Differential pressure switch
Models 310, 313

Applications

- Power generation
- Waste water management
- Oil and gas
- Petrochemical industries

Special features

- Internal Switch point adjustment for critical applications
- Switch point repeatability of ±2% of FSR for reliable switching
- Adjustable differential for flexible on/off control

Fig. Left: Model 310 / 313, GM weatherproof enclosure
Right: Model 310, GN weatherproof enclosure

Description

The model 310 differential pressure switch has been designed for control and monitoring applications. Model 310 is specially designed for sensing very low differential pressure in mmWC / mbar ranges.

The switch point repeatability to ±2% enables reliable switching in critical operating conditions. Low pressure ranges with diaphragm sensor elements enable to meet a variety of applications in oil,gas,power,steel and petrochemical industries.

Adjustable switch differential combinations are available to realize flexible on/off controls. This wide setting range is often needed for the on/off control mode of cyclic applications.

The switch point can be specified on site, with internal adjustment options. Depending on the application, the appropriate variant for the contact version and the electrical connection can be selected.

Specifications

Basic information	
Switch enclosure	■ GM style aluminium pressure die cast, weatherproof to IP66 ■ GN style aluminium die cast, weatherproof to IP66 ■ GK style aluminium pressure die cast, weatherproof and flameproof to group IIC as per IS/IEC 60079-1 (note 1)
Measuring element	■ Neoprene diaphragm (standard) ■ Nitrile diaphragm ■ EPDM diaphragm ■ Silicon diaphragm
Wetted parts	Aluminium

Output signal	
Ranges	→ See table "Setting range"
Switching differential	■ GN - 310, Fixed, 1 SPDT switch only ■ GM / GK -310, Fixed ■ GM / GK - 313 Wideband adjustable. Refer table s 2, 3 & 4 for values
Repeatability (note 4)	± 2% of FSR
Maximum working pressure	0.5 bar for all ranges
Scale accuracy (note 6)	±5% of FSR
Switching element (notes 10 & 11)	Instrument quality SPDT microswitch

Operating condition	
Permissible ambient temperature (note 12)	–10°C ... +60°C [14 ... 140°F]
Maximum process temperature (note 13)	95°C for Neoprene 110°C for Nitrile 130°C for EPDM 200°C for Silicone
Ingress protection	IP66
Process connection	1/4" NPT(F) per ASME B1.20.1 standard Other connections through adaptor
Electrical connection	1/2" NPT(F) per ASME B1.20.1 single entry standard Dual entry on request
Mounting	Vertical position to the process connector

Ordering matrix

Sample model number □ □ □ □ □ □ □ □

Switch enclosure

GM style aluminium pressure die cast, weatherproof to IP66 — **GM**

GN style aluminium pressure die cast, weatherproof to IP66 — **GN**

GK style aluminium pressure die cast, weatherproof and flameproof to Gr.IIC as per IS/IEC 60079-1 — **GK**

Model

Basic differential pressure switch meant for low / ultra low range span having very low fixed switching differential — **310**

Same as 310, but with auxiliary mechanism providing adjustment of switching differential between 6 to 10% minimum 60% maximum of FSR (not available in GN enclosure) — **313**

Sensor material and wetted parts

Neoprene diaphragm and cast aluminium wetted parts — **N5**

Silicone diaphragm and cast aluminium wetted parts — **S5**

EPDM diaphragm and cast aluminium wetted parts — **E5**

Nitrile diaphragm and cast aluminium wetted parts — **B5**

Range code

Refer table-1 — □

Switch code and rating

Refer table-5 — □

Electrical entry code

Refer table-6 — □

Mounting type

Wall — **W**

2" pipe — **2**

Universal — **U**

Mounting material

Mild steel — **C**

304 SS — **4**

316 SS — **2**

Table 1: Range code and availability

Range code	Range mbar	Maximum working pressure - bar	310		313
			GN	GM / GK	GM / GK
M009	–2.5 ... 2.5	0.5	✓	✓	×
M011	0 ... 2.5	0.5	×	✓	×
M036	0.5 ... 5	0.5	✓	✓	✓
M037	1 ... 10	0.5	×	✓	✓
M038	2.5 ... 15	0.5	✓	✓	✓
M039	2.5 ... 25	0.5	✓	✓	✓
M041	5 ... 50	0.5	×	✓	✓
M045	7.5 ... 75	0.5	✓	✓	✓
M046	10 ... 100	0.5	×	✓	✓

