

T 8365 EN

Type 4746 Electric or Pneumatic Limit Switch



Application

Limit switches with inductive, electric or pneumatic contacts for attachment to pneumatic or electric control valves, to Type 4763 Electropneumatic Positioners or Type 4765 Pneumatic Positioners

Rated travels from 7.5 to 180 mm

Limit switches issue a signal when an adjusted limit is exceeded or not reached. This signal is suitable for initiating visual or audible alarms as well as actuating valves or other switching units. Moreover, the limit switches can be connected to central control or alarm systems.

Optionally available with:

- Two inductive limit contacts
- Two electric limit contacts or
- Two pneumatic limit contacts

It is possible to override all the limit contacts. They can be adjusted to be either an NC or NO contact. The metal tag of the NO contact is outside the pick-up field and the contact closed. The metal tag of the NC contact is outside the pick-up field.

Versions also available

- For use in hazardous areas in type of protection intrinsically safe Ex II 2G Ex ia IIC T6 or Ex II 3G Ex nA II T6 for Zone 2
- Conforming to Canadian or US explosion protection approvals

Special features

- Excellent switching accuracy
- The limit contacts do not influence each other
- Hysteresis (dead band) dependent on effective lever length

Attachment to control valves with cast yokes or rod-type yokes according to IEC 60534-6 as well as to Type 4763 Electropneumatic Positioners or Type 4765 Pneumatic Positioners

Versions

Type 4746-x2 (Fig. 1) · Inductive limit contact with non-contact limit value pick-up using metal tags and proximity switches (according to EN 60947-5-6)

On request with proximity switches with integral output amplifier designed as three-wire switch (no transistor relay)

Type 4746-x3 · Electric limit switch with electric double-throw switch with friction snap-action contacts



Fig. 1: Type 4746-x2 Inductive Limit Switch

Type 4746-04 · Pneumatic limit switch with pneumatic limit contacts and downstream pneumatic microswitches. Supply air 1.4 bar (20 psi), output 0 or 1.4 bar (20 psi)

Versions for hazardous areas

Type 4746-1 · Limit switch with contact circuit in type of protection intrinsically safe Ex II 2G Ex ia IIC T6

Type 4746-8 · Limit switch in type of protection non-sparking Ex II 3G Ex nA II T6 for Zone 2

Versions with Canadian or US explosion protection certification are available.

Refer to the summary of explosion protection certificates.

Special version on request: Housing for limit contacts, see page 4

For more information on the selection and application of positioners and limit switches, refer to Information Sheet

► T 8350.

Principle of operation (Fig. 2 to Fig. 4)

The valve travel is transmitted either directly to the pin (1.1) and lever (1) of the limit switch by the plate (20) or by a coupling pin when a positioner is attached. The linear travel is converted into a rotary motion by the shaft (2).

All limit switches have a small hysteresis which depends on the lever length L (see Technical data). Due to this, unnecessary contact changeover is avoided and signal processing is facilitated even when the valve stem position is within the limit signal range.

Type 4746-x2 Inductive Limit Switch (Fig. 2)

In this version, the shaft (2) carries two switch cases (3) with adjustable metal tags (4.1) for non-contact activation of the proximity switches (5). When the tag is located in the inductive field of the switch, the switch assumes a high resistance. When it moves outside the field, the switch assumes a low resistance. The switching function and switching point are continuously adjustable using the adjustment screw (3.1).

For operation of the standard inductive limit switches (two-wire according to EN 60947-5-6), appropriate transistor relays must be connected to the output circuit. The three-wire version comprising the SB3,5-E2 proximity switch includes an integrated output amplifier and does not require a transistor relay.

Type 4746-x3 Electric Limit Switch (Fig. 3)

In this version, the shaft (2) carries two switch cases (3) with adjustable cam disks (4.2). Each cam disk activates an electric double-throw switch (7) over the roller (6.1), which is attached to the switch lever (6). The switching function and switching point are continuously adjustable using the adjustment screw (3.1).

Type 4746-04 Pneumatic Limit Switch (Fig. 4)

In this version, the shaft (2) carries two switch cases (3) with adjustable cam disks (4.2). Inside the switch (8), each cam disk activates a nozzle-flapper system whose cascade pressure (p_{k1} or p_{k2}) is used to reverse the pneumatic microswitch (9).

