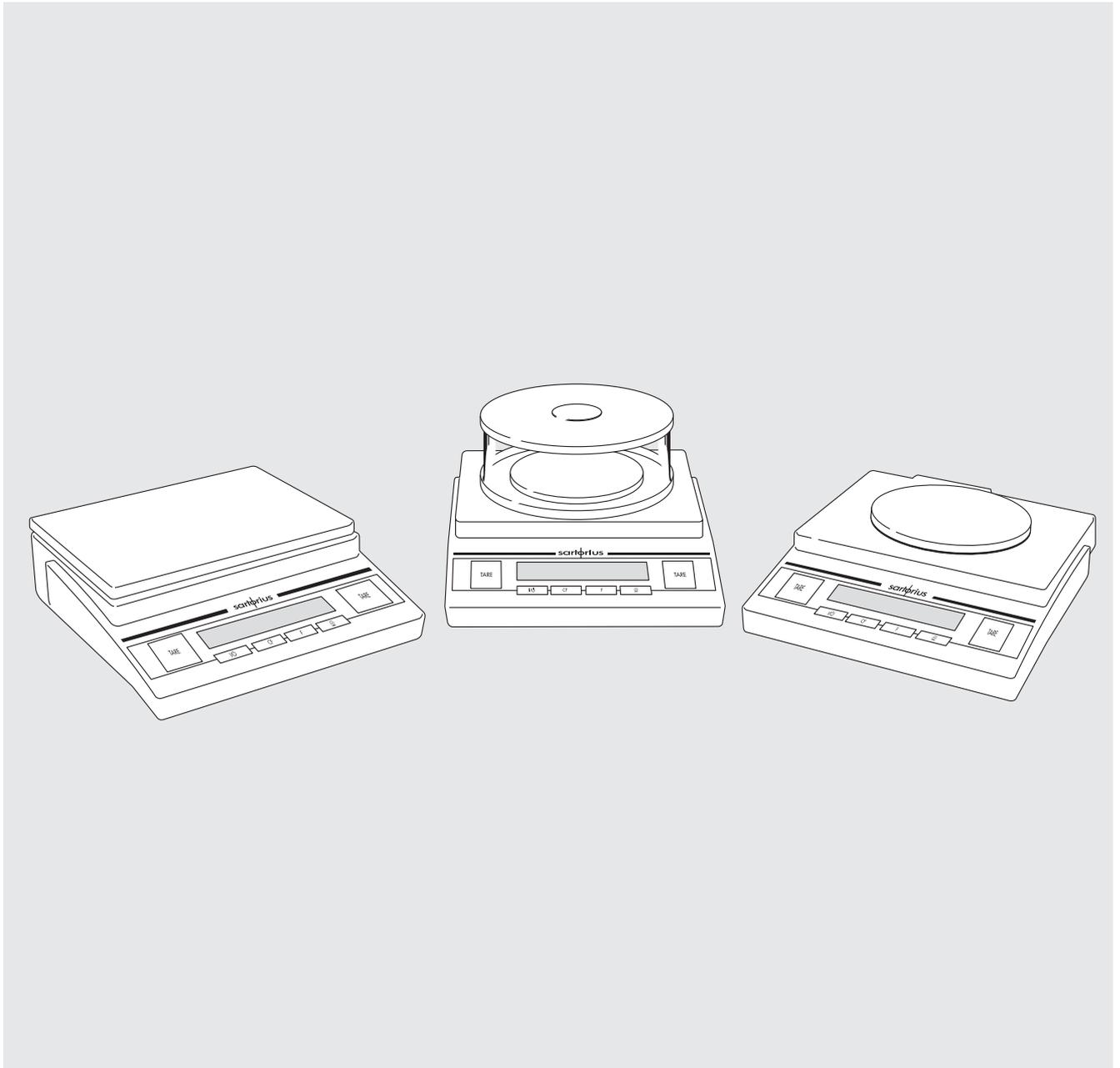


# Sartorius Basic<sup>lite</sup> and Gold

Service Manual  
Electronic Precision and Gold Models

incl. Spare Parts List and Service Specifications



Sartorius AG, Weighing Technology



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## General Information

### Service Concept

All repair service, including diagnostics, should be performed at a well equipped repair center.

Spare Parts are available in sets (see the list on page 15).

