

The comparison of digital temperature sensors Pt of industrial purpose. Conclusions.

Before a sale of the land plot the master have announced, that he has a good neighbor. Plutarch

Model, Accuracy class, Manufacturer	ТПУ 0304/М3- MB class A Elemer, Russia	MBT 5250 class B+ Danfoss	MBT 5560 class B+ Danfoss	ТСПТ-101, class A Tesey, Russia	Ferrum TS, TSG, TSK, class A, Russia, IRON Sunrise Corp.
Purpose, measuring substance	liquid, gas, solid, loose	liquid, gas	liquid, gas, solid	liquid, gas, solid, loose	liquid, gas, solid, loose
Temperature measurement range, °C	-60...+200	-50...+200	-50...+200	-50...+120	-100...+200
Temperature whether range, °C	-60...+70	-40...+65	-40...+65	-55...+60/85	-100...+60/85
Intrinsic safety degree	1ExdIICT6	no	no	0ExialIICT4/T6	0Ex ia IICT6.. T5 Ga
Dust and water protection	IP65	IP65	IP67	IP66	IP68/IP66
Main normalized measurement error limit, %	±(0,15.. 0,28) increases up to 3 times in sensors < 160 mm	±(0,22.. 0,28)	±0,5 typical	±0,28	±0,22 in working conditions
Additional error, %	±0,75	no information	±0,5	no information	inside of Main error
Influence of whether temperature, %	±0,6	no information	indirect, see additional error	±0,23 (0,5°C/ 100°C)	TS-±0,03, TSG-±0,01 inside Main error
Maximal velocity of measured substance, water/air, m/s	30/30	3/25	25/25	23/25	30/100
Vibro protection	1g up to 100 Hz	4g up to 100 Hz	4g to 2 kHz	5g to 150 Hz	5g to 500 Hz
Strike protection	absent	100g 6 ms/-	85g6ms/500g1ms	25g6ms/10g16ms	40g 6 ms/15g 16 ms
Working pressure, bar	63	100	100	10 and 63	25, 40, 500
Output signal	RS485	4-20mA	4-20mA	4-20mA, RS485	RS485
Fastness, Thermal inertia, sec. (63%, water 0,4 m/s)	3...45	6	30	16	1,5; in glove - 3
Supply voltage, V	24	24	24	24	3,3 или 5
Supply current, mA	33 000	20 000	20 000	20 000	3+1,8n, n-meas./min.
Readiness time after supply on, sec.	900	no information	no information	no information	0,05
Guaranty, years	2	1,5	1,5	5	5

Additional useful functional possibilities and Ferrum properties
 temperature relay mode; digital filter; information encryption; any working position; 2-point calibration in exploitation; galvanic output isolation 2,5 kV; communication protocols: Hyperterminal, Mod-bus; service operation 50 years; to a class A of accuracy possible accuracy classes in 5 and 15 times higher; interface plug heating, automatic starting on whether temperature lower -40 °C, power no more 10 mWatt at -60 °C and no more 30 mWatt on -100 °C; normed error of sensor groups on temperature difference.

- CONCLUSIONS:** 1) all sensors of the same accuracy class, but the analogs accuracy may decrease from 2 to 9 times, depending on circumstances, and not for Ferrum; absence of additional measurement error means accuracy rising in 2-3 times;
 2) additionally to measurement class in Ferrum the classes possibility in 5 and 15 times higher, a last on the etalon level of the 3-rd category;
 3) analog switching on takes in 18 000 times longer;
 4) power consumption of Ferrum in 40 000 times less;
 5) Ferrum has in 17 times higher a level of temperature unreliability (reliability 99,7% against 95; 95% is a distortion possibility of 5 measurements from each hundred);
 6) in a protection for mechanic strikes leads an import sensor, Ferrum has a small delay, but it has a possibility to improve;
 7) sensors Ferrum provide the best degree of dust and water protection, intrinsic safety, pressure and velocity of measuring substance, thermal inertia, guaranty time;
 8) optional heating of sensor Ferrum in 100 times less power than analogs, up to 10 mWatt, operates automatically at a whether lower -40 °C, a higher reliability at low temperatures up to -60 °C, if required;
 9) a user program soft of group information gather and sensor diagnostics;
 10) sensors Ferrum provide the service life up to 50 years against analog's several years;
 11) Ferrum price nearly respond an analogs price, 160 usd.

Sensors Ferrum in the presented Comparison demonstrate an improvement of 30 characteristics in 2.. 10 times and twice up to dozens thousands times. Analogues are modern and simply excellent sensors, but in comparison with ours turn out to be technically backward, equally as and another industrial sensors.