closed room where the humidity should not exceed the permissible limit of 75% and the temperature ranging from 0°C to 60°C. The room should be free of active vapors or chemical compounds. In case of storage longer than 14 days before installing cage device should be connected to the battery charger.

10. List of spare parts

10.1. Cage unit

- 10.1.1. Cage device ECHO/AK-PG-(A or B or C or D)-EN1
- 10.1.2. Battery BAKS-9
- 10.1.3. Manipulator EPG
- 10.1.4. Coupler SS-32, 64, 48, 80
- 10.1.5. Plug ZGT28KP7a
- 10.1.6. Socket ZGT28B7Sa
- 10.1.7. Socket CM02E20-27P

10.2. Headframe unit

- 10.2.1. Headframe device ECHO/AS-PG-(A or B or C or D)-EN1
 - power supply block
 - transmitting block TB
 - control block CB
 - receiving block RB
 - impulse control block ICB
 - galvanic separation block GSB1
 - galvanic separation block GSB2
 - relay type Finder 48.52 (12VDC)
- 10.2.2. Microphone unit MNO-6
- 10.2.3. Loudspeaker G
- 10.2.4. Feedback microphone MK
- 10.2.5. Coupler SK-32, 64, 48, 80
- 10.2.6. Plug MIC-324
- 10.2.7. Plug MIC-323
- 10.2.8. Plug MIC-322
- 10.2.9. Plug XLR

It is allowed to replace these items. Any repair of components may only be performed by authorized employees of the CARBONEX company.

11. Guarantee

The manufacturer,

CARBONEX Sp. z o.o.

ul. Budowlana 19

41- 100 Siemianowice Śląskie, Poland

guarantees:

- 11.1. The highest quality and proper functioning of the device in accordance with the terms and conditions given in this manual.
- 11.2. Guarantee period: 12 months from the date of purchase.
- 11.3. During guarantee period, all the repairs are carried out free of cost, provided that the customer shall be responsible for any transportation cost.
- 11.4. Guarantee terms and conditions do not apply if the mechanical damages are caused by improper use and operation of the device.
- 11.5. Sales and after sales service. After sales service and supply of spare parts on payment. Any repair/damage shall be reported through phone/fax no. +48 32 2030819 or to service department of:

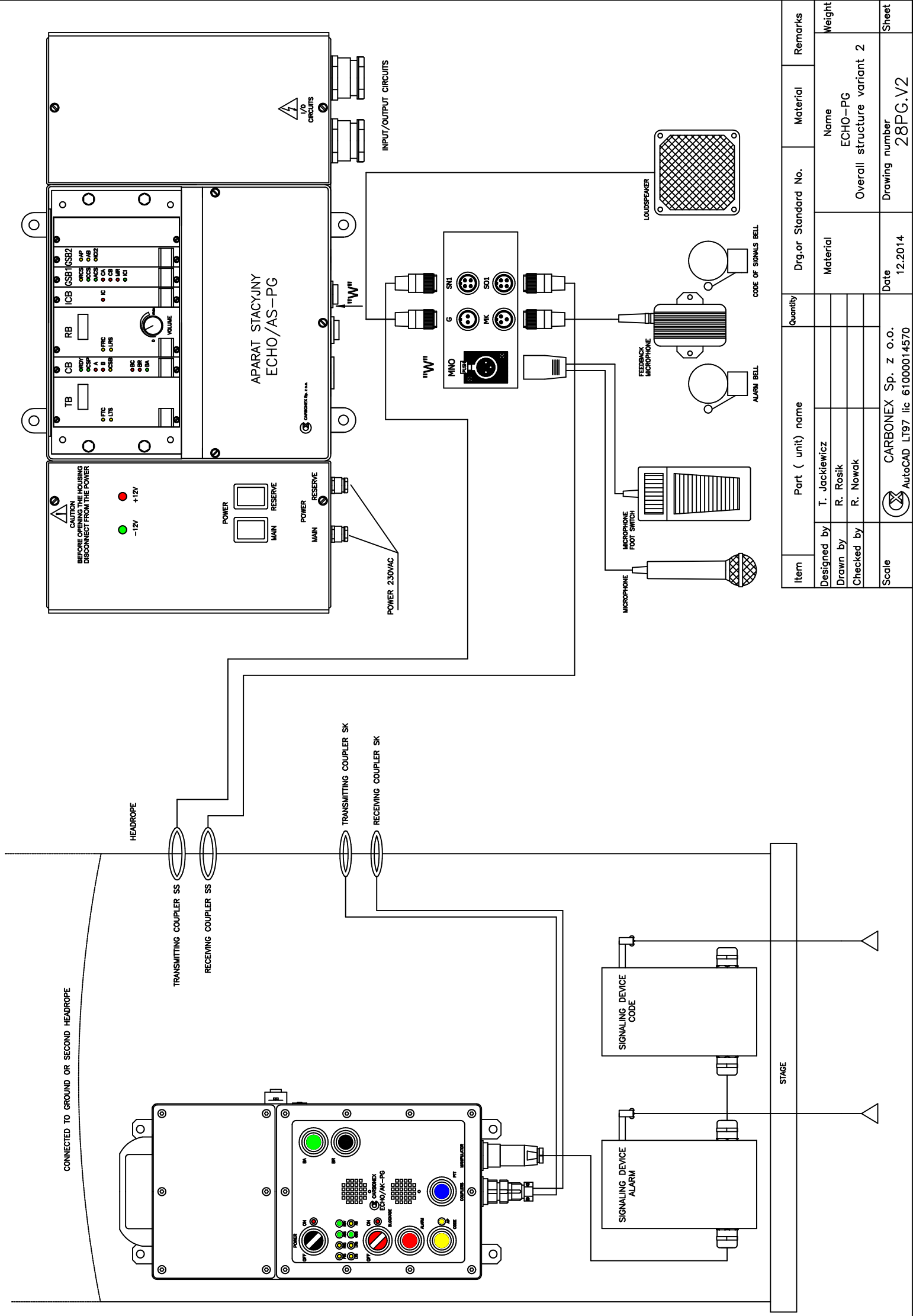
CARBONEX Sp. z o.o.

ul. Budowlana 19

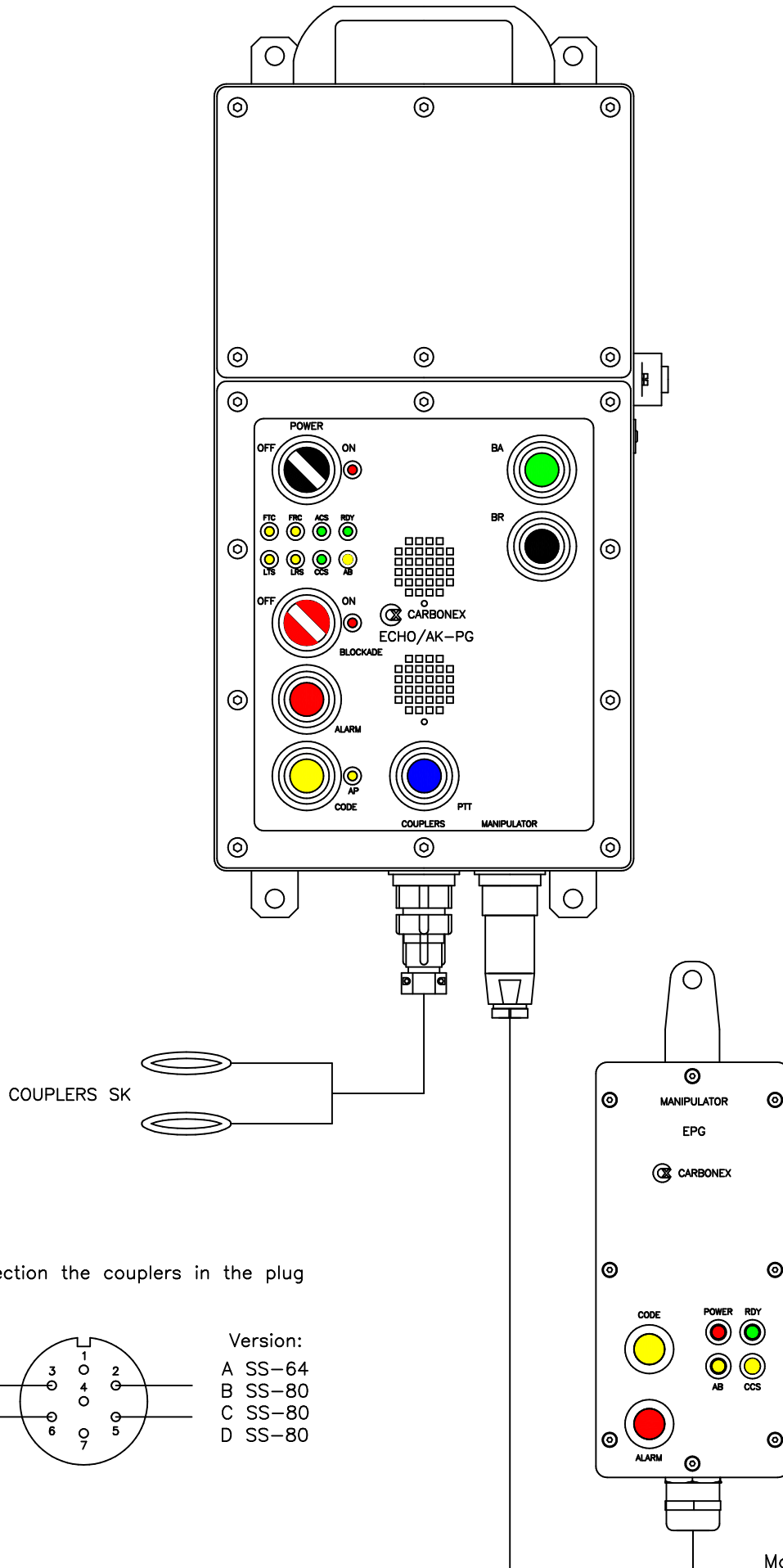
41- 100 Siemianowice Śląskie, Poland

e-mail: biuro@carbonex.com.pl

web: www.carbonex.com.pl



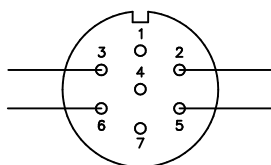
Item	Part (unit) name	Quantity	Drq.or Standard No.	Material	Remarks
Designed by	T. Jackiewicz				
Drawn by	R. Rosik				
Checked by	R. Nowak				
Scale	CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570				
			Date	12.2014	
			Drawing number	28PG.V2	
			Weight	ECHO-PG Overall structure variant 2	
			Sheet		



