



**EN** Operating instructions. . . . .pages 1 to 8  
Translation of the original operating instructions

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**1. About this document**

**1.1 Function**

This operating instructions manual provides all the information you need for the mounting, set-up and commissioning to ensure the safe operation and disassembly of the safety switchgear. The operating instructions must be available in a legible condition and a complete version in the vicinity of the device.

**1.2 Target group: authorised qualified personnel**

All operations described in this operating instructions manual must be carried out by trained specialist personnel, authorised by the plant operator only.

Please make sure that you have read and understood these operating instructions and that you know all applicable legislations regarding occupational safety and accident prevention prior to installation and putting the component into operation.

The machine builder must carefully select the harmonised standards to be complied with as well as other technical specifications for the selection, mounting and integration of the components.

**1.3 Explanation of the symbols used**



**Information, hint, note:**

This symbol is used for identifying useful additional information.



**Caution:** Failure to comply with this warning notice could lead to failures or malfunctions.

**Warning:** Failure to comply with this warning notice could lead to physical injury and/or damage to the machine.

**1.4 Appropriate use**

The products described in these operating instructions are developed to execute safety-related functions as part of an entire plant or machine. It is the responsibility of the manufacturer of a machine or plant to ensure the correct functionality of the entire machinery or plant.

The safety switchgear must be exclusively used in accordance with the versions listed below or for the applications authorised by the manufacturer. Detailed information regarding the range of applications can be found in the chapter "Product description".

**1.5 General safety instructions**

The user must observe the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.



Further technical information can be found in the Schmersal catalogues or in the online catalogue on the Internet: [www.schmersal.net](http://www.schmersal.net).

The information contained in this operating instructions manual is provided without liability and is subject to technical modifications.



The entire concept of the control system, in which the safety component is integrated, must be validated to EN ISO 13849-2.

There are no residual risks, provided that the safety instructions as well as the instructions regarding mounting, commissioning, operation and maintenance are observed.

### 1.6 Warning about misuse



In case of inadequate or improper use or manipulations of the safety switchgear, personal hazards or damage to machinery or plant components cannot be excluded. The relevant requirements of the standard EN 1088 must be observed.

### 1.7 Exclusion of liability

We shall accept no liability for damages and malfunctions resulting from defective mounting or failure to comply with this operating instructions manual. The manufacturer shall accept no liability for damages resulting from the use of unauthorised spare parts or accessories.

For safety reasons, invasive work on the device as well as arbitrary repairs, conversions and modifications to the device are strictly forbidden; the manufacturer shall accept no liability for damages resulting from such invasive work, arbitrary repairs, conversions and/or modifications to the device.

## 2. Product description

### 2.1 Ordering code

This operating instructions manual applies to the following types:

#### AZM 200D-①-T-1P2P2P②

No.	Option	Description
①	SK	Screw connection
	CC	Cage clamps
	ST1	Connector plug M23, (8+1)-pole
	ST2	Connector plug M12, 8-pole
	ST3	Connector plug M23, 12-pole
②		Power to unlock
	A	Power to lock



Only if the information described in this operating instructions manual are realised correctly, the safety function and therefore the compliance with the Machinery Directive is maintained.

### 2.2 Special versions

For special versions, which are not listed in the order code below 2.1, these specifications apply accordingly, provided that they correspond to the standard version.



Additional information regarding the special versions can be found on the enclosed form.

### 2.3 Destination and use

The AZM 200 with non-contact electronic safety sensors is designed for application in safety circuits and is used for monitoring the position of movable safety guards.



The AZM 200D is a safety switch with additional interlocking function.

The safety function consists of safely switching off the safety outputs when the safety guard is unlocked (PL d / control category 3) or opened (PL e / control category 4) and maintaining the safe switched off condition of the safety outputs for as long as the safety guard is open.



Interlocks with power to lock principle may only be used in special cases after a thorough evaluation of the accident risk, since the safety guard can be opened immediately on failure of the power supply or upon activation of the main switch.

### LED functions

The safety switch signals the operational state as well as errors through three coloured LED's installed at the front side of the device.