Whenever the cam disk (4.2) activates the switch lever (6) over the roller (6.1), the nozzle in the pneumatic switch is opened and the supply air p_z is switched from the microswitch through to port A1 or A2.; i.e the input 5 is connected to output 3 and $p_{a1} = p_z$ or $p_{a2} = p_z$. The nozzle (8.1) is closed in the pneumatic switch (8) and the supply air applied to the microswitch is cut off first when the cam disk has released the switch lever (6).; i.e. $p_{a1} = 0$ or $p_{a2} = 0$. The switching function and switching point are continuously adjustable using the adjustment screw (3.1).

Travel range

The limit switch requires different levers (1) depending on the travel range of the valve used:

- Lever I (149 mm) for travels up to max. 60 mm
- Lever II (202 mm) for travels exceeding 60 to max. 180 mm

Whenever the limit switch is attached to positioners, a special lever, regardless of the valve travel, needs to be used.

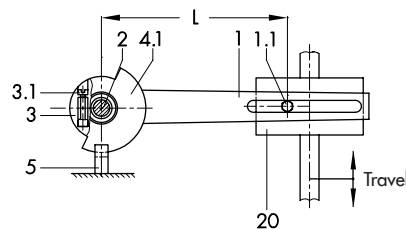


Fig. 2: Functional diagram of inductive limit contact

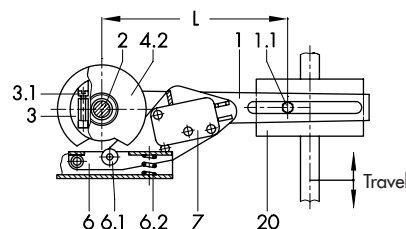
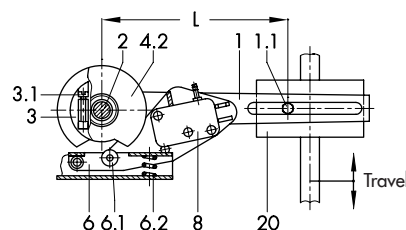
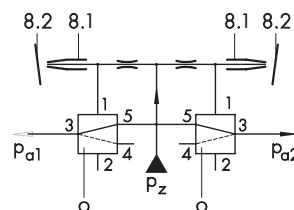


Fig. 3: Functional diagram of electric limit switch



4.1 · Functional diagram of mechanical switching mechanism



4.2 · Functional diagram of switching function

Fig. 4: Pneumatic limit switch

- | | | | |
|-----|---------------------------------------|-----|---|
| 1 | Lever for valve travel | 6.1 | Roller |
| 1.1 | Pin | 6.2 | Spring |
| 2 | Shaft | 7 | Electric switch |
| 3 | Switch case | 8 | Pneumatic switch |
| 3.1 | Adjustment screw | 8.1 | Nozzle (in switch) |
| 4.1 | Metal tag | 8.2 | Flapper (in switch) |
| 4.2 | Cam disk | 9 | Pneumatic microswitch |
| 5 | Proximity switch of the control valve | 20 | Plate attached either to actuator stem or plug stem |
| 6 | Switch lever | | |