View of connection the couplers in the plug

Version:


A SS-32
B SS-48
C SS-80
D SS-80

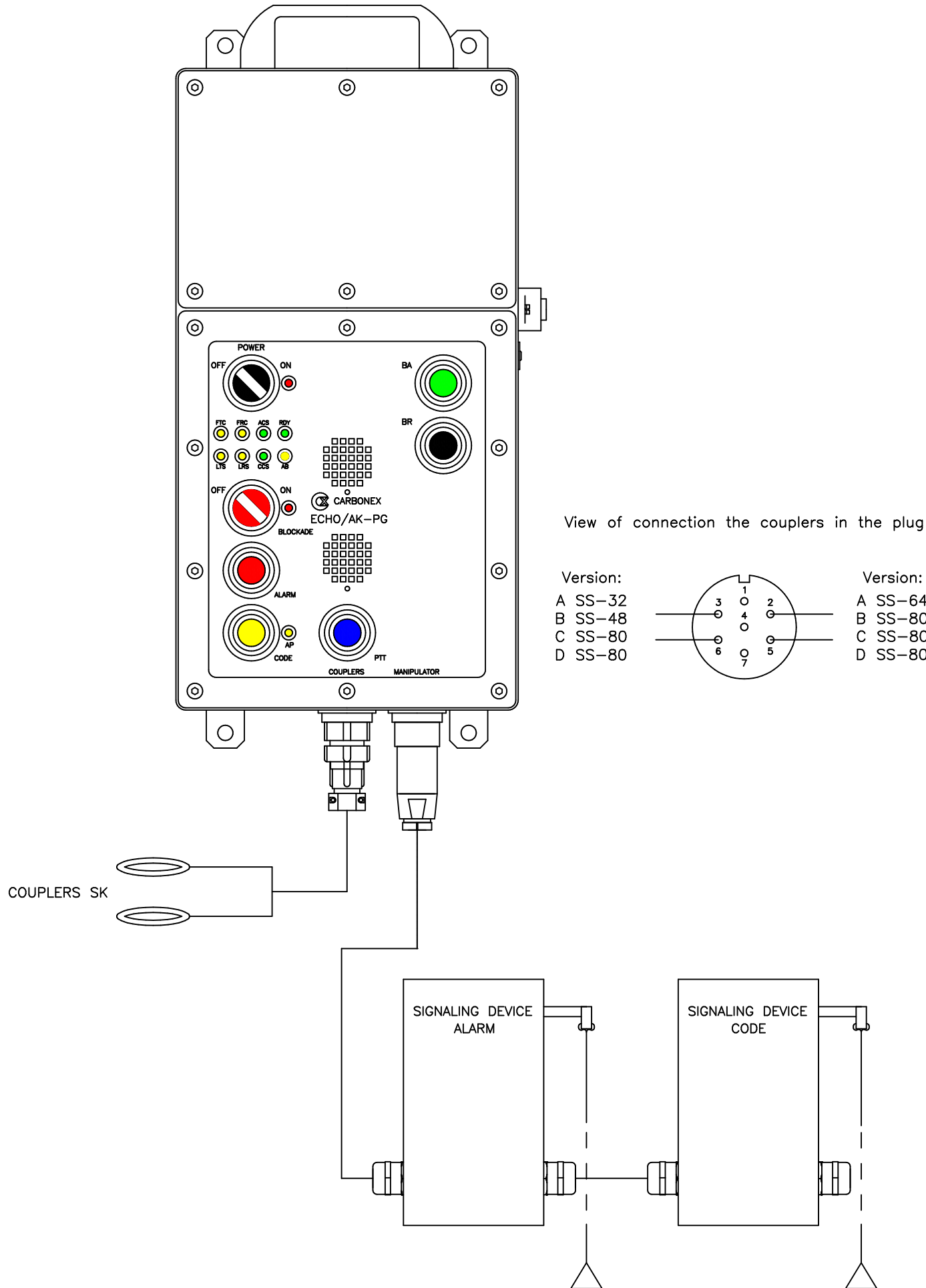



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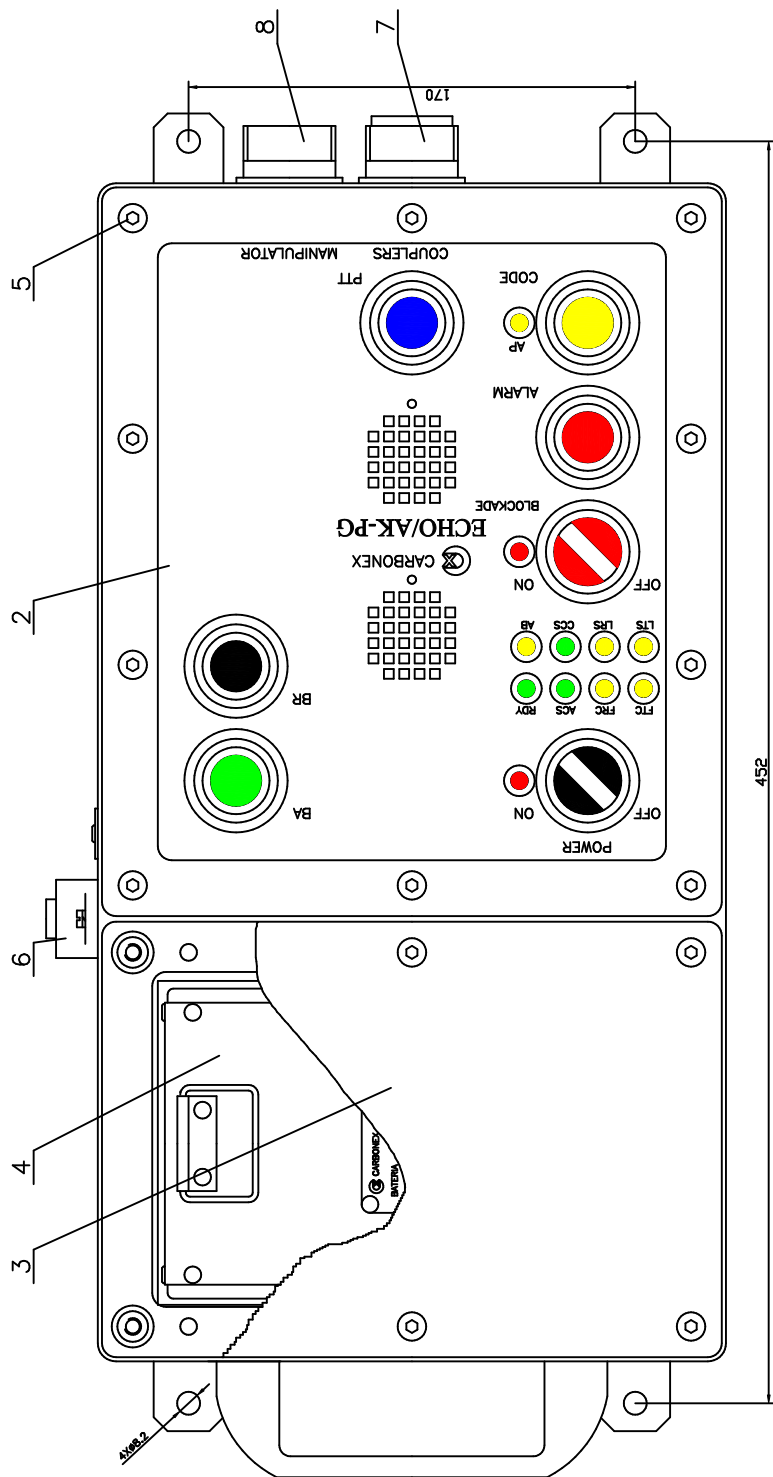
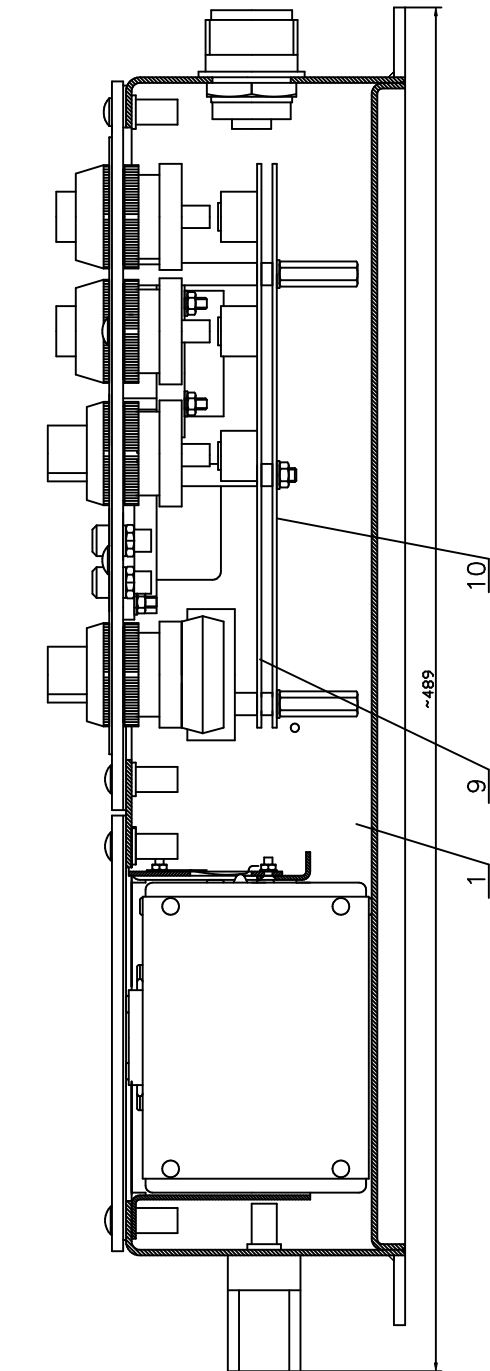
A SS-64
B SS-80
C SS-80
D SS-80

