DaimlerChrysler Ford GM

Part Submission Warrant

Part Name: PPBS 19 SW CONT. GRA. STR. | Cust. Part Number: 1931019

Shown on Drawing No.: 19303900-FORD | Org. Part Number: 1931019

Engineering Change Level: "k" | Dated: 18.09.2013

Additional Engineering Changes: | Dated:

Safety and/or Government Regulation: ☐ Yes ☑ No | Purchase Order No.: | Weight (kg): 0,0385

Checking Aid No.: | Checking Aid Engineering Change Level: | Dated:

ORGANIZATION MANUFACTURING INFORMATION

Schlemmer GmbH / 53-739-7536
Organization Name & Supplier/Vendor Code

Philipp-Reis-Strasse 18
Street Address

Haßfurt | Region: | 97437 | Germany
City | Region | Postal Code | Country

CUSTOMER SUBMITTAL INFORMATION

Nursan Otomotiv EOOD
Customer Name / Division

Ayhan Akif
Buyer / Buyer Code

Application

MATERIALS REPORTING:

Has customer-required Substances of Concern information been reported? ☑ Yes ☐ No ☐ n/a

Submitted by IMDS or other customer format: IMDS-ID: 123073159

Are polymeric parts identified with appropriate ISO marking codes? ☐ Yes ☐ No ☑ n/a

REASON FOR SUBMISSION (Check at least one)

- ☑ Initial submission
- ☐ Engineering Change(s)
- ☐ Tooling: Transfer, Replacement, Refurbishment, or additional
- ☐ Correction of Discrepancy
- ☐ Tooling inactive > than 1 year
- ☐ Change to Optional Construction or Material
- ☐ Supplier or Material Source Change
- ☐ Change in Part Processing
- ☐ Parts produced at Additional Location
- ☐ Other - please specify below

REQUESTED SUBMISSION LEVEL (Check one)

- ☐ Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.
- ☐ Level 2 - Warrant with product samples and limited supporting data submitted to customer.
- ☑ Level 3 - Warrant with product samples and complete supporting data submitted to customer.
- ☐ Level 4 - Warrant and other requirements as defined by customer.
- ☐ Level 5 - Warrant with product samples and complete supporting data reviewed at supplier's manufacturing location.

SUBMISSION RESULTS

The results for ☑ dimensional measurements ☑ material and functional tests ☐ appearance criteria ☐ statistical process package

These results meet all design record requirements: ☑ Yes ☐ No (If 'NO' - Explanation Required)

Mold / Cavity / Production Process

DECLARATION

I affirm that the samples represented by this warrant are representative of our parts, which were made by a process that meets all Production Part Approval Process Manual 4rd Edition Requirements. I further affirm that these samples were produced at the production rate of 1.200 m / 1 hour. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from this declaration below.

EXPLANATION / COMMENTS: Report: 21441 Material: PP BS (SRS PP 2050)

Is each Customer Tool properly tagged and numbered? ☐ Yes ☐ No ☑ n/a

Organization Authorized Signature: i.A. Schlemmer GmbH Postfach 13 09 | 85582 Poing/Germany Tanja Voithenleitner | CQI Quality Engineering tanja.voithenleitner@schlemmer.com Tel.: +49(0)8121 7804-123

Dated: 12.01.2016

Print Name: i.A. Tanja Voithenleitner | Phone No.: +49 (0)159 041 167 98 | Fax No.:

Title: GQ1 | E-mail: tanja.voithenleitner@schlemmer.com

FOR CUSTOMER USE ONLY (IF APPLICABLE)

PPAP Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other

Customer Signature | Dated:

Print Name | Customer Tracking Number (optional)

The original copy of this document shall remain at the supplier's location while the part is active (see Glossary).

