



## BIN Sp. z o.o.

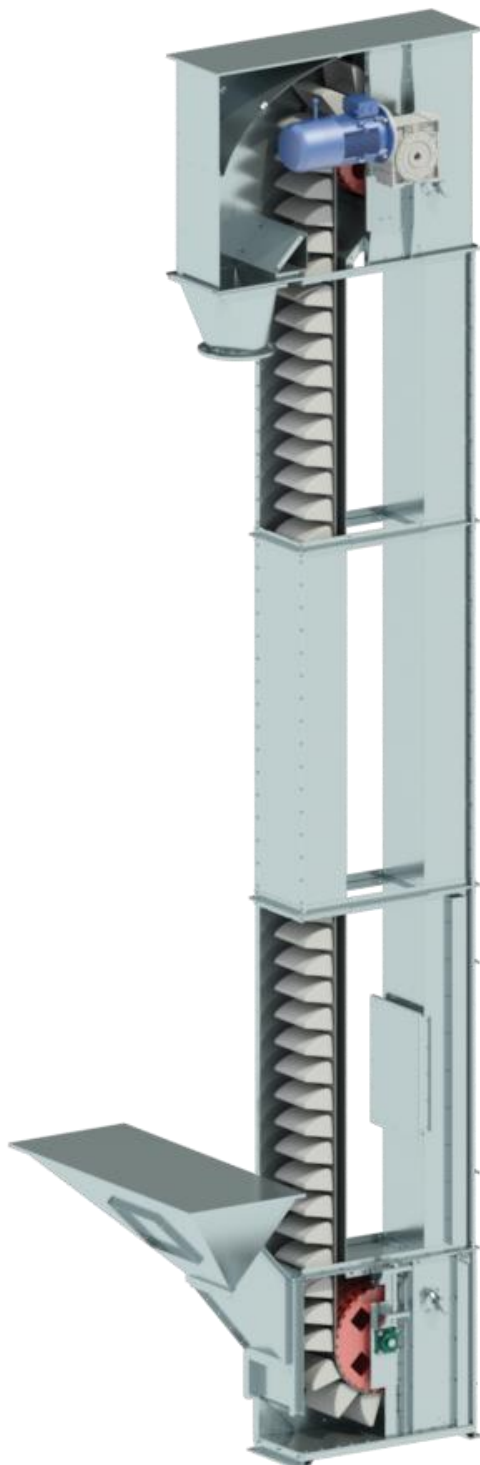
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## BUCKET ELEVATOR

<b>TYPE:</b>	<b>PK290</b>
<b>MODEL:</b>	PK290-120-3.3, PK290-100-3.3
	PK290-120-4.7, PK290-100-4.7
	PK290-120-5.7, PK290-200-5.7
	PK290-120-7.1, PK290-100-7.1
	PK290-120-8.6, PK290-100-8.6
	PK290-120-10.0, PK290-100-10.0
	PK290-120-11.4, PK290-100-11.4
	PK290-120-12.8, PK290-100-12.8
	PK290-120-14.3, PK290-100-14.3
	PK290-120-15.7, PK290-100-15.7
	PK290-120-17.1, PK290-100-17.1
	PK290-120-18.6, PK290-100-18.6
	PK290-120-20.0, PK290-100-20.0
	PK290-120-21.4, PK290-100-21.4
	PK290-120-22.8, PK290-100-22.8
	PK290-120-24.2, PK290-100-24.2
	PK290-120-25.6, PK290-100-25.6
	PK290-120-27.1, PK290-100-27.1
	PK290-120-28.5, PK290-100-28.5
	PK290-120-29.9, PK290-100-29.9
	PK290-120-31.4, PK290-100-31.4
	PK290-120-32.8, PK290-100-32.8
	PK290-120-34.2, PK290-100-34.2

## OPERATING MANUAL

(IO:PK290)

Drawings and descriptions included in this manual may contain optional and special components, not provided in the standard version. Before placing an order, the Customer may obtain comprehensive and up-to-date information on the products to be ordered. We reserve the right to make changes in our products. All rights reserved. Any reproduction, even partial, solely with our consent.



## INTRODUCTION

Thank you for purchasing a bucket elevator from BIN. This machine is provided with safety devices protecting people operating it and the elevator itself during its normal operation. However, these devices cannot ensure complete safety in all circumstances, and, therefore, before operators start to use it, they must thoroughly read this Operating Manual and understand matters described in it. This way errors during the machine installation, and during its operation itself can be avoided. Please, do not use or operate the machine before becoming acquainted with and understanding each function of the elevator.

The Operating Manual aims at acquainting the user with a correct operation of the purchased product. It contains practical guidelines that must be known to a user during operation of the bucket elevator.

**If any content of this operating manual is not understood by or is unclear for the user, please, contact the manufacturer or its representative for explanation.**



**This operating manual forms an integral part of the product, and should be kept for further use.**



**Before starting to operate the machine, read this operating manual, and, in particular, the chapter concerning safety at work.**



**Each use of the machine for purposes other than those specified in the operating manual shall be treated as the misuse. The manufacturer shall not be held responsible for any resultant damage, and the risk is born solely by the user. All and any unauthorised changes to the product design exclude the manufacturer's responsibility regarding**



**The warning sign in the operating manual indicates that the special caution must be exercised because of the danger to people and possibility of product damage.**



**Bucket elevators are high power electromechanical devices. Their incorrect operation may cause fire, fatal electric shock, burning, or other severe injury.**

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# 1. Safety

## 1.1. Basic safety rules

1. People operating, performing maintenance or overhauls of the bucket elevator are obliged to adhere to general occupational safety regulations.
2. The user is obliged to read and understand operating manuals for the bucket elevator and for all other auxiliary equipment, and to strictly adhere to them.
3. The bucket elevator can only be operated by able-bodied adults. These persons need to be fully aware of undertaken activities.
4. In particular, the following is forbidden:
  - operation by any “third” persons, who are not familiar with the Operating Manual;
  - operation by people who are ill, or under influence of alcohol or narcotic drugs.
5. The bucket elevator should be secured against access of children.
6. The elevator must be installed in the special bucket elevator tower or in other building structures, on the basis of an individual design developed by people holding relevant licences.
7. Installation of the elevator requires the use of special equipment, and relevant know-how. Therefore, the machine can only be installed by an installation company authorised by BIN. The installation company should cooperate with an entity ordering installation, in terms of works organisation, financial settlements, and acceptance of installation works.
8. The design and construction of the bucket elevator must include providing access to operating areas in its upper part, i.e., near an outlet from the elevator, at the electric drive location, and to all head components. Appropriate operating platforms must be installed at those places, with a ladder, stairs, or other devices ensuring access to them.
9. The ladder, stairs, etc., need to be provided with a safety device immediately and automatically stopping the elevator and its auxiliary devices on any attempt to climb onto them when devices are operating.
10. The design and construction of the bucket elevator must include ensuring access to places of operation of the segment with installation openings, and to all components of its foot.
11. Each entry onto the bucket elevator must be preceded by a command issued by an employer or a person authorised by them.
12. An owner is obliged to provide the bucket elevator with detailed occupational health and safety instructions.
13. Bucket elevators are intended to be operated in climate conditions prevailing in Poland, indoors and outdoors.
14. In the event of bad lighting conditions, a location where the elevator is operated should be equipped with additional general lighting.
15. The bucket elevator and its surroundings should always be kept tidy and clean.
16. During operation, the drive unit (an electric motor and a reducer), as well as the elevator cannot be covered with anything. Do not let the dust and other contamination to accumulate on the above elevator units. Ignoring of any of the above recommendations may result in motor overheating or fire.
17. It is forbidden to leave any tools, items, etc., on the bucket elevator or its structure due to a risk of an operator or any third persons being hit by objects falling from height.
18. All overhaul works, maintenance, repairs, technical servicing, etc., can only be performed when the elevator and other auxiliary devices are disconnected from power sources and after placing a board stating “Attention: overhaul - do not start up”.
19. Pay particular attention when dismantling guards of the segment with installation openings and releasing the motor brake, when all buckets of the working band (working strand) are emptied.
20. The power supply should be disconnected with a delta-star switch, which should then be secured with a padlock. The user itself shall equip the delta-star switch with a padlock securing the devices

against start-up by unauthorised people, as well as against an unintended start-up during maintenance operations.

21. When there are hazards related to noise, causing problems in communication, then special equipment for smooth communication between workers is required.
22. It is forbidden for people to stay near the elevator while any works at height are in progress, and the area around the machine should be secured against any access of third parties.
23. Ban on use of naked flame, smoking, and conducting welding works or similar within 10 m radius of the elevator or its auxiliary devices should be strictly adhered to.
24. Before starting the bucket elevator or other auxiliary devices, make sure that there are no people at a place of unloading and loading.
25. All covers and safety devices provided in the bucket elevator by the manufacturer must be installed.
26. The user is responsible for construction and operating condition of the lightning protection system and protective earthing system of the bucket elevator and possible devices, as well as structures to which the elevator is fixed.
27. The user is responsible for correct connection of power delivery points and their correct operation.
28. All components of the power supply system must be secured against any damage.
29. The elevator must be connected and started for the first time by an electrician holding relevant licences.
30. At least once a year, the User should order a qualified electrician holding relevant licences to inspect all electric equipment components.
31. It is forbidden for the elevator motor to operate with the switch in the position "Y" for longer than 10 seconds.
32. In case of any outage in power supply, switch the elevator and all auxiliary devices off.
33. The bucket elevator and its direct surroundings must be used and maintained in a way preventing starting of a fire, and it should be provided with handheld fire extinguishing equipment, including a dry powder or carbon-dioxide extinguisher.
34. In the event of the fire:
  - evacuate people from the danger zone;
  - call the fire brigade;
  - disconnect devices from the power supply;
  - start extinguishing the fire.
35. It is forbidden to extinguishing fires of electric systems with water or a foam extinguisher.
36. When any situation hazardous to human life or health is discovered, the equipment must be stopped immediately and power supply to the equipment must be disconnected with the main switch.
37. When any defects or damages to the elevator are found, which may affect human safety or safety of transported materials, the investor is obliged to immediately notify them in writing to the elevator manufacturer.
38. The repair and maintenance operations can only be conducted by able-bodied adults holding relevant qualifications.
39. When the elevator is working outdoors, do not attempt any works in adverse weather conditions (rain, heavy frost, ice, strong wind, lightnings, poor visibility).
40. Observe rules for complete control over the elevator and auxiliary equipment connected to the grid.
41. It is forbidden to make any changes in design or to change the intended use of the equipment without the producer's consent in writing.
42. Any design changes in the finished product require the new technical acceptance by the manufacturer or its authorised representative.
43. All equipment and systems connected to the bucket elevator (e.g., feeding pipes of silos) must be constructed in such way that they do not damage the elevator.
44. When any BIN devices, sets of devices or structures (screw conveyors, elevator towers, etc.) are connected to the bucket elevator, then necessary information on their operation, including control, switching on/off, lubrication, operation of electric equipment, and other, can be found in

relevant operating manuals for that equipment. The manufacturer accepts a possibility for equipping the elevator in devices, sets of devices or structures from other manufacturers provided they are "CE" marked and have the "EC declaration of conformity". This forms the basis for use of relevant operating manuals of these devices, as a part of their correct operation.

45. The elevators are labelled with safety marks. Each user is obliged to become acquainted with their meaning.

## 1.2. Information and warning signs

### Safety signs

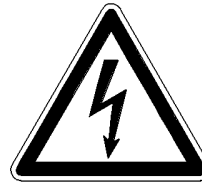
All safety signs are installed on the segment with installation openings.



READ THE  
OPERATING  
MANUAL



NOTE  
DANGER



ELECTRIC  
SHOCK  
HAZARD



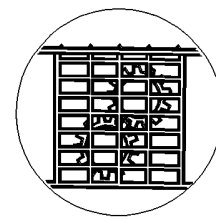
OBLIGATORY USE OF SAFETY  
GLOVES



OBLIGATORY USE OF  
SAFETY FOOTWEAR



NO USING OF A NAKED FLAME  
OR SMOKING



OBLIGATORY  
USE OF COVERS

### Nominal plate and a CE mark

The nominal plate is installed on the segment with installation openings, near safety signs.

Model:  
Year of production:  
Serial number:  
Weight  
Power:  
Voltage:  
Frequency:  
Protection class:  
Further information – see the Operating Manual

	BIN Sp. z o.o. 87-700 Aleksandrów Kujawski ul. Narutowicza 12 POLSKA <a href="http://www.bin.agro.pl">www.bin.agro.pl</a>
	Model: XX/XXXXX
	Rok produkcji: 20XX
	Numer seryjny: XXXX-XX
	Masa: XXX kg
	Moc: XX kW
	Napięcie: ~ 3x400V
	Częstotliwość: 50Hz
	Stopień ochrony: IP XX
	Dalsze informacje zostały podane w instrukcji obsługi.

Nominal plate with a CE mark



**Note!** Warning signs, nominal plates and other information provided on the equipment must be kept legible and clean. When the signs or marks mentioned above are damaged or destroyed, or a part containing them is replaced, new plates should be purchased from BIN Company and installed on the product.

## 2. General product description

### 2.1. Intended use of the product

Bucket elevators of the PK290 type are stationary devices intended to be used for vertical transport of cereal and maize grain, and oil seeds. They enable transport of material to a significant height, while requiring small space for their erection. They are indispensable for construction and organising of grain collection and storage places. They are particularly useful for loading and unloading of grain silos. It is forbidden to use bucket elevators for transport of materials other than listed, and in particular, materials of density exceeding  $800 \text{ kg/m}^3$ . When the elevator is used contrary to its intended use, the manufacturer shall not be held responsible for any resultant damage.

**NOTE:** The bucket elevator (listed in the table below) must always be fixed to structural components, ensuring its stability. This function can be fulfilled by other structure or a specially constructed tower. Installation conditions and methods must be described in a relevant design prepared by a person holding relevant licences, and this is a precondition for granting a guarantee, issuing an EC Declaration of Conformity, and correct operation of the elevator.

### 2.2. Basic technical data of the elevator

Table 1. Technical and installation data for elevators of the PK290 type.

Model	Maximum capacity [t/h]	Total height Hc [m]	Lift height Hp [m]	Elevator weight [kg]
PK290-120-3.3	120	5.46	3.33	1123
PK290-120-4.7	120	6.89	4.75	1240
PK290-120-5.7	120	7.84	5.70	1298
PK290-120-7.1	120	9.26	7.13	1459
PK290-120-8.6	120	10.69	8.55	1569
PK290-120-10.0	120	12.11	9.98	1704
PK290-120-11.4	120	13.54	11.40	1794
PK290-120-12.8	120	14.96	12.83	1918
PK290-120-14.3	120	16.39	14.25	2028
PK290-120-15.7	120	17.81	15.68	2182
PK290-120-17.1	120	19.24	17.1	2266
PK290-120-18.6	120	20.66	18.53	2375
PK290-120-20.0	120	22.09	19.95	2670
PK290-120-21.4	120	23.51	21.38	2778
PK290-120-22.8	120	24.94	22.8	2869
PK290-120-24.2	120	26.36	24.23	2977
PK290-120-25.6	120	27.79	25.65	3086
PK290-120-27.1	120	29.21	27.08	3195
PK290-120-28.5	120	30.64	28.5	3363
PK290-120-29.9	120	32.06	29.93	3474
PK290-120-31.4	120	33.49	31.35	3629
PK290-120-32.8	120	34.91	32.78	3737
PK290-120-34.2	120	36.34	34.2	3827
PK290-100-3.3	100	5.46	3.33	1118

Model	Maximum capacity [t/h]	Total height Hc [m]	Lift height Hp [m]	Elevator weight [kg]
PK290-100-4.3	100	6.89	4.75	1226
PK290-100-5.7	100	7.84	5.70	1293
PK290-100-7.1	100	9.26	7.13	1401
PK290-100-8.6	100	10.69	8.55	1558
PK290-100-10.0	100	12.11	9.98	1667
PK290-100-11.4	100	13.54	11.40	1778
PK290-100-12.8	100	14.96	12.83	1887
PK290-100-14.3	100	16.39	14.25	1991
PK290-100-15.7	100	17.81	15.68	2145
PK290-100-17.1	100	19.24	17.1	2251
PK290-100-18.6	100	20.66	18.53	2359
PK290-100-20.0	100	22.09	19.95	2464
PK290-100-21.4	100	23.51	21.38	2566
PK290-100-22.8	100	24.94	22.8	2656
PK290-100-24.2	100	26.36	24.23	2764
PK290-100-25.6	100	27.79	25.65	3054
PK290-100-27.1	100	29.21	27.08	3163
PK290-100-28.5	100	30.64	28.5	3253
PK290-100-29.9	100	32.06	29.93	3362
PK290-100-31.4	100	33.49	31.35	3511
PK290-100-32.8	100	34.91	32.78	3620
PK290-100-34.2	100	36.34	34.2	3790

- a relationship describing calculation of the total belt length,  $L_{cp}$  [rm].

$$L_{cp} = (2.12 + 1.8) + (2 \times H_p) + 0.5^{*}) + 2^{**})$$

\*) - a reserve designated for one connection of the belt (each additional connection of the belt shall require a relevant increase in its length)

\*\*)- a reserve required when the bucket elevator extension (237.5 mm) - PK290-PODW and an additional segment (712.5 mm) - PK290-SEG0.71 are used

