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TECHNICAL SPECIFICATION

Flip DOT STRIP

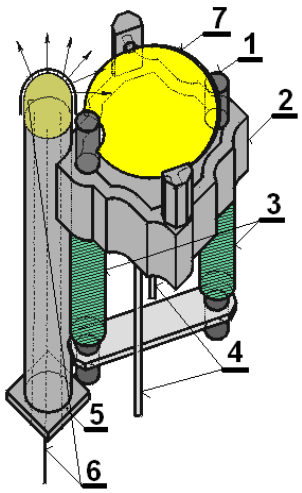
BS10LED, BS15LED

BS10, BS15

Release: 3, 3. 1. 2019, BUSE s.r.o.

DESCRIPTION OF FUNCTION

BUSE is producer of own patented electromagnetic display devices with uniform text depiction at any surrounding light intensity.
BUSE display technology consist of DOT-LED stripe wherein one common cell an electromagnet, flipping disc (DOT) and LED diode is installed.
BUSE Company provides display with stripes without LED applied as well. Make-up of the single elements is depicted bellow (Pict.1).



principle cell

Legend

1	Core of electromagnet
2	Stripe housing
3	Coil
4	Coil termination pins
5	Stripe LED carrier (pin guige)
6	LED with terminals
7	Disc

The DOT-LED display cell works on the electromagnetic principle. The displayed surface is made of flipping discs with a permanent electromagnet. To create the signs and texts the colors of the disc sides differs.
To flip the disc to the set-disc color a current impulse to the coil is applied.
To flip the disc to the reset-disc color a current impulse of the reversed polarity is applied. The disc position remains unchanged after current impulse to flip the disc has vanished.

The LED diode illuminates the disc to ensure the readability when the surrounding light intensity is low. In case a DOT display without LED other illumination source is used to ensure the readability.

STRIP ASSEMBLY OVERVIEW

The base element of the strip is molded housing where on the electromagnetic elements are assembled. The stripe with LED applied is with LED-carrier assembled. This LED-carrier has a function of distance board that secures a position of LED diodes in assembled displays and the LED-carrier determinates the stripe distance from PCB (printed circuit board).
Design of the LED-carrier (distance board) relates to the used thick of the unassembled and assembled PCB. Fundamental assembly dimensions state pict.3 to pict.6.

As a standard the 7 discs stripes are manufactured and delivered. The distances between discs are 10,16 mm or 15,24 mm. Stripes with less number of discs in one stripe is possible to manufacture after agreement with producer.

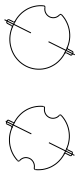
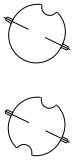
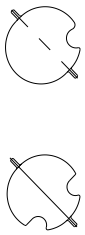
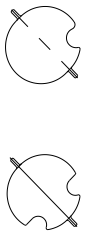
The discs could be designed as stopped or non-stopped after disc flipping.

As a standard following disc colors are manufactured:

disc set-color	yellow
disc reset-color	black

Additional reflective disc set-colors are possible after discussion with producer to manufacture:
white, red, green… on demand.

In the table Tab.1 basic types of stripes are listed.

Description	DOT		Stripe descr.		Disc spacing
	Disc diameter	Shape and stopping	Illumination	Dimensions	
BS 1004	c. 9mm	 ROUND STOPPED ROUND UNSTOPPED	with LED	pict.3	10,16 mm
BS 1005	c. 9mm	 ROUND STOPPED ROUND UNSTOPPED	without LED	pict.4	10,16 mm
BS 1508	c. 14mm	 ROUND STOPPED ROUND UNSTOPPED	without LED	pict.5	15,24 mm
BS 1509	c. 14mm	 ROUND STOPPED ROUND UNSTOPPED	with LED	pict.6	15,24 mm