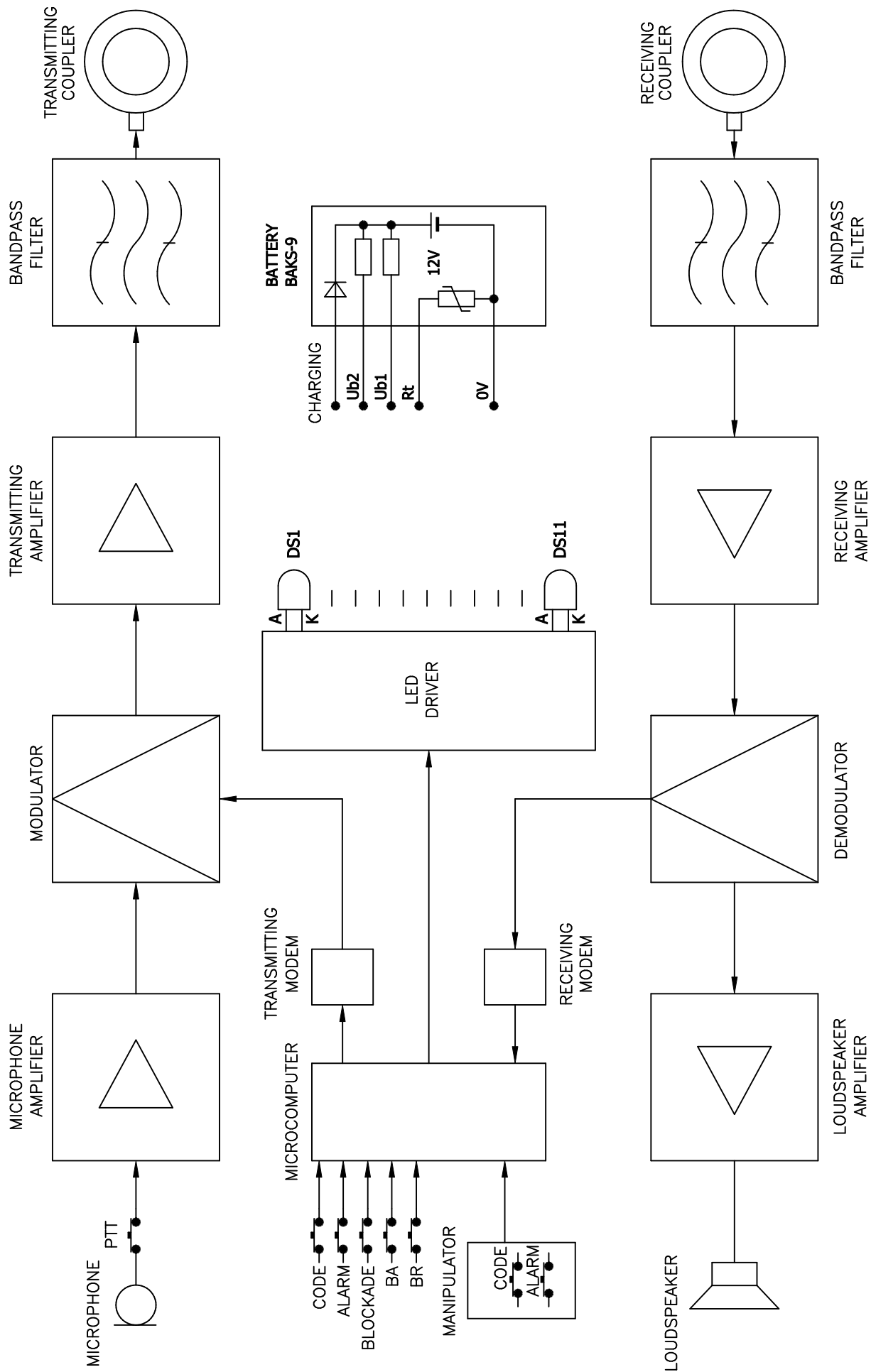
Manipulator type EPG
drawing number 28PG.01.04


Designed by	T. Jackiewicz			Material	Name ECHO/AK-PG Cage unit – overall structure variant 1	Weight
Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.01.V1	Sheet



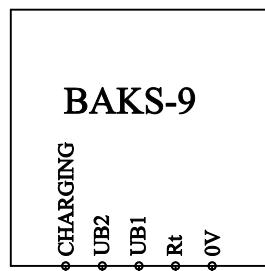
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Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale						
	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.01.V2	Sheet

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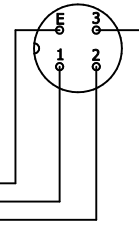


Designed by	T. Jackiewicz			Material	Name ECHO/AK-PG Cage device – block diagram	Weight
Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.01.02	Sheet

