Control system
for process parameters
of air-cooled gas units
(ACU)

TiNK
Research and
production
enterprise

Control system for process parameters of air-cooled gas units (ACU)

The system is designed for continuous monitoring of vibration and temperature parameters of air cooled units (ACU) of gas

Description

Control system for process parameters of air-cooled gas units (ACU) consists of a TIK-PLC 991 controller and DVA144.XXX vibration sensors connected to each other via RS-485 interface (Modbus RTU protocol). One TIK-PLC 991 controller supports connection of up to 7 sensors (without additional power supply) via the RS-485 digital interface.

The controller compares signal values received from sensors with set points, exchanges information with the superior system via RS-485 interface and switches relay contacts when parameters exceed threshold values (EP). The controller has a discrete input, which can be used to change the operation mode or to acknowledge relay signals.

If it's necessary to control the temperature of fans, it's possible to connect thermal resistance sensors to the digital input of the controller with a Tair-1 converter manufactured by NPK VIP (or an analogue).

The vibration sensors are mounted on the bearing unit of the electric motor. The sensor cable is available as an unplugged cable or as a sealed connector with IP68 moisture and dust protection. There are terminal boxes on the racks of the ACU's to connect the sensor cables into one trunk cable. One terminal box allows the connection of up to 6 sensors. The system controller is located in the control cabinet.

System features:
- automatic measurement and monitoring of vibration/temperature of the air-cooled gas units (ACU);
- output of signals to the APCS to implement the functions of process protections and interlocks when the system is part of the APCS or to the executive relays during autonomous operation of the system;
- self-monitoring, which provides testing of the system's functionality without disassembly.

Specifications

Interface

Type . . . . RS-485 digital (Modbus RTU Master / Slave)
Data transfer rate, Mbit/s . . . . up to 3
No. of intrinsically safe channels for connecting sensors 1
No. of channels to receive information from the controller 1
No. of measuring intrinsically safe channels connected to one controller (without additional power supply):
- RS 485 Modbus RTU (Master) 7

No. of input non-intrinsically safe channels:
- discrete input (+24V) 1

No. of output channels per controller:
- 4-20 mA 1
- relay output 2
- RS-485 Modbus RTU (Slave) 1

Power supply of the TIK-PLC 991 controller, V . . . . +24±2

Metrological parameters

Dynamic range of acceleration, not more, m/s² 400
Operating frequency range, Hz 2/3/5/10-1000
Vibration velocity RMS measurement range, mm/s 0-100

Performance

Operating temperature range, °C :
- DVA144.XXX vibration sensor . . . . -40 (60) ...+80
- TIK-PLC 991 controller . . . . -40 ...+60

Reliability and manufacturer's warranties

MTBF, hours, not less than
- DVA144.XXX vibration sensor 40 000
- TIK-PLC 991 controller 20 000
Service life, years, not less than 10
Warranty service life, months 18
Interval of verification, years 2

Sensor and controller design options

DVA144.104 vibration sensor

Triangular housing, 3 screw mounting, single cable connection

B A
+U
GND
DO*
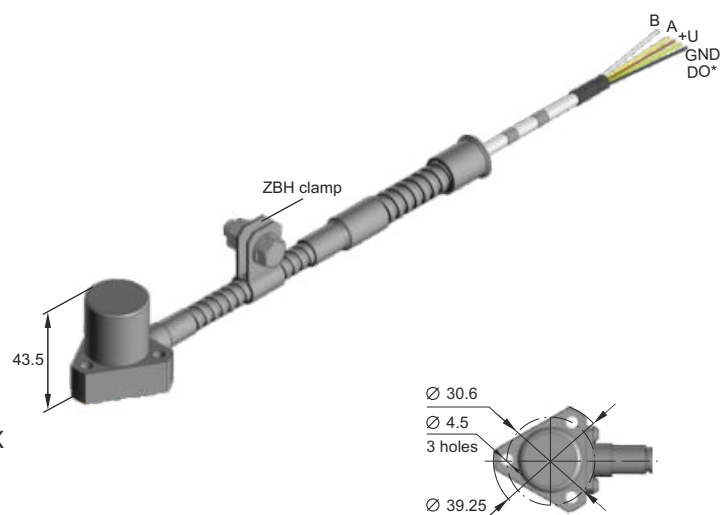
ZBH clamp

Specifications

Overall dimensions ⌀ 39.25x43.5 mm
Weight 100 g
Protection class IP65/IP68
Explosion protection 0Ex ia IIC T6...T2 Ga X / PO Ex ia I Ma X
2Ex nA IIC T6...T2 Gc X
Mount M4x21 (M4x28) screw 3 pcs.