DaimlerChrysler Ford General Motors

Production Part Approval - Dimensional Results

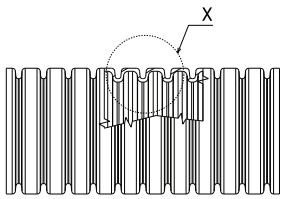
ORGANIZATION:	Schlemmer GmbH	PART NUMBER:	1931019 1931019
SUPPLIER/VENDOR CODE:	53-739-7536	PART NAME:	PPBS 19 SW CONT. GRA. STR.
INSPECTION FACILITY:		DESIGN RECORD CHANGE LEVEL:	"k"
		ENGINEERING CHANCE DOCUMENTS:	

ITEM	DIMENSION / SPECIFICATION	SPECIFICATION / LIMITS	TEST DATE	QTY. TESTED	ORGANIZATION MEASUREMENT RESULTS (DATA)	OK	NOT OK
1	ØA: 24,00 mm	± 0,40 mm	08.12.15	3 pcs.	24,12 - 24,22 mm	x	
2	ØI: 19,40 mm	± 0,40 mm	08.12.15	3 pcs.	19,40 - 19,50 mm	x	
3	a: 3,10 mm	± 0,15 mm	08.12.15	3 pcs.	3,16 - 3,19 mm	x	
4	b: 2,20 mm	± 0,15 mm	08.12.15	3 pcs.	2,21 - 2,25 mm	x	
5	s:	0,17 - 0,51 mm	08.12.15	3 pcs.	0,26 - 0,32 mm	x	
6	angle: 11°	± 4°	08.12.15	3 pcs.	10 - 12°	x	
7	bendingradius:	35 mm	08.12.15	3 pcs.	35 mm	x	
8	weight:	38 g/m	08.12.15	3 pcs.	38 g/m	x	
9	marking:	non-ending axial grey stripes	08.12.15	3 pcs.	non-ending axial grey stripes	x	
10	lower operating temperature:	-40 °C	08.12.15	3 pcs.	-40 °C	x	
11	continuous operating temperature:	+ 125 °C	08.12.15	3 pcs.	+ 125 °C	x	
12	upper operating temperature:	+ 150 °C + 135 °C	08.12.15	3 pcs.	+ 150 °C + 135 °C	x	
13	inflammability:	FMVSS 302	08.12.15	3 pcs.	FMVSS 302	x	
14	filling grade:	80%	08.12.15	3 pcs.	80%	x	
15	Material:	PP BS (SRS PP 2050)	08.12.15	3 pcs.	PP BS (SRS PP 2050)	x	
16	color:	black	08.12.15	3 pcs.	black	x	

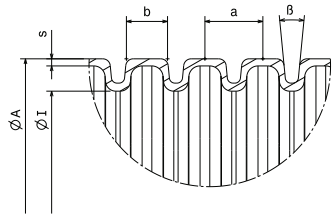
Blanket statements of conformance are unacceptable for any test results.

Schlemmer GmbH
Postfach 13 09 | 85582 Poing/Germany
Tanja Voithenleitner | CQI-Quality Engineering
tanja.voithenleitner@schlemmer.com
Tel.: +49(0)8121 7804-123

