

ADAM OPEL AG TDC Central Laboratories	ENGINEERING MATERIAL SPECIFICATION	QS 1010Z0 Mild Steel Flat Products
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Note: This Engineering Material Specification has been superseded by GMW2M-ST-S. It may be applied only for current projects including γ -platform.
For all future projects from Δ and ε upwards the GMW are binding. References old to new for indications on drawings etc. see Appendix.

Translation of Technische Lieferbedingungen für Werkstoffe QS 1010 Z0, Flachzeug aus weichen unlegierten Stählen

1 Material

Mild unalloyed steel, killed or rimmed.

2 Manufacturing Process

The choice of melting process, method of casting and forming process are the prerogative of the manufacturer. In special cases, however, such details may be agreed upon on the order (see material release).

3 Form of Supply

Continuously hot or cold rolled flat products as

3.1

strip in coils

3.2

sheet

3.3

longitudinal splitted strips or bars from longitudinal splitted strips or sheets

3.4

Hot rolled flat products
are usually supplied in thicknesses greater than 1,75 mm.

4 Condition of Delivery

Designation

4.1

Scale free
For this category either hot rolled or cold
reduced material can be used.

QS 1010 Z0

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Despite spot checks possibly performed by Opel, it is the supplier's responsibility that the delivered parts are in line with the Opel drawings. Deliveries of samples, first off-tool parts and parts, whose performance has been changed, must be accompanied by a test report showing the test results in terms of figures.				

4.2

Hot rolled, scale free
(possibly skin passed) Cold reduced, annealed,
scale free flat products can also be used
optionally provided that the minimum mechanical
property requirements (clause 7.2.1) for the
hot rolled scale free condition are met.

QS 1010 ZW

4.3

Cold reduced, annealed, skin passed, scale free

QS 1010 ZK

4.4

Cold reduced, annealed, skin passed,
for painting (suitable for taking a high quality
exterior paint finish).

QS 1010 ZL

4.5

Cold reduced, (annealed), temper rolled in
different conditions (range of tempers)
Coding to DIN EN 10 139 (draft 10.92)

HK 290	QS 1010 ZB
HK 340	QS 1010 ZC
HK 390	QS 1010 ZE
HK 440	QS 1010 ZD
HK 490	QS 1010 ZM
HK 590	QS 1010 ZG
HK 690	QS 1010 ZH

5 Application

These flat products are used for cold forming and for manufacturing of welded tubes.
Cold reduced flat product with the appropriate surface type and surface finish is suitable for the application
of surface coatings (metallic platings by melt dipping or thermal spray painting, electrolytical platings,
organic coatings and/or other coatings).
For case hardening parts applies basically the Engineering Specification QS 1010 ZU.

6 Note

Samples of components or material released to this specification shall be tested for conformity with the
requirements of this specification and approved by Product Engineering Department prior to
commencement of delivery of bulk supplies.
In the event of any intentional deviations from the requirements of this specification, it is the sole
responsibility of the supplier to inform the purchaser of all such deviations. Furthermore, the supplier shall
submit unsolicited samples for reapproval by Product Engineering Department prior to commencement of
delivery of deviant bulk supplies.

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7 Requirements

7.1 Chemical Composition (Product Analysis) in % by Mass

7.1.1

Carbon 0,12 max (0,06 to 0,15 for case hardening)
 Manganese 0,20 to 0,50
 Phosphorus 0,025 max
 Sulphur 0,025 max
 Nitrogen 0,008 max (content of not fixed nitrogen by rimmed steel)

7.1.2 When the drawing and/or the material release specifies killed steel the nitrogen content must be completely fixed. An Aluminium content (metallic) of 0,02 % by mass min must be maintained unless other nitrogen-fixing elements are used.

7.1.3 Elements not listed in clause 7.1.1 shall not be added intentionally to the steel apart from those used for the final treatments of the melt prior to casting without the agreement of the Opel TDC-Central Laboratories or Quality Assurance Departments. Provisions must be made to prevent the addition of such elements from scrap or other materials used in the manufacturing process which would impair the mechanical properties, formability and serviceability of the finished components.

7.2 Mechanical Properties - as Delivered

7.2.1 Flat products, hot rolled, scale free

Designation	Tensile strength R_m N/mm ²	Yield or proof stress R_e oder $R_{p0,2}$ N/mm ²	Elongation A_{80} A_5 ($L_0 = 80$ mm, ($L_0 = 5,65 \cdot \sqrt{S_0}$) $b_0 = 20$ mm) % min	
QS 1010 ZW	310 to 440	215 to 350	25	29
QS 1010 ZW boron alloyed	280 to 390	180 to 280	34	38

7.2.2 Flat products, cold reduced, annealed, skin passed, scale free

QS 1010 ZK	270 to 410	140 to 280	28	-
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7.2.3 Flat products cold reduced, (annealed), temper rolled

Designation hardness	Tensile	Yield or	Elongation		Brinell
	strength	proof stress	A_{80}	A_5	with
	R_m	R_e or $R_{p0,2}$	($L_0 = 80\text{ mm}$, $b_0 = 20\text{ mm}$)	($L_0 = 5,65 \cdot \sqrt{S_0}$)	$F = 30\text{ D}^2$
	N/mm ²	N/mm ²	% min		
QS 1010 ZB	290 to 430	200 to 380	18	24	85 to 125
QS 1010 ZC	340 to 490	250 min	-	-	100 to 145
QS 1010 ZE	390 to 540	310 min	-	-	115 to 155
QS 1010 ZD	440 to 590	360 min	-	-	130 to 170
QS 1010 ZM	490 to 640	420 min	-	-	145 to 190
QS 1010 ZG	590 to 740	520 min	-	-	170 to 215
QS 1010 ZH	690 min	630 min	-	-	200 min

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7.2.4 Deviations from the specified mechanical properties in clauses 7.2.1 to 7.2.3 must be specified in the engineering drawing and must be included in the material release.

