

Electronic Limit Switch Type 3738-20

with optional solenoid valve
for on/off rotary actuators



Application

Electronic limit switch for on/off applications to indicate the end position of rotary actuators. Optionally with integrated solenoid valve.



Special features

- Automation of on/off valves
- Limit switch and optional integrated solenoid valve united in a compact housing or with commercially available external solenoid valves (Ex ia, Ex e)
- Proven operation concept already used in Series 373x Positioners: Menu-driven, on-site operation using one rotary pushbutton, display easy to read in any mounting position
- Trouble-free integration into existing systems
NAMUR contacts (IEC 60947-5-6)
Solenoid valve 24 V DC
Intrinsically safe version
- Compact attachment and simple operation
- Any mounting position according to VDI/VDE 3845, level 2
- Contactless, wear-free magnetostrictive sensor system
No mechanical linkage
No adjustment work necessary
Stable measured data and drift-free switching points
High level of accuracy
- Electric power for electronic limit switch supplied over a two-wire system solely from the NAMUR signal
- Automatic initialization
- Easy-to-read LC display with selectable reading direction, LED for solenoid valve status
- Communication connection for convenient parameter settings and documentation
- Certified safety, use in safety instrumented systems according to IEC 61508
- Diagnostic functions
Advanced partial stroke test (PST)
Rotary motion counter
Operating hours counter
Transit time measurement



Fig. 1 · Type 3738 Electronic Limit Switch with open cover



Fig. 2 · Type 3738 mounted on a piston actuator

Versions

Type 3738-20-xxx1400xxx000 Electronic Limit Switch with integrated solenoid valve

The electronic limit switch with integrated solenoid valve form a compact unit together with a suitable rotary actuator, which is easy to mount. The 3/2-way or 5/2-way function of the solenoid valve is selected by changing the position of a molded seal. This version can be mounted directly onto a Pfeiffer BR 31 b Rotary Actuators. The need for additional air connections is eliminated.

Type 3738-20-xxx1000xxxx00 Electronic Limit Switch for external solenoid valve

The electronic limit switch for an external solenoid valve allows switching capacities up to max. 18 W at 24 V DC, meaning all common solenoid valves, even in the Ex e versions, can be combined with the electronic limit switch.

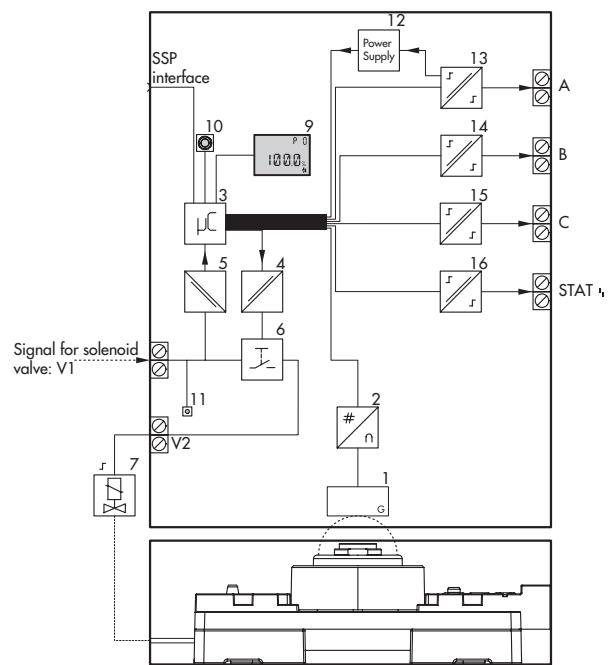
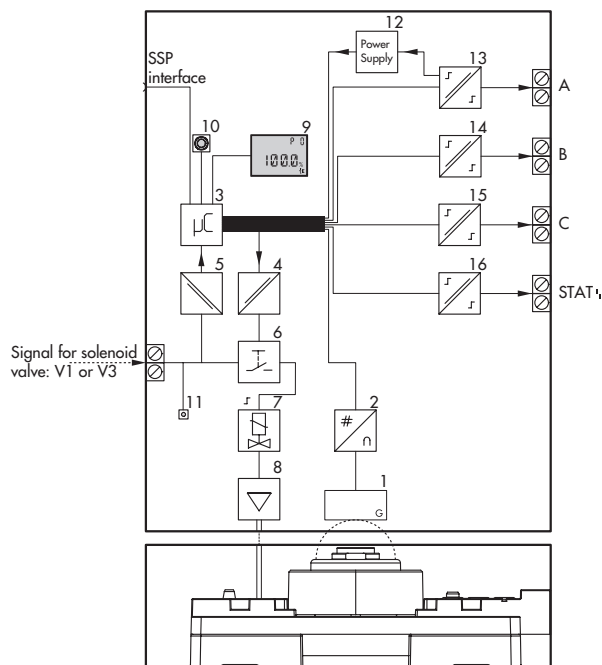
Principle of operation

