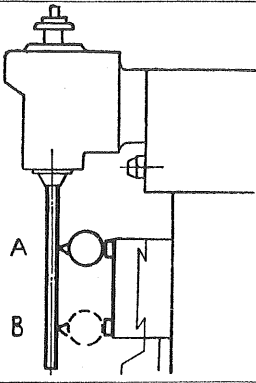
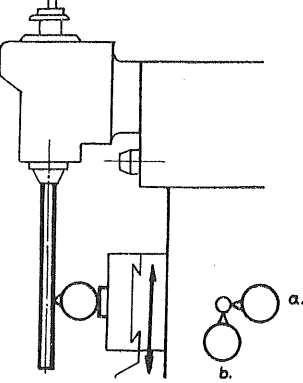
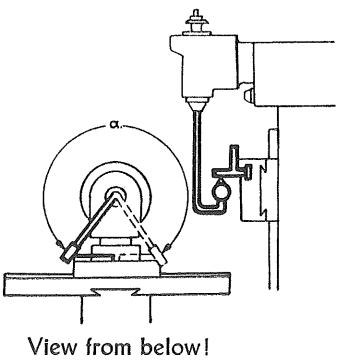
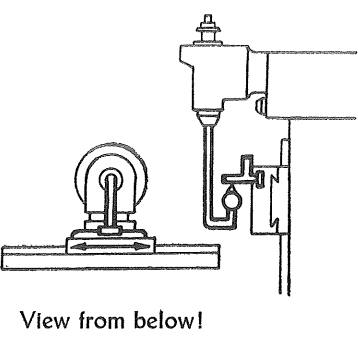
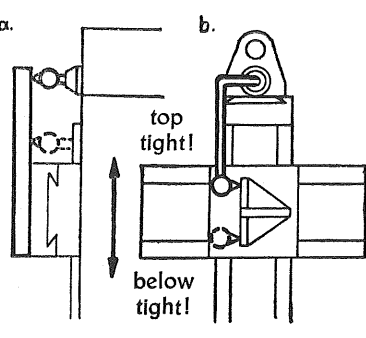