SIGNATURE	TITLE	DATE
i.A. Tanja Voithenleitner	GQ1	12.01.2016



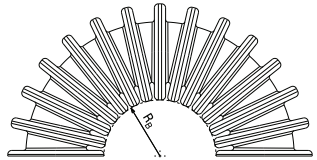
Detail X



Container		Ringware / Coil		Nenn-weite Nominal Width NW	ØA mm	ØI mm	a mm	b mm	s mm	ß ±4° Grad Degree	Biege-[2] radius Bending-radius R_B mm	Gewicht ca. Weight Approx. g/m	Liefereinheit / Delivery Unit / m		
													Container		
EDV-Art.-Nr. ungeschlitzt Part- No. Unslit	EDV-Art.-Nr. geschlitzt Part- No. Slit	EDV-Art.-Nr. ungeschlitzt Part- No. Unslit	EDV-Art.-Nr. geschlitzt Part- No. Slit										ungeschlitzt Unslit	geschlitzt Slit	Ring/Coil
1931004	1931104	1931504	1931554	4,5	7,1	5,0	2,2	1,2	0,17 - 0,51	30	12	9	9000	10000	100
1931006	1931106	1931506	1931556	6	9,2	6,0	2,8	1,7	min. 0,17	26	10	14	5000	5000	100
1931007	1931107	1931507	1931557	7,5	9,9	6,9	2,6	1,8	0,17 - 0,51	11	15	12	5000	5000	50
1931008	1931108	1931508	1931558	8,5	11,6	8,5	2,3	1,4	0,17 - 0,51	20	18	13	3300	4000	50
1931010	1931110	1931510	1931560	10	12,7	10,1	2,7	1,8	0,17 - 0,64	20	18	14	3000	3300	50
1931012	1931112	1931512	1931142	12	15,6	12,0	3,1	2,2	min. 0,17	11	20	21	2200	2200	50
1931013	1931113	1931143	1931563	13	15,8	12,9	2,7	1,8	0,17 - 0,51	11	22	23	2000	2200	50
1931014	1931114	1931514	1931144	14	18,3	14,5	3,2	2,3	min. 0,17	11	25	28	1700	1700	50
1931016	1931116	1931516	1931146	16	18,8	15,2	2,5	1,5	min. 0,17	18	25	28	1500	1500	50
1931017	1931117	1931567	1931147	17	21,0	16,8	3,2	2,2	0,17 - 0,51	11	30	30	1100	1300	50
1931019	1931119	1931519	1931149	19	24,0	19,4	3,1	2,2	0,17 - 0,51	11	35	38	800	1000	50
1931022	1931122	1931522	1931152	22	25,5	21,8	3,1	2,2	min. 0,20	11	37	44	700	900	50
1931023	1931123	1931523	1931153	23	28,0	23,7	3,1	2,2	0,20 - 0,77	11	42	53	650	700	50
1931026	1931126	1931526	1931156	26	31,3	26,4	3,1	2,2	min. 0,25	11	47	64	600	500	25
1931029	1931129	1931529	1931579	29	33,9	29,3	3,4	2,3	min. 0,25	11	60	66	450	500	25
1931037	1931137	1931537	1931167	37	42,0	36,7	3,9	2,8	min. 0,30	12	70	98	250	300	25
1931058	1931158	1931509		8,5 AHW	12,9	8,5	3,1	2,1	0,17 - 0,51	18	17	22	3000	3300	50
1931061	1931161	1931511		11 AHW	15,7	11,1	3,1	2,1	0,17 - 0,51	18	22	26	2000	2200	50
1931065	1931165	1931515		15 AHW	21,2	15,0	3,9	2,7	0,17 - 0,51	12	30	39	1100	1300	50
1931069	1931169	1931520		19 AHW	25,7	19,1	4,3	2,9	0,17 - 0,51	12	38	50	700	900	50
1931076	1931176	1931527		26S AHW	31,6	24,9	4,2	2,6	min. 0,30	6	50	70	450	500	25

[2] Die angegebenen minimalen Biegeradien beziehen sich auf das ungeschlitzte Wellrohr
The listed minimal bending radii refer to the unslit tube

kleinster Biegeradius des geschlitzten Wellrohres:
3 x ØI bei Füllgrad 50% bis 75%
Minimum bending radius of the slit tube 3 x ØI provided tube is not filled by more than 50% to 75%



Toleranzen / Tolerances				
Nennweiten Nominal Widths	ØA	ØI	a	b
4,5 - 16	±0,3	±0,3	±0,10	±0,10
17 - 29	±0,4	±0,4	±0,15	±0,15
37	±0,5	±0,5	±0,20	±0,20
8,5AHW - 11AHW	±0,3	±0,3	±0,10	±0,10
15AHW - 26S AHW	±0,4	±0,4	±0,15	±0,15

Eigenschaften Properties	Prüfvorschrift Test specification	Prüfdauer Test period	Einheit Unit	Wert Value
untere Gebrauchs-temperatur Lower operating temperature		24h	°C	-40
Dauergebrauchs-temperatur Continuous operating temperature		3000h	°C	+125
obere Gebrauchs-temperatur, kurzzeitig Upper operating temperature		240 h 500 h	°C °C	+150 +135
Brennbarkeit Inflammability	FMVSS 302 [1]			Selbstverlöschend Self-extinguishing
max. Füllgrad/ Filling grade			%	80

[1] in Anlehnung an FMVSS 302
in accordance with FMVSS 302

Kennzeichnung:

Endloser axialer grauer Streifen, alternierend mit Tintenstrahlbedruckung
S.R.S >PP< BS NW xx(AHW) YY
Bezeichnung in Klammer nur wo zutreffennd
Abstand Schriftende zu nächstem Schriftanfang: 450 mm ± 50 mm
YY: 2-stelliges Kennzeichen des Herstelllandes nach EN ISO 3166

Marking:

Non-ending axial grey stripes, alternating print with an ink jet
S.R.S >PP< BS NW xx(AHW) YY
Designation between brackets only for appropriate types
Distance between end and beginning of next print: 450 mm ± 50 mm
YY:Two-letter identification code for the country of manufacture according to EN ISO 3166