- a relationship describing a way for calculating the number of buckets  $I_k$  [pcs.] for the elevator of the PK290-120-..... type

$$I_k = \frac{(L_{cp}-3)}{0,14} + 1$$

- a relationship describing a way for calculating the number of buckets  $I_k$  [pcs.] for the elevator of the PK290-100-..... type

$$I_k = \frac{(L_{cp}-3)}{0,166} + 1$$

A result should be rounded up

$L_{cp}$  – the total belt length from Table 7 or Table 8, rounded up to 0.25m



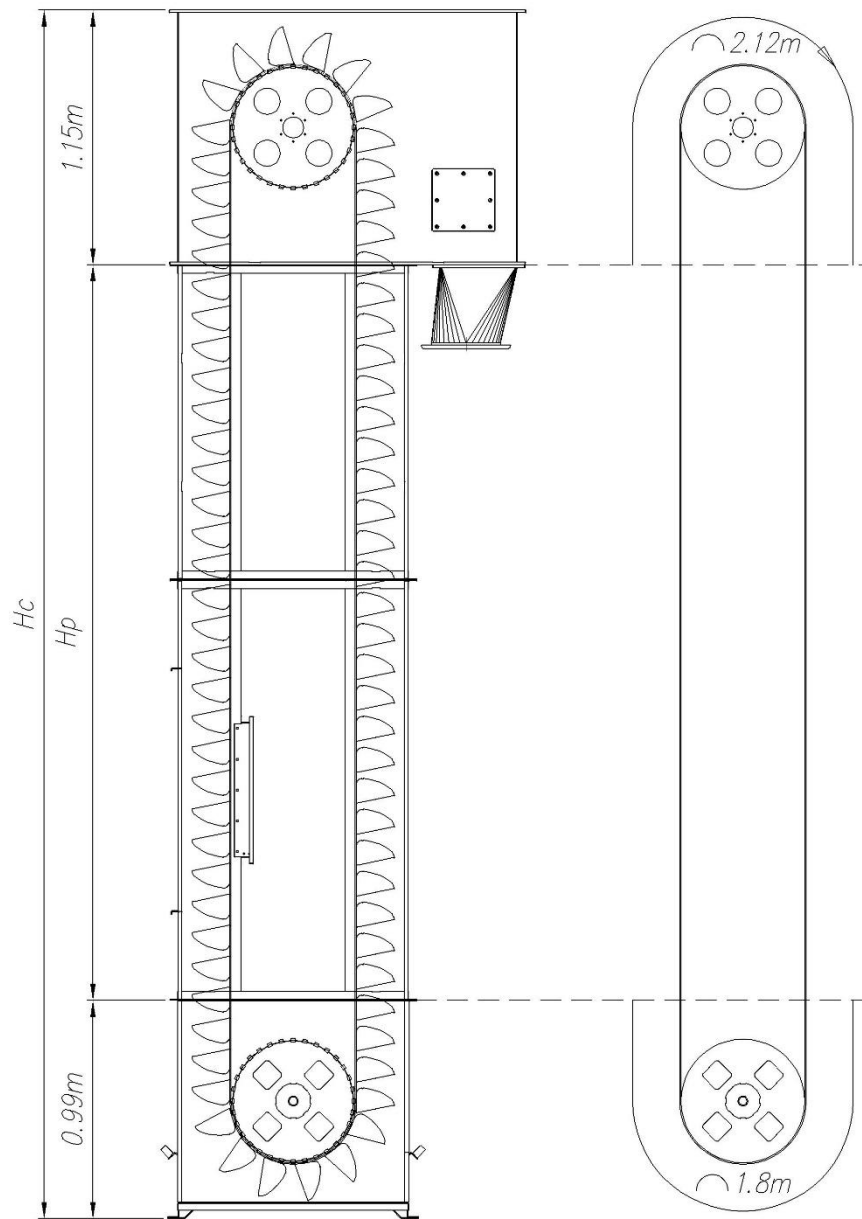


Figure 1. A diagram to Table 1 (Characteristic dimensions of a bucket elevator of the PK290 type. Dimensions required to determine the total length of the working belt.)

In no device shown in the manual, the level of noise exceeds 70 dB(A).

Table 2. Technical and operating data of elevators of the PK290-120 and PK290-100 type.

Elevator model	Motor type	Nominal motor power	Rotational speed	Power supply voltage	Frequency	Drum rotational speed	Nominal capacity
		[kW]	[rpm]	[V]	[Hz]	[rpm]	[tonnes/h]
PK290-120-3.3	SKg100L4-HSY	3.0	1450	~ 3x400	50	97	up to 120*
PK290-120-4.7	SKg112M4-HSY	4.0					
PK290-120-5.7							
PK290-120-7.1	SKg132S4-HSY	5.5					
PK290-120-8.6							
PK290-120-10.0	SKg132M4-HSY	7.5					
PK290-120-11.4							
PK290-120-12.8	SKg132M4-HSY	9.2					
PK290-120-14.3							
PK290-120-15.7							
PK290-120-17.1	SKg160M4-HSY	11.0					
PK290-120-18.6							
PK290-120-20.0	SKg160L4-HSY	15.0					
PK290-120-21.4							
PK290-120-22.8							
PK290-120-24.2							
PK290-120-25.6							
PK290-120-27.1							
PK290-120-28.5	SKg180M4-HSY	18.5					
PK290-120-29.9							
PK290-120-31.4							
PK290-120-32.8							
PK290-120-34.2							
PK290-100-3.3	SKg100L4-HSY	3.0	1450	~ 3x400	50	97	up to 100**
PK290-100-4.7	SKg112M4-HSY	4.0					
PK290-100-5.7							
PK290-100-7.1	SKg132S4-HSY	5.5					
PK290-100-8.6							
PK290-100-10.0	SKg132M4-HSY	7.5					
PK290-100-11.4							
PK290-100-12.8							
PK290-100-14.3	SKg132M4-HSY	9.2					
PK290-100-15.7							
PK290-100-17.1	SKg160M4-HSY	11.0					
PK290-100-18.6							
PK290-100-20.0	SKg160L4-HSY	15.0					
PK290-100-21.4							
PK290-100-22.8							
PK290-100-24.2							
PK290-100-25.6							
PK290-100-27.1							
PK290-100-28.5	SKg180M4-HSY	18.5					
PK290-100-29.9							
PK290-100-31.4							
PK290-100-32.8							
PK290-100-34.2							

\* the nominal capacity is determined by the material bulk density, depending on its type, size, moisture content, contamination level, etc.:

120 t/h (for wheat of bulk density of 750 kg/m<sup>3</sup>)

95 t/h (for oats of bulk density of 600 kg/m<sup>3</sup>)

\*\* the nominal capacity is determined by the material bulk density, depending on its type, size, moisture content, contamination level, etc.:

100 t/h (for wheat of bulk density of 750 kg/m<sup>3</sup>)

80 t/h (for oats of bulk density of 600 kg/m<sup>3</sup>)

### 2.3. Design description

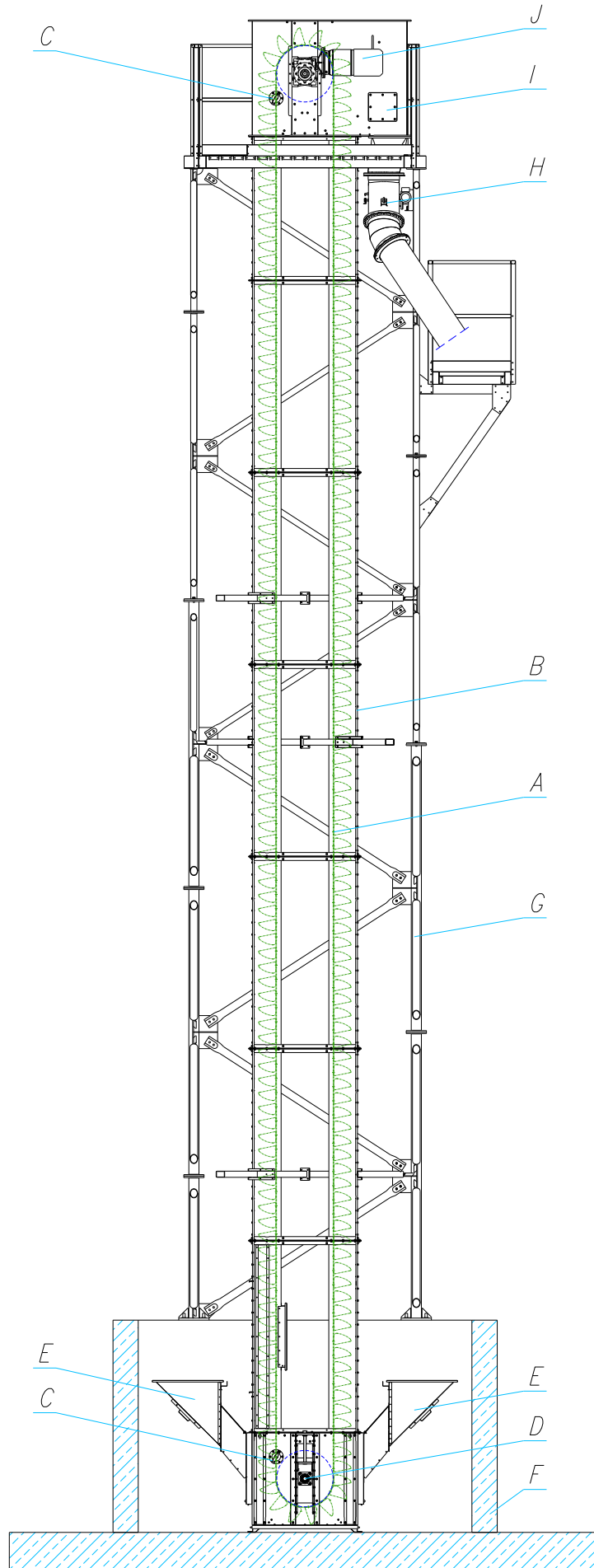


Figure 2. Construction of a bucket elevator of the PK290 type - diagram.

### A) WORKING BAND (WORKING STRAND)

The working band of the bucket elevator is formed by a working belt with buckets fixed to it. The working belt of the elevator is made of a 315 mm wide and 8 mm thick textile and rubber belt. The belt length and the number of buckets depend on a specific elevator model - in accordance with Table 7 or Table 8. Table 1. Technical and installation data for elevators of the PK290 type. The belt has three rows of openings for installation of buckets. The figure below presents a way of fixing buckets to the working belt, as well as requirements for its connection.

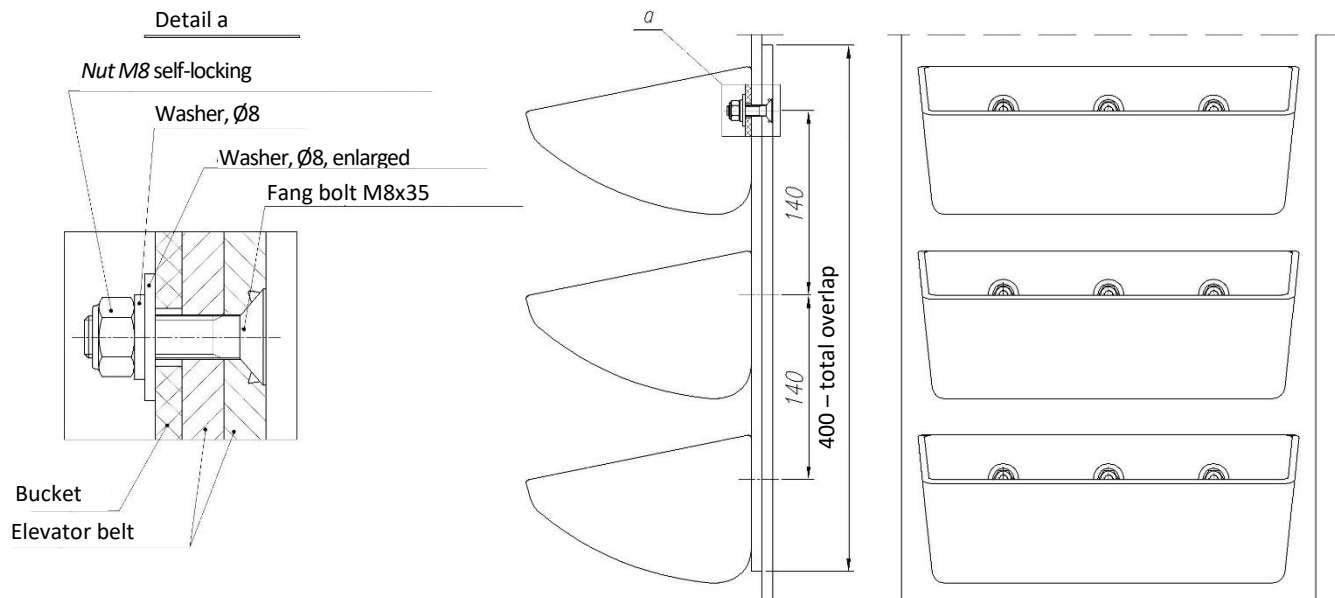


Figure 3. A fragment of the working band (working strand) of an elevator of the PK290 type.



- **A minimum length of the belt joint - with three successive buckets (the length of 400 mm - the figure above).**
- **When the working belt is being joined, the tensioning mechanism should be set in a position in which the return drum is in the maximum upper position. Otherwise, it is not possible to adjust belt tensioning, or that possibility is limited.**

### B) BODY SEGMENT

The bucket elevator body is formed of segments, so elevators of different heights can be constructed. One segment of the elevator body has a form of a rectangular double pipe, being a casing for the working band. It is made of galvanised metal sheet and represents an indispensable construction component of each elevator of the PK290 type.

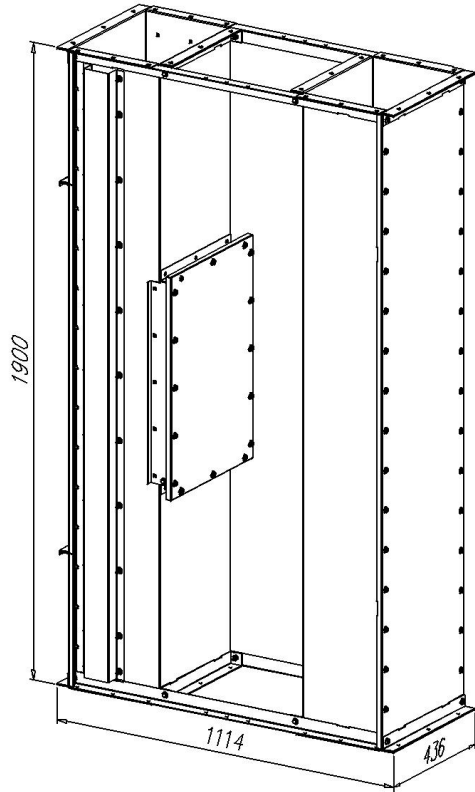
BIN sp. z o.o. manufacturers body segments of the following types:

- a 1.9 m high segment;
- a 1.9 m high segment with installation openings;
- a 1.425 m high segment;
- a segment – a bucket elevator extension (237.5 mm) – optional equipment
- a segment – a bucket elevator extension (712.5 mm) – optional equipment

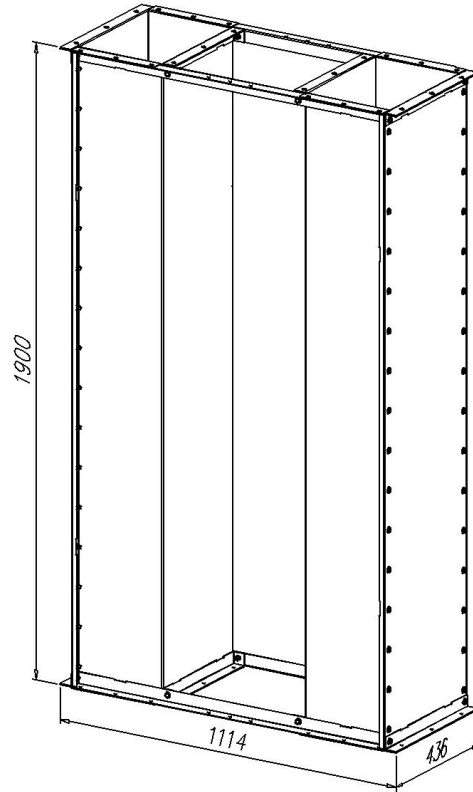
The 1.9 m high segment with installation openings is used in every model of the elevator, and is fixed to its feet, always as the first segment of the body. It is used for performance of installation activities and works related to the elevator operation. The further part of the body is formed by remaining segments in quantities specified in Table 7 or Table 8. Additionally, the elevator can be extended with an additional segment that is 237.5 mm or 712.5 mm long.

Figure 4. Body segments - characteristic dimensions

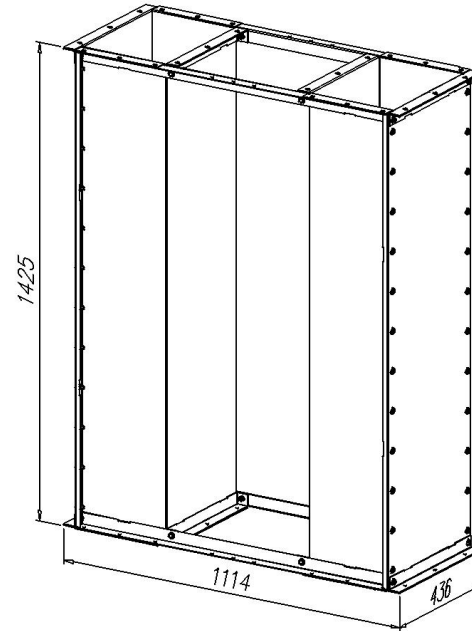
A 1.9 m high segment with installation openings;



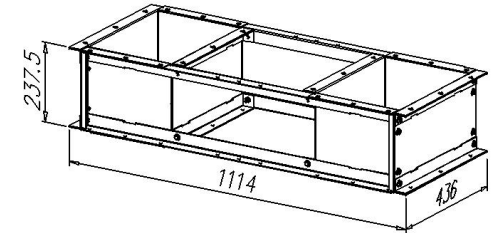
A 1.9 m high segment;



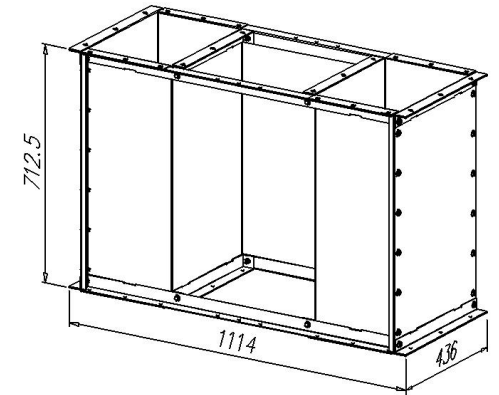
A 1.425 m high segment;



A segment - a 237.5 mm high elevator extension



A segment - a 712.5 mm high elevator extension



### C) BELT POSITION SENSOR

The belt position sensor is a device installed in the elevator head and foot. It consists of a limit switch and a triggering mechanism. When the working band is too close to the body wall, the limit switch should (due to its correct connection) stop the bucket elevator drive. When a distance between the working band and the body wall is too small, this indicates the elevator defects, or an incorrect position of the foot return drum, or that the working band works in a skid (the return drum has stopped due to an incorrect tension of the working band (working strand)). The belt position sensor is a standard equipment of the elevator food and head (2 pieces in each part).

