

#### **General data**

RF 15 (15  $\times$  15 mm) and RF 19 (19  $\times$  19 mm) with distinct key click, for use under an overlay or with RK 90 keycaps. Can be fully illuminated.

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#### Content

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#### **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: $T_0 = 50$ °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	Red low-current LED	
Max. forward current $I_F$ :	20 mA	30 mA	
Current reduction from: $T_0 = 50$ °C:	approx 0.6 mA/°C	approx 0.5 mA/°C	
Wavelength typ:	470 nm	645 nm	
Forward voltage $U_F/I_F$ typ:	2.7 V/10 mA	1.6 V/1 mA	
Reverse voltage $U_B/I_F$ typ:	5V/100 μA min.	5 V/100 μA min.	
Ambient temperature, operating:	- 20 °C + 80 °C	- 20 °C + 80 °C	

#### 2 mm LED

(valid for 25 °C)	Red LED	Green LED	Green LED superbright
Max. forward current $I_F$ : Current reduction from: $T_0 = 50$ °C: Light current $f_V/I_F$ typ: Wavelength typ: Forward voltage $U_F/I_F$ typ: Reverse voltage $U_R/I_F$ typ: Ambient temperature, operating:	30 mA 0.5 mA/°C - 637 nm 1.8 V/20 mA 5 V/100 μA min. - 55 °C + 100 °C	30 mA 0.5 mA/°C - 569 nm 2.1 V/10 mA 5 V/100 μA min. - 40 °C + 100 °C	30 mA - - 510-545 nm 3.5 V/20 mA - -30 °C + 100 °C
	Yellow LED	White LED	Blue LED
Max. forward current $I_F$ : Current reduction from: $T_0 = 50$ °C: Light current $f_V/I_F$ typ: Wavelength typ: Forward voltage $U_F/I_F$ typ: Reverse voltage $U_R/I_F$ typ: Ambient temperature, operating:	50 mA 0.8 mA/°C 250 mIm/20 mA 590 nm 1.9 V/20 mA 5 V/100 μA min. -40 °C + 100 °C	25 mA - - 3.6 V/20 mA - - 20 °C + 80 °C	30 mA - - 464-485 nm 3.6 V/20 mA - 20 °C + 80 °C
	Multi-colour LED		
Max. forward current $I_F$ : Current reduction from: $T_0 = 50$ °C: Light current $f_V/I_F$ typ: Wavelength typ: Forward voltage $U_F/I_F$ typ: Reverse voltage $U_R/I_F$ typ: Ambient temperature, operating:	30 mA approx 0.6 mA/°C - 635/565 nm 2 V/10 mA - - 20 °C + 80 °C		

Calculating the Rated power Example for 5 Volt: series resistor: of series:

 $R_{V} = \frac{U_{B} - U_{F}}{I_{F}}$   $P_{V} = I_{F}^{2} \times R_{V}$   $R_{V} = \frac{5V - 2.0 \text{ V}}{0.02 \text{ A}} = 150 \Omega \text{ (= standard value)}$ 



#### 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		Rated power max.	
Colour of lens	see order block	(ohmic load)	Au: 2 W, Ag: 12.5 W
Recommended key grid	19.05 mm	Contact resistance when	
		new max.	100 m $\Omega$
Dimensions		Contact resistance acc.	
Length	15 mm	to life max.	$3\Omega$
Width	15 mm	Insulation resistance	$10^9 \Omega$
Overall height	9.7 mm	ESD strength (underneath	
_		overlay)	15 kV
Mechanical design		Bouncing time max.	5 ms
Mounting	soldering into PCB		
Terminals	contacts tin-plated,	Other specifications	
	fix contact Ag plated	Ambient temp. operating	
Contact system	snap-action contact	min.	-25 °C
Contact arrangement	1 NÖ	Ambient temp. operating	
Contact materials	Au/Ag	max.	+70 °C
	T	_	_

RF

Mechanical characteristics
Operating force max.
Operating travel

Illumination

LED colour

LED type

Operating travel 0.5 mm Switching travel 0.5 mm

Robustness min. with through-plated PCB

100 N

2 ... 3 N

spot-/fully illuminated

see order block

see order block

**Electrical characteristics** 

Rated voltage min.
Rated voltage max.
Rated current min.
Au: 0.02 V, Ag: 3 V
Au: 42 V, Ag: 50 V
Au: 0.01 mA, Ag: 0.1 mA
Au: 100 mA, Ag: 250 mA

Resistance at variable environment

Resistance to constant

Storage temperature min.

Storage temperature max.

Storage temperature max.

Operating life min. Soldering time max. Soldering temperature

max.

(product)

(in tube)

environment

Flammability of materials

IEC 600 68-2-3 and 2-30 according to

IEC 600 68-2-14 and 2-33

1000000 2.5 sec.

-40 °C

+80 °C

+50 °C

according to

250 °C UL 94 HB

## C&K

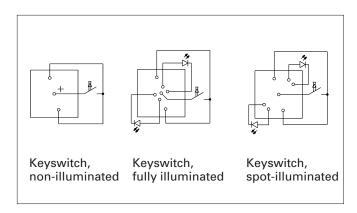
#### Force/Travel Diagram – Keyswitch RF 15

# Operation characteristic limits RF F(N) F1 F2 O,0,2 O,4 S (mm) O,6 O,8 1

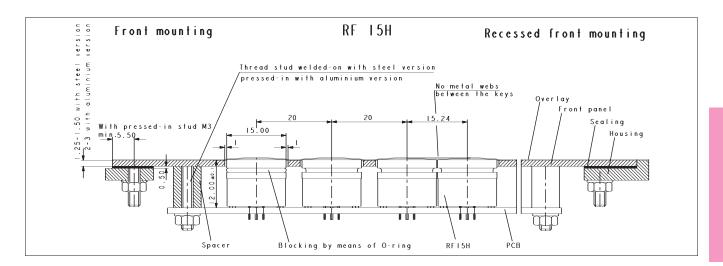
F 1 = Max. operating force

F 2 = Force at contact F 2 is max. 55% of F 1

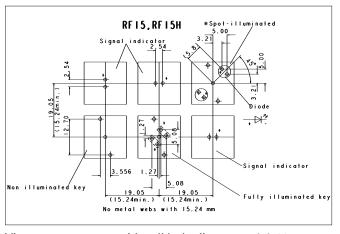
#### Circuit Diagram - Keyswitch RF 15



#### **Dimensional Drawing RF 15**

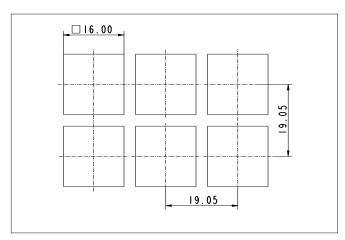


#### **Hole Pattern RF 15**



View on component side, all hole diameters 1,1 +/- 0,1 mm

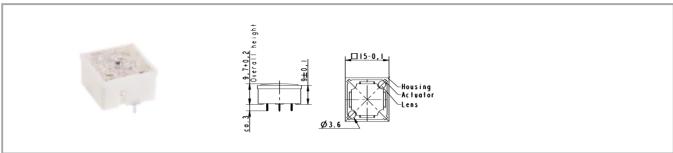
#### Hole Pattern - Front Panel



RF



#### 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 - 26

#### Accessories:

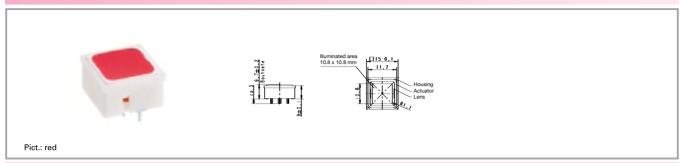
Keycap for RF 15, snap-on, for overall height 12.5 mm: 5.46.654.059/0227 Other keycaps see chapter RK90

4





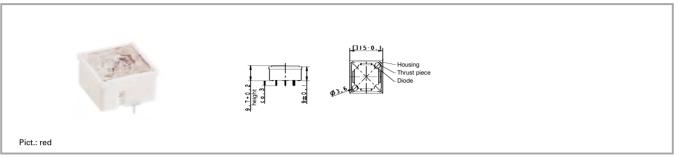
#### RF 15 short-travel keyswitch, fully illuminated with 2 LEDs



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

Technical data see page 4 - 26

#### 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	transparent	red	3 mm	3.14.100.031/0000
Au	spot illumination 1 LED	transparent	green	3 mm	3.14.100.032/0000
Au	spot illumination 1 LED	transparent	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	transparent	red	3 mm	3.14.100.041/0000
Ag	spot illumination 1 LED	transparent	green	3 mm	3.14.100.042/0000
Ag	spot illumination 1 LED	transparent	yellow	3 mm	3.14.100.043/0000

Technical data see page 4 - 26

Double-spot LED illumination available on request.



