Laboratory Equipment Manufacturer
www.mrclab.com

INSTRUCTION MANUAL FOR

Precision Balances

BPS Series

PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

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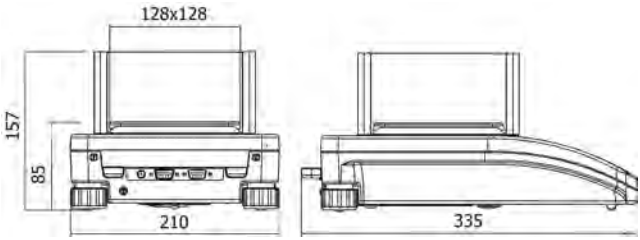
Contents

1. TECHNICAL PARAMETERS

Balances series BPS with pan 128 x 128 mm:

Type											
	With external calibration	BPS 510 C1CT	BPS 200 2000-C1	BPS 60-C1	BPS 110-C1	BPS 210-C1	BPS 360-C1	BPS 510-C1		BPS 750-C1	BPS 1000-C1
	With internal calibration	BPS 510 C2CT	BPS 200 2000-C2		BPS 110-C2	BPS 210-C2	BPS 360-C2		BPS 600-C2	BPS 750-C2	BPS 1000-C2
Max capacity		510g / 2550ct	200 / 2000g	60g	110g	210g	360g	510g	600g	750g	1000g
Tare range		-510g / -2550ct	-2000g	-60g	-110g	-210g	-360g	-510g	-600g	-750g	-1000g
Min capacity		0,02g / 0,1ct	20mg	20 mg							
Accuracy		0,001g / 0,005ct	1/10mg	1 mg							
Repeatability		0,001g / 0,005ct	1/10mg	1 mg						1,5 mg	
Linearity		±0,001g /0,005ct	±2 / 10mg	± 2 mg						± 3 mg	
Work temp.		+15 ℃ ÷ +30 ℃									
Supply		Adaptor 230V 50Hz AC /11 V AC									
Sensibility		2 ppm/℃ in temp. +18℃ - +30℃									
Pan size		128 x 128mm									

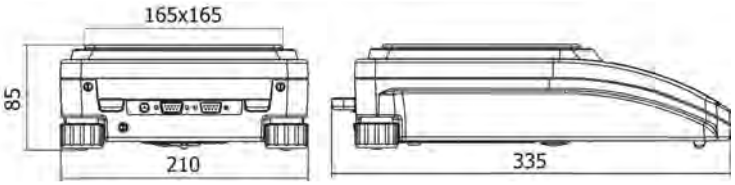
Dimensions:



Balances BPS with pan 195 x 195 mm:

With external calibration	BPS 2100-C1CT	BPS 600-C1	BPS 1200-C1	BPS 2100-C1	BPS 3500-C1	BPS 4500-C1	BPS 6000-C1
With internal calibration	BPS 2100-C2CT		BPS 1200-C2	BPS 2100-C2	BPS 3500-C2	BPS 4500-C2	BPS 6000-C2
Max capacity	2100 g / 10500 ct	600 g	1200g	2100 g	3500 g	4500 g	6000 g
Tare range	-2100 g / -10500 ct	-600 g	-1200g	-2100 g	-3500 g	-4500 g	-6000 g
Min capacity	0,5 g / 2,5 ct	500 mg					
Accuracy	0,01 g / 0,05 ct	10 mg					
Repeatability	0,01 g / 0,05 ct	10 mg					15 mg
Linearity	± 0,01 g / 0,05 ct	± 20 mg					
Work temp.	+15 ℃ ÷ +30 ℃						
Supply	Zasilacz 230V 50Hz AC /11 V AC						
Sensibility	2 ppm/℃ w temp. +18℃ - +30℃						
Pan size	195 x 195mm						

Dimensions:



2. INTRODUCTION

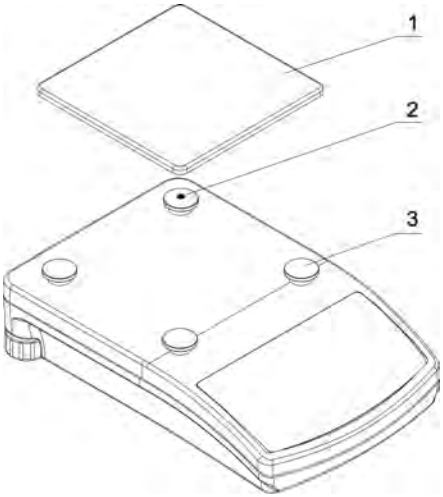
This precise balances is a device used for mass determination in laboratory conditions. It can be used as non-automatic balance only so the weight should be replaced very gently in the centre position on the pan. The result should be read after its stabilization.

3. USAGE CONDITIONS

The balance cannot be used for dynamical weighing. Even if small samples are added or deducted the result should be read after the balance reaches stability. Do not put magnetic samples on the pan. It can damage measure set in the balance. Avoid overload of the pan and dynamical weighing. Remember that tare (eg. container on the pan) should be deducted from total weight. Do not use the balance in explosion hazard environment. The balance cannot work in explosive environment. It is not allowed to make any mechanical modernization in the balance. Avoid places where vibrations of ground, blasts of air and changes of moisture can occur. Balance should not work in position where electromagnetic disturbances can take place. Balance should not be in operation before its leveling.

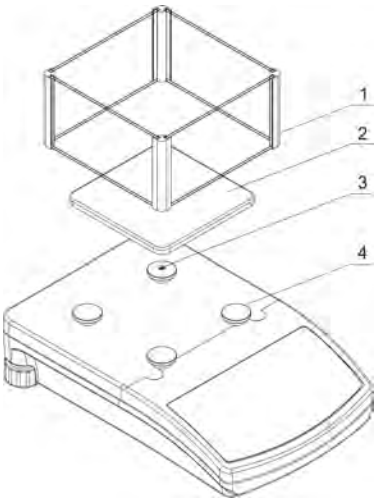
4. ELEMENTS ASSEMBLY FOR BALANCES BPS SERIES

Elements assembly for balances with accuracy 10 mg:



- Take the tape off the spring on the gum plug (2),
- Put the pan on (1) gum plugs (3),
- Check if the pan lean on the gum plugs.

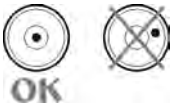
Elements assembly for balances with accuracy 1mg:



- Take the tape off the spring on the gum plug (3),
- Put the pan on (2) gum plugs (4),
- Put glass shield on the pan (1),which is on the balance cover,
- Check if the pan lean on gum plugs.

4.1. Setting

Before switching on the device, please level the balance using the feet situated at the back of its casing. The bubble of the level should be situation in the centre of the ring.



4.2. List of standard elements of delivery

- Balance
- Pan and shield
- Adapter
- User manual

4.3. Cleaning

Balance should be cleaned with use of a damp cloth. Gently rub dirty places. Weighing pan must be removed from the balance for cleaning. **Cleaning weighing pan when it is installed may cause damage of balance mechanism. Remember about disconnecting the balance from power supply before the cleaning.**

4.4. Connecting to mains

Balance can be connected to mains only by means of original supply wire which is basic equipment of balance. Rated voltage (given on data plate) should be consistent with mains rated voltage.
Supply wire can be connected only to socket with ground contact. Switch on supply of moisture analyzer – plug of supply wire should be connected to the socket on the back of analyzer casing.
Display of moisture analyzer will indicate name and number of program, next display will indicate 0.000 g (for balances with accuracy of 1 mg) or 0.00 g (for balances with accuracy of 10 mg). If indication is different from zero, press **ZERO/TARE** key.

4.5. Connection of additional equipment

Before connection of additional equipment or its change (printer, computer PC), disconnect the balance from power supply. Only additional equipment which is

recommended by the manufacturer of balance can be connected to it. After connecting the devices, plug in the balance to power supply.

5. BASIC SERVICE EQUIPMENT

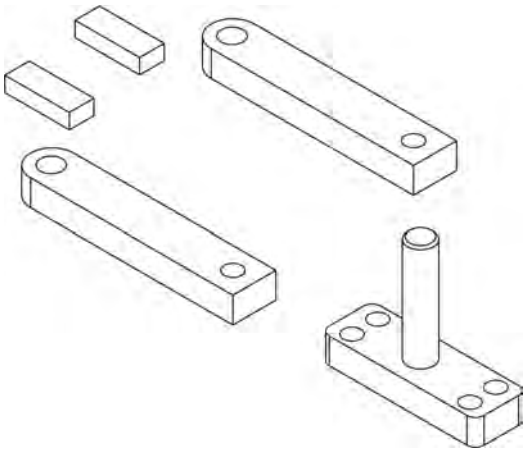
5.1. Introduction

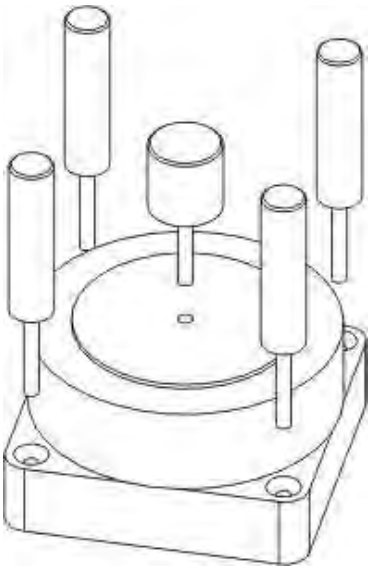
Servicing of precision laboratory balances series BPS requires qualified personnel, tools and equipment suitable for such service