If the strain-gauge load receptor should become defective, the entire balance/scale should be replaced.

### Overview of BL and GL Models

Status: 03/98

BL150, BL150S, BL150-000V1, BL3, BL310, BL3100  
BL6, BL600, BL610, BL6100, BL12

GM1205, GM1502, GM312, GM3101, GM601, GM612, GM6101

### Service Tools and Equipment

In addition to standard tools, you will need the following special tools to work on the Basic<sup>lite</sup> Series and Gold Series balances/scales:

Qty.	Designation	Order no.
	BPI adapter/service data output port	6740-71
	Sartocas service software, version 1.30 or later, and	6740-33
	RS-232 cable for connecting the balance/scale to PC, or	7357312
	CAS Psion Server, version 4.6 or later	6739-98

### Accompanying Literature

Installation and Operating Instructions for Basic<sup>lite</sup> and Gold Series Balances/  
Scales

# Operating the Balance/Scale

## Functions of the Keys

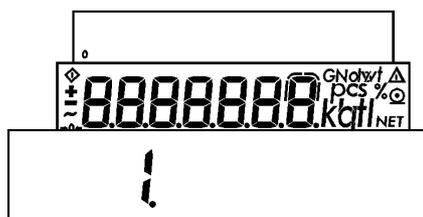
-  On/off.
-  Clear function. Used to interrupt/cancel functions.
-  Function key. Starts the selected application program.  
(To display selected reference sample quantity or percentage, press and hold this key for approx. 2 seconds.)
-  Print key.
-  Tare key. (To start calibration/adjustment, press and hold this key for approx. 2 seconds.)

## Balance/Scale Operating Menu

### Accessing the Balance/Scale Operating Menu and Changing the Settings

#### Accessing the Menu: +

- Turn the balance/scale off and then turn it back on.
- Press  briefly while all display segments are lit.
- If "1" is displayed, the menu is locked (read-only).



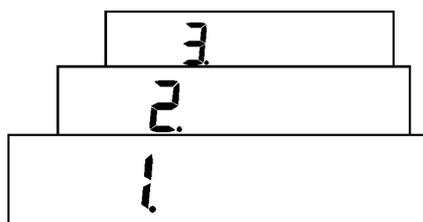
Menu-01.TIF

Note:

If the menu is locked, change the code setting from 8-1-2 to 8-1-1. Once you store this code, the menu is accessible.

#### Selecting a Menu Code: and

- To select a certain menu code, press  to change the number of the digit displayed to the desired number. Numbers change in a cyclical sequence, starting at 1 again after 9 is reached.

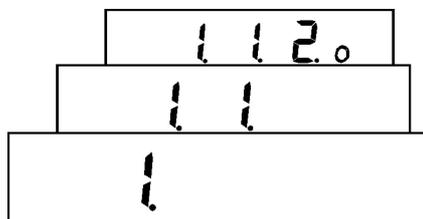


Menu-02.TIF

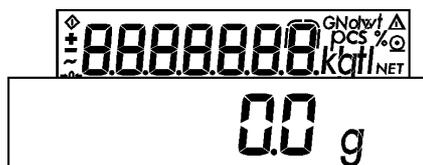
- To select the next digit (menu level), press 

#### Changing a Menu Code Setting: (press and hold)

- To confirm the desired code setting, press the  for approx. 2 seconds. The superscript "o" is displayed to indicate that this is the current setting.
- To exit the balance/scale operating menu and store the new settings, press  for approx. 2 seconds.
- To exit the balance/scale operating menu without storing any changes to the settings, press .



Menu-03.TIF



Menu-04.TIF

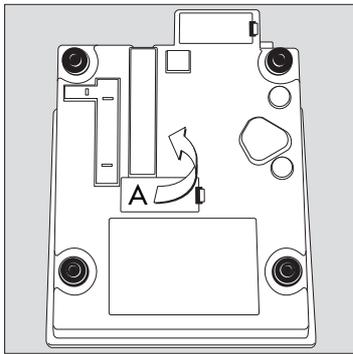
## Activating the BPI Mode

Note:

The BPI mode must be activated in the balance/scale before you can work with the service software. You need to use this software, for example, to adjust:

- the span after the zero-point offset was changed
- the linearity and/or
- after replacing a PCB.