43.5

⌀ 30.6
⌀ 4.5
3 holes

⌀ 39.25

DVA144.164 vibration sensor

Triangular housing, 3 screw mounting, TIK-KXX connector
on the cable

ZBH clamp

36

B A
+U
GND
DO*

Specifications

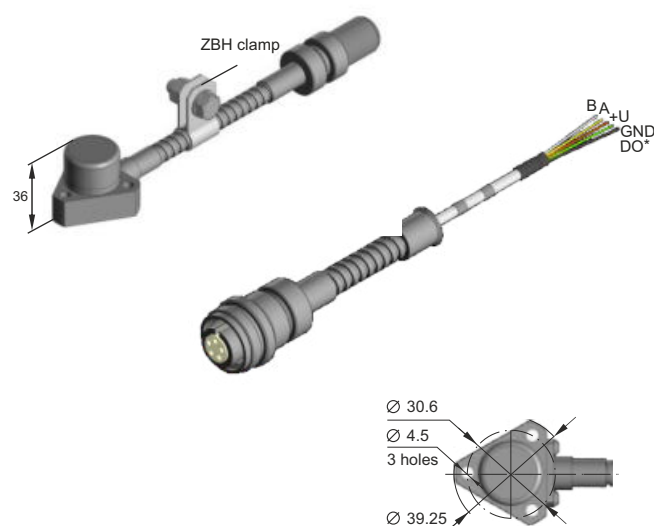**Overall dimensions** ⌀ 39.25x36 mm
Weight 100 g
Protection class IP65/IP68
Explosion protection 0Ex ia IIC T6...T2 Ga X / PO Ex ia I Ma X
2Ex nA IIC T6...T2 Gc X
Mount M4x21 (M4x28) screw 3 pcs.

⌀ 30.6
⌀ 4.5
3 holes

⌀ 39.25

*For version with discrete output

TIK-PLC.991.11 controller
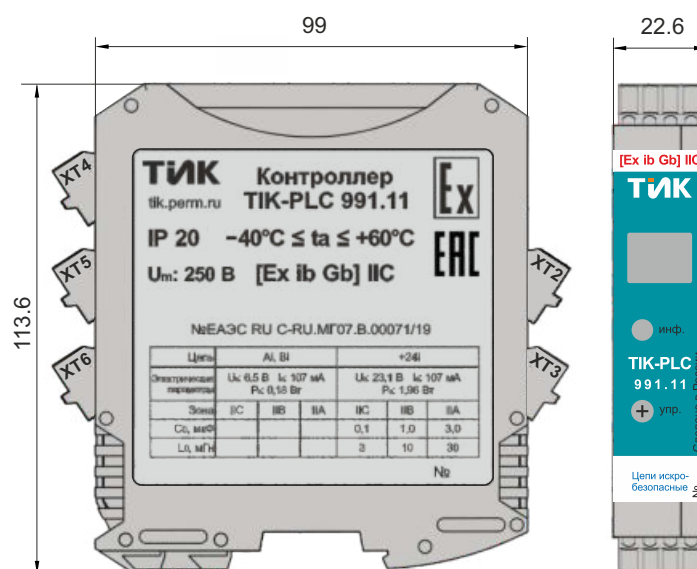
Specifications

