

Specifications LED

3 mm LED

(valid for 25 °C)	Red LED	Green LED	Yellow LED
Max. forward current I_F :	30 mA	30 mA	20 mA
Current reduction from: $T_0 = 50\text{ °C}$:	approx 0.5 mA/°C	approx 0.5 mA/°C	approx 0.2 mA/°C
Wavelength typ:	635 nm	565 nm	586 nm
Forward voltage U_F/I_F typ:	2 V/10 mA	2 V/10 mA	2 V/10 mA
Reverse voltage U_R/I_F typ:	5 V/100 µA min.	5 V/100 µA min.	5 V/100 µA min.
Ambient temperature, operating:	- 20 °C ... + 80 °C	- 20 °C ... + 80 °C	- 20 °C ... + 80 °C
	Blue LED	White LED	Green LED superbright
Max. forward current I_F :	20 mA	25 mA	30 mA
Current reduction from: $T_0 = 50\text{ °C}$:	approx 0.6 mA/°C	-	-
Wavelength typ:	470 nm	-	510-545 nm
Forward voltage U_F/I_F typ:	2.7 V/10 mA	3.6 V/20 mA	3.5 V/20 mA
Reverse voltage U_R/I_F typ:	5V/100 µA min.	-	-
Ambient temperature, operating:	- 20 °C ... + 80 °C	- 20 °C ... + 80 °C	-30 °C ... + 100 °C

2 mm LED (full illumination of RF 15/19)

(valid for 25 °C)	Red LED	Green LED	Yellow LED
Max. forward current I_F :	30 mA	30 mA	50 mA
Current reduction from: $T_0 = 50\text{ °C}$:	0.5 mA/°C	0.5 mA/°C	0.8 mA/°C
Light current f_v/I_F typ:	-	-	250 mIm/20 mA
Wavelength typ:	637 nm	569 nm	590 nm
Forward voltage U_F/I_F typ:	1.8 V/20 mA	2.1 V/10 mA	1.9 V/20 mA
Reverse voltage U_R/I_F typ:	5 V/100 µA min.	5 V/100 µA min.	5 V/100 µA min.
Ambient temperature, operating:	- 55 °C ... + 100 °C	- 40 °C ... + 100 °C	-40 °C ... + 100 °C
	Blue LED	Multi-colour LED	
Max. forward current I_F :	30 mA	30 mA	
Current reduction from: $T_0 = 50\text{ °C}$:	-	approx 0.6 mA/°C	
Light current f_v/I_F typ:	-	-	
Wavelength typ:	464-485 nm	635/565 nm	
Forward voltage U_F/I_F typ:	3.6 V/20 mA	2 V/10 mA	
Reverse voltage U_R/I_F typ:	-	-	
Ambient temperature, operating:	- 20 °C ... + 80 °C	- 20 °C ... + 80 °C	

4

Calculating the series resistor:	Rated power of series:	Example for 5 Volt:
$R_V = \frac{U_B - U_F}{I_F}$	$P_V = I_F^2 \times R_V$	$R_V = \frac{5V - 2,0V}{0,02 A} = 150 \Omega (= \text{standard value})$

RF

RF 15 - Short-travel keyswitch



General Data

Low-profile keyboards with RF 15 components should be designed with a 19.05 mm grid. With this grid, frame webs remain free between the individual keys. The overlay can be glued onto these frame webs; we recommend area embossing over the keys for the overlays.

Technical Data

General information

Colour of lens	see order block
Recommended key grid	19.05 mm

Dimensions

Length	15 mm
Width	15 mm
Overall height	9.7 mm

Mechanical design

Mounting	soldering in PCB
Terminals	THT
Contact system	snap-action contact
Contact arrangement	1 NO
Contact materials	see order block
Illumination	see order block
LED colour	see order block
LED type	see order block

Mechanical characteristics

Operating force max.	2.9 ^{+0.6} N
Switching travel	0.5 ^{+0.2} mm
Robustness min.	with through-plated PCB 100 N

Electrical characteristics

Rated voltage min.	Au: 0.02 V, Ag: 3 V
Rated voltage max.	Au: 35 V, Ag: 50 V
Rated current min.	Au: 0.01 mA, Ag: 0.1 mA
Rated current max.	Au: 100 mA, Ag: 250 mA
Rated power max. (ohmic load)	Au: 2 W, Ag: 12.5 W
Contact resistance when new max.	100 mΩ
Insulation resistance	10 ⁹ Ω

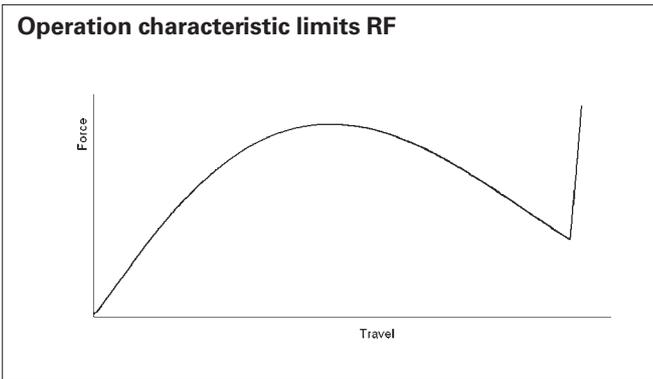
Other specifications

Ambient temp. operating min.	-25 °C
Ambient temp. operating max.	+70 °C
Environmental resistance	acc. to IEC 60068-2 -14, -30, -33 and -78
Operating life min. (operations)	1,000,000
Solderability / solder heat resistance	according to E DIN IEC 600 28-2-20
Wave soldering	260 °C max.
Manual soldering	350 °C / 5 sec. max.

