

# Strain gauges for determination of residual stress

The hole drilling method is frequently used to determine residual stress. In this method, after installation of the strain gauge rosette onto the workpiece, the residual stress state is disturbed by a suitable action.

Following this action, residual stresses cause strains on the surface of the workpiece, which are detected by the strain gauge and then used to calculate the residual stress state.

## Hole drilling method, based on the integral method

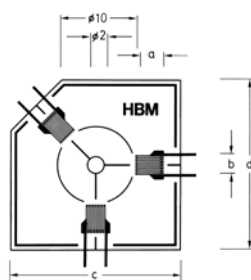
The RY21 or RY61 can be used to determine residual stresses based on the integral method.

The result is the integral mean value of the residual stresses over the entire drilling depth.

### RY21

**0°/45°/90° hole drilling rosette**  
Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

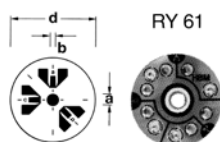
Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals
				Measuring grid		Meas. grid carrier			
Steel	Aluminum			Other	Ω	a	b		
1-RY21-3/120			120	3	2.5	22.1	22.1	4.5	LS 5

Distance drilling center to measurement grid middle: 6.78 mm

### RY61

**0°/45°/90° hole drilling rosette**  
for use with HBM drilling device RY 61  
Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$   
Application temperature range: +10°... +60°C

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals <sup>(1)</sup>
				Measuring grid		Meas. grid carrier			
Steel	Aluminum			Other	Ω	a	b		
1-RY61-1.5/120			120	1.5	0.8	–	12	2	LS 5

<sup>(1)</sup> Solder terminals are not mandatory

#### Specifications:

Resistance tolerance  $\pm 1\%$   
Minimum radius of curvature 1,000 mm  
More specifications: see page 19

As these strain gauges are covered by a printed board, they can be used on level or weakly curved surfaces only.

Distance drilling center to measurement grid middle: 2.55 mm

# Strain gauges for determination of residual stress

## Hole drilling method based on the high-speed drilling method

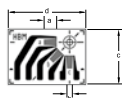
Residual stresses can be determined with the high-speed drilling method using strain gauges RY61K and RY61R, the two variants RY61S, VY61S, and RY61M. MTS3000 is the drilling device required for this method.

The results are the residual stresses resolved over the set drilling depth.

### RY61K

**0°/45°/90° rectangular hole drilling rosette**  
Strain gauge with integrated solder tabs  
Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals (1)
				Measuring grid		Meas. grid carrier			
Steel	Aluminum			Other	Ω	a	b		
1-RY61-1.5/120K			120	1.5	0.8	7.2	10.2	2	LS 7

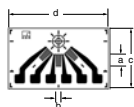
<sup>(1)</sup> Solder terminals are not mandatory

Distance drilling center to measurement grid middle: 2.55 mm

### RY61R

**0°/45°/90° hole drilling rosette**  
Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals (1)
				Measuring grid		Meas. grid carrier			
Steel	Aluminum			Other	Ω	a	b		
1-RY61-1.5/120R			120	1.5	0.8	8	13.5	2	LS 7

<sup>(1)</sup> Solder terminals are not mandatory

Distance drilling center to measurement grid middle: 2.55 mm

# Strain gauges for determination of residual stress

## RY61S

### 0°/45°/90° hole drilling rosette

Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals (1)
				Measuring grid		Meas. grid carrier			
Steel	Aluminum			Other	Ω	a	b		
1-RY61-1.5/120S			120	1.5	0.8	–	10.2	2	LS 5

<sup>(1)</sup> Solder terminals are not mandatory

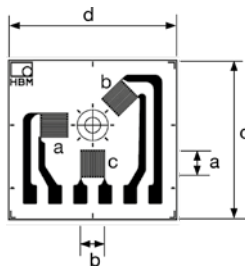
Distance drilling center to measurement grid middle: 2.55 mm

## RY61-3,2/120S

### 0°/45°/90° hole drilling rosette

Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals (1)
				Measuring grid		Meas. grid carrier			
Steel	Aluminum			Other	Ω	a	b		
1-RY61-3.2/120S			120	3.2	3.2	20.9	22	10	LS 5

<sup>(1)</sup> Solder terminals are not mandatory

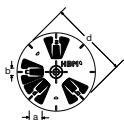
Distance drilling center to measurement grid middle: 5.07 mm

## VY61S

### 0°/45°/90°/135° hole drilling rosette

Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals (1)
				Measuring grid		Meas. grid carrier			
Steel	Aluminum	Other	Ω	a	b	c	d	V	
1-VY61-1.5/120S			120	1.5	0.8	–	10.2	2	LS 5

<sup>(1)</sup> Solder terminals are not mandatory

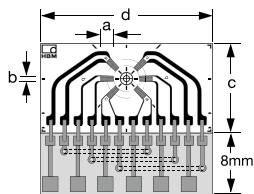
Distance drilling center to measurement grid middle: 2.55 mm

# Strain gauges for determination of residual stress

## RY61M

0°/45°/90° hole drilling rosette, symmetrical  
Temperature response matched to steel  
with  $\alpha = 10.8 \cdot 10^{-6}/K$

Illustrations show actual size



Contents per package: 5 pcs.

Types available from stock		Variants	Noml. resistance	Dimensions (mm)				Maximum excitation voltage	Sldr. terminals
Steel	Aluminum			Measuring grid		Meas. grid carrier <sup>(1)</sup>			
				Other	Ω	a	b		
1-RY61-1.5/120M			120	1.5	0.77	11.7	22.5	2.5	–
1-RY61-1.5/350M			350	1.5	0.77	11.7	22.5	4.5	–

<sup>(1)</sup> Dimensions of SG without printed circuit board

Even minor eccentricities can cause major measurement errors in residual stress analysis based on the hole drilling method.  
The advantage of the RY61M symmetrical hole drilling rosette with 6 measuring grids is that due to the opposing radially arranged measurement grids, any measurement errors in a common measuring grid direction can be almost completely compensated for.  
Distance drilling center to measurement grid middle: 2.55 mm

## Special features

- Self-compensated
- Less cabling outlay