Overall dimensions 99x113.6x22.6 mm
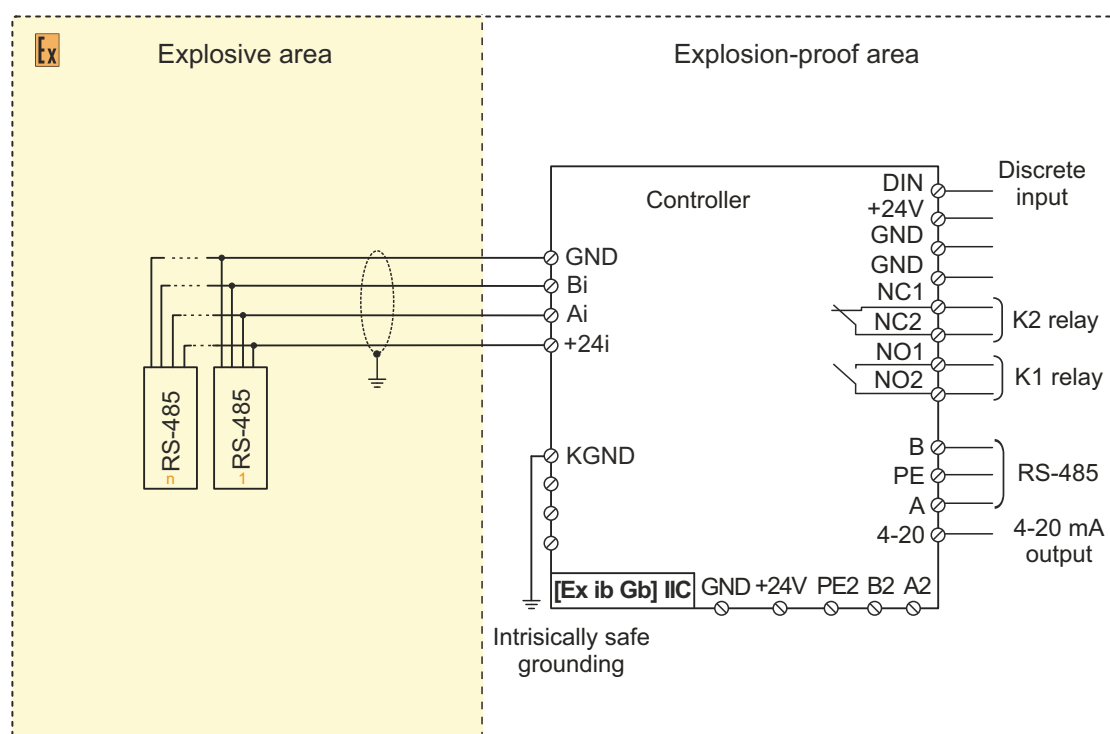**Weight** 200 g
