


## Ex- TBK/ TRK

Capillary temperature control and limiter



Identification	 II 2G Ex de mb IIC T6 (T5 or T4) II 2D Ex tD A21 IP6x T100°C
EC-type examination certificate	<b>ZELM 03 ATEX 0171</b>
Ambient temperature range	<b>-40°C - +60°C</b>
Control range	<b>0 - 50°C</b> <b>0 - 100°C</b> <b>0 - 300°C</b>
Rated current	<b>16 A</b>
Rated voltage	<b>400 V</b>
Type of protection	<b>IP65</b>

### Temperature controller and limiter

The temperature controller or the temperature limiter is provided for the use in industrial plants and is used for temperature measurement of surfaces, air temperatures or in protection tubes for general two-point control. In particular it is provided for heat tracing and protective cabinet heaters within an Ex-area of zone 1 or higher. The pressure-proof encapsulated switching element is mounted into a cabinet of ignition protection type „increased safety“. The cabinet material is polyester. The switching element of the limiter has a manual reset mechanism.

Equipment and protective systems intended for use in hazardous areas according to directive 94/9/EG

Temperature limiter	Ex TBK ... / .. KA
Temperature controller	Ex TRK ... / .. KA
Temperature controller limiter combination	Ex TBK/TRK ... / .. KA

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**Warning**

The installation, configuration and commissioning may only be carried out by appropriately trained personal. On-site installation and safety regulations must be observed.



**Reservation**

Technical alteration without prior notice. Changes, mistakes and misprints are no reason for a claim for damage. For security components and systems the relevant standards and regulations must be observed and the corresponding operating and assembly instructions.



**Installation notes**

For the installation / operation the EN 60079-14/ EN 61241-14 and the applicable regulations for installation as well as the generally recognized regulations of industry and these instructions shall prevail. The devices should not be thrown or fall. If a damage to the device is detected, the device must be sent back for examination.

**Establishment and operation**

The sensor is fixed on the pipe using a tension band or tape. It is important to avoid exerting pressure on the sensor system. It must be ensured, that even during operation no pressure will be exerted on the sensor system.  
Please find further notes on establishment and operation in chapter 4.0.

**Design**

The switching hysteresis depends on the adjustable temperature range end value. 2-point schemes generate heat waves in the heating system with dead times, so that in the controlled state min. and max. temperatures result, whose difference is usually more than three times the amount of the switching hysteresis. Heated items show, according to thermal inertia (mass, material), lower temperature fluctuations.



**Repair**

Dismantling takes place in reverse order as the assembly. A repair of the device is depending on the switching element not possible. All other repairs should only take place in the factory of the manufacturer. The basic units (applications without terminal box) are irreparable with the exception of the capillaries. These may only be changed in the factory. An intervention is not allowed. Changes that alter the design of the unit, lead to the expiration of the certificate and any warranty claim.

Read these instructions before putting the unit into operation. Keep the manual at a place accessible for all users at any time. Please help us to improve this manual. We are grateful for your suggestions.

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## 1.0 DESCRIPTION

### Characteristics

capillaries with VA-conduit
modular design
easy installation
different cabinet sizes
up to 4 devices in one cabinet
simple optical alignment
good legibility of the temperatures
versions for different temperature ranges



Single module TBK or TRK in smallest cabinet size 160x75x75cm

Temperature changes are recorded by the sensor and directly transmitted through the capillaries and membranes to the precision snapaction switch. The switching temperature can, after removing the cabinet cover, be adjusted by a wheel with a temperature range from 0°C continuously. Temperature setting and limiter resetting can also be carried out under tension (terminal block covered). The representation of the contact in the wiring diagram assumes that the sensor temperature is more than 5°K lower than the temperature set on the setpoint tuner. The capillary controller - limiter is suitable for temperatures up to 300°C and 16 A/ 400 V.

The maximum operating voltage is 400 V. The load is switched on single-pole microswitch with potential free contacts, in which the max. switching current is 16 A. The switches are housed with spring terminals for easy wiring in an Ex-cabinet. The sensors consist of liquid-filled flask with 1 to 3 m long capillary tube of stainless steel. The thermostat is delivered with Ex-approved cable glands and blanking plugs, in which this cable management opens up multiple connections, such as: power supply loop to save connection boxes and the possibility of using M25 and M32 glands for direct heater circuit conduct and the alarm output.