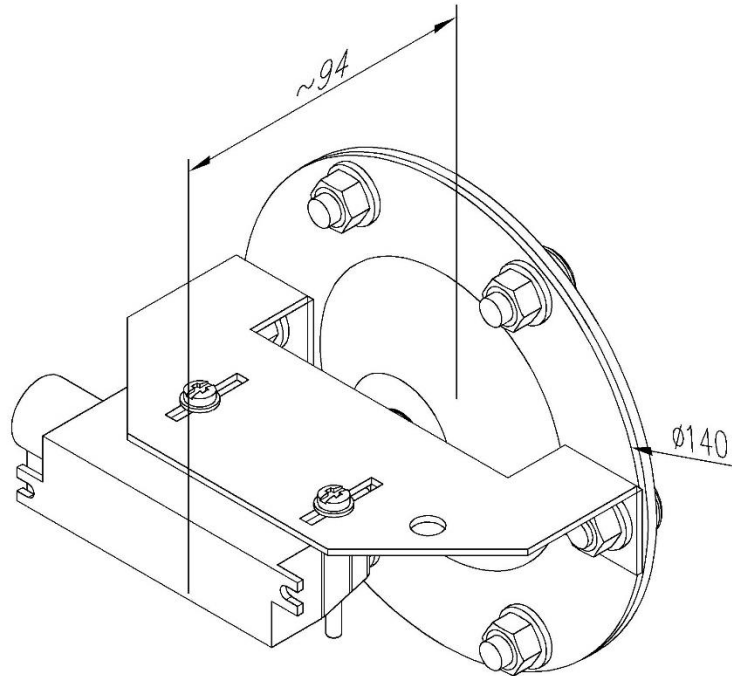


Figure 5. Belt position sensor

### D) BUCKET ELEVATOR FOOT

The foot is one of the basic units of the bucket elevator. It forms a casing of the return drum and enables installation of the elevator body segments and loading pockets. It has four openings in its bottom part, to connect the elevator to the foundation with expansion anchors.

The return drum installed in side walls of the foot, and has mechanisms for tensioning of the working band. Those mechanisms consist of bolts M24 with nuts and guides enabling vertical movement of the drum by approximately 13 cm. Bolts of the mechanism and roller bearings of the drum require periodic lubrication with solid grease, to ensure a long-term smooth operation of those components. In the bottom part of the foot, on the left and the right side of the return drum, there are openings with shutters for operation of the working band of the elevator, and for cleaning of the foot. The foot is provided with four eyes for its lifting and transfer at a location of its installation, using universal lifting equipment.



**NOTE:** The eyes cannot be used to lift the assembled elevator. When the assembled bucket elevator is lifted using foot eyes, the machine can be damaged, causing hazard to human life and health.

The foot is made of galvanised/hot-dip galvanised metal sheet, while the return drum is coated with paint.

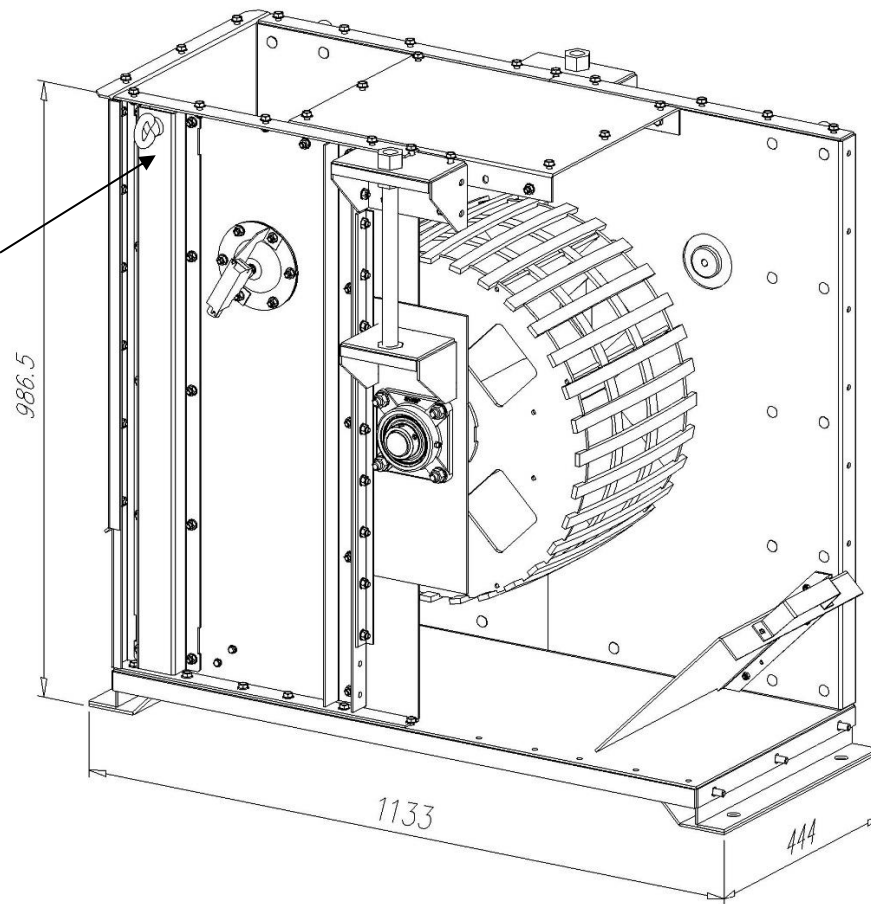
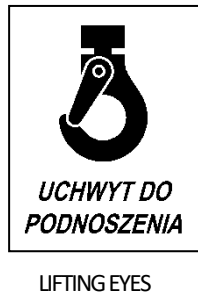


Figure 6. A foot of a bucket elevator with a return drum visible.

#### E) LOADING POCKET AND POCKET CONNECTORS

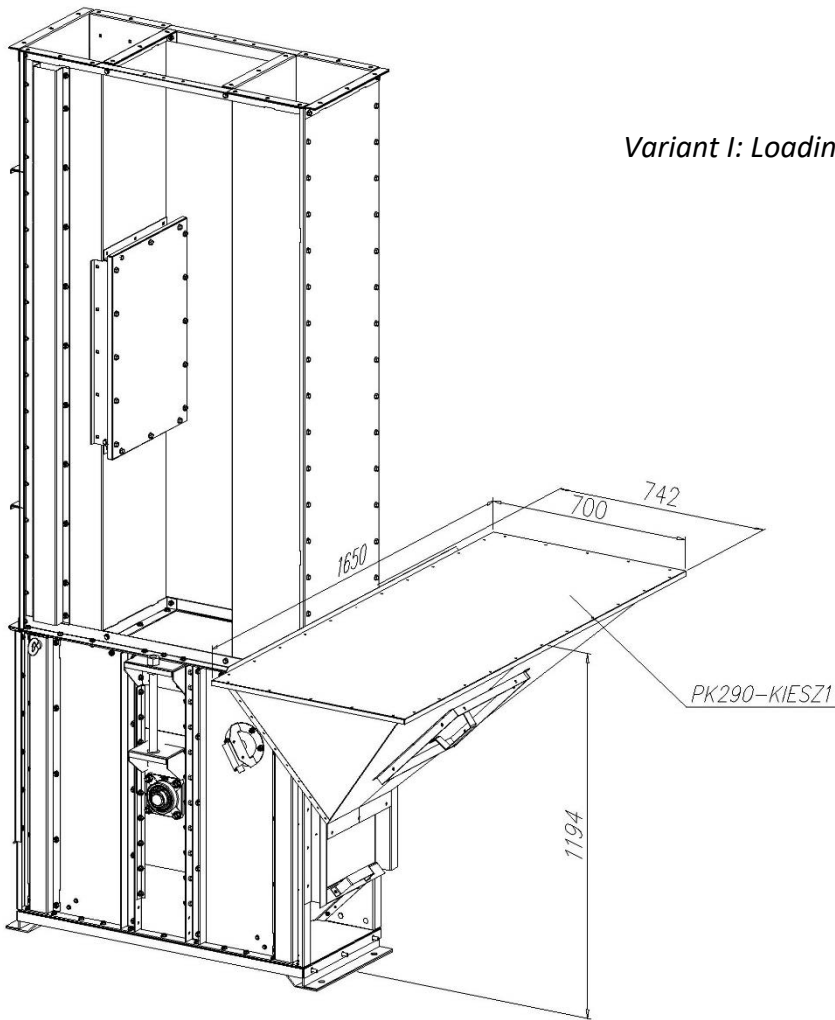
Pocket 1 enables loading of the bucket elevator using other devices for grain and seeds transport, such as screw, belt or scrapper conveyors, or other. It is a place for connecting outlets of those devices. One or two pockets are installed on the bucket elevator foot. When it is necessary to move the loading pocket away from the foot, the pocket connector needs to be used. The connector moves the pocket away from the elevator foot by ca. 0.25 m and raises it by ca. 0.31 m. When the connector is installed, the loading pocket needs to be anchored to the foundation, using supports provided with the pocket connector.

Loading pocket 1 consists of four side walls, with one inclined at ca. 45°, so the transported material can be easily fed into the elevator foot. That wall also contains an opening with a cover, for operation of devices during machine work. A pocket cover is screwed to the upper part of the side walls, and it is used for installation of connections of auxiliary devices.

Pocket 2 is used to load the bucket elevator through a BIN feed hopper. It consists of two side walls, an upper wall and a bottom plate. Grain is fed from the hopper to the pocket through a connection of a screw conveyor fixed to the upper wall.

Pocket 2 is used for direct connection of one or two downpipes or screw conveyors. The pocket is provided with two spigots of a nominal diameter of 300 mm, for direct connection of devices. An inspection viewing glass is installed in the pocket side wall, to monitor the machine operation. All loading pockets and the pocket connector are made of galvanised steel sheet.

*Variant I: Loading pocket 1*



*Variant II: Loading pocket 1 with a connector*

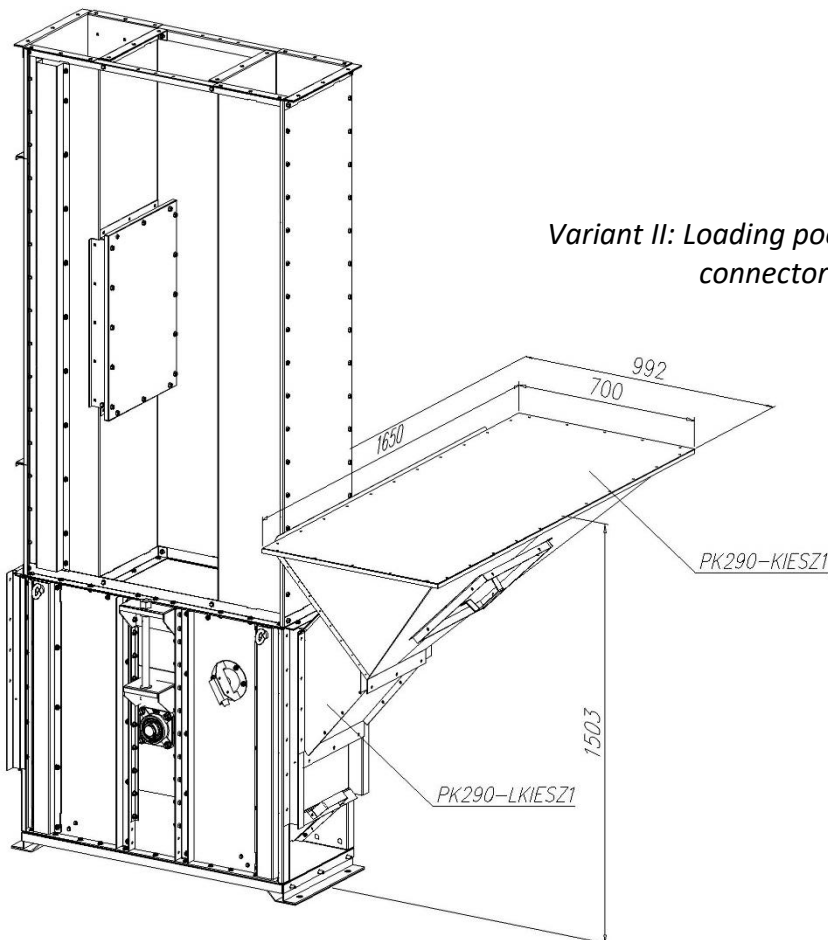


Figure 7. Loading pocket 1 of a bucket elevator - installation variants



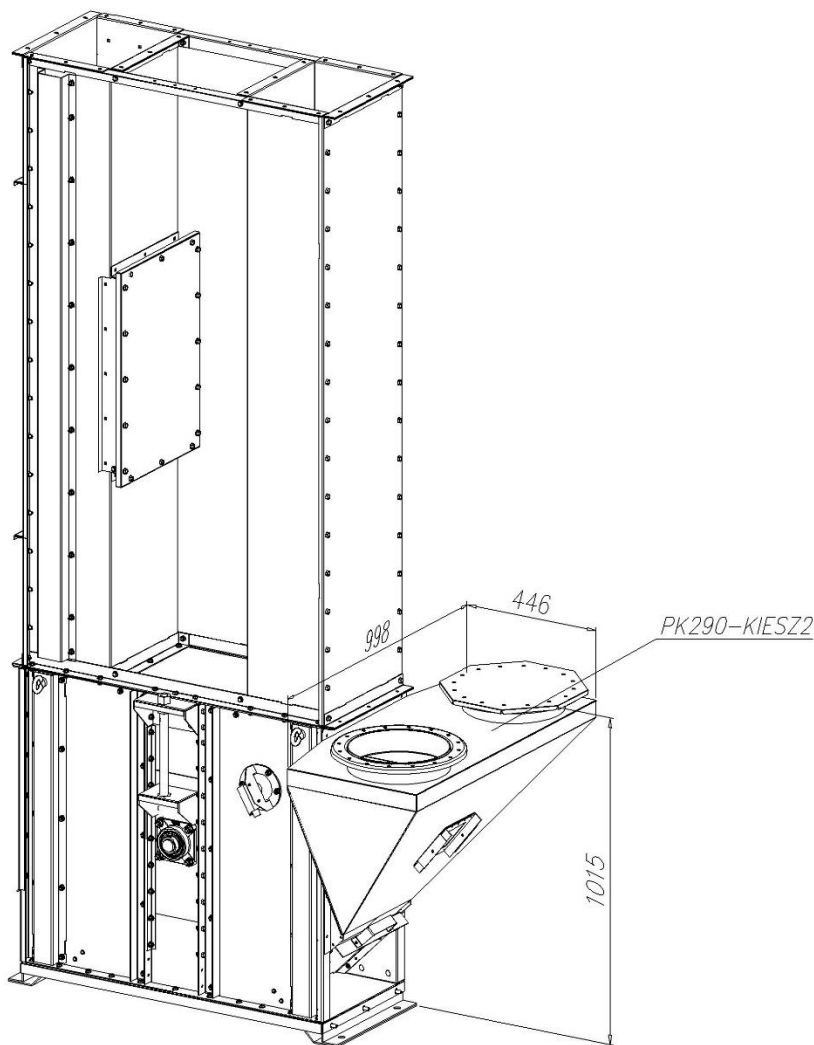


Figure 8. Loading pocket 2 of a bucket elevator

## F) FOUNDATION

The investor should order people holding required licences to prepare an appropriate foundation, its documentation, and associated tests, as required by current legislation. The foundations shape, dimensions and construction depend on machines and equipment working with the bucket elevator, and on user's individual operational conditions. Therefore, a foundation constructed for an elevator provided with a supporting tower will be different than the one constructed for an elevator fixed to other structures. Furthermore, a different foundation will be needed for installation of auxiliary belt or screw conveyors, or an inlet hopper, etc.

BIN sp. z o.o. has a construction design with an operating manual and installation and workshop documentation for the bucket elevator tower, with an example of the foundation and equipment. When the bucket elevator of the PK250 type is purchased, the investor may receive a copy of such design. Then, they should order a person holding a required licence to develop the relevant design taking into account local conditions, investment conditions, and guidelines included in the relevant construction design. Furthermore, when designing and constructing a foundation for a bucket elevator, the following conditions need to be observed:

### GUIDELINES FOR DESIGNING FOUNDATIONS

- A correctly designed and constructed foundation is one of preconditions for correct installation, and failure-free operation of the bucket elevator and its optional support tower.
- The bucket elevator should be fixed to the foundation/foundation slab with steel expansion, glued-in, or concreted anchors.
- Geotechnical conditions - when designing foundations for bucket elevators, local geotechnical conditions should be considered.

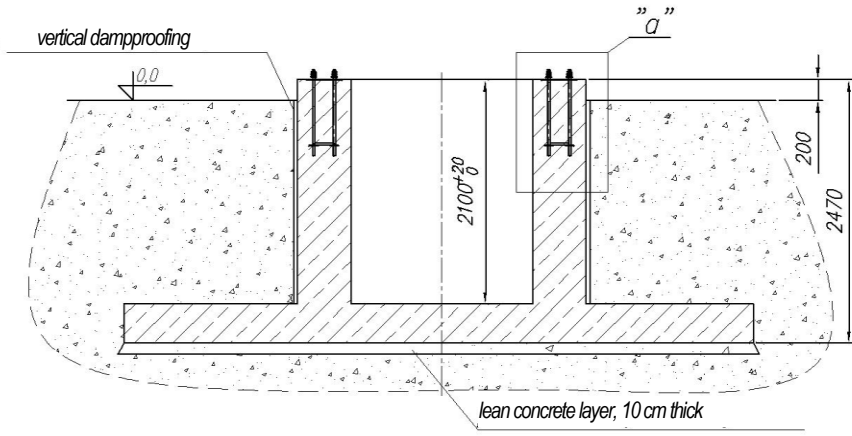
- The foundation load (by the elevator and the tower, with installed and auxiliary devices) according to the construction design (available at BIN sp. z o.o.).
- Minimum concrete class– C16/20 (B20).