Protection class Ip20
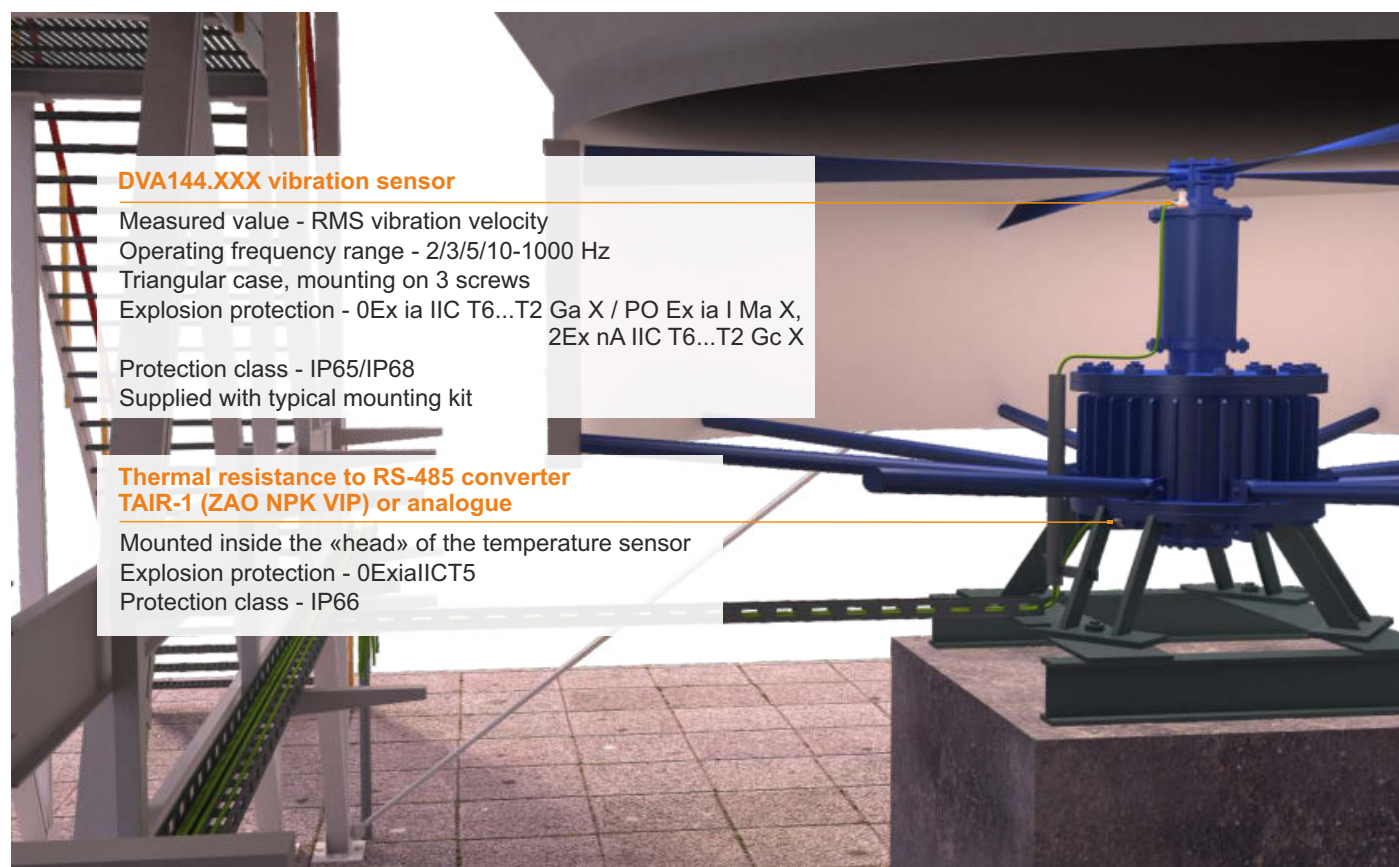**Explosion protection** [Ex ib Gb] IIC
