-	Item	Nadca 207	DC-9999-1, Rev. 18 (GM)	AMTD-DC2010, Rev. L, Ford	EN ISO 683-xx	DNV-GL
1	Process control	-	by GM	by Tool Source	by manufacture	by manufacture
2	Materials manufacturers approval	-	Yes, on steel supplier cost, initial test piece 16"x16"x16", if OK, GM serial number, then 30 months provisional period, during this period min. 25 pcs with thickness over 10" must be tested, acceptance rate  Approved Supplier 18  Approved Supplier 28  Approved Supplier 28  Approved Supplier 18  Approved Su	Provisional source - testing period of 30 months, using this period 25 pcs should be tested, 88% acceptance rate requires, When the piece is rejected, a new block mus be substituted by the steel supplier at his cost. The steel supplier will be inspected by Ford Motor Co. Approved source - when all is OK after 30 months period. The list of approved and provisional surces is listed in the specification	-	Approval of manufacturer (AOM) for materials delivered with VL certificate (Issued by DNV GL) or by W certificate (Issued by manufacturer)
3	Tool source approval	-	Yes, if the Tool Source fails to test or fails to insure that the material test of the insert is properly performed, they will be required to replace entire insert to include material + penalty of 400 USD decucted from the final invoice, The Tools Source is guarantor of acceptable heat treat	If the Tool Source fails to insure that the material and heat treatment qualification test for an insert are properly performed, they will be required to reapice entire insert to include material, heat treat and labour, unless subsequent heat treat test data indicates an acceptable insert. If the insert is assessed as acceptable after delivery to the plant, the USD 1000 will be deducted from the invocie for each incidence of noncompliance	-	
4	Welding workshops approval	-	-	-	-	Approval of welding workshop (WWA), DNVGL-CP- 0352
5	Heat treatment workshops approval	-	Yes, on heat treater cost, initial test piece 16"x16"x16", GM seriál number, if OK, testing period 40 months, durting this period min. 40 pcs (25 being at least 10" thick), acceptance rate 95%, heat treater is inspected by GM if all the conditions are met	Provisional source - testing period of 30 months, during this period 25 pcs should be tested, 88% acceptance rate requires, When the piece is rejected, a new block mus be substituted by the steel supplier at his cost. The steel supplier will be inspected by Ford Motor Co. Approved source - when all is OK after 30 months period. The list of approved and provisional sources are listed in the specification	-	Approval of Heat Treatment workshop, DNVGL-CP- 0351
6	Non-destructive testing operator/supervisor approval	-	-	-	-	Certified according to standards or schemes, e.g. ISO 9712
7	Heat treatment that require approval	-	all heat treat steps in process flow	all heat treat steps in process flow	-	Annealing, solution heat treatment, normalizing, quenching, tempering, stress relieving, surtface hardening
8	Testing lab approval	-	Yes, the list of approved Labs published by GM	Yes, the list of approved Labs published by FMC	-	-
9	Traceability	by Part/Die number	by GM serial number	by Part/Die number	By Heat/Cast Number	By Heat/Cast Number
10	Steel selection	Nadca Grade A-H	H13&Dievar, W403 VMR, ADC3, TQ1, DAC-55, DSS-13,		according to the specified steel grade in the specification	Z-grade steels (plates with through thickness properties), BCA steels (steels with brittle crack arresting properties), COD steels (steels with crack initiation resistance), Corrosion resistant steels for cargo oil tanks, Rolled steels for boilers, pressures vessels and special applications, Stainless steels
10	Steel selection  Annealed Brinell hardness	Nadca Grade A-H max. 235 HBW	H13&Dievar, W403 VMR, ADC3, TQ1, DAC-55, DSS-13,	tested per ASTM A-681, will not exceed 217 BHN (Brinell Hardness Number)		properties), BCA steels (steels with brittle crack arresting properties), COD steels (steels with crack initiation resistance), Corrosion resistant steels for cargo oil tanks, Rolled steels for boilers, pressures vessels and special applications, Stainless steels
