MEASUREMENT REPORT

MEASUREMENTS DATA

TEST DATA

Measurement point	Forged_Deep_Rolled	Date	01-00-1900
Workpiece's reference	Forged_Deep_Rolled	Location	Sint Lab
Customer name	0.0	Job number	0

MATERIAL DATA

Material type	ASTM A182 F22		
Young modulus	210000.0	±	5.0%
Poisson's ratio	0.33	±	5.0%
Yield stress	0.0 MPa	Thickness	50.00 mm

AMPLIFIER / STRAIN GAGE DETAILS

Rosette	K-RY61-1.5/120R	Rosette type	B
Rosette diameter	5.10 mm	Position	Grid A in axial direction
Gage factor - Grid A	1.93 ±	1.5%	
Gage factor - Grid B	1.93 ±	1.5%	
Gage factor - Grid C	1.93 ±	1.5%	

HOLE DATA

Total depth	2.000 mm	Number of steps	56
Hole diameter	1.74 mm	Hole eccentricity	0.020 mm
Hole radius X_1	0.86 mm	Hole radius X_2	0.90 mm
Hole radius Y_1	0.86 mm	Hole radius Y_2	0.86 mm

INSTRUMENT DATA

Hole drilling device	MTS3000-Restan	SINT n.	640	/	641
Strain gage amplifier	QuantumX MX440	SINT n.	1329		
Dial gauge	Mitutoyo 2046SB	SINT n.	992	/	993

The measurement uncertainties stated in this document were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k=2, that for a normal distribution, corresponding to a confidence level of about 95%.

Test Owner	**Head of Residual stress area**
0	Ing. Alessio Benincasa

SINT Technology

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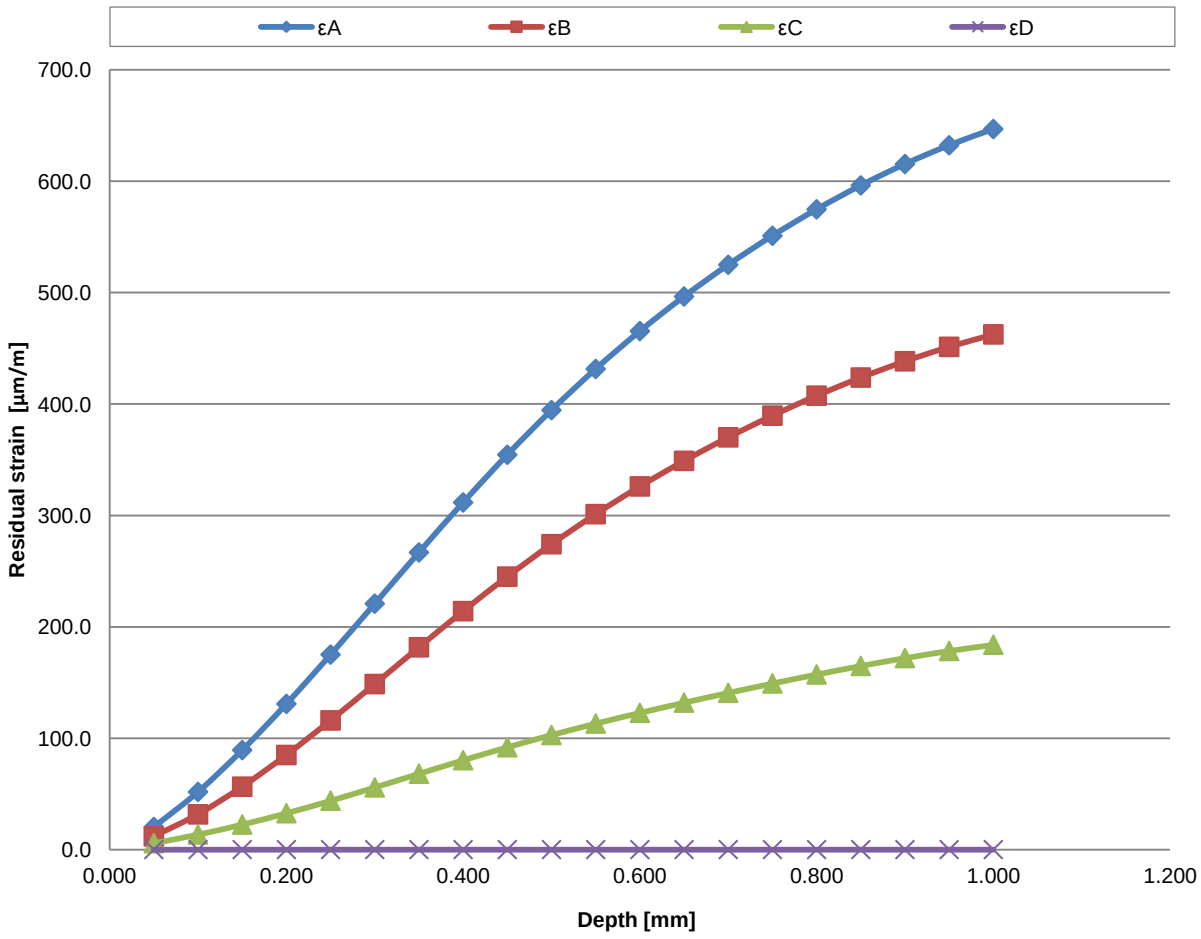
ACQUIRED STRAINS