The electronic limit switch is designed for attachment to rotary actuators. The angle of rotation is measured without contact using a magnet (on a screw) positioned centrally on the actuator shaft. The screw with magnet does not need to be adjusted. The AMR (anisotropic magnetoresistive) sensor located in the device together with the measuring electronics (1) can detect the directional change of the applied magnetic field and, as a result, sense the rotation of the actuator.

The rotary actuator is operated by a solenoid valve (7) which converts the binary signal issued by electric control equipment (6) into a binary pressure signal.

The limit switch for fail-safe position (contact A, 13) and the limit switch for operating position (contact B, 14) issue a limit signal when the valve reaches the corresponding end position. The switching points of the contacts can be adjusted within the actuator's range of rotation. Contact C (15) indicates when the PST target range of the advanced partial stroke test has been reached. The fault alarm contact STAT (16) indicates the generation of any status and error messages.

Schematic diagrams



Legends for Figs. 3 and 4

- | | | | | | |
|------|---------------------------------------|----|---------------------------------------|----|--|
| 1 | AMR sensor with measuring electronics | 7 | Solenoid valve (integrated, external) | 13 | Contact A (limit switch for fail-safe position) |
| 2 | A/D converter | 8 | Air capacity booster | 14 | Contact B (limit switch for operating position) |
| 3 | Microcontroller | 9 | Display | 15 | Contact C (signal when PST target range reached) |
| 4, 5 | Galvanic isolation | 10 | Rotary pushbutton (on-site operation) | 16 | Contact STAT (fault alarm contact) |
| 6 | Actuation of solenoid valve | 11 | LED for solenoid valve | | |
| | | 12 | Internal supply | | |

Fig. 3 · Type 3738-20-xxx1400xxx000
Version with integrated solenoid valve

Fig. 4 · Type 3738-20-xxx1000xxxx00
Version with external solenoid valve

An electronic limit switch version for an external solenoid valve is available for higher air capacities required by large actuators.

Operation

A rotary pushbutton and LC display are used to operate the electronic limit switch on site.

The functions for start-up, display readings and service functions are set over Codes (0 to 28). When a fault occurs, a corresponding error code appears on the display.

SAMSON's TROVIS-VIEW can be used to operate the electronic limit switch. An SSP interface on the electronic limit switch is used to connect it to the computer using an adapter cable.

Mounting

The Type 3730-20 Electronic Limit Switch is mounted according to VDI/VDE 3845, fixing level 2 on rotary actuators using a mounting platform.

Various mounting parts (accessories) are available depending on the shaft height of the rotary actuator.

Pneumatic connections:

Version with **external** solenoid valve:

The input pressure at the external solenoid valve must not exceed the maximum supply pressure (refer to the specifications given by the solenoid valve manufacturer).

Version with **integrated** solenoid valve:

The supply pressure at the inlet must not exceed 6 bar.

All air pipes and hoses must be thoroughly blown through prior to connecting them. The need for external piping is eliminated when certain pneumatic actuators are used. The air is connected over holes in the mounting platform and actuator.