5.2. Tools and equipment

Screwdriver Philips
Flat screwdriver
Tubular spanner 5,5 mm
Hexagonal wrench (imbus) 2,5 mm
Hexagonal wrench (imbus) 5 mm
Combination pliers
Tweezers
Soldering iron with adjustable tip temperature
Adhesive tape 8 mm
Slide calliper
Magnifying glass X10
Multimeter
Cable RS232 balance-computer (converter USB – RS 232)
Special assembly set

5.3. Special assembly set





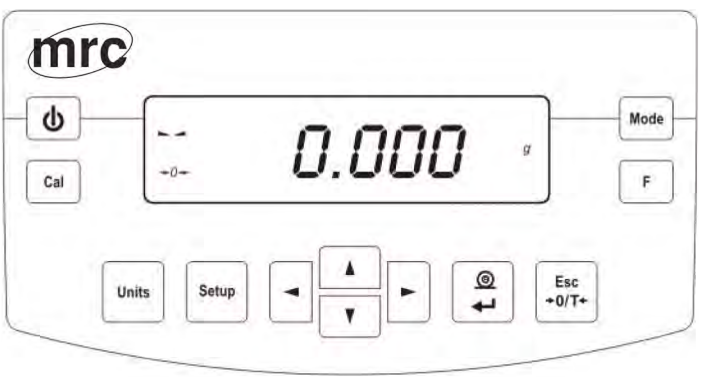
5.4. Weights

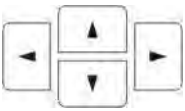
F_2 – according to OIML	1g	± 0,3 mg	- 1 piece
F_2 – according to OIML	2g	± 0,4 mg	- 1 piece
F_2 – according to OIML	5g	± 0,5 mg	- 1 piece
F_2 – according to OIML	10g	± 0,6 mg	- 1 piece
F_2 – according to OIML	20g	± 0,8 mg	- 1 piece
F_2 – according to OIML	50g	± 1 mg	- 1 piece
F_2 – according to OIML	100g	± 1,5 mg	- 1 piece
F_2 – according to OIML	200g	± 3 mg	- 1 piece
F_2 – according to OIML	500g	± 7,5 mg	- 1 piece
F_2 – according to OIML	1kg	± 15 mg	- 1 piece
F_2 – according to OIML	2g	± 30 mg	- 1 piece

5.5. Assembly table

Assembly table should be stable, shock and vibration resistance, leveled, placed far from heat sources.

6. KEYBOARD



	**On/Off** key, switches on/off display of balance. After switching off the display other subassemblies are supplied and balance is in stand-by mode.
	Key **F** is function key, user enters setting for selected work mode
	Key **MODE** – work mode selection
	Key **UNITS**, changes weighing units
	**Print/Enter** key– sending display state to external device (Print) or confirmation of chosen value or function (Enter).
	Key **ESC/ZEROTARA** – zero/tare key.
	Starts adjusting/calibration automatically
	Main menu key
	Navigation keys group – change of parameters value; moving in menu.

7. START UP

After connecting to supply the balance shows name and number of the software and starts weighing function up.

7.1. Time of temperature stabilization

Before the weighing it is necessary to wait until balance reaches temperature stabilization. It is 30 minutes for BPS balances. If balance was kept in lower temperature (Winter time) time of temperature stabilization takes 4 hours.

During temperature stabilization display can indicate various results. The balance works correctly only in temperature range presented in point 1.
If balance is in different environment there is black triangle mark on the display.
.

If balance shows the mark temperature of surrounding should be increased or decreased if it is high. It is recommended to make the temperature changes very slowly ≤ 0,5 ℃/h.

8. USER MENU

There are 7 basic groups in user menu. Each of the groups has different name starting with letter **P**.

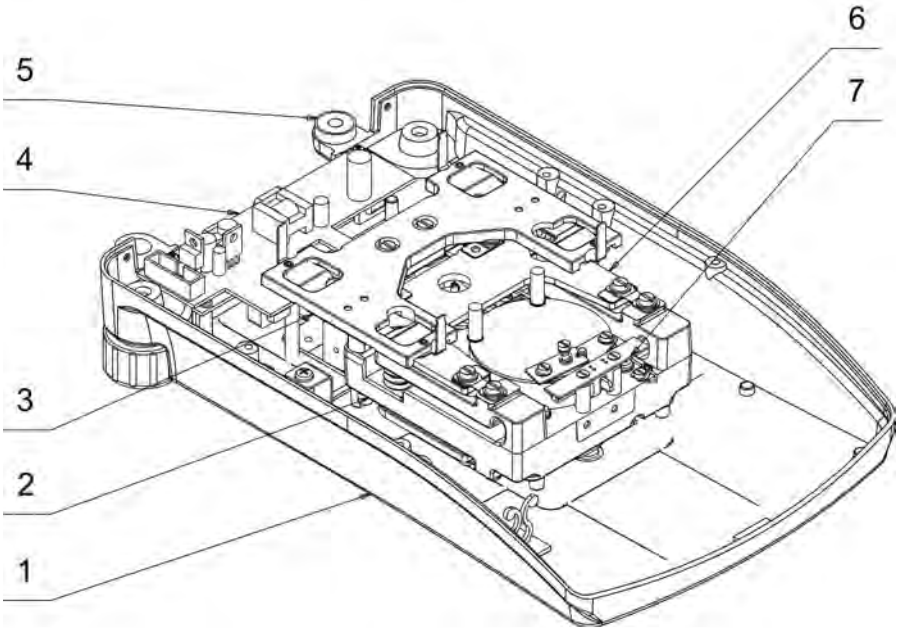
8.1. Moving in user menu

User moves in menu using following keys:

Setup	Enter main menu -key **Setup.**
▼	Parameters group selection or parameters value change
▲	Parameters group selection or parameters value change.
►	Parameters group selection which should be activated.
◄	Goes one level up.
Esc →0/T←	Cancels parameter change, key **Esc/TARA**.
↵	Confirmation / acceptation - key **PRINT/ENTER**.

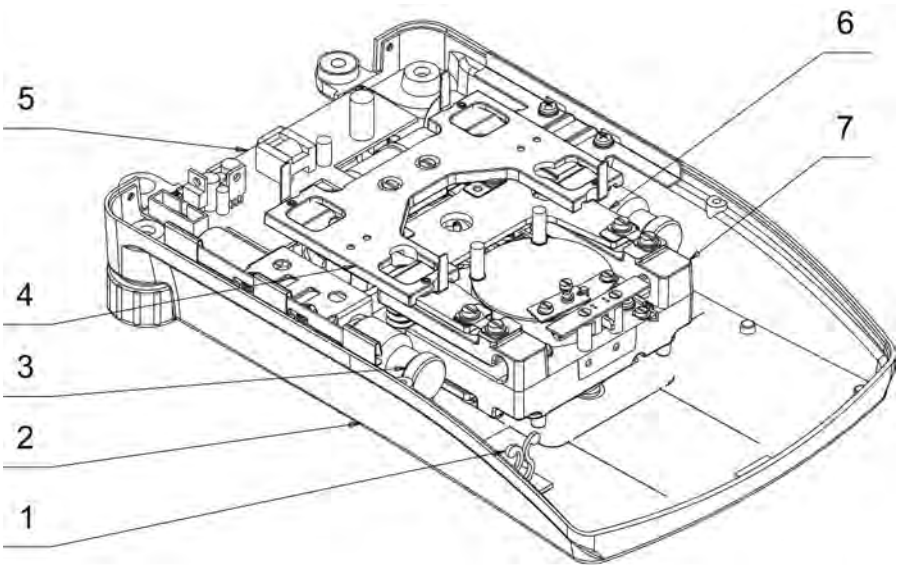
9. VIEW OF BALANCE INSIDE

9.1. With external calibration



No.	Name	No of drawing or norm
1	Base BPS-C1 Base BPS-C2	BPS C1-73 BPS C2-72
2	Subassembly	WPS-C 10-01-023
3	Cross set 128 Cross set 128/2000 Cross set 165	BPS 201-00/1000 BPS 201-00/2000 WPX 202-00/6000
4	Supply board	168xxx.pcb
5	Lever Φ18x20	YJ-CR 1810
6	Horizontal rocker	WPX 140-04 T
7	Sensor board	169xxx.pcb