## 2.0 TECHNICAL DATA



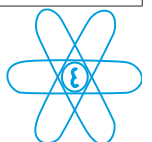
Measuring ranges	0-50°C, 0-100°C und 0-300°C
Capillary lengths	1 m, 3 m, 5 m
Contact	
Switching capacity	max. 4000 VA
AC voltage	min. 10 V, 0,1 A
Nominal current	16 A ~
Nominal voltage	400 V ~
Type of protection	IP65
Dimensions (W x H x D):	
Polyester	160 x 75 x 75 mm
Mounting dimensions	148 x 45 mm
Ambient temperature	- 40°C - +60°C**
**Continuous service temperature cable	≤ 90°C
Cable gland	M 25 Ms-ni (-40°C - 100°C) terminal box 160x75 M 32 plastic (-40°C - 70°C) terminal box 160x160; 160x260; 160x360 PG 9 metall (-40°C - 100°C) module
Extensions lead	M25 Ms-ni round cable diameter 11,5 mm - 15,5 mm M32 plastic round cable diameter 12 mm - 21 mm PG 9 metal included in scope of delivery (module)
EC - type examination certificate	ZELM 03 ATEX 0171 (single- and combination device)
Type of ignition protection (gas)	II2G Ex de mb IIC T6 or T5 or T4
Type of ignition protection (dust)	II2D Ex tD A21 IP6x T100°C
Identification	 0344  II2G Ex de mb IIC T6 or T5 or T4 II2D Ex tD A21 IP6x T100°C

Table 1

Setting ranges	0..50°C	0..100°C	0..300°C
Cut-off accuracy*	+ 1 K	+ 1,5 K	+ 4,5 K
Switching difference	+ 1,5 K	+ 3 K	+ 9 K
max. sensor temperature	70°C	120°C	320°C
Sensor dimensions	6x250 mm	6x135 mm	4x175 mm
Capillaries (V4A)	1 / 3 / 5 m	1 / 3 / 5 m	1 / 3 / 5 m

\*Condition at delivery. Depending on the ambient temperature this value can double.

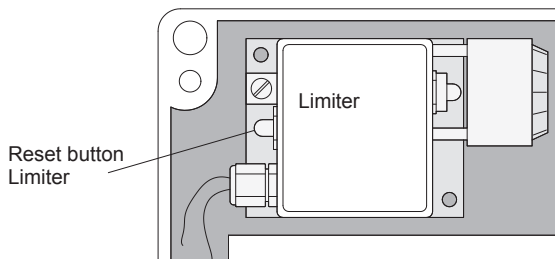


### 3.0 LIMITER RESET

The safety temperature limiters are equipped with a lock-out. An automatic resetting is not possible.

Each safety temperature limiter needs to be reset over manual reset button after correcting the failure.

The release of the reset button is only possible after the fall below of the nominal available.



### 3.1 LIMITER ACTION

After opening the cover, the desired temperatures can be adjusted at the thermostates.

They operate on the principle of liquid expansion. If the temperature changes in the fluid-filled sensor systems (consisting of probe, capillary and membranes) the volume changes. The thereby resulting movement of the membranes actuates the micro switch via lever.

When the set temperature is exceeded, the temperature controller switches from clamp 5 to clamp 6 and the temperature limiter switches from clamp 2 to clamp 3.

The safety thermostat can be turned on again by pressing the limiter release after the temperature drops.