#### CONDITIONS FOR FOUNDATIONS CONSTRUCTION AND ACCEPTANCE

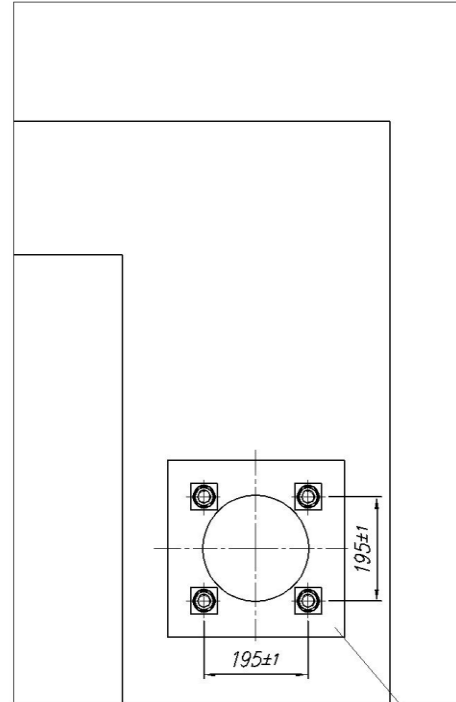
- Foundation/foundation slabs must be constructed in accordance with construction best practices and BIN Sp. z o.o. guidelines.
- A topsoil layer and non-load bearing layers under the foundation must be removed.
- Construct sand and cement bedding, class 7.5–10 MPa (substrate of B7.5–B10 lean concrete), 100 mm thick.
- Foundation drainage should be provided.
- The concrete must be vibrated.
- Before concrete works, a reinforcement report should be drawn up together with a construction site manager.
- Acceptance of the foundation in a presence of a construction site manager, an installation company manager and the Investor's representative is precondition for starting installation of the elevator.
- The construction site manager confirms acceptance of the foundation with an entry in the site logbook, before installation of the elevator starts.
- When the foundations are not constructed correctly, installation of the elevator may be cancelled.
- BIN Sp. z o.o. shall not be held responsible for any elevator damage and other damage resulting from incorrect design and construction of the foundation.

Figure 9 presents guidelines for construction of a foundation for a bucket elevator with a support tower and most commonly used equipment, for illustrative geotechnical conditions (the drawing is a part of a documentation for a repeatable construction design with an operating manual and installation and workshop documentation).

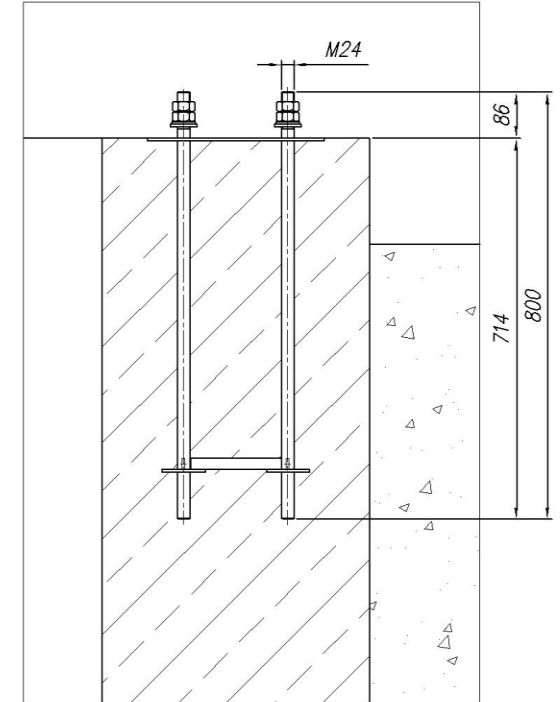
Figure 9. Guidelines for construction of a foundation for an elevator with a support tower WPK.



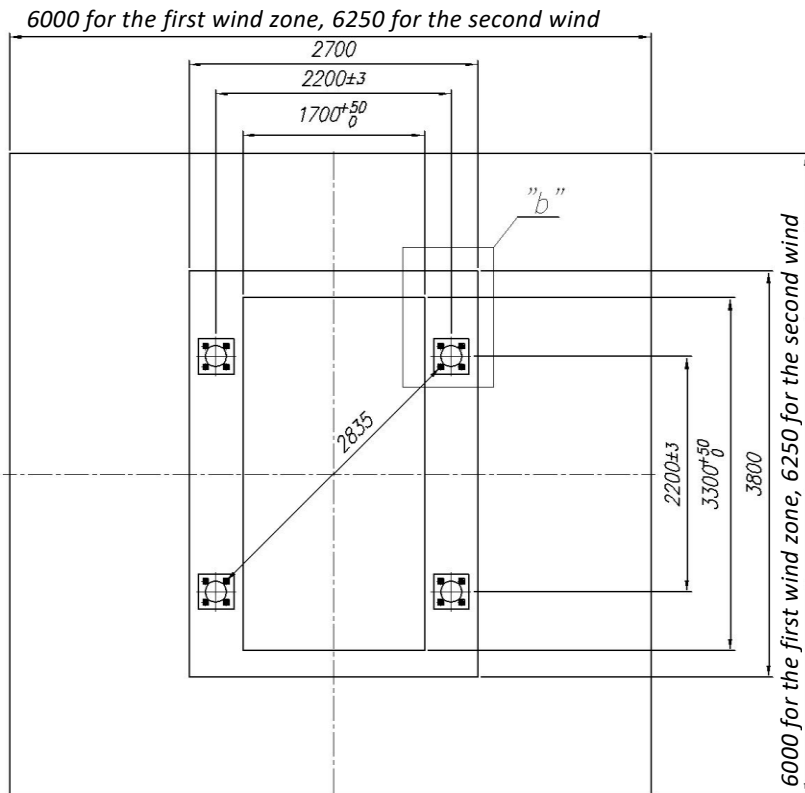
Detail "b"  
Scale 1:10



Detail "a"  
Scale 1:10



Anchor of the PK tower



G) SUPPORT TOWER OF THE ELEVATOR/OPERATING PLATFORM OF THE BUCKET ELEVATOR OF THE PK290 TYPE/MULTIFUNCTIONAL SUPPORT

ELEVATOR SUPPORT TOWER

The tower of the bucket elevator, of the WPK type, is a high frame structure with a square base, of nominal dimensions of 2.2 m x 2.2 m. All detailed information about the tower and basic auxiliary devices is provided in the construction design with an operating manual and installation and workshop documentation (available at BIN sp. z o.o.). The manufactured towers have a design suitable for the following models of the offered elevators of the PK290 type:

*Table 3. A list of individual models of the PK290 type and corresponding towers of the WPK-1 type.*

Elevator model of the PK290-120 type	Elevator model of the PK290-100 type	Tower model of the WPK-1 type
PK290-120-14.3	PK290-100-14.3	WPK-1-12.8
PK290-120-15.7	PK290-100-15.7	WPK-1-14.3
PK290-120-17.1	PK290-100-17.1	WPK-1-15.7
PK290-120-18.6	PK290-100-18.6	WPK-1-17.1
PK290-120-20.0	PK290-100-20.0	WPK-1-18.5
PK290-120-21.4	PK290-100-21.4	WPK-1-20.0
PK290-120-22.8	PK290-100-22.8	WPK-1-21.4
PK290-120-24.2	PK290-100-24.2	WPK-1-22.8
PK290-120-25.6	PK290-100-25.6	WPK-1-24.2
PK290-120-27.1	PK290-100-27.1	WPK-1-25.6
PK290-120-28.5	PK290-100-28.5	WPK-1-27.1
PK290-120-29.9	PK290-100-29.9	WPK-1-28.5

Installation of the bucket elevator equipped with a tower requires construction of an appropriate foundation with special anchors used to fix the tower. Detailed guidelines for designing and construction of the foundation and a way for installation of anchors are described in this operating manual (section F) and in the construction design for the tower of the WPK-1 type.

OPERATING PLATFORM OF THE BUCKET ELEVATOR OF THE PK250/PK290 TYPE

The operating platform is intended for operation and use of the drive unit and the head of the bucket elevator of the PK250 and PK290 type. Basic units of the operating platform (Figure 10) are an access platform installed in the upper part of the bucket elevator and a vertical ladder with a safety cage and a secured entry, providing access to the platform and installation components of the ladder. The operating platform is required when the elevator is installed without the support tower that includes the operating platform. The length and the number of fixing components of the ladder depend on a conditions for ensuring access to the ladder. When a free-standing elevator is installed, the ladder should reach to the foundation (Figure 10), and when the elevator PK290 is fixed to a silo wall, the ladder should reach to the level of the operating platform installed on the silo. Installation of the operating platform and the ladder should meet formal, legal and normative requirements for access measures to platforms.

The operating platform of the bucket elevator of the PK290 type can only be installed during installation of the elevator and it cannot be installed on already existing elevators.

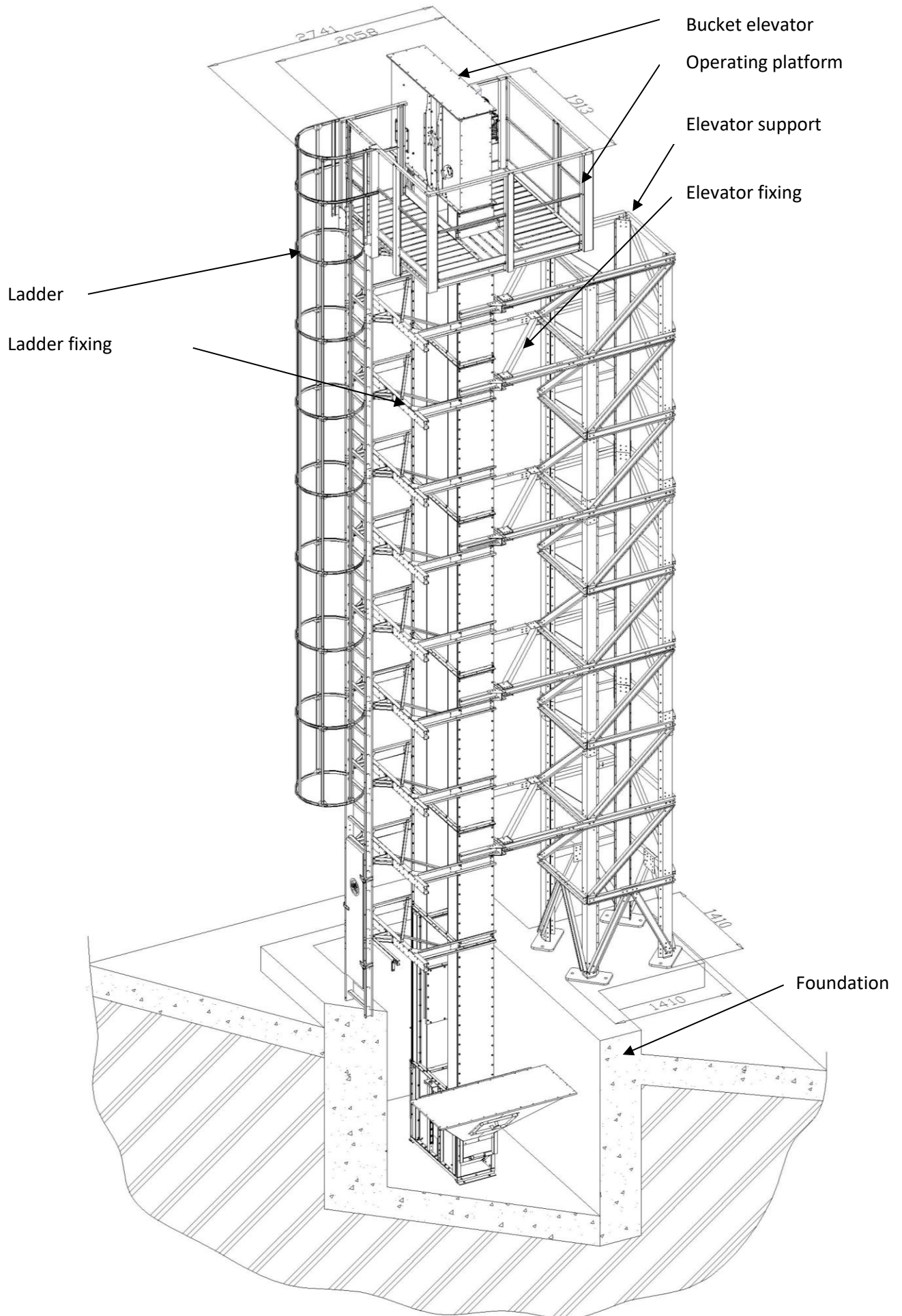


Figure 10 Operating platform for an elevator of the PK290 type.

## A COVER FOR AN ACCESS PASS FROM A BUCKET ELEVATOR TO AN OPERATING PLATFORM ON A SILO

The cover is a safety component providing protection during operation, and especially when climbing up or down the ladder between the operating platform on the silo and the operating platform on the bucket elevator. The cover consists of a number of protective meshes fixed around the ladder. The pass cover can be installed on platforms of silos of the NBIN100, NBIN200, NBIN500, NBIN1000, NBIN1500, FBIN9, FBIN11, FBIN14, FBIN17, or FBIN19 type.

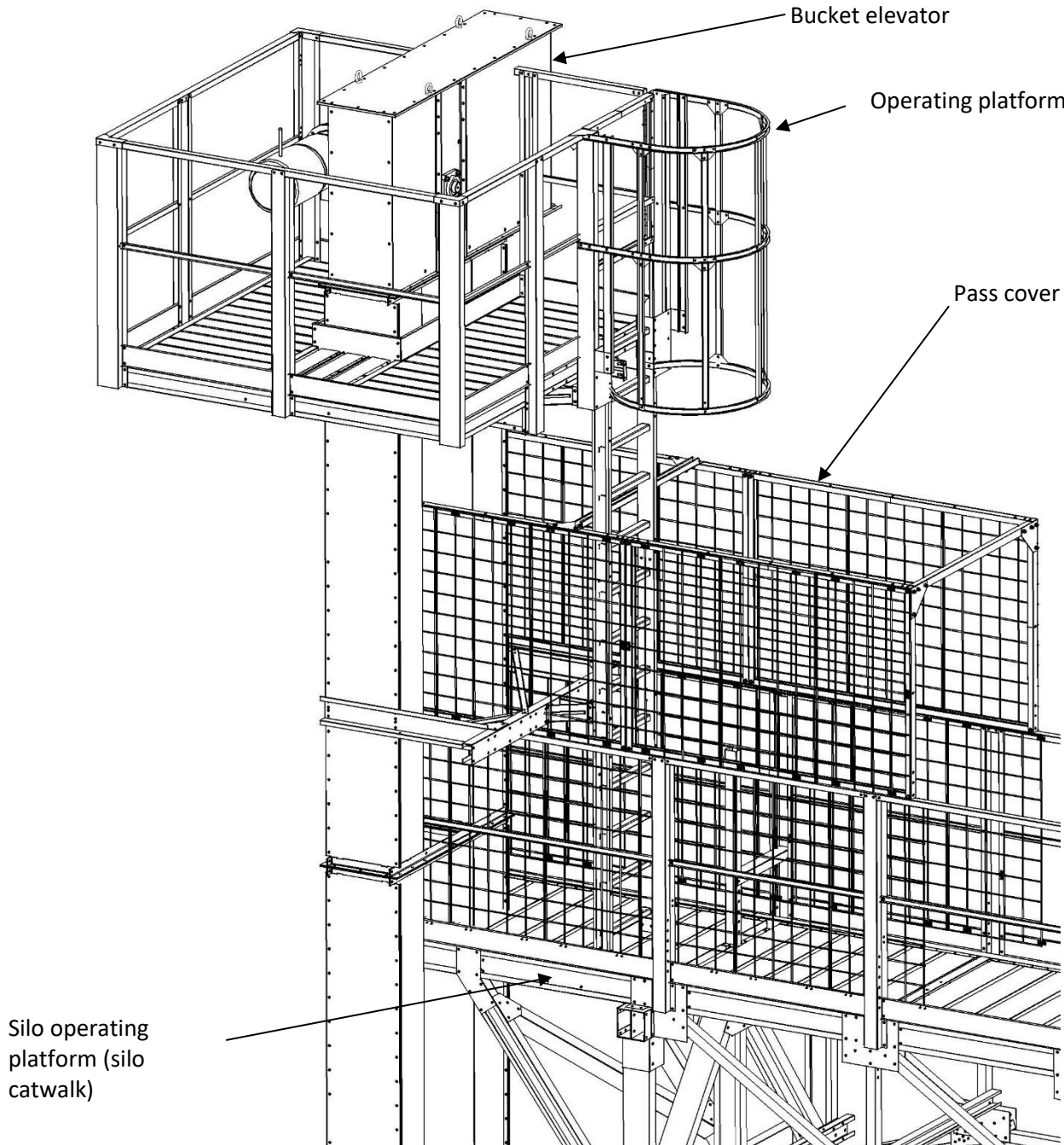


Figure 11. Cover of a pass from the bucket elevator.

## MULTIFUNCTIONAL SUPPORT FOR DOWNPIPES AND CONVEYORS

A multifunctional support for downpipes and conveyors is a frame structure with a square base. Its main load-bearing component are four posts connected with each other with horizontal beams and diagonal struts. All detailed information about the support is provided in the construction design with installation and workshop documentation (available at BIN sp. z o.o.).

The support can be installed as a support for the bucket elevator of the PK290 type (Figure 10). The elevator should be fixed to the support structure with a sufficient number of fixing elements of the PRS-MOC/PK type (Table 4).

*Table 4. A list of individual models of the PK290 type and corresponding supports of the PRS type.*

Elevator model of the PK290-120 type	Elevator model of the PK290-100 type	Support model of the PRS type	Number of fittings of the PRS-MOC/PK type
PK290-120-8.6	PK290-100-8.6	PRS-6M	3
PK290-120-10.0	PK290-100-10.0	PRS-8M	4
PK290-120-11.4	PK290-100-11.4	PRS-9M	5
PK290-120-12.8	PK290-100-12.8	PRS-11M	6

The support of the PRS type can also be used to support downpipes (Figure 12). Heights of supports for downpipes are provided in Table 6. The upper segment with a boom of the PRS-MOC/RURI is a necessary component of the supports for downpipes. The segment is of a variable height, from 625 mm to 1575 mm. The boom can be installed every 950 mm on the entire length of the support of the PRS type. Furthermore, it is equipped with rotating connections, so it can be adjusted to a specific downpipe type. Pipe fixing components of the RU300-MOC1 type, described in this manual (section H) are also necessary for fixing the downpipe.

