Electric or Pneumatic Limit Switch
Type 4746

Application
Limit switch with inductive, electric or pneumatic limit switches for attachment to pneumatic or electric control valves, to Type 4763 Electropneumatic Positioners or Type 4765 Pneumatic Positioners
For rated travels from 7.5 to 150 mm

The limit switches supply a signal when an adjusted limit value is exceeded in either direction. This signal is suitable for initiating visual or audible alarms as well as pilot valves or other switching units. Moreover, the limit switches can be connected to central control or alarm systems.

The limit switches are optionally available with
- Two inductive limit switches
- Two electric limit switches or
- Two pneumatic limit switches

The limit switches can be overridden. They can optionally be used as break (normally closed) or make (normally opened) contacts. The metal tag is outside the inductive field for the break contact and inside the inductive field for the make contact.

Also available are versions
- For use in hazardous areas in type of protection "Intrinsic Safety" ⟨Ex⟩ II 2 G EEx ia IIC T6 or ⟨Ex⟩ II 3 G EEx nA II T6 for Zone 2
- Designed according to Canadian or US explosion protection certifications

Further features include
- Excellent switching accuracy
- No mutual influencing of the incorporated limit switches
- Hysteresis (dead band) dependent on effective lever length

Attachment to control valves with cast yokes or rod-type yokes according to IEC 60534-6-1 as well as to Type 4763 Electropneumatic Positioners or Type 4765 Pneumatic Positioners

Versions
Type 4746-x2 (Fig. 1) · Inductive limit switch with frictionless limit value sensor using metal tags and proximity switches (according to EN 60 947-5-6)

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

Type 4746-04 · Pneumatic limit switch with incorporated pneumatic switches and subsequent pneumatic microswitches Supply: 1.4 bar (20 psi), output 0 or 1.4 bar (20 psi)

Fig. 1 · Type 4746-x2 Inductive Limit Switch

Versions for hazardous areas
4746-1 · Limit switch with contact circuit in type of protection "Intrinsic Safety" ⟨Ex⟩ II 2 G EEx ia IIC T6

Type 4746-8 · Limit switch in type of protection "Non-sparking" ⟨Ex⟩ II 3 G EEx nA II T6 for Zone 2

Versions with Canadian or US explosion protection certifications are available.
A summary of the approved explosion protection certificates can be found on page 5.
For information on the selection and application of positioners and limit switches, refer to Information Sheet T 8350 EN.

Principle of operation (Figs. 2 to 4)

The valve travel is transmitted either directly via the plate (20) onto the pin (1.1) and the lever (1) of the limit switch or, when the limit switch module is attached to a positioner, via a coupling pin. In this case, the linear valve travel is converted into a rotary motion via 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 these switches, the shaft (2) is provided with two switch cases (3) containing adjustable metal tags (4.1) for frictionless operation of the proximity switches (5). The proximity switches grow highly resistive when the metal tag is within the inductive field, whereas they become low-ohmic (lowly resistive) when the metal tag is outside the field. The switching function and the limit value are steplessly adjustable using the adjustment screw (3.1).

For operation of the standard inductive limit switches (two-wire according to EN 60 947-5-6), appropriate transistor relays must be connected to the output circuit. The three-wire version comprising the Type SB 3.5-E2 proximity switch includes an integrated output amplifier and does not require a transistor relay.

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

In these switches, the shaft (2) is provided with two switch cases (3) containing adjustable cam discs (4.2). Each cam disc actuates an electric double-throw switch (7) by means of the roller (6.1) mounted to the switch lever (6). The switching function and the limit value are continuously adjustable using the adjustment screw (3.1).

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

In these devices, the shaft (2) is provided with two switch cases (3) containing adjustable cam discs (4.2). Inside the switch (8), each cam disc actuates a nozzle-flapper system whose cascade pressure (p_{k1} or p_{k2}) is used to reverse the pneumatic microswitches (9).