Depth [mm]	ε_A [µm/m]	±U ε_A [µm/m]	ε_B [µm/m]	±U ε_B [µm/m]	ε_C [µm/m]	±U ε_C [µm/m]	ε_D [µm/m]	±U ε_D [µm/m]
0.050	20.3	2.7	11.9	2.6	5.8	2.6	/	/
0.100	51.8	2.7	31.7	2.7	13.5	2.6	/	/
0.150	89.3	3.0	56.5	2.8	22.5	2.7	/	/
0.200	130.8	3.3	84.9	2.9	32.7	2.7	/	/
0.250	175.0	3.7	116.0	3.2	43.9	2.7	/	/
0.300	220.8	4.2	148.6	3.5	55.9	2.8	/	/
0.350	266.8	4.8	181.6	3.8	68.2	2.8	/	/
0.400	311.7	5.4	214.1	4.2	80.3	2.9	/	/
0.450	354.5	6.0	245.1	4.5	91.9	3.0	/	/
0.500	394.5	6.5	274.2	4.9	102.9	3.1	/	/
0.550	431.5	7.0	301.2	5.2	113.2	3.1	/	/
0.600	465.5	7.5	326.0	5.6	122.8	3.2	/	/
0.650	496.6	7.9	349.0	5.9	132.0	3.3	/	/
0.700	525.0	8.3	370.1	6.2	140.7	3.4	/	/
0.750	551.1	8.7	389.6	6.4	149.2	3.5	/	/
0.800	574.8	9.0	407.5	6.7	157.3	3.5	/	/
0.850	596.3	9.4	423.8	6.9	164.9	3.6	/	/
0.900	615.5	9.6	438.4	7.1	172.0	3.7	/	/
0.950	632.3	9.9	451.3	7.3	178.4	3.8	/	/
1.000	646.9	10.1	462.5	7.4	183.9	3.8	/	/

p_{std}^2	0.04	[µm/m]
q_{std}^2	0.02	[µm/m]
t_{std}^2	0.00	[µm/m]



MEASUREMENT REPORT

ASTM E837-13 RESULTS

ASTM E837-13: UNIFORM STRESS

Type:		Blind		$\sigma_{V.M}$ [MPa]	567.6	±	30.5
σ_{MIN} [MPa]	-655.2	±	35.0	σ_X [MPa]	-652.3	±	38.7
σ_{MAX} [MPa]	-312.0	±	19.8	σ_Y [MPa]	-314.9	±	18.2
β [°]	-84.7	±	0.4	τ_{XY} [MPa]	-31.3	±	8.3

ASTM E837-13: NOT UNIFORM STRESS

Depth [mm]	σ_{MIN} [MPa]	±U σ_{MIN} [MPa]	σ_{MAX} [MPa]	±U σ_{MAX} [MPa]	β [°]	±U β [°]	$\sigma_{V.M}$ [MPa]	±U $\sigma_{V.M}$ [MPa]
0.025	-534.9	28.9	-235.2	15.8	86.1	0.4	464.3	25.4
0.075	-631.1	33.8	-258.1	16.9	-89.2	0.4	549.6	29.6
0.125	-673.7	35.9	-265.1	17.3	-86.2	0.4	587.8	31.5
0.175	-676.8	36.1	-267.8	17.4	-84.1	0.4	590.4	31.7
0.225	-676.1	36.0	-278.1	18.0	-82.8	0.4	588.6	31.6
0.275	-682.6	36.4	-296.0	18.9	-82.3	0.4	592.9	31.8
0.325	-688.1	36.6	-314.0	19.9	-82.2	0.4	596.7	32.0
0.375	-678.9	36.2	-321.4	20.3	-82.2	0.4	588.2	31.6
0.425	-652.7	34.8	-317.3	20.1	-82.1	0.4	565.3	30.4
0.475	-623.5	33.4	-312.1	19.8	-82.0	0.4	540.0	29.1
0.525	-597.0	32.0	-311.1	19.7	-81.9	0.4	517.2	28.0
0.575	-582.4	31.3	-319.9	20.2	-81.8	0.4	505.2	27.4
0.625	-582.8	31.3	-340.4	21.3	-81.8	0.4	507.1	27.5
0.675	-595.3	31.9	-371.1	23.0	-81.9	0.4	520.8	28.2
0.725	-616.0	33.0	-408.3	25.0	-82.1	0.4	542.8	29.3
0.775	-633.6	33.9	-443.0	27.0	-82.3	0.4	563.0	30.3
0.825	-640.2	34.2	-467.1	28.3	-82.4	0.4	573.6	30.8
0.875	-632.1	33.8	-475.8	28.8	-82.5	0.4	570.3	30.7
0.925	-612.5	32.8	-471.7	28.6	-82.5	0.4	555.6	29.9
0.975	-588.0	31.6	-462.4	28.0	-82.5	0.4	536.4	29.0

