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Россия +7(495)268-04-70

Казахстан +7(727) 345-47-04

Беларусь +(375) 257-127-884

Узбекистан +998(71)205-18-59

Киргизия +996(312)96-26-47

эл.почта: phb@nt-rt.ru || сайт: <https://pepperl-fuchs.nt-rt.ru/>



Inertial measurement unit

IMUF99PL-SC3600-0KB16V1501

- Dynamic inclination measurement despite external acceleration
- Adjustable ranges for compensation of external accelerations, disturbances
- Adjustable thresholds for detection of measured value overruns
- Measurement of inclination, acceleration and rotation rate in 3 axis each
- CAN bus with CANopen

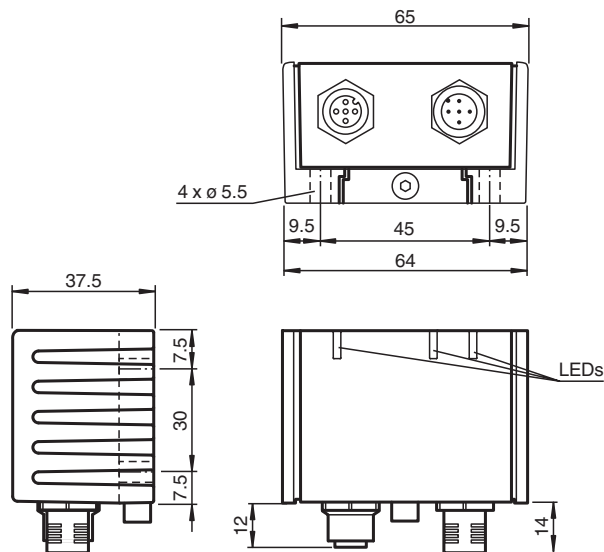
Inertial measurement unit for inclination, acceleration and rotation rate measurement in 3-axis each



Function

The IMUF99 is optimized to provide stabilized inclination and acceleration data as well as rotation rate data. The horizontal inclination can be reliably determined using the 3 measuring axis. The dynamic angle accuracy can be individually configured by selecting a compensation range to counteract the influence of external accelerations. Different output types are selectable for the angle definition (Euler angle, Euler vector, quaternions). In addition, accelerations and rotation rates are reliably measured in the 3 measuring axis. For further optimization of the measured value quality, filters can be set to suppress external vibrations.

Dimensions



Technical Data

General specifications	
Type	Inertial measurement unit 3-axis
Measuring technology	MEMS
Inclination measurement	
Measurement range	0 ... 360 °
Static accuracy	± 0.15 ° at 25 °C for inclination range ±45 ° ± 0.2 ° at 25 °C for inclination range ±90 ° ± 0.3 ° at 25 °C for inclination range 360 °
Dynamic accuracy	< 0.5 ° absolute, absolut, bei 25 °C über 360 ° Neigungsbereich
Resolution	0.01 °