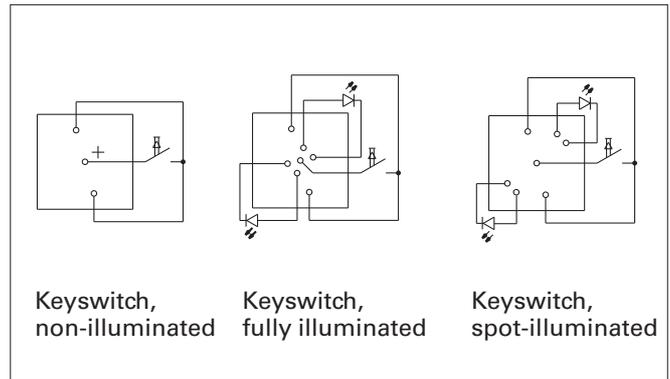
4

RF

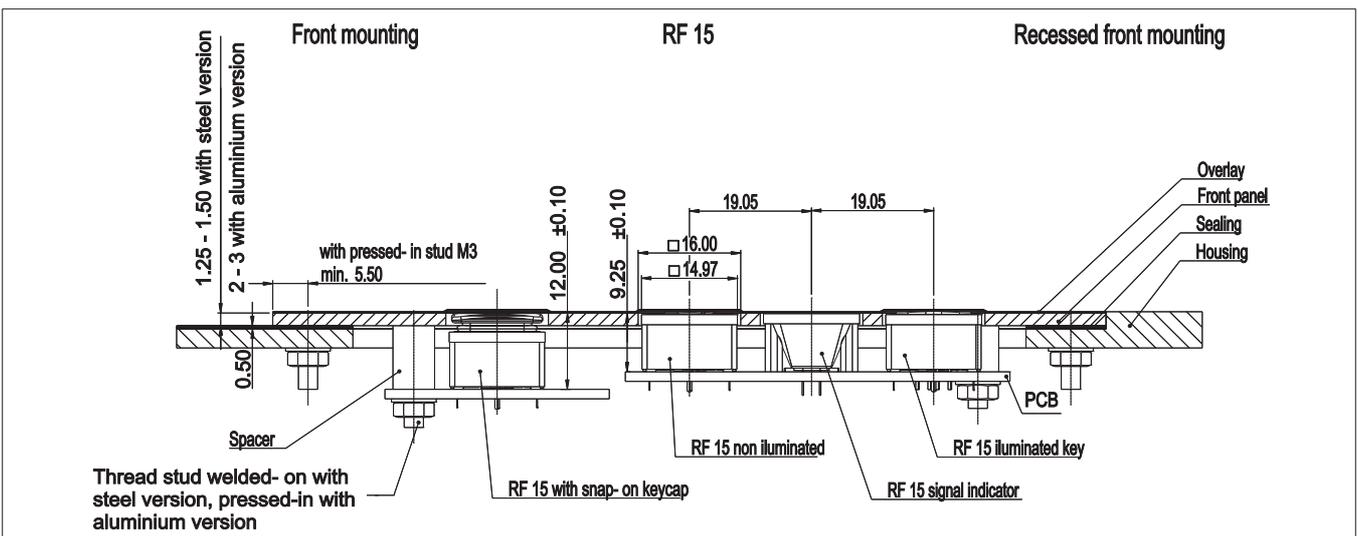
Force/Travel Diagram – Keyswitch RF 15



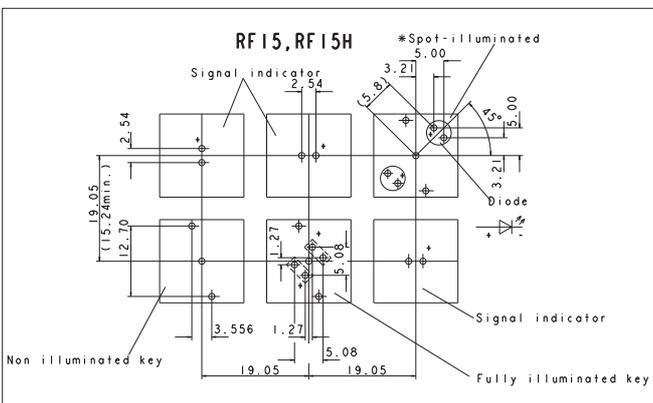
Circuit Diagram – Keyswitch RF 15



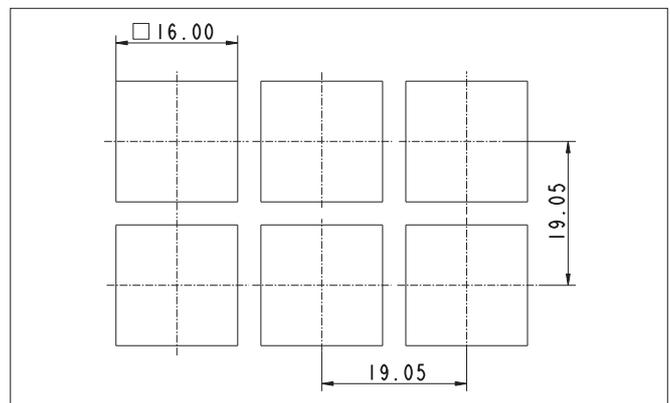
Dimensional Drawing RF 15



Hole Pattern RF 15

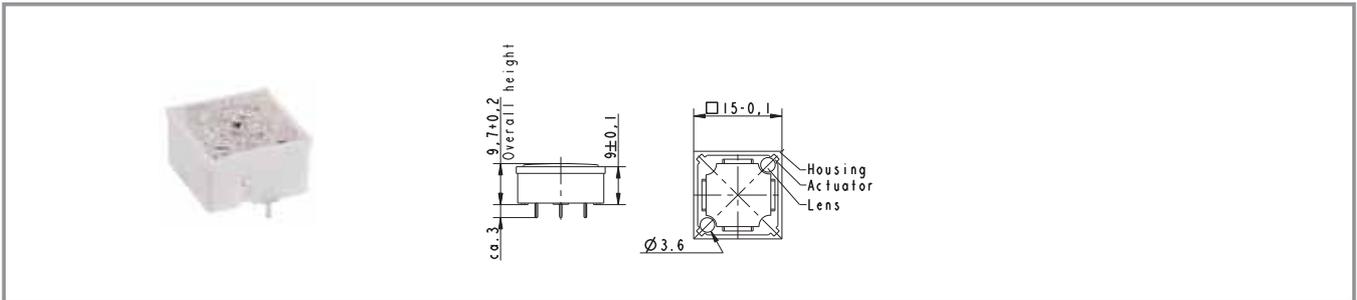


Hole Pattern – Front Panel



View on component side, all hole diameters 1,1 \pm 0,1 mm

RF 15 - Short-travel keyswitch, non-illuminated



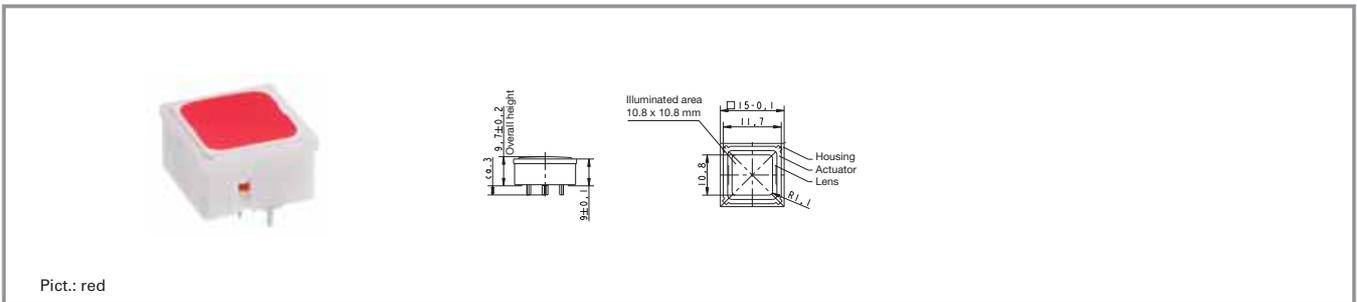
Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	not illuminated	transparent	-	-	3.14.100.001/0000
Ag	not illuminated	transparent	-	-	3.14.100.006/0000

Technical data see page 4 - 42

For keycaps, refer to chapter accessories and system RK 90.

If exchangeable legends are required, or if an overall height of 12.5 mm is required, a keycap can be mounted on the non-illuminated keys. The keycap legend is visible through a window in the overlay. You can change the legend by replacing the keycap.