Depth [mm]	σ_X [MPa]	±U σ_X [MPa]	σ_Y [MPa]	±U σ_Y [MPa]	τ_{XY} [MPa]	±U τ_{XY} [MPa]
0.025	-533.5	32.0	-236.6	14.6	20.4	8.0
0.075	-631.1	37.5	-258.1	15.5	-5.3	7.8
0.125	-671.9	39.8	-267.0	15.9	-27.3	8.2
0.175	-672.5	39.8	-272.2	16.2	-42.2	8.6
0.225	-669.8	39.7	-284.4	16.7	-49.6	8.9
0.275	-675.6	40.0	-303.0	17.6	-51.6	9.0
0.325	-681.1	40.3	-321.0	18.4	-50.6	9.0
0.375	-672.2	39.8	-328.1	18.8	-48.3	8.9
0.425	-646.4	38.3	-323.6	18.6	-45.6	8.8
0.475	-617.5	36.7	-318.1	18.3	-42.9	8.6
0.525	-591.3	35.2	-316.8	18.2	-40.0	8.5
0.575	-577.0	34.4	-325.2	18.6	-37.2	8.4
0.625	-577.8	34.5	-345.4	19.6	-34.3	8.3
0.675	-590.9	35.2	-375.6	21.0	-31.3	8.3
0.725	-612.0	36.4	-412.2	22.8	-28.3	8.2
0.775	-630.1	37.4	-446.5	24.5	-25.4	8.1
0.825	-637.2	37.8	-470.1	25.7	-22.7	8.0
0.875	-629.4	37.4	-478.4	26.1	-20.3	8.0
0.925	-610.1	36.3	-474.1	25.9	-18.2	8.0
0.975	-585.9	34.9	-464.6	25.4	-16.2	7.9