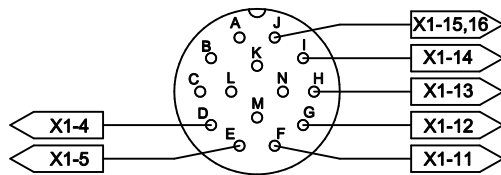
BATTERY SOCKET



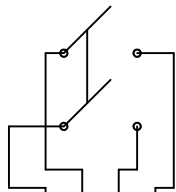
CHARGING SOCKET



MANIPULATOR SOCKET



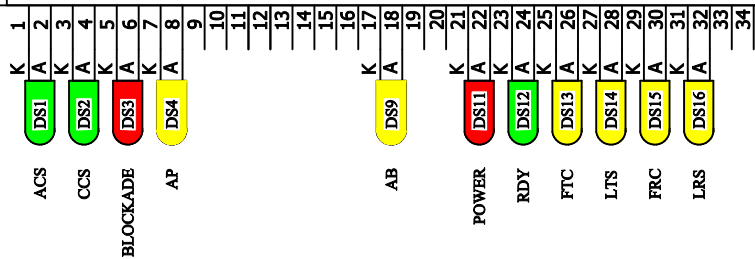
POWER SWITCH



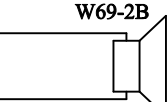
BOARD PF



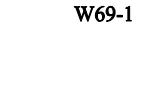
BOARD PS



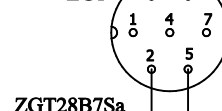
LOUDSPEAKER




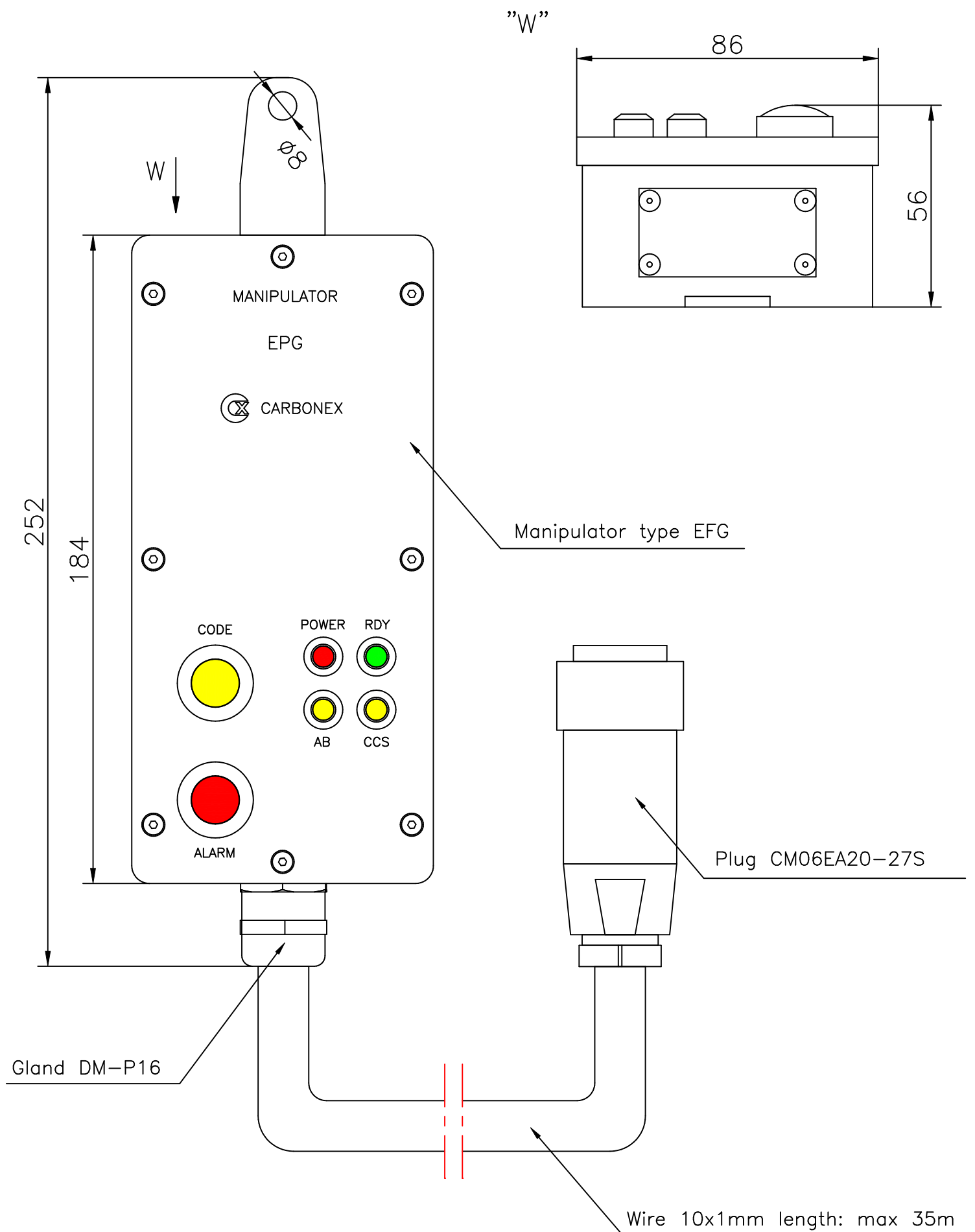
MICROPHONE




COUPLER SOCKET



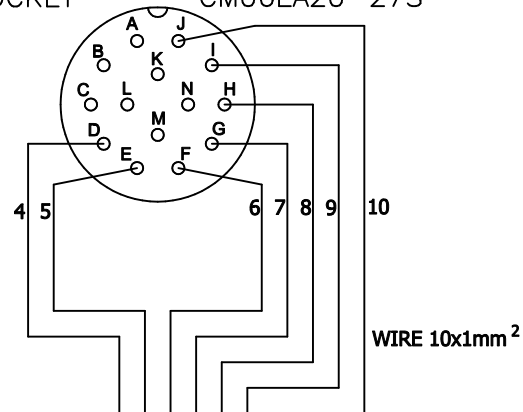
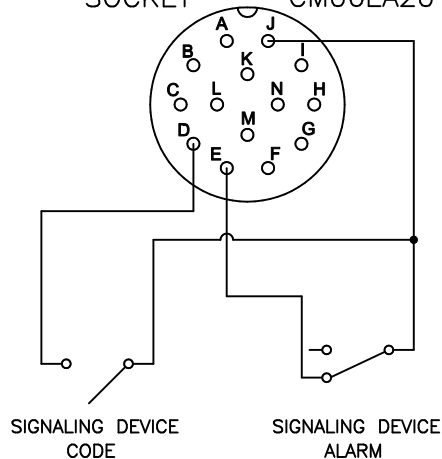
Designed by	T. Jackiewicz			Material	Name ECHO/AK-PG Cage device - assembly diagram	Weight
Drawn by	R. Rosik					
Checked by	R. Nowak					
Manager						
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.01.03	Sheet



Designed by	T. Jackiewicz			Material	Name ECHO/AK-PG Manipulator EPG - outline drawing	Weight
Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.01.04	Sheet

SOCKET CM06EA20-27S

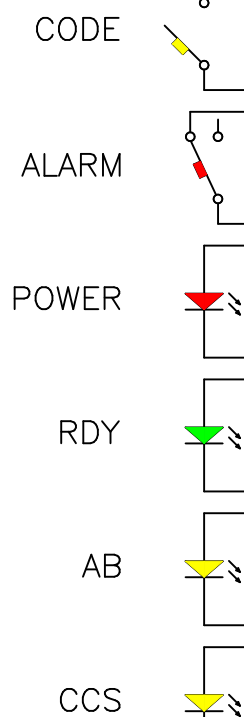
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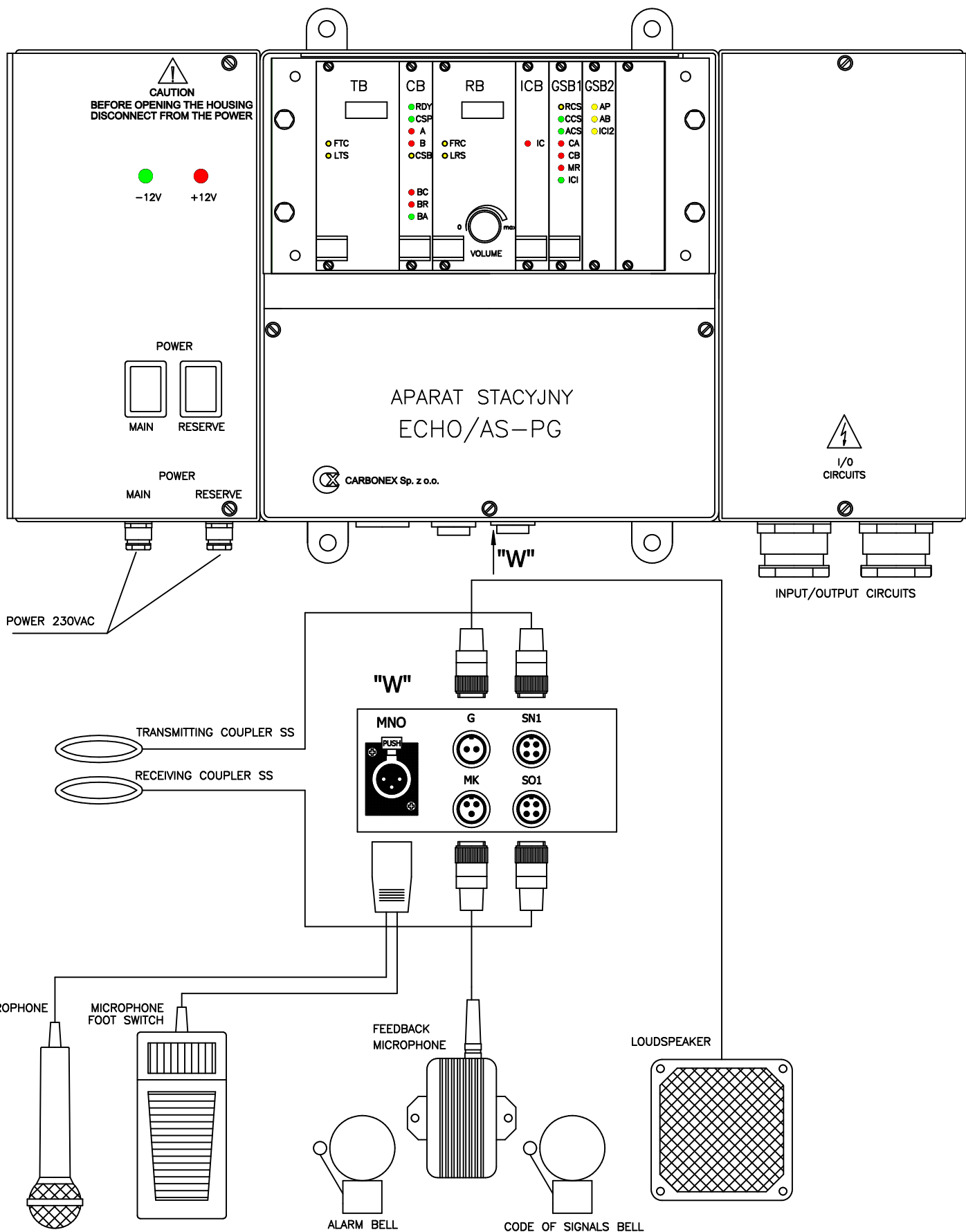
View of connection the signaling devices in the plug