Table 2: Switching differential for model 310, GN enclosure

Range Code	Range mbar	On-off fixed differential in mbar	
		GN 310	
		D / 3	4
M009	-2.5 ... 2.5	±1.0	±1.0
M036	0.5 ... 5	1.0	0.8
M038	2.5 ... 15	1.2	1.0
M039	2.5 ... 25	1.2	1.0
M045	7.5 ... 75	5.0	4.0

Table 3: Switching differential for model 313, GM / GK enclosure

Range Code	Range mbar	On-off wideband differential in mbar	
		GM 313	GK 313
		W	W
M037	1 ... 10	2.1	3.0
M038	2.5 ... 15	4.0	4.0
M039	2.5 ... 25	5.0	6.0
M041	5 ... 50	7.0	8.0
M045	7.5 ... 75	9.0	10.0
M046	10 ... 100	10.0	15.0

Table 4: Switching differential for model 310, GM / GK enclosure

Range Code	Range	On-off fixed differential in mbar					
		GM 310			GK 310		
		D / 3	4	5	D / 3	4	5
M009	–2.5 ... 2.5	±1.0	±1.0	-	±1.6	±1.6	-
M011	0 ... 2.5	0.8	0.6	0.7	0.7	1.1	1.3
M036	0.5 ... 5	1.0	0.8	0.9	1.1	1.4	1.6
M037	1 ... 10	1.0	0.8	0.9	1.2	1.6	1.6
M038	2.5 ... 15	1.1	1.0	1.3	1.4	1.8	2.3
M039	2.5 ... 25	1.2	1.2	1.5	1.6	2.1	2.7
M041	5 ... 50	1.3	1.5	2.2	2.3	2.7	3.9
M045	7.5 ... 75	1.5	1.7	2.5	2.7	3.0	4.5
M046	10 ... 100	2.0	2.2	2.8	3.6	3.9	5.0

- For style GN 310 micro switch cides '3', 'D' and '4' are only possible. DPDT is not available in model GN 310
- For on-off differential values with swtich codes '9' and 'G' consult sales.
- To arrive at differentil for DPDT switching, apply multiplication factor of 1.3 to the above values.
- Chemical seals are not available.
- 2" pipe mounting is not possible in GN enclosure.
- For M009 range in GM / GK 310 micro switch code '2' and '5' are not available.

Table 5: Switch code, rating and availability (note 10)

Switch code		Contact version	AC rating	DC rating in Ampere						Availability in models			
				Resistive			Inductive			SPDT		DPDT	
SPDT	DPDT			250V	125V	30V	250V	125V	30V	GN	GM/ GK	GN	GM/ GK
D	DD	General purpose	15A 250 / 125V	0.2	0.4	2.0	0.02	0.03	1.0	310	310	-	310
3	33	General purpose	15A 250 / 125V	-	-	-	-	-	-	310	310	-	310
W	WW	General purpose	15A 250 / 125V	0.3	0.60	10.0	0.30	0.60	10.0	310	310	-	313
4	44	With Gold alloy contact.	1A 125V	-	0.5	0.5	-	0.25	0.25	310	310	-	310
5	55	General purpose with good DC rating.	5A 250 / 125V	0.2	0.4	4.0	0.2	0.4	3.0	-	310	-	310
9	99	Hermetically sealed, inert gas filled with Silver alloy contact.	1A 115V 400 Hz.	-	-	3.0 ✶	-	-	1.0 ✶	-	310	-	310
G	GG	Hermetically sealed, inert gas filled with Gold plated contact.	-	-	-	1.0 ✶	-	-	0.25 ✶	-	310	-	310

✶ For Codes 9, 99, G, GG; DC Rating of Resitive and Inductive is 28V

Table 6: Electrical entry

Size *	Single entry			Dual entry		
	GN	GM	GK	GN	GM	GK
1/2" NPT(F) per ASME B1.20.1	A	A	A	-	N	N
3/4" NPT(F) per ASME B1.20.1 through adaptor	-	L	-	-	O	-
M20 × 1.5 per ISO724 **	-	E	E	-	EB	EB
7 pin plug through connector ***	-	C	-	-	-	-
9 pin plug through connector ***	-	D	-	-	-	-

* Cable gland available on request

** Possible in GK enclosure as direct. Others through adaptor.

*** Possible only in GM enclosure.

NOTES

1. IS/IEC 60079–1 is equivalent to NEC CL.1, DIV.1, Gr.A and B.

2. Style GM/GN is weatherproof only if all entries and joint faces are properly sealed. Style GK is weatherproof only if cover 'O' ring is retained in position and flameproof only if proper FLP cable gland is used. It is recommended to procure cable glands along with GK instruments to avoid neglect of it while installation.