9.2. With internal calibration



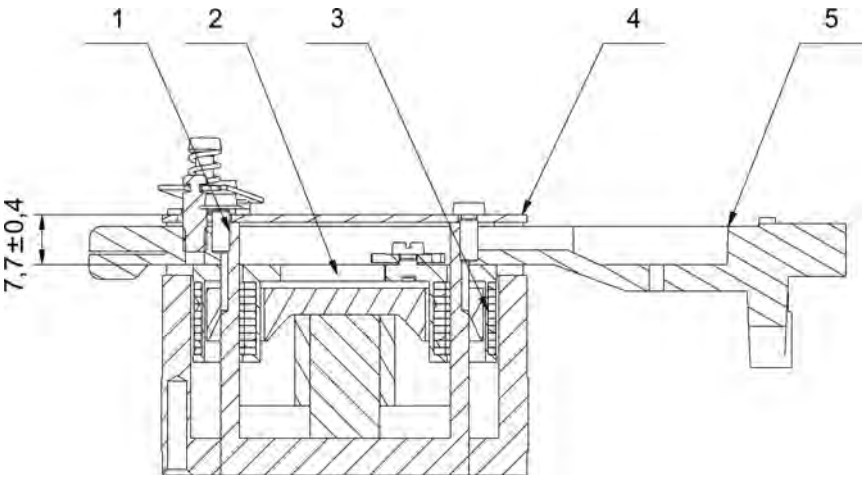
No.	Name	No of drawing or norm
1	Tape grip	KLB 350-01A-RT
2	Base BPS-C1 Base BPS-C2	BPS C1-73 BPS C2-72
3	Calibration weight 49g Calibration weight 150g Calibration weight 450g	WPS 110/C/2-03e WPX 300-14 WPX 300-03
4	Cross set 128 Cross set 128/2000 Cross set 165	BPS 201-00/1000 BPS 201-00/2000 WPX 202-00/6000
5	Supply board	168xxx.pcb
6	Horizontal rocker	WPX 140-04 T
7	Case Subcomponent	WPS/C 10-01-023

10. MECHANISM ASSEMBLY

Mechanism assembly is presented in attachment No 1.

11. INITIAL LEVELLING OF BALANCE MECHANISM

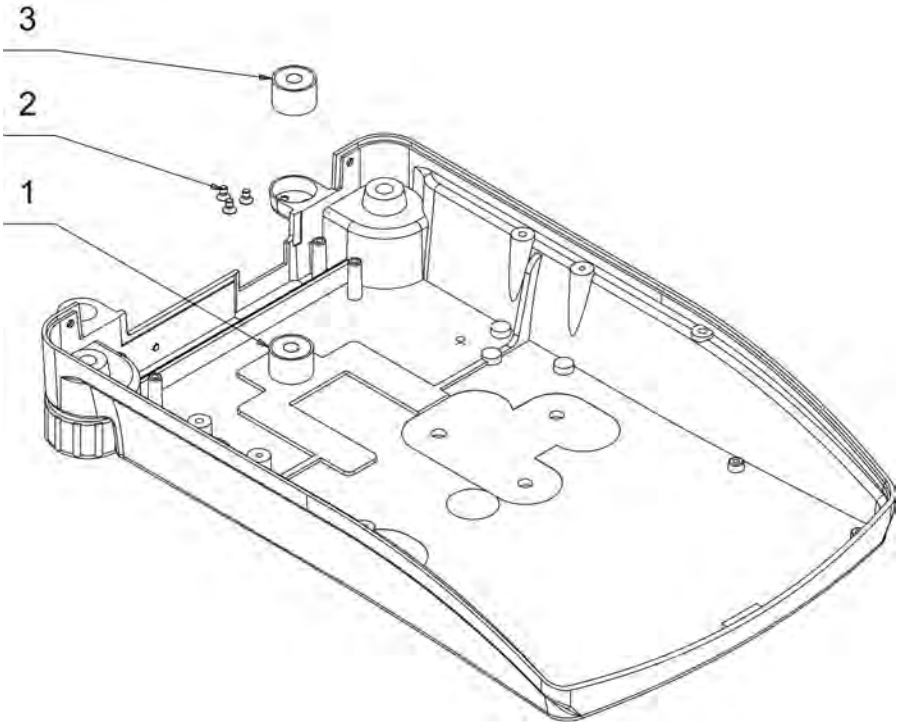
- assembly the cross on vertical rocker,
- place under lever appropriate element loading the coil (depending on balance model),
- screw tightly loading element to lever - 1 brass screw M3x6
- screw tightly coil to lever - 2 brass screws M3x6 (coil should be set central with regard to magnet body and should not touch its walls)
- place pan on dampers
- place on the pan mass equal to ½ of max range of given balance
- correct coil position, distance of coil surface from top of magnet body should be equal to **7,7 ±0,4 mm**



No	Name	No of drawing or norm
1	Screw M3 x 8	PN-85/M-82215
2	Coil loading part	
3	Coil	WAA/S-160-52
4	Magnet Body S40	WAA/S-160-33
5	Coil lever Coil lever	WPS/C 10-02-131 (pan 128) WPS/C 10-02-201 (pan 195)

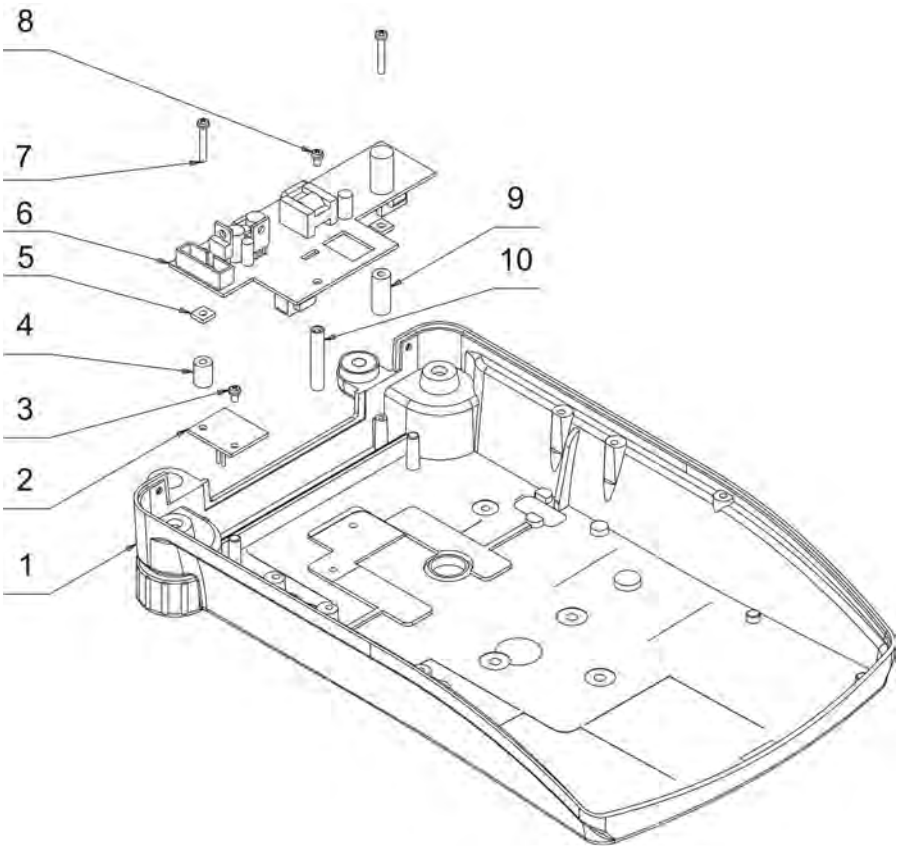
12. ASSEMBLY OF BPS BALANCE BASE

12.1. Lever indicator assembly



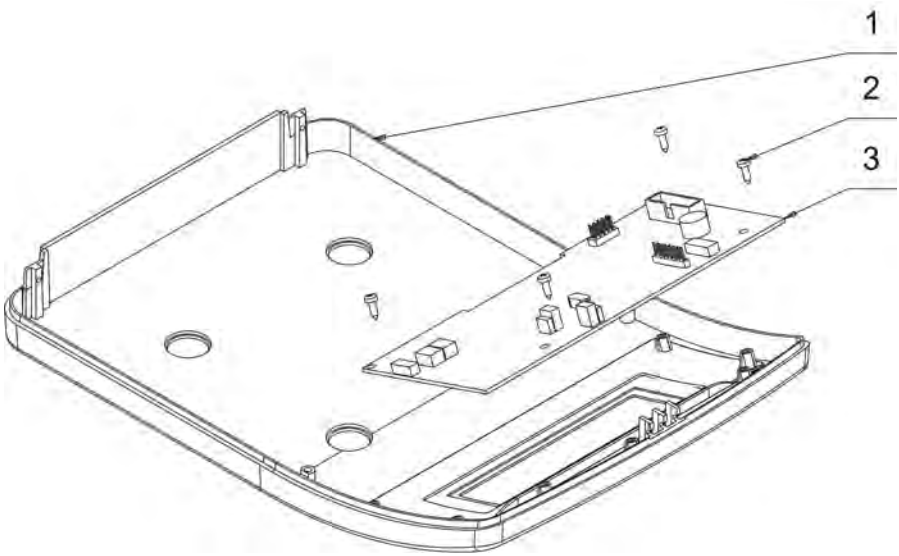
No	Name	No of drawing or norm
1	Calibrating level indicator	
2	Screw M3 x 5	PN-86/M-82208
3	Level indicator Φ18 x 20	YJ-CR 1810