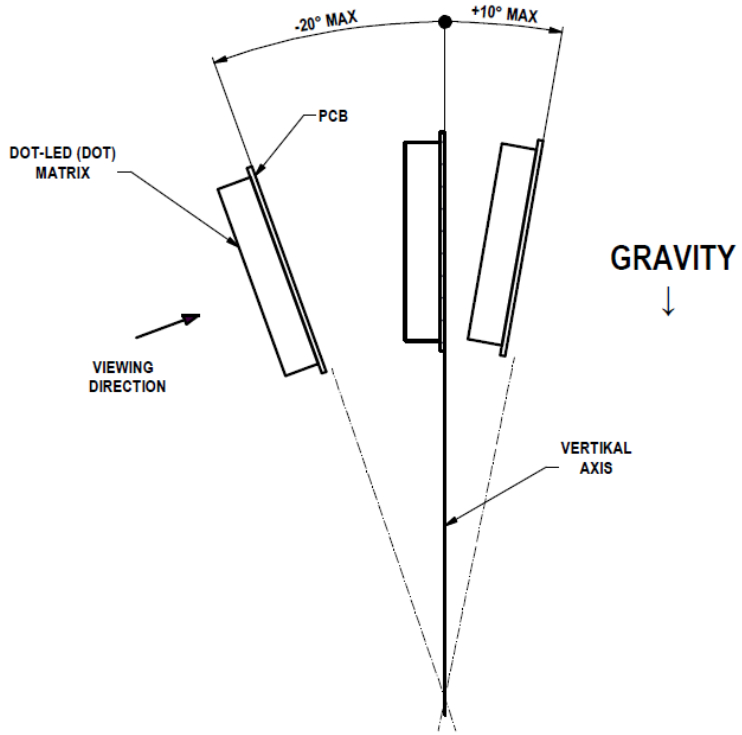
Tab.1 Basic manufactured stripes overview

Identification of type number see the Appendix 1.

TECHNICAL PARAMETERS

Operating conditions

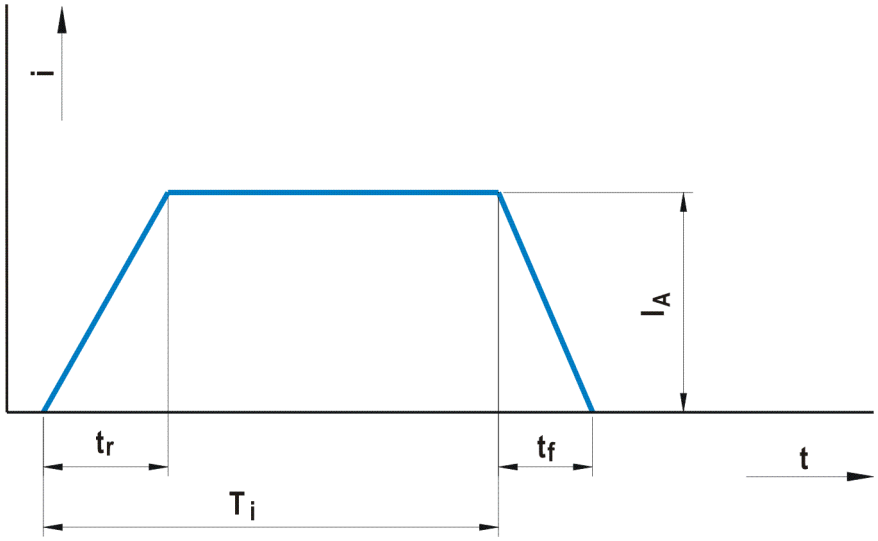
Temperature Range	-40° C to +80 ° C (operating ambient temperature) -50° C to +85 ° C (storage temperature)
Humidity	up to 95% provided no condensation (at 40° C)
Operating orientation	LED up-right corner (front view), see pict.3, 4, 5, 6 tilt between -20° and +10° from vertical plain is allowed, see pict.2
Outdoor Application	Weatherproof enclosure required



Pict.2. Operating orientation

Disc coil drive characteristics

Current drive characteristics (recommended)