<b>green</b>	supply voltage on
<b>red:</b>	error (see flash codes)
<b>yellow</b>	operating condition

### 2.4 Technical data

Standards:	IEC/EN 60947-5-1, EN ISO 13849-1, IEC 61508; IEC 60947-5-3
Material of the enclosure:	glass-fibre reinforced thermoplastic, self-extinguishing
Mechanical life:	≥ 1 million operations
Holding force $F_{max}$ :	2000 N
Latching force:	30 N
Protection class:	IP67 to IEC/EN 60529
Insulation protection class:	II,
Overvoltage category:	III
Degree of pollution:	3
Execution of the electrical connection:	screw terminals or cage clamp connection, M12 or M23 connector
Cable section:	min. 0.25 mm <sup>2</sup> , max. 1.5 mm <sup>2</sup> (including conductor ferrules)
Tightening torque for the cover screws:	0.7 ... 1 Nm (Torx T10)
Cable entry:	M20
Cable length:	max. 200 m (Cable length and cable section alter the voltage drop depending on the output current)

#### Switching distances to IEC 60947-5-3:

assured switching distance $s_{a0}$ :	14 mm
assured switch-off distance $s_{a1}$ :	22 mm
Switching frequency:	1 Hz

#### Ambient conditions:

Ambient temperature:	-25 °C ... +60 °C
Storage and transport temperature:	-25 °C ... +85 °C
Resistance to vibration:	10 ... 55 Hz, amplitude 1 mm
Resistance to shock:	30 g / 11 ms
Switching frequency:	1 Hz
Response time:	< 60 ms
Duration of risk:	< 120 ms
Time to readiness:	< 4000 ms
Max. actuating speed:	≤ 0.2 ms

#### Electrical data:

Rated operating voltage $U_e$ :	24 VDC -15% / +10% (stabilised PELV)
Rated operating current $I_e$ :	1.2 A
Required short-circuit current:	100 A
No-load current $I_0$ :	max. 0.5 A
Rated impulse withstand voltage $U_{imp}$ :	0.8 kV
Rated insulation voltage $U_i$ :	32 VDC
Device insulation:	
- Screw terminals or cage clamps:	≤ 4 A when used to UL 508
- Connector M12:	≤ 2 A
- Connector M12:	≤ 4 A
Operating current $I_{e3}$ :	typically 2 mA at 24 V
<b>Safety outputs Y1 ... Y4:</b>	p-type, short-circuit proof
Rated operating voltage $U_{e1}$ :	0 V ... 4 V under $U_e$
Rated operating current $I_{e1}$ :	Y1, Y2: max. depending 0.25 A Y3, Y4: max. 0.1 A*
Utilisation category:	DC-13
Leakage current $I_r$ :	≤ 0.5 mA
<b>Diagnostic output OUT:</b>	short-circuit proof, p-type
Rated operating voltage $U_{e2}$ :	0 V ... 4 V under $U_e$
Operating current $I_{e2}$ :	max. 0.1 A*
Utilisation category:	DC-13: 24 V / 0.05 A
* Residual current through outputs Y3, Y4, OUT:	$I_{Y3} + I_{Y4} + I_{OUT} \leq 0.1 A$

### Magnet control IN:

Rated operating voltage $U_{e4/Low}$ :	-3 V ... 5 V
Rated operating voltage $U_{e4/High}$ :	15 V ... 30 V
Operating current $I_{e4}$ :	typically 10 mA at 24 V, dynamically 20 mA
Magnet:	100% ED

### 2.5 Safety classification

#### Safety guard monitoring, Y1 and Y2

Standards:	EN ISO 13849-1, IEC 61508, IEC 60947-5-3
PL:	up to e
Control category:	up to 4
PFH value:	$4 \times 10^{-9} / h$
SIL:	up to 3
Service life:	20 years
Classification:	PDF-M

#### Locking monitoring, Y3 and Y4

Standards:	EN ISO 13849-1, IEC 61508, IEC 60947-5-3
PL:	up to d
Control category:	up to 3
PFH value:	$1 \times 10^{-7} / h$
SIL:	up to 2
Service life:	20 years
Classification:	PDF-M

## 3. Mounting

### 3.1 General mounting instructions

For fitting the safety switch and the actuator, two mounting holes for M6 screws with washers (washers included in delivery) are provided. The safety switch must not be used as end stop. Any mounting position. The unused opening must be sealed by means of slot sealing plugs. The unused actuator opening must be sealed by means of the dust-proof flap (included in delivery).