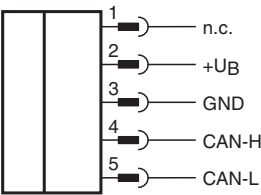
Technical Data

Repeat accuracy		$\pm 0.1^\circ$
Temperature influence		$\pm 0.015^\circ / K$
Acceleration measurement		
Measurement range		$\pm 4 g$
Linearity		$\pm 0.5\%$ of the measured value, up to $\pm 1 g$ for $-40 \dots +85^\circ C$
Resolution		0.001 g
Frequency range		0 ... 30 Hz
Rotation rate measurement		
Measurement range		$\pm 250^\circ/s$
Accuracy		$\pm 0.2^\circ/s$ at $25^\circ C$ in the measuring range $\pm 45^\circ/s$ $\pm 0.5^\circ/s$ at $25^\circ C$ in the measuring range $\pm 120^\circ/s$ $\pm 1^\circ/s$ at $25^\circ C$ in the measuring range $\pm 250^\circ/s$
Resolution		0.01 $^\circ/s$
Functional safety related parameters		
MTTF _d		628 a
Mission Time (T _M)		10 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, yellow
Status indicator		LED, green
Error indicator		LED, red
Electrical specifications		
Operating voltage	U _B	5 ... 30 V DC
No-load supply current	I ₀	$\leq 80 \text{ mA}$
Power consumption	P ₀	$\leq 0.6 \text{ W}$
Interface		
Interface type		CANopen
Node ID		0 ... 126 , programmable
Transfer rate		125 ... 1000 kBit/s , programmable
Termination		external
Cycle time		10 ... 655350 ms , programmable
Standard conformity		
Climatic testing		EN IEC 60068-2-38 , cyclic 12h + 12h, 94% humidity EN 60068-2-14 , test Na, -50 ... +85 $^\circ C$, 10 cycles
Salt spray test		IEC 60068-2-52 , cyclic
Emitted interference		EN IEC 61000-6-4:2019 , EN 55011:2016+A1:2017+A11:2020
Noise immunity		EN IEC 61000-6-2:2019 , ISO 7637-2:2011 , ISO 7637-3:2016 , ISO 16750-2:2012
Shock resistance		EN 60068-2-27, 100 g, 6 ms
Vibration resistance		EN 60068-2-6, 20 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		E87056 , cULus Listed, General Purpose, Class 2 Power Source, Type 1 enclosure , if UL marking is marked on the product. For use in NFPA 79 Applications only. adapters providing field wiring on request
E1 Type approval		10R-06
Ambient conditions		
Ambient temperature		$-40 \dots 85^\circ C$ ($-40 \dots 185^\circ F$)
Storage temperature		$-40 \dots 85^\circ C$ ($-40 \dots 185^\circ F$)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69
Mass		265 g
Dimensions		
Height		37 mm

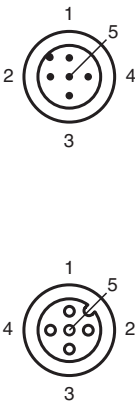
Technical Data

Width	45 mm
Length	65 mm
Factory settings	
Node ID	16
Transfer rate	250 kBit/s
Cycle time	10 ms
Compensation range	4