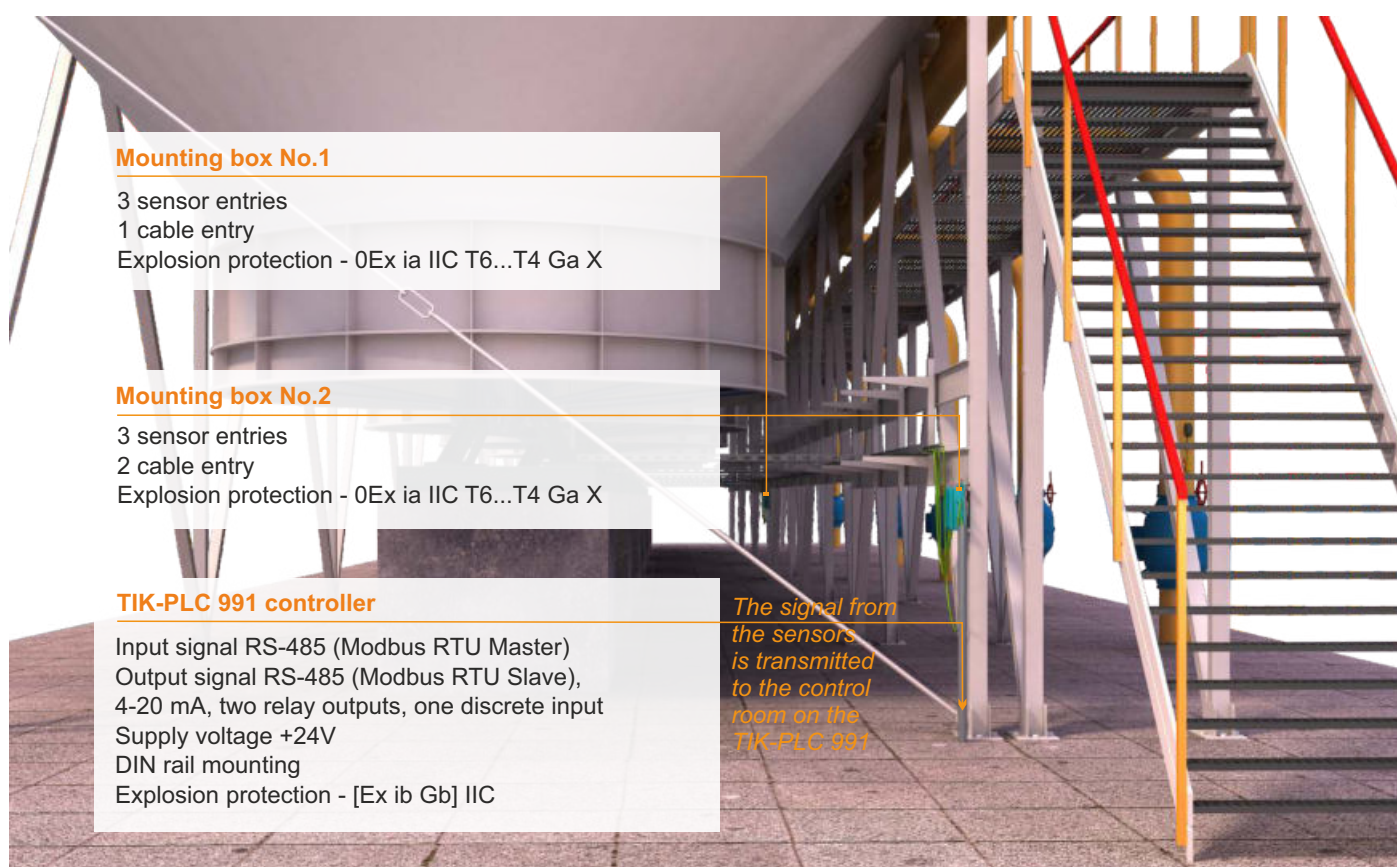**Mount** on DIN rail
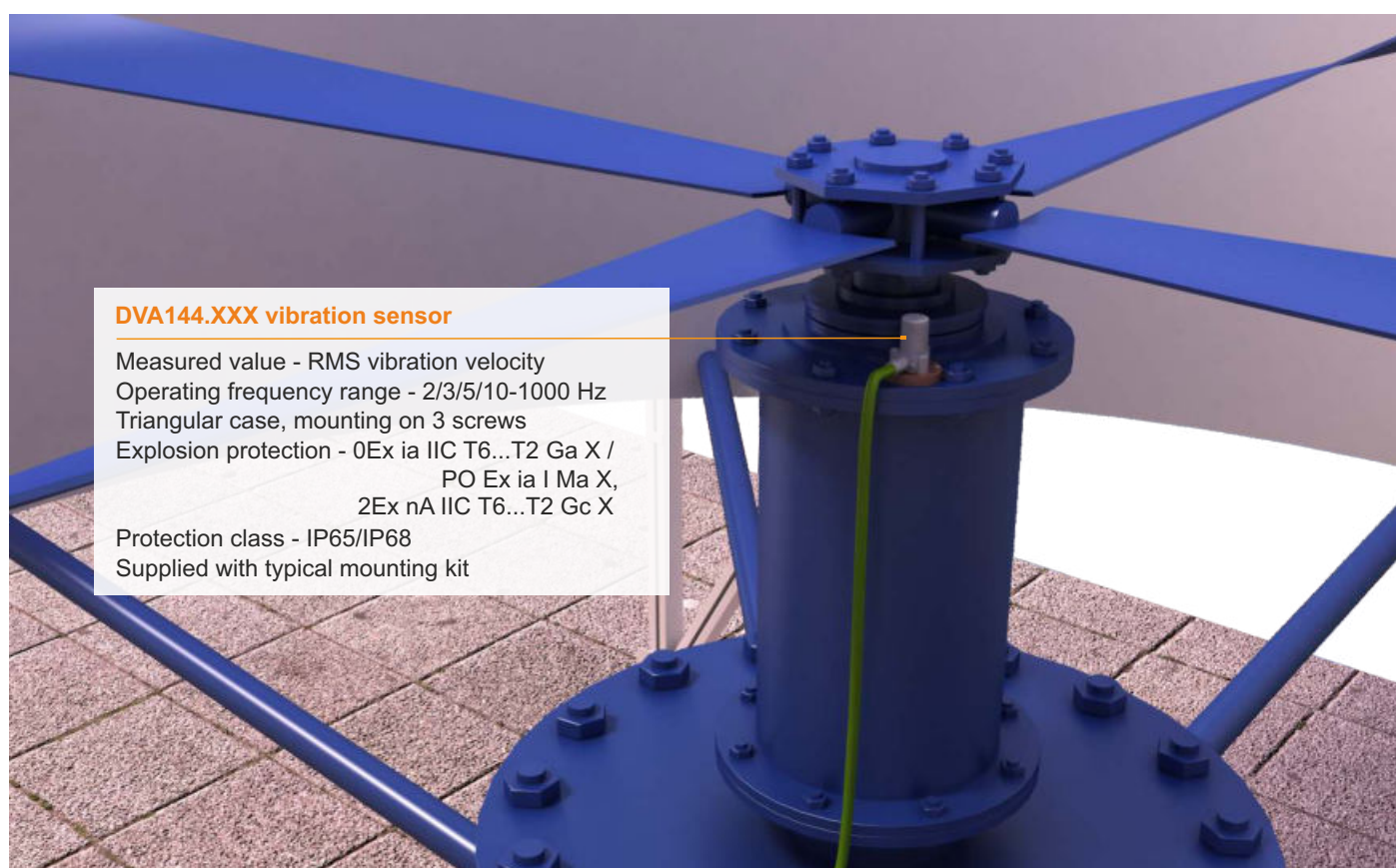