Electrical connections

The electronic limit switch is powered by the connection of the limit switch A. An additional electrical auxiliary power supply is not required.

Cable entry

The threaded connection for the terminal compartment is designed with an M20 x 1.5 thread.

The screw terminals are designed for wire cross-sections of 1.5 mm². Tighten by at least 0.5 Nm.

Use in safety instrumented systems

Safe indication of end positions

All switching contacts of the Type 3738-20 Electronic Limit Switch behave as stipulated in IEC 60947-5-6 and are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) according to IEC 61508.

Emergency venting (in preparation)

When the optional integrated solenoid valve is used, the electronic limit switch discharges its pneumatic output to the atmosphere when the solenoid valve is de-energized. This causes the mounted actuator to be vented.

Table 1 · Technical data

Electronic limit switch	Type	3738-20-xxx1400xxx000	3738-20-xxx1000xxxx00
Version		With internal solenoid valve	For external solenoid valve
Range of rotation	Minimum	0 to 30°	
	Maximum	0 to 170°	
Communication	Local communication	SAMSON SSP interface with serial interface adapter	
	Software requirements	TROVIS-VIEW with database module 3738-20	
Supply air	Supply pressure	2.4 to 6 bar	Same as specifications of the solenoid valve manufacturer
	Air quality	Acc. to ISO 8573-1, edition 2004 Max. particle size and density: Class 4 Oil content: Class 3 Moisture and water: Class 3 Pressure dew point: At least 10 K beneath the lowest ambient temperature to be expected	Same as specifications of the solenoid valve manufacturer
Electric power supply		Powered over limit switch A	
Permissible ambient temperature		-25 to 80 °C	-40 to 80 °C
		The limits specified in the EC Type Examination Certificate additionally apply.	
Influences	Temperature	± 0.7 %/90° angle over the permissible temperature range	
	Vibrations	≤ 0.25 % up to 2500 Hz and 4 g according to IEC 770	
Electromagnetic compatibility		Requirements conforming to EN 61000-6-2, EN 61000-6-3 and NAMUR Recommendation NE 21	
Electrical connections		Four M20 x 1.5 cable glands for 6 to 12 mm clamping range, screw terminals for 0.2 to 2.5 mm ² wire cross-sections	
Explosion protection		See certificates in Table 2	
Degree of protection		IP 66	

Electronic limit switch		Type	3738-20-xxx1400xxx000	3738-20-xxx1000xxxx00
Version			With internal solenoid valve	For external solenoid valve
Safety approval	Safe indication of end positions	–		Type 3738-20-xxx1000xxx200: The limit switches are suitable for use in safety-related applications up to SIL 2 (single device) and SIL 3 (redundant configuration) acc. to IEC 61508
	Safe venting	Being prepared		–
Materials	Housing		Die-cast aluminum EN AC-ALSi12(Fe) (EN AC-44300) acc. to DIN EN 1706, powder paint coated	
	Housing cover		PC	
	Cover seal		PU	
	Indicating wheel		PC	
	Magnet material		Hard ferrite	
Weight			Approx. 1.2 kg	Approx. 1.0 kg
Contacts · Only for connection according to IEC 60947-5-6, reverse polarity protection, galvanic isolation				
Switching contacts	No response/ no fault		≥ 2.1 mA	
	Response/ fault indication		≤ 1.2 mA	
Switching function			NC contact	
Hysteresis			1 %	
Contacts	Contact A Limit switch for fail-safe position (solenoid valve de-energized)		PTO (power to open): Responds when the switching point falls below the value for lower end position (P5) PTC (power to close): Responds when the switching point exceeds the value for upper end position (P6)	
	Contact B Limit switch for operating position (solenoid valve energized)		PTO (power to open): Responds when the switching point exceeds the value for upper end position (P6) PTC (power to close): Responds when the switching point falls below the value for lower end position (P5)	
	Contact B_LB		Signal for wire breakage according to IEC 60947-5-6	
	Contact C Signal when target range reached during advanced partial stroke test		Responds when the switching point exceeds the MIN value of PST target range (P12)	
	Contact STAT Fault alarm contact		Responds when a status message or error message is generated	