*Table 5 A list of individual support models of the PRS type for downpipes.*

PRS model (WSK code)	H [m]
PRS-6M	5.78
PRS-7M	6.73
PRS-8M	7.68
PRS-9M	8.63
PRS-10M	9.58
PRS-11M	10.53

Installation of the support for downpipes requires the use of special equipment, and relevant know-how. Therefore, the device can only be installed by an installation company authorised by BIN. Due to risks related to the installation works, it is forbidden for the investor or other companies not authorised by BIN to perform these works. Installation can be started when a building permit is obtained, necessary foundations are constructed, and all components of the structure are gathered, including accessory devices and components. Detailed guidelines for the foundation design and construction, as well as for anchoring are described in the construction design with installation and workshop documentation. The investor can receive a copy of such design. Then, they should order a person holding a required licence to develop the relevant design taking into account local conditions, investment conditions, and guidelines included in the said design.

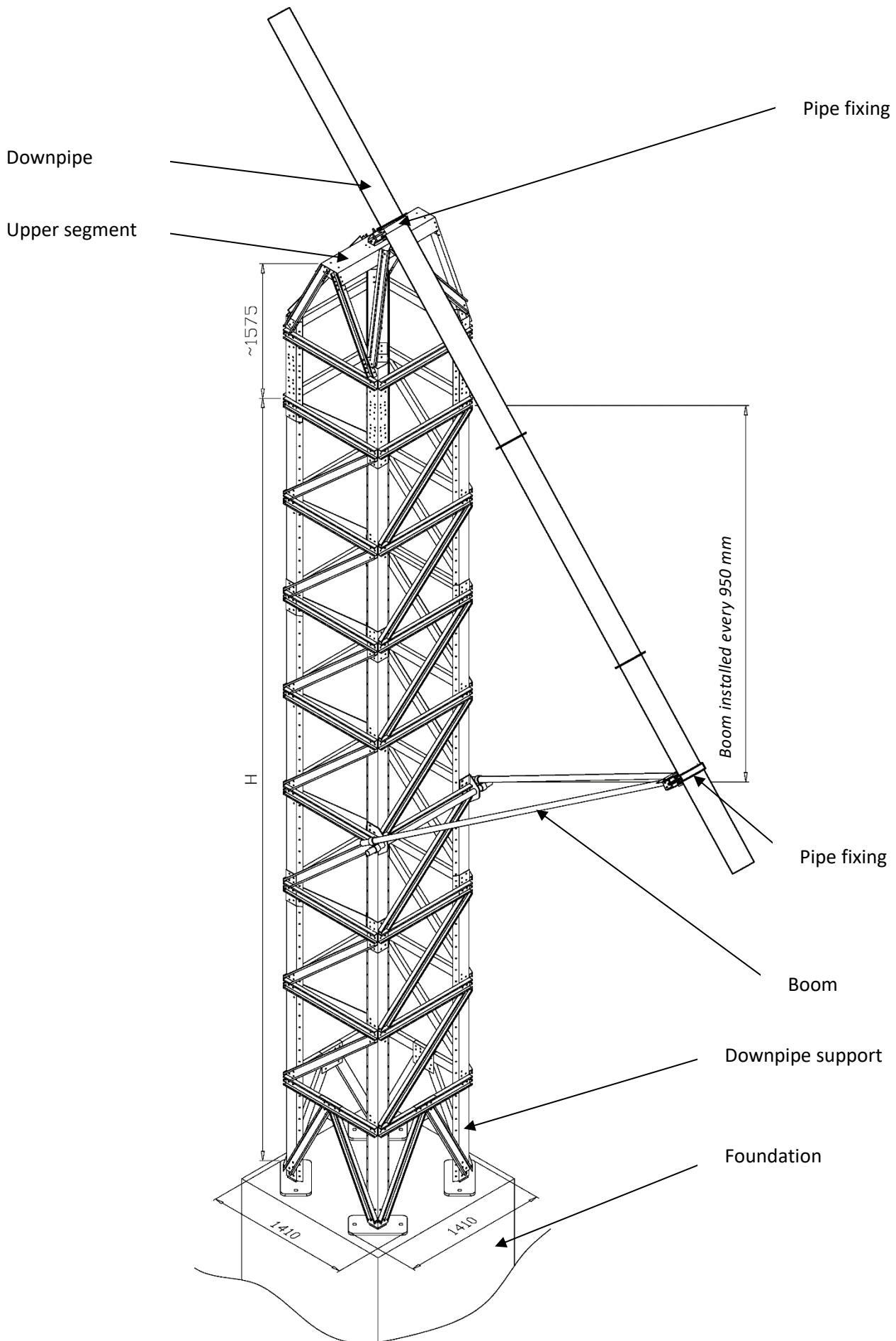


Figure 12. Downpipe support.



### ELEVATOR FIXING TO A SILO WALL

A bucket elevator of the PK290 type can be fixed to a wall of a silo of the NBIN and FBIN type. This is done with dedicated fixing components. Installation of the elevator with fixing components requires the use of special equipment, and relevant know-how. Due to risks related to the installation works, it is forbidden for the investor or other companies not authorised by BIN to perform these works. The number of fixing components depends on a height of the bucket elevator and is established at the bid stage by a trained BIN employee.

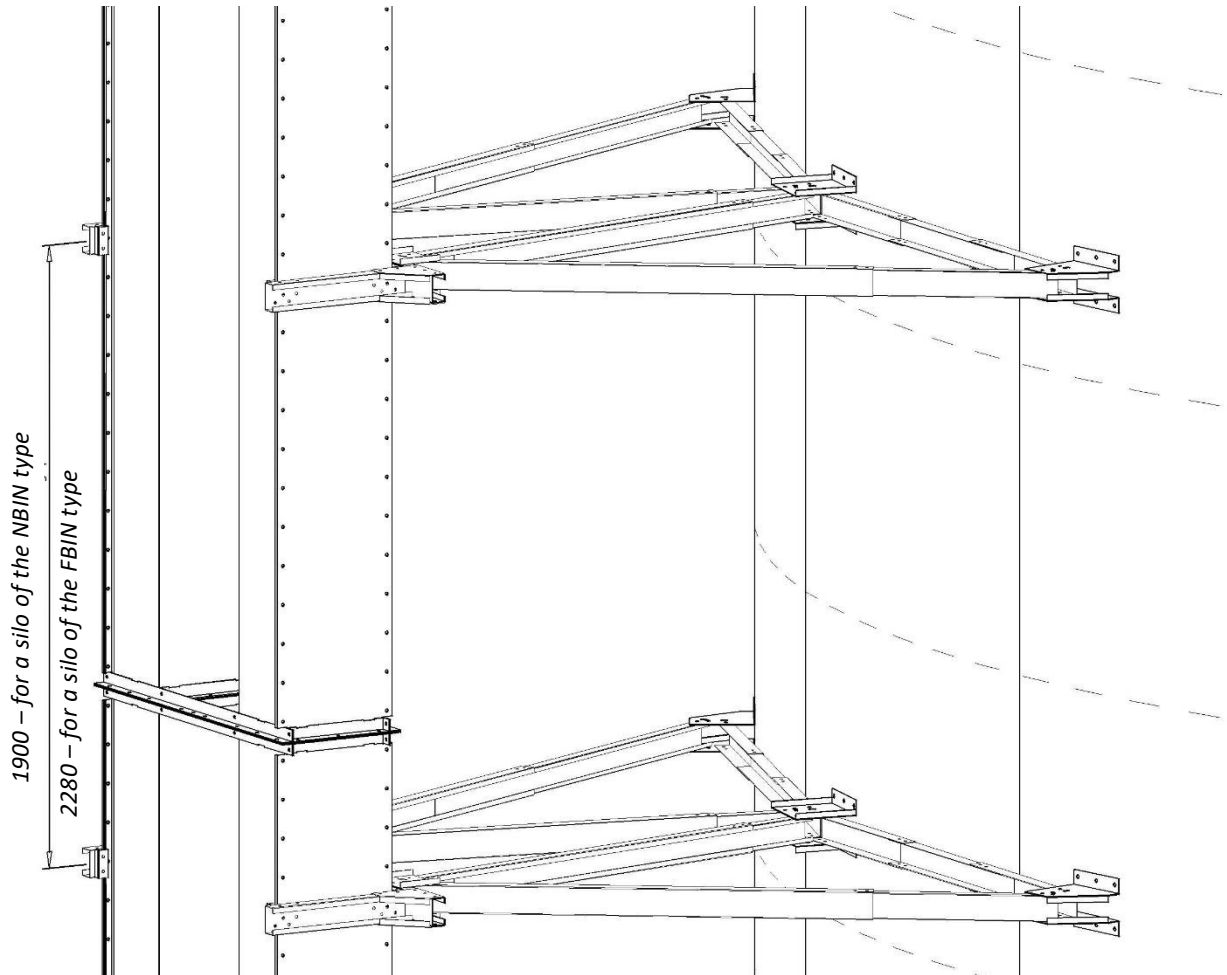


Figure 13. Elevator fixing to a silo.

## H) TWO-WAY SEPARATOR - RU300-ROZ2/RU300-ROZ2/NE

The separator is normally prepared for connection to the head of the PK290 elevator. A symmetrical two-way separator is connected to an outlet connection of the bucket elevator and enables directing the stream of the transported material to an appropriate downpipe (one of two side by side pipes). When two, three or a higher number of separators are connected, the number of downpipes to which the transported material can be directed, increases proportionally. The separator consists of a body with three spigots provided with rotating flanges. One inlet spigot (an inlet for material from the bucket elevator) and two outlet spigots for connection of downpipes. A mobile hatch installed in the body is a working component directly responsible for directing the material stream to a relevant outlet spigot. The working hatch is controlled with the cable of the PK-ROZ2-200/LIN type (of a length not exceeding 12.5 m) or using an electric motor through a screw reducer. Both the cable and the electric drive are not a standard equipment of a separator. The separator is made of hot-dip galvanised steel sheet.

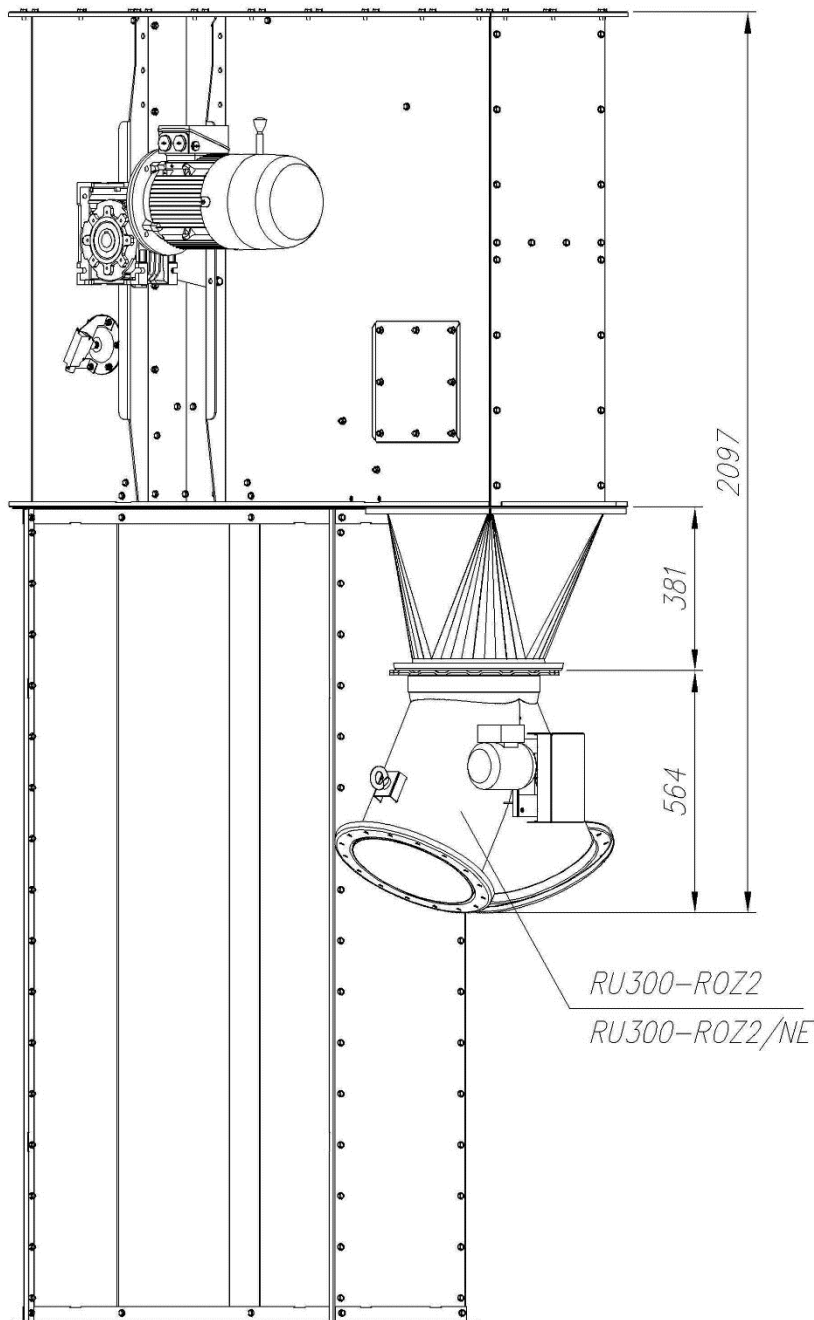


Figure 14. Separators for transported material.

Table 6. A technical specification of a two-way separator with an electric drive.

Item	parameter	unit	two-way separator
1.	Motor type		SKg 56 - 4B2
2.	Nominal motor power	kW	0.09
3.	Engine rotational speed	rpm	1380
4.	Power supply voltage	V	3x400
5.	Screw reducer type		SRT 28 B14
6.	Reducer transmission ratio		i = 100

### I) BUCKET ELEVATOR HEAD

The head acts as a housing for the elevator drive drum and determines a shape and dimensions of the outlet duct, enabling installation of a relevant spigot. Furthermore, it is also a location for connection of a drive unit for the bucket elevator. The head is installed on the last (top) segment of the elevator body. Bearings of the drive drum are installed in the head side walls, and the drum cooperates with a relevant drive unit. The head is not provided with a drive unit as a standard option. The head is made of galvanised metal sheet. The drive drum is coated with paint. The outlet spigot forms a standard equipment of the bucket elevator, it is 300 mm in diameter, and it is adjusted for installation of elements of the gravitational transport of 300 mm in diameter, manufactured by BIN.

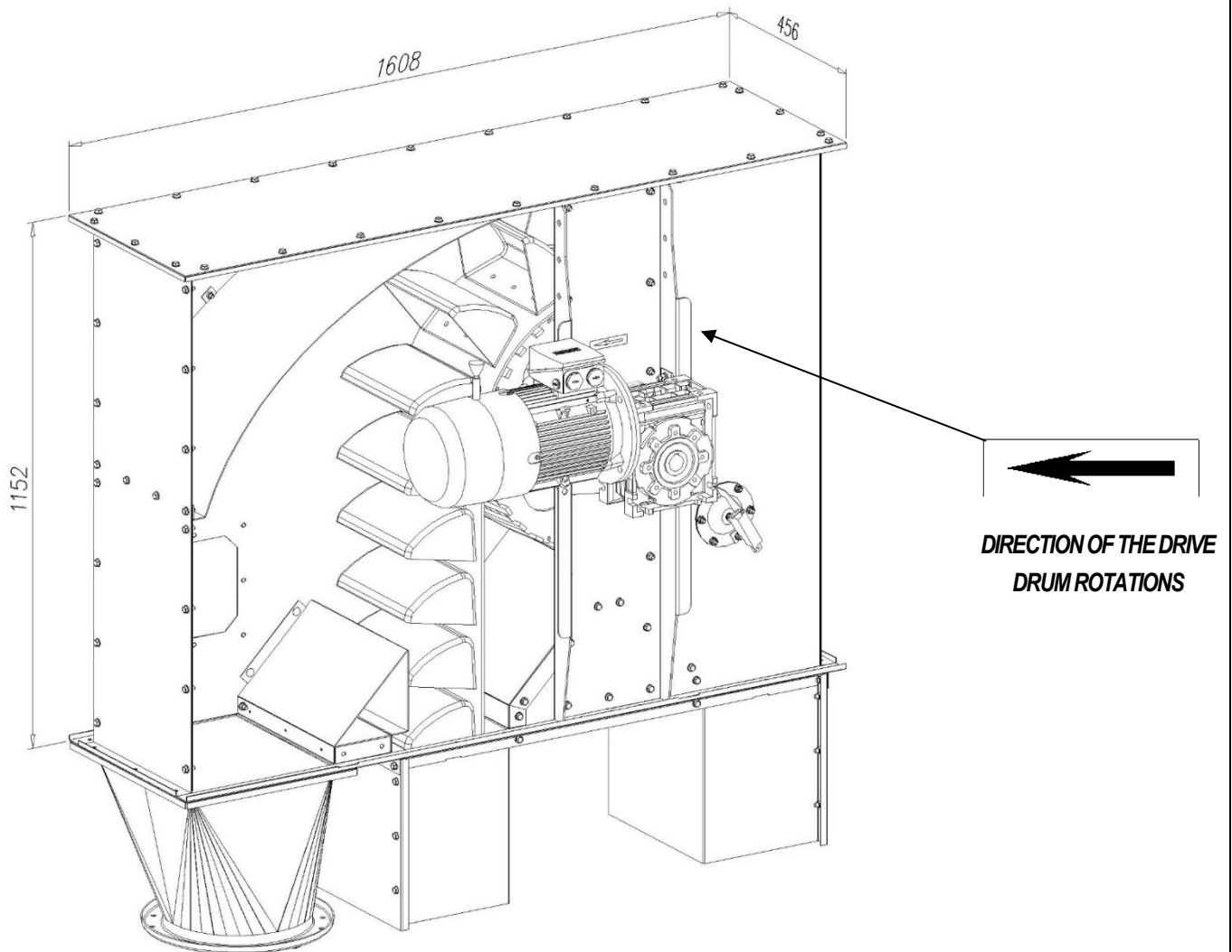


Figure 15. The head of the bucket elevator with a drive unit.