Toleranzen für Wellschlauch-Abschnitte:

1% der Gesamtlänge + Teilung a (Mitte Wellenberg zu Mitte Wellenberg)
Endsumme auf ganze Zahl aufrunden = + Toleranz.
(Schnitt am Wellenberg)

Tolerances for corrugated tube pieces:

1% of total length + wave-length a (mid. crest to mid. crest).
Total rounded up to the next whole number = + tolerance.
(cut on the crest)

Der deutsche Text ist bindend.
The German language of this text shall be binding.

Toleranzen/TOLERANCES: -	*	Art.Nr. für ungeschl.: Ringware zugefügt	18.09.13	Chu
	j	D-unit of 1931016 was 1700m/Updated drawing	05.02.13	Chu
	i	Art.Nr.1931146 hinzu/Zeichnung überarbeitet	25.01.10	Chu
Oberflächengüte/SURFACE FINISH: -	h	Art. Nr. 1931144 und 1931152 hinzu	21.09.06	Chu
Farbe/COLOR: schwarz/black	Index	Kurzbeschreibung/SHORT TERM	Datum/ DATE	Name
Werkstoff/MATERIAL: SRS PP 2050 PP BS	Gewicht/WEIGHT: / g	Masstab/SCALE: /	ISO PROJEKTION METHODE 1	DIMENSIONS IN MILLIMETERS
			Erstellt mit/PRODUCED ON: CATIA 5 R10	
Name / Datum	Ersatz fuer/REPLACES DRAWING			
Gezeichnet/ DRAWING BY: Stark 26.09.1996	Vom/DATED:			
Geprueft/ APPROVED: Schmidt 26.09.2000	Ersatz durch/REPLACED BY: - Vom/DATED: -			

SCHLEMMER GMBH
Gruberstrasse 48
D-85586 POING

Benennung/DESIGNATION: Wellschlauch PP BS / Corrugated Tube PP BS

Zeichnungs-Nr./DRAWING NO.: 19303900-Ford

Format: A1

Blatt/PAGE: 01
von/OF: 01

Schlemmer

Control Plan (Corrugated tubes) Produktlenkungsplan

No.: KP SRP 000-1

Part / Part Family: (Teil / Teilefamilie:)
corrugated standard hose with continuous geometry
standard Wellschlauch

__Prototype__Pre-Launch X Production __ Prototyp __ Vorserie Produktion	Key Contact / Phone Steffen Hofmann +49 8121 804 146	Date (Orig.) (Erstausgabe:) 04.05.2001	Date (Rev.) (Datum und Änderungsindex) 29.04.2014 Rev. 18	Created: (Erstellt :) St. Hofmann (CQ1)	Approved: (Freigegeben:) St. Brotzki CQL)

Drawing (Rev.): (Zeichnung / Index) Schlemmer drawing all standard *(für alle Standard)*	Part-Number (Supplier) all	Part Name / Description (Produktname und Bezeichnung:) corrugated standard hose with continuous geometry *Standard Wellschlauch*	Core Team: (APQP) L. Cenadi (P), D. Kolbe (QS), J. Rührseitz (PL), St. Hofmann (CQ1)	Distribution: (Verteiler:) Schlemmer

Customer Engineering Approval Date (If Req'd): Customer Quality Approval Date (If Req'd): Other Approval Date (If Req'd): (Freigabe durch Kunden [nur wenn gefordert])