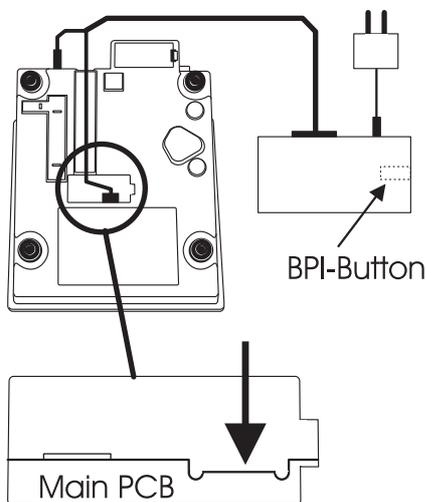
The BPI adapter (part no. 6740-71) must be connected to the balance/scale before the BPI mode can be activated. The procedure for connecting the adapter is as follows:



Data-01.EPS

- Turn off the balance/scale and disconnect it from the power supply
- Remove the weighing pan
- Remove the protective cap (A) from the bottom of the balance/scale.
- The main PCB is now accessible through an opening in the balance/scale housing.
- Connect the white plug on the cable of BPI adapter to the corresponding position on the main PCB.
- Connect the plug on the power cable of the BPI adapter to the power jack on the balance/scale.
- Plug the balance/scale AC adapter into the power jack on the BPI adapter.

The equipment is now connected as follows:



BPI-01e.EPS

- The balance/scale has a 25-pin RS-232 interface for the service software
- There is a separate power supply to the balance/scale so that the BPI mode can be activated (only with battery not possible).
- Replace the weighing pan and turn on the balance/scale.
- When 0.0 is displayed, use a suitable tool to press and hold the button on the BPI adapter (accessible through an opening in the housing).
- The balance/scale now performs its self-test (display segment check) repeatedly.
- Wait until the segment check has lit up at least 3 times; then press the button again.
- The balance/scale electronics are now in the BPI mode and you can use the balance/scale with the service software.

**Caution!**

After working in the BPI mode, make sure to set the write-protect again (using the "Close" function in the service software program) so that the balance/scale returns to the SBI mode (SBI = serial balance interface; this is the standard data transfer protocol). Otherwise you will not be able to operate peripheral devices with the balance/scale; when  is pressed, the error code "E 30" is displayed.

# Calibrating/Adjusting the Balance/Scale

## Calibration/Adjustment Sequence

After installation, or following maintenance or repair work, check and, if necessary, adjust the following factors:

1. Overload stop
2. Zero-point offset value
3. Off-center load
4. Linearity
5. Span

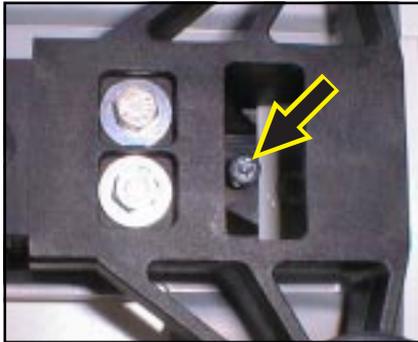
## Adjusting the Overload Stops

The overload stop must be reset after the strain-gauge load receptor has been damaged or replaced. Weight readouts greater than the balance/scale's maximum capacity must be read off. The service software is required for this procedure.

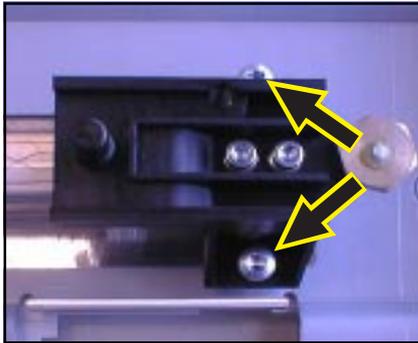
- Activate the BPI mode (see page 5)
- Service software: Select the "Diagnostics" program; then select the "High Resolution" subprogram
- When adjusting the overload stop, read off the weight value shown on the Psion server or PC display
- After adjusting the overload stop, activate the "Close" function in the service software to reset the balance/scale to the SBI mode.