When the cam disc (4.2) with its cam operates the switch lever (6) via the roller (6.1), the nozzle in the switch is opened and the available supply pressure p_z is fed from the microswitch to output A_1 or A_2 respectively. This means that input 5 is connected to output 3 and $p_{a1} = p_z$ or $p_{a2} = p_z$. As soon as the cam releases the switch lever (6), the nozzle (8.1) in the pneumatic switch (8) is closed. The microswitch changes over and the available air supply is shut off; i.e. $p_{a1} = 0$ or $p_{a2} = 0$. The switching function and the limit value are continuously adjustable using the adjustment screw (3.1).

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

Lever I (157 mm) for travels up to max. 60 mm
Lever II (210 mm) for travels exceeding 60 mm
Whenever the limit switch is attached to positioners, a special lever, which is independent of the valve travel, needs to be used.

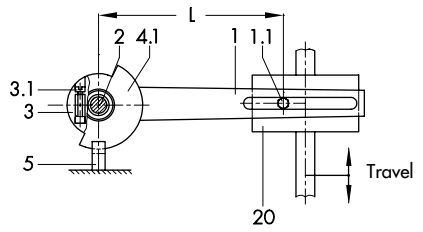


Fig. 2 · Functional diagram of the inductive limit switch

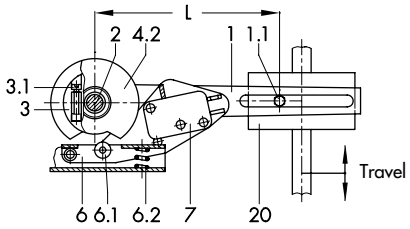


Fig. 3 · Functional diagram of the electric limit switch

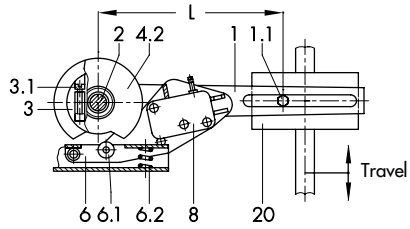


Fig. 4.1 · Functional diagram of the switching mechanism

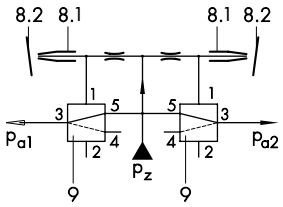


Fig. 4.2 · Functional diagram of the switching function

Fig. 4 · Pneumatic limit switch

Legend to Figs. 2 to 4

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

Table 1 · Technical data · All pressures stated in bar (gauge)

Inductive Limit Switch	**Type 4746-x2**		**Type 4746-0281**
Control circuit	Switching amplifier acc. to EN 60 947-5-6		Three-wire switch Operating voltage: 10 to 30 V
Proximity switch	SJ 3.5-N	SJ 3.5-SN	SB 3.5-E2
Permissible ambient temperature[1)]	–20 to 70 °C	–20 to 100 °C	–20 to 70 °C
With metal cable gland	–25 to 70 °C	–40 to 100 °C	–25 to 70 °C
Degree of protection	IP 65		
Weight	Approx. 0.7 kg		
Type 4746-x3 Electric Limit Switch			
Switching element	Electric limit switch: changeover/SPDT switch (single-pole/double-throw type)		
Permissible load	Alternating voltage: 220 V, 6.9 A Direct 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		
Degree of protection	IP 65		
Weight	Approx. 0.7 kg		
Type 4746-04 Pneumatic Limit Switch			
Switching element	Pneumatic limit switch with subsequent pneumatic microswitch		
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 output capacity	1 switch closed: 0.7 m_n^3/h 2 switches closed: 1.0 m_n^3/h		
Permissible ambient temperature[1)]	–20 to 60 °C		
Degree of protection	IP 54		
Weight	Approx. 0.75 kg		
Materials			
Case and cover	Aluminum, powder-coated		
Lever and shaft	1.4571		
Cable gland	M20 x 1.5 · Black polyamide		

[1)] Observe the limitations concerning permissible ambient temperatures specified in the EC Type Examination Certificate.