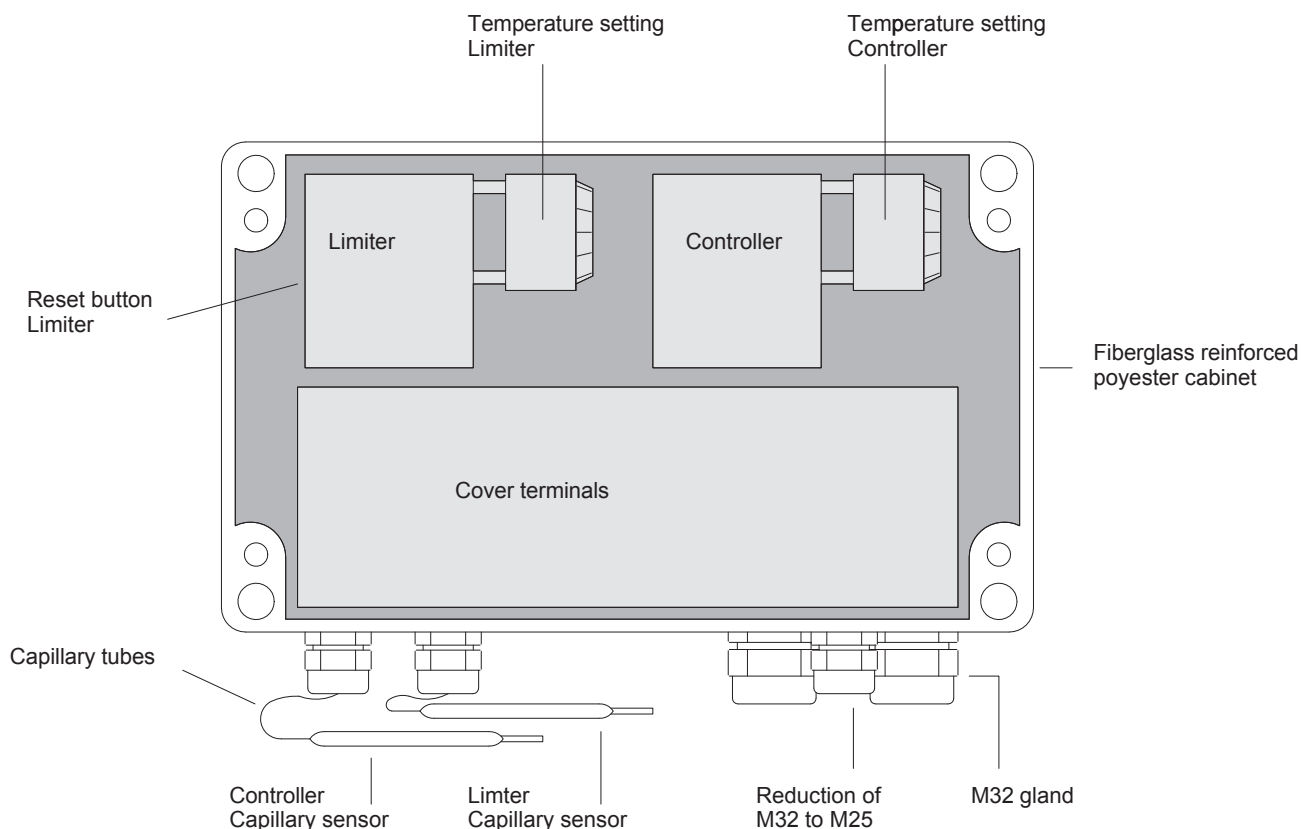
After setting the desired temperature, the cabinet cover, gasket included (undamaged), must be mounted again, as this is the only way to guarantee protection IP 65 and the explosion protection

### 4.0 NOTES ON INSTALLATION AND OPERATION

The capillaries may not be squashed or kinked. This applies to storage and transport. The minimum bending radius of 15 mm must be observed. The sensor itself may not be deformed in any way. The smallest deformation means maladjustment and thus a deviation from the set point of the temperature set on the inner adjuster. The measured temperature corresponds to the mean temperature of the capillary. The temperature of the capillaries and the switching elements have very little influence on the switching behaviour. According to DIN the sensors may be heated max. 20% over the measuring range, without any misalignment of the switching point. All designs must be tested before use and after

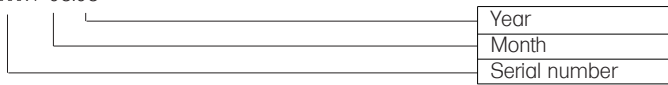
installation at temperatures above 0°C for their ability to function. The contact of the switching element is a power contact. Too small switching power less than 10 mA, 12 V) can lead to high contact transitions and thus to functional incapacity. This error can be corrected by switching a lamp of 50 watts 230 volts. After that the unit can be used for small electrical ratings higher than 10 mA and 12 V again. The interconnection of individual approved components to one heating corresponds to a new unit, in which the temperature behavior must as a rule be re-evaluated at proper installation.