RF 15 - Short-travel keyswitch, fully illuminated with 2 LED



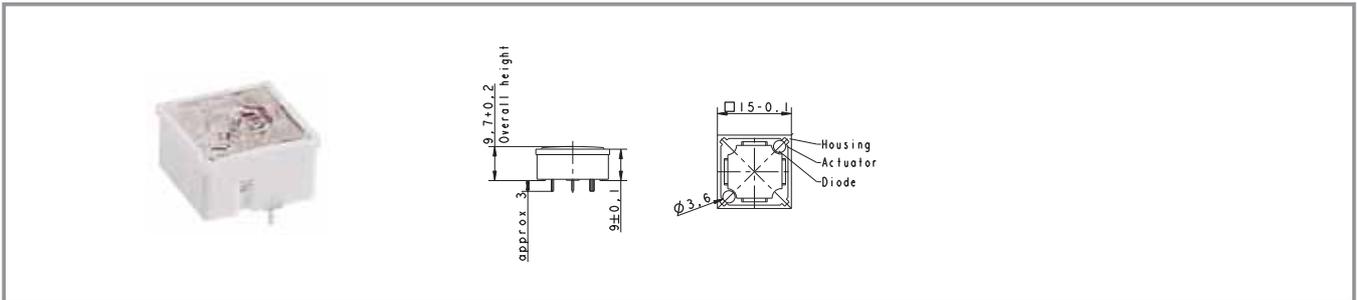
Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	fully illuminated 2 LED	red	red	2 mm	3.14.200.011/0000
Au	fully illuminated 2 LED	green	green	2 mm	3.14.200.012/0000
Au	fully illuminated 2 LED	yellow	yellow	2 mm	3.14.200.013/0000
Au	fully illuminated 2 LED	orange	yellow	2 mm	3.14.200.014/0000
Au	fully illuminated 2 LED	blue	blue	2 mm	3.14.200.015/0000
Ag	fully illuminated 2 LED	red	red	2 mm	3.14.200.021/0000
Ag	fully illuminated 2 LED	green	green	2 mm	3.14.200.022/0000
Ag	fully illuminated 2 LED	yellow	yellow	2 mm	3.14.200.023/0000
Ag	fully illuminated 2 LED	orange	yellow	2 mm	3.14.200.024/0000
Ag	fully illuminated 2 LED	blue	blue	2 mm	3.14.200.025/0000

Technical data see page 4 - 42

For keycaps, refer to RK 90 system design.

Technical data of LED see separate page at the beginning of this chapter.