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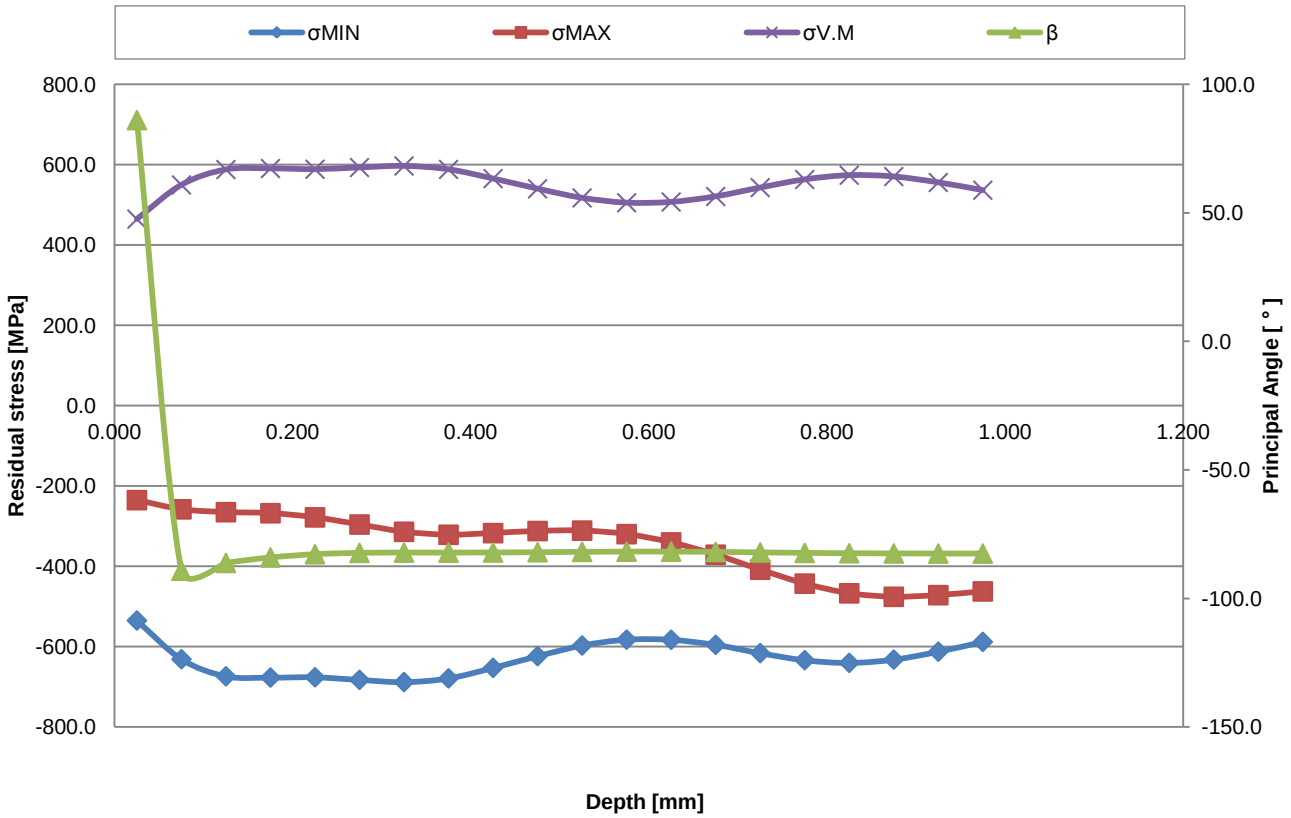
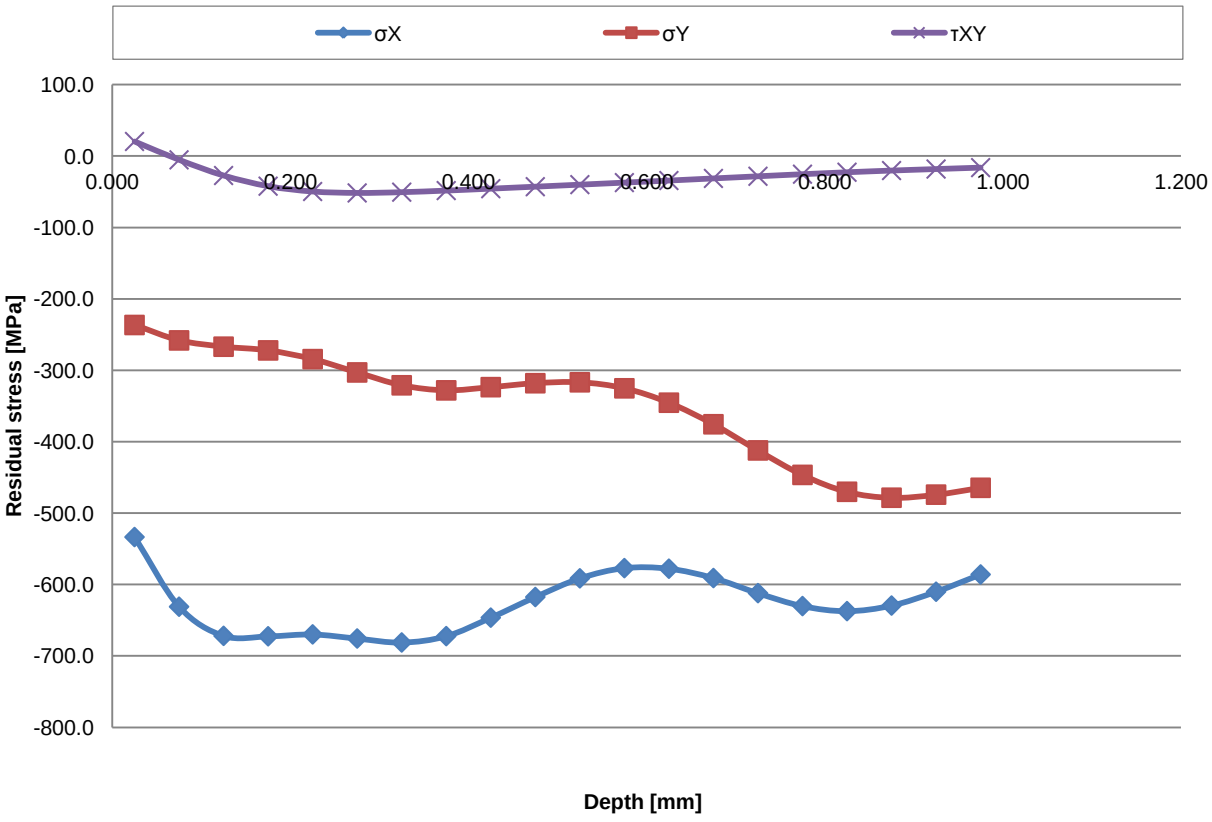
ASTM E837-13 PLOTS





NOTE Several computed stresses significantly exceed 80 % of the material yield stress, then the results are considered as indicative only. In general, the computed stresses whose values exceed 80 % of the material yield stress tend to be overestimated.