3. Intrinsic Safety (Exi) — Differential Pressure switches are classified as simple apparatus as they neither generate nor store energy. Hence differential pressure switches in weatherproof (GM) enclosures also may be used in intrinsically safe systems without certification provided the power source is certified Intrinsically Safe. Because of the low voltages and currents it is recommended to use gold contact and / or sealed contacts.

4. Accuracy & Repeatability are not different for all blind differential pressure switches. A shift of ±2% may be observed in setpoint when pressure falls from full static pressure. Settings will also shift with varying temperature.

5. The instrument is calibrated in the mounting position depicted in the drawing. Mounting in any other direction will cause a minor range shift, especially in low and compound ranges.

6. A differential pressure switch is a switching device and not a measuring instrument — eventhough it has a scale to assist setting. For this reason, Test Certificates will not contain individual ON-OFF switching values at different scale readings. Maximum differential obtained alone will be declared, besides other specifications.

7. Select working range of the instrument such that the set value lies in the mid 35% of the range i.e., between 35% and 70% of range span.

8. For switching differential values please refer respective Differential Table. Switching differentials furnished are nominal values under test conditions at mid-scale and will vary with range settings and operating conditions.

9. On and off settings should not exceed the upper or lower range value.

10. DPDT action is achieved by two SPDT switches synchronised to practical limits i.e., ±2% of FSR. Deadband for DPDT contacts are higher than that of SPDT as force required to actuate the contacts are more.

11. Contact life of microswitches are 5×10^5 switching cycles for nominal load. To quench DC sparks, use diode in parallel with inductance, ensuring polarity. A 'R–C' network is also recommended with 'R' value in Ohms equal to coil resistance and 'C' value in micro Farads equal to holding current in Amps.

12. Ambient temperature range: All models are suitable for operating within a range of ambient temperature from (–) 10°C to (+) 60°C provided the process does not freeze within this range. Below 0°C, precautions should be taken in humid atmospheres to prevent frost formation inside the instrument from jamming the mechanism. Occasional excursions beyond this range are possible but accuracy might be impaired. The microswitch is the limiting factor which should never exceed the limits (–) 25°C to (+) 80°C.

13. Fluid Temperature: A differential pressure switch when connected to the process is not subjected to through flow and therefore is not fully exposed to the fluid temperature. Use of adequate length of impulse piping will greatly reduce excessive heating of the sensing element. For e.g., connection of 7.5 cm of 12 mm dia impulse piping will reduce water temperature of 100°C to 65°C at an ambient temperature of 50°C. Ask factory for piping nomogram #441184–4 for different temperatures.

14. Ensure that impulse pipework applies no stress on sensing element housing and use spanners to hold pressure port/housing when connections are made.