### 5.0 DEVICE STRUCTURE



## 6.0 SERIAL NUMBER

xxxx / 03.03



## 6.1 ORDERING INDICATIONS

The order of the abbreviations is the order in which the base units are installed. A letter is always followed by the corresponding numbers. The first module determines the type designation. R or B for the first module are thus already in place.



1	B	Limiters
	R	Controller
2	Temperature setting range	
	5	0 to +50°C
	1	0 to 100°C
	3	0 to 300°C
3	Capillary length	
	1	1 m
	3	3 m
5	5 m	
4	Combination device (e.g., TBK/TRK see chapter: 7.0)	
5*	-	Standard cabinet 75 with 1 x M25 VA
	M	M32 gland
	R	M32 reduction on M25
	B	Blanking plug
6	-	Screw terminals (standard)
	Z	Cage clamp

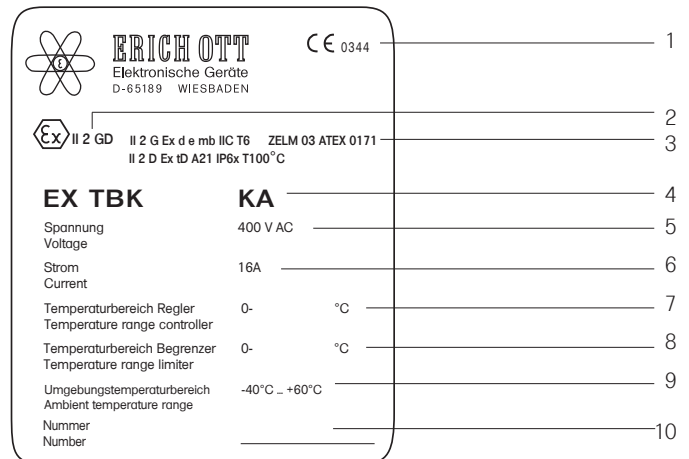
\* The number of glands depends on the dimensions of the cabinet (see table 2, chapter 7.0). M25 and M32 can then be freely combined. The only exception is the smallest cabinet (160 x 75 x 75), which is delivered with only one M25 gland.

### Example:

Limiters - Controller - Combination.  
 Module 1: Limiter with a temperature setting range of 0 - 50 °C and a capillary length of 1m;  
 Module 2: Controller with a temperature setting range of 0 - 100 °C and a capillary length of 1 m;  
 Module 3: Controller with a temperature setting range of 0 - 300 °C and a capillary length of 3 m;  
 The glands are M32, reduction of M25 and M32



## 6.2 NAMEPLATE



1- Supervising agency	6- Rated current
2- Ex- Labelling	7- Setting range controller
3- Testing office/EC-type examination certificate	8- Setting range limiter
4- Type designation	9- admissible ambient temperature
5- Rated voltage	10- Serial device number

## 7.0 COMBINATION DEVICES

Different users need at an object several independent temperature limiters, controller or monitors. For this we offer to incorporate combinations of base units in one junction box, or one base unit in a larger terminal box. At the same time it is then necessary to deliver the base unit as spare part. There are 3 terminal boxes for 1 to 4 base units, equipped with terminals 2,5 (4) mm² and glands M32, M25.

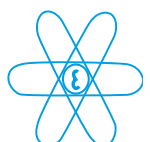
Table 2:

Number of modules	1	1	2	3	4
Type designation	T...K/ KA	T...K/ KA	T...K/.../ KA	T...K/.../.../ KA	T...K/.../.../.../ KA
Cabinet size	160x75x 75	160x160x 90	260x160x 90	360x160x 90	360x160x 90
Mounting dimensions	148x45	140x110	240x110	340x110	340x110
Number of glands	M25	2xM32	3xM32	4xM32	4xM32