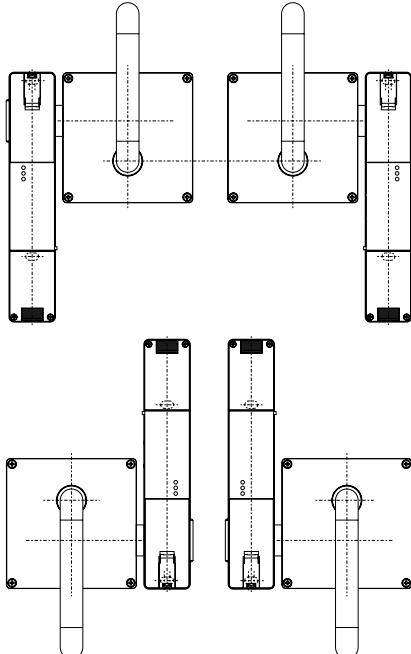


Please observe the remarks of the standards EN ISO 12100, EN 953 and EN 1088.

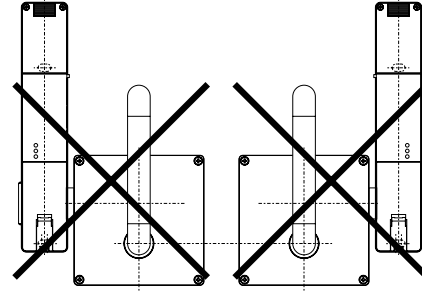


The constructor must provide for the necessary strain relief of the connections.

### Admissible mounting set-up



### Inadmissible mounting set-up

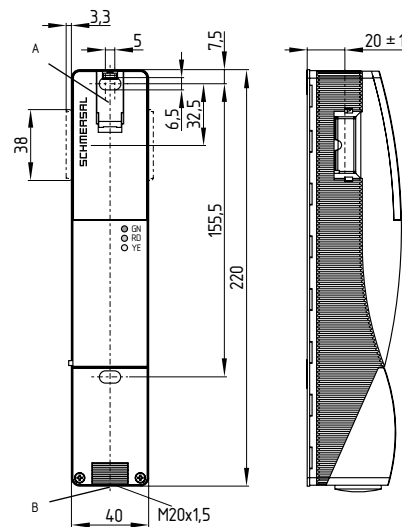


### Mounting of the actuators and the safety switches

Refer to the mounting instructions manual for the corresponding actuator.

### 3.2 Dimensions

All measurements in mm.

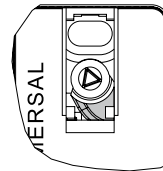


#### Legend

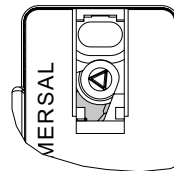
A: Manual release  
B: Cable entry

### Manual release

For the machine set-up, the safety switch can be unlocked in de-energised condition. After opening of the plastic flap "A" (refer to image "Dimensions"), the triangular key must be turned clockwise to bring the blocking bolt in unlocking condition. The normal locking function is only restored after the triangular key has been returned to its original position. Caution: do not turn beyond the latching point! After being put into operation, the manual release must be secured by closing the plastic flap "A" and affixing the seal, which is included in delivery.



Component ready for operation



Component not ready for operation

### 4. Electrical connection

#### 4.1 General information for electrical connection



The electrical connection may only be carried out by authorised personnel in a de-energised condition.

The power supply for the safety switch must provide protection against permanent overvoltage. To that effect, stabilised PELV supply units must be used. The safety outputs can be directly integrated in the safety circuit of the control system. For applications up to PL e / control category 4 to EN ISO 13849-1, the safety outputs of the safety switch or safety switches must be connected to a safety-monitoring module of the same control category (refer to wiring examples). The antivalent switching safety outputs Y3 and Y4 are suitable for requirements up to PL d / control category 3. To that effect, the outputs must be connected to a safety-monitoring module meeting at least the requirements of PL d / control category 3 to EN ISO 13849-1. The outputs cannot be wired in series.

Inductive loads (e.g. contactors, relays, etc.) are to be provided with suitable interference suppression circuitry.