TIK-PLC.991.11 wiring diagram

The maximum number n is limited in accordance with the manual

TïK Research and
production
enterprise

Typical scheme of vibration control of ACU No. 1 (3 vibration channels + 3 temp. channels)

DVA144.XXX vibration sensor

Measured value - RMS vibration velocity
Operating frequency range - 2/3/5/10-1000 Hz
Triangular case, mounting on 3 screws
Explosion protection - 0Ex ia IIC T6...T2 Ga X / PO Ex ia I Ma X,
2Ex nA IIC T6...T2 Gc X

Protection class - IP65/IP68
Supplied with typical mounting kit

**Thermal resistance to RS-485 converter
TAIR-1 (ZAO NPK VIP) or analogue**

Mounted inside the «head» of the temperature sensor
Explosion protection - 0ExiaIICT5
Protection class - IP66

Mounting box

6 sensor entries
1 cable entry
Explosion protection - 0Ex ia IIC T6...T4 Ga X

TIK-PLC 991 controller
Input signal RS-485 (Modbus RTU Master)
Output signal RS-485 (Modbus RTU Slave),
4-20 mA, two relay outputs, one discrete input
Supply voltage +24V
DIN rail mounting
Explosion protection - [Ex ib Gb] IIC

*The signal from the sensors is transmitted
to the control room on the TIK-PLC 991*

Typical scheme of vibration control of ACU No. 2 (6 vibration channels)

DVA144.XXX vibration sensor

Measured value - RMS vibration velocity
Operating frequency range - 2/3/5/10-1000 Hz
Triangular case, mounting on 3 screws
Explosion protection - 0Ex ia IIC T6...T2 Ga X /
PO Ex ia I Ma X,
2Ex nA IIC T6...T2 Gc X
Protection class - IP65/IP68
Supplied with typical mounting kit

Mounting box No.1

3 sensor entries
1 cable entry
Explosion protection - 0Ex ia IIC T6...T4 Ga X

Mounting box No.2

3 sensor entries
2 cable entry
Explosion protection - 0Ex ia IIC T6...T4 Ga X

TIK-PLC 991 controller

Input signal RS-485 (Modbus RTU Master)
Output signal RS-485 (Modbus RTU Slave),
4-20 mA, two relay outputs, one discrete input
Supply voltage +24V
DIN rail mounting
Explosion protection - [Ex ib Gb] IIC

The signal from the sensors is transmitted to the control room on the TIK-PLC 991

Facility photos

Symbols

compressor stations	
compressor stations with GCU	
gas pipeline	
gas compressor plant	
underground gas storages	
gas transmission centers	
borders of gas transport companies	
branch name	
pipeline diameter	
metering stations	
compressor stations equipped with PIK-VT systems	

Норильск
Дудинка
Ямбург
Новокузнецк
Томск
Кемерово
Новосибирск
Ноябрьск
Сургут
Тобольск
Омск
Югорск
Уренгой
Казахстан
Москово
Полянская
Вологда
Калуга
Мозырь
Таллинн
Выборг
Астрахань
Волгоград
Атырау
Баку
Грузия
Азербайджан
Ереван
Сухуми
Симферополь

Approval documents

Certificate of conformity for TIK-PLC controllers №POCC RU.HE06.H10461
Certification body "Exspert-C" Ltd.
Test report №0302D of 08/02/23, issued by the testing laboratory "Test-Grupp"

Valid till 08/01/2026

Certificate of conformity for TIK-PLC controllers №POCC RU.HE06.H06212
Certification body "Expert-S" Ltd. Test report №0104D of 05/04/23, issued by the testing laboratory "Test Group".

Valid till 05/03/2026

Declaration of conformity of TP TC 020/2011 "Electromagnetic compatibility of technical devices" for TIK-PLC controllers,
Registration number of EEU N RU D-RU.HB27.B.13862/20
Test report №35597R dd. 08/04/20, issued by the testing laboratory
"Express-Test" LLC Rusfline Investments.

Valid till 08/03/2025

Certificate of conformity with TP TC 012/2011 "About safety of equipment for operation in explosive environments" for TIK-PLC equipment, EAEC registration number RU C-RU.МГ07.B.00358/23,
Series RU №0390283
Test Report №13И-23 of 09/14/23

Valid till 10/18/2028

Certificate of Type Approval of Measuring Instruments No.69044-17
for the DVA vibration transducers

Valid until 10/25/2027

15112023