MANIPULATOR

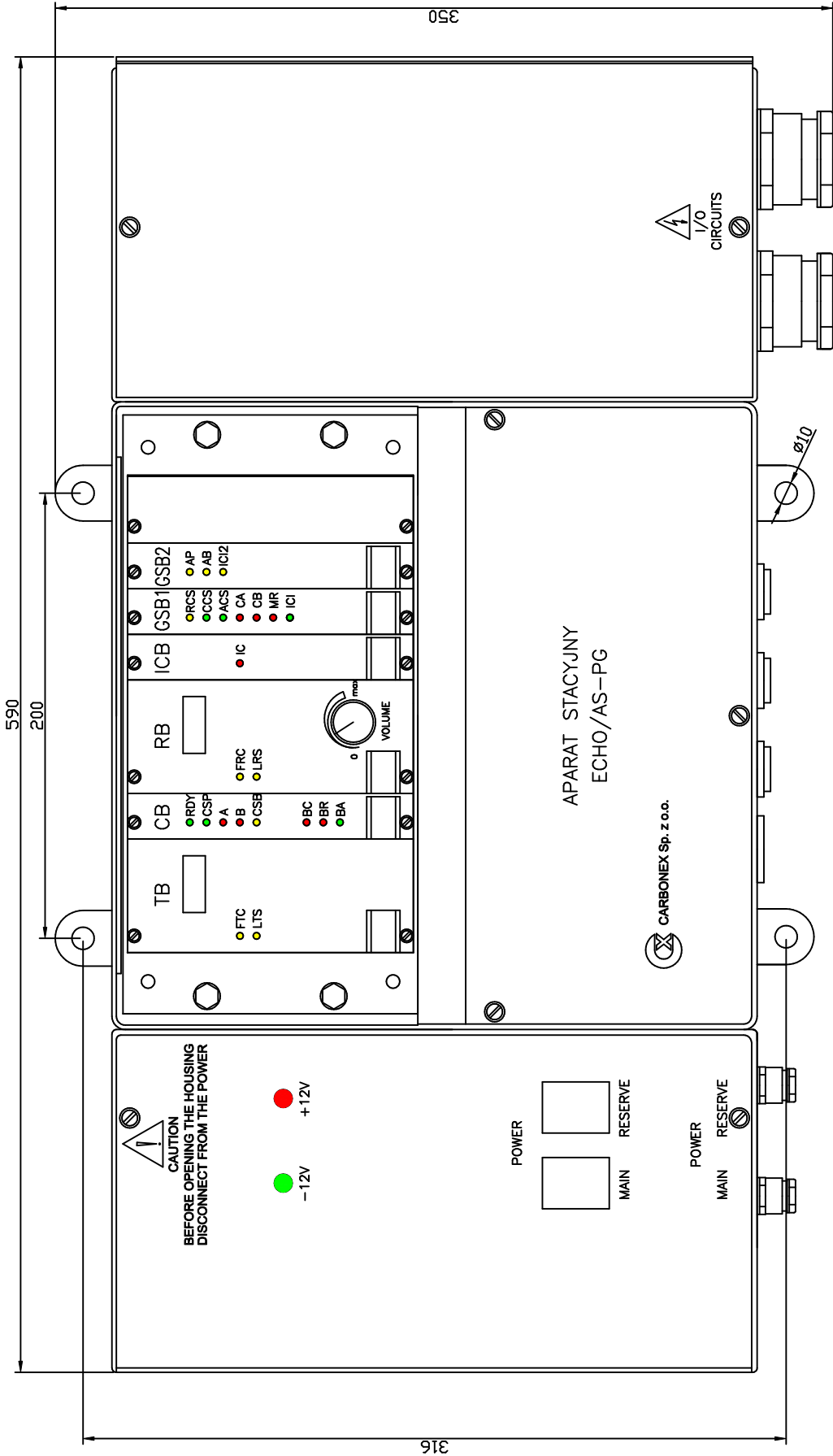
LZ10 1 2 3 4 5 6 7 8 9 10



Designed by	T. Jackiewicz			Material	Name ECHO/AK-PG Manipulator EPG - assembly diagram	Weight
Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.01.05	Sheet



Item	Part (unit) name			Quantity	Drg.or Standard No.		Material	Remarks
Designed by	T. Jackiewicz			Material	Name ECHO-AS/PG Headframe unit - overall structure	Weight		
Drawn by	R. Rosik							
Checked by	R. Nowak							
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.02		Sheet	

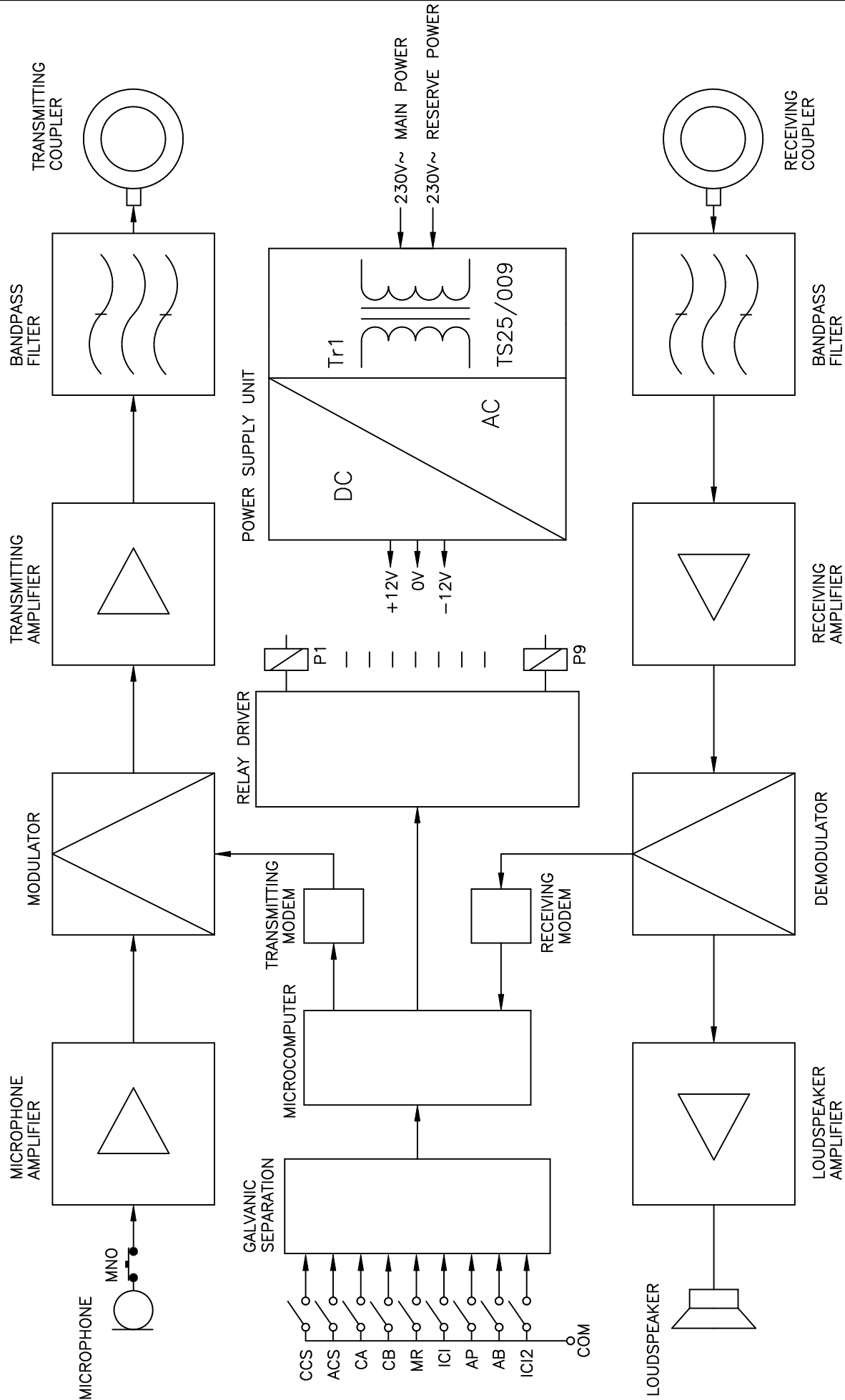



NOTE:
ALL DIMENSIONS IN MILLIMETERS

Item	Part (unit) name		Quantity	Drg.or Standard No.	Material	Remarks
Designed by	T. Jackiewicz					
Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale	CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date	12.2014	
				Drawing number	28PG.02.01	Sheet

Name
ECHO/AS-PG
Headframe device
- outline drawing

Weight



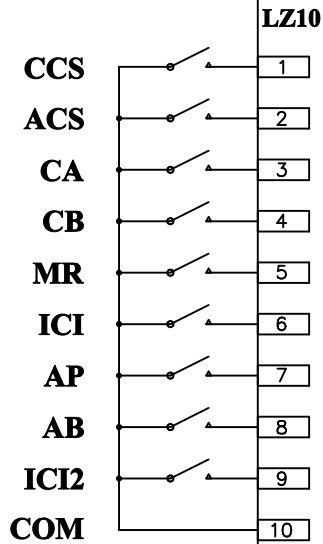
Designed by	T. Jackiewicz			Material	Name ECHO/AS-PG Headframe device – block diagram	Weight
Drawn by	R. Rosik					
Checked by	R. Giel					
Manager						
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.02.02	Sheet