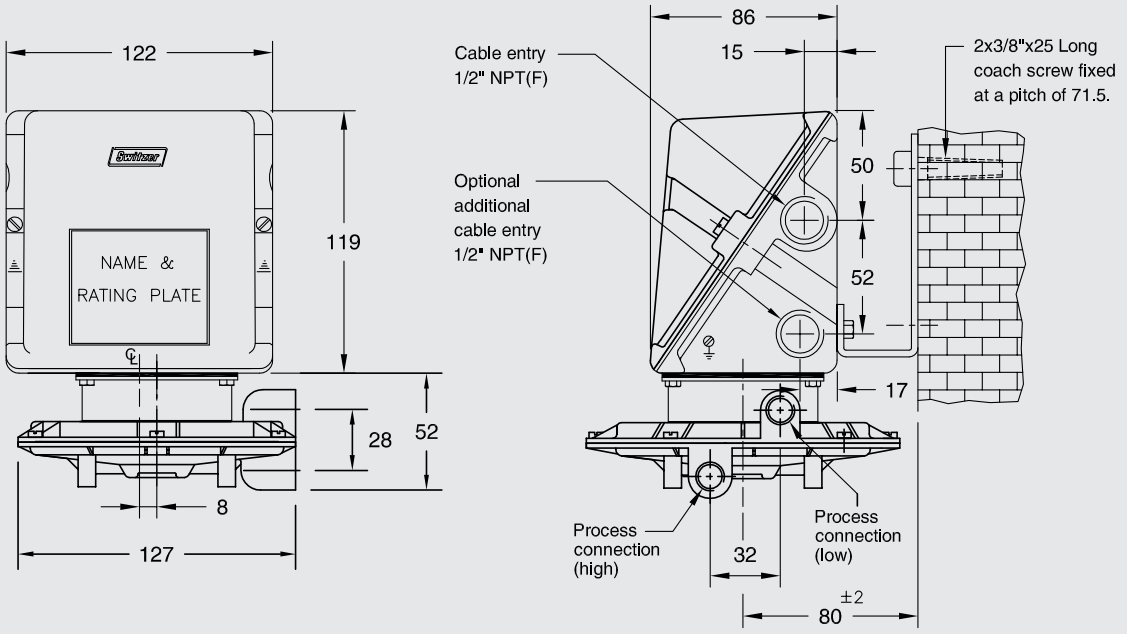
15. Accuracy figures are exclusive of test equipment tolerance on the claimed values.