#### RF 15 N short-travel keyswitch





100  $m\Omega$ 

+50 °C

1000000

according to

IEC 600 68-2-3 and 2-30

#### **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.

Contact resistance when

Other specifications

Operating life min.

(in tube)

#### **Technical data**

General	inform	ation
General	11110111	auvi

Colour of lens see order block new max. Recommended key grid 19.05 mm Contact resistance acc. to life max.

 $3 \Omega$  $10^9 \Omega$ **Dimensions** Insulation resistance ESD strength 15 mm Length 15 kV Width 15 mm (underneath overlay) Overall height 6.2 mm Bouncing time max. 5 ms

Mechanical design

Mounting soldering into PCB Ambient temp. operating Terminals contacts tin-plated, -25 °C min. fix contact Ag plated Ambient temp. operating

Contact system snap-action contact +70 °C max. Contact arrangement -40 °C 1 NO Storage temperature min. Contact materials Au/Ag Storage temperature max.

Illumination external 3 mm LED +80 °C (product) possible if height < 12 mm Storage temperature max.

Mechanical characteristics

Resistance to constant Operating force max. 2 ... 3 N environment Operating travel 0.5 mm Switching travel 0.5 mm Resistance at variable

Au: 2 W, Ag: 12.5 W

according to Robustness min. with through-plated PCB environment IEC 600 68-2-14 and 2-33

100 N

**Electrical characteristics** Soldering time max. 2.5 sec. Au: 0.02 V, Ag: 3 V Rated voltage min. Soldering temperature Rated voltage max. Au: 42 V, Ag: 50 V 250 °C max. Rated current min. Au: 0.01 mA, Ag: 0.1 mA Flammability of materials UL 94 HB

Rated current max. Au: 100 mA, Ag: 250 mA Rated power max.

RF

(ohmic load)

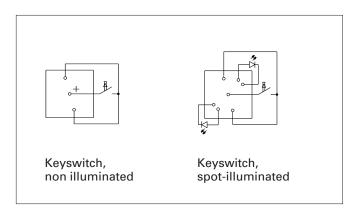
### C&K

#### Force/Travel Diagram – Keyswitch RF 15 N

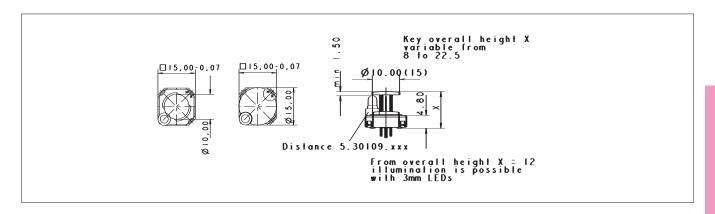
# Operation characteristic limits RF F (N) F1 F2 O,2 O,4 S (mm) F2

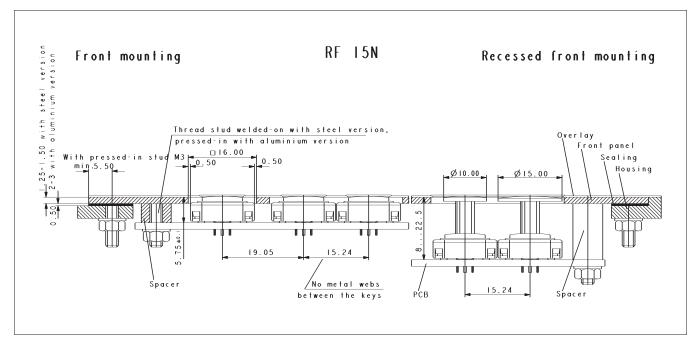
#### F 1 = Max. operating force F 2 = Force at contact F 2 is max. 55% of F 1

#### Circuit Diagram - Keyswitch RF 15 N



#### **Dimensional Drawings RF 15 N**



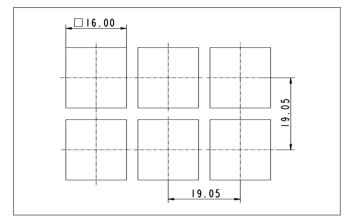


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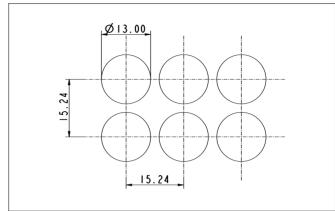
RF

#### **Hole Patterns – Front Panel RF 15 N**

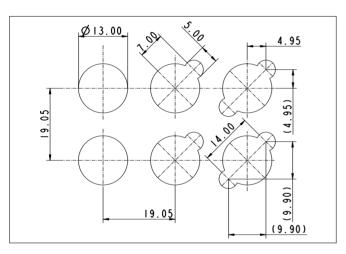
#### RF 15 N without plunger



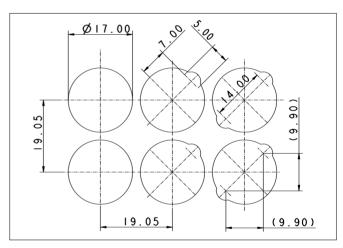
RF 15 N with plunger ø 10 mm, non-illuminated



RF 15 N with plunger ø 10 mm, illuminated

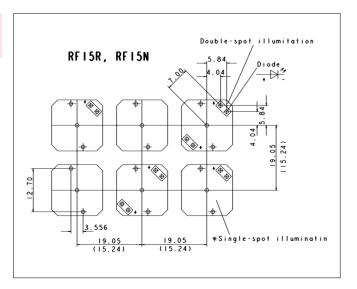


RF 15 N with plunger ø 15 mm, illuminated



#### Hole Pattern RF 15 N

RF



View on component side All hole diameters 1,1 +/- 0,1 mm PCB layout Keyswitch 1/400" grid

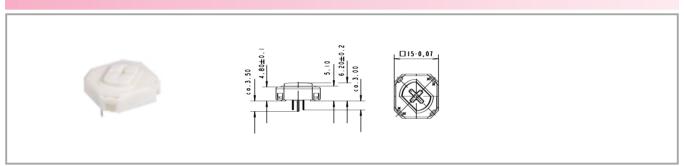
#### RF short-travel keyswitches



#### **Accessories RF 15 N short-travel keyswitch**

Description	Photo	Order no.	Page
LED yellow, 3mm	1111	1.90.690.103/0000	
LED spacer for RF 15 N, $\emptyset$ 5 mm, spacing length 2.2 mm, light grey, for use with overall height of 12.5 mm		5.30.109.010/0756	
Extension plunger for RF 15 N, Ø 10 mm, overall height 22.5 mm	T	5.46.011.028/0710	
Extension plunger for RF 15 N, Ø 15 mm, overall height 22.5 mm	T	5.46.017.028/0710	

#### 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	19.05 mm	6.2 mm	3.14.100.601/0000
Ag	external 3 mm LED possible if height	19.05 mm	6.2 mm	3.14.100.606/0000

Technical data see page 4 - 32



#### 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.

Contact resistance when

#### **Technical data**

**General information** 

Recommended key grid	15.24 mm	new max.	100 m $\Omega$
		Contact resistance acc.	• 0
Dimensions		to life max.	<b>3</b> Ω
Length	15 mm	Insulation resistance	10 <sup>9</sup> Ω
Width	15 mm	ESD strength	
Overall height	9,7/12,5 mm	(underneath overlay)	15 kV
		Bouncing time max.	5 ms
Mechanical design			
Mounting	soldering into PCB	Other specifications	
Terminals	contacts tin-plated,	Ambient temp. operating	
	fix contact Ag plated	min.	-25 °C
Contact system	snap-action contact	Ambient temp, operating	
Contact arrangement	1 NÖ	max.	+70 °C
Contact materials	Au/Ag	Storage temperature min.	-40 °C
Illumination	spot illumination	Storage temperature max.	
LED colour	see order block	(product)	+80 °C
LED type	see order block	Storage temperature max.	
-71		(in tube)	+50 °C
Mechanical characteristics		Resistance to constant	
Operating force max.	2 3 N	environment	according to
Operating travel	0.5 mm	5	IEC 600 68-2-3 and 2-30
Switching travel	0.5 mm	Resistance at variable	120 000 00 2 0 4114 2 00
Robustness min.	with through-plated PCB	environment	according to
nobastnoss mm.	100 N	on vironinone	IEC 600 68-2-14 and 2-33
	10014	Operating life min.	1000000
Electrical characteristics		Soldering time max.	2.5 sec.
Rated voltage min.	Au: 0.02 V, Ag: 3 V	Soldering time max. Soldering temperature	2.3 360.
Rated voltage min.	Au: 42 V, Ag: 50 V	max.	250 °C
Rated current min.	Au: 0.01 mA, Ag: 0.1 mA	Flammability of materials	UL 94 HB
nateu current iiiii.	Au. 0.01 IIIA, Ag. 0.1 IIIA	i iaiiiiiabiiity oi iiiateilais	OL 34 FID