### J) A DRIVE UNIT OF A BUCKET ELEVATOR

The drive unit is fixed to the elevator head. Through a shaft with bearings, it initiates the rotating movement of the drive drum. It consists of a screw or conical-cylindrical reducer and an electric motor with an electromagnetic DC brake.

Each of driving units can be installed either on the left or on the right side of the bucket elevator head. The type of the drive unit depends on the conveyor type. Guidelines concerning the drive used are provided in Table 7 and in Table 8.

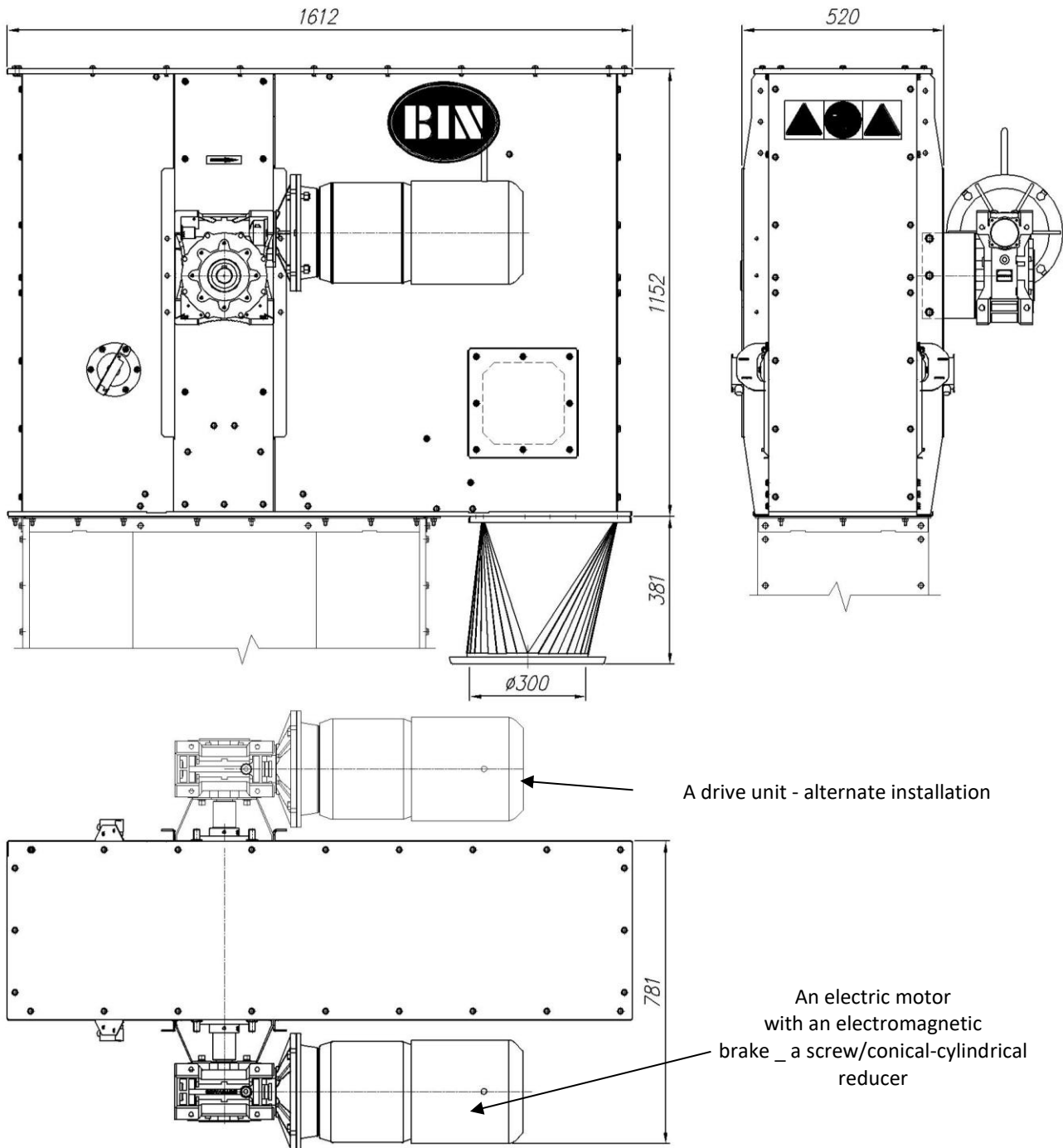


Figure 16. A drive unit of a bucket elevator

## 2.4. Elevator design

Table 7. A list of equipment for elevators of the PK290-120 type.

Unit of an elevator of the PK290 type	Team name	Elevator foot	Elevator head	Drive unit of 3kW	Drive unit of 4kW	Drive unit of 5.5kW	Drive unit of 7.5kW	Drive unit of 9.2kW	Drive unit of 11kW	Drive unit of 15kW	Drive unit of 18.5kW	8 mm working belt	Working bucket	1.9 m segment with installation openings	1.9 m segment	1.425m segment
	unit weight*) [kg]	277	304	66	74	126	150	166	166	213	3	4.6 kg/rm	0.48	164	107	85
	Unit dimensions*) LxWxH [m]	0.98 x 1.13 x 0.61	1.61 x 1.15 x 0.52	0.67 x 0.25 x 0.39	0.73 x 0.25 x 0.39	0.93 x 0.30 x 0.50	0.93 x 0.30 x 0.50	0.87 x 0.30 x 0.52	0.87 x 0.30 x 0.52	1.07 x 0.35 x 0.75	1.30 x 0.35 x 0.6	L x 0.32 x 0.008	0.29 x 0.17 x 0.11	0.44 x 1.11 x 1.90	0.44 x 1.11 x 1.90	0.44 x 1.11 x 1.425
A model of an elevator of the PK290 type, of 120 t/h capacity	PK290-120-3.3	1 pcs.	1 pcs.	1 pcs.	-	-	-	-	-	-	-	12.9 rm	76 pcs.	1 pcs.	-	1 pcs.
	PK290-120-4.7	1 pcs.	1 pcs.	-	1 pcs.	-	-	-	-	-	-	15.8 rm	96 pcs.	1 pcs.	-	2 pcs.
	PK290-120-5.7	1 pcs.	1 pcs.	-	1 pcs.	-	-	-	-	-	-	17.7 rm	110 pcs.	1 pcs.	2 pcs.	-
	PK290-120-7.1	1 pcs.	1 pcs.	-	-	1 pcs.	-	-	-	-	-	20.5 rm	130 pcs.	1 pcs.	2 pcs.	1 pcs.
	PK290-120-8.6	1 pcs.	1 pcs.	-	-	1 pcs.	-	-	-	-	-	23.4 rm	150 pcs.	1 pcs.	2 pcs.	2 pcs.
	PK290-120-10.0	1 pcs.	1 pcs.	-	-	-	1 pcs.	-	-	-	-	26.2 rm	171 pcs.	1 pcs.	2 pcs.	3 pcs.
	PK290-120-11.4	1 pcs.	1 pcs.	-	-	-	1 pcs.	-	-	-	-	29.1 rm	191 pcs.	1 pcs.	5 pcs.	-
	PK290-120-12.8	1 pcs.	1 pcs.	-	-	-	-	1 pcs.	-	-	-	31.9 rm	212 pcs.	1 pcs.	5 pcs.	1 pcs.
	PK290-120-14.3	1 pcs.	1 pcs.	-	-	-	-	1 pcs.	-	-	-	34.8 rm	232 pcs.	1 pcs.	5 pcs.	2 pcs.
	PK290-120-15.7	1 pcs.	1 pcs.	-	-	-	-	1 pcs.	-	-	-	37.6 rm	252 pcs.	1 pcs.	5 pcs.	3 pcs.
	PK290-120-17.1	1 pcs.	1 pcs.	-	-	-	-	-	1 pcs.	-	-	40.5 rm	272 pcs.	1 pcs.	8 pcs.	-
	PK290-120-18.6	1 pcs.	1 pcs.	-	-	-	-	-	1 pcs.	-	-	43.3 rm	293 pcs.	1 pcs.	8 pcs.	1 pcs.
	PK290-120-20.0	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	46.2 rm	313 pcs.	1 pcs.	8 pcs.	2 pcs.
	PK290-120-21.4	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	49.0 rm	334 pcs.	1 pcs.	8 pcs.	3 pcs.
	PK290-120-22.8	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	51.9 rm	354 pcs.	1 pcs.	11 pcs.	-
	PK290-120-24.2	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	54.7 rm	374 pcs.	1 pcs.	11 pcs.	1 pcs.
	PK290-120-25.6	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	57.5 rm	395 pcs.	1 pcs.	11 pcs.	2 pcs.
	PK290-120-27.1	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	60.4 rm	415 pcs.	1 pcs.	11 pcs.	3 pcs.
	PK290-120-28.5	1 pcs.	1 pcs.	-	-	-	-	-	-	-	1 pcs.	63.3 rm	436 pcs.	1 pcs.	14 pcs.	-
	PK290-120-29.9	1 pcs.	1 pcs.	-	-	-	-	-	-	-	1 pcs.	66.1 rm	456 pcs.	1 pcs.	14 pcs.	1 pcs.
PK290-120-31.4	1 pcs.	1 pcs.	-	-	-	-	-	-	-	1 pcs.	69.0 rm	476 pcs.	1 pcs.	14 pcs.	2 pcs.	
PK290-120-32.8	1 pcs.	1 pcs.	-	-	-	-	-	-	-	1 pcs.	71.8 rm	496 pcs.	1 pcs.	14 pcs.	3 pcs.	
PK290-120-34.2	1 pcs.	1 pcs.	-	-	-	-	-	-	-	1 pcs.	74.7 rm	517 pcs.	1 pcs.	17 pcs.	-	

\*) – the unit weight and dimensions are only for illustrative purposes, specified for a machine packed for transport, packaging included.

Table 8. A list of equipment for elevators of the PK290-100 type.

Unit of an elevator of the PK290 type	Unit name	Elevator foot	Elevator head	Drive unit of 3kW	Drive unit of 4kW	Drive unit of 5.5kW	Drive unit of 7.5kW	Drive unit of 9.2kW	Drive unit of 11kW	Drive unit of 15kW	Drive unit of 18.5kW	8 mm working belt	Working bucket	1.9 m segment with installation openings	1.9 m segment	1.425m segment
	unit weight*) [kg]	277	304	66	74	126	150	166	166	213	3	4.6 kg/rm	0.48	164	107	85
	Unit dimensions*) LxWxH [m]	0.98 x 1.13 x 0.61	1.61 x 1.15 x 0.52	0.67 x 0.25 x 0.39	0.73 x 0.25 x 0.39	0.93 x 0.30 x 0.50	0.93 x 0.30 x 0.50	0.87 x 0.30 x 0.52	0.87 x 0.30 x 0.52	1.07 x 0.35 x 0.75	1.30 x 0.35 x 0.6	L x 0.32 x 0.008	0.29 x 0.17 x 0.11	0.44 x 1.11 x 1.90	0.44 x 1.11 x 1.90	0.44 x 1.11 x 1.425
A model of an elevator of the PK290 type, of 100 t/h capacity	PK290-100-3.3	1 pcs.	1 pcs.	1 pcs.	-	-	-	-	-	-	-	12.9 rm	64 pcs.	1 pcs.	-	1 pcs.
	PK290-100-4.7	1 pcs.	1 pcs.	1 pcs.	-	-	-	-	-	-	-	15.8 rm	82 pcs.	1 pcs.	-	2 pcs.
	PK290-100-5.7	1 pcs.	1 pcs.	-	1 pcs.	-	-	-	-	-	-	17.7 rm	94 pcs.	1 pcs.	2 pcs.	-
	PK290-100-7.1	1 pcs.	1 pcs.	-	1 pcs.	-	-	-	-	-	-	20.5 rm	111 pcs.	1 pcs.	2 pcs.	1 pcs.
	PK290-100-8.6	1 pcs.	1 pcs.	-	-	1 pcs.	-	-	-	-	-	23.4 rm	129 pcs.	1 pcs.	2 pcs.	2 pcs.
	PK290-100-10.0	1 pcs.	1 pcs.	-	-	1 pcs.	-	-	-	-	-	26.2 rm	146 pcs.	1 pcs.	2 pcs.	3 pcs.
	PK290-100-11.4	1 pcs.	1 pcs.	-	-	-	1 pcs.	-	-	-	-	29.1 rm	164 pcs.	1 pcs.	5 pcs.	-
	PK290-100-12.8	1 pcs.	1 pcs.	-	-	-	1 pcs.	-	-	-	-	31.9 rm	182 pcs.	1 pcs.	5 pcs.	1 pcs.
	PK290-100-14.3	1 pcs.	1 pcs.	-	-	-	1 pcs.	-	-	-	-	34.8 rm	199 pcs.	1 pcs.	5 pcs.	2 pcs.
	PK290-100-15.7	1 pcs.	1 pcs.	-	-	-	1 pcs.	-	-	-	-	37.6 rm	216 pcs.	1 pcs.	5 pcs.	3 pcs.
	PK290-100-17.1	1 pcs.	1 pcs.	-	-	-	-	1 pcs.	-	-	-	40.5 rm	233 pcs.	1 pcs.	8 pcs.	-
	PK290-100-18.6	1 pcs.	1 pcs.	-	-	-	-	1 pcs.	-	-	-	43.3 rm	251 pcs.	1 pcs.	8 pcs.	1 pcs.
	PK290-100-20.0	1 pcs.	1 pcs.	-	-	-	-	1 pcs.	-	-	-	46.2 rm	268 pcs.	1 pcs.	8 pcs.	2 pcs.
	PK290-100-21.4	1 pcs.	1 pcs.	-	-	-	-	-	1 pcs.	-	-	49.0 rm	286 pcs.	1 pcs.	8 pcs.	3 pcs.
	PK290-100-22.8	1 pcs.	1 pcs.	-	-	-	-	-	1 pcs.	-	-	51.9 rm	303 pcs.	1 pcs.	11 pcs.	-
	PK290-100-24.2	1 pcs.	1 pcs.	-	-	-	-	-	1 pcs.	-	-	54.7 rm	321 pcs.	1 pcs.	11 pcs.	1 pcs.
	PK290-100-25.6	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	57.5 rm	338 pcs.	1 pcs.	11 pcs.	2 pcs.
	PK290-100-27.1	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	60.4 rm	356 pcs.	1 pcs.	11 pcs.	3 pcs.
	PK290-100-28.5	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	63.3 rm	373 pcs.	1 pcs.	14 pcs.	-
	PK290-100-29.9	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	66.1 rm	391 pcs.	1 pcs.	14 pcs.	1 pcs.
PK290-100-31.4	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	69.0 rm	408 pcs.	1 pcs.	14 pcs.	2 pcs.	
PK290-100-32.8	1 pcs.	1 pcs.	-	-	-	-	-	-	1 pcs.	-	71.8 rm	425 pcs.	1 pcs.	14 pcs.	3 pcs.	
PK290-100-34.2	1 pcs.	1 pcs.	-	-	-	-	-	-	-	1 pcs.	74.7 rm	443 pcs.	1 pcs.	17 pcs.	-	

\*) – the unit weight and dimensions are only for illustrative purposes, specified for a machine packed for transport, packaging included.

### 3. Initial operations and preparing the elevator for operation

#### 3.1. Formal and legal arrangements for the investment

Construction of bucket elevators together with associated facilities and equipment should be conducted in accordance with the current Construction Law:

- The Construction Law Act of 07/07/1994 (Journal of Laws No. 89, item 414, as amended)
- Minister of Agriculture and Food Economy Regulation of 07/10/1997 concerning technical requirements that should be met by agricultural construction and their location (Journal of Laws No. 132, item 877, as amended)

The investor responsible for meeting all formal and legal issues for the investment, including the design. The designer is responsible for designing the foundations (methods for the elevator fixing) for the elevator and other equipment (when used) and for drawing up a land development plan.

This operating manual contains guidelines for designing foundations, together with sizes of elevators. The whole elevator design documentation was drawn up at BIN spółka z o.o. Elevators were designed in accordance with current standards and regulations. They are intended to be used in climate conditions of Poland.

The investor is obliged to provide the user with necessary information concerning rules of operation (starting, stopping, controlling, signalisation, etc.) for the elevator and all equipment used together with it, including emergency procedures in the event of a fire, trapping, blocking of material in the equipment, and similar situations.

#### 3.2. Elevator location

- Elevators can be installed indoors or outdoors, provided a sufficient space is ensured.
- Elevators should be located at a sufficient distance from overhead power lines.
- Elevators can be erected at a minimum distance of 15 m away from storage of organic fertilisers: manure, liquid manure, and similar.
- Some units of the bucket elevator (the foot, the elevator pocket, etc.) are usually installed below the ground level. The said units should be effectively secured against access of ground and stormwaters, etc. It is forbidden to install and operate the elevator with its units covered by water (groundwater, stormwater, etc.).

#### 3.3. Ordering an elevator

Orders for elevators and spare parts can be placed with BIN Sp. z o.o. or with authorised BIN sales representatives.

Each time, before purchasing any components a customer should consult the manufacturer or a sales representative in detail about planned investment.

The manufacturer prepares the elevator before shipment in accordance with the specification.

#### 3.4. Transport of elevator components

Elevators are delivered as packed elements. Transport is arranged by a seller or the customer, under additional arrangements. The components require a transport vehicle of dimensions and capacity resulting from data - Table 7 and in Table 8. The cargo body of the vehicle must be provided with a tight tarpaulin. In transport, all equipment must be secured against sudden movement.

Loading and unloading should be performed with forklift trucks of capacity resulting from data - Table 7 and Table 8. During a delivery acceptance, an elevator buyer is obliged to check the delivery completeness against the specification attached to the components.