Table 1: Technical data

Inductive Limit Switch	Type 4746-x2			Type 4746-0281
Control circuit	Switching amplifier according to EN 60947-5-6			Three-wire switch Operating voltage 10 to 30 V
Proximity switch	SC3,5-N0-YE ²⁾	SJ3,5-SN	SJ3,5-S1N	SB3,5-E2
Permissible ambient temperature ¹⁾	-20 to +70 °C	-20 to +100 °C	-20 to +100 °C	-20 to +70 °C
With metal cable gland	-40 to +70 °C	-50 to +100 °C	-40 to +100 °C	-25 to +70 °C
Switching function	NC contact	NC contact	NO contact	NO contact
Electrical connections	One M20x1.5 cable gland for 5.5 to 13 mm clamping range Screw terminals for 0.2 to 2.5 mm ² wire cross-section			
Degree of protection	IP 65			
Weight	Approx. 0.7 kg			
Type 4746-x3 Electric Limit Switch · Specifications apply to silver and gold-plated contacts				
Switching element	Electric limit switch: changeover contact/SPDT (single-pole/double-throw type)			
Permissible load	AC voltage: 220 V/6.9 A DC voltage: 220 V/0.25 A · 20 V/6.9 A			
Permissible ambient temperature ¹⁾	-20 to +85 °C			
With metal cable gland	-40 to +85 °C			
Electrical connections	One M20x1.5 cable gland for 5.5 to 13 mm clamping range Screw terminals for 0.2 to 2.5 mm ² wire cross-section			
Degree of protection	IP65			
Weight	Approx. 0.7 kg			
Type 4746-04 Pneumatic Limit Switch				
Switching element	Pneumatic limit contact with downstream pneumatic microswitch			
Supply	Supply air 1.4 bar (20 psi), can be briefly overloaded up to 4 bar (60 psi)			
Air consumption	0.04 m _n ³ /h			
Output	0 or 1.4 bar (20 psi)			
Air capacity	One switch closed: 0.7 m _n ³ /h · Two switches closed: 1.0 m _n ³ /h			
Permissible ambient temperature	-20 to +60 °C			
Degree of protection	IP54			
Weight	Approx. 0.75 kg			
Materials				
Housing and cover	Powder-coated aluminum			
Lever and shaft	1.4571			
Cable gland	M20x1.5, black polyamide			
Travel range				
Attachment according to IEC 60534-6	Lever I: 7.5 to 60 mm · Lever II: 60 to 180 mm			
Attachment to Type 4763/5 Positioner	Travel same as positioner			
Conformity	CE			

¹⁾ Observe the limits concerning permissible ambient temperatures specified in the type examination certificate.

²⁾ Models manufactured until 2006 with SJ3,5-N proximity switch.

Table 2: Technical data for Type 4746-1 with type of protection Ex ia (ATEX)

Maximum values for connection to certified intrinsically safe circuits

Limit Switch	Type 4746-12		Type 4746-13
	Inductive		Electric
U _i	16 V	16 V	45 V
I _i	52 mA	25 mA	–
P _i	169 mW	64 mW	2 W
C _i (effective internal capacitance)	60 nF	50 nF	Negligibly small
L _i (effective internal inductance)	160 µH	250 µH	
Temperature classes	Ambient temperature range according to EC type examination certificate (technical data specified in Table 1 apply additionally)		
T4	-45 to +89 °C	-45 to +100 °C	-45 to +80 °C
T5	-45 to +60 °C	-45 to +81 °C	-45 to +70 °C
T6	-45 to +45 °C	-45 to +66 °C	-45 to +60 °C

Table 3: Hysteresis (dead band)

Type 4746	-x2	-x3	-04
Lever length L	Hysteresis		
50 mm	0.15 (0.25 ¹⁾) mm	0.6 mm	0.75 mm
120 mm	0.30 (0.55 ¹⁾) mm	1.0 mm	1.5 mm

¹⁾ Special version

Ordering text

Types 4746-x2/-x3/-04 Limit Switch

Operating as a NO/NC contact to indicate valve OPEN/
CLOSED

Optionally, special version

Accessories

Mounting parts for attachment to

Type 4763 or 4765 Positioner

Valve with cast yoke with lever I or II

Valve with rod-type yoke with lever I or II

Adapter ½ NPT for electrical connections

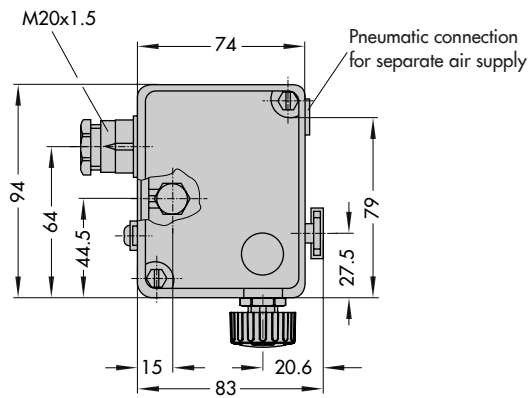
Special version on request:

Housing with electric terminals, ready for installing one or two inductive cylinder-shaped limit switches with M8 or M12 male thread