11		max. 235 HBW    1000	235 HBW  conform to the steel grade	(Brinell Hardness Number)  Conform to steel grade in the specification	specification  In the conformity to the heat treatment conditions +U,	properties), BCA steels (steels with brittle crack arresting properties), COD steels (steels with crack initiation resistance), Corrosion resistant steels for cargo oil tanks, Rolled steels for boilers, pressures vessels and special applications, Stainless steels
11	Annealed Brinell hardness	## 100-24   ## 100-24   ## 100-25   ## 100	235 HBW	. (Brinell Hardness Number)	specification  In the conformity to the heat treatment conditions +U, +S, +A, +AT, +TH, +AC, +AC+C, +FP, +SR  According to the specified steel grade in the specification + Permissible deviations between the	properties), BCA steels (steels with brittle crack arresting properties), COD steels (steels with crack initiation resistance), Corosion resistant steels for cargo oil tanks, Rolled steels for boilers, pressures vessels and special applications, Stainless steels  The chemical composition shall comply with the limits given by specification  In accordance to the specification, addittionally the special state of the elegants such by specification and state of the elegants such as the same such
11 12 13 14	Annealed Brinell hardness  Chemical Analysis	max. 235 HBW    1000	235 HBW  conform to the steel grade  ASTM-E45 Inclusions Type Thin Heavy	(Brinell Hardness Number)  Conform to steel grade in the specification	specification  In the conformity to the heat treatment conditions +U, +S, +A, +AT, +TH, +AC, +AC+C, +FP, +SR  According to the specified steel grade in the specification + Permissible deviations between the product and the limiting values given by specification  In accordance with ISO 4967, method A, EN 10247, JIS	properties), BCA steels (steels with brittle crack arresting properties), COD steels (steels with crack initiation resistance), Corrosion resistant steels for cargo oil tanks, Rolled steels for boilers, pressures vessels and special applications, Stainless steels  The chemical composition shall comply with the limits given by specification  In accordance to the specification, addittionaly the content of the elements sulphur, phosphorus, and oxygen shall be restricted to maximum 0,005%, 0,015%, and 25 ppm, respectivelly, testing method ISO,

16	Annealed Microstructure Rating Number	NADCA Annealed Microstructure Reference Chart, AS1AS18, magnification 500x	NADCA Annealed Microstructure Reference Chart, AS1AS18, magnification 500x		-	-
17	Ministrative Basinantias Lauria	NADCA Banding Segregation Reference Chart,	NADCA Banding Segregation Reference Chart,	NADCA Banding Segregation Reference Chart,		
17	Microbanding Designation Levels	magnification 50x	magnification 50x	magnification 50x, 100x, and ASTM E3	<u>-</u>	-
18	Impact Capability test Result	Annealed Steel Capability, Class 1 Hardened Steel, ASTM E23 or ISO 148/R442	AVG 13,5 J, min. 10,8 J	Mandatory for input material quality and for real parts, the samples must be quenched and triple tempered	ISO 148/1	Relevant for all grades where specified in the following sections, Charpy V-notch test
19	Melt Practice	VAR, ESR	ESR, VAR	ESR, VAR	-	-
20	Heat check resistance	=	=	Dunker-test, no cracking after 15 000 cycles		-
21	Spheroidization and distribution of carbides	-	-	-	defined by specification for +AC and +AC+C, according to SEP 1520 or ASTm A892	-
22	Structure of ferrite-pearlite	<del>-</del>	<del>-</del>	-	for +FP, max. 10% of bainite	-
23	Distribution of carbides		large primary carbides will be cause for rejection	in order to to evaluate the compliance to the recommended austenitizing temperature, this specification requires a micro examination of a test coupon removed from production work piece after heat treatment to analyze whether all of the primary and most of secondary carbides have gone to solution, large primary carbides will be cause for rejection	The carbides shall be distributed as agreed upon in accordance with ISO 5949	