**It is forbidden to carry the pallets above people and animals.**



**During transport and storage, elevator units should be protected against moisture, especially components of the electrical wiring.**

**When the components become wet, they must be dried thoroughly, and their correct operation must be verified. Storage of wet elements may cause irreversible changes in the product parameters. The manufacturer shall not be held responsible for the above-mentioned defects resulting from a failure to observe the above recommendations.**

### **3.5. Electric systems and start-up**

The manufacturer equips elevators with the following electric subunits:

- electric three-phase motor with a DC brake;
- lockable main switch;
- limit switch with a pusher drive;
- motor (thermal) switch;
- undervoltage release;
- housing for the thermal switch and the undervoltage release.

The design documentation of the investment must include appropriate design study for the wiring system, taking into account the elevator connection together with auxiliary equipment. The investor is responsible for drawing up of this design study by a person holding relevant licences in accordance with current legislation.

The investor is responsible for construction of the electrical wiring system in accordance with the said design study by an electrician holding relevant licences.

Regardless of the function and construction method, the design study and the constructed wiring system must meet the following requirements:

- motor correctly connected (as required by a motor manufacturer),
- motor secured by a correct connection and adjustment of the thermal switch;
- securing against unintended starting of the elevator after power outage (undervoltage release);
- an option for securing the elevator against unintended start (e.g., a lockable delta star switch),
- voltage supplied to all units should be within ranges specified by manufacturers of those units;
- function for automatic stop of the elevator work (a control contact K) in the event of any incorrect work of accessories (e.g., failure of another conveyor) or people entering areas dangerous for them (e.g., a silo in which the elevator works).

The investor is responsible for delivery (at its own expense) of all electric equipment and units not being a part of the elevator equipment, but necessary for construction of required electrical wiring.

The investor is responsible for providing guidelines of the elevator manufacturer (included in this operating manual) to a person designing and constructing the wiring system.

A person constructing the wiring system should perform the first test starting of the elevator, check correctness of the motor rotations and consistence of current values on nominal plates of the motor and the thermal switch.

**The manufacturer requires a written confirmation of construction and checking of the wiring system by an electrician holding required licences.**



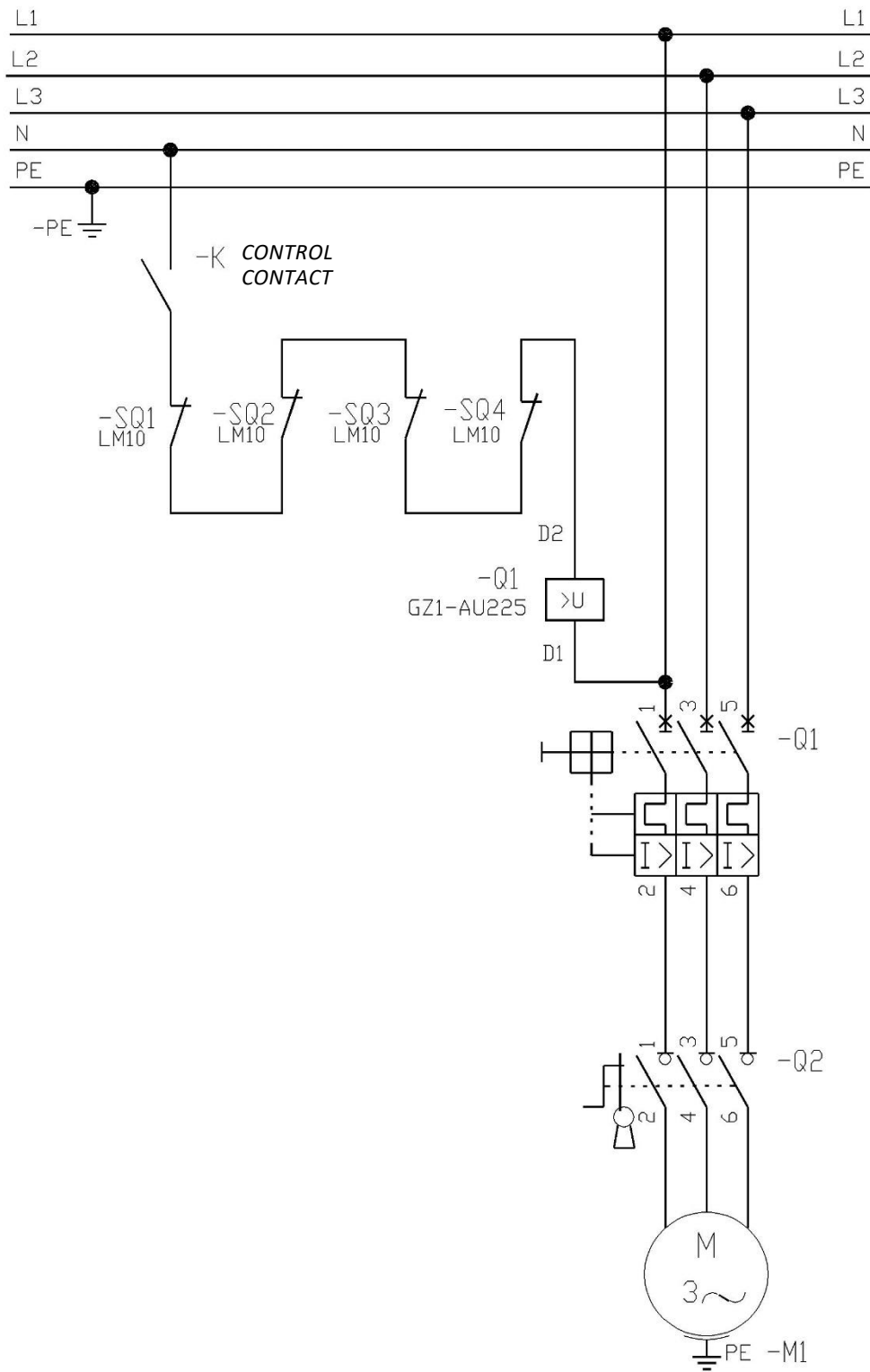


Figure 17. An example of the wiring diagram for elevators of the PK290 type

The above diagram represents general guidelines for construction of the wiring system for the elevator of the PK290 type. The units used can be replaced by equivalent devices having identical functions.

- M1: An electric three-phase motor with a DC brake;
- Q1: A thermal overcurrent circuit breaker with undervoltage release;
- Q2: A lockable main switch;
- SQ1, SQ2, SQ3, SQ4: A limit switch with a pusher drive - a belt position sensor described in Chapter 2.3, section C).
- K: The control contact; when closed, the contact enables operation of PK290, when open, PK290 cannot work; the contact should open in the case of:
  - an attempt to enter the silo by opening a manhole when PK290 operates as an unloading/loading conveyor for the silo;
  - stopping of the elevator or other equipment responsible for efficient reception of grain from PK290,
  - other conditions (depending on individual investment solutions), when further work of the PK290 elevator may pose a threat to health or life of humans or animals, or may result in a damage to the elevator or other equipment.

Bucket elevators with a 5.5 kW motor should be connected to the power grid in accordance with the description shown in the nominal plate.

Bucket elevators of a power exceeding 5.5 kW should be connected to the power grid directly in a "delta" system.

Table 9. A list of electric equipment for elevators of the PK290 type.

Elevator model	Motor type	Nominal motor power	Thermal overcurrent protection	Mains switch
		[kW]		
PK290-120-3.3	SKg100L4-HSY	3.0	GZ1-M14 6-10A	ŁK25R-2.8211 OB2Z
PK290-120-4.7	SKg112M4-HSY	4.0		
PK290-120-5.7				
PK290-120-7.1	SKg132S4-HSY	5.5	GZ1-M16 9-14A	
PK290-120-8.6	SKg132M4-HSY	7.5	GZ1-M20 13-18A	
PK290-120-10.0				
PK290-120-11.4				
PK290-120-12.8	SKg132M4-HSY	9.2	GZ1-M25 20-25A	ŁK63R-2.8211 OB2ZC
PK290-120-14.3				
PK290-120-15.7				
PK290-120-17.1	SKg160M4-HSY	11.0	GZ1-M25 24-32A	
PK290-120-18.6				
PK290-120-20.0	SKg160L4-HSY	15.0	GZ1-M25 24-32A	
PK290-120-21.4				
PK290-120-22.8				
PK290-120-24.2				
PK290-120-25.6				
PK290-120-27.1				
PK290-120-28.5	SKg180M4-HSY	18.5	GZ1-M25 25-40A	
PK290-120-29.9				
PK290-120-31.4				
PK290-120-32.8				
PK290-120-34.2				
PK290-100-3.3	SKg100L4-HSY	3.0	GZ1-M14 6-10A	ŁK25R-2.8211 OB2Z
PK290-100-4.7	SKg112M4-HSY	4.0		
PK290-100-5.7				
PK290-100-7.1				
PK290-100-8.6	SKg132S4-HSY	5.5	GZ1-M16 9-14A	
PK290-100-10.0	SKg132M4-HSY	7.5	GZ1-M20 13-18A	
PK290-100-11.4				
PK290-100-12.8				
PK290-100-14.3				
PK290-100-15.7				

PK290-100-17.1	SKg132M4-HSY	9.2	GZ1-M25 20-25A	ŁK63R-2.8211 OB2ZC
PK290-100-18.6				
PK290-100-20.0				
PK290-100-21.4	SKg160M4-HSY	11.0		
PK290-100-22.8				
PK290-100-24.2				
PK290-100-25.6	SKg160L4-HSY	15.0	GZ1-M25 24-32A	
PK290-100-27.1				
PK290-100-28.5				
PK290-100-29.9				
PK290-100-31.4				
PK290-100-32.8				
PK290-100-34.2	SKg180M4-HSY	18.5	GZ1-M25 25-40A	

### 3.6. Electric shock protection - lightning arrester system

The elevators should be protected against consequences of a lightning. A system must be provided, protecting people and animals against the electric shock related to the wiring of the elevator and its auxiliary equipment. The investor is obliged to provide the electric shock protection for people and animals, and to construct the lightning arrester system and the protective earthing of the elevator. Construction and performance verification of the lightning arrester system and the protective earthing of the elevator should be ordered at a person with required qualifications.

### 3.7. Fire prevention

The investor is obliged to fulfil all obligations related to fire prevention, including ensuring access and evacuation routes, access to sources of extinguishing water, and distribution of extinguishing equipment and fire safety instructions. Fire prevention aspects are governed by the Regulation of the Minister of Interior and Administration of 07 June 2010 concerning fire prevention in buildings, other structures, and terrains (Journal of Laws, 2010, No. 109, item 719) and the Minister of Interior and Administration Regulation of 24 July 2009 concerning supplies of water for extinguishing purposes and fire department access roads (Journal of Laws 2009, No. 124, Item 1030).

### 3.8. Information on installation

- a) Installation of the elevator requires the use of special equipment, and relevant know-how. Therefore, the machine can only be installed by an installation company authorised by BIN. The installation company should cooperate with an entity ordering installation, in terms of works organisation, financial settlements, and acceptance of installation works. Installation by the investor or companies not authorised by BIN is forbidden due to related hazards. Installation can be started after appropriate foundations are constructed and all components of the elevator and auxiliary equipment (e.g., downpipes, separators, supports, etc.) are gathered on site.
- b) During installation of the bucket elevator, lifting devices of a minimum load bearing capacity of Table 1 is necessary. Installation of the elevator with other devices (such as towers, separators, etc.) requires the use of lifting devices of a higher load bearing capacity, resulting from the documentation of those devices.
- c) The below requirements must be met to guarantee correct operation of the elevator:
  - **vertical position of the elevator**  
A vertical arrangement of longitudinal axes of the elevator segments needs to be ensured. The maximum acceptable deviation of the elevator's longitudinal axis from the vertical cannot exceed 10 mm. Measurements can be performed with a theodolite, a survey device for measurement of horizontal and vertical angles.
  - **elevator shape**

Despite correctly located transverse cross-sections of the elevator (maximum, bottom and upper cross-sections), any deformations between them, called a deflection arrow, should be avoided. The maximum acceptable value of the deflection arrow, at any location along the entire height of the elevator, cannot exceed 10 mm. Measurements can be performed with a theodolite, as in the above case.

**- elevator segment rotation**

On the entire length of the elevator, any of its cross-sections cannot be rotated in relation to successive cross-sections around their joint vertical axis. During installation of individual segments, monitor relative positions of their diagonals.

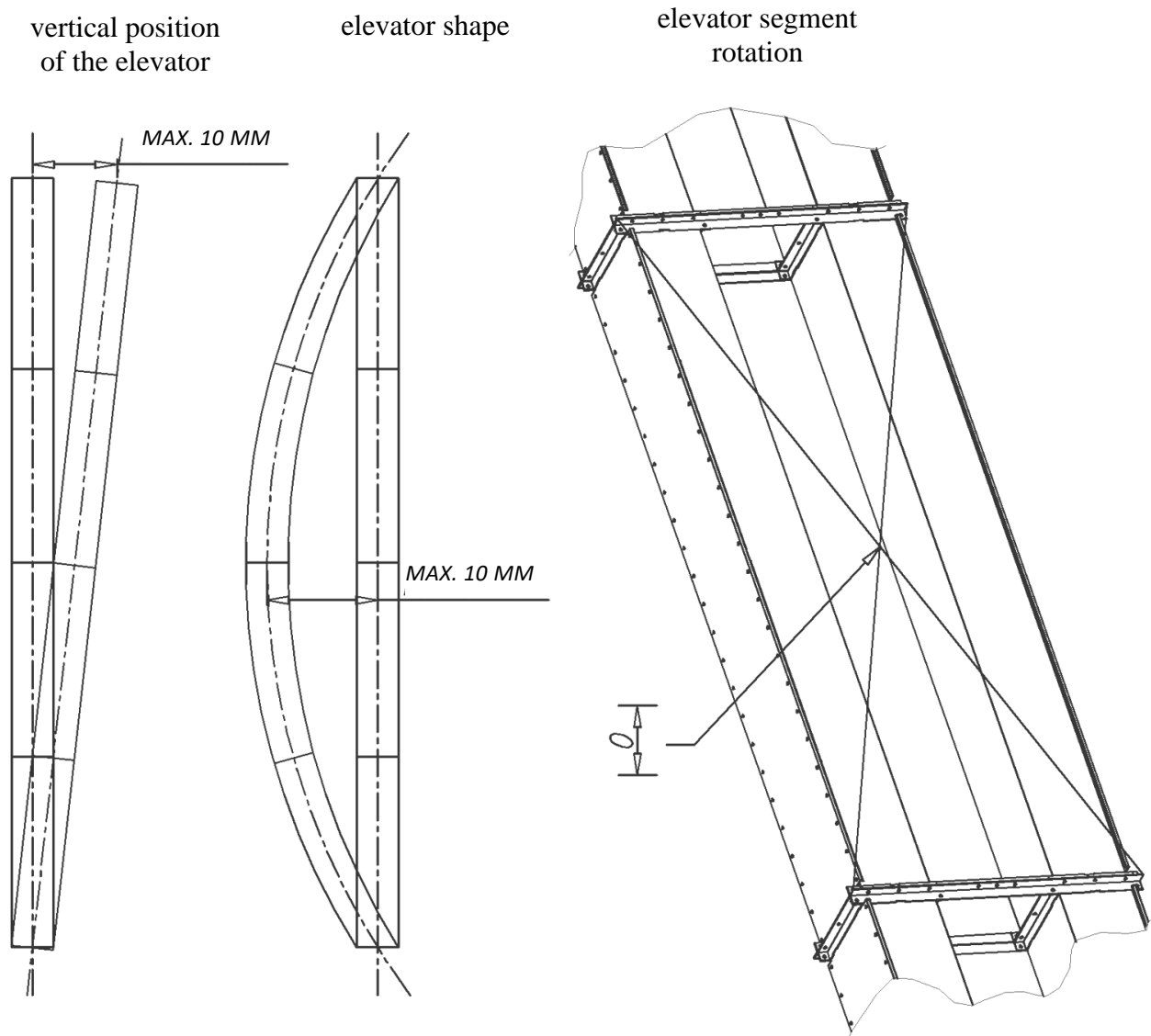


Figure 18. Conditions for correct installation of a bucket elevator - diagram.

## 4. Operation

### 4.1. Operation of an elevator

#### **A sequence of operations during silo loading with a bucket elevator (Figure 19) - Example:**

- 1) close the unloading shutter Z2;
- 2) open the loading shutter Z1;
- 3) set the two-way separator, R2, in a position to the loading conveyor PZ;
- 4) start the loading conveyor, PZ;
- 5) start the bucket elevator, PK;
- 6) start the inlet hopper, KP;
- 7) unload the transport vehicle, PT.

When the silo loading is completed, stop the individual devices in a sequence reverse to the described above.

#### **A sequence of operations during silo unloading with a bucket elevator (Figure 20) - Example:**

- 1) set the two-way separator, R2, in a position to a transport vehicle, PT;
- 2) check, and when necessary, close the unloading shutter, Z2,
- 3) start the bucket elevator, PK;
- 4) start the underfloor conveyor, PP;
- 5) gradually and slowly open the unloading shutter Z2 (open the shutter Z2 so the PP, PK or other conveyors are not blocked); the silo unloading process can be stopped by performing in reverse the actions described above.

When the transported material stops to gravitationally feed the shutter Z2, stop the unloading (in accordance with guidelines in section 5). Check whether the openings of the shutter Z2 and the internal conveyor PW (in the silo axis) are not covered by the material stored in the silo.

When the above conditions are met, further unloading can be performed as follows:

- 6) check and, whenever necessary, set the R2 separator in a position to a transport vehicle, PT;
- 7) start the bucket elevator, PK;
- 8) start the underfloor conveyor, PP;
- 9) start the internal conveyor, PW;

When the transported material stops to feed the shutter Z2, stop the unloading (in accordance with guidelines in section 5). The internal conveyor PW should be removed from a special support, open covers, etc. (depending on the silo model and the internal conveyor).

When the above conditions are met, further unloading can be performed as follows:

- 10) check and, whenever necessary, set the R2 separator in a position to a transport vehicle, PT;
- 11) start the bucket elevator, PK;
- 12) start the underfloor conveyor, PP;
- 13) start the internal conveyor, PW;

The unloading can be continued until the transported material stops to feed the shutter Z2, then stop the unloading (in accordance with guidelines in section 5).