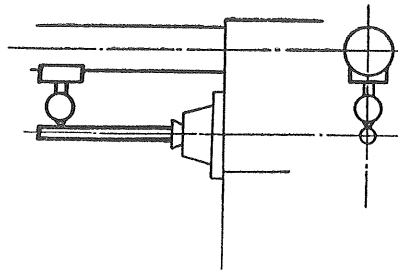
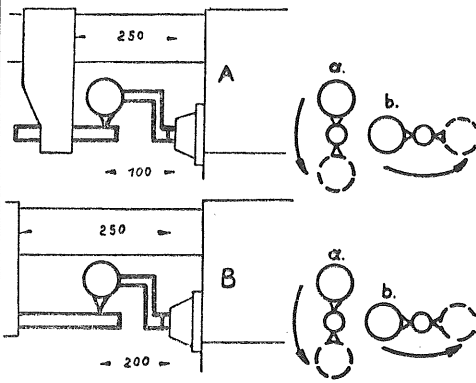
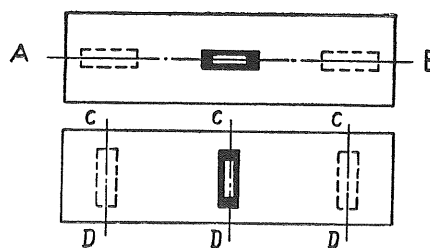
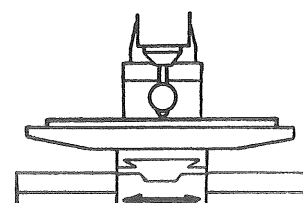
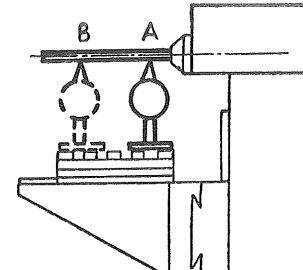
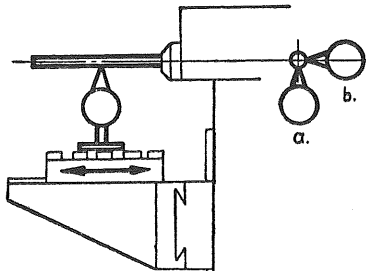
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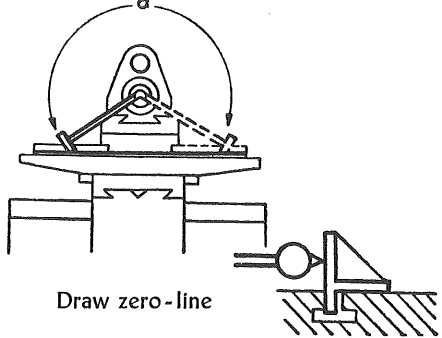
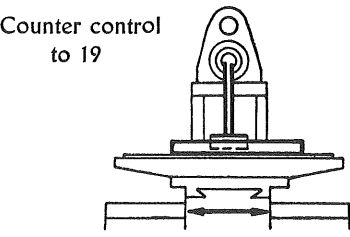
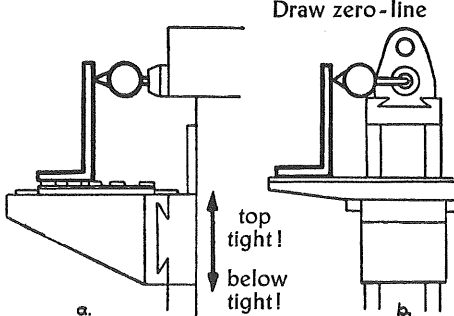
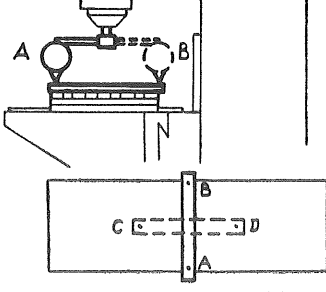
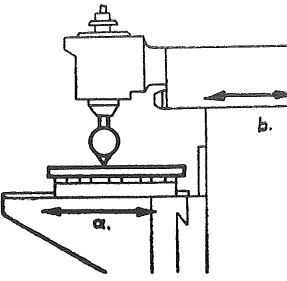
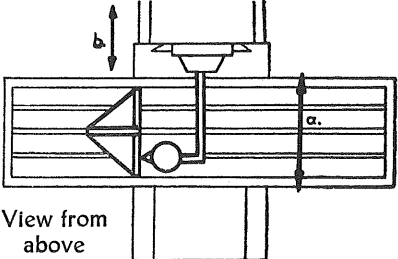
Type: Sk 250 600 Consignee: Transocean, Montreal

Serial No. 11 660 Order No. _____ Date: 20.12.62 Purchaser: Rigal

No.	Object of measurement	Illustration	Measuring tool	Perm. tolerance	Measured tolerance (deviation)	Instruction for test method
1	Planeness of clamping plate of vertical work holding table		Level 7 7/8 - 11 13/16" long with graduated vial 0,0012 - 0,002 inch	In direction AB: 0,0016 inch	/	Put work holding table into central position in reg. to longitudinal- and hight direction. Put level at center and both ends onto clamping plate of work holding table. (Direction A B)
2	Concentric running of internal taper of horizontal milling spindle		Check plug with tapered end and cylindrical measuring rod, 11 13/16" long Dial gage	Pos.: A 0,0004 inch Pos.: B 0,0008 inch	.0002 .0002	Put check plug into spindle cone. Adjust dial gage to circumference of check plug. Turn milling spindle, thereby take readings of dial gage, first at A, than at B (at free end of check plug).
3	True running of external taper of horizontal milling spindle		Dial gage	0,0004 inch	/	Adjust dial gage on external taper (vertical to cone surface). Turn milling spindle, at the same time read off indication of dial gage.
4	Axial driving fit of horizontal milling spindle		Dial gage Flattened tool center	0,0004 inch	0	Set center into spindle cone. Adjust dial gage on testing edge of center. Turn spindle with axial load, pointing toward headstock, thereby read off indication of dial gage.
5	Concentric running of internal taper of vertical milling spindle		Check plug with tapered end and cylindrical measuring rod, 11 13/16" long Dial gage	Pos.: A 0,0004 inch Pos.: B 0,0008 inch	.0002 .0006	Put check plug into spindle cone. Adjust dial gage to circumference of check plug. Turn milling spindle thereby take readings of dial gage, first at A, than at B (free end of check plug).
6	Axial driving fit of vertical milling spindle		Dial gage Flattened tool center	0,0004 inch	.0004	Set center into spindle cone. Adjust dial gage on testing edge of center. Turn spindle with axial load, pointing toward headstock, thereby read off indication off dial gage.
7	Parallelism of clamping plate of vertical work holding table in relation to longitudinal movement		Dial gage Straight edge: 13 49/64" Length (according to max. longitudinal movement)	0,0008 inch	.0002	Put straight edge in longitudinal direction onto work holding table. Adjust dial gage into spindle cone. Tracer at straight edge. Move table in longitudinal direction, thereby take readings of dial gage.