ECHO/AS-PG

INPUTS

MAIN POWER

RESERVE POWER



P1

P2

P3

P4

P5

P6

P7

P8

P9

RDY

IC

A

B

BA


BR

CSP

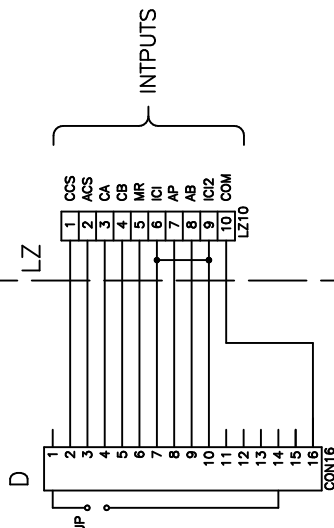
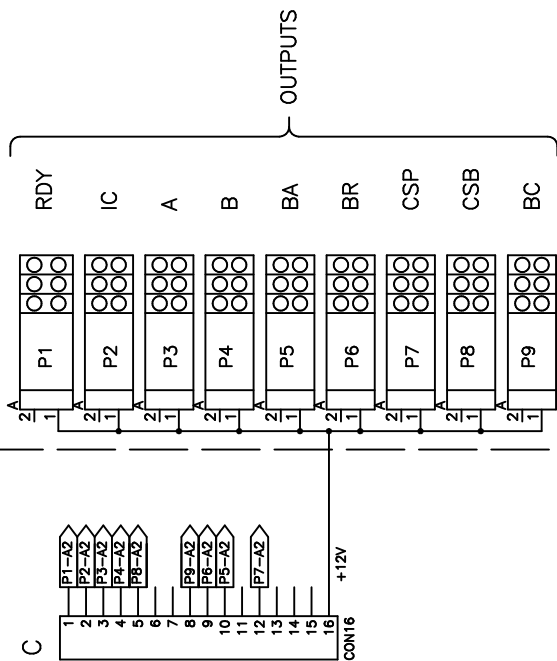
CSB

BC

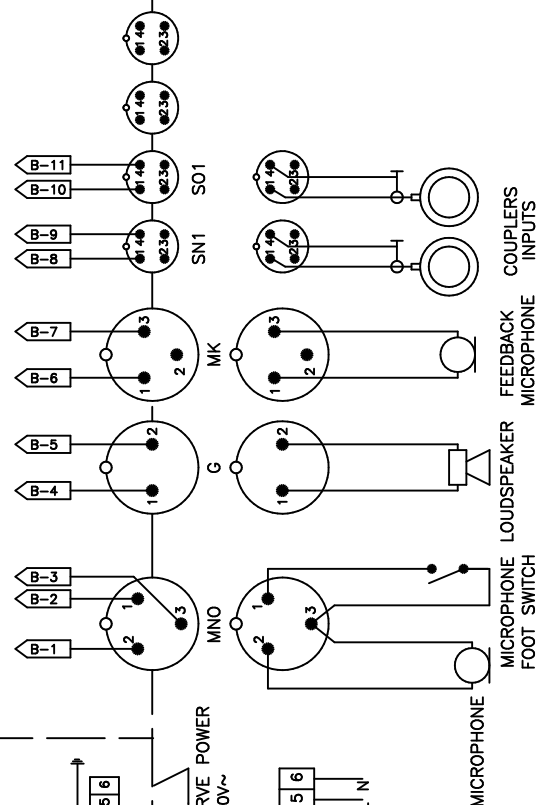
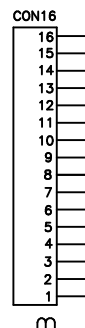
OUTPUTS

Designed by	T. Jackiewicz			Material	Name ECHO/AS-PG Headframe device - input/output circuits	Weight
Drawn by	R. Rosik					
Checked by	R. Nowak					
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.02.03	Sheet

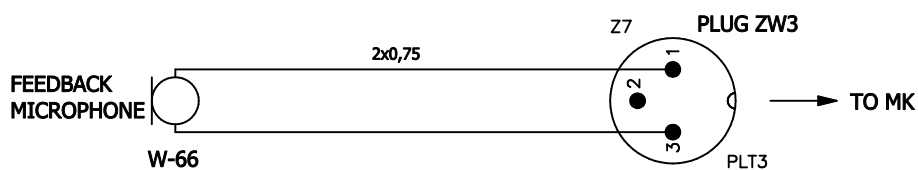
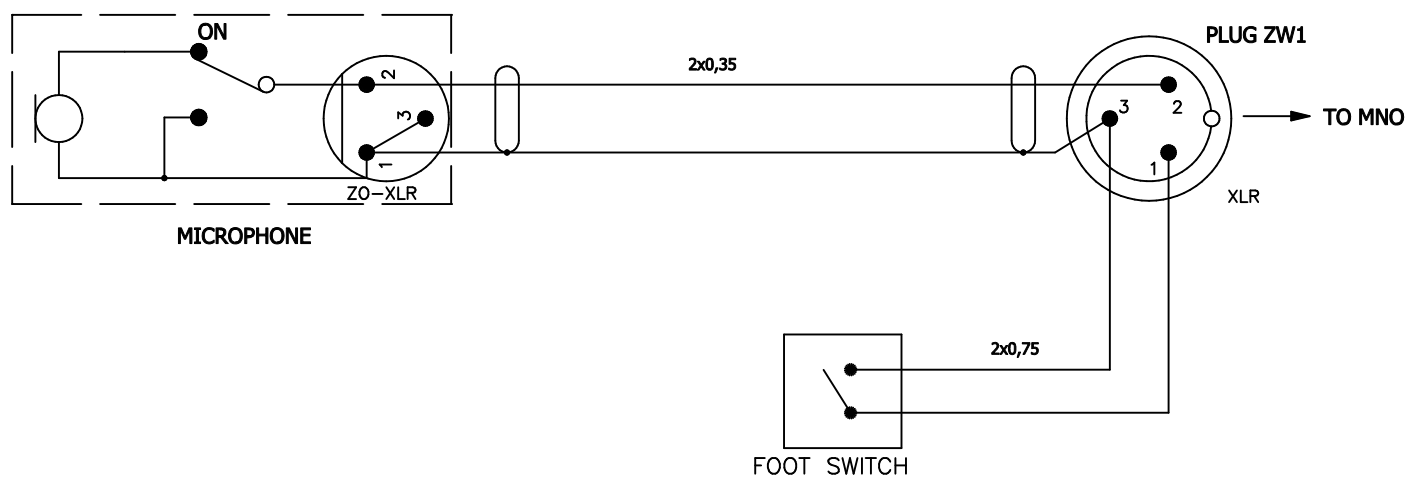
ECHO/AS-PG