12.2. Adaptor board assembly



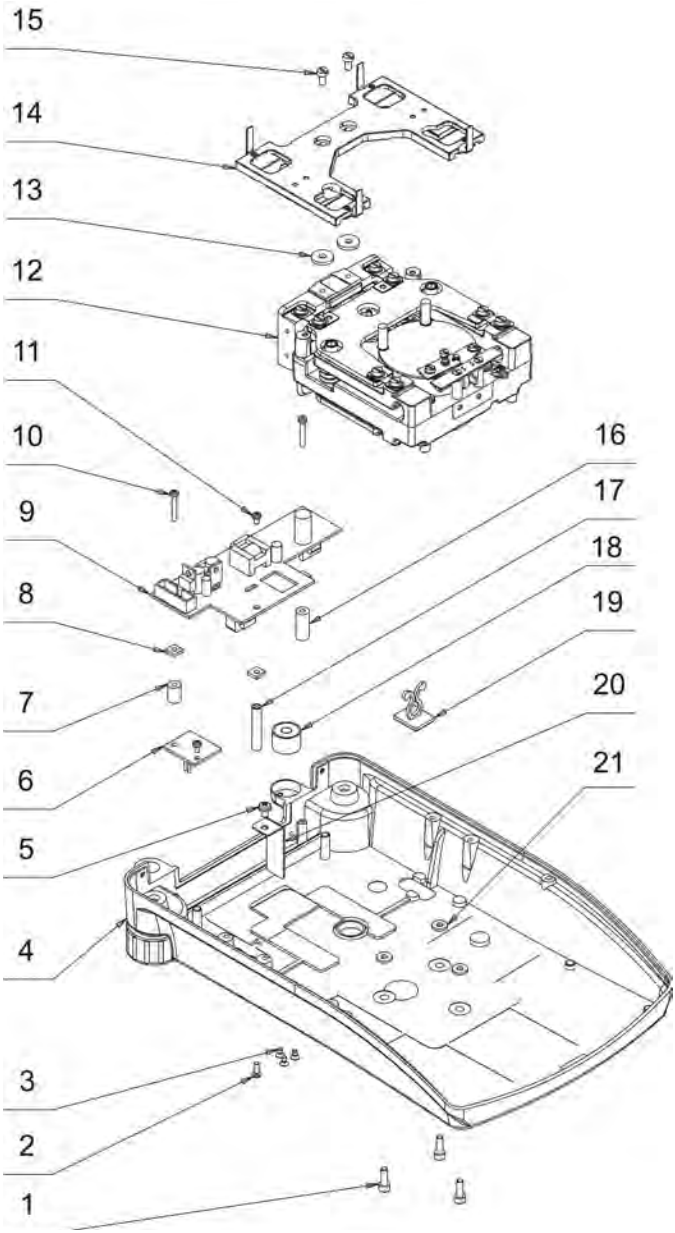
No	Name	No of drawing or norm
1	Base BPS-C1 Base BPS-C2	BPS C1-73 BPS C2-72
2	Calibration board	175xxx.pcb
3	Screw M3 x 5	ISO 7045
4	Distance sleeve	WPS 200-30
5	Washer	BPS 200-05
6	Supply board	168xxx.pcb
7	Screw M3 x 20	ISO 7045
8	Screw M3 x 5	ISO 7045
9	Distance sleeve	WPS 200-30
10	Post	WPS 200-31

12.3. Display board assembly



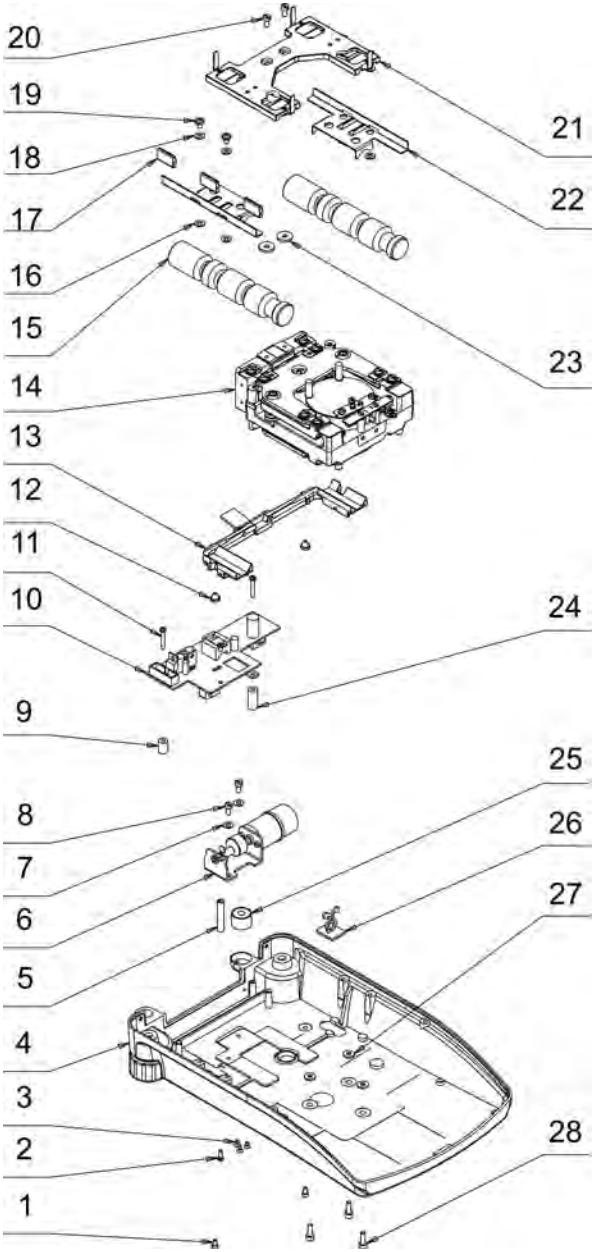
No	Name	No of drawing or norm
1	Cover 128 Cover 165	WPS 100-06 WPS 100-05
2	Screw M3 x 6	BN 13577
3	Main board	167xxx.pcb

12.4. Mechanism assembly in balance with external calibration



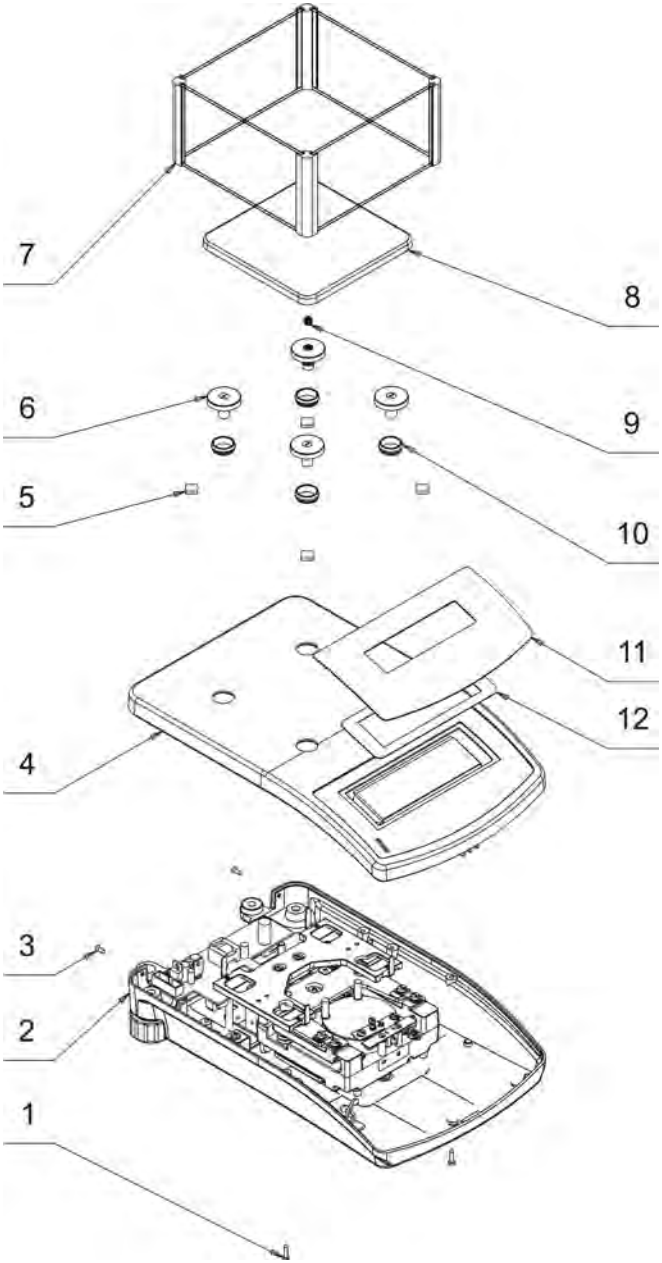
No.	Name	No of drawing or norm
1	Screw M4 x 12	PN-87/M-82302
2	Screw M3 x 6	ISO 7045
3	Screw M3 x 5	DIN 965A
4	Base BPS-C1 Base BPS-C2	BPS C1-73 BPS C2-72
5	Screw M4 x 8	BN 4825
6	Calibration board	175xxx.pcb
7	Distance sleeve	WPS 200-30
8	Washer	BPS 200-05
9	Supply board	168xxx.pcb
10	Screw M3 x 20	ISO 7045
11	Screw M3 x 5	ISO 7045
12	Balance mechanism	
13	Washer	WPS/C 1-51
14	Cross set 128 Cross set 128/2000 Cross set 165	BPS 201-00/1000 BPS 201-00/2000 WPX 202-00/6000
15	Screw M4 x 8	PN-85/M-82215
16	Distance sleeve	WPS 200-30
17	Post	WPS 200-31
18	Lever Φ18x20	YJ-CR 1810
19	Tape grip	KLB 350-01A-RT
20	Cable grip	WPS/C 1-29
21	Washer 1,5	WAA 210x-01-207