No.	Object of measurement	Illustration	Measuring tool	Perm. tolerance	Measured tolerance (deviation)	Instruction for test method
8	Parallelism of clamping plate of vertical work holding table in relation to vertical milling spindle		Check plug with tapered end and cyl. meas. rod $15\frac{3}{4}$ " long. Dial gage. Foot of stand: min. $7\frac{7}{8}$ " long	$0,0008 / 11\frac{13}{16}$ inch	$\cdot 0006$	Put work holding table into central position and top position in reg. to longitudinal direction. Insert check plug into spindle cone. Adjust dial gage to work holding table. Set tracer inside at lower end of check plug. Put check plug into center position of concentricity-deviation. Check first at A, than at B. Don't move work holding table.
9	Parallelism of high-movement of vertical work holding table in relation to milling spindle a) at internal level b) at side level		Check plug with tapered end and cyl. meas. rod Dial gage	a) $0,0008$ inch for total high mov. of vert. work hold. table b) $0,0008$ inch for total high mov. of vert. work hold. table	$\cdot 0002$ $\cdot 0004$	Set work holding table into central position. Insert check plug into spindle cone. Put tracer to check plug and bring check plug into centre position of concentricity-deviation. Now move work holding table in high direction, thereby read of indication of dial gage.
10	Rectangulartiy of guide slot of vertical work holding table in relation to vertical milling spindle	 View from below!	Stop ledger min. $5\frac{20}{32}$ " long Dial gage Revolv. arm	At a meas. length of $11\frac{13}{16}$ inch $0,0008$ inch	$\cdot 0006$	Set work holding table into central position. Insert stop ledger into guide slot of work holding table. Adjust dial gage into spindle cone. Put tracer to stop ledger (at vertical level) and traverse the latter by gage length. Revolve dial gage by angle. Take readings before and after revol. motion.
11	Parallelism of guide slot of vertical work holding table in relation to its longitudinal movement	 View from below!	Stop ledger min. $5\frac{20}{32}$ " long Dial gage	$0,0008 / 11\frac{13}{16}$ inch	$\cdot 0004$	Insert stop ledger into guide slot of work holding table. Adjust dial gage into spindle cone. Put tracer to stop ledger (at vertical level). Traverse work holding table in longitudinal motion, thereby hold stop ledger in place by hand. Read off indication of dial gage.
12	Parallelism of clamping plate of vertical work holding table a) in relation to front column - guide of support b) in relation to lateral column - guide of support		a) Straight edge $13\frac{49}{64}$ " Length = High adjustability of support b) T-square Length: $12\frac{10}{32}$ " Dial gage	a) $0,0008$ inch b) $0,0008$ inch	$\cdot 0008$ $\cdot 0006$	Set work holding table in central position. Clamp support tightly in lowest position. Put straight edge (resp. T-square) into work holding table. Set dial gage into spindle cone. Tracer at the top on fixed leg of straight edge (resp. T-square). Now loosen support, traverse to top pos. and clamp tight. Read off indications of dial gage in both end pos. (leg: top and below).