Part / Process Number	Process Name / Operation Description *Arbeitsgangbeschreibung*	Machine, Tool, Device, Jig *Anlage*	Characteristics: No.	Product	Process	Spec Char. Class	Methods: Product/Process Specification/ Tolerance	Measurement equipment *Prüfmittel*	Size *Größe*	Sample Freq. *Frequenz*	Resp. *Verantwortl.*	Control Method *Methode*	Documentation	Corrective action *Korrekturmaßnahmen*
0	Release of tools *Freigaben der Werkzeuge*	mould blocks *Formbacken*	1	contour of corrugated tube (sharp edges within the profil range) *Kontur Schlauch*		◊	no sharp edges no damage *k. scharfe Kanten* *k. Beschädigungen*	visual check *visuell*				visual check *visuell*	internal homologation of mould blocks (every chain)	document differences, detect responsibilities and start improvements *Abweichungen dokumentieren, Ursachen ermitteln und Maßnahmen einleiten*
						◊	Dim. according drw operational reliability *Maße nach freigeg. Zeichnung und Funktionstüchtigkeit*	caliper gauge and balance *Meßschieber Meßschiene*	1 turn of mould blocks *1 Ketten-umlauf*	new mould blocks *neues Werkzeug oder -änderung*	prod. manager *Prod. Manager*	Dimension check *Maßprüfung*	Measure report *Messbericht*	
			2	part formed *Form Teil*		◊	filling / roundness *Füllung / Rundheit*	visual check *Visuell*				visual check *visuell*		
1	Incoming inspection (Granulate) *Wareneingangsprüfug Granulat*		1	Material *Material*		◊	conformity from material with order *Konformität der Werkstoffbestellung*	visual check *visuell*		each delivery *Jede Lieferung*	Incoming inspection department *WE*	Identity check, *Identprüf./Vergl. Bestelltext mit Lieferschein, Kennzeichnung*	keep test certificate *Test Zertikikat aufbewahren*	reject delivery, claim (7-D) *Reklamationsbearbeitung starten*
2	placing at disposal *Vorbereitung Material*		1	Material *Material*		◊	Material according production order *Material gemäß Produktionsauftrag*	visual check *visuell*		each production order *Jeder Fertigungssauftrag*	shiftleader, operator *Schichtführer Werker*	comparison PO with material lab. *Verg. Artikelnummer m. Materialetkett*	control chart production order *QRK Freigabe, Linienfreigabe*	no machine release for production and start improvements *keine Freigabe der Maschine für Fertigung*
			2	mixing unit (holes in surface) *Mischer*		◊	visual control of mixing unit; change of material *Visueller Check des Mischers gerade nach Materialwechsel*	visual check *visuell*		each start of production *bei Fertigungsbeginn*	shift-leader *Schichtführer*	visual check *visuell*	release in control chart *QRK Freigabe*	No release to the machine for production, immediately action induce, find out root cause and induce action
3	corrugated tube extrusion *Extrusion*	Extrusion-line *Rohranlage*	1	inside diameter *Innendurchmesser*		◊	check according *Prüfung nach* PA 1501-02	caliper gauge (multiple gauges) *Meßschieber*	1 meter	After backfitting of the machine respectively after new start every 4 hours *Nach Umbau der Maschine bzw. Neustart alle 4 Stunden*	shift-leader, *Schichtführer*	attributive check *Attributivprüfung*	release in control chart *QRK Freigabe*	*Keine Freigabe der Maschine für Fertigung, Sofortmaßnahmen einleiten, Ursache ermitteln und Maßnahmen einleiten*
			2	outside diameter *Aussendurchmesser*		◊	check according *Prüfung nach* PA 1501-02	caliper gauge (multiple gauges) *Meßschieber*	1 meter		shift-leader, *Schichtführer*	attributive check *Attributivprüfung*	release in control chart *QRK Freigabe*	
			3	wall thickness area 1 / area 2 *Wandstärke zw. Bereich 1 u. 2*		◊	check according *Prüfung nach* PA 1501-02	caliper gauge (multiple gauges) *Meßschieber*	1 meter		shift-leader, *Schichtführer*	attributive check *Attributivprüfung*	release in control chart *QRK Freigabe*	
			4	Weight per meter *Gewicht in Meter*			Weight *Gewicht*	balance (multiple gauges) *Waage*	1 meter		shift-leader, *Schichtführer*	control of weight *Gewichtskontrolle*	control chart *QRK Freigabe*	
			5	printing *Bedruckung*		◊	check acc. each PO *Prüfung n. j. Auftrag* PA 1501-02	visual check measuring bench (multiple gauges)	4 meter	printer change and change of parameter every 4 hours *nach Druckertausch oder Parameteränd. oder alle 4 Stunden*	shift-leader, *Schichtführer*	visual check attributive check *Attributivprüfung* *visuell*	control chart *QRK Freigabe*	
			6	slitting (if necessary) *Schlitzen (wenn gefordert)*		◊	check acc. each PO *Prüfung n. j. Auftrag* PA 1501-02	visual check *visuell*	1 meter	start of produvction every 4 hours *zu Produktions-beginn alle 4 Stunden*	shift-leader, *Schichtführer*	visual check *visuell*	control chart *QRK Freigabe*	
			7	flammability test (if necessary) *Flammbarkeitstest (wenn gefordert)*		◊	check according *Prüfung nach* PA 1501-02	light (laboratory) *Licht*	1 piece		shift-leader, *Schichtführer*	attributive check *Attributivprüfung*	control chart *QRK Freigabe*	
			8	part formed *Ausformung*	parameter	◊	filling / roundness *Füllung / Ovalität* PA 1501-02	visual check *visuell*	one turn of mould blocks *1 Ketten-umlauf*	production start *zu Produktions-beginn*	shift-leader, *Schichtführer*	visual check *visuell*	control chart *QRK Freigabe*	Repair failure, check machine parameter find root cause and induce action No release to the machine
					automatic control of parameter (not for all) parameter) *automatische Kontrolle der Parameter (nicht aller)*	◊	data sheet *Datenblatt*	check of electronic parameter	all parameter	every 4 hours *alle 4 Stunden*	operator *Werker*	acoustically or visual interlock if out of Spec	progress chart none *Linienfreigabe* FB 1402-01	*Störung beheben, Ursache ermitteln und Maßnahmen einleiten keine Freigabe der Maschine*
						◊	data sheet *Datenblatt*	*Überprüfung aller elektron. Parameter*	100%	continuous *immer*	equipment *Maschine*	automatic *b. Abweichungen von den gesetzten Parametern ertönt oder erscheint ein Alarm*		