Au: 100 mA, Ag: 250 mA

Au: 2 W, Ag: 12.5 W

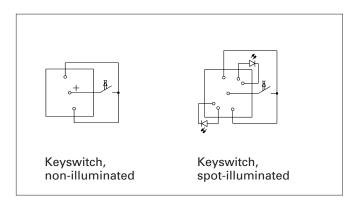
Rated current max. Rated power max. (ohmic load)

### C&K

#### Force/Travel Diagram - Keyswitch RF 15 R

# Operation characteristic limits RF F(N) F1 F2 Operation characteristic limits RF

#### Circuit Diagram – Keyswitch RF 15 R

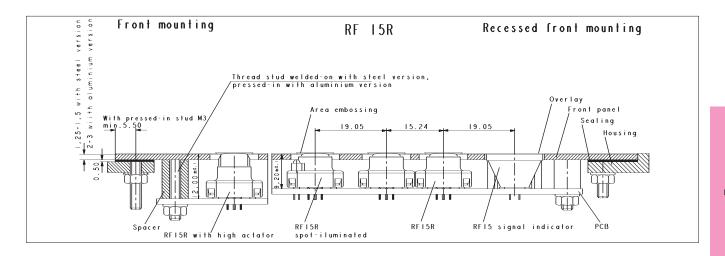


F 1 = Max. operating force

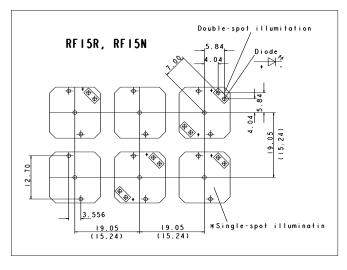
F 2 = Force at contact

F 2 is max. 55% of F 1

#### **Dimensional Drawing RF 15 R**



#### **Hole Pattern RF 15 R**

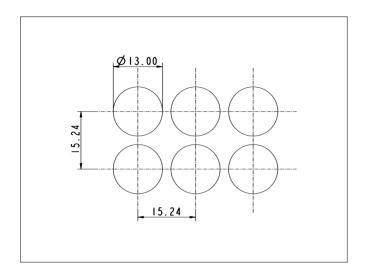


View on component side All hole diameters 1,1 +/- 0,1 mm PCB layout Keyswitch 1/400" grid 4

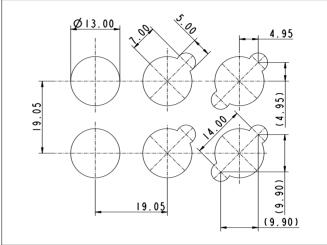


#### **Hole Pattern – Front Panel RF 15 R**

#### RF 15 R, non-illuminated



#### RF 15 R, illuminated

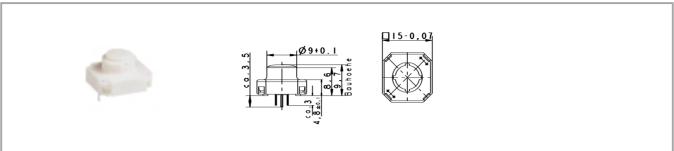


RF

4 - 38 **PCB** Keyswitches



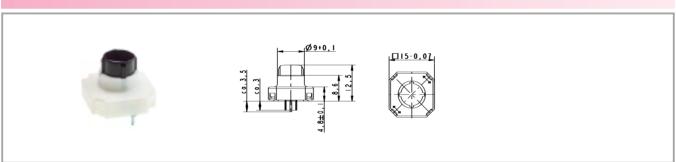
#### RF 15 R low short-travel keyswitch, non-illuminated



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 - 36

#### RF 15 R high short-travel keyswitch, non-illuminated

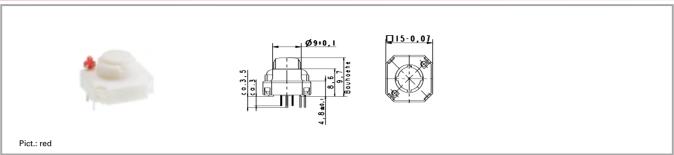


Contact materials	Overall height	Illumination	LED type	LED colour	Order no.
Au	12.5 mm	not illuminated			3.14.100.801/0000
Ag	12.5 mm	not illuminated			3.14.100.806/0000

Technical data see page 4 - 36



#### RF 15 R low short-travel keyswitch, 1 LED spot-illumination



Contact materials	Overall height	Illumination	LED type	LED colour	Order no.
Au	9.7 mm	spot illumination 1 LED	2 mm	red	3.14.100.531/0000
Au	9.7 mm	spot illumination 1 LED	2 mm	green	3.14.100.532/0000
Au	9.7 mm	spot illumination 1 LED	2 mm	yellow	3.14.100.533/0000
Ag	9.7 mm	spot illumination 1 LED	2 mm	red	3.14.100.541/0000
Ag	9.7 mm	spot illumination 1 LED	2 mm	green	3.14.100.542/0000
Ag	9.7 mm	spot illumination 1 LED	2 mm	yellow	3.14.100.543/0000

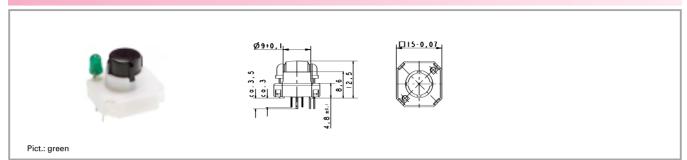
Technical data see page 4 - 36

Versions with 2 LEDs available on request.

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#### RF 15 R high short-travel keyswitch, 1 LED spot-illumination



Contact materials	Overall height	Illumination	LED type	LED colour	Order no.
Au	12.5 mm	spot illumination 1 LED	3 mm	blue	3.14.100.830/0000
Au	12.5 mm	spot illumination 1 LED	3 mm	red	3.14.100.831/0000
Au	12.5 mm	spot illumination 1 LED	3 mm	green	3.14.100.832/0000
Au	12.5 mm	spot illumination 1 LED	3 mm	yellow	3.14.100.833/0000
Ag	12.5 mm	spot illumination 1 LED	3 mm	blue	3.14.100.840/0000
Ag	12.5 mm	spot illumination 1 LED	3 mm	red	3.14.100.841/0000
Ag	12.5 mm	spot illumination 1 LED	3 mm	green	3.14.100.842/0000
Ag	12.5 mm	spot illumination 1 LED	3 mm	yellow	3.14.100.843/0000

Technical data see page 4 - 36

Versions with 2 LEDs available on request.



#### RF 15 H short-travel keyswitch



#### **General data**

#### **Application notes:**

The RF 15 H key has an overall height of 12.5 mm and can be fully illuminated. When designing membrane keyboards, we recommend using a key grid of at least 19.05 mm and a 0.13 mm overlay with area embossing over the keys. You can use the O-ring (accessory) to block the key and use it as an indicator field or blank spaceholder.

#### **Technical data**

<b>General information</b> Colour of lens	see order block	Rated power max. (ohmic load)	Au: 2 W, Ag: 12.5 W
Recommended key grid	20 mm	Contact resistance when	Au. 2 VV, Ag. 12.5 VV
necommended key grid	20111111	new max.	100 m $\Omega$
Dimensions		Contact resistance acc.	100 11122
Length	15 mm	to life max.	3 Ω
Width	15 mm	Insulation resistance	10 <sup>9</sup> Ω
Overall height	12.5 mm	ESD strength	
ū		(underneath overlay)	15 kV
Mechanical design		Bouncing time max.	5 ms
Mounting	soldering into PCB	-	
Terminals	see order block	Other specifications	
Contact system	snap-action contact	Ambient temp. operating	
Contact arrangement	1 NO	min.	-25 °C
Contact materials	Au/Ag	Ambient temp. operating	
Illumination	not illuminated /	max.	+70 °C
	fully illuminated	Storage temperature min.	-40 °C
LED colour	see order block	Storage temperature max.	