#### Requirements for the connected safety-monitoring module:

- Dual-channel safety input, suitable for 2 or 4 p-type semi-conductor outputs

#### Safety outputs Y1, Y2

The safety-monitoring module must tolerate internal functional with cyclic switch-off of the safety outputs Y1 and Y2 for max. 2 ms (typically < 1 ms). The switch-off stage of the test cycle is temporarily reduced by an active ohmic discharge of the cable. The safety-monitoring module does not need to have a cross-wire short monitoring function, if necessary, the cross-wire short monitoring function must be disabled.

#### Safety outputs Y3 and Y4

The safety outputs Y3 and Y4 are antivalent switching outputs. A short concordance (< 50 ms) must be accepted, as the AZM 200D might present small switching delays.

#### Cable

If the cable input is realised through a metric M20 cable gland, this gland must be dimensioned by the user so as to fit the cable used. A cable gland with strain relief and suitable IP protection class must be used.



The maximum cable length is 200 m (for ST2 M12 connectors approx. 20 m depending on the cable section used for an operating current of 0.5 A). The maximum cable section is 1.5 mm<sup>2</sup>, incl. conductor ferules. Prior to the connection, the cable must be stripped by 40+5 mm and insulated by 5 mm.

### 5. Operating principle and diagnostic functions

#### Magnet control

In the power to unlock version of the AZM 200, the safety switch is unlocked when the IN signal (= 24V) is set. In the power to lock version of the AZM 200, the safety switch is locked when the IN signal (= 24 V) is set.

#### 5.1 Safety switch with diagnostic output

##### Mode of operation of the safety outputs

The unlocking of the safety switch causes the safety outputs Y3 and Y4 to be disabled. As long as the actuator is inserted in the safety switch, the unlocked safety guard can be relocked, in which case the safety outputs will be re-enabled.

#### The safety guard must not be opened.



Enabling path 1 is depicted by the safety outputs Y1/Y2 of the AZM 200D. This path switches when the actuator is detected for applications up to PL e / control category 4.

Enabling path 2 (Y3/Y4) enables (unlocks) both outputs, when the actuator is detected AND the target is detected AND the locked condition is detected.



Information for the selection of suitable safety-monitoring modules can be found in the Schmersal catalogues or in the online catalogue on the Internet: [www.schmersal.net](http://www.schmersal.net).

#### Operating principle of the electronic diagnostic output

The short-circuit proof diagnostic output can be used for central visualisation or control functions, e.g. in a PLC. The diagnostic output is not a safety-related output!

#### Error

Errors, which no longer guarantee the function of the safety switch (internal errors) cause the safety outputs to be disabled. Any error that does not immediately affect the safe functionality of the safety switch (e.g. cross-wire short, ambient temperature too high, interference potential at a safety output) will lead to a delayed shut-down (refer to table 1).

After fault rectification, the sensor can be reset by opening and relocking the relevant guard door. The safety outputs enable and allow a restart. An interlocking chain must be permanently "locked" to enable the reactivation.



If more than one fault is detected at the safety outputs Y1/Y2, the AZM 200 will be electronically locked and a normal fault reset will no longer be possible. To reset this type of interlocking, the AZM 200, must be isolated from the power supply after elimination of the error causes.



The safety outputs Y3 and Y4 are not monitored. This task is assumed by the downstream safety-monitoring module.

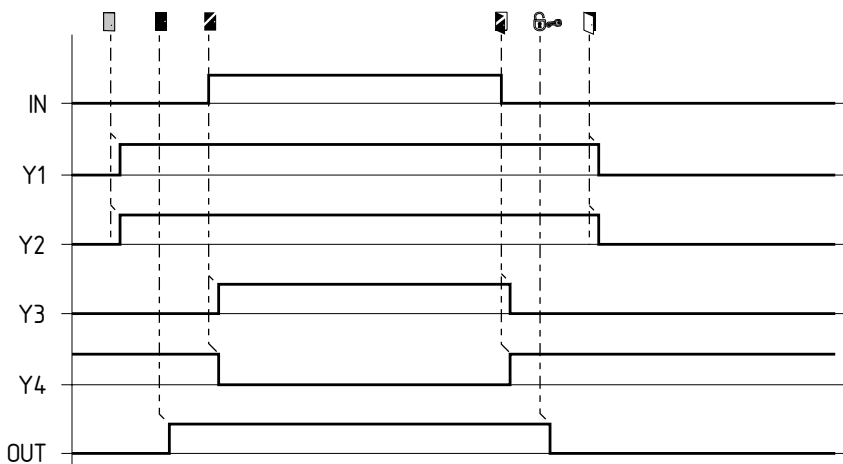
To test the outputs, the AZM 200D must be operated at least once a year (energisation of the IN input). The ambivalence of the outputs Y3 and Y4 must be tested.