Schlemmer

Control Plan (Corrugated tubes) Produktlenkungsplan

No.: KP SRP 000-1

Part / Part Family: (Teil / Teilefamilie:)
corrugated standard hose with continuous geometry
standard Wellschlauch

__Prototype__Pre-Launch X Production __ Prototyp __ Vorserie Produktion	Key Contact / Phone Steffen Hofmann +49 8121 804 146	Date (Orig.) (Erstausgabe:) 04.05.2001	Date (Rev.) (Datum und Änderungsindex) 29.04.2014 Rev. 18	Created: (Erstellt :) St. Hofmann (CQ1)	Approved: (Freigegeben:) St. Brotzki CQL)

Drawing (Rev.): (Zeichnung / Index) Schlemmer drawing all standard *(für alle Standard)*	Part-Number (Supplier) all	Part Name / Description (Produktname und Bezeichnung:) corrugated standard hose with continuous geometry *Standard Wellschlauch*	Core Team: (APQP) L. Cenadi (P), D. Kolbe (QS), J. Rührseitz (PL), St. Hofmann (CQ1)	Distribution: (Verteiler:) Schlemmer

Customer Engineering Approval Date (If Req'd): Customer Quality Approval Date (If Req'd): Other Approval Date (If Req'd): (Freigabe durch Kunden [nur wenn gefordert])