Connection

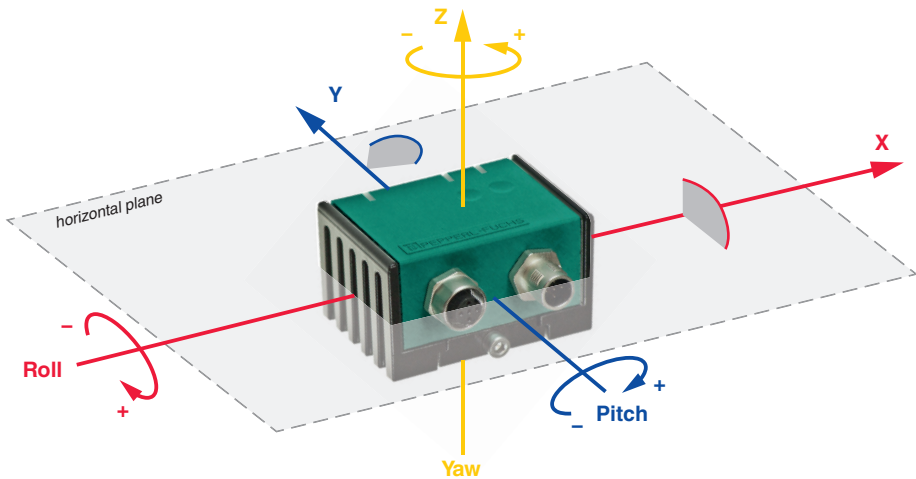


Connection Assignment



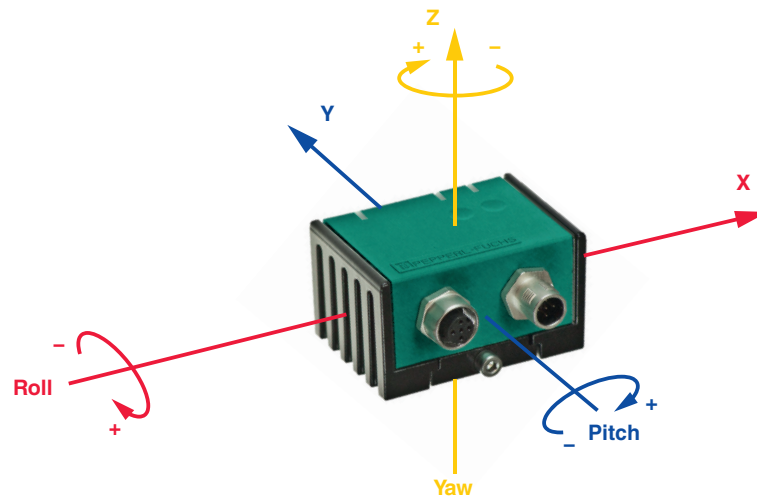
Operation

Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for P+F angles INX or INY
Angle range 0 ° ... 360 °

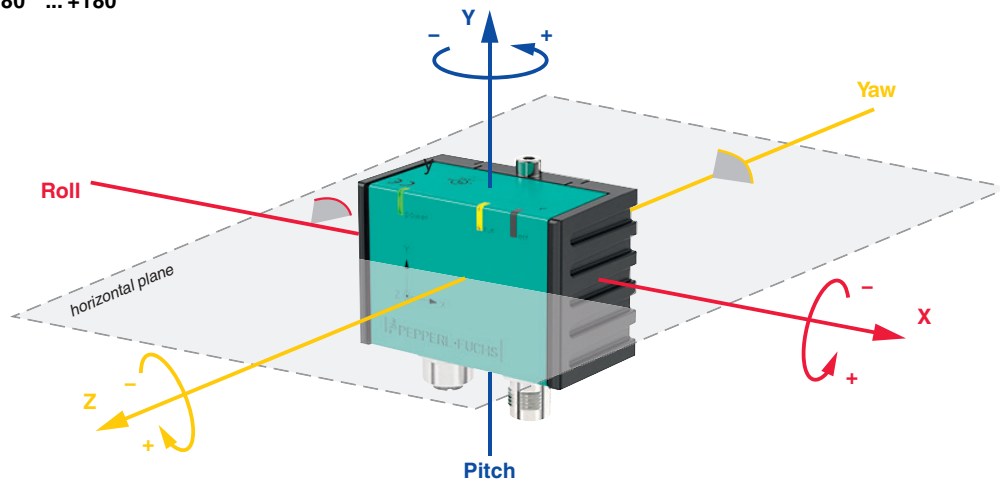


Operation

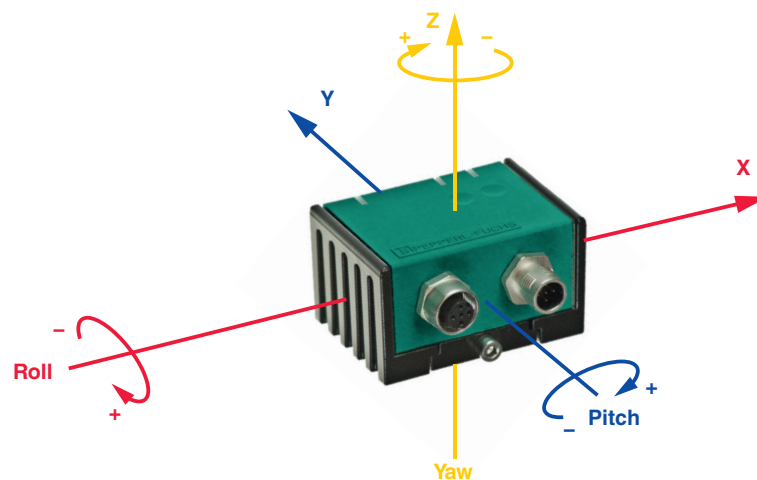
Body fixed coordinate system (intrinsic or co-rotating) for P+F angle INZ
Angle range $0^\circ \dots 360^\circ$



Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for Euler angle ZXZ
Angle range $-180^\circ \dots +180^\circ$



Body fixed coordinate system (intrinsic or co-rotating) for Euler angle zy'x''
Angle range $-180^\circ \dots +180^\circ$

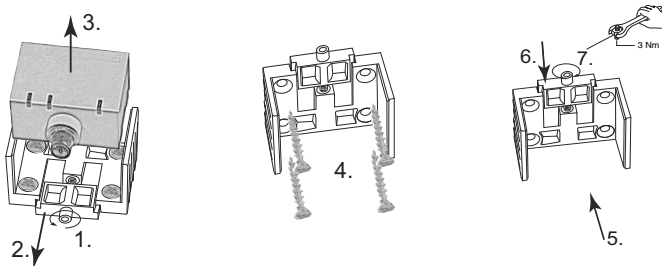


Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.

Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
 2. Slide back the clamping element until you are able to remove the sensor module from the housing.
 3. Remove the sensor module from the housing.
 4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
 5. Place the sensor module in the housing.
 6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
 7. Finally tighten the central screw.
- The sensor is now mounted correctly.



Inertial measurement unit

IMUF99PL-SC3600-0KB20V1501

- Dynamic inclination measurement despite external acceleration
- Adjustable ranges for compensation of external accelerations, disturbances
- Adjustable thresholds for detection of measured value overruns
- Measurement of inclination, acceleration and rotation rate in 3 axis each
- CAN bus with SAE J1939 protocol

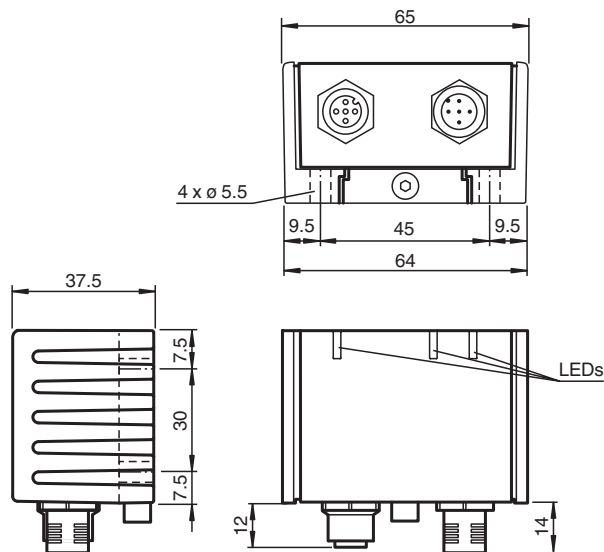
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Resolution	0.01 °

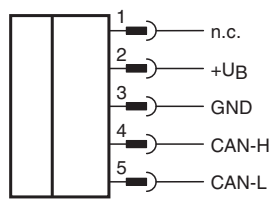
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Measurement range		$\pm 250^\circ/s$
Accuracy		$\pm 0.2^\circ/s$ at $25^\circ C$ in the measuring range $\pm 45^\circ/s$ $\pm 0.5^\circ/s$ at $25^\circ C$ in the measuring range $\pm 120^\circ/s$ $\pm 1^\circ/s$ at $25^\circ C$ in the measuring range $\pm 250^\circ/s$
Resolution		0.01 $^\circ/s$
Functional safety related parameters		
MTTF _d		628 a
Mission Time (T _M)		10 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U _B	5 ... 30 V DC
No-load supply current	I ₀	$\leq 80 \text{ mA}$
Power consumption	P ₀	$\leq 0.6 \text{ W}$
Interface		
Interface type		CAN bus with SAE J1939 protocol
Node ID		0 ... 253 , programmable
Transfer rate		10 ... 1000 kBit/s , programmable
Termination		external
Cycle time		10 ... 655350 ms , programmable
Standard conformity		
Climatic testing		EN IEC 60068-2-38 , cyclic 12h + 12h, 94% humidity EN 60068-2-14 , test Na, -50 ... +85 $^\circ C$, 10 cycles
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Storage temperature		$-40 \dots 85^\circ C$ ($-40 \dots 185^\circ F$)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69
Mass		265 g
Dimensions		
Height		37 mm