Balance/Scale Type	Test Weights
BL 150 ...	200g ± 10%
BL310, GM312	400g ± 10%
BL600/610, GM601/612	650g ± 10%
BL1500, GM1502	1,600g ± 10%
BL3/3100, GM3101	3,500g ± 10%
BL6/6100, GM6101	6,500g ± 10%
BL12	13,000g ± 10%

### Adjusting the Center-load Stop



Anschl01.JPG



Anschl02.JPG

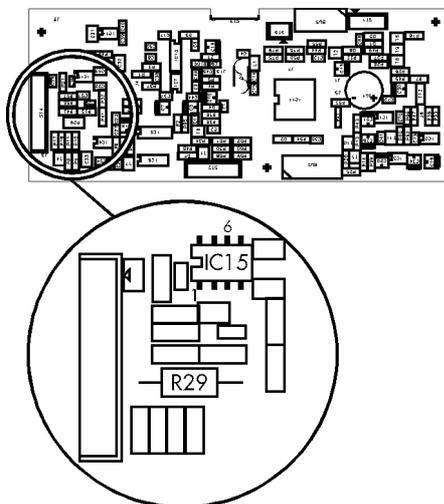
- Open the balance/scale (see page 9) and then reconnect it to the power supply
  - Center the required test weight and an additional 200 g (corresponds to the weight of the weighing pan and the shock absorber) on the weighing pan.
  - The service software display shows a stable weight readout
  - Adjust the stop screw inward until the overload limit is just reached
  - The weight readout is no longer stable
  - Adjust the stop screw ½ turn outward
  - The center-load stop is now properly adjusted
- 
- On balances and scales with a round pan, there are two overload screws (see arrows). Both have to be adjusted.

### Zero-point Offset Value

The zero-point offset value adjustment is necessary for adapting the bridge voltage of the strain-gauge load receptor to the operating range of the balance/scale electronics. This may be necessary:

- after replacing the strain-gauge system
- after replacing the main PCB
- if the span cannot be adjusted (even with the service software) and the error code "E 02" is displayed
- when the zero-point offset voltage has changed and is outside the tolerance limit (e.g., due to the strain gauge load receptor being "bent")

### Adjusting the Zero-point Offset Value



Offset1.TIF

- Open the balance/scale (see page 9)
- Connect the cable from the digital voltmeter (DVM) to IC15, pin 6 and ground
- Place the shock absorber and the weighing pan on the balance/scale and reconnect the power supply
- Use the DVM to check the preload voltage with no load on the balance/scale

**Target (mV)**

– 0.25 to – 0.49

**A/D converter output (%)**

4.3% to 8.3%

- If the zero-point offset voltage is outside the tolerance range listed above, balancing resistor R29 must be adjusted in accordance with the table below.

## Table of Balancing Resistors

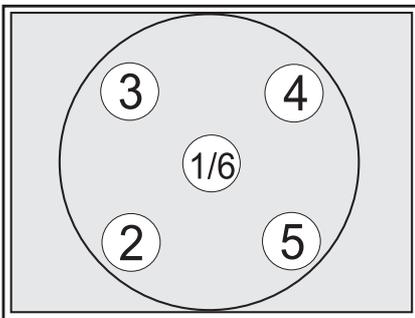
Zero-point offset voltage (V)	R29 resistance value (ohms)
2.475 - 2.310	10
2.310 - 2.144	1,800
2.144 - 1.979	3,600
1.979 - 1.813	6,200
1.813 - 1.648	9,100
1.648 - 1.482	12,000
1.482 - 1.317	15,000
1.317 - 1.151	20,000
1.151 - 0.968	27,000
0.968 - 0.820	33,000
0.820 - 0.655	43,000
0.655 - 0.489	51,000
0.489 - 0.324	68,000
0.342 - 0.158	100,000
0.158 - -0.007	150,000

The balancing resistor must have the following specifications:

Metal film, 0.6 W, 1%, TK50

## Off-center Load

### Checking the Off-center Load



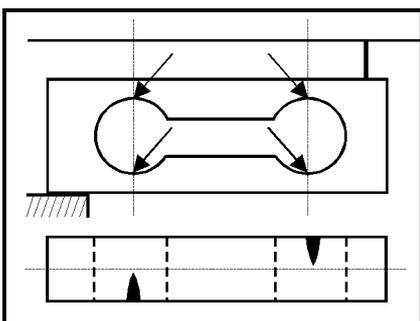
Eckl-o2.EPS

- Center the test weight (see “Service Specifications,” page 14) on the weighing pan (position 1) and press **TARE**  
“0.0” is displayed (depending on model and settings)
- Place the test weight on positions 2, 3, 4 and 5 in sequence
- The absolute values displayed for all 4 positions must be within the limits listed in the service specifications (see page 14)
- If the off-center load error exceeds the tolerance listed in the service specifications in any of these 4 positions, the off-center load should be adjusted with the greatest positive error value (see “Adjusting the Off-center Load” below)