#### Error warning

A fault has occurred, which causes the safety outputs to be disabled after 30 minutes. The safety outputs initially remain enabled. In this way, the process can be shutdown in a controlled manner. An error warning is deleted in the slave when the error cause is eliminated.

### Behaviour of the diagnostic outputs

(Example: power to unlock version)



### Legend

	Safety guard open		Safety guard closed
	unlock guard		Safety guard locked
	Door ajar		Actuator not inserted

**Table 1: the diagnostic function of the AZM 200D safety switch**

System condition	Solenoid control IN		LED			Safety outputs				Diagnostic output
	Power to unlock	Power to lock	green	red	yellow	Y1	Y2	Y3	Y4	OUT
Door open	24 V (0 V)	0 V (24 V)	On	Off	Off	0 V	0 V	0 V	24 V	0 V
Door closed, <b>actuator not inserted</b>	24 V	0 V	On	Off	flashes 3 Hz	24 V	24 V	0 V	24 V	0 V
Door closed, actuator inserted, <b>not locked</b>	24 V	0 V	On	Off	flashes	24 V	24 V	0 V	24 V	24 V
Door closed, actuator inserted, <b>interlocking blocked</b>	0 V	24 V	On	Off	flashes	24 V	24 V	0 V	24 V	24 V
Guard closed, actuator inserted and locked	0 V	24 V	On	Off	an	24 V	24 V	24 V	0 V	24 V
<b>Error warning</b> <sup>1)</sup> solenoid interlock locked	0 V	24 V	On	flashes <sup>2)</sup>	On	24 V <sup>1)</sup>	24 V <sup>1)</sup>	24 V	0 V	0 V
Error	0 V (24 V)	24 V (0 V)	On	flashes <sup>2)</sup>	Off	0 V	0 V	24 V	0 V	0 V

<sup>1)</sup> after 30 min: disabling due to fault

<sup>2)</sup> refer to flash code

**Table 2: flash codes red LED**

Flash codes (red)	Designation	Autonomous switch-off after	Error cause
1 flash pulse	Error (warning) at output Y1	30 min	Fault in output test or voltage at output Y1, although the output is disabled.
2 flash pulses	Error (warning) at output Y2	30 min	Fault in output test or voltage at output Y2, although the output is disabled.
3 flash pulses	Error (warning) cross-wire short	30 min	Cross-wire short between the output cables or fault at both outputs
4 flash pulses	Error (warning) temperature too high	30 min	The temperature measurement reveals an internal temperature that is too high
5 flash pulses	Error target	0 min	Wrong or defective actuator
6 flash pulses	Error target combination	0 min	An invalid combination of targets was detected (blocking bolt detection or tamper attempt)
Continuous red signal	internal error	0 min	

### 6. Set-up and maintenance

#### 6.1 Functional testing

The safety function of the safety components must be tested. The following conditions must be previously checked and met:

1. Fitting of the safety switch and the actuator
2. Check the integrity of the cable entry and connections
3. Check the switch enclosure for damage

#### 6.2 Maintenance

A regular visual inspection and functional test, including the following steps, is recommended:

1. Check the fixing of the safety switch and the actuator
2. Remove particles of dust and soiling
3. Check cable entry and connections

**Damaged or defective components must be replaced.**

### 7. Disassembly and disposal

#### 7.1 Disassembly

The safety switchgear must be disassembled in a de-energised condition only.