Part / Process Number	Process Name / Operation Description *Arbeitsgangbeschreibung*	Machine, Tool, Device, Jig *Anlage*	Characteristics				Methods							Corrective action *Korrekturmaßnahmen*
			No.	Product	Process	Spec Char. Class	Product/Process Specification/ Tolerance	Measurement equipment *Prüfmittel*	Size *Größe*	Sample Freq. *Frequenz*	Resp. *Verantwortl.*	Control Method *Methode*	Documentation	
3	corrugated tube extrusion *Extrusion*	Extrusionline *Extrusion Rohranlage*	9	wall thickness *Wandstärke*		◊	check according *Prüfung nach* PA 1501-03	visual check *visuell*	1 meter	every hour *stündlich*	operator *Werker*	visual check *visuell*	none keine	Inform supervisor, *Vorgesetzten informieren,*
			10	Weight per meter *Gewicht je Meter*			Weight *Gewicht* PA 1501-03	balance (multiple gauges) *Waage*	1 meter	every hour *stündlich*	operator *Werker*	control of weight *Gewichtskontrolle*	none *keine*	
			11	printing *Bedruckung*		◊	check according production order *Prüfung nach*	visual check *visuell*	1 meter	continuous *immer*	worker *Werker*	visual check *visuell*	none *keine*	
			12	slitting (if necessary) *Schlitzen (wenn notwendig)*		◊	*je Fertigungsauftrag* PA 1501-03	visual check *visuell*	1 meter	continuous *immer*	worker *Werker*	visual check *visuell*	none *keine*	
			13	cut (only for pieces) *Abschnitt (nur für Teile gültig)*		◊		visual check *visuell*	sampling inspection *Muster*	continuous *immer*	worker *Werker*	visual check *visuell*	none *keine*	
			14	length (only pieces) *Länge (nur für Teile gültig)*		◊		measuring bare (multiple gauges) *Meßschiene*	sampling inspection *Muster*	continuous *immer*	worker *Werker*	visual check *visuell*	none *keine*	
			15	packing (pieces, coil & container) *Verpackung* *(Teile, Bund & Container)*		◊		visual check *visuell*	every packing	continuous *immer*	worker *Werker*	visual check *visuell*	none *keine*	
			16	packing *Verpackung*	quantity / packing unit *Quantität / Verpackung*	◊	quantity *Quantität*	counter (multiple) *Zähler*	100%	each packing *jede Verpackung*	worker *Werker*	visual check *visuell*	Improvement list *Fortschrittsliste*	Inform supervisor, repair failure *Vorgesetzten informieren,r Fehler eparieren*
			17	outside diameter *Aussendurchmesser*		◊	check according *Prüfung nach* PA 1501-04	caliper gauge (multiple gauges) *Meßschieber*	1 meter	daily *täglich*	quality department *QS*	attributive check *Attributivprüfung*	release in sheet *QRK Freigabe*	Inform supervisor, and start improvements (record it) no machine release for production
			18	inside diameter *Innendurchmesser*		◊	check according *Prüfung nach* PA 1501-04	caliper gauge (multiple gauges) *Meßschieber*	1 meter	daily *täglich*	quality department *QS*	attributive check *Attributivprüfung*	release in sheet *QRK Freigabe*	*Vorgesetzten informieren,* *Sofortmaßnahmen einleiten,* *Ursache ermitteln und*
			19	wall thickness area 1 / area 2 *Wandstärke zw. Punkt 1 und 2*		◊	check according *Prüfung nach* PA 1501-04	caliper gauge (multiple gauges) *Meßschieber*	1 meter	daily *täglich*	quality department *QS*	attributive check *Attributivprüfung*	release in sheet *QRK Freigabe*	*Maßnahmen einleiten* *keine Freigabe der Maschine* *für Fertigung*
			20	Weight per meter *Gewicht je Meter*			Weight *Gewicht*	balance (multiple gauges) *Waage*	1 meter	daily *täglich*	quality department *QS*	control of weight *Gewichtskontrolle*	release in sheet *QRK Freigabe*	
			21	printing *Bedruckung*		◊	check according production order *Prüfung nach* *je Fertigungsauftrag* PA 1501-04	visual check measuring bare (multiple gauges) *Visuell* *Meßschiene*	4 meter	daily *täglich*	quality department *QS*	visual check attributive check *Attributivprüfung* *visuell*	none *keine*	
			22	slitting (if necessary) *Schlitzen (wenn notwendig)*		◊		visual check *visuell*	1 meter	daily *täglich*	quality department *QS*	visual check *visuell*	none *keine*	
			23	cut (only for pieces) *Abschnitt (nur für Teile gültig)*		◊		visual check *visuell*	3 pieces *3 Stück*	daily *täglich*	quality department *QS*	visual check *visuell*	none *keine*	
			24	length (only pieces) *Länge (nur für Teile gültig)*		◊		measuring bare (multiple gauges) *Meßschiene*	3 pieces *3 Stück*	daily	quality department *QS*	visual check *visuell*	none *keine*	

Schlemmer

Control Plan (Corrugated tubes) Produktlenkungsplan

No.: KP SRP 000-1

Part / Part Family: (Teil / Teilefamilie:)
corrugated standard hose with continuous geometry
standard Wellschlauch

__Prototype__Pre-Launch X Production __ Prototyp __ Vorserie Produktion	Key Contact / Phone Steffen Hofmann +49 8121 804 146	Date (Orig.) (Erstausgabe:) 04.05.2001	Date (Rev.) (Datum und Änderungsindex) 29.04.2014 Rev. 18	Created: (Erstellt :) St. Hofmann (CQ1)	Approved: (Freigegeben:) St. Brotzki CQL)