### Adjusting the Off-center Load

- Remove the weighing pan and any shock absorber.
- Remove the Phillips screw (A) and remove the hood.
- Remove the 2 fastening screws from the pan support (7 mm open-end wrench) and remove the pan support.
- The strain-gauge load receptor is now accessible.
- Correct the off-center load by filing on one of the thin sections. Always file the thin section that corresponds to the greatest off-center load error.

Note: Only small deviations can be adjusted. If the strain gauge load receptor is visibly bent an adjustment is not possible anymore!!



Eckl-o1.TIF

- Place the pan support on the load receptor and fasten it. Place the hood, shock absorber and weighing pan back on the balance/scale.
- Check the off-center load and readjust it if necessary.

## Linearity

Adjust the linearity using the service software.

- Activate the BPI mode (see page 7)
- Connect the balance/scale to the PC and start the linearity program in the service software
- Reset the balance/scale to the SBI mode by activating the "Close" function in the service software
- Check the span adjustment and adjust if necessary (see "Span Adjustment" below)

## Span Adjustment

### Note:

There are two ways to perform span adjustment:

1. With the service software or
2. as described in this manual

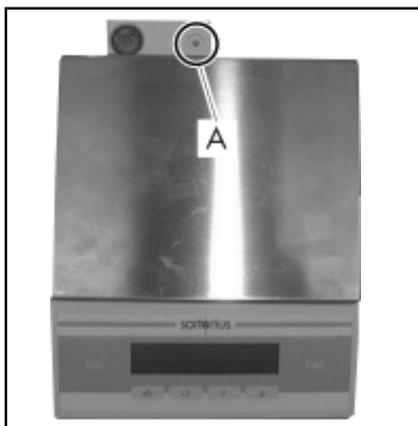
- Select the menu code "External adjustment accessible" (code 1 5 2)
- If necessary, set the weight unit for the calibration weight (code 1 4 x) (factory setting: "kg" – code 1 4 2)
- Unload the balance/scale and, if necessary, press **TARE** to tare the display
- Press and hold the **F** key for >3 sec. to activate the calibration routine
- The weight value of the required calibration weight is displayed without weight unit; e.g., "+ 5.000"
- Center the prompted weight on the weighing pan (e.g. 5.000 kg)

### Important:

**The balance/scale will only accept a weight that is within a tolerance range of approximately 2% of the nominal weight. Any greater error can only be adjusted using the service software.**

- After the adjustment procedure, the weight is displayed with weight unit (e.g., "+ 5.000 kg")
- Remove the calibration weight
- Check the span again and adjust it if necessary

## Opening and Closing the Balance/Scale



Öffnen.TIF

- Disconnect the balance/scale from power (remove the battery, if one is installed).
- Remove the weighing pan, as well as any shock absorber and/or pan support, and place to one side.
- Remove the Phillips screw (A).
- Remove the hood by carefully pulling it towards the front. Make sure that you do not damage the ribbon cable that connects the display PCB to the main PCB.
- The display PCB, main PCB and load receptor are now accessible.

## Replacing PCBs

In the case of defects, do not attempt to make any repairs at the component level, but replace the entire subassembly.

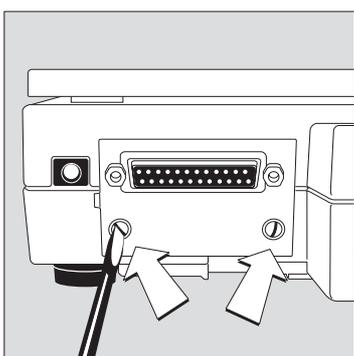
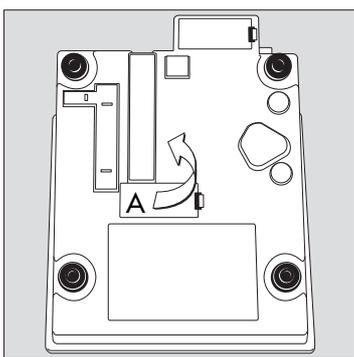
### Replacing the Main PCB

Note:

Before replacing the main PCB, use the service software to read out and store the balance/scale's data record, if possible. If this is not possible, order a pre-programmed PCB, indicating the balance/scale model and serial number.