No.	Object of measurement	Illustration	Measuring tool	Perm. tolerance	Measured tolerance (deviation)	Instruction for test method
13	Parallelism of back stop guide in relation to axis of horizontal milling spindle at vertical level		Check plug with tapered end and cyl. meas. rod. $11^{19}/_{10}$ " long Dial gage Direct vision prism $1^{31}/_{32}$ " long	$0,0008/11^{18}/_{10}$ inch	/	Put check plug into spindle cone. Tighten back stop guide. Clamp dial gage to prism. Adjust tracer to check plug. Press prism by hand against back stop guide and move it parallel to check plug, thereby read off indication of dial gage. Attention: Before test operation begins, put check plug into central pos. of concentricity-deviation.
14	Alignment of bore of outer bearing with center line of milling spindle a) at vertical level b) at horizontal level		Check plug suitable for outer bearing Dial gage, required contact pressure: min. 7 oz	Pos. A: a) $0,0012$ inch b) $0,0012$ inch Pos. B: a) $0,0016$ inch b) $0,0016$ inch	/ / $\cdot 00010$ $\cdot 0008$	Put check plug into bore of outer bearing and dial gage into spindle cone. Adjust tracer to check plug. Revolve motion: Turn milling spindle, thereby read off always 2 places of circumference, revolved by 180 deg. The difference of the 2 indications (revolved by 180 deg.) equals the double value of the deviation. Test at A and B of outer bearing.
15	Planeness of clamping plate of angular table		Level $7^{7}/_{8} - 11^{19}/_{10}$ " long with vial $0,0012 - 0,002$ inch	In direction: A-B: $\pm 0,0016$ inch In direction: C-D: $\pm 0,0016$ inch	/ /	Adjust work holding table into central position as to longitudinal and transverse direction. Put level according to illustr. longitudinal (dir. A - B) and crosswise (C - D) at center and both ends of clamping plate of angular table.
16	Parallelism of clamping plate of angular table in relation to its longitudinal movement		Dial gage Straight edge, length according to max. longitudinal movement	$0,0008$ inch	$\cdot 0004$	Put straight edge in longitudinal direction onto center of work holding table. Adjust dial gage into spindle cone. Tracer at straight edge. Move table in longitudinal direction, thereby take readings of dial gage.
17	Parallelism of clamping plate of angular table in relation to horizontal milling spindle		Check plug with tapered end and cyl. meas. rod. $11^{19}/_{10}$ " long Dial gage foot of stand: $7^{7}/_{8}$ " long	$0,0008/11^{19}/_{10}$ inch	$\cdot 0006$	Put work holding table into centre pos. as to longitudinal and height direction. Adjust check plug into spindle cone. Put dial gage onto angular table. Set tracer at lower end of check plug. Fix check plug at center pos. of concentricity-deviation. Check first at A, than at B. Work holding table remains fixed.
18	Parallelism of the transverse movement of angular table in relation to horizontal spindle a) at vertical level b) at horizontal level		Check plug with tapered end and cyl. meas. rod. Dial gage	a) $0,0008$ inch for total cross movement of angular table b) $0,0008$ inch for total cross movement of angular table	/ /	Set work holding table into central position. Insert check plug into spindle cone. Adjust dial gage onto angular table. Put tracer to check plug and bring check plug into center pos. of concentricity-deviation. Now move angular table crosswise (transverse move.) and read off indication of dial gage.

No.	Object of measurement	Illustration	Measuring tool	Perm. tolerance	Measured tolerance (deviation)	Instruction for test method
19	Rect-angularity of guide slot of angular table in relation to horizontal spindle	 Draw zero-line	Stop ledger min. 5 ²⁹ / ₃₂ " long Dial gage Revolv. arm	At a meas. length of 11 ¹³ / ₁₆ inch 0,0008 inch	•0004	Set work hold. table into central pos. as to longitudinal direction. Insert stop ledger into guide slot of angular table. Adjust dial gage into spindle cone. Put tracer to stop ledger (at horizontal level) and move ledger by gage length. Revolve dial gage by angle. Take reading before and after revolv. motion.
20	Parallelism of guide slot of angular table as to its longitudinal movement	 Counter control to 19	Stop ledger min. 5 ²⁹ / ₃₂ " long Dial gage	0,0008 / 11 ¹³ / ₁₆ inch	•0002	Insert stop ledger into guide slot of angular table. Adjust dial gage into spindle cone. Put tracer to stop ledger (at horizontal level). Travers work hold. table in longitudinal motion, thereby hold stop ledger in place by hand. Read off indication of dial gage.
21	Rect-angularity of clamping plate of angular table a) as to front column-guide b) as to lateral column-guide	 Draw zero-line	Square (angle gage) length of leg. 13 ⁴⁹ / ₆₄ inch Dial gage	a) 0,0008 inch b) 0,0008 inch	•0006 •0004	Set angular table in central pos. as to longitudinal and transverse direction. Tighten support in lowest pos. Put square onto angular table. Adjust dial gage into spindle cone. Put tracer at top of leg of angle gage (square). Loosen support, shift into top position and clamp it again tight. Take readings at both end positions (leg: top and below).
22	Rect-angularity of clamping plate of angular table in relation to vertical spindle	 Draw zero-line at vertical head	Dial gage Revolv. arm Straight edge or gage blade 10 inch long	AB = 0,0008 " CD = 0,0008 " meas. length: 7 ⁷ / ₈ inch	•0006 •0004	Set angular table in central pos. as to longitudinal direction. Fasten revolv. arm and disc gage onto vertical milling spindle. Put straight edge (gage blade) at angular table in pos. A-B resp. C-D. Adjust tracer to straight edge at A resp. C. Revolve. Turn vertical milling spindle by 180 deg. Tracer at B resp. D. Take reading of dial gage.
23	Parallelism of clamping plate of angular table a) in relation to transverse motion of angular table a) as to transverse motion of the spindle head		Dial gage Straight edge 10 inch long	a) 0,0008 " for total transverse motion of angular table b) 0,0008 " for total transverse motion of spindle head	•0004	Adjust angular table in central pos. as to longitudinal direction. Put straight edge at center of angular table in transverse direction. Set dial gage into spindle cone and tracer to straight edge. a) Move angular table in transverse direction and take reading of dial gage. b) Move spindle head in transverse direction and take reading of dial gage.
24	Rectangularity of guide slot of angular table a) in relation to transverse motion of angular table b) as to transverse motion of spindle head	 View from above	T-square length of leg 7 ⁷ / ₈ inch Dial gage	a) 0,0008 " for total transverse motion of angular table b) 0,0008 " for total transverse motion of spindle head	•0004	Place T-square horizontal against guide slot of angular table. Adjust dial gage to spindle cone. Set tracer at T-square (vertical-lexer). a) Move angular table in transverse direction. Take reading of dial gage. b) Move spindle head in transverse direction and read off dial gage.