Dimensions in mm

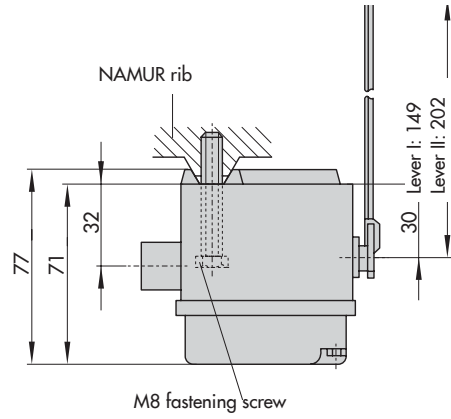
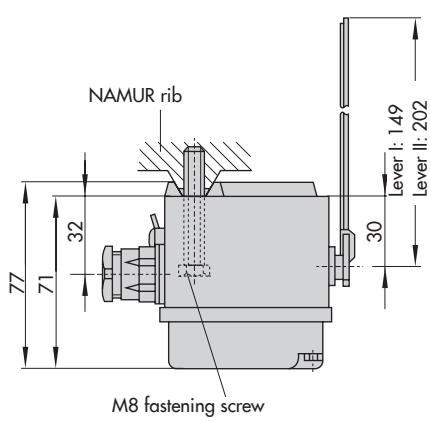
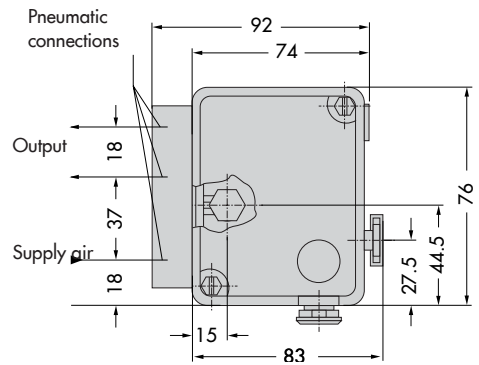
Type 4746-x2 and Type 4746-x3

Pneumatic connection for separate air supply, tapped hole G 1/8



Type 4746-04

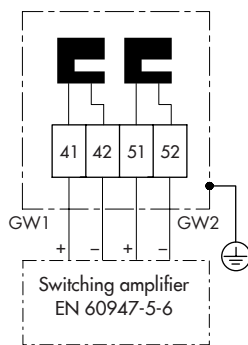
Pneumatic connections, tapped hole G 1/8 or 1/8 NPT



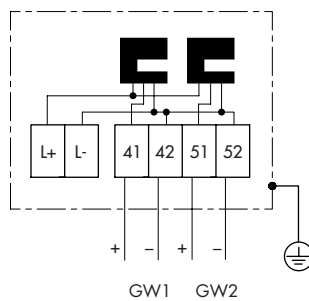
The dimensions required for attachment to Type 4765 Pneumatic Positioner and Type 4763 Electropneumatic Positioners can be found in Mounting and Operating Instructions ► EB 8365.