RF 15 - Short-travel keyswitch, 1 LED spot-illumination



Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	spot illumination 1 LED	opaque white	blue	3 mm	3.14.100.030/0000
Au	spot illumination 1 LED	opaque white	red	3 mm	3.14.100.031/0000
Au	spot illumination 1 LED	opaque white	green	3 mm	3.14.100.032/0000
Au	spot illumination 1 LED	opaque white	yellow	3 mm	3.14.100.033/0000
Ag	spot illumination 1 LED	opaque white	blue	3 mm	3.14.100.040/0000
Ag	spot illumination 1 LED	opaque white	red	3 mm	3.14.100.041/0000
Ag	spot illumination 1 LED	opaque white	green	3 mm	3.14.100.042/0000
Ag	spot illumination 1 LED	opaque white	yellow	3 mm	3.14.100.043/0000

Technical data see page 4 - 42

Double-spot LED illumination available on request

Technical data of LED see separate page at the beginning of this chapter.

4

RF 15 N - Short-travel keyswitch



General Data

The RF 15N keyswitch provides a minimum overall height of 6.2 mm. The overall height can be varied by extension plungers which are inserted into the cross-like notches on the actuator tops. LEDs can only be arranged separately next to the keyswitches up to an overall height of 10 mm (i.e. without plunger or with small plunger). Keyswitches with overall heights of 12 mm or more can be provided with a maximum of 2 LEDs which are inserted into the recesses of the keyswitch housing. LEDs of keyswitches with overall heights of 12.5 mm or more should be placed onto LED spacers in order to obtain satisfactory illumination.

Technical Data

4

General information

Colour of lens see order block
 Recommended key grid 19.05 mm

Dimensions

Length 15 mm
 Width 15 mm
 Overall height 6.2 mm

Mechanical design

Mounting soldering in PCB
 Terminals THT
 Contact system snap-action contact
 Contact arrangement 1 NO
 Contact materials see order block
 Illumination external 3 mm LED possible if height more than 12 mm

Mechanical characteristics

Operating force max. 2.9 ± 0.6 N
 Switching travel $0.5^{+0.2}$ mm
 Robustness min. 100 with through-plated PCB N

Electrical characteristics

Rated voltage min. Au: 0.02 V, Ag: 3 V
 Rated voltage max. Au: 35 V, Ag: 50 V
 Rated current min. Au: 0.01 mA, Ag: 0.1 mA
 Rated current max. Au: 100 mA, Ag: 250 mA
 Rated power max. Au: 2 W, Ag: 12.5 W
 (ohmic load)
 Contact resistance when new max. 100 mΩ
 Insulation resistance $10^9 \Omega$

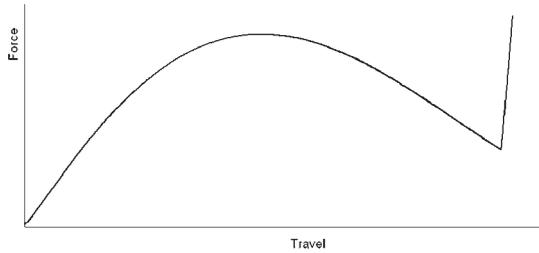
Other specifications

Ambient temp. operating min. -25 °C
 Ambient temp. operating max. +70 °C
 Storage temperature max. +50 °C
 (in tube)
 Environmental resistance acc. to IEC 60068-2 -14, -30, -33 and -78
 1,000,000
 Operating life min. (operations)
 Solderability / solder heat resistance according to E DIN IEC 600 28-2-20
 Wave soldering 260 °C max.
 Manual soldering 350 °C / 5 sec. max.

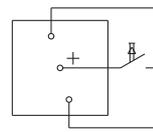
RF

Force/Travel Diagram – Keyswitch RF 15 N

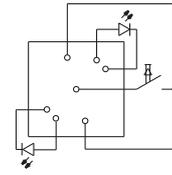
Operation characteristic limits RF



Circuit Diagram – Keyswitch RF 15 N

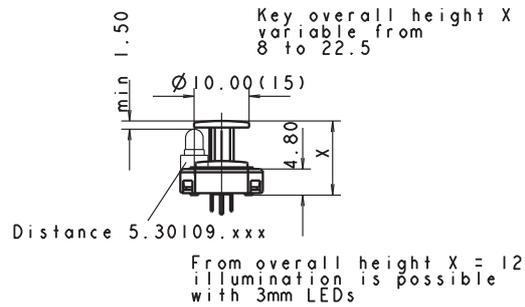
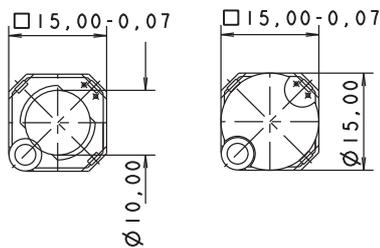