- Open the balance/scale (see page 9)
- Disconnect all cables
- Remove the fastening screws from the main PCB
- Remove the old PCB
- Take the zero-point offset resistor from the old PCB and place it on the new PCB
- Follow the above instructions in reverse order to install the new main PCB
- The balance/scale must now be programmed with the required data record (unless you have installed a pre-programmed PCB)
- The following factors must be checked and, if necessary, adjusted:
  - Zero-point offset value
  - Linearity
  - Span

### Installing the YDO01BL Data Output Port



- Open the balance/scale (see page 9)
- Lay the balance/scale on its side
- Remove the protective cap (A)
- Guide the ribbon cable from the output port through the opening in the balance/scale housing and plug it into the main PCB (make sure the plug and the positive/negative poles are in the correct positions)
- Replace the protective cap (A)
- Thread the ribbon cable from the output port through the guides provided for this purpose on the base of the balance/scale housing
- Turn the balance/scale upright
- Remove the plate from the back of the housing by pulling it upward
- Use the 2 screws to fasten the output port in the position made available by removing the plate
- Close the balance/scale
- Then test the output port with the following peripheral devices (as available):
  - Sartorius printer; e.g., model YDP03-OCE
  - Service software (SBI test)
  - Data transfer software for PCs and laptops, e.g., Balance Reader

## Overview of the Balance Operating Menu

<b>1</b>	<b>Balance/Scale Functions</b>		<b>2</b>	<b>Application Programs</b>	
<b>1 1</b>	<b>Adapt Filter</b>		<b>2 1</b>	<b>Program Selection</b>	
1 1 1	Minimum vibration		2 1 1	Basic weighing function	
1 1 2	Normal vibration		2 1 2	Toggle weight units	
1 1 3	Strong vibration		2 1 3	Net-total (tare memory)	
1 1 4	Extreme vibration		2 1 4	Counting	
<b>1 3</b>	<b>Stability Range</b>		2 1 5	Weighing in percent	
1 3 1	¼ digit		2 1 12	Averaging	
1 3 2	½ digit				
1 3 3	1 digit				
1 3 4	2 digits				
1 3 5	4 digits				
<b>1 4</b>	<b>Weight Unit for Calibration Weight</b>		<b>3</b>	<b>Application Parameters</b>	
1 4 1	Grams		<b>3 1</b>	<b>Weight Unit 2</b>	
1 4 2	Kilograms		3 1 2	Grams	g
1 4 3	Pounds		3 1 3	Kilograms	kg
			3 1 4	Carats	ct
			3 1 5	Pounds	lb
<b>1 6</b>	<b>Auto Zero</b>		3 1 6	Ounces	oz
1 6 1	On		3 1 7	Troy ounces	ozt
1 6 2	Off		3 1 8	Hong Kong taels	tl
			3 1 9	Singapore taels	tl
<b>1 7</b>	<b>Weight Unit 1</b>		3 1 10	Taiwanese taels	tl
1 7 2	Grams	g	3 1 11	Grains	GN
1 7 3	Kilograms	kg	3 1 12	Pennyweights	dwt
1 7 4	Carats	ct	3 1 13	Milligrams	mg
1 7 5	Pounds	lb	3 1 14	Parts per pound	o
1 7 6	Ounces	oz	3 1 15	Chinese taels	tl
1 7 7	Troy ounces	ozt	3 1 16	Mommes	m
1 7 8	Hong Kong taels	tl	3 1 17	Austrian carats	k
1 7 9	Singapore taels	tl	3 1 18	Tola	t
1 7 10	Taiwanese taels	tl	3 1 19	Baht	b
1 7 11	Grains	GN	3 1 20	Mesghal	m
1 7 12	Pennyweights	dwt			
1 7 13	Milligrams	mg	<b>3 3</b>	<b>Preset reference sample quantity / reference percentage / number of subweighing operations for averaging</b>	
1 7 14	Parts per pound	o	3 3 1	5	
1 7 15	Chinese taels	tl	3 3 2	10	
1 7 16	Mommes	m	3 3 3	20	
1 7 17	Austrian carats	k	3 3 4	50	
1 7 18	Tola	t	3 3 5	100	
1 7 19	Baht	b			
1 7 20	Mesghal	m			