Integrated solenoid valve (Type 3738-20-xxx1400xxx000)	
Version	3/2-way or 5/2-way function Function determined by the position of the molded seal
Kvs coefficient	0.32
Service life	1,000,000 switching cycles
Temperature range (operation)	–25 to +80 °C
Switching voltage	
Nominal voltage	24 V DC, reverse polarity protection, galvanic isolation
Current draw	$I = 2.7 \times \frac{U}{3650 \Omega} - 3.325 \text{ mA}$ · Corresponding to 14.4 mA at 24 V DC
Signal 0	No response < 6 V DC
Signal 1	Min. 19.6 V DC Min. 32 V DC
Switching capacity	24 V DC, 15.2 mA (0.36 W)
Duty cycle	100 %
Destruction limit	32 V DC

External solenoid valve (Type 3730-20-xxx1000xxxx00)	
Read manufacturer's specifications!	
Nominal voltage	24 V DC, max. 18 W
Switching voltage	
Signal 0	No response < 6 V DC
Signal 1	Min. 19.6 V DC

Table 2 · Explosion protection certificates

Type of approval	Certificate number	Date	Comments
EC Type Examination Certificate	PTB 08 ATEX 2039 X	2009-03-16	Type 3738-20-110 Ⓢ II 2G Ex ia IIC/IIB T6, Ⓢ II 2D Ex iaD A21 IP 66 T80°C
First Addendum		2009-10-20	Type 3738-20-310 Ⓢ II 2G Ex e [ia] IIC T4, Ⓢ II 2D Ex iD A21 IP 66 T80°C

Electrical connections

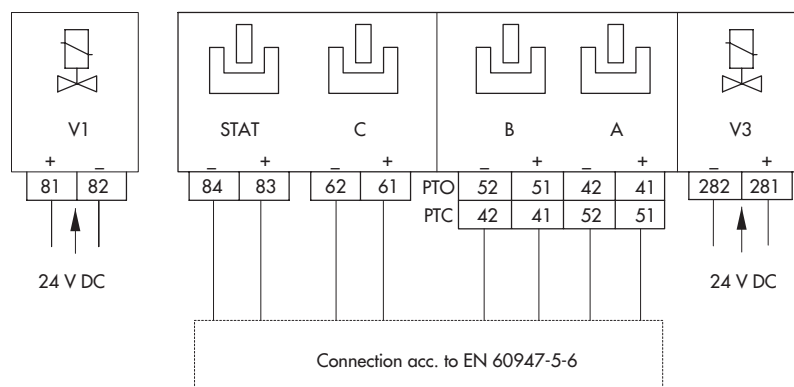


Fig. 5 · Version with internal solenoid valve (Type 3738-20-xxx1400xxx000)

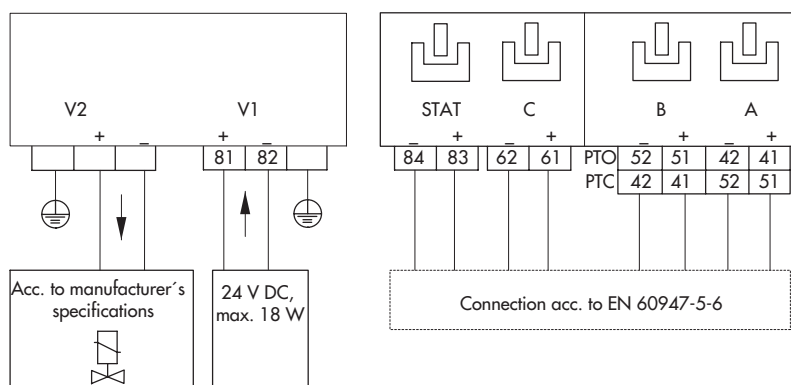


Fig. 6 · Version for external solenoid valve (Type 3738-20-xxx1000xxxx00)

