Leuchtturm Automation Co., Ltd.
深圳市朝瑞自动化系统有限公司

HKCFS Co., LTD.
创富世（香港）有限公司

EPHY MESS

Gesellschaft für Elektro-Physikalische Meßgeräte mbH

Slot Resistance Thermometers

EPHY MESS
Gesellschaft für Elektro-Physikalische Meßgeräte mbH

Contents

1. Slot Resistance Thermometer (NWT)
Bifilar and chip type design

1.1 EPHY-MESS NWT delivery program list

EPHY-MESS NWT delivery program list		
rigid NWT bifilar measuring winding	**flexible NWT** bifilar measuring winding	**chip type NWT** point measurement
NWT-ST rigid, mica insulated standard thermometer with bifilar winding for max. temperatures of 200°C.	**NWT-SH** flexible NWT with bifilar winding insulated with PTFE shrinking tube for maximum temperatures of 180° C.	**M-OK / AK** flexible chip-type NWT contained in silicon HGW casing, insulated with PTFE shrinking tube for maximum temperatures of 180° C.
NWT-A shielded, rigid NWT with bifilar winding for max. temperatures of 200° C.		**M-OK / KS** flexible, extremely thin chip-type NWT with non-tension encapsulation in moulded PESU housing, for maximum temperatu-res of 180° C.
		M-OK / ZS rigid, extremely solid chip-type NWT cast into an epoxy intermediate slider case, for maximum temperatures of 180°C.
IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb **ATEX:** II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db **TR:** Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U		

The advantages of the EPHY-MESS NWTs

- low heat capacity which guarantees instantaneous thermal coupling
- excellent electrical insulation offering suitable heat conductivity at the same time, taking into account voltage strain during long time operation
- bifilar design prevents induction voltage resulting in measurement errors
- point measurement of the chip-type model with classical NWT design
- resistant to stress like shock, pressure and vibration
- resistant to commercial available impregnating agents, hardening-and drying processes
- delivery with acceptance test and factory test certificate according to EN 10204 (upon request)
- all NWTs available with IBExU certificate for increased safety and intrinsically safe application

1.2 Slot resistance thermometer with bifilar winding

1.2.1 The rigid mica insulated design (NWT-ST)

The rigid mica insulated models are suitable for use in winding slots of high-voltage engines. ATEX, IECEx and TR-approval for use in hazardous areas with protection types:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

Structure

A platinum wire with bifilar winding is attached to the carrier body. The connection lines are attached strain relieved. The measuring sensor and the cable outlet are insulated with several layers of fine mica.

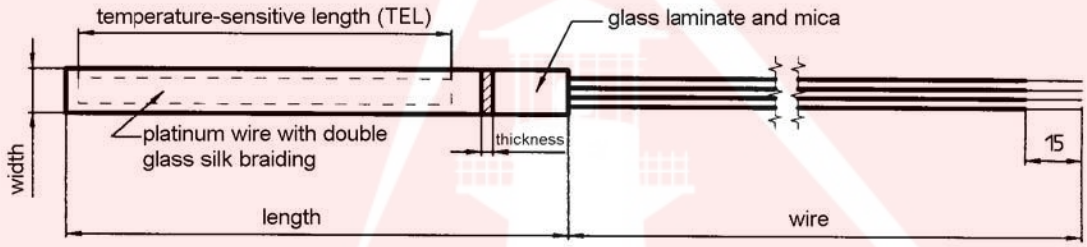


***Fig. 1**, NWT-ST*

Available NWT-ST dimensions

	thickness	width	length
dimensions	1 mm -3 mm	5 mm -20 mm	75 mm -500 mm
dim. tolerances	± 0.2 mm	± 0.2 mm	± 2 mm
special dimensions upon request			