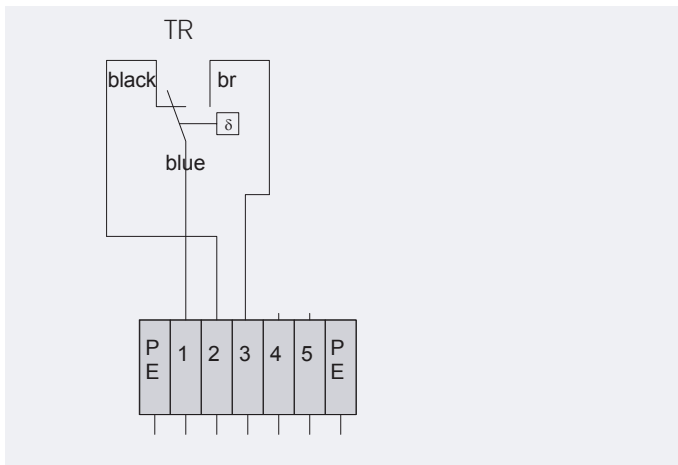


160x160x90

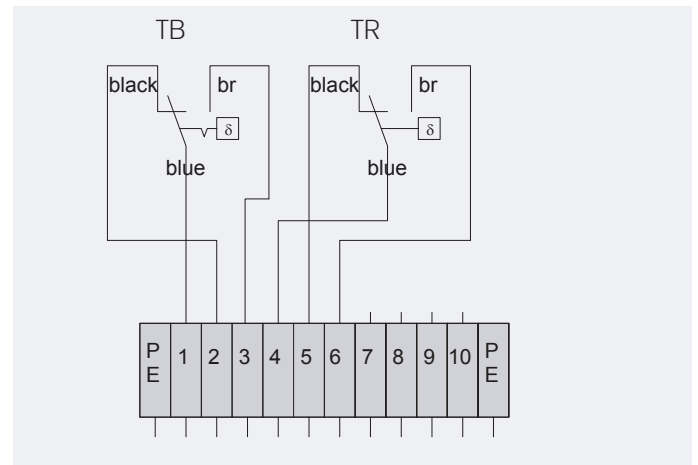
160x260x90



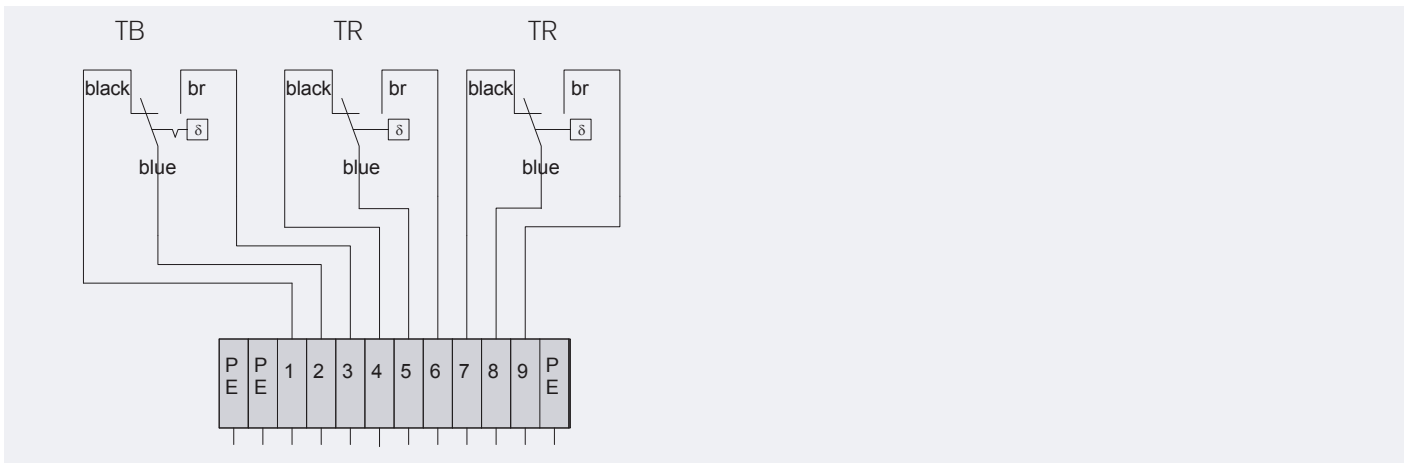
7.1 CONNECTION EXAMPLES



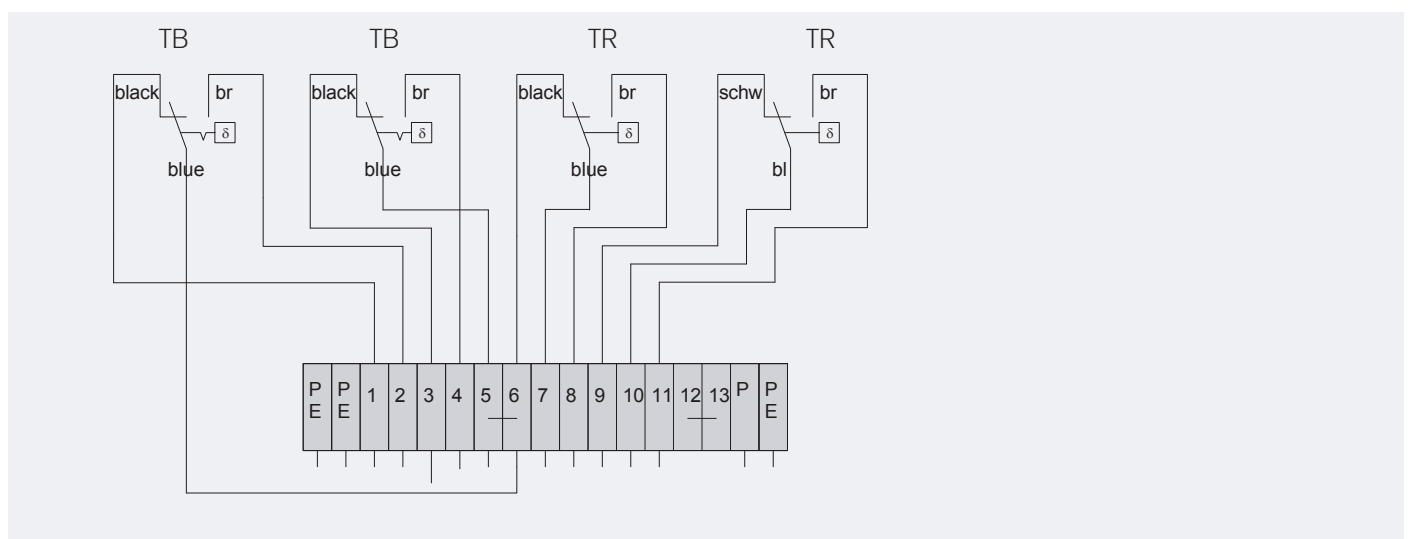
Single device TRK



Combination Device TBK/ TRK



Combination device TBK/ TRK/ TRK



Combination device TBK/ TBK/ TRK/ TRK

Seal unused cable glands with closure pot (Scope of delivery)!  
The switches are in switching position „on“.

## 8.0 INSTALLATION

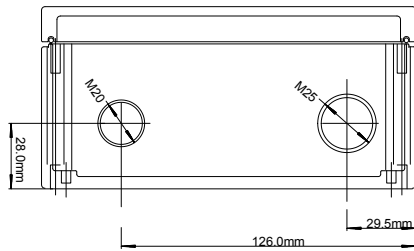
To mount the device on a mounting plate, four holes are provided on the cabinet of the temperature controller or limiter to attach the device to the mounting plate using two M4 (M5) screws DIN 84. Spacing for Fixing see drawing. The cord must be laid safely according to the guidelines of line installation. The seal inserts for the cable entry must be chosen according to the pipe diameter.

for the attachment no metal bands may be used, as these could deform

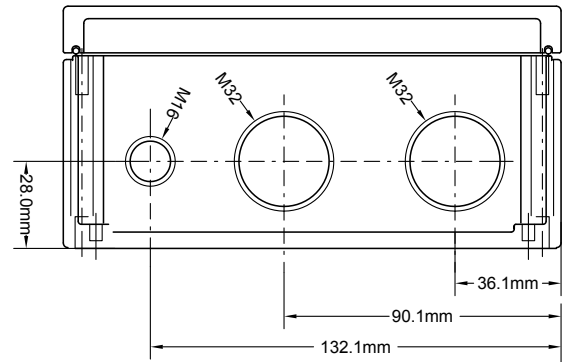
the sensor during tightening. For this reason the use of fiberglass tape is recommended.