16. All performance data are guaranteed to ±5%.

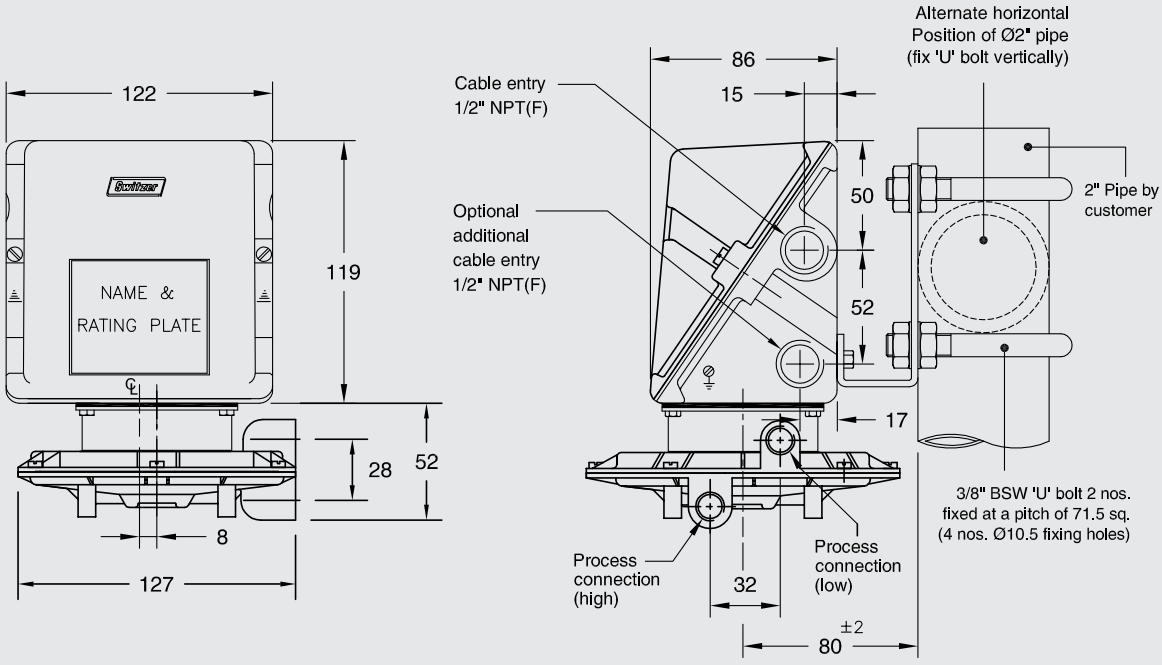
Dimensions in mm

Model 310 / 313 GM enclosure

Wall mounting



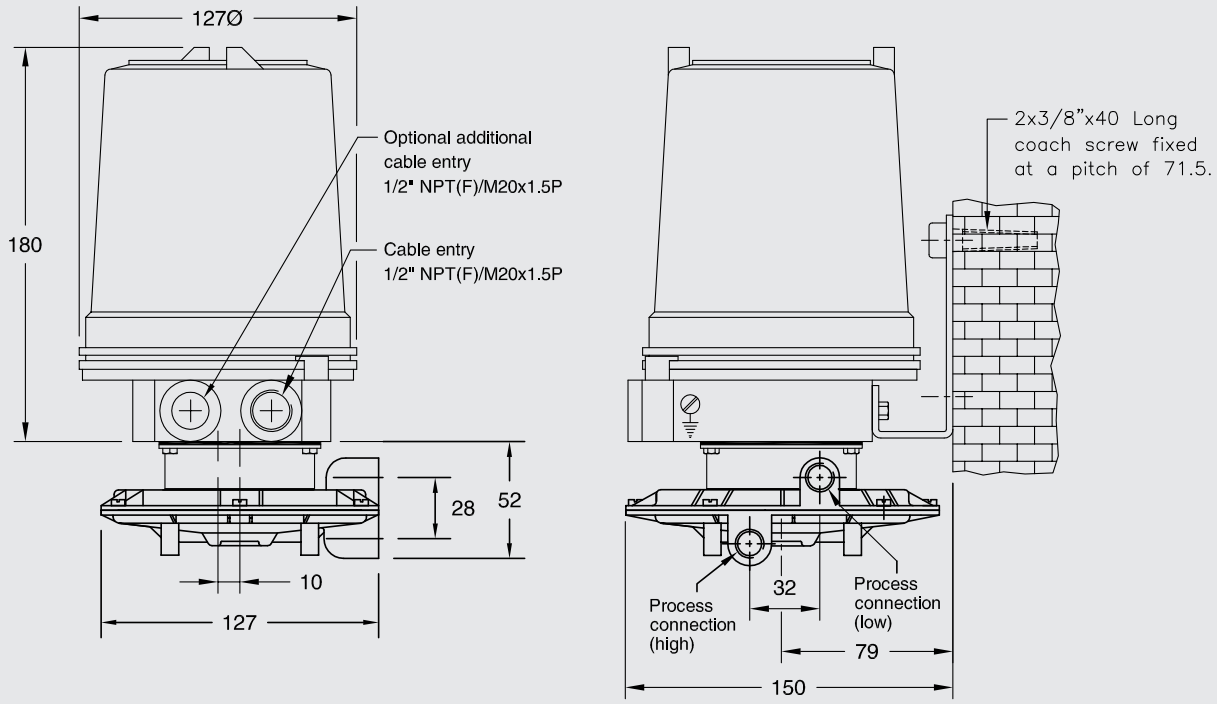
Pipe mounting



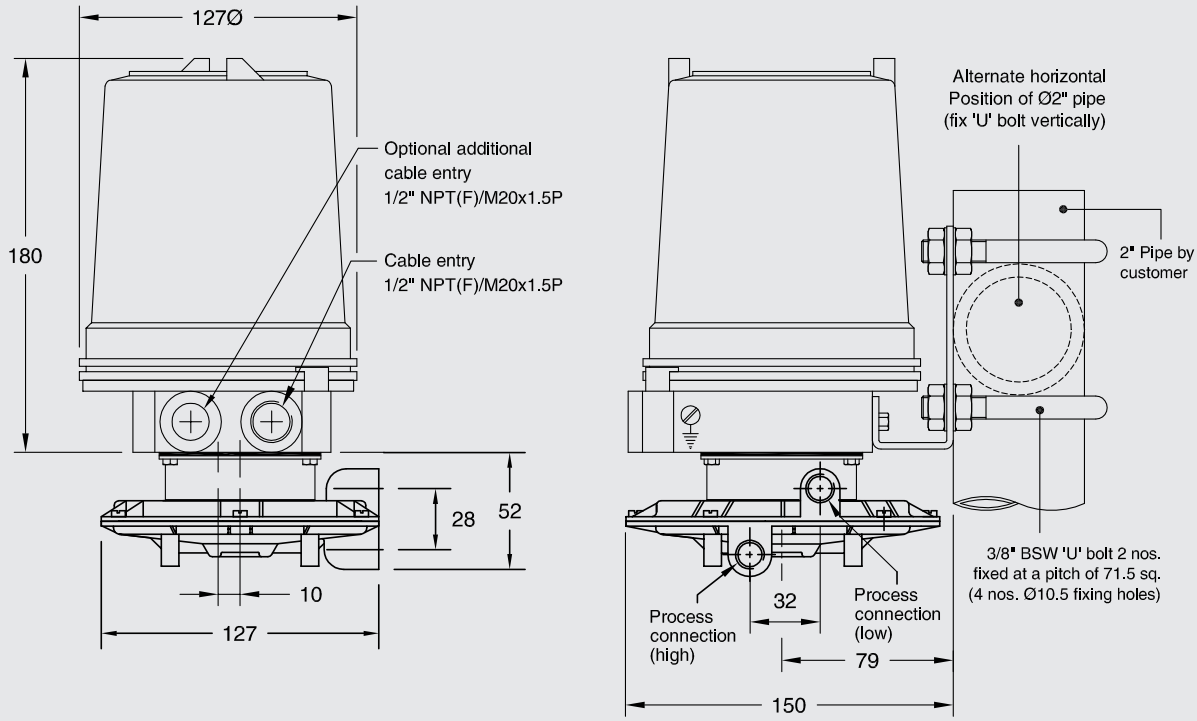
Dimensions in mm

Model 310 / 313 GK enclosure

Wall mounting