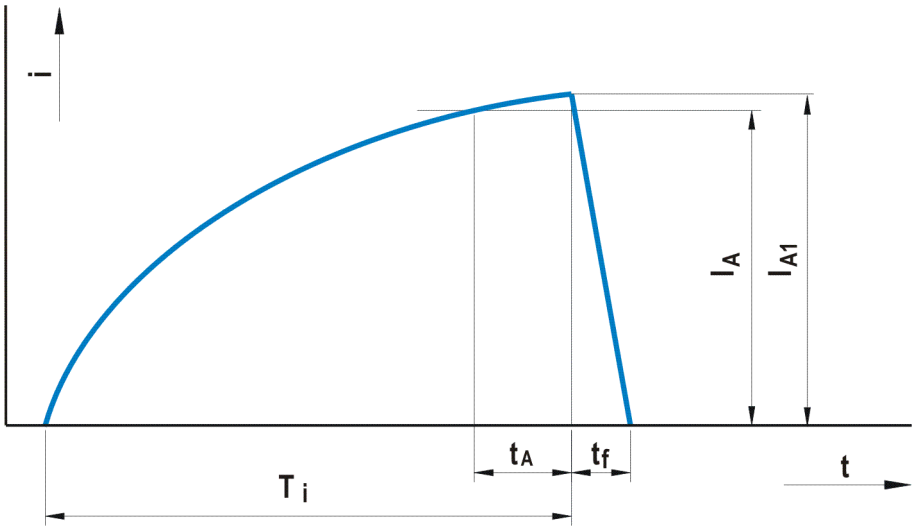


Current pulse duration	$0,8 < T_i < 2,0$ ms
Current rise time	$0 < t_r < 0,4$ ms
Current fall time	$0 < t_f < 0,4$ ms
Current pulse amplitude	$300 < I_A < 600$ mA

Recommended values for 1 DOT:

- current pulse amplitude	$350 < I_A < 450$ mA
- current pulse duration	T_i = 1ms per dot

Voltage drive characteristics



Current pulse duration	$0,8 < T_i < 2,0$ ms
Duration of $i > I_A$	$t_A > 0,2$ms
Current fall time	$0 < t_f < 0,4$ ms
Current I_A	$I_A > 300$ mA
Current I_{A1} amplitude (max.)	$I_{A1} < 800$ mA

Stripe is a current operated device. Applied voltage must be sufficient to develop the minimum current requirement at all operating condition. Coil requirements are specified at stripe input terminals.

Coil Resistance

18,0 Ω ± 10 % (at +20°C ambient)
Temperature resistance coefficient 0,004 deg^{-1}

Equivalent circuit diagram for drive current calculation

Consist of serial connection of resistor R_s = 18 Ω and coil L_s = 6mH

Power dissipation limits

0,60 W per coil at -40°C to +20° C temperature ambient
0,30 W per coil at +80°C temperature ambient

Disc transfer time

~ 100ms (stopped disc)
~ 1,5s (unstopped disc)
(I_A = 350mA, T_i = 1 ms, current drive)