RF

Mechanical characteristics	
Operating force max.	2 3 N
Operating travel	0.5 mm
Switching travel	0.5 mm
Robustness min.	with through-plated PCB 100 N

see order block

#### Flectrical characteristics

Electrical characteristics	
Rated voltage min.	Au: 0.02 V, Ag: 3 V
Rated voltage max.	Au: 42 V, Ag: 50 V
Rated current min.	Au: 0.01 mA, Ag: 0.1 m/
Rated current max.	Au: 100 mA, Ag: 250 m/

Analisant tanan analisan	20 0
Ambient temp. operating	
max.	+70 °C
Storage temperature min.	-40 °C
Storage temperature max.	
(product)	+80 °C
Storage temperature max.	100 0
(in tube)	+50 °C
•	+50 C
Resistance to constant	
environment	according to
	IEC 600 68-2-3 and 2-30
Resistance at variable	
environment	according to
	IEC 600 68-2-14 and 2-33
Operating life min.	1000000
	2.5 sec.
Soldering time max.	2.5 Sec.
Soldering temperature	
max.	250 °C
Flammability of materials	UL 94 HB
-	

LED type

## C&K

#### Force/Travel Diagram – Keyswitch RF 15 H

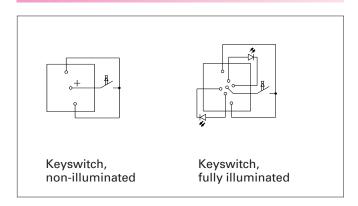
# Operation characteristic limits RF F1 F2 Operation characteristic limits RF F1 F2 Operation characteristic limits RF

F 1 = Max. operating force

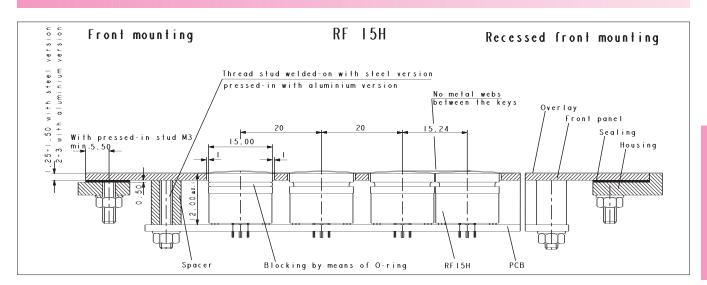
F 2 = Force at contact

F 2 is max. 55% of F 1

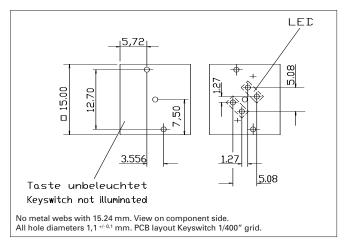
#### Circuit Diagram - Keyswitch RF 15 H



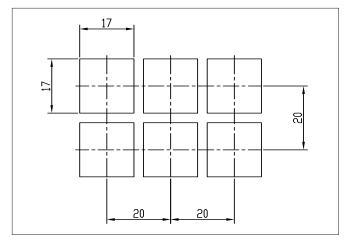
#### **Dimensional Drawing**



#### **Hole Pattern**



#### **Hole Pattern - Front Panel**



4

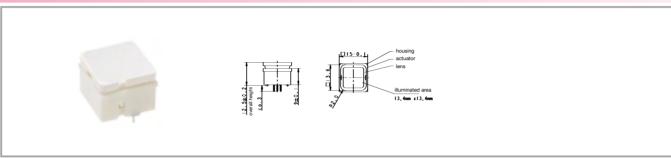
RF



#### **Accessories RF 15 H short-travel keyswitch**

Description	Photo	Order no.	Page
O-ring, black, for blocking the operating stroke	0	5.30.120.009/0100	

#### RF 15 H short-travel keyswitch, non-illuminated



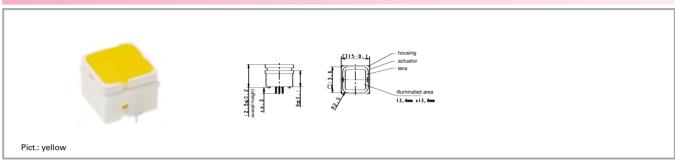
Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	not illuminated	white			3.14.100.702/0000
Ag	not illuminated	white			3.14.100.707/0000

Technical data see page 4 - 42

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#### RF 15 H short-travel keyswitch, fully illuminated



Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	fully illuminated 2 LEDs	red	red	2 mm	3.14.200.731/0000
Au	fully illuminated 2 LEDs	green	green	2 mm	3.14.200.732/0000
Au	fully illuminated 1 LED	green	green super bright	3 mm	3.14.200.736/0000
Au	fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.200.733/0000
Au	fully illuminated 1 LED	white	white	3 mm	3.14.200.735/0000
Au	fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.200.738/0000
Au	fully illuminated 1 LED	blue	blue	3 mm	3.14.200.739/0000
Au	fully illuminated 2 LEDs	white	multi colour	3 mm	3.14.100.734/0000
Ag	fully illuminated 2 LEDs	red	red	2 mm	3.14.200.741/0000
Ag	fully illuminated 2 LEDs	green	green	2 mm	3.14.200.742/0000
Ag	fully illuminated 1 LED	green	green super bright	3 mm	3.14.200.746/0000
Ag	fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.200.743/0000
Ag	fully illuminated 1 LED	white	white	3 mm	3.14.200.745/0000
Ag	fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.200.748/0000
Ag	fully illuminated 1 LED	blue	blue	3 mm	3.14.200.749/0000
Ag	fully illuminated 2 LEDs	white	multi colour	3 mm	3.14.100.744/0000

Technical data see page 4 - 42

When using the keyswitches with multicolour LEDs the illumination colour can be varied from red to green by change of polarity. Due to the frequency of the polarity-changes the colours red, green, yellow as well as all secondary colours from these are possible.

4



#### **RF 15 signal indicator**



#### **Technical data**

**General information** 

Colour of lens Recommended key grid

**Dimensions** 

Length Width Overall height

Mechanical design

Mounting Illumination LED colour LED type

Other specifications

Ambient temp. operating min.
Ambient temp. operating

max.

see order block 19.05 mm

15 mm 15 mm 9.7 mm

soldering into PCB fully illuminated 1 LED see order block 2 mm

-25 °C

+70 °C

Storage temperature min. Storage temperature max.

(product)

Storage temperature max. (in tube)

Resistance to constant environment

Resistance at variable environment

Soldering time max.
Soldering temperature

max.

Flammability of materials

-40 °C

+80 °C

+50 °C

according to

IEC 600 68-2-3 and 2-30

according to

IEC 600 68-2-14 and 2-33

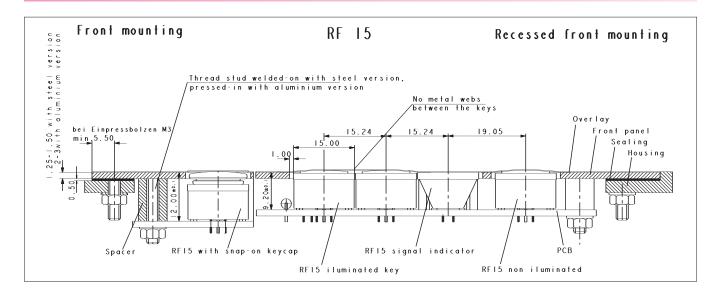
2.5 sec.

250 °C UL 94 HB





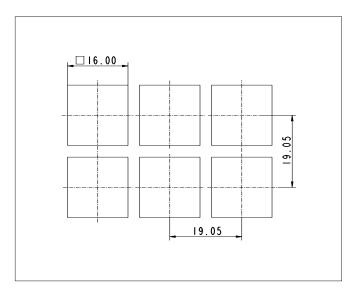
#### **Dimensional Drawing Signal Indicator RF 15**



#### **Hole Pattern**

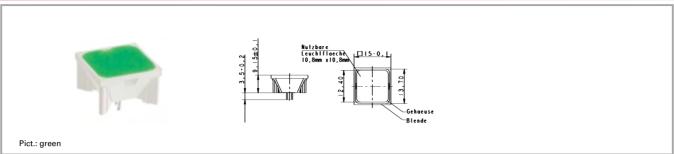
# RF15, RF15H \*Spot-illuminated 5.00 Signal indicator 3.21 Signal indicator 3.21 Signal indicator 3.21 Signal indicator 5.08 All hole diameters 1,1 +6.1 mm. View on component side. All hole diameters 1,1 +6.1 mm.