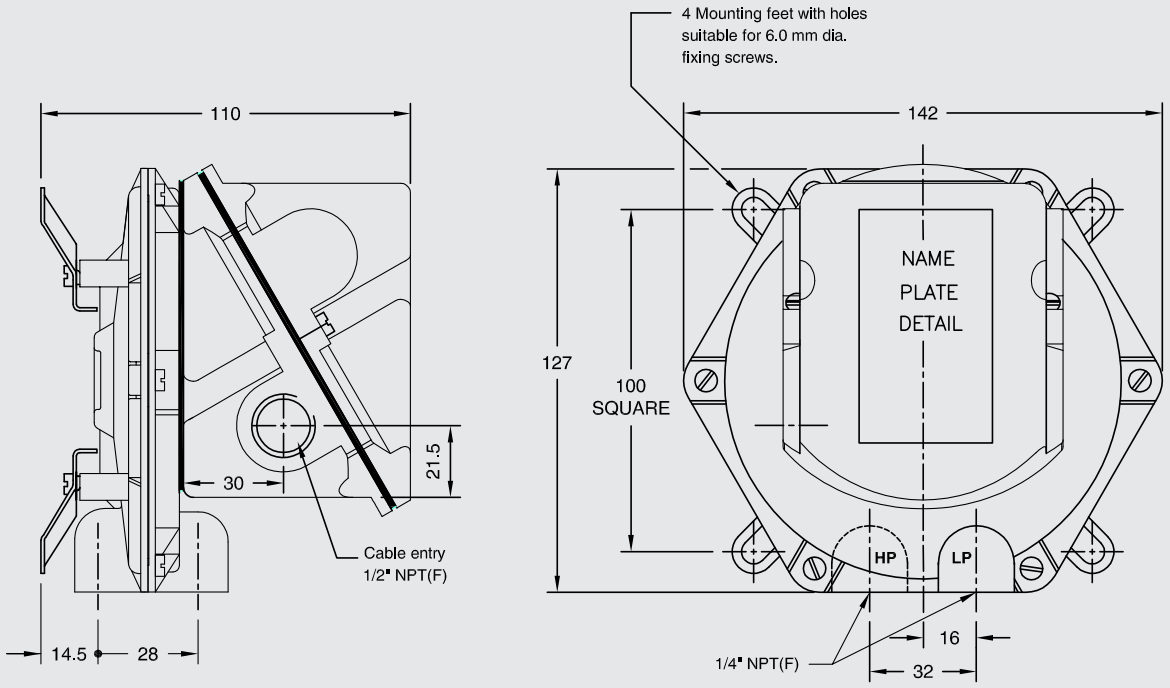


Pipe mounting



Dimensions in mm

Model GN 310



Ordering information

Switch enclosure/ Model / Sensor material and wetted parts / Range code / Switch code and rating / Electrical entry code / Mounting type / Mounting material

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