## 5 Interface

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### 5 1 Baud rate

---

5 1 1	150 baud
5 1 2	300 baud
5 1 3	600 baud
5 1 4	1,200 baud
5 1 5	2,400 baud
5 1 6	4,800 baud
5 1 7	9,600 baud

### 5 2 Parity

---

5 2 1	Mark
5 2 2	Space
5 2 3	Odd
5 2 4	Even

### 5 3 Number of Stop Bits

---

5 3 1	1
5 3 2	2

### 5 4 Handshake Mode

---

5 4 1	Software handshake
5 4 2	Hardware handshake, 1 char. after CTS
5 4 3	Hardware handshake, 2 char. after CTS

## 6 Print in Weighing Mode

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### 6 1 Manual/auto print mode

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6 1 1	Manual without stability
6 1 2	Manual with stability
6 1 3	Automatic without stability
6 1 4	Automatic at stability

## 7 Print in Application Mode

---

### 7 1 Line Format

---

7 1 1	Without data ID codes
7 1 2	With data ID codes

## 8 Extra Functions

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### 8 1 Menu Access

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8 1 1	Parameter settings can be changed
8 1 2	Read only

### 8 2 External Switch Function

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8 2 1	 key
8 2 4	 key
8 2 5	 key
8 2 6	 key
8 2 8	 key

### 8 3 Power-on Mode \*)

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8 3 1	Off > on
8 3 2	Stand-by > on

## 9 Reset Menu

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### 9 1 Factory Settings

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9 - 1	Restore factory settings
9 - 2	Do not restore factory settings

\*) Auto-On function  
by setting a jumper on the main PCB or  
data interface PCB.

## Error Codes

Display	Cause	Solution
H	Balance/scale capacity exceeded	Unload the scale
L	No pan Something is touching the pan	Place the pan on the scale Remove whatever is touching the pan
E 01	Display overflow; i.e., the value to be output cannot be displayed	Reduce the load on the scale
E 02	Calibration parameter not met; e.g.,: – scale/balance not tared – load on balance/scale	Only start calibration when zero is displayed Press <b>[TARE]</b> to tare Unload the balance/scale
E 10	<b>[F]</b> key is blocked when there is data stored in the 2nd tare memory	Press <b>[CF]</b> to clear the 2nd tare memory
E 11	Value cannot be stored in the 2nd tare memory	Press <b>[TARE]</b>
E 22	Weight too light, or no load on the scale	Increase the weight on the scale
E 30	<b>[☉]</b> key pressed while BPI mode active	Set the scale to the SBI mode (e.g., by activating the "Close" function in the MC1 server)
E 50	Overflow or underflow in the temperature compensation converter	TK sensor or main PCB is defective (replacement required)
E 53	Temperature compensation converter is not functioning. The processor is not receiving any measured data from the TK switch	TK sensor or main PCB is defective (replacement required)
E 54	A/D converter output is below the limit	The scale is underloaded; minimum either the weighing pan/load plate is not on the scale or there is a mechanical defect or a defect in the main PCB
E 55	A/D converter output is above the maximum limit	Either the scale is overloaded or there is a mechanical defect or a defect in the main PCB

## Service Specifications

Model	Weighing Capacity	Readability	Reproduceability		Off-Center Load		TCS ppm/K
			Test weight	Permissible Tolerances	Test weight	Permissible Tolerance (±)	
BL150	150 g	0,01 g	100 g	0,01 g	100 g	0,03 g	20
BL150-000V1	150 g	0,01 g	100 g	0,01 g	100 g	0,03 g	20
BL310	310 g	0,01 g	200 g	0,01 g	200 g	0,03 g	10
BL610	610 g	0,01 g	500 g	0,01 g	500 g	0,03 g	5
BL600	610 g	0,1 g	500 g	0,1 g	500 g	0,3 g	50
BL1500	1500 g	0,1 g	1000 g	0,1 g	1000 g	0,3 g	20
BL3100	3100 g	0,1 g	2000 g	0,1 g	2000 g	0,3 g	10
BL6100	6100 g	0,1 g	5000 g	0,1 g	5000 g	0,3 g	5
BL3	3000 g	1 g	2000 g	1 g	2000 g	3 g	100
BL6	6000 g	1 g	5000 g	1 g	5000 g	3 g	50
BL12	12.000 g	1 g	10.000 g	1 g	10.000 g	3 g	25
GM312	310 g	0,01 g	200 g	0,01 g	200 g	0,03 g	10
GM612	610 g	0,01 g	500 g	0,01 g	500 g	0,03 g	5
GM1205	1200 g	0,05 g	1000 g	0,1 g	1000 g	0,15 g	20
GM6101	6100 g	0,1 g	5000 g	0,1 g	5000 g	0,3 g	5