Keyswitch,
non illuminated

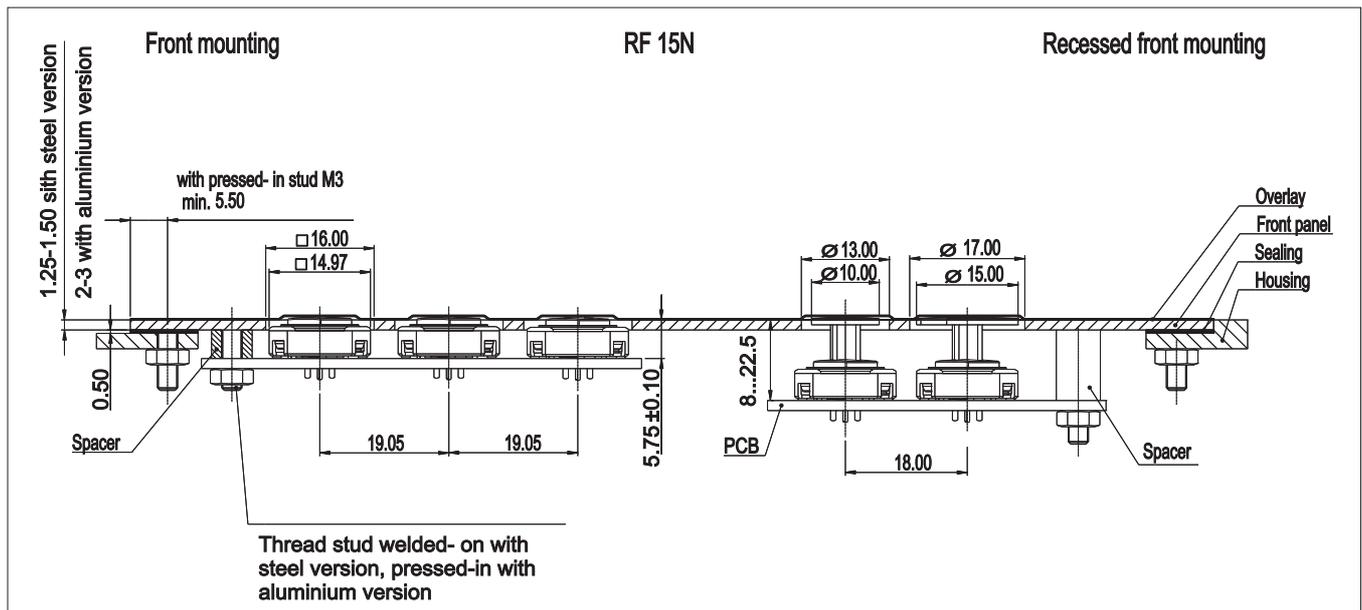


Keyswitch,
spot-illuminated

Dimensional Drawings RF 15 N



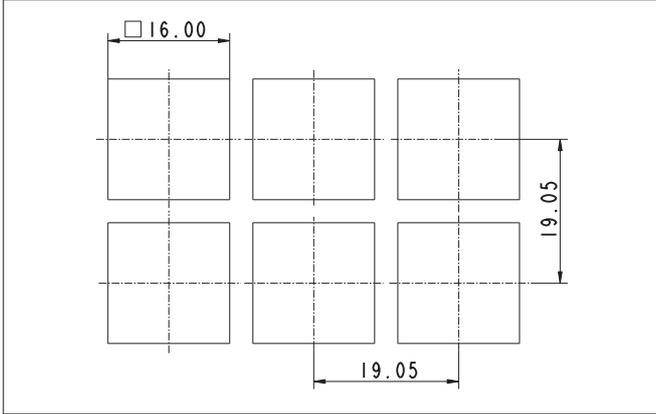
4



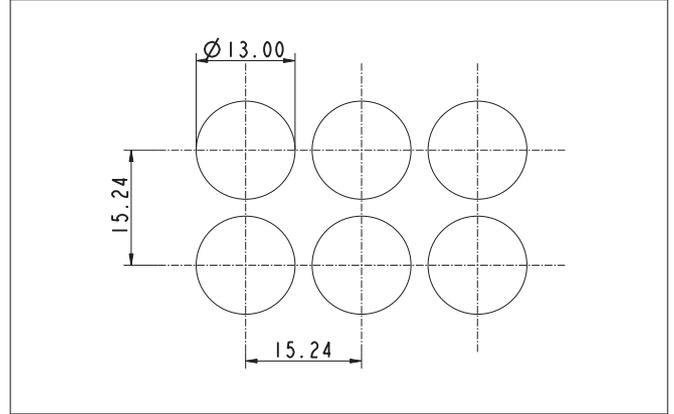
RF

Hole Patterns – Front Panel RF 15 N

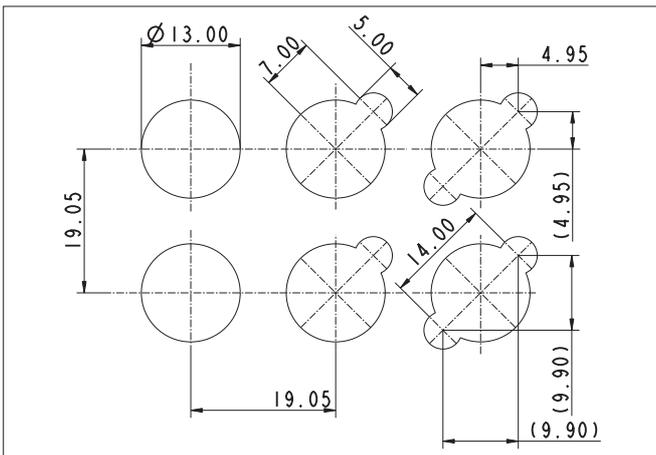
RF 15 N without plunger



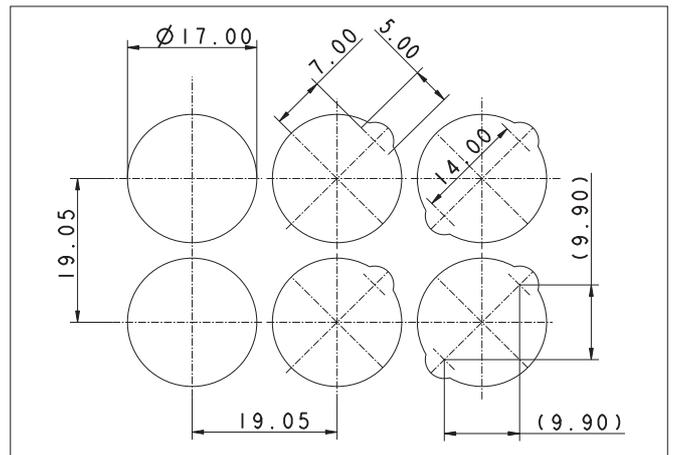
RF 15 N with plunger \varnothing 10 mm, non-illuminated