1.2.2 Slot resistance thermometer in intermediate layer (NWT-ZS)

Structure

A platinum wire with bifilar winding is attached to the carrier body. The connection lines are attached strain relieved. The measuring sensor and the cable outlet are insulated with several layers of fine mica. In addition they are coated with a resin-impregnated glass fiber binding. The NWT-ZS thermometers of this design are characterized by their extremely high mechanical sturdiness. ATEX IECEx and TR-approval for use in hazardous areas with protection types:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

Available NWT-ZS dimensions

	thickness	width	length
dimensions	2 mm - 5 mm	6 mm - 12 mm	100 mm -500 mm
dim. tolerances	± 0.2 mm	± 0.2 mm	± 2 mm
special dimensions upon request			

1.2.3 The rigid shielded mica insulated design (NWT-A)

Structure

The structure of the internal thermometer is the same as for the NWT-ST. The copper shielding plate is arranged toward the outside. It is connected to the shielding mesh structure and the ground wire. The shielding of the connecting wire is connected to both ground wires with up to 50 A current.
All wires (measuring lines and ground wires) of the standard model are arranged on a common front side. A special design with opposite lines is available upon request. ATEX, IECEx and TR-approval for use in hazardous areas with protection types:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

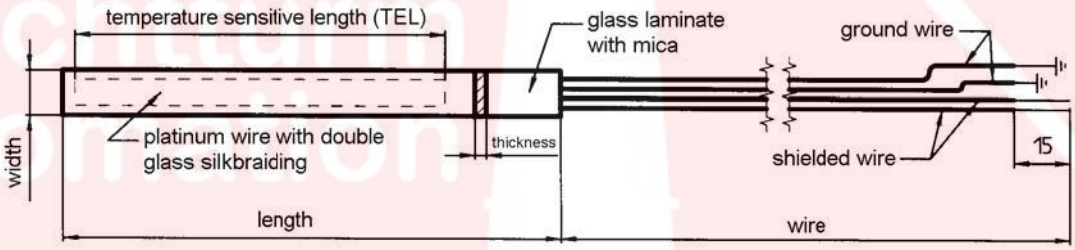


Fig. 2, *NWT-A*

Available NWT-A dimensions

	thickness	width	length
dimensions	2.5 -5 mm	8 -20 mm	100 -500 mm
dim. tolerances	± 0.2 mm	± 0.2 mm	± 2 mm
special dimensions upon request			

1.2.4 The flexible design with insulation consisting of shrinking tube (NWT-SH)

The flexible NWT is suitable for applications, where a certain flexibility of the thermometer body must be guaranteed during assembly or operation. All flexible NWT manufactured by EPHY-MESS are provided with bifilar winding. ATEX, IECEx and TR-approval for use in hazardous areas with protection types:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

Structure

The platinum wire with bifilar winding is attached to the carrier body. It is contained, relieved from pressure, in an insulating preformed body offering additional insulation due to the use of a casting compound of permanent flexibility and covering. For external insulation the NWT and its cable outlet are covered with a PTFE shrinking tube.