24	Surface quality		-	-	According to enquiry and order, non or +HW (Hor work), +PI (Pickled), +BC (Blasted and cleaned), +RMP (Rough machined), +MA (Machined), +SH (Peeled/turned), +G (Ground), +C (Cold drown), +CP (Cold pilgered), +CR (Cold rolled)	according to enquiry or order
25	Special dimensional inspection	-	-	max. thickness of the parent block shall never be larger than 20" (508 mm)	An agreed number of product shall be inspected for their shape and dimensions	according to enquiry or order
26	Hardenabilty	-	-	-	+H, +HH, +HL, if applicable, ISO 642, the hardness values shall be determined in accordance with ISO 6508-1, Scale C	-
27	Surface hardness	-	-	-	after flame of induction hardening, ISO 6508-1, Scale C	-
28	Machinability	-	-	-	All steels are machineable in the condition "soft annealed"	-
29	Cold shearability	-	-	-	All steels are shearable in the condition "soft annealed"	-
30	Decarburization	-	-	-	According to enquiry and order, evaluated by ISO 3887	
31	Testing procedure certificate	by Part/Die number	by GM serial number	by Part/Die number	ISO 10474 or EN 10204 or JIS G 0415, by Cast number	Declaration of conformance: by naming the steel as BCA, COD, RCU, RBB, RCW grade on the certificate, the manufacturer declare conformance with the qualified specification
32	Tensile test	-	-	-	ISO 6892-1, upper yield strength $\rm R_{\rm eH} or R_{\rm 0,2}$	Required for all grades in accordance with the requirements of the relevant section ( $R_m$ min, $R_{eH}$ or $R_{0,2}$ , elongation A5 min, reduction of area Z min (%))
33	Reduction and deformation ratio	5:1	5:1	5:1	4:1	Between from 1,5 up 6: 1 depending of raw product
34	Brittle crack test	-	-	The tool source has the opportunity to finish machine	The hardness in the usual conditions of delivery. For	yes, test specified by specification
35	Hardness	-	-	the insert using high speed milling practices in lieu of EDM cavity maschining, to assure uniformity of hardness throughout the entire work piece, triple	product in treatment conditions +S, +A, +TH, +AC, +AC+C, +FP, the hardness shall be measured in accordance to ISO 6506-1.	For forgings which have been batch tested, at least 10% of the forgings to be tested for hardness
36	Visual survey	-	-	-		Forgings for which certification by the Society is required shall be presented to the surveyor for visual survey. The surveyor may require areas to be etched for the purpose of investigating weld repair
37	Equipment for heat treatment	AMS 2750 F	10 bar/N2 furnace, min.cooling rate 70 *F/min (21,1 *C/min) based on Ts, load thermocouples dia 3,1 mm, type K, Digital Data Recorder, furnace certified and maintained in accordance with MiL-H-6875, 90 days prior heat treatment at max.	The furnace must be capable of interrupting the quench to maintain max. surface - core difference of 111 C. Min. 2 thermocouples will be placed on the work piece to provide recording data for the surface temprature Ts and core temperature Tc, cooling rate 28 C/min at minimum		ASTM A991 or AMS 2750 F or others, with regular intervals of measurement, agreed by the Society
38	Steel material certificate	-	Steel supplier - Certificate of conformance (Heat Designation, Annealed Brinell Hardness, Chamical Analysis, Microcleanliness level, Ultrasonic Testing, Grain Size Number, Microbadning segregation (Pass/Fails), Annealed Microstructure Rating Number, Response to Heat Treatment, Impact Capability Test Result), Frequency 100%	not defined	-	-
39	Heat treatment certification	Nadca certificate "Heat treatment quality Certification of conformance" for each part by Part number	HT101 form, identical with Nadca-207	not defined	yes, if indicated by "T" by each heat-treatment conditions	The supplier shall maintain records of heat treatment indentifying the furnace used, furnace charge, date, temperature, and time at temperature. The records shall be presented to the surveyor on request