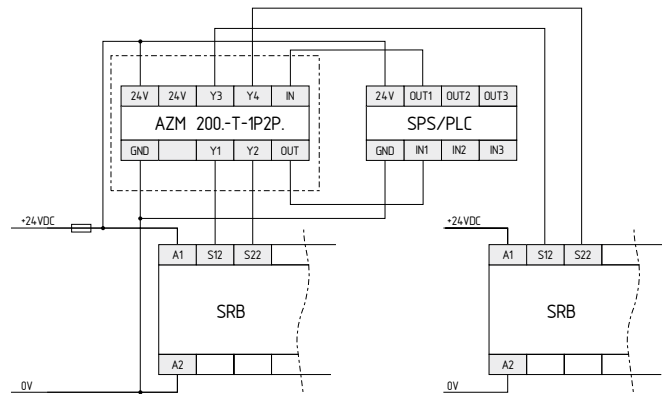
#### 7.2 Disposal

The safety switchgear must be disposed of in an appropriate manner in accordance with the national prescriptions and legislations.

### 8. Appendix

#### 8.1 Wiring example

The application examples shown are suggestions. They however do not release the user from carefully checking whether the switchgear and its set-up are suitable for the individual application.



### 8.2 Wiring configuration and connector accessories

Function safety switchgear		Pin configuration of the connector	Colour code or conductor numbering of the below-mentioned Schmersal connectors		Possible colour code of other commercially available connectors	
					to EN 60947-5-2: 2007	DIN 47100
<b>A1</b>	U <sub>e</sub>	1	BN	1	BN	WH
<b>OUT</b>	Diagnostic output	2	WH	2	WH	BN
<b>A2</b>	GND	3	BU	3	BU	gn
<b>Y1</b>	Safety output 1	4	BK	4	BK	YE
<b>Y3</b>	Safety output 3	5	GY	5	GY	GY
<b>Y4</b>	Safety output 4	6	VT	6	PK	PK
<b>Y2</b>	Safety output 2	7	RD	7	VT	BU
<b>IN</b>	Solenoid control	8	PK	8	OR / shielded	RD
<b>LED</b>	LED+	9		9		
<b>Button</b>	Input/output	10		10		
<b>Button</b>	Input/output	11		11		
<b>NC</b>	-	12		12		

Connector plug ST1 M23, (8+1)-pole



Connector plug ST2 M12, 8-pole



Connector plug ST3 M23, 12-pole



Connecting cables with female connector  
IP67, M23, (8+1)-pole - 8 x 0.75 mm<sup>2</sup>

Cable length	Part number
5.0 m	1209959
10.0 m	1209958

Connecting cables with female connector  
IP67, M12, 8-pole - 8 x 0.23 mm<sup>2</sup>

Cable length	Part number
2.5 m	1209963
5.0 m	1209964
10.0 m	1209960



Connecting cables with female connector  
IP67, M23, 12-pole - 12 x 0.75 mm<sup>2</sup>

Cable length	Part number
5.0 m	1208520

#### Colour code legend

Code	Colour	Code	Colour	Code	Colour	Code	Colour
BK	black	GN	green	PK	pink	WH	white
BN	brown	GY	grey	RD	red	YE	yellow
BU	blue	OR	orange	VT	violet		

8.3 EC Declaration of conformity

	
<b>EC Declaration of conformity</b>	
Translation of the original declaration of conformity valid as of December 29, 2009	K.A. Schmersal GmbH Industrielle Sicherheitssysteme Mödinghofe 30, 42279 Wuppertal Germany Internet: www.schmersal.com
We hereby certify that the hereafter described safety components both in its basic design and construction conform to the applicable European Directives.	
<b>Name of the safety component:</b>	AZM 200
<b>Description of the safety component:</b>	Interlocking device with electromagnetic interlock for safety functions
<b>Harmonised EC-Directives:</b>	2006/42/EC - EC-Machinery Directive 2004/108/EC - EMC-Directive
<b>Person authorized for the compilation of the technical documentation:</b>	Ulrich Loss Mödinghofe 30 42279 Wuppertal
<b>Notified body, which approved the full quality assurance system, referred to in Annex X, 2006/42/EC:</b>	TÜV Rheinland Industrie Service GmbH Alboinstr.56 12103 Berlin ID n°: 0035
<b>Place and date of issue:</b>	Wuppertal, September 9, 2009
AZM 200-B-EN	
	Authorised signature <b>Heinz Schmersal</b> Managing Director



**Note**

The currently valid declaration of conformity can be downloaded from the internet at [www.schmersal.net](http://www.schmersal.net).



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