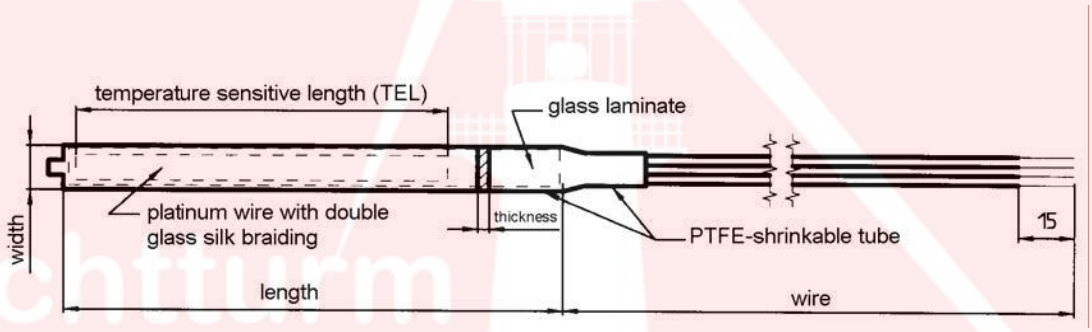


Fig. 3, *NWT-SH*

Available NWT-SH dimensions

	thickness	width	length	total length with SH insul.
dimensions	2 mm	8 mm	100 mm	125 mm
	2 mm	8 mm	150 mm	175 mm
	2 mm	8 mm	200 mm	225 mm
	2 mm	8 mm	250 mm	275 mm
	2 mm	10.0 mm	150 mm	175 mm
	2 mm	10.0 mm	250 mm	275 mm
	2 mm	10.0 mm	500 mm	525 mm
	2 mm	12.0 mm	250 mm	275 mm
dim. tolerances	±0.2 mm	±0.2 mm	±2 mm	±5 mm
special dimensions upon request				

1.2.5 Technical data of the bifilar NWT

	NWT-ST	NWT-ZS	NWT-A	NWT-SH
operating temperature	max. 200° C			max. 180° C
measuring resistor	Pt 100 acc. to DIN EN 60751			
measuring winding	resistance wire with bifilar winding			
temperature sensitive length (TEL)	thermometer length minus approx. 40 mm		thermometer length minus approx. 105 mm	thermometer length minus approx. 20 mm
bending radius	rigid			min. 100 mm
wires Teflon -Insulation color according to DIN	AWG20 -AWG28, as requested by customer		AWG20 -AWG22, as requested by customer	AWG20 -AWG28, as requested by customer
earth circuit max. current intensity 50 A	not applicable	not applicable	AWG 14/19 Teflon®-insulation	not applicable
insulation (sensor)	fine mica, multiple layers	same as NWT-ST plus resin impreg-nated glass fibre coating	fine mica, multiple layers	design: several layers of insulating preformed parts and Teflon® shrinking tube
dielectric strength *) **(sensor and wire)**	2.5 kV / AC 50Hz / 1min.			3kV / AC 50Hz / 1min.
IECEx, ATEX, TR-approval	IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U			

*) increased dielectric strength of up to 5 kV / 1min. upon request.
All insulants used, correspond to at least insulating category H (180° C) according to IEC publication 85 (edition 84)

1.3 Chip-type NWT with dot like measuring spot

1.3.1 Flexible chip-type NWT located in support structure (M-OK / AK)

Flexible chip-type NWT located in a support structure are designed for control applications, where a punctual measurement (TSL = 2 mm) and a flexible type of NWT are required. The chip-type NWT of the M-OK / AK design is approved for use within the ranges of *increased safety*.

Structure

The measuring resistor is, relieved from pressure, contained in an insulating preformed silicon body. Using a casting compound and cover having permanent flexibility provides for an additional insulation. For external insulation the NWT and the cable outlet are covered with a PTFE shrinkable tube. IECEx, ATEX and TR-approval for use in hazardous areas with protection types:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

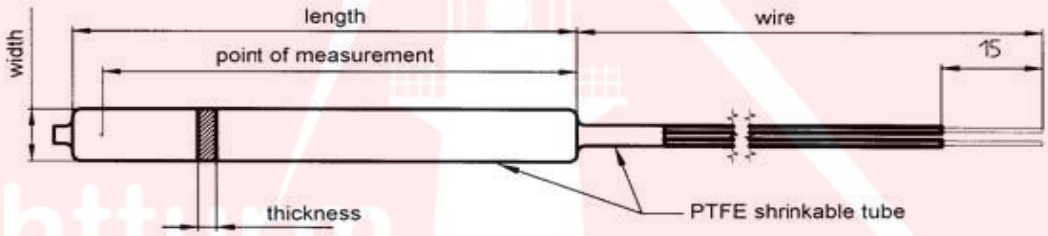


Fig. 4, *M-OK / AK*

1.3.2 Flexible chip-type NWT embedded in preformed PESU carrier (M-OK / KS)

Due to its thickness of only 2 mm the flexible chip-type NWT embedded in a preformed PESU carrier element is designed to extend the operative range of the punctual measuring NWT into areas which until now could be covered only by the bifilar-type NWT. IECEx, ATEX and TR-approval for use in hazardous areas with protection types:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

Structure

The measuring resistor is, relieved from pressure, embedded in and cast into a preformed PESU carrier. Due to the excellent electric properties of the carrier material, high-tension strength, ranges below 4.0 kV do not require any further insulation of the sensor.