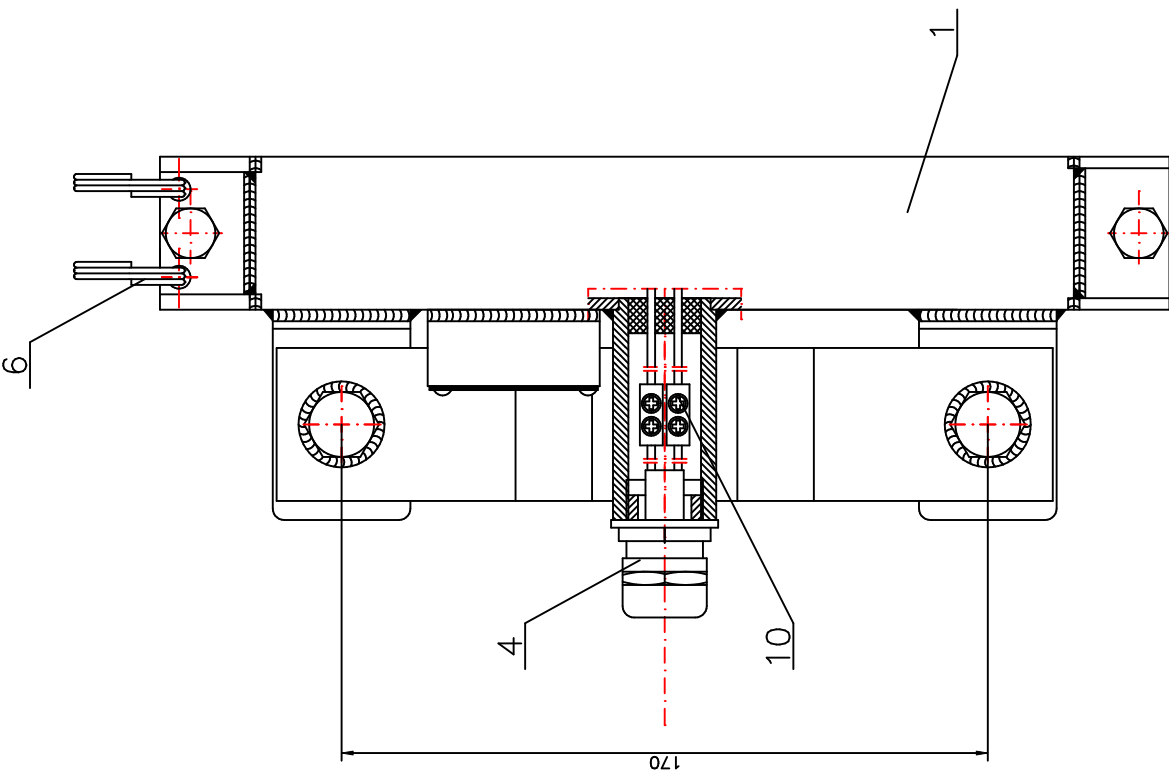
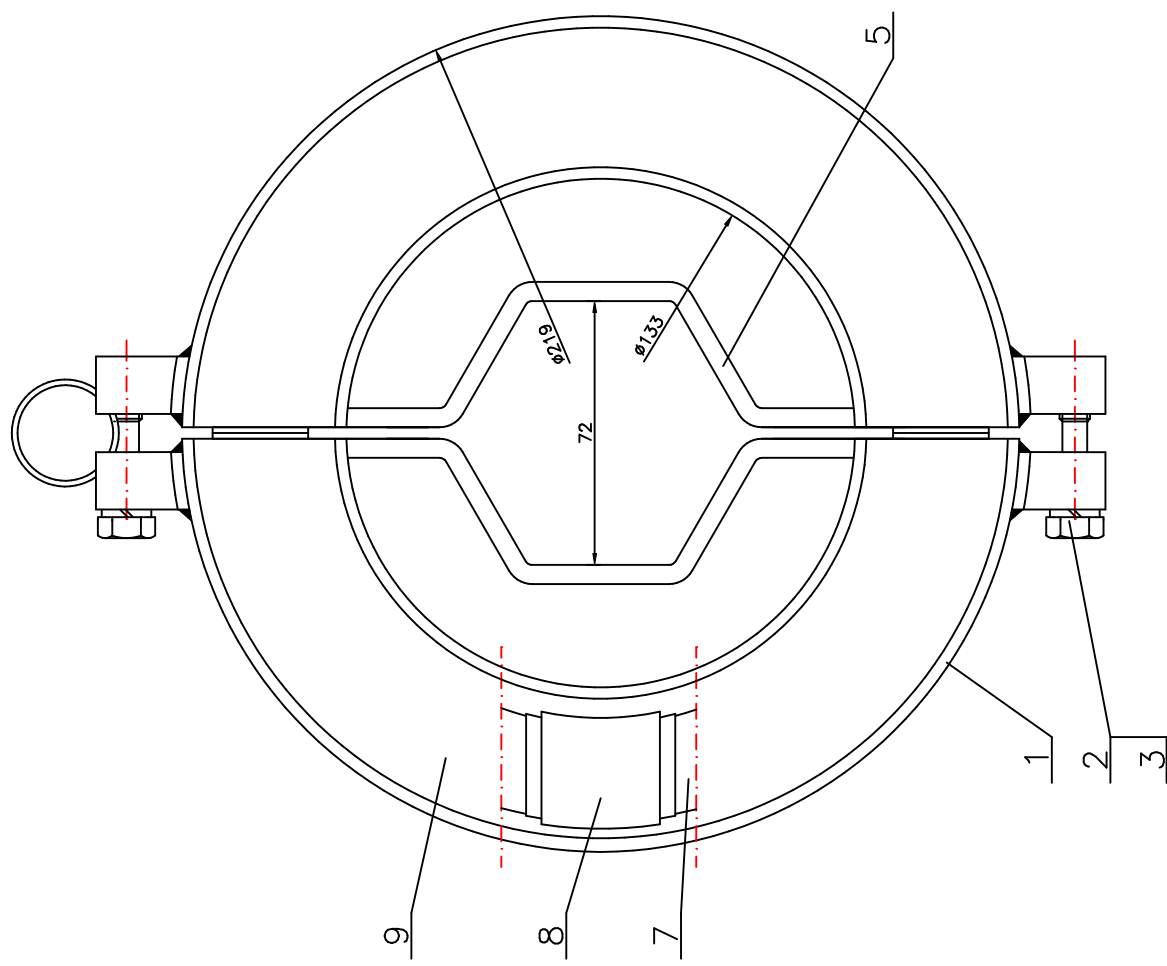
Version A	Version B	Version C	Version D
SN1 or SK-64	SS-80 or SK-80	SS-80 or SK-80	SS-80 or SK-80
SO1 or SK-32	SS-48 or SK-48	SS-80 or SK-80	SS-80 or SK-80



Item	Part (unit) name	Quantity	Drg.or Standard No.	Material	Remarks
Designed by	T. Jackiewicz		Material	Name ECHO/AS-PG Headframe unit - assembly diagram	Weight
Drawn by	R. Rosik				
Checked by	R. Nowak				
Manager					
Scale	CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570		Date 12.2014	Drawing number 28PG.02.04	Sheet

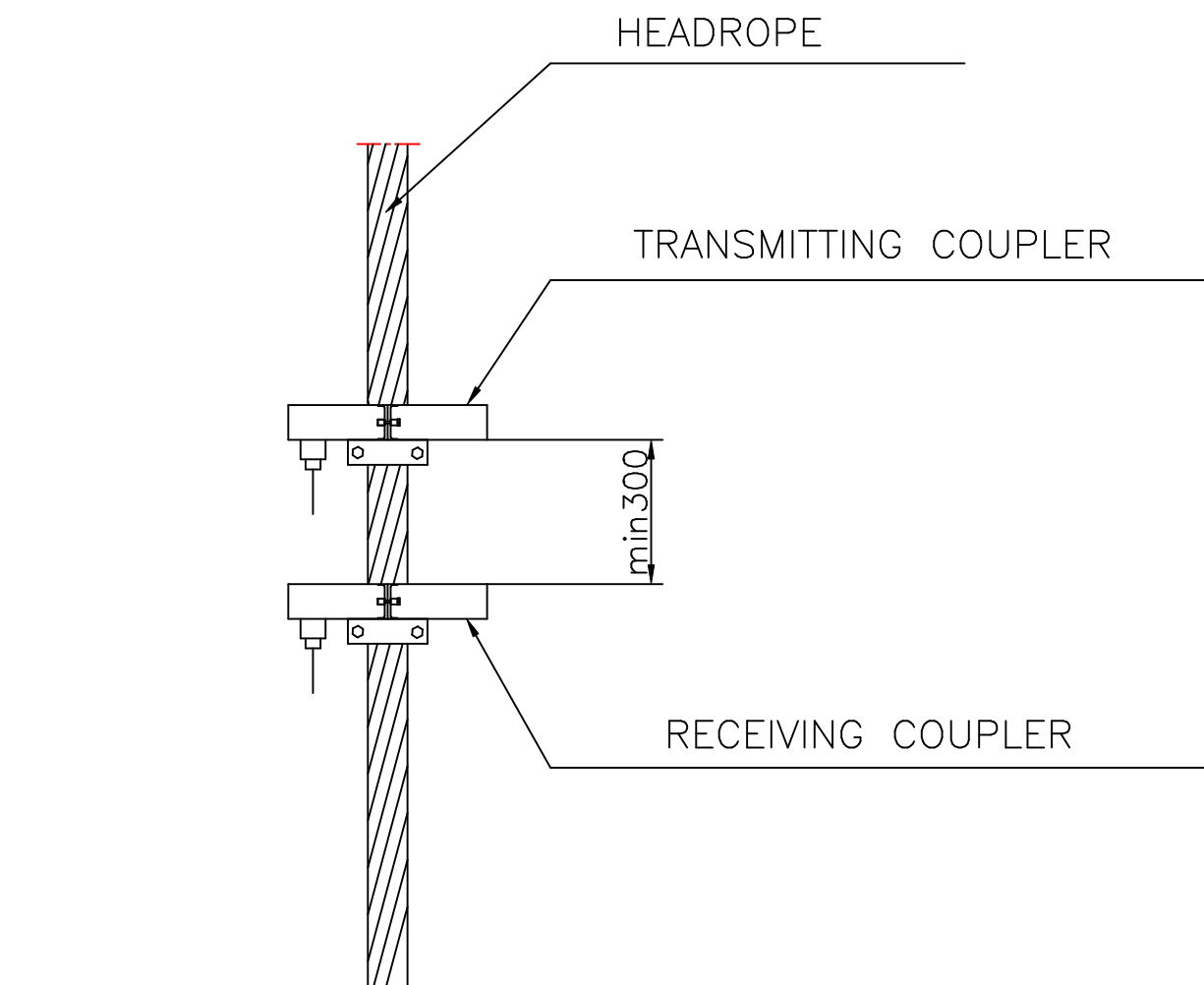


Item	Part (unit) name			Quantity	Drg.or Standard No.		Material	Remarks	
Designed by	T. Jackiewicz			Material	Name ECHO/AS-PG Headframe unit – diagram of microphone and feedback microphone			Weight	
Drawn by	R. Rosik								
Checked by	R. Nowak								
Scale		 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014		Drawing number 28PG.02.05		Sheet