12.5. Mechanism assembly in balance with internal calibration



No.	Name	No of drawing or norm
1	Screw M3 x 6	PN-87/M-82302
2	ScrewM3 x 6	ISO 7045
3	Screw M3 x 5	DIN 965A
4	Base BPS-C1 Base BPS-C2	BPS C1-73 BPS C2-72
5	Post	WPS 200-31
6	Power set	BPS 200-00
7	Washer	BPS 200-05
8	Screw M3 x 5	ISO 7045
9	Distance sleeve	WPS 200-30
10	Supply board	168xxx.pcb
11	Screw M3 x 20	ISO 7045
12	Pile pin	BPS 200-10
13	Lever set	BPS 200-15
14	Mechanism	
15	Calibration weight 49g Calibration weight 150g Calibration weight 450g	WPS 110/C/2-03e WPX 300-14 WPX 300-03
16	Washer 4,3	PN-78/M-82005
17	Tape grip	WPX 300-17
18	Washer 4,3	PN-78/M-82005
19	Screw M4 x 8	BN 4825
20	Screw M4 x 8	PN-85/M-82215
21	Cross set 128 Cross set 128/2000 Cross set 165	BPS 201-00/1000 BPS 201-00/2000 WPX 202-00/6000
22	Small grip weight Big weight grip	WPX 300-16/h WPX 300-04
23	Washer	WPS/C 1-51
24	Distance sleeve	WPS 200-30
25	Lever Φ18x20	YJ-CR 1810
26	Tape grip	KLB 350-01A-RT
27	Washer 1,5	WAA 210x-01-207
28	Screw M4 x 12	PN-87/M-82302

13. COMPLETE BALANCE ASSEMBLY



No	Name	No of drawing or norm
1	Screw M3 x 12	BN 13577
2	Base BPS-C1 Base BPS-C2	BPS C1-73 BPS C2-72
3	Screw M3 x 12	BN 13577
4	Cover 128 Cover 165	WPS 100-06 WPS 100-05
5	Positioning part	WLC xAx-17
6	Elastic bumber of small pan Elastic bumper of big pan	WPX 201-01 WPX 203-01
7	Pan shield 128	WPX 450-01-033
8	Square pan 128 Pan set 195	WPX 120-01 BPS 200-32
9	Contact spring	WPX 203-52
10	Front sleeve	WPS 100-12
11	Keyboard (with parameters)	K-12-P72_b
12	Display screen	WAA 210/X-05-003/LCD

14. TYPICAL DEFECTS AND THEIR REMOVAL

14.1. Messages informing about type of balance defect

- **Full 1 – converter work rang is exceeded**

This damage can be caused by single dynamic shock or permanent damage of mechanism

Defect removal:
Check the mechanism, pay attention to condition of spring parts, flexures and string can't be broken or bend. They must be in perfect condition .
If mechanism is not damaged, move directly to calibration of balance.

CAUTION:
If it is necessary to replace one of spring parts, pay attention to the fact that internal walls of magnet must be perfectly clean and coil should move in magnet without friction, perfectly loosely and without resistance.

Next after flexure or coil replacement check quantity of divisions from A/C transducer. After moisture analyzer assembly and check of quantity of divisions

from A/C transducer, move to factory calibration of balance. Proceed according to calibration procedures of moisture analyzer in BPS series.

After **each repair** of balance checking of eccentricity and linearity of indications has to be made and if necessary, make the regulations.
It is advised to define factory parameters of balance and checking its metrology characteristics. In case of deleting temperature corrections it is necessary to delve process of TEMPERATURE COMENSATION.

Next cause of error occurrence is damage of A/C transducer block placed on the mainboard. Damage of A/C transducer block is characterised by lack of increase divisions from transducer. Increase can be check by entering in factory parameters of balance and by observing change of transducer divisions while loading the balance. After change of position sensor board, check quantity of divisions from A/C transducer. In such case pay special attention not to delete temperature corrections.

- **Full 2 – exceed of weighing range**

Damage similarly to case of damage Full 1 may be caused by single dynamic wave or permanent damage of mechanism .

Procedure during repair should be the same as in case of Full 1 .

- **Null – too few number of divisions from transducer**

During appearance of display NULL , one should perform through discussion with client to define reason for error occurrence , very often this error is single , caused by mistake of user during process of starting the balance:

- balance put on without pan
- pan of the balance not installed correctly

Before starting service actions :

- Make visual inspections to eliminate damages caused by fall of balance from the height
- Calibrate the balance according to factory calibration
- Check eccentricity of balance and propriety of indications .

After identifying incorrectness, open the balance and make visual investigation of balance mechanism. Check number of divisions from A/C transducer.

- Empty pan - $1*10^6 \div 2*10^6$ divisions
- max. capacity – quantity of divisions $\leq 1*10^6$

In case of mechanical part damage, replace damaged element and proceed as in case described for Full 1.

- **HI or HIGH – exceeded number of divisions from transducer for start mass**

To find the cause of error occurrence, one should make thorough conversation with customer or user of balance . Very often case is error during starting the balance :

- balance started with load on the pan
- pan of balance installed incorrectly

Before starting service actions:

- Make visual inspections to eliminate damages caused by fall of balance from the height
- Calibrate the balance according to factory calibration
- Check eccentricity of balance and propriety of indications .

In case of finding irregularity follow the procedure described in case for FULL 1 .

The cause of appearance of errors HI/HIGH or NULL can be damage of analogue board or damage of position sensor . The most often it appears in following way :

- NULL – lack of convection of coil in magnet , the most often display shows NULL.
- HI/HIGH – to big deflection of coil , lack of control of work of coil in position sensor and readout of change of position of coil .

CAUTION: All of described errors can be caused by single impact or by permanent damage of mechanism.

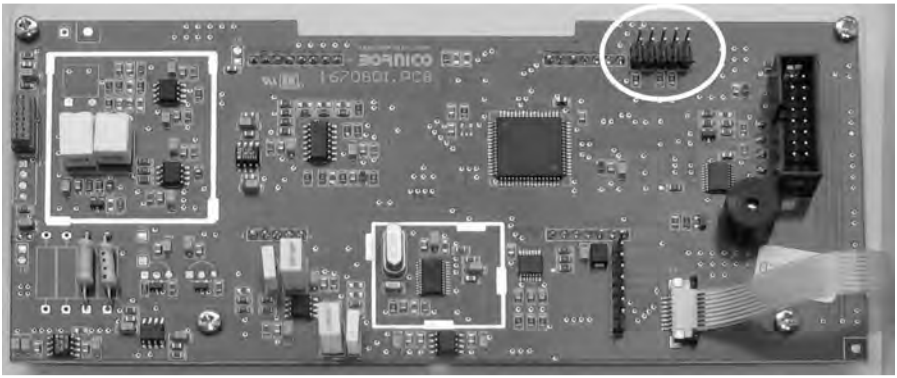
TABLE 1 – The most common problems, their locations, method of checking and solutions.

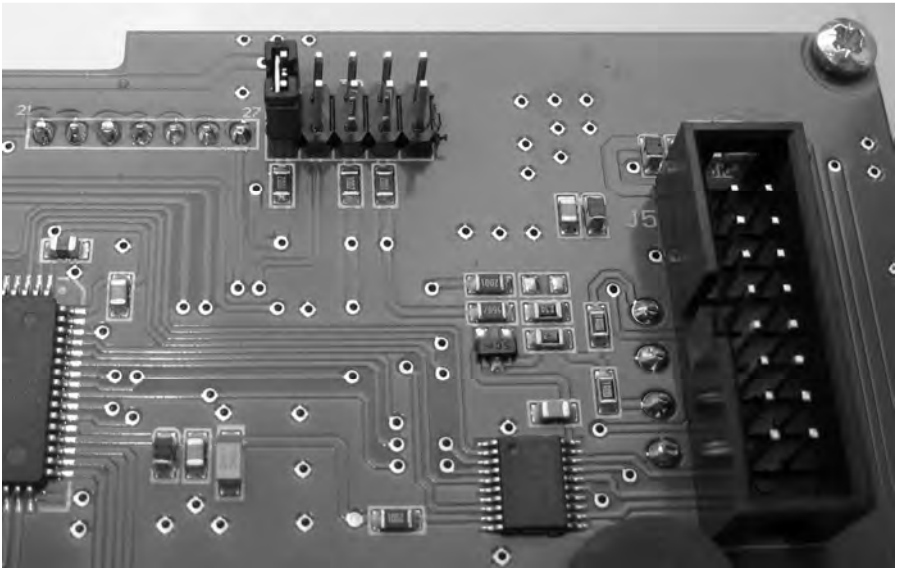
Problem	Location	Check	Solution
LACK OF SUPPLY	Damaged adaptor. Damaged cable of connection supply of main board.	Measure the voltage on accumulator pin round-about 11÷14V AC. Check cable connecting junction boar input/output with main board	Lack of adaptor voltage replace adaptor. Damaged connecting cable should be replaced.
LACK OF EXPOSURE ON DISPLAY	Lack of supply of balance . Lack of communication between tapes joints . Damaged display placed on main board. Damaged processor of balance	Check „mounting" of coil (if yes supply is correct). Check propriety of connections of all tapes . Connect spare display. Connect spare main board	Replace damaged tape. Replace main board. Replace all display. Replace processor.
UNSTABLE RESULT UNSTABLE ZERO ERRORS OF INDICATIONS	Incorrect set user parameters (filters). Contaminated inside of balance (foreign bodies). Contamination of magnet. Damaged spring elements.* Movement of internal calibration weight.	See user manual. Investigation of balance inside. Investigation of magnet inside – must be free of foreign bodies. Estimate visually with use of magnifying glass straightness of all spring elements. Estimate visually if they do not seize up mechanism elements.	Set appropriate parameters for given moisture analyzer and operating conditions. Clean the inside. Clean the magnet and set centrically coil, so it doesn't seize up the body edges. Replace damaged elements with new ones. *Set weights