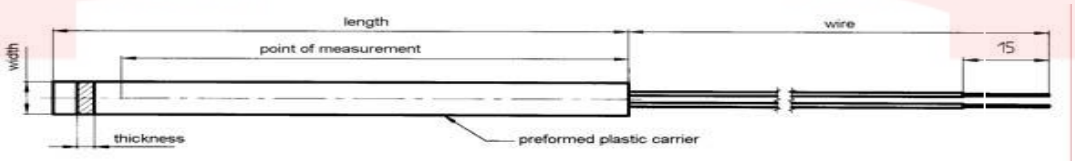


Fig. 5, *M-OK / KS*

1.3.3 Rigid chip-type NWT located in epoxy intermediate slider case (M-OK / ZS)

The rigid chip-type NWT sensors located in an epoxy intermediate slider case represent a further element of the chip-type NWT delivery program. They form the counterpart of the bifilar-type NWT-ST sensors. IECEx, ATEX and TR-approval for use in hazardous areas with protection type:

IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb
ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db
TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U

Structure

The measuring resistor is contained in and cast into an epoxy intermediate slider case (HGW). Due to the excellent electrical properties of the HGW and the casting compound this sensor has an extremely high mechanical stability and does not require any further insulation for high voltage strength ranges below 2.5 kV.