Dimensions

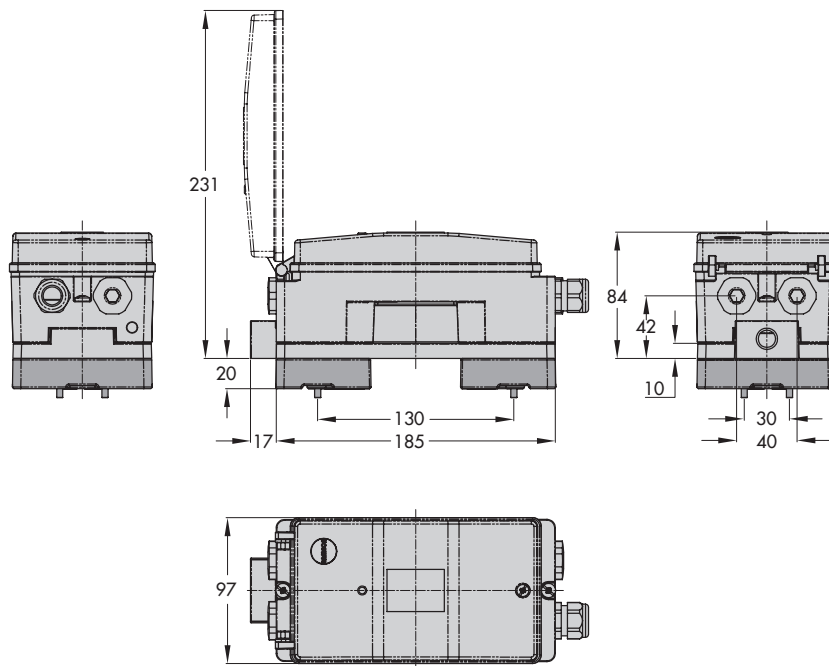


Fig. 7 · Dimensional drawing for Type 3738-20 Electronic Limit Switch

Article code

Electronic Limit Switch	Type 3738-20	x	x	x	1	x	0	0	x	x	x	x	0	x
With LC display														
Explosion protection														
Without		0	0	0										
⊕ II 2G Ex ia IIC/IIB T6, ⊕ II 2D Ex iaD A21 IP 66 T 80 °C, ATEX		1	1	0										
⊕ II 2G Ex e [ia] IIC T4, ⊕ II 2D Ex tD A21 IP 66 T 80 °C		3	1	0	0									
Solenoid valve														
External					0									
Integrated					4						0			
Company version														
SAMSON								0						
AIR TORQUE								1						
Housing														
Standard aluminum, black structured, RAL 9005									1					
Cover														
Gray-beige										0				
Black										1				
Silver-gray										3				
Safety approval														
None											0			
TÜV/IEC 61508 (for safe indication of end positions)						0					2			
Special applications														
None														0

Table 2 · Accessories	Order no.
Attachment to rotary actuators according to VDI/VDE 3845, fixing level 2	
Attachment (20 mm shaft height)	1400-9859
Attachment (30 mm shaft height)	1400-9860
Attachment (50 mm shaft height)	1400-9861
Mounting platform (black) G ¼	1380-1266
Mounting platform (black) ¼ NPT	1380-1268
TROVIS-VIEW Configuration and Operator Interface software	
TROVIS-VIEW with device module 3738-20	
Serial interface adapter (SAMSON SSP interface – RS-232 port of computer)	1400-7700
Isolated USB interface adapter (SAMSON SSP interface – USB port of computer)	1400-9740

Ordering text

Electronic Limit Switch	Type 3738-20
Explosion protection	Without/with
Solenoid valve	Integrated or external
Company version	SAMSON/ AIR TORQUE
Housing cover version	See article code
Safety approval	Without/with
Special applications	
Accessories for mounting	
TROVIS-VIEW	



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