7.2.5 The mechanical properties in clauses 7.2.1 to 7.2.3 must be guaranteed; this applies to a period starting at the time when the products are made available as agreed when the order was placed and extending for

8 days in the case of the rimmed grades and for
6 months in the case of killed grades.

7.2.6 For the grade cold reduced, annealed, skin passed for painted exterior body-parts, QS 1010 ZL, the mechanical properties for QS 1010 ZK applies (clause 7.2.2).

7.2.7 The values from the tensile test applies for flat products < 600 mm width for longitudinal test pieces, for flat products ≥ 600 mm width for transverse test pieces.

7.2.8 The values for the yield stress applies at not significant yield stress for the 0,2 % proof stress ($R_{p0,2}$) otherwise for the upper yield stress (R_{eh}).

7.2.9 The specified minimum yield stress for hot rolled flat products of 215 N/mm² shall be guaranteed by changing parts made from this material in a coated type from cold reduced flat products.

As a function of the difficulty for manufacturing the parts following possibilities can be offered:

ZSt E 220 (not standardized in SEW 093)
ZSt E 220 P (to SEW 094)
ZSt E 180 BH (to SEW 094)

7.3 Weldability

The steels are guaranteed suitable for welding by the usual welding methods.

7.4 Surface Condition

Depending on the order details all types of flat product to this specification shall have an appropriate type of surface and surface finish. Irregularities of the surface such as stripes in the rolling directions as well as occasionally occurring bulges, slight scratches, rubbing spots, pittings, small scores or marks, creases (folds), indentations or other mechanical damages are permissible as far as they do not affect the formability, function and appearance of the components.

7.5 Welding Seams at Coils

7.5.1 For hot rolled strips pickling welding seams (butt welding seams produced before running in the pickle) are not permissible.

7.5.2 For cold reduced strips are the pickling welding seams from the manufacturing of hot rolled strips permissible without any restriction.

Butt welding seams in cold reduced strips are permissible, but they shall not be existing in a part.

For cold reduced strips with surface type B to DIN EN 10 130 (corresponding to surface type 05 to DIN 1623, part 1), the butt welding seams shall be indicated by perforation. They can be recognized by sensors and shall be cutted off.

For cold reduced strips with surface type A to DIN EN 10 130 (corresponding to surface type 03 to DIN 1623, part 1) butt welding seams shall not be existing (because of not existing detecting devices).

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8 Additional Requirements

8.1

The details of this material specification cover only the requirements of Product Engineering Department. The requirements for processing (forming, welding, surface treatment) must also be considered when determining the DIN EN or DIN grade for the purchase specification.

8.2

The allocation of the appropriate DIN EN or DIN grade requires agreement with Production Planning Department and in case Steel Quality Department.

If the DIN EN or DIN steel grade is changed after production start this shall have been agreed upon by Product Engineering Department in case of preceded functional tests.

8.3

Requirements regarding the formability e.g. n-, r-, or cupping values have to be agreed upon separately.

9 Test Methods

9.1

All mechanical tests to be carried out at a temperature of $+23^{\circ}\text{C} \pm 5 \text{ K}$ (room temperature to DIN 50 014).

9.2

The tensile test shall be carried out

9.2.1 on flat products with thickness $< 3 \text{ mm}$ to DIN EN 10 002, part 1, 04.91 (Appendix A) using test pieces shape 2 (original gauge length $L_0 = 80 \text{ mm}$, width $b_0 = 20 \text{ mm}$).

9.2.2 on flat products with thickness $\geq 3 \text{ mm}$ to DIN EN 10 002, part 1, 04.91 (Appendix C) using proportional test pieces with original gauge length $L_0 = 5,65 \cdot \sqrt{S_0}$ (S_0 = original cross-sectional area of the gauge length).

9.3

9.3

The brinell hardness is carried out in accordance to DIN 50 351, 02.85.

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10 Note

For flat products with special surface protection the following specifications apply:

QS 1010 ZA	Aluminium coated mild steel strip and sheet
QS 1010 ZQ	
QS 1010 ZN	Zinc-nickel alloy plated steel strip and sheet.
QS 1010 ZP	Terne coated mild steel strip and sheet.
QS 1010 ZV	Hot dip galvanised mild steel strip and sheet.

For flat products suitable for case hardening the following specification applies:

QS 1010 ZU	Mild strip and sheet for case hardening.
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11 Classification of Steel Types

11.1 Hot Rolled Flat Products

DIN EN 10 111 ¹⁾	DIN 1614, part 2 (03.86)	
	Designation	Material number
DD 11	St W 22	1.0332
- ²⁾	U St W 23	1.0334
DD 12	RR St W 23	1.0398
DD 13	St W 24	1.0335
DD 14	St W 25 ³⁾	-

¹⁾ at the moment under discussion

²⁾ rimmed St W 23 is no longer in use.

³⁾ St W 25 not included in DIN 1614, part 2, shall be added.

11.2 Cold Reduced

DIN EN 10 130 (10.91)	DIN 1623, part 1 (02.83)	
	Designation	Material number
Fe P 01	St 12	1.0330
-	U St 13	1.0333
Fe P 03	RR St 13	1.0347
Fe P 04	St 14	1.0338
Fe P 05	St 15 ⁴⁾	1.0312 ⁴⁾

⁴⁾ Designation and material number not included in DIN 1623, part 1, but the designations are in use.