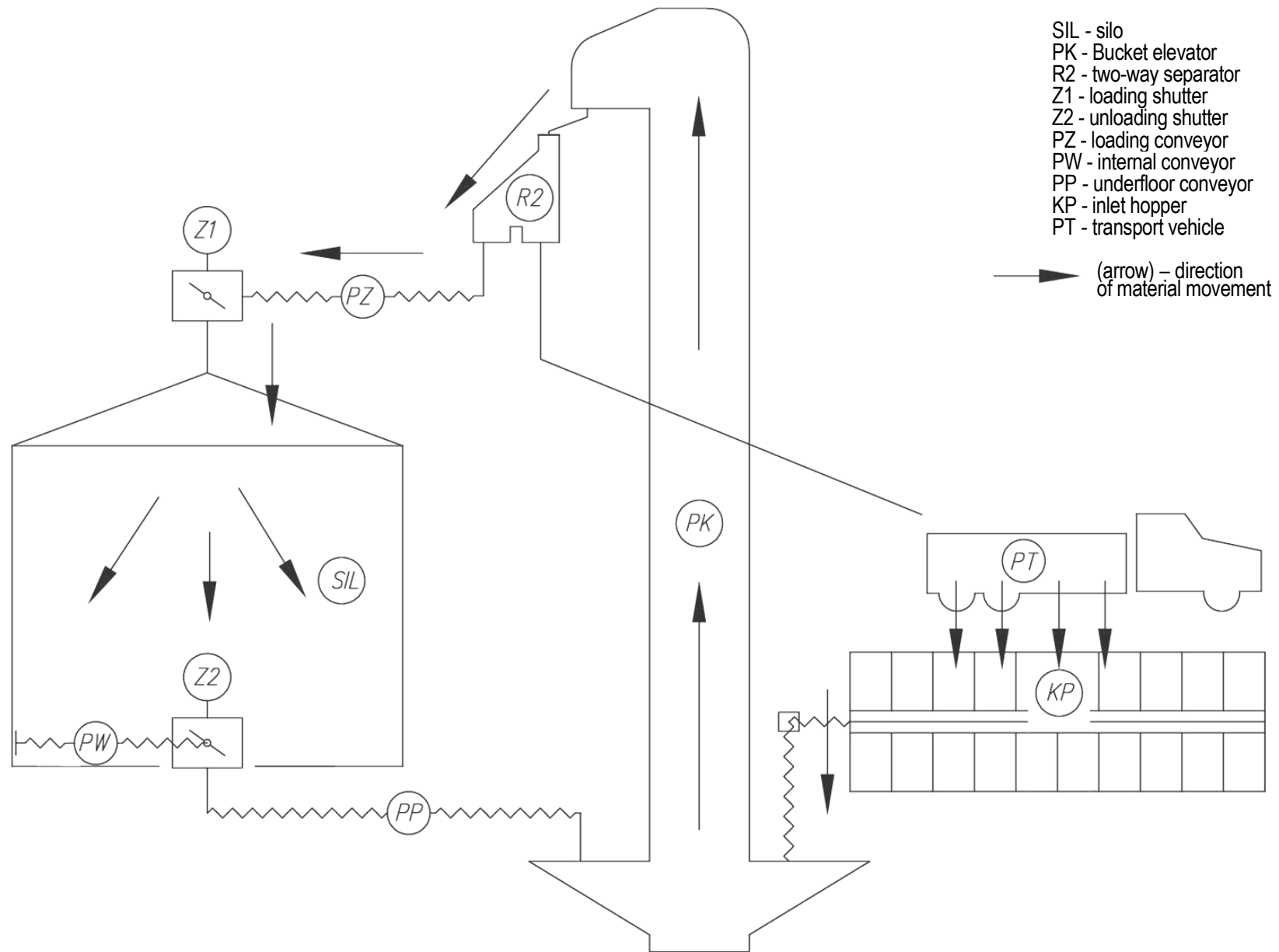


Figure 19. A sequence of activities performed during a silo loading with a bucket elevator - a diagram.

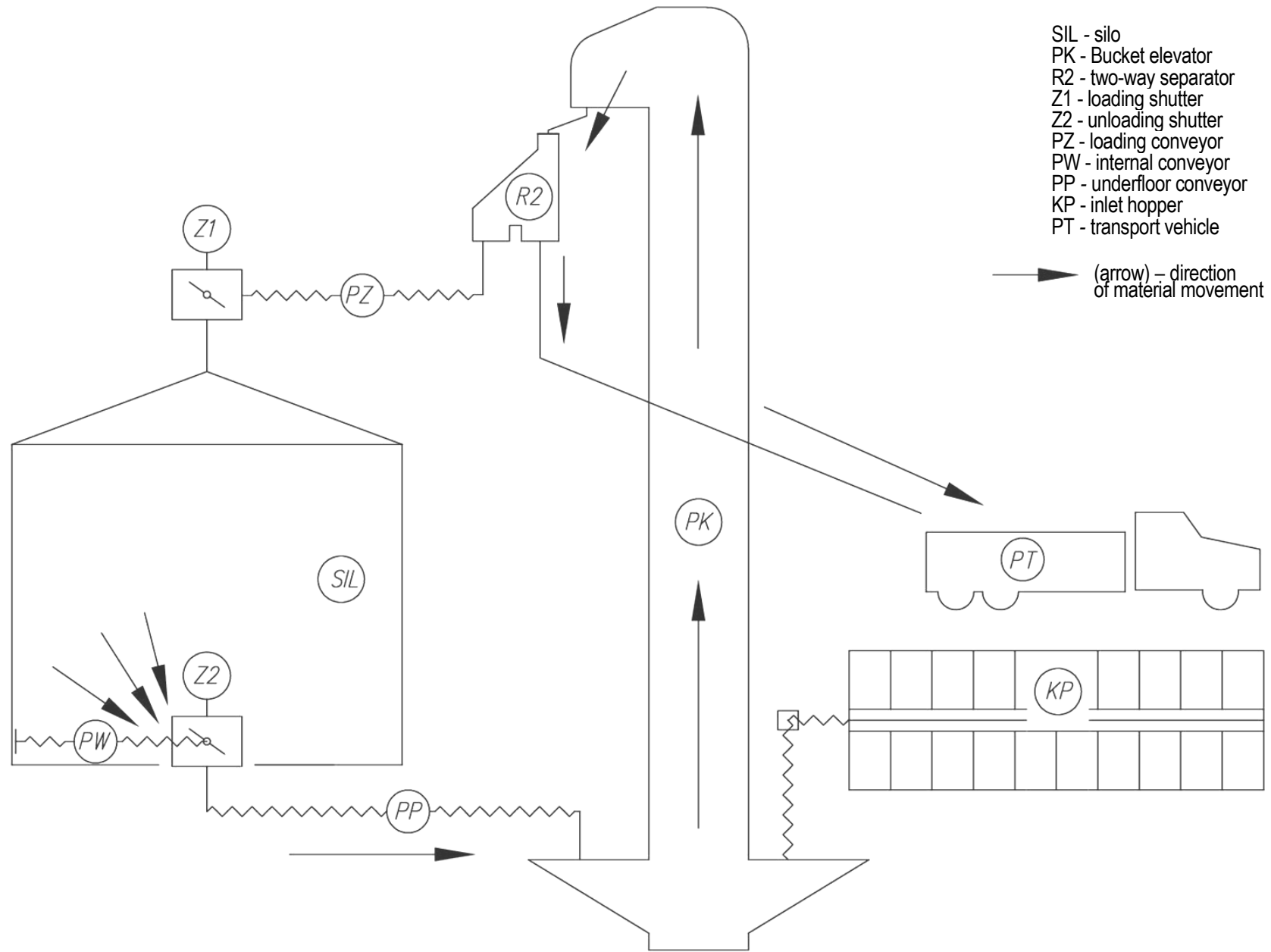


Figure 20. A sequence of activities performed during a silo unloading with a bucket elevator - a diagram.

#### 4.1.1. Conditions for correct operation of an elevator

Before starting transport of transported material:

- check the operational condition of the elevator and its accessories;
- ensure that there are no people at locations of transported material inlet and outlet;
- arrange efficient collection of material from the elevator, to prevent its overload.

It is not recommended to stop an elevator which working units (buckets and a feet) are filled with transported material. This may cause problem with restarting it.



**Bucket elevators of the PK290 type are not equipped with devices dosing and cutting off the flow of transported material. For this reason, auxiliary devices must be equipped with such components, to prevent overflowing and damage to elevators in the case of their unforeseen stopping.**

PK290 elevators are not suitable for transport of material that is highly contaminated, locally aggregated, etc. Any attempt to transport such grain may result in overload or damage, and in consequence, stopping of the machine.



**In an emergency, stop the machine by pressing the red EMERGENCY STOP button on the dashboard.**

In the case of power outage, the system of elevators will be permanently stopped. Restoring of power supply will not restart the machines automatically. To restart the elevators, repeat the starting sequence from the beginning.

When the work is completed, remove the remains of transported material accumulated in the elevator foot. If the said residues are left, it may cause troubles during the subsequent start of the elevator.

#### 4.1.2. Elevator control

**Methods for starting and stopping the elevator may differ from those described below. This results from a design of the electrical wiring system, in which used electric units (mainly control devices) differ from those delivered by the elevator manufacturer.**

##### Starting the elevator

- Set the main switch in the position "I",
- Press the black ON button on the motor switch (Figure 21).

##### Stopping the elevator

- Cut the grain inflow to the elevator (close the shutters) and wait until the machine is completely empty,
- Press the red OFF button on the motor switch (Figure 21);
- Set the main switch in the position "0".



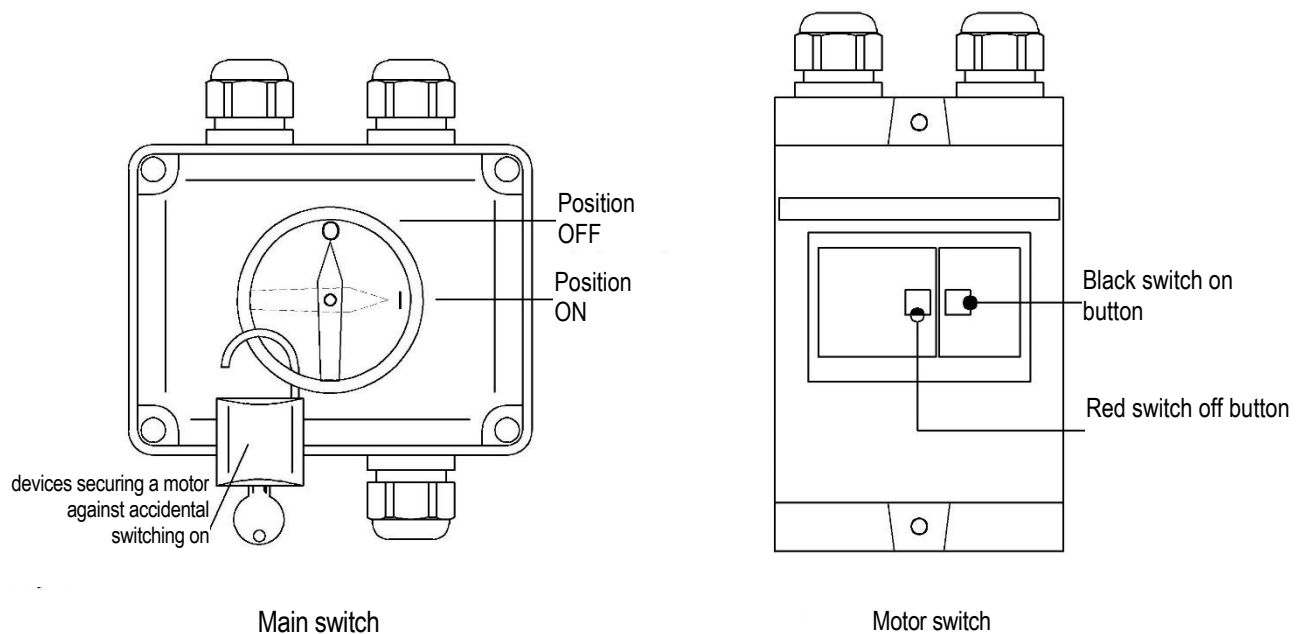


Figure 21. The control devices for a bucket elevator of the PK290 type.

## 4.2. Elevator operation

Correct and punctual maintenance inspections, maintenance and possible repairs guarantee availability of the full operating capacity of the elevators and prevent their premature and excessive wear.

### 4.2.1. Periodic maintenance and regular overhauls

#### Periodic maintenance covers:

- inspection of safety devices, that is, belt position sensors, electric safety units, etc. (correct operation, no mechanical damage, etc.);
- verification of a condition of the electrical wiring system by an authorised electrician (including inspection and adjustment of the air gap of an electromagnetic DC gap in accordance with an operating manual of that device);
- inspection and adjustment of tensioning of the working band (belt);
- inspection of tightening of buckets of the working band;
- inspection of a technical condition of welded, screwed and other connections;
- inspection of anti-corrosion coatings;
- inspection of rolling bearings;
- inspection of other moving and fixed components.

The periodic maintenance of the elevator should be performed with a person authorised to perform maintenance of construction structures. The person performing the maintenance should draw up a report on inspection of the elevator operating condition. The user should maintain an elevator maintenance logbook.

#### Maintenance frequency:

Periodic maintenance frequency should be adapted to intensity of use, but it should take place at least once a year. All safety devices, i.e., the motor switch, the main switch, and other, should be inspected at least once a month or before each start of the elevator.



**At least once a year, the User should order a qualified electrician holding relevant licences to inspect all electric equipment components.**

The regular maintenance includes small repairs, and possible repairs of anti-corrosion coats.



**NOTE!** Anti-corrosion coating of screws can be damaged during installation (tightening). In such case, regular repairs include applying anti-corrosion coatings on damaged surfaces.

Once a week and/or after each longer break in the elevator operation (before it is started again), the following components need to be lubricated:

- rolling bearings of the head drive drum;
- rolling bearings of the return drum in the foot;
- screw mechanisms for belt tensioning installed in the foot.

#### 4.2.2. General overhaul

Overhauls are performed according to a scope and needs, depending on wear of buckets, a load-bearing band (load-bearing strand), connections, etc. (at least once every eight years), and during them relevant parts are either repaired or replaced with new.

Such overhauls cover the scope of regular maintenance and:

- replacement of roller bearings, gaskets, etc.
- applying of new anti-corrosion coatings;
- other necessary repairs.



**All damages must be repaired immediately, and parts that are damaged or worn must be repaired or replaced with new ones.**

#### 4.2.3. Spare parts

When any elevator components are worn, damaged or lost, they can be purchased from BIN. The manufacturer does not provide for the use of spare parts from manufacturers other than BIN. To purchase spare parts, contact BIN in writing, specifying the following details:

- Device name
- Proof of purchase
- Device model
- Year of production
- Serial number

Before placing an order, define precisely (on phone) types of spare parts ordered. A need for BIN representative's visit to correctly identify a part cannot be excluded.

The manufacturer does not provide the elevator with spare parts.

#### 4.2.4. Disassembling and disposal

Elevators are devices made of materials not harmful to the environment and can be scrapped, and all their components can be recycled.

During disassembling, particular attention should be paid to safety, due to components large dimensions and the height. Disassembling should be ordered at a specialist company.

As of 19/06/2023 I approve for use the Operating Manual:

title - *Bucket elevator PK290*

revision - 1

issued on - 16/06/2023.

Chief Constructor  
Mieczysław Laskowski



.....  
(signature)

## 5. Warranty

**BIN Spółka z o. o. guarantees correct operation of the purchased product from our company. The warranty covers 12 months from the date of sales and is valid only together with a proof of sales issued to a user by us or by our representative. The warranty covers free of charge removal of defects significantly affecting product performance. Therefore, application of warranty provisions under Article 558.1 of the Civil Code is explicitly excluded.**

### General Guarantee Terms And Conditions

1. The territory of the Guarantee Application

This guarantee is valid within the territory of Poland. The warrantor shall cover costs of transport related to an accepted warranty complaint for a distance of up to 250 kilometres covered, according to standard rates.

2. The warranty does not apply to defects resulting from incorrect or excessive operation, natural wear of parts, or other reasons outside the manufacturer's control.

3. The warranty shall not cover any other costs unspecified above, especially costs being a consequence of the equipment stoppage.

4. The warranty becomes invalid when:

- use of the product contrary to its intended use;
- installation was incorrect or any unapproved changes are made;
- works requiring specialist licences are performed by unauthorised persons.

### Specific Guarantee Terms And Conditions

1. In the case of products:

- with electric motors, warranty for motors is granted by their manufacturer.
- delivered as components - a customer will verify condition of these components on delivery, and then will store them on its own responsibility until they are assembled. Flat components of galvanised sheets require special attention. They should be stored in a way ensuring a free flow of air around each component. When wet galvanised metal sheets are in contact, this results in formation of irremovable spots even during a short storage.

2. BIN Sp. z o.o. guarantees correct anti-corrosion protection for manufactured hot-dip galvanised products. A minimum weight of zinc coating of 200 g/m<sup>2</sup> for all products made of hot-dip galvanised steel is required. Furthermore, products can have parameters of no importance from an anti-corrosion protection point of view, and thus not covered by a warranty, such as:

- different colouring, zinc coat shade, etc., on individual product components (depending on a material supplier);
- visible cracks and scratches created in the metal sheet production process with a minimum zinc coating weight maintained.

3. When arrangements made during placement of an order or included in the Operating Manual include obligations for a buyer, then the warranty does not cover consequences of failure to perform or incorrect performance of these obligations.

4. Outdated financial liabilities of a buyer towards the warrantor or the seller result in a loss of the warranty rights until the outstanding liabilities are covered.

### Exercising of warranty rights

Any defects found a customer notifies to the seller in writing. The seller shall notify the customer about a way of handling their complaint, a place and a time of warranty repair no later than within 14 days.

Manufacturer:

BIN Sp. z o.o.  
87-700 Aleksandrów Kujawski  
at Narutowicza 12

.....

Seller

*(seller's signature is not required when an invoice includes a note of granting the warranty)*