RF 15 N with plunger \varnothing 10 mm, illuminated

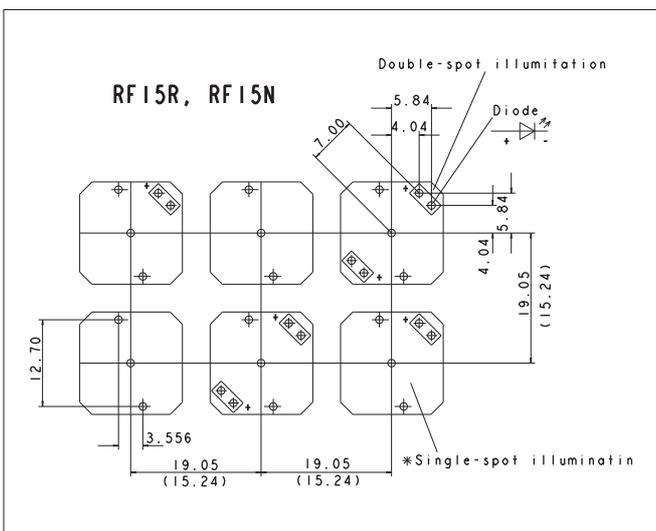


RF 15 N with plunger \varnothing 15 mm, illuminated



4

Hole Pattern RF 15 N



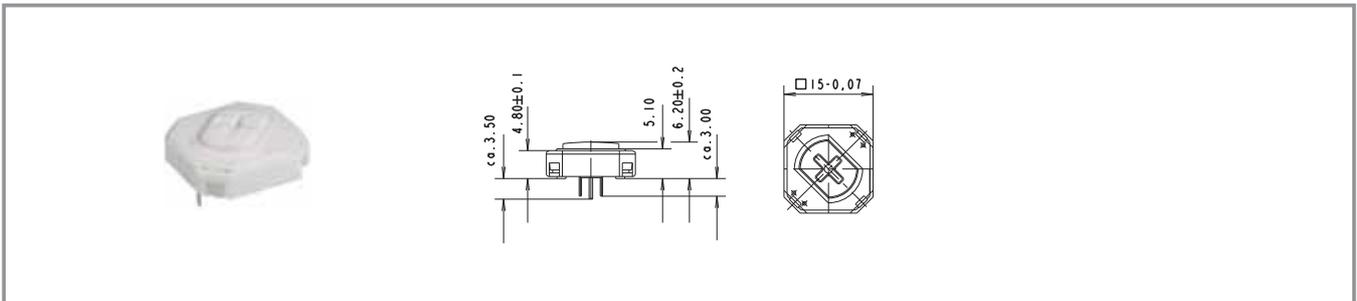
View on component side
All hole diameters 1.1 ± 0.1 mm
PCB layout keyswitch 1/400" grid

RF

Typical accessories RF 15 N - Short-travel keyswitch

Description	Photo	Order no.	Additional accessories see page
RF 15 N - LED spacer \varnothing 5 mm, spacing length 2.2 mm, light grey, for use with overall height of 12.5 mm		5.30.109.010/0756	4 - 84
RF 15 N - Extension plunger, \varnothing 10 mm, overall height 22.5 mm		5.46.011.028/0710	4 - 80
RF 15 N - Extension plunger, \varnothing 15 mm, overall height 22.5 mm		5.46.017.028/0710	4 - 81

RF 15 N - Short-travel keyswitch, non-illuminated



Contact materials	Illumination	Recommended key grid	Overall height	Order no.
Au	external 3 mm LED possible if height more than 12 mm	19.05 mm	6.2 mm	3.14.100.601/0000
Ag	external 3 mm LED possible if height more than 12 mm	19.05 mm	6.2 mm	3.14.100.606/0000

Technical data see page 4 - 48

For keycaps, refer to RK 90 system design.
Double-spot LED illumination available on request.

RF 15 R - Short-travel keyswitch



General Data

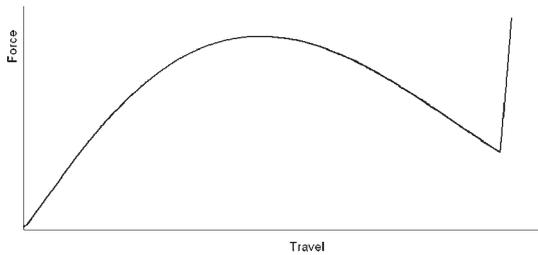
The round actuator of the RF 15 R keyswitch requires round front panel cut-outs. These make it possible to use a narrow keyboard grid of only 15.24 mm with sufficiently large frame webs between the individual keys. We recommend area embossing over the actuators for the overlay.

Technical Data

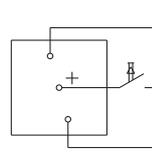
4	General information		Electrical characteristics			
	Recommended key grid	15.24 mm	Rated voltage min.	Au: 0.02 V, Ag: 3 V		
	Dimensions	Length	15 mm	Rated voltage max.	Au: 35 V, Ag: 50 V	
		Width	15 mm	Rated current min.	Au: 0.01 mA, Ag: 0.1 mA	
		Overall height	see order block	Rated current max.	Au: 100 mA, Ag: 250 mA	
	Mechanical design	Mounting	soldering in PCB	Rated power max. (ohmic load)	Au: 2 W, Ag: 12.5 W	
		Terminals	THT	Contact resistance when new max.	100 mΩ	
		Contact system	snap-action contact	Insulation resistance	10 ⁹ Ω	
		Contact arrangement	1 NO	Other specifications	Ambient temp. operating min.	-25 °C
		Contact materials	see order block		Ambient temp. operating max.	+70 °C
LED colour	see order block	Environmental resistance	acc. to IEC 60068-2			
LED type	see order block	Operating life min. (operations)	-14, -30, -33 and -78	1,000,000		
RF	Mechanical characteristics		Solderability / solder heat resistance	according to E DIN IEC 600 28-2-20		
	Operating force max.	2.9±0.6 N	Wave soldering	260 °C max.		
	Switching travel	0.5±0.2 mm	Manual soldering	350 °C / 5 sec. max.		
	Robustness min.	with through-plated PCB 100 N				