Lifetime

200 millions disc turns over

Display colors

disc set-color	yellow (white, red, green ... on demand)
disc reset-color	black

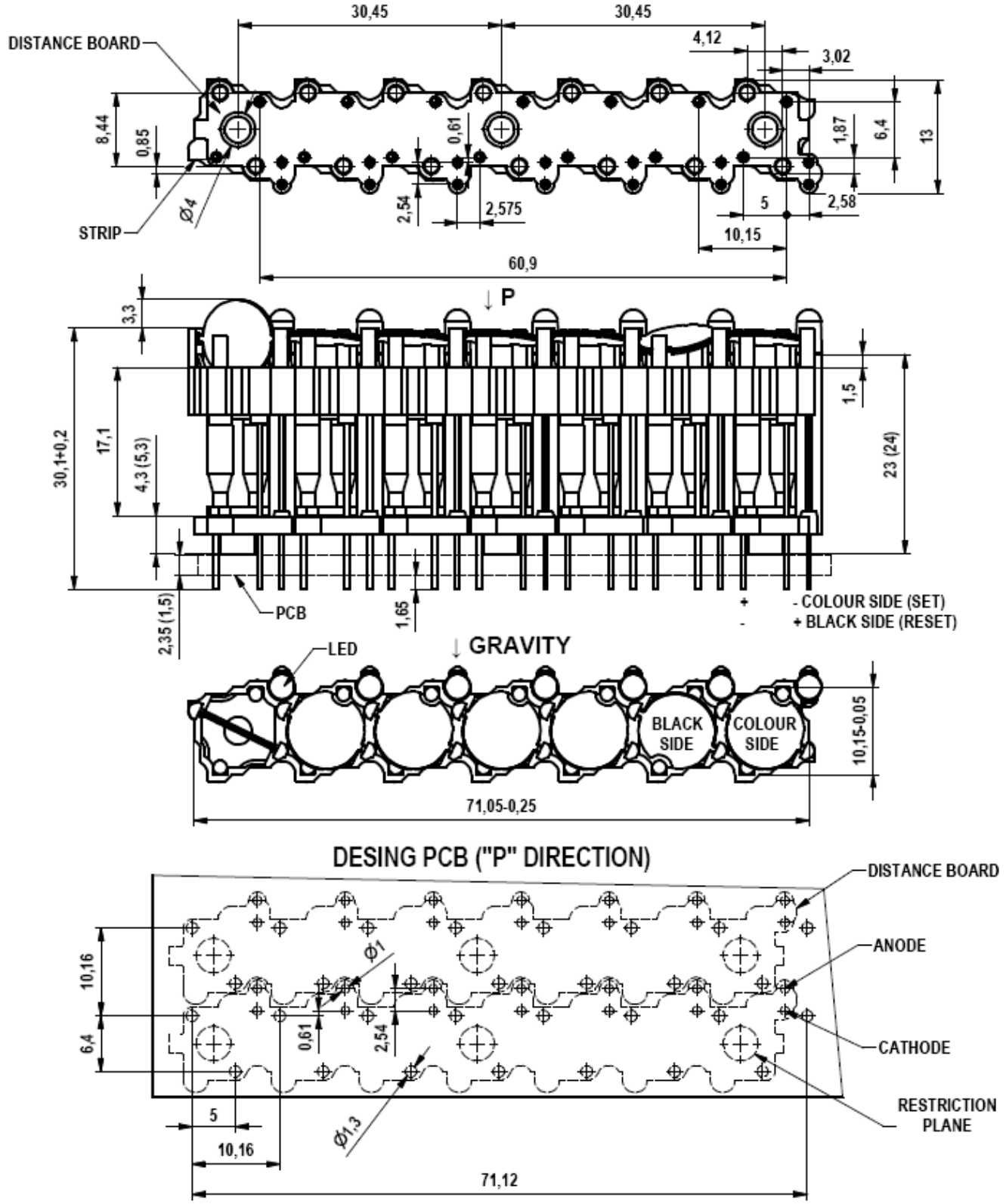
LED characteristics

Maximum levels (at Ta = 25°C)