#### **Hole Pattern – Front Panel**



RF

#### RF 15 signal indicator, fully illuminated, 1 LED



Overall height	Illumination	Colour of lens	LED colour	LED type	Order no.
9.7 mm	fully illuminated 1 LED	red	red	2 mm	3.14.200.051/0000
9.7 mm	fully illuminated 1 LED	green	green	2 mm	3.14.200.052/0000
9.7 mm	fully illuminated 1 LED	yellow	yellow	2 mm	3.14.200.053/0000
9.7 mm	fully illuminated 1 LED	orange	yellow	2 mm	3.14.200.054/0000
9.7 mm	fully illuminated 1 LED	blue	blue	2 mm	3.14.200.055/0000

Technical data see page 4 - 46



#### RF 19 short-travel keyswitch



#### **General data**

#### **Application notes:**

RF 19 keys offer a large actuation area. When designing low-profile keyboards with a grid of >= 23 mm, 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 overlay.

#### **Technical data**

General information		Rated power max.	
Colour of lens	see order block	(ohmic load)	Au: 2 W, Ag: 12.5 W
Recommended key grid	23 mm	Contact resistance when	_
, -		new max.	100 m $\Omega$
Dimensions		Contact resistance acc.	
Length	19.05 mm	to life max.	$3\Omega$
Width	19.05 mm	Insulation resistance	$10^9 \Omega$
Overall height	9.7 mm	ESD strength	
-		(underneath overlay)	15 kV
Mechanical design		Bouncing time max.	5 ms
Mounting	soldering into PCB	_	
Terminals	contacts tin-plated,	Other specifications	
	fix contact Ag plated	Ambient temp, operating	
Contact system	snap-action contact	min.	-25 °C
Contact arrangement	1 NO	Ambient temp, operating	

RF

Mechanical characteristics	
Operating force max.	2 3 N
Operating travel	0.5 mm
Switching travel	0.5 mm
Robustness min.	with through-plated PCB 100 N

Au/Ag

spot-/fully illuminated

see order block

see order block

**Electrical characteristics** 

Contact materials

Illumination

LED colour LED type

Rated voltage min. Au: 0.02 V, Ag: 3 V Au: 42 V, Ag: 50 V Rated voltage max. Au: 0.01 mA, Ag: 0.1 mA Rated current min. Rated current max. Au: 100 mA, Ag: 250 mA

Bouncing time max.	5 ms
Other specifications Ambient temp. operating	
min.	-25 °C
Ambient temp. operating max.	+70 °C
Storage temperature min. Storage temperature max.	-40 °C
(product)	+80 °C
Storage temperature max. (in tube)	+50 °C
Resistance to constant environment	according to IEC 600 68-2-3 and 2-30
Resistance at variable	1EC 000 06-2-3 and 2-30
environment	according to IEC 600 68-2-14 and 2-33
Operating life min.	1000000
Soldering time max. Soldering temperature	2.5 sec.
max.	250 °C UL 94 HB
Flammability of materials	UL 94 ND

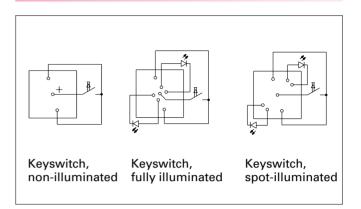
### C&K

#### Force/Travel Diagram - Keyswitch RF 19

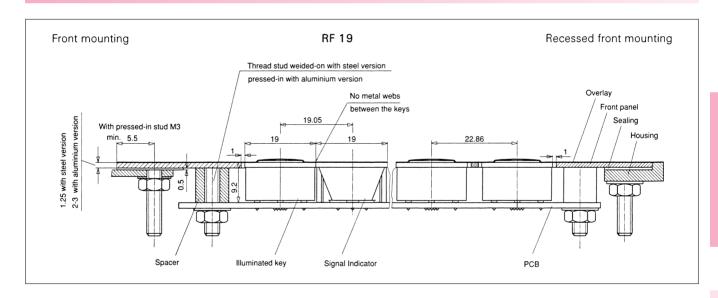
# Operation characteristic limits RF F(N) F1 F2 1 0 0 0,2 0,4 8 (mm) 0,6 0,8 1

F 1 = Max. operating force F 2 = Force at contact F 2 is max. 55% of F 1

#### Circuit Diagram - Keyswitch RF 19



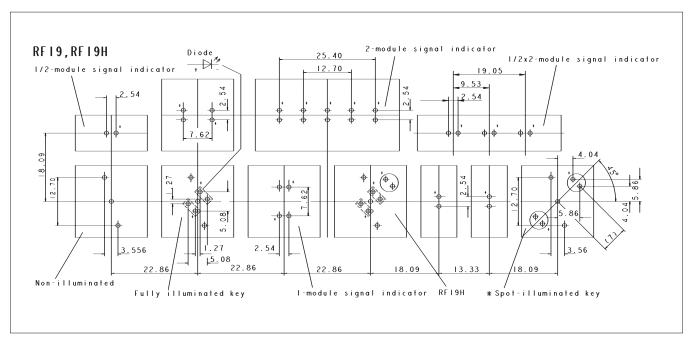
#### **Dimensional Drawing**



RF



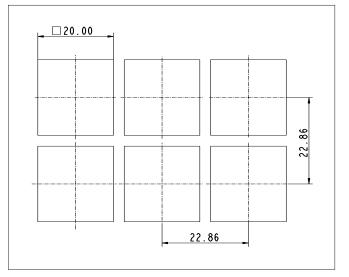
#### **Hole Patterns RF 19**



\* The LED may be positioned either on the left-hand or right-hand side. Standard version: LED on left-hand side View on component side, all hole diameters 1,1 +/- 0,1 mm

#### **Hole Patterns – Front Panel RF 19**

4



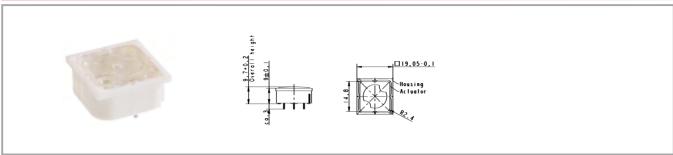
RF

4 - 52 PCB Keyswitches





#### RF 19 short-travel keyswitch, non-illuminated

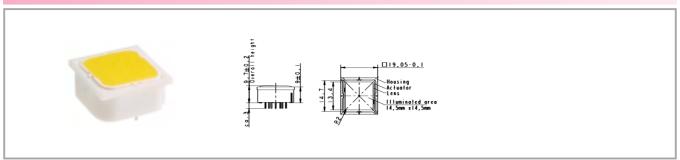


Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	not illuminated	transparent			3.14.001.001/0000
Ag	not illuminated	transparent			3.14.001.006/0000

Technical data see page 4 - 50



#### RF 19 short-travel keyswitch, fully illuminated with 2 LEDs



Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	fully illuminated 2 LEDs	red	red	2 mm	3.14.002.011/0000
Au	fully illuminated 2 LEDs	green	green	2 mm	3.14.002.012/0000
Au	fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.002.013/0000
Au	fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.002.014/0000
Au	fully illuminated 2 LEDs	blue	blue	2 mm	3.14.002.015/0000
Ag	fully illuminated 2 LEDs	red	red	2 mm	3.14.002.021/0000
Ag	fully illuminated 2 LEDs	green	green	2 mm	3.14.002.022/0000
Ag	fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.002.023/0000
Ag	fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.002.024/0000
Ag	fully illuminated 2 LEDs	blue	blue	2 mm	3.14.002.025/0000

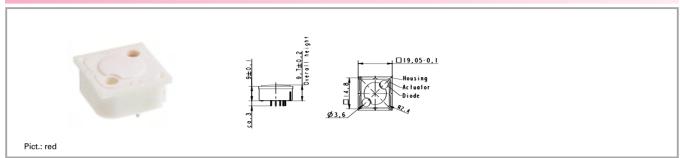
Technical data see page 4 - 50

4





#### RF 19 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	3.14.001.030/0000
Au	spot illumination 1 LED	transparent	red	3 mm	3.14.001.031/0000
Au	spot illumination 1 LED	transparent	green	3 mm	3.14.001.032/0000
Au	spot illumination 1 LED	transparent	yellow	3 mm	3.14.001.033/0000
Ag	spot illumination 1 LED	opaque white	blue	3 mm	3.14.001.040/0000
Ag	spot illumination 1 LED	transparent	red	3 mm	3.14.001.041/0000
Ag	spot illumination 1 LED	transparent	green	3 mm	3.14.001.042/0000
Ag	spot illumination 1 LED	transparent	yellow	3 mm	3.14.001.043/0000

Technical data see page 4 - 50

Versions with 2 LEDs available on request.