LACK OF CALIBRATION REPEATABILITY	Damaged mechanism of balance	Estimate visually with magnifier straightness of spring parts..	Replace damaged elements with new ones.
ECCENTRICITY ERROR	Incorrectly leveled balance. Out of adjustment mechanism.	Level the balance Check eccentricity of indications .	Regulate the eccentricity
INDICATION CREEP UNDER LOADING	Wrong chosen exemplary resistor. Damaged electronics.	Make visual inspections (contamination, damaged spring parts).	Clean the mechanism, eventually magnet. If necessary replace spring parts.
LINEARITY ERROR	Damaged mechanism of balance Out of adjustment linearity.	Estimate visually with magnifier straightness of all spring parts..	Defective parts replace with new ones . Execute the linearity correction.
LACK OF TRANSMISSION BALANCE - COMPUTER	Incorrectly set transmission parameters. Damaged RS cable. Damaged electronic main board. Damaged RS tape.	Set correct transmission parameters . Check RS cable Check RS tape.	Replace RS cable. Replace RS tape.

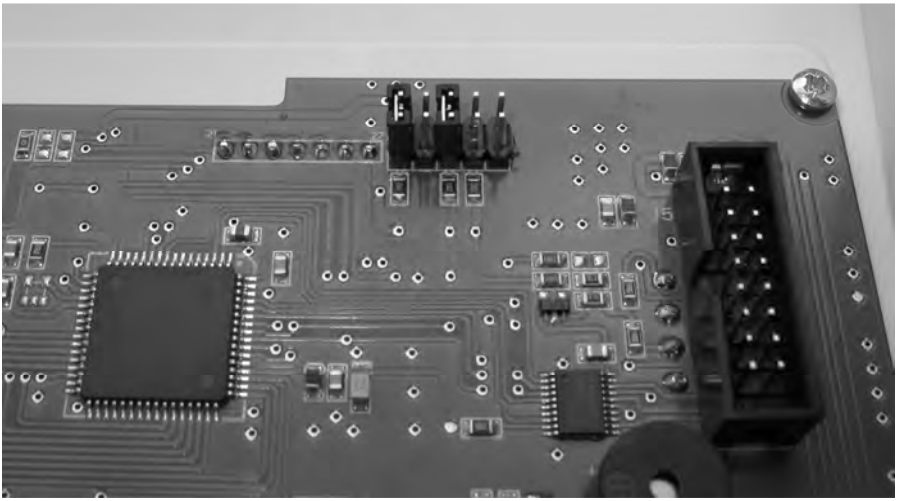
15. FACTORY MENU

Factory menu contains parameters required for starting, setting and regulation of balance. It is possible to enter to factory parameters by placing jumper on pins marked by **J2** on main board 167xxx.PCB (placing of pins is shown on picture below).

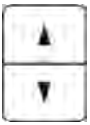




If the balance does not react on changes in the software place jumper on pins as it is show below. It enables to change the software parameters.



To move in factory menu use the keys:

	Enter to main menu.
	Navigation keys, change vale of parameters
	Leave menu.
	Acceptation

15.1. Description of factory parameters

Way of entry to factory menu:

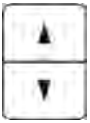
	Enter to main manu pressing key **Setup**.
	Set parameters next to submenu group **P0 FAct.**
	Enter to submenu **P0 FAct.**

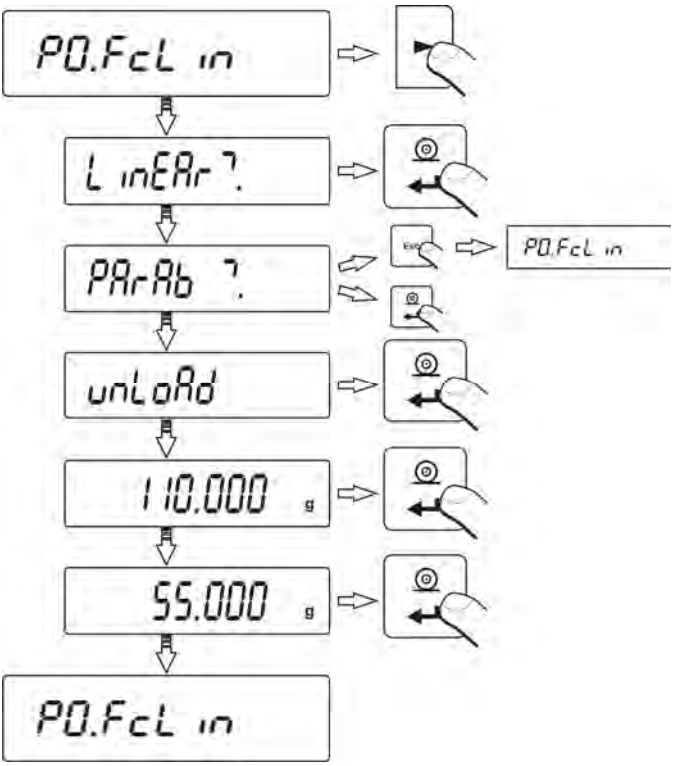
TABLE 2 – Factory parameters

No	name	Description
P0.0	dFlt	Causes deleting all settings in balance and adopting by software default settings.
P0.1	nb	Parameter which changes write (change) factory number of balance
P0.2	A/d	Displays divisions from analog-digital converter
P0.3	A/dt	Displays divisions from temperature converter
P0.4	EcAL	**Selects balance:** **YES** – for balances C1 –with external calibration **no** – for balances C2 – with internal calibration
P0.5	div	Place of decimal point with value of last digit.
P0.6	FuLS	Set max range.
P0.7	rn92	Set optional second range.
P0.8	Esrg	Mass in carat units. **YES** **no**
P0.9	Auto	Range of moisture analyzer autozero operation: (possibility of change value from 0.1 to 5.0 divisions).
P0.A	Con	Displays stable measurement (possibility of changing value 2 ÷ 32).

P0.b	trn9	Temperature range for automatic calibration.
P0.c	I_uu	Value of internal calibration weight – given on weight or inside balance.
P0.d	E_uu	Value of external calibration weight.
P0.E	FcAl	Factory calibration of balance. To accept each step use key  **PRINT**.

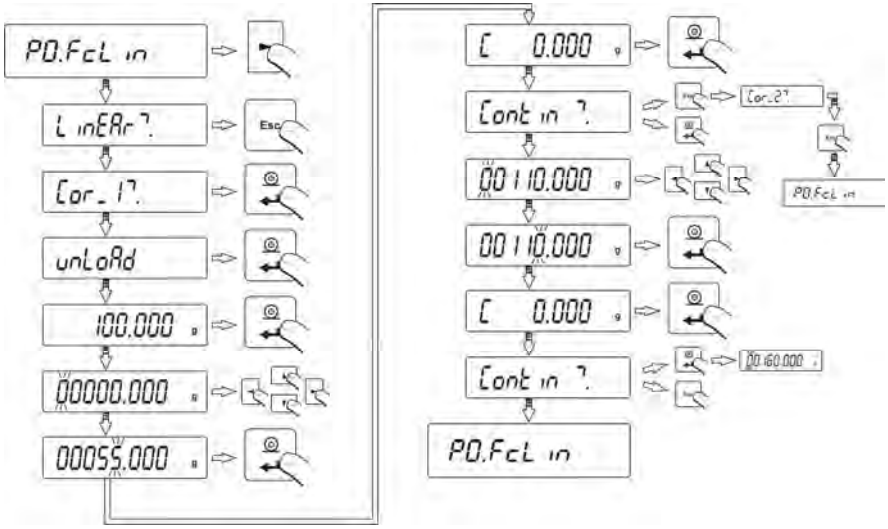
Parameter number: P0.F
Parameter name: cLin

Parabolic correction:



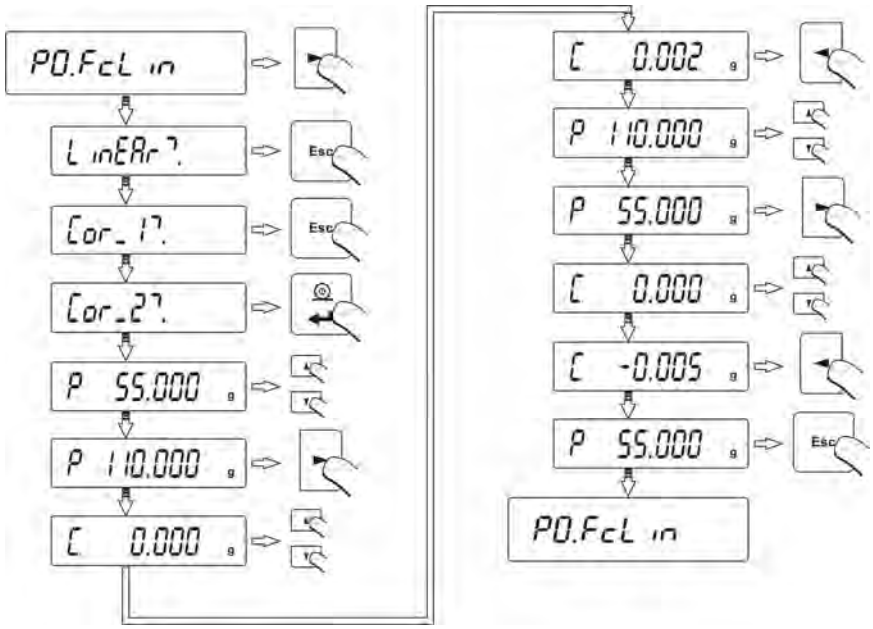
Parameter number: P0.F
Parameter name: cLin

Manual correction of linearity:



Parameter number: P0.F
Parameter name: cLin

Manual correction of linearity corrections:



P0.G	ctE	Temperature compensation: • Balances with internal calibration After entering parameter **ctE**, balance shows command **Attent!** – after pressing key **Print** balance shows 0.0000 g ℃ - press key ▲, then DAC is settled automatically. Divisions from converter A/C are displayed on the display then balance shows 0.0000 g ℃. Press key **PRINT** – balance goes through internal calibration then mass value with black mark is displayed. Press **PRINT** – balance goes through internal calibration and then return into **P0.G**. • Balances with external calibration After entering parameter **ctE** balance displays command **Attent!** – after pressing key **Print** balance shows 0.0000 g ℃

		Press key  , then DAC is settled automatically. Balance displays 0.0000 g℃ – press key **PRINT** twice–at first step of temperature compensation is started. Value of weight is displayed. After replacing weight press **PRINT**. Balance displays value of weight used in previous step. Press key **PRINT** twice– second step of temperature compensation is started. Value of weight is displayed. After replacing weight continue pressing **PRINT** – balance return to menu **P0.G**.
P0.h	LFt	Declaration of verified/not verified balances **ON** - verified **OFF –** not verified
P0.i	Pd	Distinguishing last digit on the printout. **nonE** – no distinguished **LASt** – last digit distinguished **tuuo** – 2 last digits distinguished.
P0.j	L_cr	Cancelling zero and sensibility factor. **LtE Z?** – cancelling zero factor. Accept with **PRINT** key and set **On** –zero factor is settled to zero or **OFF** – zero factor is not settled to zero; **LtE C?** – cancelling sensibility factor. Accept with **PRINT** and set **On** – sensibility factor is settled to zero or **OFF** –sensibility factor is not settled to zero.
P0.k	d_r9	Movable range: **no** – movable range is off **YES** – movable range is on.
P0.L	uPol	Converter work: **no** – -3 ÷ +3 V (bipolar) **YES** - 0÷ +2,25 V (unipolar).
P0.n	b_uP	Backup –spare copy: **Print?** – printing spare copy **rEc?** – Deception of spare copy.
P0.o	btLd	Bootloader – software mode

16. COOPERATION WITH PRINTER OR COMPUTER

ATTENTION

External device connected to RS 232 must be supplied from common net of low voltage with anti-electric shock protection avoiding difference between potentials on zero conductors and connected device.

Transmission parameters recorded in balance:

- Transmission speed - 2400 ÷ 19200 bit / s
- Data bits - 8 bits
- Stop bits - 1 bit
- Parity control - lack.

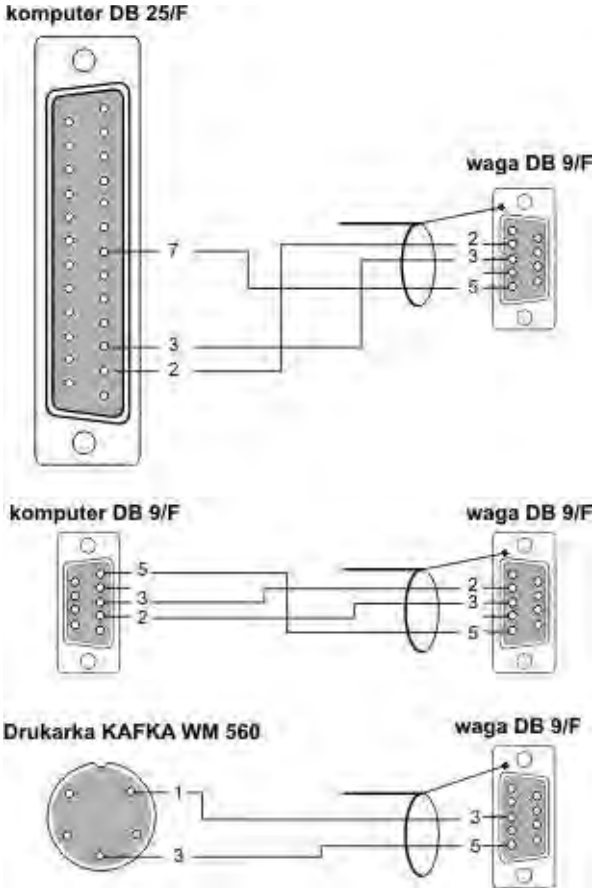
Displayed value can be sent through port RS 232 to external device in one of three following ways:

- Manually - after pressing **PRINT**
- Automatically - after stabilization
- Constantly - after function activation or sending control command
- As replay to external device command (see additional functions).

Displayed value can be sent through port RS232 as one of following values:

- Stable – information is sent after stabilization
- Not stable – displayed data are sent to external device after pressing **PRINT** (it is marked with **<?>** ahead result).

16.1. Schemes of net connections



BALANCE	COMPUTER
2 (RxD)	3 (TxD)
3 (TxD)	2 (RxD)
4 (DTR)	6 (DSR)
5 (GND)	5 (GND)
6 (DSR)	6 (DTR)
7 (RTS)	8 (CTS)
8 (CTS)	7 (RTS)

16.2. Printing with date and time

Each result can be printed with date and time on. It is possible only when the balance is connected to printer **Kafka 1/Z** or **Kafka SQ S**.
Parameter **P2 GLP** should be settled as:

PdAt - YES
Ptin - YES.

16.3. Cooperation with statistic printer KAFKA SQS

After connection to printer **KAFKA SQ S,** statistics can be made. Example of printout of statistics:

1	*9:02:15*	*+ 7.0016*	*g*
2	*9:02:39*	*+ 5.0152*	*g*
3	*9:02:58*	*+ 12.0171*	*g*
4	*9:03:15*	*+ 9.9937*	*g*
5	*9:03:34*	*+ 12.0169*	*g*
6	*9:03:48*	*+ 22.0111*	*g*

Date 13.09.2001 Time. 9:04

n	*6*		*amount of samples*
sum x	*68.0556*	*g*	*sample mass sum*
$\bar{x}$	*11.34260*	*g*	*average value*
s	*5.92328*	*g*	*standard deviation*
srel	*52.22*	*%*	*variation factor*
min	*5.0152*	*g*	*min value*
max	*22.0111*	*g*	*max value*
R	*16.9959*	*g*	*difference max – min.*

16.4. Sending data format

Result can be sent from balance to external device after pressing **PRINT** on balance or sending command from computer.

16.5. Format of sending data after pressing PRINT

Depending on setting parameter **P4.5 PStb,** only stable measurement or temporary mass is sent

ATTENTION
For verified balances parameters printout is blocked

Printout

1	2	3	4 - 12	13	14 - 16	17	18
Stability sign	space	sign	mass	space	unit	CR	LF

Stability sign - [space] –if stable
- [?] – not stable
- [^] – if range + is exceeded
- [v] – if range – is exceeded

sign - [space] – for plus values or [-] minus value
mass - 9 signs – adjustment to right
unit - 3 signs - adjustment to left

16.5.1. Format of sending data for commands generated from computer

Balance after accepting command replays in following ways:

XX_A CR LF - command understood, start up
XX_I CR LF - command not understood, inaccessible at this time
XX_^ CR LF - command understood, but max range is exceeded
XX_v CR LF - command understood, but min range is exceeded
XX_E CR LF - error during performing command – time limit is exceeded during waiting for stable result (time limit is characteristic parameter)
XX - command name

And then:

1 – 3	4	5	6	7	8 – 16	17	18 - 20	21	22
Command	space	Stability sign	space	sign	Mass	space	unit	CR	LF

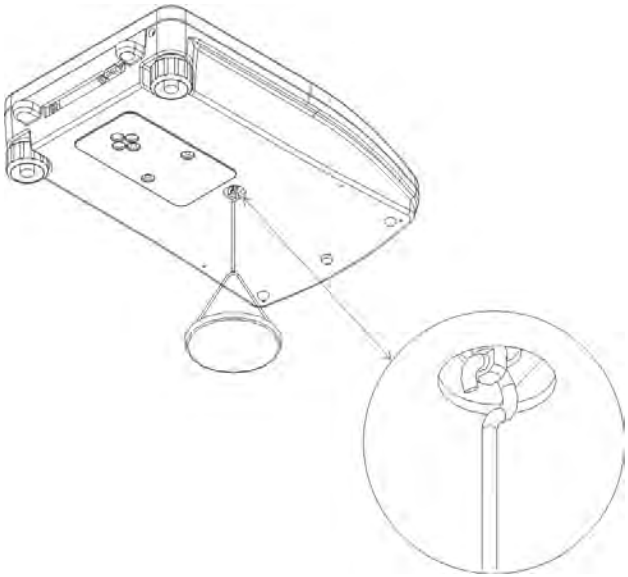
Command - 1 ÷ 3 - signs
Stability sign - [space] – if stable
- [?] – if not stable
- [^] – for error when "+" range is exceeded
- [v] – for error when "–" range is exceeded
Sign - [space] – for plus values or [-] for minus values
mass - 9 signs – adjustment to right
Unit - 3 signs – adjustment to left.