Electrical connection

Type 4746-x2



Type 4746-0281



Type 4746-x3

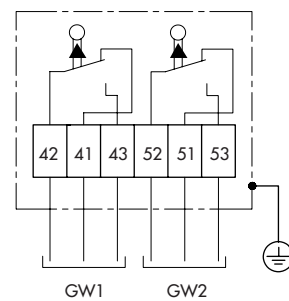




Table 4: Summary of explosion protection approvals

Type	Certification		Type of protection/description	
4746-1	 1)	Number	PTB 98 ATEX 2114	II 2G Ex ia IIC T6 Gb
		Date	2020-04-02	
	CCC Ex	Number	2021322307003671	Ex ia IIC T4...T6 Gb
		Date	2023-04-29	
		Valid until	2026-01-25	
	EAC	Number	RU C-DE.HA65.B.00615/20	1Ex ia IIC T6...T4 Gb X
		Date	2020-06-08	
Valid until		2025-05-13		
KCS	Number	13-KB4BO-0038	Ex ia IIC T6/T5/T4	
	Date	2013-01-31		
	Valid until	2026-01-31		
NEPSI	Number	GYJ23.1090X	Ex ia IIC T4...T6 Gb	
	Date	2023-04-29		
	Valid until	2028-04-28		
TR CMU 1055	Number	ZETC/36/2021	Module B II 2G Ex ia IIC T6 Gb	
	Date	2021-07-26		
TR CMU 1055	Number	ZETC/027/2024	Module D	
	Date	2024-04-22		
	Valid until	2027-08-24		
4746-3	CSA	Number	1607226	Ex ia IIC T6 or T5; Class I, Zone 0 Class I, Div. 1, Groups A,B,C,D Class II, Div. 1, Groups E,F,G Class III Class I, Div. 2, Groups A,B,C,D T6/T5/T4 Class II, Div. 2, Groups E,F,G Class III
		Date	2024-08-16	
FM	Number	FM24US0232	IS Class I,II,III, Div.1, GP A,B,C,D,E,F,G, T* Type 3R IS Class I, Zn 0, AEx ia IIC, T* NI Class I, Div.2, GP A,B,C,D,F,G T* * See Addendum	
	Date	2025-01-02		
4746-8	 2)	Number	PTB 02 ATEX 2012 X	II 3G Ex nA II T6
		Date	2002-04-05	
	CCC Ex	Number	2021322307003671	Ex ec IIC T4...T6 Gc
		Date	2023-04-29	
		Valid until	2026-01-25	
NEPSI	Number	GYJ23.1090X	Ex ec IIC T4...T6 Gc	
	Date	2023-04-29		
	Valid until	2028-04-28		
TR CMU 1055	Number	ZETC/36/2021	Module B II 3G Ex nA II T6	
	Date	2021-07-26		
TR CMU 1055	Number	ZETC/111/2021	Module D	
	Date	2021-08-25		
	Valid until	2024-08-24		

1) EC type examination certificate

2) Statement of conformity

Article code

Limit switch (device index .07 or higher)		Type 4746-	x	x	x	x	x	x	x	0	x	x	x	x
Explosion protection														
Without		0												
ATEX	II 2G Ex ia IIC T6 Gb	1												
CSA	Ex ia IIC T6 or T5; Class I, Zone 0; Class I, Div. 1, Groups A,B,C,D; Class II, Div. 1, Groups E,F,G; Class III Class I, Div. 2, Groups A,B,C,D T6/T5/T4; Class II, Div. 2, Groups E,F,G; Class III	3												
FM	IS Class I,II,III, Div.1, GP A,B,C,D,E,F,G, T* Type 3R IS Class I, Zn 0, AEx ia IIC, T* NI Class I, Div.2, GP A,B,C,D,F,G T*	8												
ATEX II 3G Ex nA II T6		8												
Design														
Inductive			2				1/2							
Electric			3				2							
Pneumatic		0	4				2							
Contacts														
Proximity switch SC3,5-NO-YE (NAMUR NC contact) ¹⁾			2	0	0		1	0						
Proximity switch SC3,5-NO-WH (NAMUR NC contact), larger hysteresis			2	0	1		1	0						
Proximity switch SJ3,5-SN (NAMUR NC contact in safety circuit)			2	1	0		1	0						
Proximity switch SJ3,5-S1N (NAMUR NO contact in safety circuit)			2	1	1		1	0						
SAIA, electric microswitch XGK 3 (silver contacts)			3	2	0		2	1	0					
SAIA, electric microswitch XGK3-81 (gold-plated contacts)			3	2	1		2	1	0					
Pneumatic microswitch		0	4	4	0		2	0						
Proximity switch SB3,5-E2 (three-wire switch, NO contact)		0	2	8	1		2	1	0					
Switching elements														
With one switching element							1							
With two switching elements							2							
Electrical connection														
Without		0	4	4	0			0						
Plastic cable gland M20x1.5, black								1	0					
Pneumatic connections														
Without									0					
ISO 221/1-G 1/8		0	4	4	0			0	1					
1/8 -27 NPT		0	4	4	0			0	2					
Special versions														
Without										0	0	0		
CCC Ex/NEPSI	Ex ia IIC T4...T6 Gb	1	2							0	0	9		
CCC Ex/NEPSI	Ex ec IIC T4...T6 Gc	8	2							0	1	0		
EAC	1Ex ia IIC T6...T4 Gb X	1	2/3							0	1	3		
KCS	Ex ia IIC T6/T5/T4	1	2							0	1	5		
Compatibility with paint														
Without														0
Free of substances that impair paint adhesion														1

¹⁾ Type 4746-3200 only with FM certification