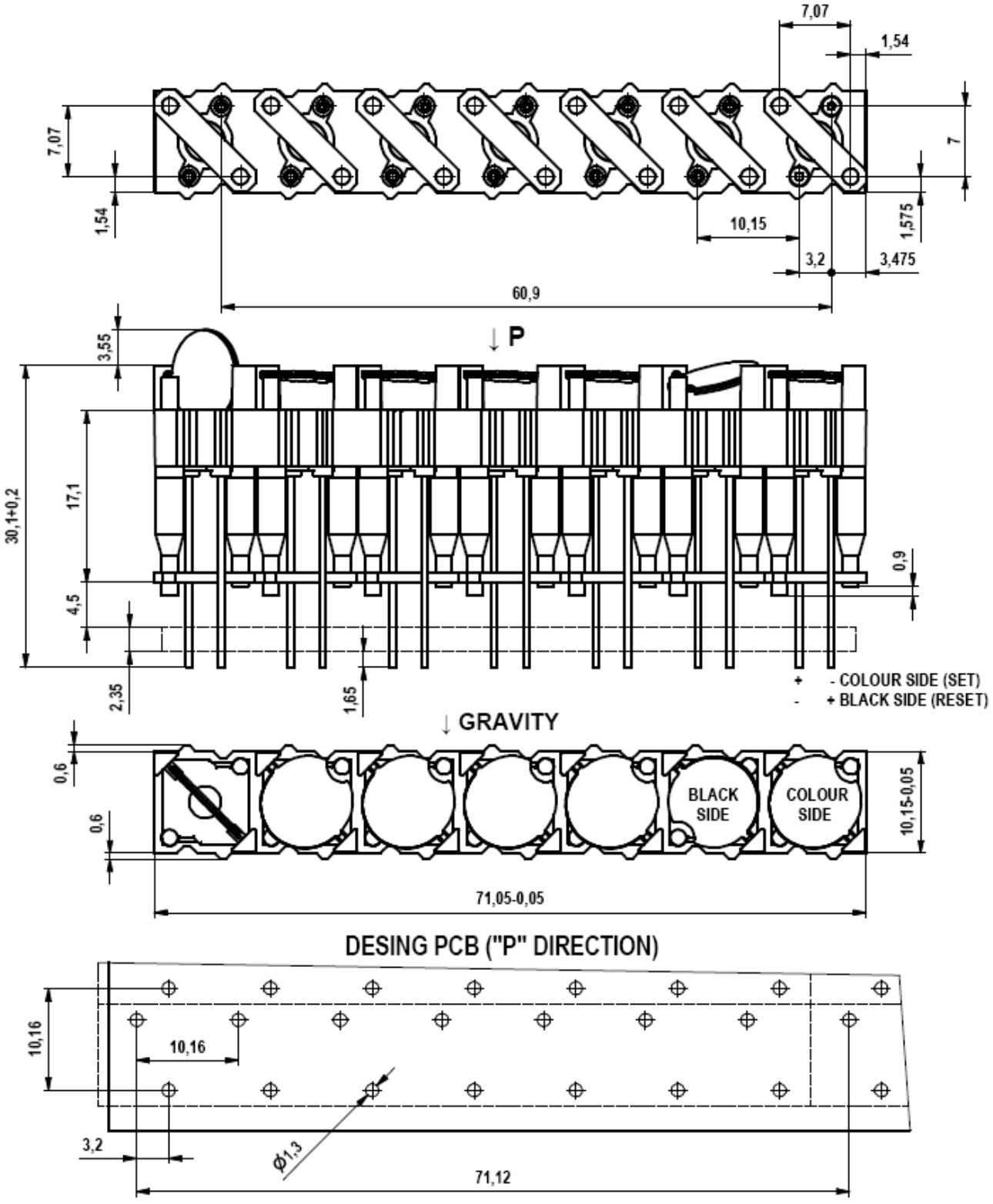
Power Dissipation	100 mW
Reverse Voltage	5 V
Average Forward Current	30 mA
Peak Forward Current	100 mA (Duty Cycle 1/10, 1 kHz)
Forward Voltage	Typ.2,2 V (from 1,9 V to 2,8 V) at (I_F=20 mA)

Peak Emission Wavelength	570 nm (I_F= 20 mA), (660 nm, 590 nm… on demand)
Lifetime	100.000 hours – illumination decrease to 50 % of original value (at +25°C temperature ambient, duty Cycle 1/10, 1 kHz, can be operated at a DC forward current of 10 mA)