Force/Travel Diagram – Keyswitch RF 15 R

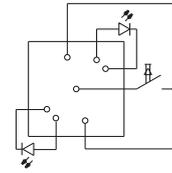
Operation characteristic limits RF



Circuit Diagram – Keyswitch RF 15 R

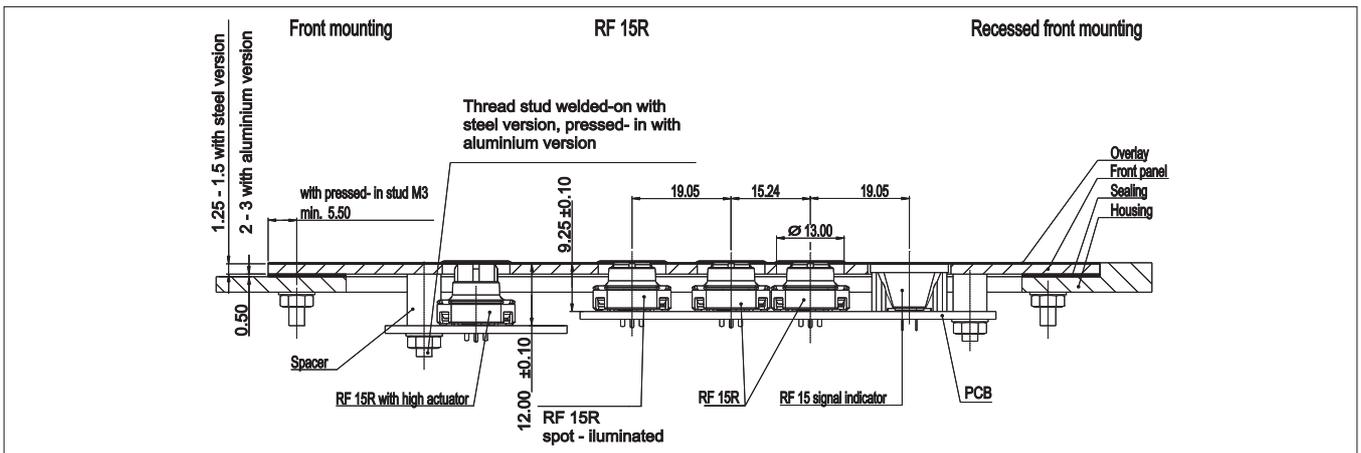


Keyswitch,
non-illuminated

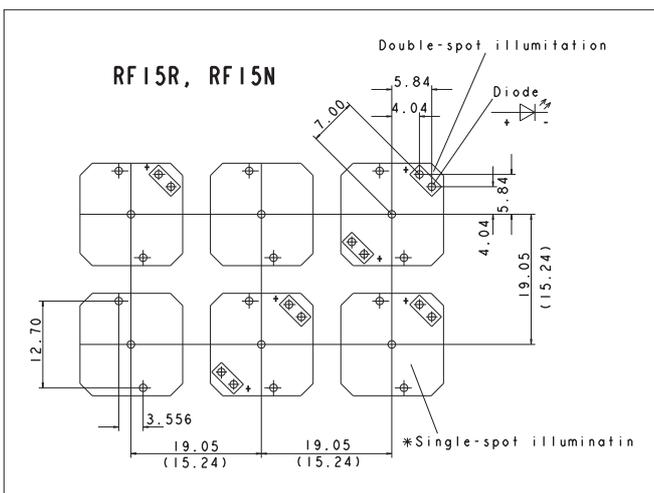


Keyswitch,
spot-illuminated

Dimensional Drawing RF 15 R



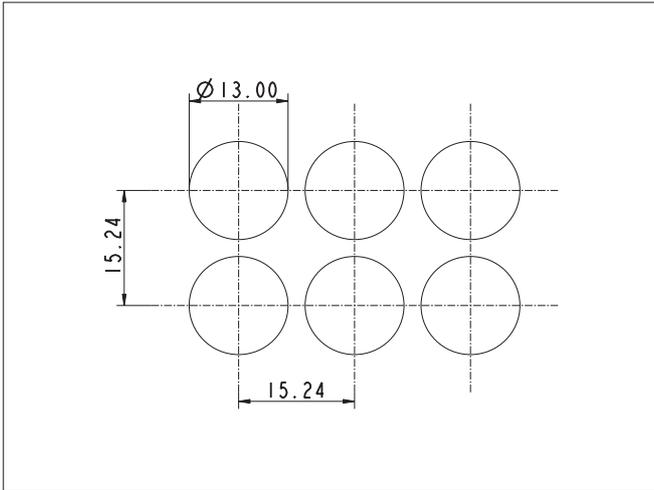
Hole Pattern RF 15 R



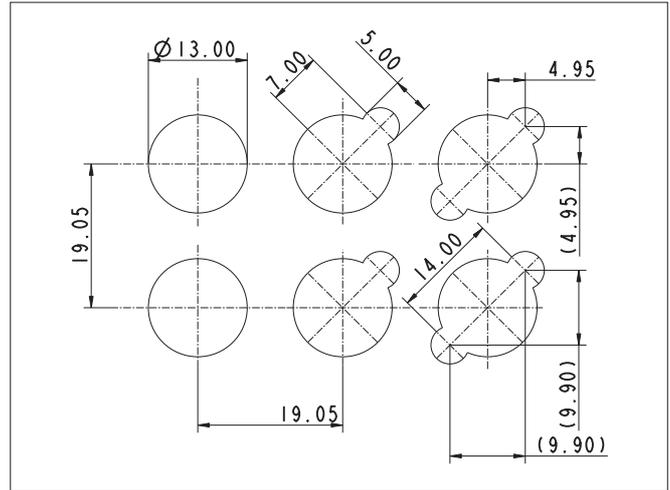
View on component side
All hole diameters 1.1 ± 0.1 mm
PCB layout keyswitch 1/400" grid