BL-DATE.XLS

Model	Class	Span			Linearity		
		Adjustm. weight	Test weight	Permissible Tolerance (±)	Tare weight	Test weight	Permissible Tolerance (±)
BL150	M1	100 g	150 g	0,02 g	g	40/70/110/150 g	0,02 g
BL150-000V1	M1	100 g	150 g	0,02 g	g	40/70/110/150 g	0,02 g
BL310	F2	100 g	300 g	0,04 g	g	70/150/220/300 g	0,02 g
BL610	F2	500 g	500 g	0,01 g	g	150/300/450/600 g	0,02 g
BL600	M1	500 g	500 g	0,2 g	g	150/300/450/600 g	0,1 g
BL1500	M1	1000 g	1500 g	0,2 g	g	400/700/1100/1500 g	0,2 g
BL3100	F2	2000 g	3000 g	0,4 g	g	700/1500/2200/3000 g	0,2 g
BL6100	F2	5000 g	5000 g	0,1 g	g	1500/3000/4500/6000 g	0,2 g
BL3	M1	2000 g	3000 g	3 g	g	700/1500/2200/3000 g	2 g
BL6	M1	5000 g	5000 g	1 g	g	1500/3000/4500/6000 g	2 g
BL12	M1	10.000 g	10.000 g	1 g	g	3000/6000/8000/12.000 g	2 g
GM312	F2	100 g	300 g	0,04 g	g	70/150/220/300 g	0,02 g
GM612	F2	500 g	500 g	0,01 g	g	150/300/450/600 g	0,02 g
GM1205	M1	1000 g	1000 g	0,05 g	g	300/600/800/1200 g	0,1 g
GM6101	F2	5000 g	5000 g	0,1 g	g	1500/3000/4500/6000 g	0,2 g

BL-DATE.XLS

## Spare Parts

Spare parts list; status: 3/98

Description	Spare Part No.	BL150S	BL150	BL150-000V1	BL310	BL610	GM312	GM612	BL12	BL1500	BL1500S	BL3	BL3100	BL6	BL600	BL6100	GM1205	GM1502	GM3101	GM601	GM6101	
<b>Power supplies</b>																						
STNG8, US/CDN/J, 120V	6971947	1		1											1							
STNG8, European, 230V	6971948	1		1											1							
STNG8, ZA (RSA), 230V	6971949	1		1											1							
STNG8, AUS (Australia), 230V	6971950	1		1											1							
TNG8, universal, 115V/230V	6971951	1		1											1							
TNG8, UK, 230V	6971952	1		1											1							
Dust cover (rectangular pan)	YDC01BL														1							
Dust cover (round pan)	YDC02BL	1		1																		
Data interface	YDO01BL	1		1											1							
Rechargeable battery pack	YRB07Z	1		1											1							
Glass cylinder for draft shield	69B12180	1																				
Draft shield cover	69B12181	1																				
Weighing pan, round 100mm	69B12182	1																				
Weighing pan (rectangular)	69B12185														1							
Weighing pan, round	69P12179			1																		
Main PCB	69B12183			1																		
Main PCB	69B12187	1		1																		
Top part of housing with overlay,LCD-PCB	69B12184														1							
Top part of housing with overlay,LCD-PCB	69B12186			1											1							
Set of small parts	69B12188	1		1											1							
<b>Consisting of:</b>																						
Housing (bottom), cover, cable (1 each)																						
Cover for level indicator (1)																						
Shock absorber (4)																						
Feet (4)																						
Treaded brackets (2)																						
Bracket for cable (1)																						
Self-cutting screws (4)																						

BLGM-ET.XLS

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