#### RF 19 short-travel keyswitch, 1 NC + 1 NO



#### **Technical data**

<b>General information</b> Recommended key grid	23 mm
Dimensions	40.05

Length19.05 mmWidth19.05 mmOverall height9.7 mm

Mechanical design

Mounting soldering into PCB contacts tin-plated, fix contact Ag plated

Contact system bridge contact
Contact arrangement 1 NC + 1 NO
Contact materials Au/Ag
Illumination none

Mechanical characteristics

Operating force max. 2 ... 3 N
Operating travel 0.5 mm
Switching travel 0.5 mm
Robustness min. with through-plated PCB

Electrical characteristics
Rated voltage min.
Rated voltage max.
Rated current min.
Au: 0.02 V, Ag: 3 V V
Au: 42 V, Ag: 50 V V
Au: 0.01 mA,
Ag: 0.1 mA mA
Au: 100 mA,
Ag: 250 mA mA
Rated power max.

(ohmic load) Au: 2 W, Ag: 12.5 W

Bouncing time max.

Other specifications

Ambient temp. operating min. -25 °C

Ambient temp. operating max. +70 °C

Storage temperature min. Storage temperature max. (product) +80 °C

Storage temperature max. (in tube) +50 °C

Resistance to constant environment according

Resistance at variable environment

Operating life min.
Soldering time max.
Soldering temperature
max.
Flammability of materials

according to

IEC 600 68-2-3 and 2-30

according to IEC 600 68-2-14 and 2-33 100000

100000 5 sec.

5 ms

265 °C UL 94 HB

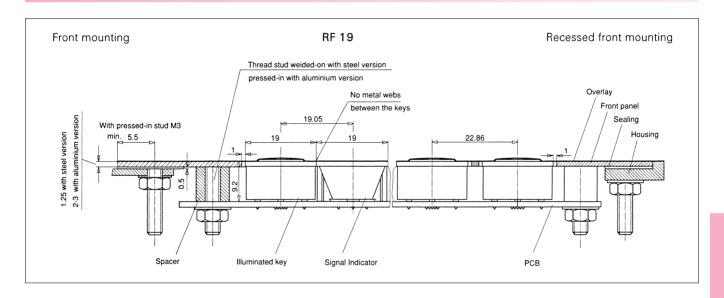
4

### C&K

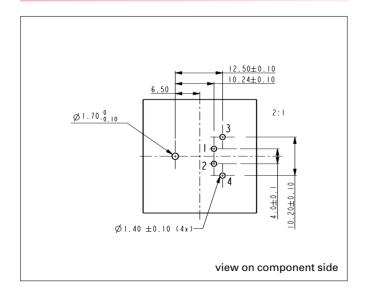
#### **Circuit Diagram**

$$SIF - \begin{cases} 1 \\ - - - \end{cases}$$

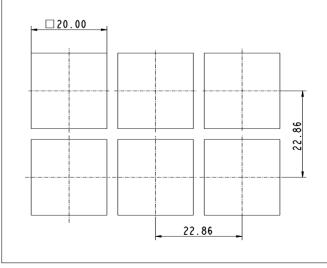
#### **Dimensional Drawing**



#### **Hole Pattern**



#### **Hole Pattern - Front Panel**

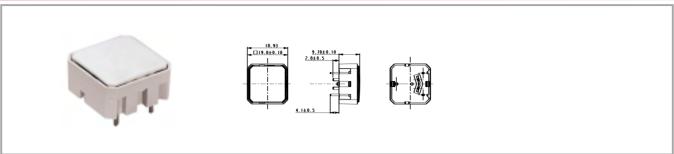


4

RF



#### RF 19 short-travel keyswitch, non-illuminated



Contact materials	Contact arrangement	Illumination	Colour of lens	Order no.
Au	1 NC + 1 NO	not illuminated	opaque white	1.16.000.991/0000
Ag	1 NC + 1 NO	not illuminated	opaque white	1.16.000.990/0000

Technical data see page 4 - 56

4



#### RF 19 H short-travel keyswitch



#### **General data**

#### **Application notes:**

The RF 19H key has an overall height of 12.5 mm and can be fully illuminated. When designing membrane keyboards, we recommend using a key grid of at least 23 mm and a 0.13 mm overlay with area embossing over the keys. You can use the O-ring (accessory) to block the key and use it as an indicator field or blank spaceholder.

#### **Technical data**

**General information** 

Colour of lens Recommende

see order block ended key grid 24 mm **Dimensions** Length 19.05 mm Width 19.05 mm Overall height 12.5 mm

Mechanical design

Mounting soldering into PCB Terminals contacts tin-plated, fix contact Ag plated Contact system snap-action contact

Contact arrangement 1 NO Contact materials Au/Ag spot-fully illuminated Illumination

LED colour see order block LED type see order block

**Mechanical characteristics** 

Operating force max. 2 ... 3 N Operating travel 0.5 mm Switching travel 0.5 mm Robustness min. with through-plated PCB

100 N

**Electrical characteristics** 

Au: 0.02 V, Ag: 3 V Rated voltage min. Rated voltage max. Au: 42 V, Ag: 50 V Au: 0.01 mA, Ag: 0.1 mA Rated current min. Au: 100 mA, Ag: 250 mA Rated current max.

Rated power max. (ohmic load) Au: 2 W, Ag: 12.5 W Contact resistance when 100  $m\Omega$ new max

Contact resistance acc. 3.0 to life max. Insulation resistance  $10^9 \Omega$ 

ESD strength (underneath overlay) 15 kV Bouncing time max. 5 ms

Other specifications

Ambient temp. operating -25 °C min. Ambient temp. operating +70 °C -40 °C Storage temperature min. Storage temperature max. +80 °C (product) Storage temperature max. (in tube) +50 °C Resistance to constant

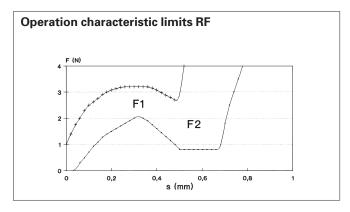
environment according to IEC 600 68-2-3 and 2-30 Resistance at variable

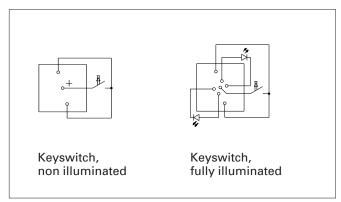
environment according to IEC 600 68-2-14 and 2-33 Operating life min. 1000000 Soldering time max. 2.5 sec.

Soldering temperature 250 °C Flammability of materials UL 94 HB

#### Force/Travel Diagram – Keyswitch RF 19 H

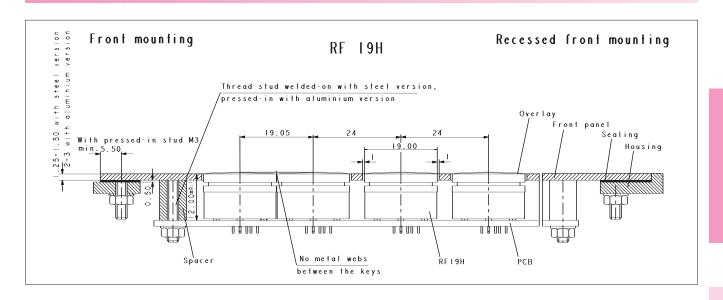
#### Circuit Diagram - Keyswitch RF 19 H





- F 1 = Max. operating force F 2 = Force at contact
- F 2 is max. 55% of F 1

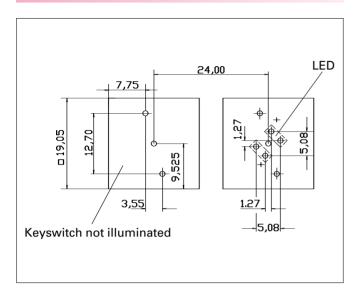
#### **Dimensional Drawing**



RF

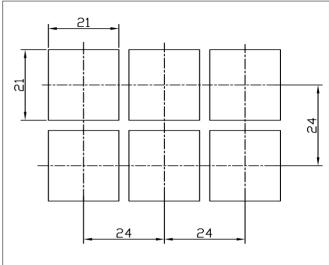


#### **Hole Pattern RF 19 H**



#### \* The LED may be positioned either on the left-hand or right-hand side. Standard version: LED on left-hand side View on component side, all hole diameters 1,1 +/- 0,1 mm

#### **Hole Pattern – Front Panel RF 19 H**



4

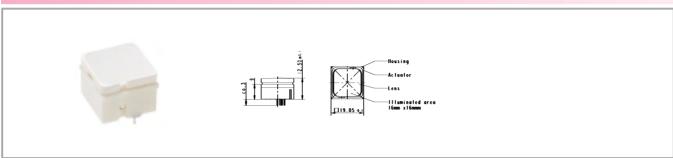
# RF short-travel keyswitches



#### **Accessories RF 19 H short-travel keyswitches**

Description	Photo	Order no.	Page
O-ring, black, 17.0 x 1.5, for blocking RF 19H keys	0	5.30.125.003/0100	