Hole Pattern – Front Panel RF 15 R

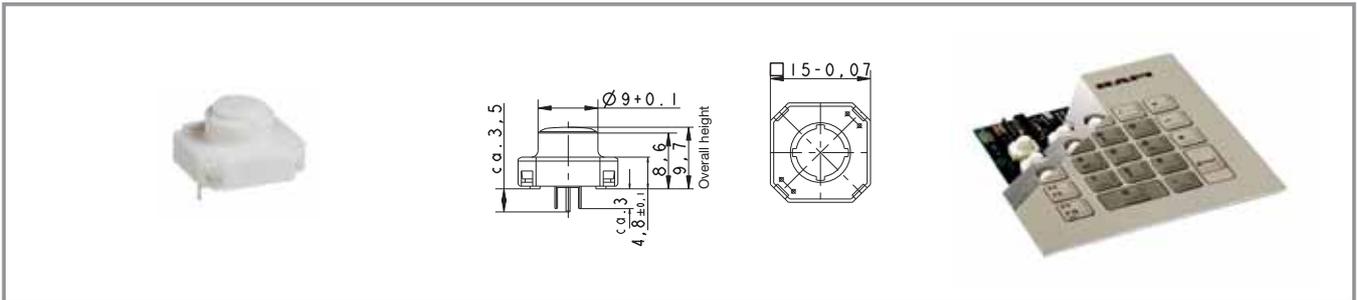
RF 15 R, non-illuminated



RF 15 R, illuminated



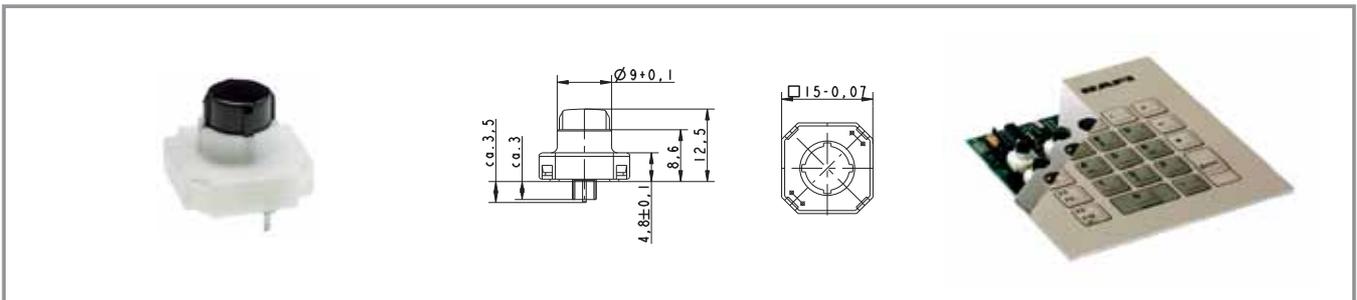
RF 15 R - Low short-travel keyswitch, non-illuminated



Contact materials	Overall height	Illumination	LED type	LED colour	Order no.
Au	9.7 mm	not illuminated	-	-	3.14.100.501/0000
Ag	9.7 mm	not illuminated	-	-	3.14.100.506/0000

Technical data see page 4 - 52

RF 15 R - High short-travel keyswitch, non-illuminated



Contact materials	Overall height	Illumination	LED type	LED colour	Order no.
Au	12.5 mm	not illuminated	-	-	3.14.100.801/0000
Ag	12.5 mm	not illuminated	-	-	3.14.100.806/0000

Technical data see page 4 - 52

RF 15/19 - Special accessories



Pict.: opaque light grey

round and triangular versions

Technical Data

Dimensions

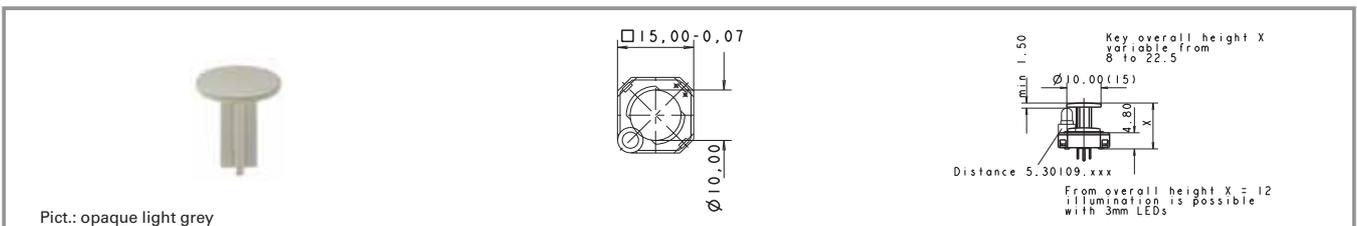
Length
Width

see order block
see order block

Overall height
Diameter
Colour

see order block
see order block
see order block

RF 15 N - Extension plunger, round head



Pict.: opaque light grey

Length	Width	Overall height	Diameter	Colour	Order no.
-	-	9 mm	10 mm	-	5.46.011.036/0710
-	-	9.7 mm	10 mm	-	5.46.011.030/0710
-	-	12.5 mm	10 mm	-	5.46.011.037/0710
-	-	13 mm	10 mm	-	5.46.011.038/0710
-	-	22.5 mm	10 mm	-	5.46.011.028/0710

Length of plunger = Overall height - 4.25 mm.

4

RF