Table 2 · Technical data for Type 4746-1 in type of protection Ex ia ATEX
Maximum values for connection to certified intrinsically safe circuits

Limit switches	**Type 4746-12**		**Type 4746-13**
Limit switches	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 inner capacitance	60 nF	50 nF	Negligibly small
L_i - Effective inner 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 80 °C	–45 to 100 °C	–45 to 80 °C
T5	–45 to 70 °C	–45 to 81 °C	–45 to 70 °C
T6	–45 to 60 °C	–45 to 66 °C	–45 to 60 °C

Table 3 · Hysteresis (dead band) in mm

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

* Special version

Ordering text

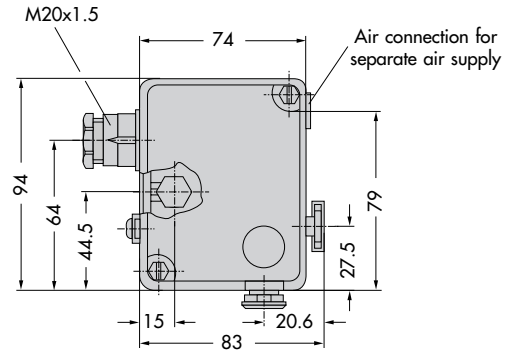
Limit Switch Types 4746 -x2/ -x3/ -04
Operating as make/ break contact
To signalize Valve OPEN-CLOSED
Optionally, special version

Accessories

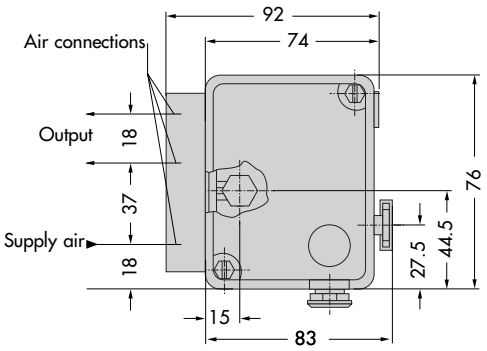
Mounting parts for attachment to
Type 4763/4765 Positioner
Valve with cast yoke with lever I or II
Valve with rod-type yoke with lever I or II
Adapter ½ NPT for electrical connections

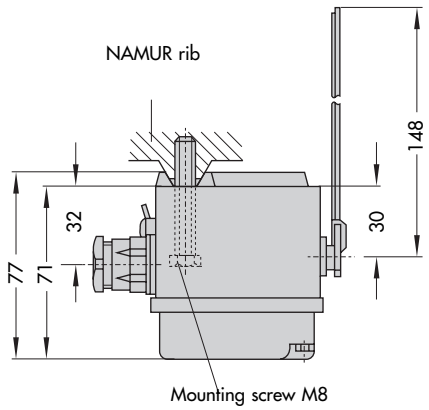
Dimensions in mm

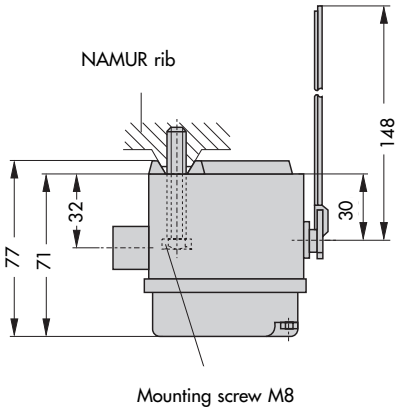
Types 4746-x2, -x3 · Air connection for separate air supply: tapped hole G ⅛