# RF 19 H keyswitch, non-illuminated

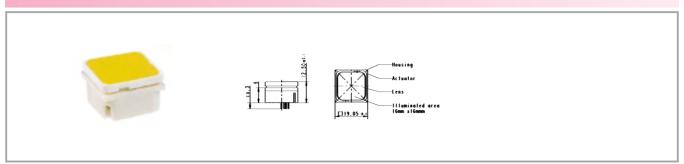


Contact materials	Illumination	Colour of lens	LED colour	LED type	Order no.
Au	not illuminated	white			3.14.001.501/0000
Ag	not illuminated	white			3.14.001.506/0000

Technical data see page 4 - 60



# RF 19 H short-travel keyswitch, fully illuminated



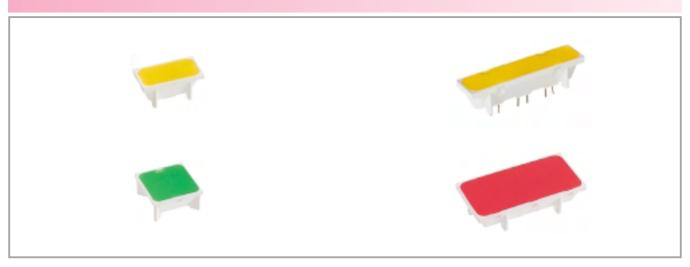
Illumination	Colour of lens	LED colour	LED type	Order no.
fully illuminated 2 LEDs	red	red	2 mm	3.14.002.613/0000
fully illuminated 2 LEDs	green	green	2 mm	3.14.002.632/0000
fully illuminated 1 LED	green	green super bright	3 mm	3.14.002.633/0000
fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.002.653/0000
fully illuminated 1 LED	white	white	3 mm	3.14.002.684/0000
fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.002.673/0000
fully illuminated 2 LEDs	white	multi colour	3 mm	3.14.001.672/0000
fully illuminated 1 LED	blue	blue	3 mm	3.14.002.683/0000
fully illuminated 2 LEDs	red	red	2 mm	3.14.002.623/0000
fully illuminated 2 LEDs	green	green	2 mm	3.14.002.642/0000
fully illuminated 1 LED	green	green super bright	3 mm	3.14.002.643/0000
fully illuminated 1 LED	blue	blue super bright	3 mm	3.14.002.688/0000
fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.002.663/0000
fully illuminated 1 LED	white	white	3 mm	3.14.002.689/0000
fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.002.678/0000
fully illuminated 2 LEDs	white	multi colour	3 mm	3.14.001.682/0000
	fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 1 LED fully illuminated 2 LEDs fully illuminated 1 LED fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 1 LED fully illuminated 2 LEDs fully illuminated 1 LED fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 1 LED fully illuminated 1 LED fully illuminated 1 LED fully illuminated 1 LED fully illuminated 2 LEDs fully illuminated 1 LED fully illuminated 1 LED fully illuminated 1 LED fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated	fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 3 green fully illuminated 4 yellow 2 LEDs fully illuminated 5 white fully illuminated 6 orange 6 yellow 6 yellow 7 yellow 7 yellow 8 yellow 9 yellow 9 yellow 9 yellow 9 yellow 9 yellow 9 yellow 1 LED 1 yellow 1 yel	fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 2 LEDs fully illuminated 3 green 3 green 4 green 5 green 5 green 5 green 6 green 7 green 8 green 8 green 9 green 9 green 8 green 9	fully illuminated 2 LEDs  fully illuminated 2 LEDs  fully illuminated 2 green green green yellow 2 mm  fully illuminated 2 LEDs  fully illuminated yellow yellow 2 mm  fully illuminated orange yellow 2 mm  fully illuminated 2 LEDs  fully illuminated orange yellow 2 mm  fully illuminated 2 LEDs  fully illuminated blue blue 3 mm  fully illuminated red red 2 mm  fully illuminated 2 LEDs  fully illuminated green green 2 mm  fully illuminated 2 LEDs  fully illuminated pred green green 2 mm  fully illuminated 2 LEDs  fully illuminated green green yellow 2 mm  fully illuminated blue blue super bright 3 mm  fully illuminated blue blue super bright 3 mm  fully illuminated yellow yellow 2 mm  fully illuminated yellow yellow 2 mm  fully illuminated orange yellow 3 mm

Technical data see page 4 - 60

When using the keyswitches with multicolour LEDs the illumination colour can be varied from red to green by change of polarity. Due to the frequency of the polarity-changes the colours red, green, yellow as well as all secondary colours from these are possible.



#### RF 19 signal indicator



#### **Technical data**

Colour of lens Recommended key grid

**Dimensions** 

Length Width Overall height

Mechanical design

Mounting Illumination LED colour LED type see order block 23/x mm

see order block see order block 9.15 mm

soldering into PCB see order block see order block see order block Other specifications

Ambient temp. operating min. -25 °C

Ambient temp. operating max. +70 °C

Storage temperature min. -40 °C

Storage temperature max. (product) +80 °C

Storage temperature max. (in tube) +50 °C

environment

Posistance at variable

Resistance to constant

Resistance at variable environment

Soldering time max. Soldering temperature max.

Flammability of materials

according to

according to

IEC 600 68-2-14 and 2-33

IEC 600 68-2-3 and 2-30

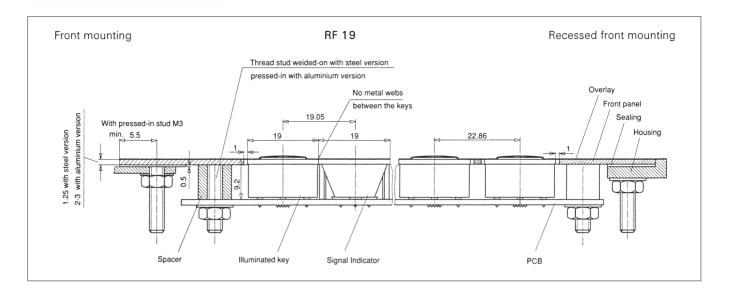
2.5 sec.

250 °C UL 94 HB

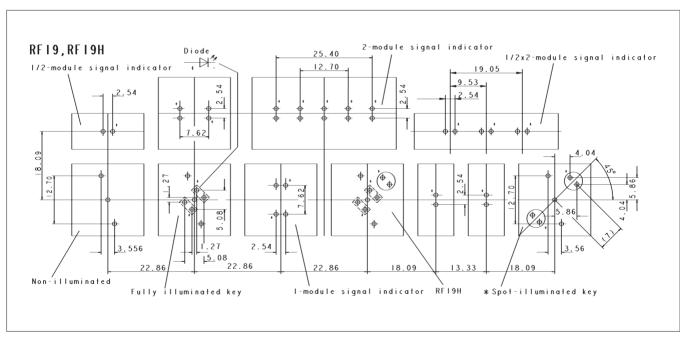


# C&K

#### **Dimensional Drawing Signal Indicator RF 19**



#### **Hole Patterns RF 19**



\* The LED may be positioned either on the left-hand or right-hand side. Standard verstion: LED on left-hand side View on component side, all hole diameters 1,1 +/- 0,1 mm

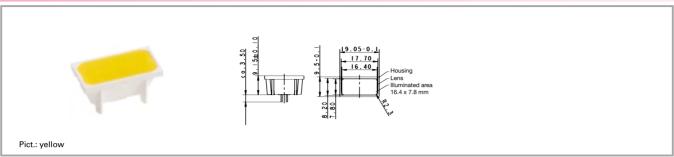
Front panel cut-out = outer keyswitch size + 1 mm

RF

PCB Keyswitches 4 - 67



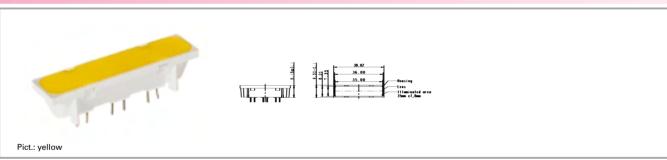
#### RF 19 signal indicator, <sup>1</sup>/<sub>2</sub> x 1-module



Illumination	Colour of lens	LED colour	LED type	Order no.
fully illuminated 1 LED	red	red	2 mm	3.14.002.061/0000
fully illuminated 1 LED	green	green	2 mm	3.14.002.062/0000
fully illuminated 1 LED	yellow	yellow	2 mm	3.14.002.063/0000
fully illuminated 1 LED	orange	yellow	2 mm	3.14.002.064/0000