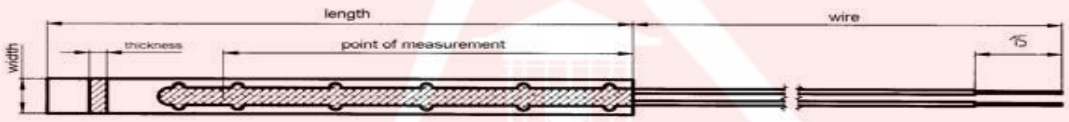


Fig. 6, *M-OK / ZS*

1.3.4 Technical data of the chip-type NWT

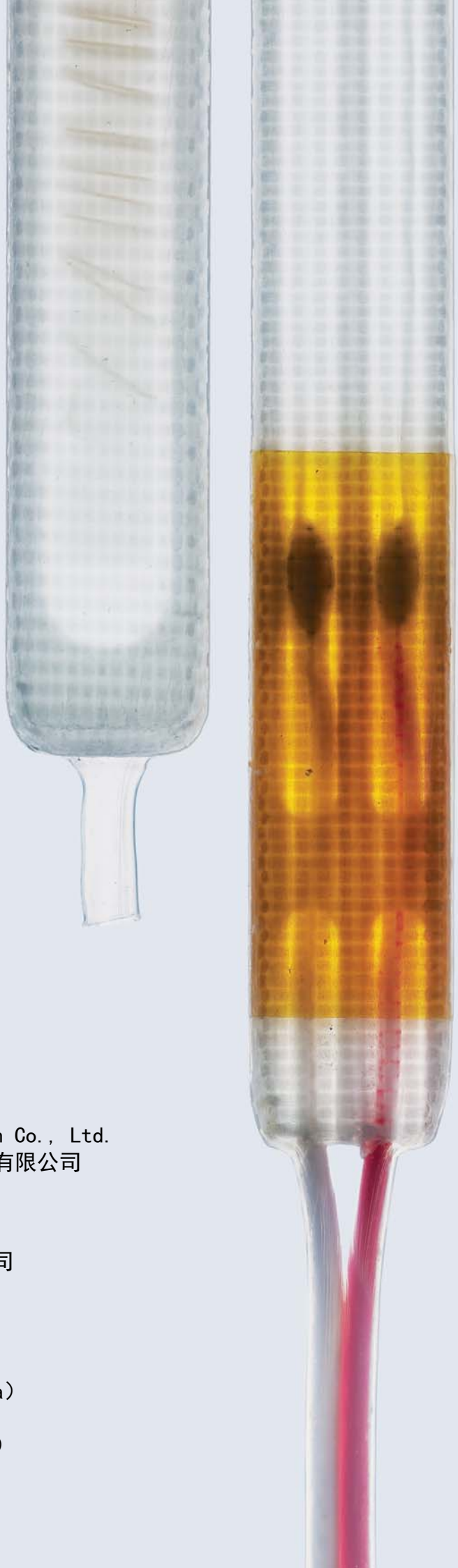
	M-OK / AK	M-OK / KS	M-OK / ZS
operating temperature	180° C max.		
measuring resistor	Pt 100 according to DIN EN 60751, category B		
measuring element	thin film sensor		
temperature sensitive length (TEL)	approx 2 mm		
bending radius	min. 100 mm		rigid
Wires PTFE-insulation, color acc. to DIN	AWG22 -AWG28, as requested by customer	AWG24 -AWG28, as requested by customer	
insulation (sensor)	design: several layers of insulating preformed silicon parts and PTFE shrinkable tube	one-layer design, pre-formed insulating part and casting compound, silicon-free	epoxy glass laminate and casting compound with additional PTFE insulation on sensor
dielectric strength*) sensor1) wire	3kV / 50 Hz / 1min. 3kV / 50 Hz / 1min.	4kV / 50 Hz / 1min. 3kV / 50 Hz / 1min.	2kV / 50 Hz / 1min. 3kV / 50 Hz / 1min.
IECEx, ATEX, TR-approval	IECEx: Ex eb IIC, Ex ta IIIC, Ex ia IIC Gb, Ex ia IIIC Gb ATEX: II 2G Ex e IIC Gb, II 2D Ex ta IIIC Da, II 2G Ex ia IIC Gb, II 2D Ex ia IIIC Db TR: Ex ia IIC U, Ex e II U, Ex ia IIIC Db U, Ex tb IIIC Db U		

*) increased dielectric strength up to 5 kV / 1min. upon request
1) for sensors with standard thickness
All insulants used correspond to at least insulant category H (180° C), acc. to IEC publication 85 (edition 84)

1.3.5 Standard dimensions and circuitry methods of the chip-type NWT-sensors

dimensions	M-OK / AK[1)]			M-OK / KS[2)]			M-OK / ZS[1)]		
T× W× L	2-line	3-line	4-line	2-line	3-line	4-line	2-line	3-line	4-line
2× 8× 50 mm				×	×	×			
2× 8× 63 mm	×						×[3)]	×[3)]	×[3)]
2 × 8 × 100 mm	×	×	×	×	×	×			
2× 10 × 60 mm							×[3)]	×[3)]	×[3)]
2× 10 × 65 mm	×	×	×	×	×	×			
2 × 10 × 100 mm									
3× 8× 50 mm							×	×	×
3 × 8 × 100 mm							×	×	×

[1)] special dimensions upon request
[2)] manufacture of sensors with special dimensions not possible
[3)] dimensions with reduced kV-strength



Leuchtturm Automation Co., Ltd.
深圳市朝瑞自动化系统有限公司

HKCFS Co., LTD.
创富世（香港）有限公司

联系人：卢有辉
电话：+852-3955 0525（HK）
座机：+86 0755-2641 8956（China）
手机：+852 9603 5397（HK）
手机：+86 150 0022 5131（China）
传真：+86 0755-8696 2729
邮箱：jerry@cfs-autos.com
网址：http://www.cfs-autos.com