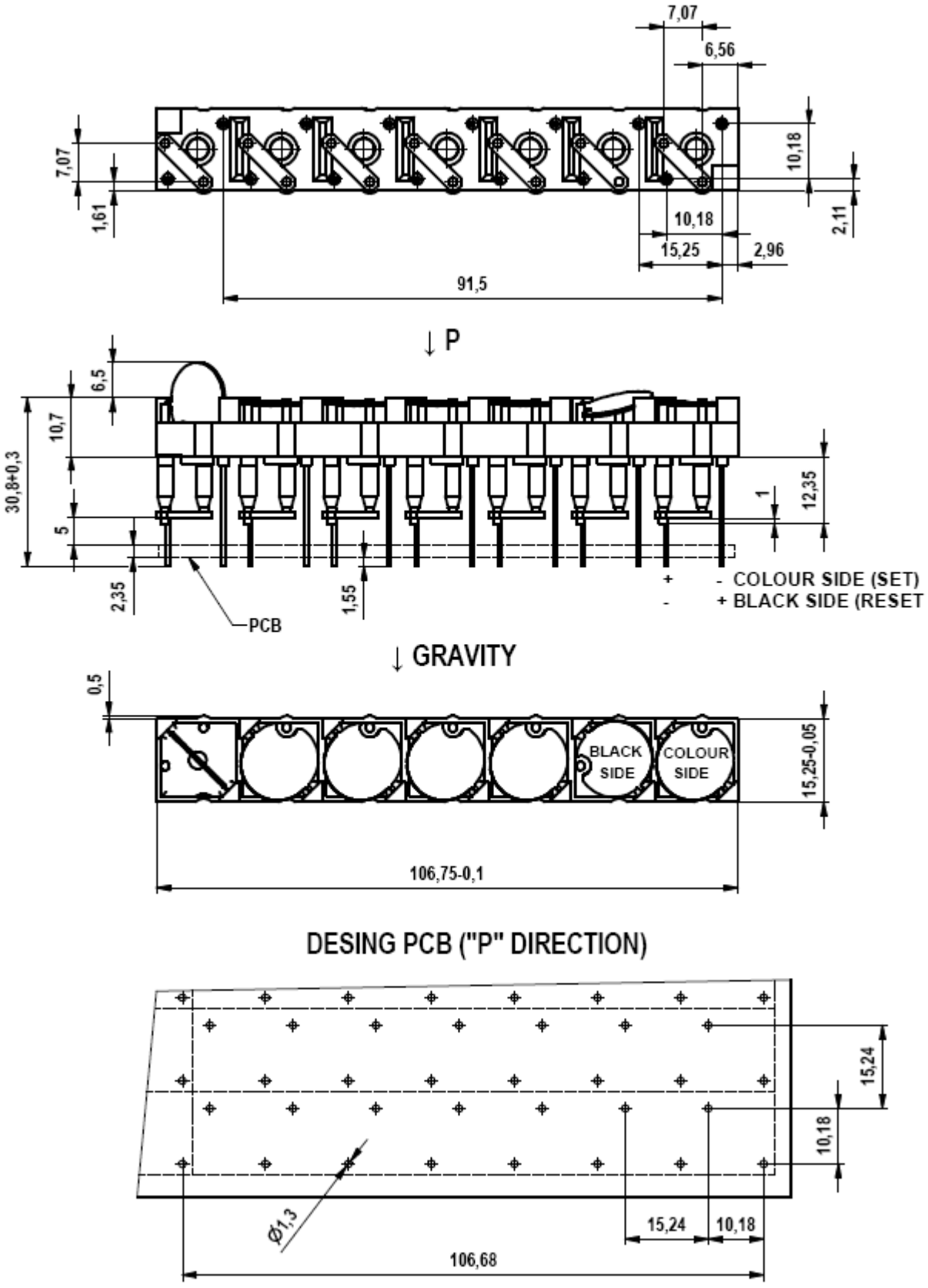
ANNEX



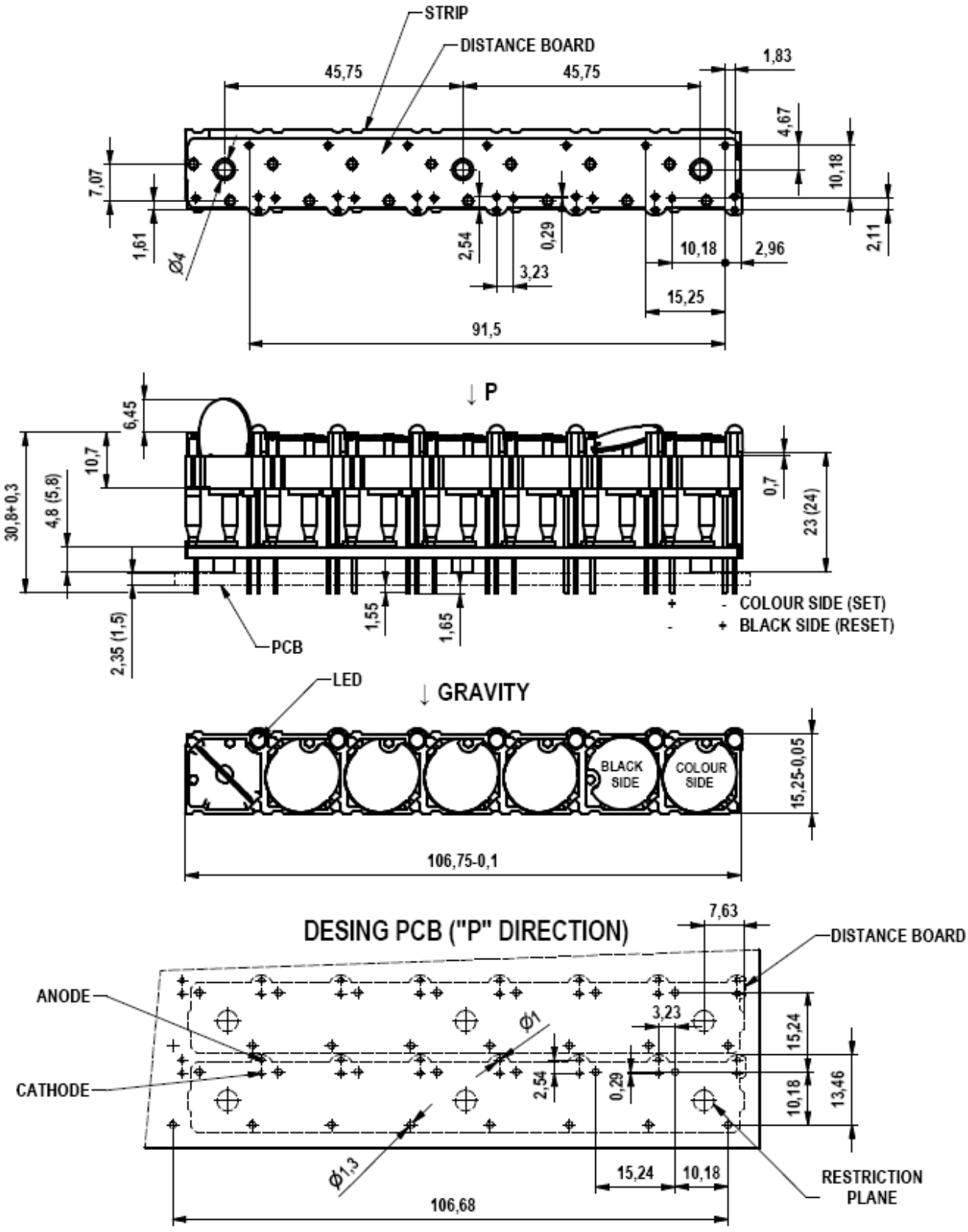
Pict.3. Layout and basic dimensions of BS 1004



Pict.4. Layout and basic dimensions of BS 1005



Pict.5. Layout and basic dimensions of BS 1508



Pict.6. Layout and basic dimensions of BS 1509

Appendix 1

Type number identification

BSAABBC.DEEE FFGGG HJJJ

AA .. disc size
- 10 .. 10mm
- 15 .. 15mm

BB .. body type identification
- …

C .. disc/body type
- S .. stopped disc
- N .. unstopped disc
- D .. stopped disc/DG reflective foil
- …

EEE .. number of display elements (DOTs)
- 100 .. 1 DOT
- 500 .. 5 DOTs
- 600 .. 6 DOTs
- 700 .. 7 DOTs

FF .. reset disc color
- 10 .. white
- 20 .. standard yellow/green fluorescent
- …
- 90 .. black supermat

GGG .. set disc color
- 103 .. white
- 104 .. DG white
- …
- 201 .. standard yellow/green fluorescent
- 202 .. DG yellow/green
- 301 .. signal red/orange
- …
- 901 .. black supermat

H .. spacer type
- O .. no spacer
- …

JJJ .. LED type
- O .. no LED
- 002 .. standard yellow/green
- 003 .. red
- 007 .. amber
- 009 .. white
- …