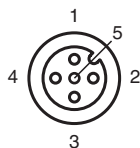
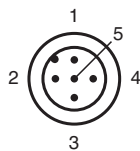
Technical Data

Width	45 mm
Length	65 mm
Factory settings	
Node ID	128
Transfer rate	250 kBit/s
Cycle time	10 ms
Compensation range	4

Connection

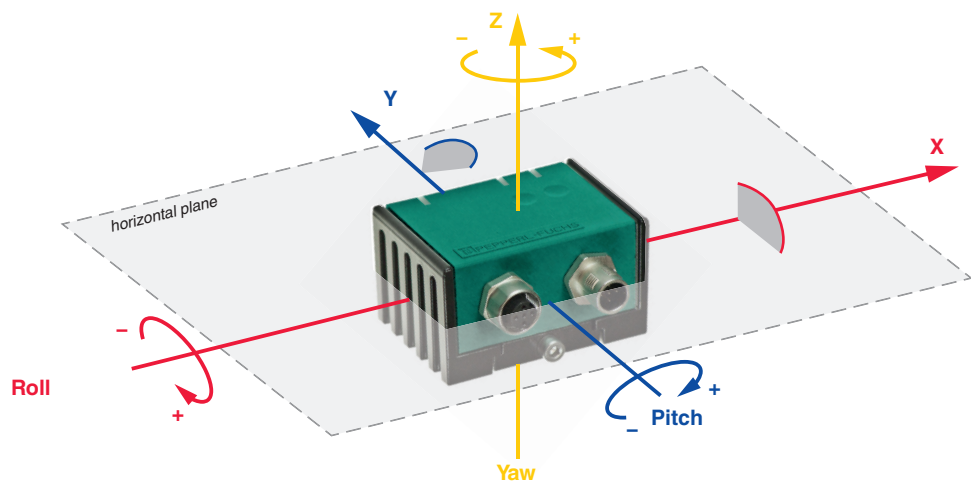


Connection Assignment



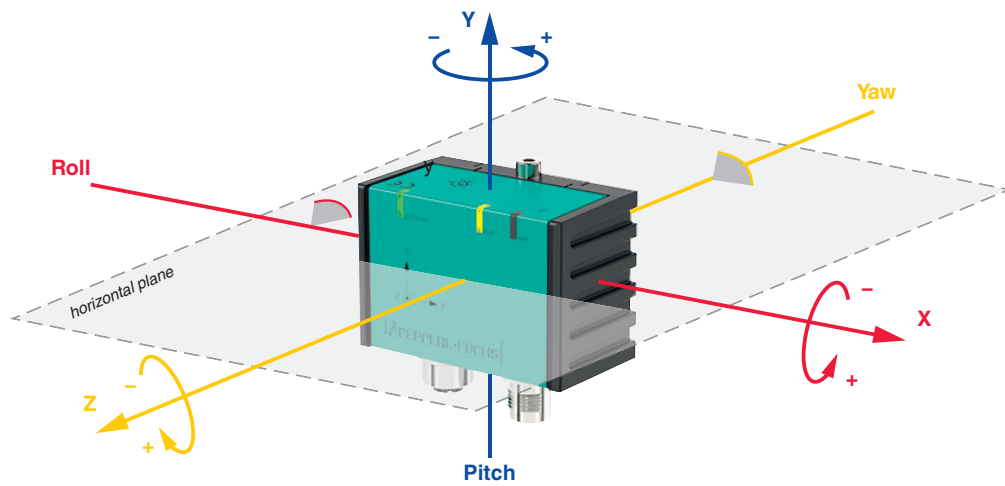
Operation

Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for P+F angles INX or INY

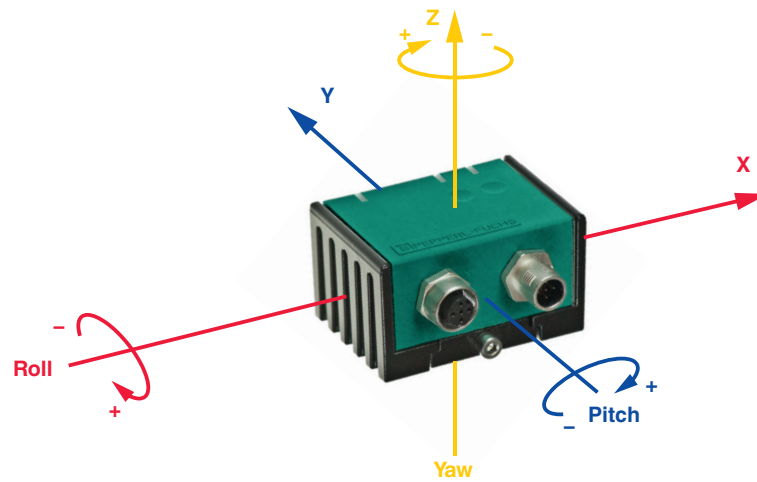


Operation

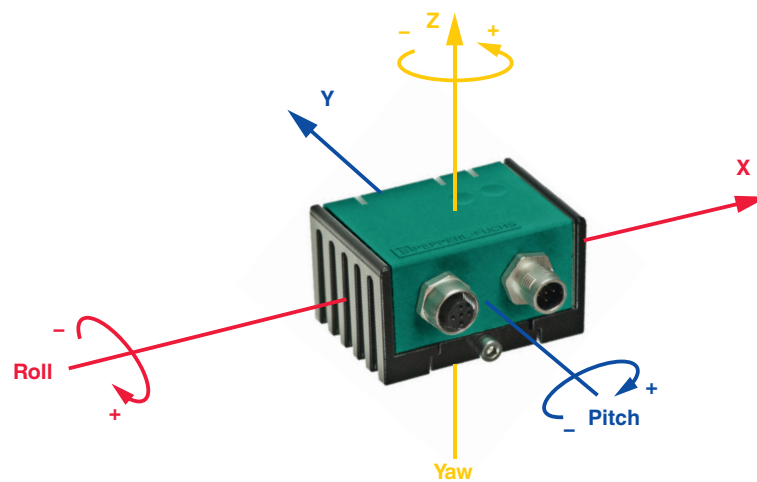
Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for Euler angle ZXZ



Body fixed coordinate system (intrinsic or co-rotating) for Euler angle zy'x''



Body fixed coordinate system (intrinsic or co-rotating) for P+F angle INZ

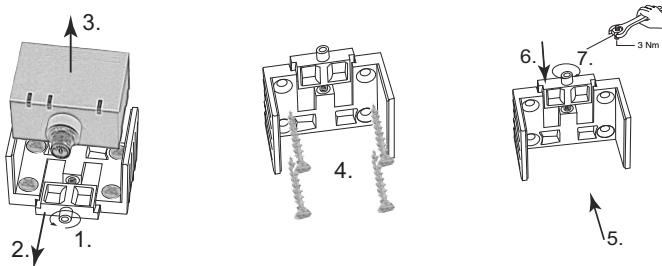


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 5. Place the sensor module in the housing.
 6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
 7. Finally tighten the central screw.
- The sensor is now mounted correctly.

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Беларусь +(375) 257-127-884

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эл.почта: phb@nt-rt.ru || сайт: <https://pepperl-fuchs.nt-rt.ru/>