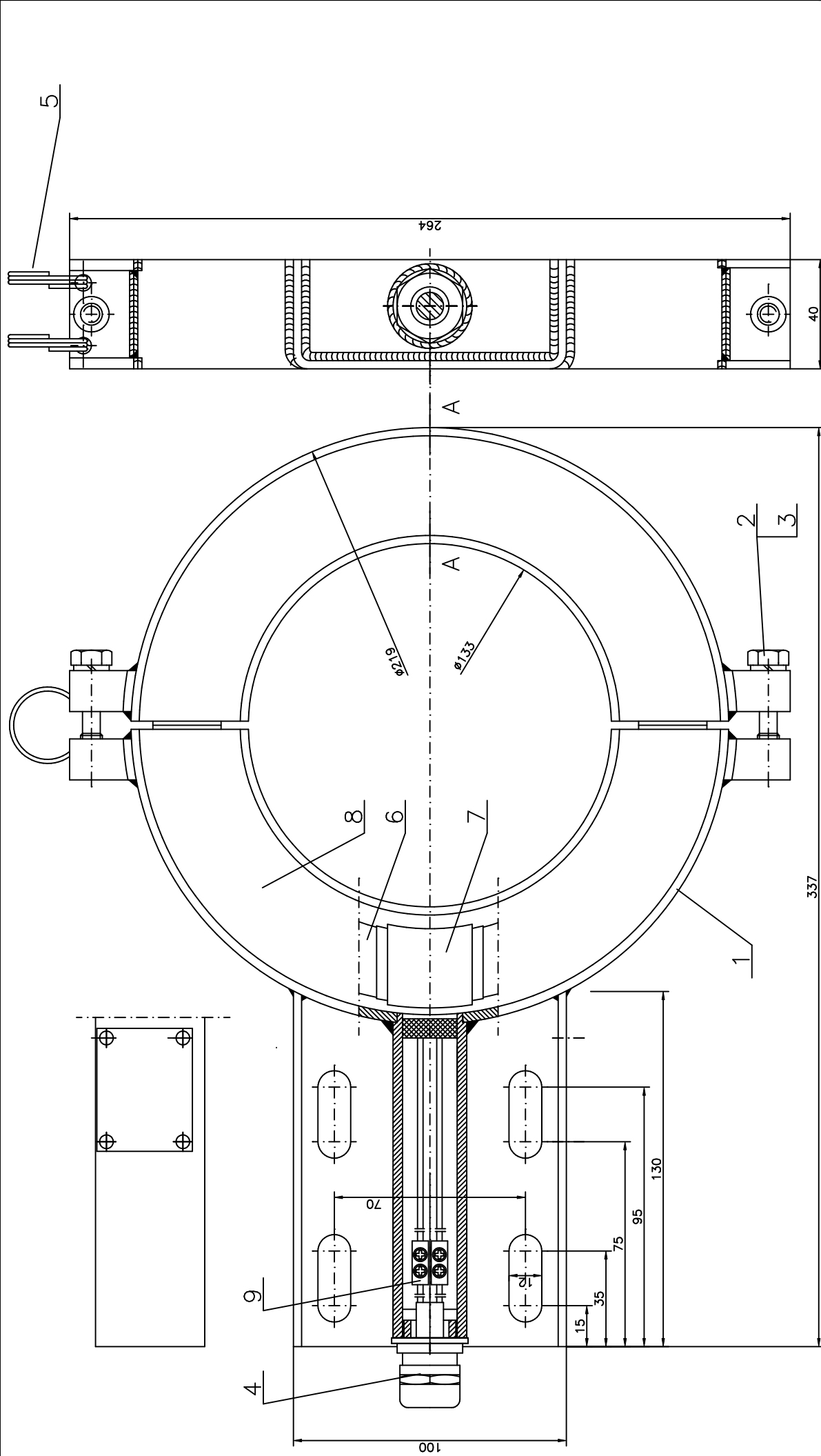
NOTE:
ALL DIMENSIONS IN MILLIMETERS

Item	Part (unit) name	Quantity	Material	Dr. or Standard No.	Remarks
10	TERMINAL BLOCK	1			
9	ENCAPSULATING COMPOUND	0.5l			
8	COIL	1	Lgt' 0.75mm ²		
7	FERRITE CORE	1pl.	EPDOS		
6	PROTECTIVE RING	1			
5	ROPE CLAMP	2	28.03.005		Fe/Zn6c
4	GLAND PG13.5	1			
3	SPRING WASHER Z8,2	2	PN-M-82008:1977		Fe/Zn6c
2	BOLT MBX40	2	28.03.002		Fe/Zn6c
1	ENCLOSURE	1	28.03.001		Fe/Zn6c
Material					
Name					
Coupler SK					
- outline drawing					
Drawing number					
28PG.03					
Sheet					
12.2014					
Date					
12.2014					
Scale					
1:1					
CARBONEX Sp. z o.o.					
AutoCAD LT97 lic 61000014570					



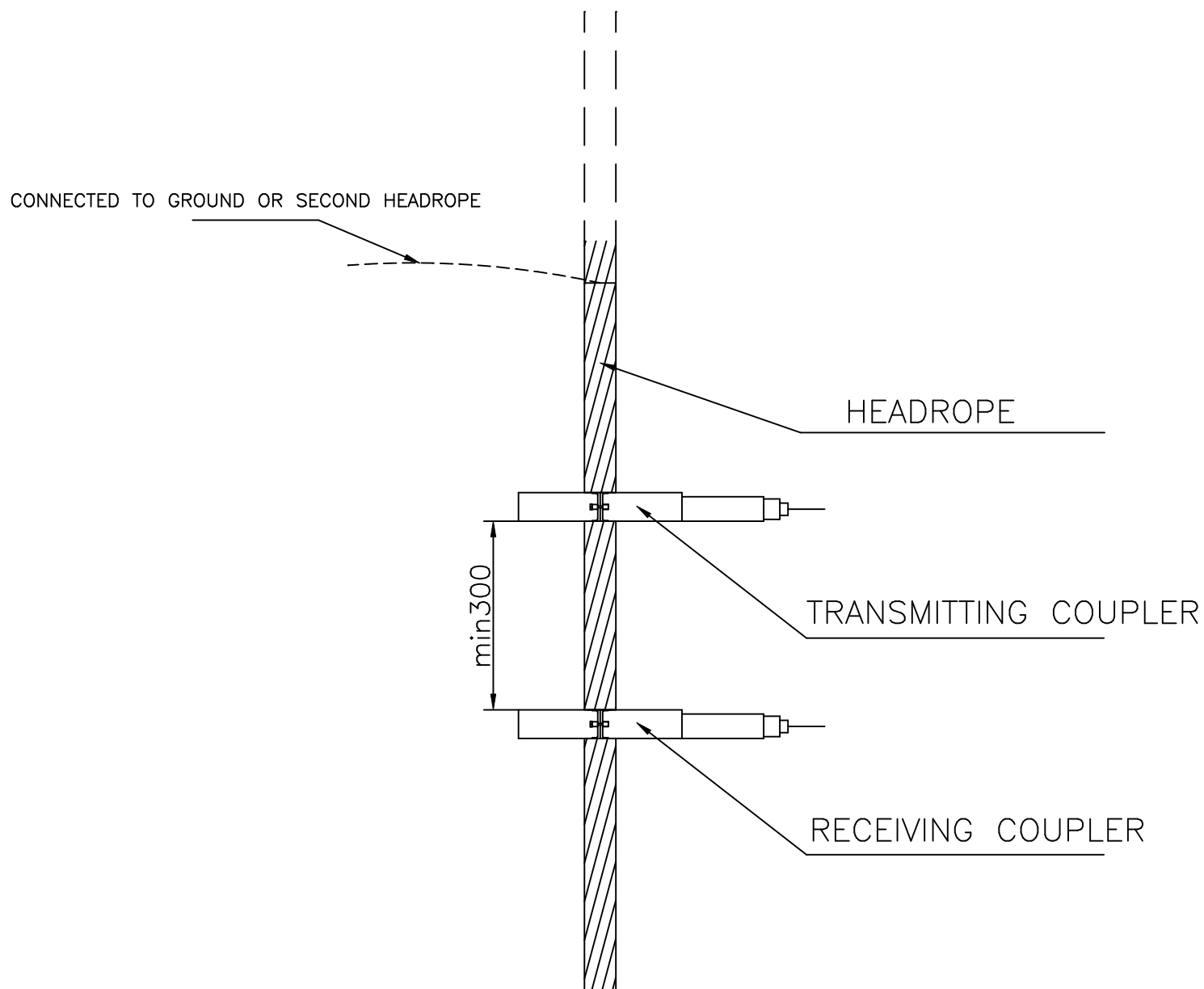
NOTE:
ALL DIMENSIONS IN MILIMETERS

Item	Part (unit) name			Quantity	Drg.or Standard No.		Material	Remarks
Designed by	T. Jackiewicz				Material	Name Coupler SK – installation drawing		Weight
Drawn by	R. Rosik							
Checked by	R. Nowak							
Manager								
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date	12.2014	Drawing number 28PG.03.01		Sheet




NOTE:
ALL DIMENSIONS IN MILLIMETERS

TERMINAL BLOCK		1	Sp.POK3	CBA
9	ENCAPSULATING COMPOUND	0.5l		
8	COIL	1	Lg' 0,75mm ²	
7	FERRITE CORE	1pl.	EPCOS	
6	PROTECTIVE RING	1		
5	GLAND PG13.5	1		
4	SPRING WASHER Z8.2	2	PN-M-82008:1977	Fe/Zn9c
3	BOLT MBX40	2	28.03.002	Fe/Zn9c
2	ENCLOSURE	1	28.03.001	Fe/Zn9c
1	Item	Part (unit) name	Qty	Remarks
Designed by	T. Jackiewicz			
Drawn by	R. Rosik			
Checked by	R. Nowak			
Scale	1:1			
CARBONEX Sp. z o.o.		Date	12.2014	Sheet
AutoCAD LT97 lic. 61000014570		Drawing number	28PG.04	



NOTE:

ALL DIMENSIONS IN MILIMETERS

Item	Part (unit) name			Quantity	Drg.or Standard No.		Material	Remarks
Designed by	T. Jackiewicz				Material	Name Coupler SS – installation drawing		Weight
Drawn by	R. Rosik							
Checked by	R. Giel							
Scale	 CARBONEX Sp. z o.o. AutoCAD LT97 lic 61000014570			Date 12.2014	Drawing number 28PG.04.01		Sheet	