17. WEIGHING LOADS UNDER BALANCE

In standard version loads can be weighed under balance. Rack which is in additional equipment can be used to replace the balance above the level.

When using this function user must:

- Remove hole plastic plug in the balance base,
- There is stationary hanger in the hole
- In the hole install proper hook to hang load (hook is a part of factory equipment), weight the load on the hook,
- Put the hole plastic plug into the base



ATTENTION
The hanger cannot be turned around or twisted under the danger of damage.
*Mass of every weighed elements should be entered using key Esc/**TARA**.*

18. LIST OF COMMANDS COMPUTER – BALANCE

- **Function** **TARA**
  Command **T** CR LF (tare)

- **Function** **ZERO**
  Command **Z** CR LF (zero)

- **Function SEND RESULT IN MAIN UNIT**
  Command **SI** CR LF (immediate sending indication)

- **Function** **SEND RESULT IN MAIN UNIT**
  Command **S** CR LF (returnable sending after stability)

- **Function SEND RESULT IN UNIT ACTUALLY USED**
  Command **SU** CR LF (sending indication in unit currently used after stability)

- **Function** **IMMEDIATELY SEND RESULT IN UNIT CURRENTLY USED**
  Command **SUI** CR LF (sending indication in unit currently used without waiting for stable measurement)

- **Function** **CONSTANCE TRANSMISSION IN BASIC UNIT**
  Command **C1** CR LF (start of constant transmission in basic unit)

- **Function** **END OF CONSTANCE TRANSMISSION IN BASIC UNIT**
  Command **C0** CR LF (end of constant transmission in basic unit)

- **Function** **CONSTANCE TRASMISSION IN UNIT CURRENTLY USED**
  Command **CU1** CR LF (transmission start in unit currently used)

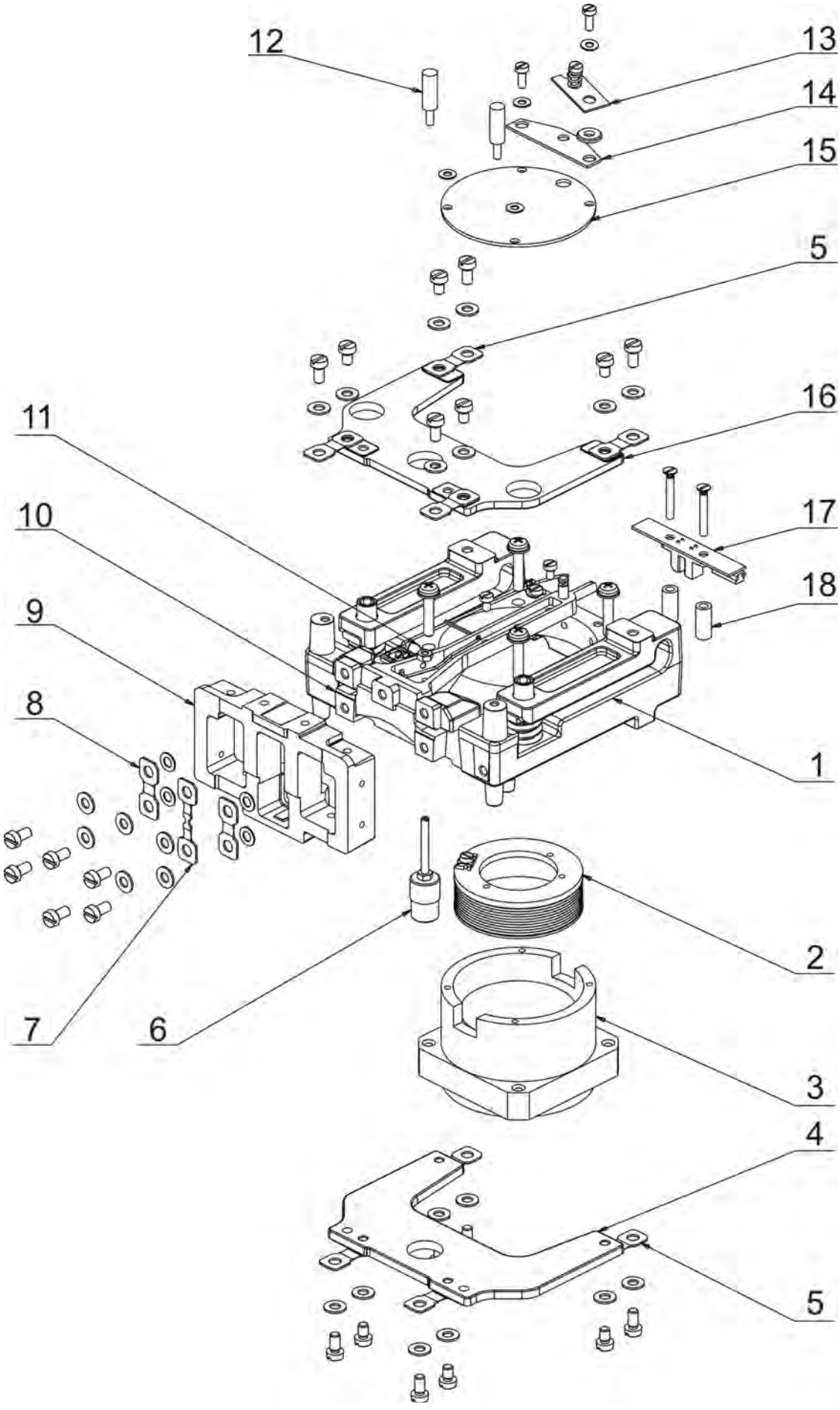
- **Function** **END OF CONSTANCE TRANSMISSION IN UNIT CURRENTLY USED**
  Command **U0** CR LF (End of constant transmission in unit currently used).

ATTENTION
*After sending command with error or the one which is not in the list but finished with CR LF balance sends command **ES CR LF** back. Spaces in formats should be omitted.*

19. COMMANDS ABOUT ERRORS

Er1 Hi	- mass beyond acceptable range during start or calibration,
Er2 nuLL	- value from converter A/C ≤ 0,
Er3 FuL1	- Value form converter A/C ≥ max range of converter,
Er4 FuL2	- max range exceeded,
Er5 rout	- mass value beyond range (during calibration, for quantity standards and percentage deviations etc.),
Er7 tout	- operation time is exceeded (zero, tare),
Er8 outr	- value (from keyboard) beyond range (for steps weighing),
Er9 Lock	- function is blocked (with LFT),
Er10 cal	- calibration error (change of mass or wrong calibration weight mass).

Appendix nr. 1



No	No	Name	No of drawing or norm
1	1	Body set	WPS/C 10-01-023
2	1	Coil S40 with wire Φ 0,12	WAA/S 160-41
3	1	Body set S40	WAA/S 160-45
4	1	Horizontal rocker	WPX 140-04 D
5	8	Horizontal flexure (0,2-0,6) Horizontal flexure (2-6)	WPX 140-01 (pan 128) WPX 141-01 (pan 195)
6	1	Vertical tare device Vertical tare device	BPS 100 (pan 128) WAS 60/C/2-30 (pan 195)
7	1	String (0,2-0,6) String (2-6)	WPX 101-11 (pan 128) WPX 100-11 (pan 195)
8	2	Vertical flexure Vertical felxure	Zaw-p1 nr 2 (pan 128) WPX 140-01 (pan 195)
9	1	Vertical rocker – 600 Vertical rocker – 6000	BPS 200-26 (pan 128) BPS 200-27 (pan 195)
10	1	Coil lever Coil lever	WPS/C 10-02-131 (pan 128) WPS/C 10-02-201 (pan 195)
11	2	Conduct tape	WPS/C 1-36
12	2	Sleeve	BPS 200-24
13	1	Washer	WPS 60-03-019
14	1	Welt	WAA/S 160-38
15	1	Lid	WAA/S 160-39
16	1	Horizontal rocker	WPX 140-04 T
17	1	Place sensor board	169xxx.pcb
18	2	Place sensor sleeve	WPS/C 10-04-005

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INSTRUCTION MANUAL FOR

Precision Balances

BWLC Series

PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

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