The capillary tube should possibly be laid protected, the minimum bending radius of 15 mm is required in any case. Cutting or bending leads to permanent failure of the device. A repeated bending of the capillary tube must be omitted, as this can lead to hair-tearing.

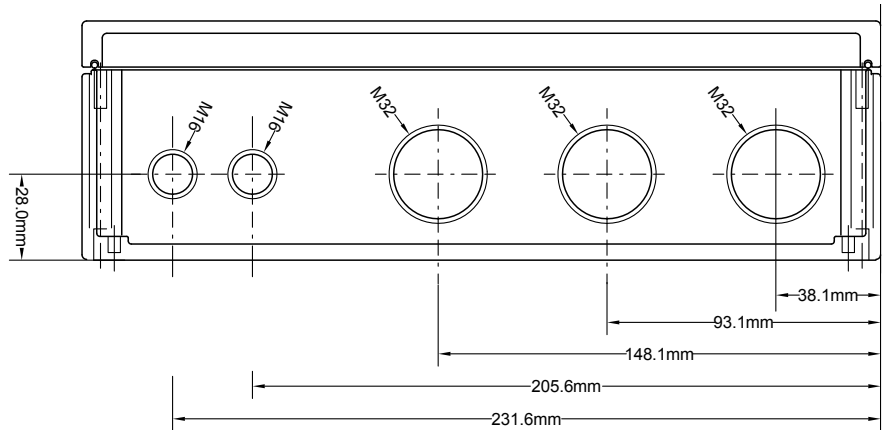
79 x160



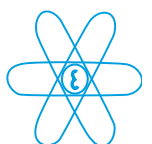
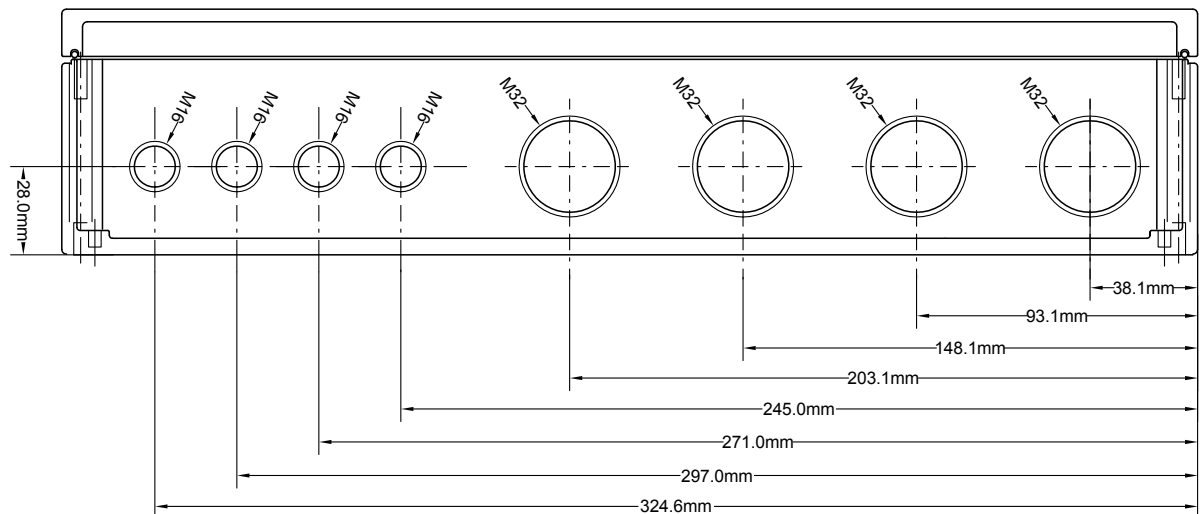
160 x160



260 x 160



360 x 160



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