No.	Object of measurement	Illustration	Measuring tool	Perm. tolerance	Measured tolerance (deviation)	Instruction for test method
25	Rectangularity of boring-spindle guide in relation to angular table		Square (length of leg: min. 5 ²⁰ / ₃₂ inch) Dial gage	a) 0,0004 " b) 0,0004 "	...0,0004... ...0,0004...	Set angular table in central pos. as to longitudinal and transverse direction. Tighten vertical boring spindle at lowest pos. Put square at angular table, adjust dial gage to spindle cone and put tracer to square (below). Now loosen boring spindle, shift in top pos. and clamp it again. Read off indications of dial gage at both end pos. (top and lowest point of leg).
26	Milling-test a) Horizontal milling spindle b) Vertical milling spindle		Plate, made of zinc-alloy 3 ¹⁵ / ₁₆ × 3 ¹⁵ / ₁₆ inch Single tooth milling cutter 200 dial gage block Dial gage			<ol style="list-style-type: none"> 1) Plane rough milling 2) Plane finishing 0,0004 – 0,0008 inch depth of cut (Gage block) 3) Mill upper edge and feet 0,0008 inch 4) Mill lower edge (Do not adjust) 5) Mill left edge (Do not adjust) 6) Mill right edge (Do not adjust)
27	Milling Counter-Test		Optimeter (Orthotest)	Edge-difference a) Horizontal milling 0,0008 inch b) Vertical milling 0,0012 inch	...0,0002... ...0,0002...	Measure at point, marked x (Label milling-samples with serial No. and keep records for 1 year)
28	Accuracy of pitch of the threaded spindle a) Horizontal b) Vertical c) On spindle head		Gage block Dial gage	<ol style="list-style-type: none"> a) at 3¹⁵/₁₆" ± 0,0004" at 7⁷/₈" ± 0,0008" at 11¹³/₁₆" ± 0,0012" <ol style="list-style-type: none"> b) at 3¹⁵/₁₆" ± 0,0004" at 7⁷/₈" ± 0,0008" at 11¹³/₁₆" ± 0,0012" <ol style="list-style-type: none"> c) at 3¹/₆₄" ± 0,0032" at 6¹⁹/₆₄" ± 0,0064" 	<ol style="list-style-type: none"> + ...0,0002 - ...0,0002 + ...0,0002 - ...0,0002 + ...0,0002 - ...0,0002 + ...0,0010 - ...0,0002 + ...0,0002 - ...0,0002 	Set dial gage at gage block edge at zero, also graduated collar at zero. Now traverse table by means of graduated collar by specified value. Determine difference of pitch-accuracy by means of gage block and dial gage.

Further instructions about measuring tools and methods are in preparation (DIN 8602 and 8603)

Fräskopfversatz $\pm 0,05$ nach links = in Zoll .0020 "