Technical data see page 4 - 66

# RF 19 signal indicator, <sup>1</sup>/<sub>2</sub> x 2-module

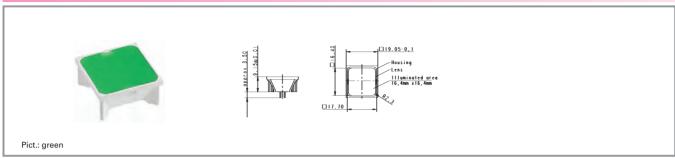


Illumination	Colour of lens	LED colour	LED type	Order no.
fully illuminated 3 LEDs	red	red	2 mm	3.14.002.908/0000
fully illuminated 3 LEDs	green	green	2 mm	3.14.002.909/0000
fully illuminated 3 LEDs	yellow	yellow	2 mm	3.14.002.910/0000
fully illuminated 3 LEDs	orange	yellow	2 mm	3.14.002.911/0000

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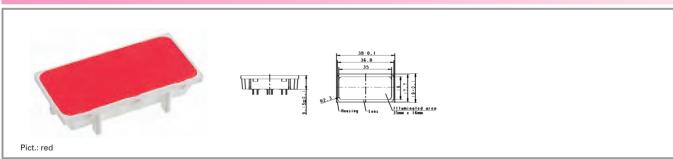
#### RF 19 signal indicator, 1 x 1-module



Illumination	Colour of lens	LED colour	LED type	Order no.
fully illuminated 2 LEDs	red	red	2 mm	3.14.002.051/0000
fully illuminated 2 LEDs	green	green	2 mm	3.14.002.052/0000
fully illuminated 2 LEDs	yellow	yellow	2 mm	3.14.002.053/0000
fully illuminated 2 LEDs	orange	yellow	2 mm	3.14.002.054/0000
fully illuminated 2 LEDs	blue	blue	2 mm	3.14.001.659/0000

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# RF 19 signal indicator, 1 x 2-module



Illumination	Colour of lens	LED colour	LED type	Order no.
fully illuminated 5 LEDs	red	red	2 mm	3.14.002.071/0000
fully illuminated 5 LEDs	green	green	2 mm	3.14.002.072/0000
fully illuminated 5 LEDs	yellow	yellow	2 mm	3.14.002.073/0000
fully illuminated 5 LEDs	orange	yellow	2 mm	3.14.002.074/0000

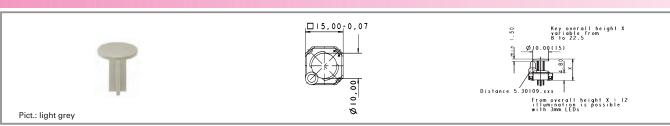
Technical data see page 4 - 66



#### RF special accessories



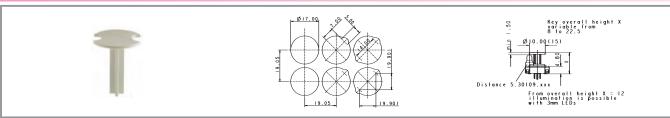
#### **Extension plunger for RF 15 N, round head**



Length	Width	Overall height	Diameter	Colour	Order no. complete
		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.

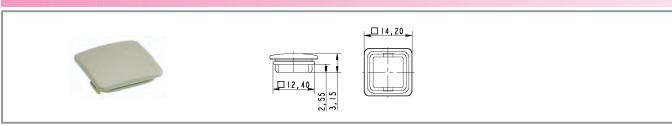
#### Extension plunger for RF 15 N, round head, with recess for LED



Length	Width	Overall height	Diameter	Colour	Order no. complete
		9 mm	15 mm		5.46.017.036/0710
		9.7 mm	15 mm		5.46.017.030/0710
		12.5 mm	15 mm		5.46.017.037/0710
		13 mm	15 mm		5.46.017.038/0710
		22.5 mm	15 mm		5.46.017.028/0710

Length of plunger = Overall height - 4.25 mm.

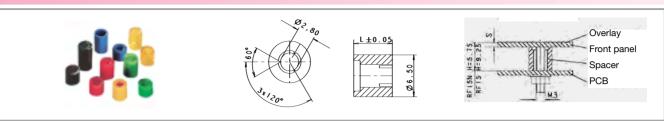
# Keycap for RF 15, snap-on, for overall height 12.5 mm



Length	Width	Overall height	Diameter	Colour	Order no. complete
14.2 mm	14.2 mm	12.5 mm		beige	5.46.654.059/0227



#### Spacers, round, for RF 15, RF 19



Length	Width	Overall height	Diameter	Colour	Order no. complete
4 mm				green	5.30.759.025/0000
4.25 mm				blue	5.30.759.026/0000
4.50 mm				red	5.30.759.027/0000
4.75 mm				blue transparent	5.30.759.028/0000
5 mm				black	5.30.759.029/0000
5.25 mm				yellow orange transparent	5.30.759.030/0000
5.50 mm				yellow	5.30.759.031/0000
5.75 mm				green	5.30.759.032/0000
6 mm				blue	5.30.759.033/0000
6.25 mm				red	5.30.759.034/0000
6.50 mm				blue transparent	5.30.759.035/0000
6.75 mm				black	5.30.759.036/0000
7 mm				yellow orange transparent	5.30.759.037/0000
7.25 mm				yellow	5.30.759.038/0000
7.50 mm				green	5.30.759.039/0000
7.75 mm				blue	5.30.759.040/0000
8 mm				red	5.30.759.041/0000
8.25 mm				blue transparent	5.30.759.042/0000
10.00 mm				black	5.30.759.043/0104

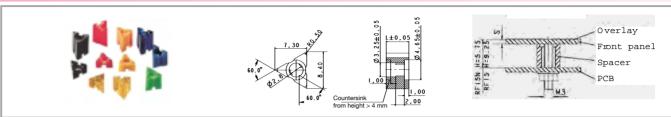
Required spacer length = Overall height of key - front panel thickness - 0.5 mm (area embossing).

4

RF



# Spacers, triangular, for RF 15, RF 19



Length	Width	Overall height	Diameter	Colour	Order no. complete
2.50 mm				blue	5.30.759.094/000
2.75 mm				red	5.30.759.095/000
3 mm				blue transparent	5.30.759.096/000
3.25 mm				black	5.30.759.097/0000
3.50 mm				yellow orange transparent	5.30.759.098/000
3.75 mm				yellow	5.30.759.099/0000
4 mm				green	5.30.759.100/0000
4.25 mm				blue	5.30.759.101/0000
4.50 mm				red	5.30.759.102/0000
4.75 mm				blue transparent	5.30.759.103/0000
5 mm				black	5.30.759.104/0000
5.25 mm				yellow orange transparent	5.30.759.105/0000
5.50 mm				yellow	5.30.759.106/0000
5.75 mm				green	5.30.759.107/0000
6 mm				blue	5.30.759.108/000
6.25 mm				red	5.30.759.109/0000
6.50 mm				blue transparent	5.30.759.110/0000
6.75 mm				black	5.30.759.111/0000
7 mm				yellow orange transparent	5.30.759.112/0000
7.25 mm				yellow	5.30.759.113/0000
7.50 mm				green	5.30.759.114/0000
7.75 mm				blue	5.30.759.115/0000
8 mm				red	5.30.759.116/000

Length	Width	Overall height	Diameter	Colour	Order no. complete
8.25 mm				blue transparent	5.30.759.117/0000
10.00 mm				black	5.30.759.124/0000
10.25 mm				yellow orange transparent	5.30.759.125/0000

Required spacer length = Overall height of key - front panel thickness - 0.5 mm (area embossing).

# LED spacer for RF 15 N Pict.: light grey

Length	Width	Overall height	Diameter	Colour	Order no. complete
2.2 mm		12.5 mm	5 mm	light grey	5.30.109.010/0756
12 mm		22.5 mm	5 mm	black	5.30.109.019/0105

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#### **C&K Components:**

 3.14001.0010000
 3.14001.0060000
 3.14001.0320000
 3.14001.0330000
 3.14002.0110000
 3.14002.0120000

 3.14002.0630000
 3.14002.6880000
 3.14100.0010000
 3.14100.0060000
 3.14100.0300000
 3.14100.0320000

 3.14100.0420000
 3.14100.5330000
 3.14100.6010000
 3.14200.0110000
 3.14200.0120000
 3.14100.5010000

 3.14200.023
 3.14002.0130000
 3.14200.0220000
 3.14100.5320000
 3.14100.5010000
 3.14100.5060000

#### RAFI:

3.14.200.013/0000 3.14.002.642/0000 3.14.002.678/0000 3.14.002.689/0000