Type 4746-04 · Air connection: tapped hole G ⅛ or ⅛ NPT

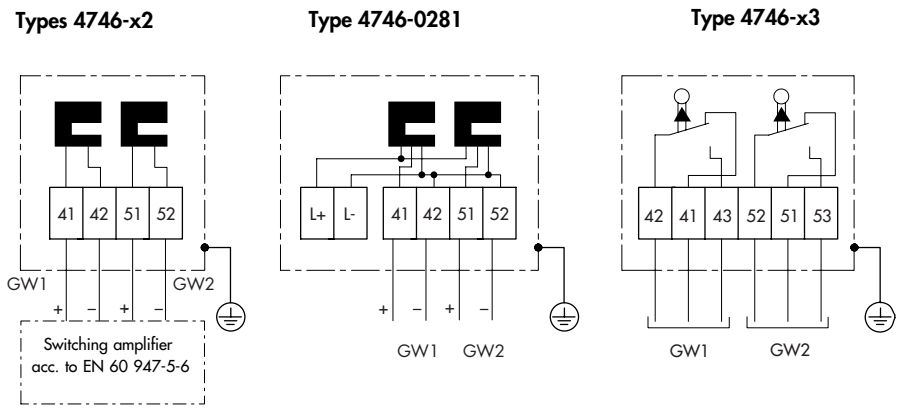






The dimensions required for attachment to Type 4765 Pneumatic Positioners or Type 4763 Electropneumatic Positioners can be found in Mounting and Operating Instructions EB 8365 EN.

Electrical connections



Summary of the approved explosion protection certificates for Type 4746

Certificate type	Certificate number	Date	Comments
EC Type Examination Certificate	PTB 98 ATEX 2114	2001-01-09	⟨Ex⟩ II 2 G EEx ia IIC T6
First Addendum		2003-03-07	Type designations changed
Statement of Conformity	PTB 02 ATEX 2012 X	2002-04-05	⟨Ex⟩ II 3 G EEx nA II T6, Zone 2
Certificate of Conformity	PTB No. Ex-81.C.2170	1981-11-16	EEx ib IIC T6
First Addendum		1986-07-30	US cable entry
Second Addendum		1988-04-29	Connector
Third Addendum		1996-05-20	Type designation changed
CSA Certificate	LR 54227-1	1985-01-31	Class I; Groups A, B, C and D
	LR 54227-5	1988-10-25	Class I; Div. 1; Groups A, B, C, D
	LR 54227-19	1994-05-09	Class II; Group G
FMRC Certificate	J.I. OMO A4. AX	1986-03-12	Class I, II, III; Div. 1; Groups A, B, C, D, E, F, G
	J.I. 5Y2 A3.AX	1995-04-26	Div. 2
	J.I. 1Q2AO.AX	1990-06-06	
SEV Certificate	98.5.50771.07	1998-04-24	EEx ib IIC T6
CZ Certificate	FTZÜ 99 Ex 106X	1999-02-18	Ex II 2 G EEx ia IIC T6
GOST Certificate	2002.C312	2003-01-10	Valid until 2008-01-01, 1 Ex ia IIC T6 X

The test certificates above are contained in the Mounting and Operating Instructions and are available on request.

Ordering code (for model index .07 or higher)

Limit Switch **Type 4746-**	x	x	x	x	2	x	x
Explosion protection							
Without	0						
⟨Ex⟩ II 2 G EEx ia IIC T6 acc. ATEX	1						
CSA/FM	3	2					
⟨Ex⟩ II 3 G EEx nA II T6 acc. ATEX	8						
Type							
Inductive		2					
Electric		3					
Pneumatic	0	4					
Two contacts							
Inductive, SJ 3.5 N		2	0	0		1	0
Inductive, SJ 3.5 SN		2	1	0		1	0
Elec. microswitch		3	2	0		1	0
Elec. microswitch (gold contacts)		3	2	1		1	0
Pneumatic microswitch	0	4	4	0		0	
Induct. SB 3.5-E2, 3-wire switch	0	2	8	1		1	0
Electrical connection							
Without	0	4	4	0		0	
M20 x 1.5						1	
Pneumatic connection							
Without							0
ISO 228/1-G⅛	0	4	4	0		0	1
⅛-27 NPT	0	4	4	0		0	2

Specifications subject to change without notice.

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