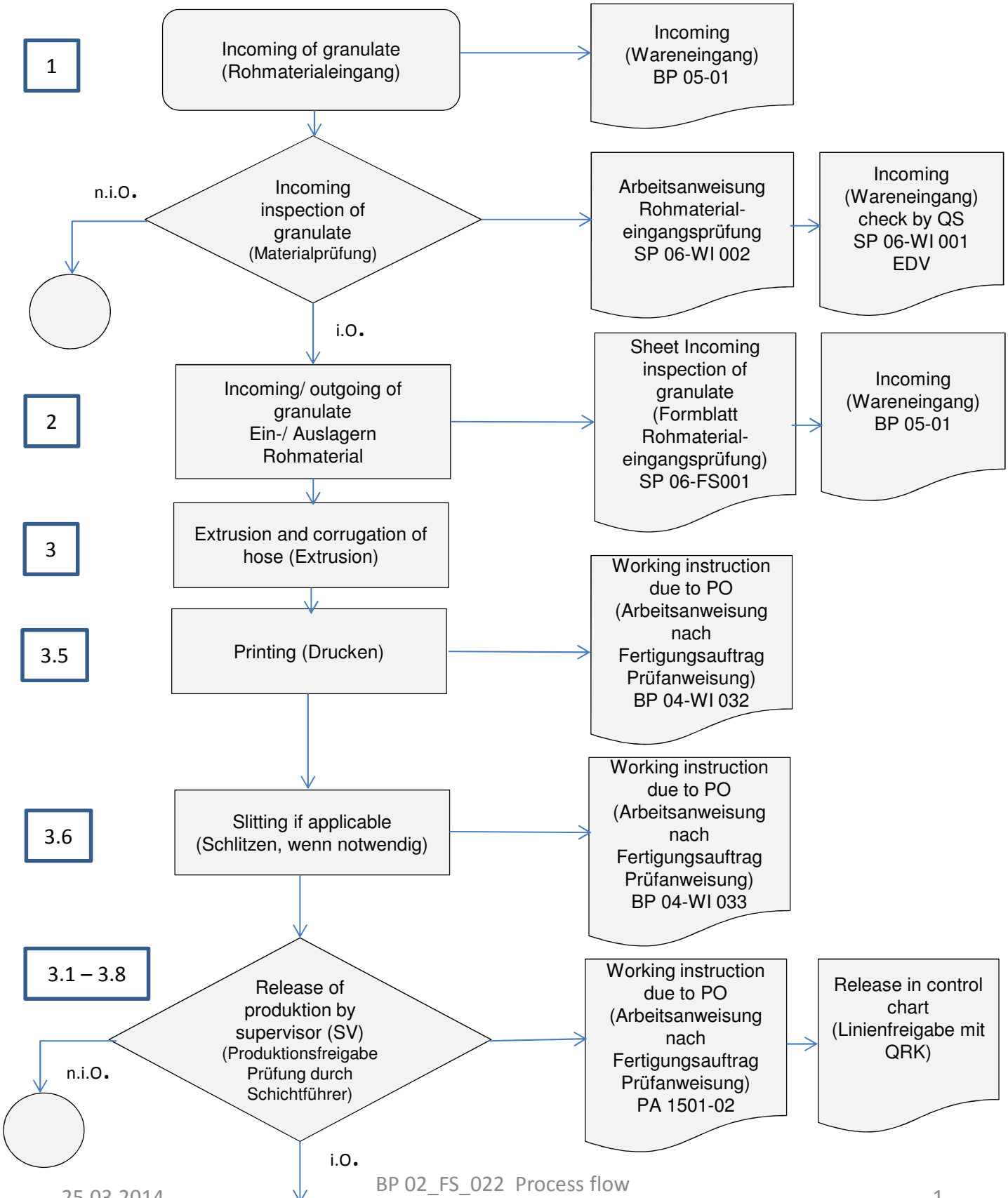
Drawing (Rev.): (Zeichnung / Index) Schlemmer drawing all standard *(für alle Standard)*	Part-Number (Supplier) all	Part Name / Description (Produktname und Bezeichnung:) corrugated standard hose with continuous geometry *Standard Wellschlauch*	Core Team: (APQP) L. Cenadi (P), D. Kolbe (QS), J. Rührseitz (PL), St. Hofmann (CQ1)	Distribution: (Verteiler:) Schlemmer

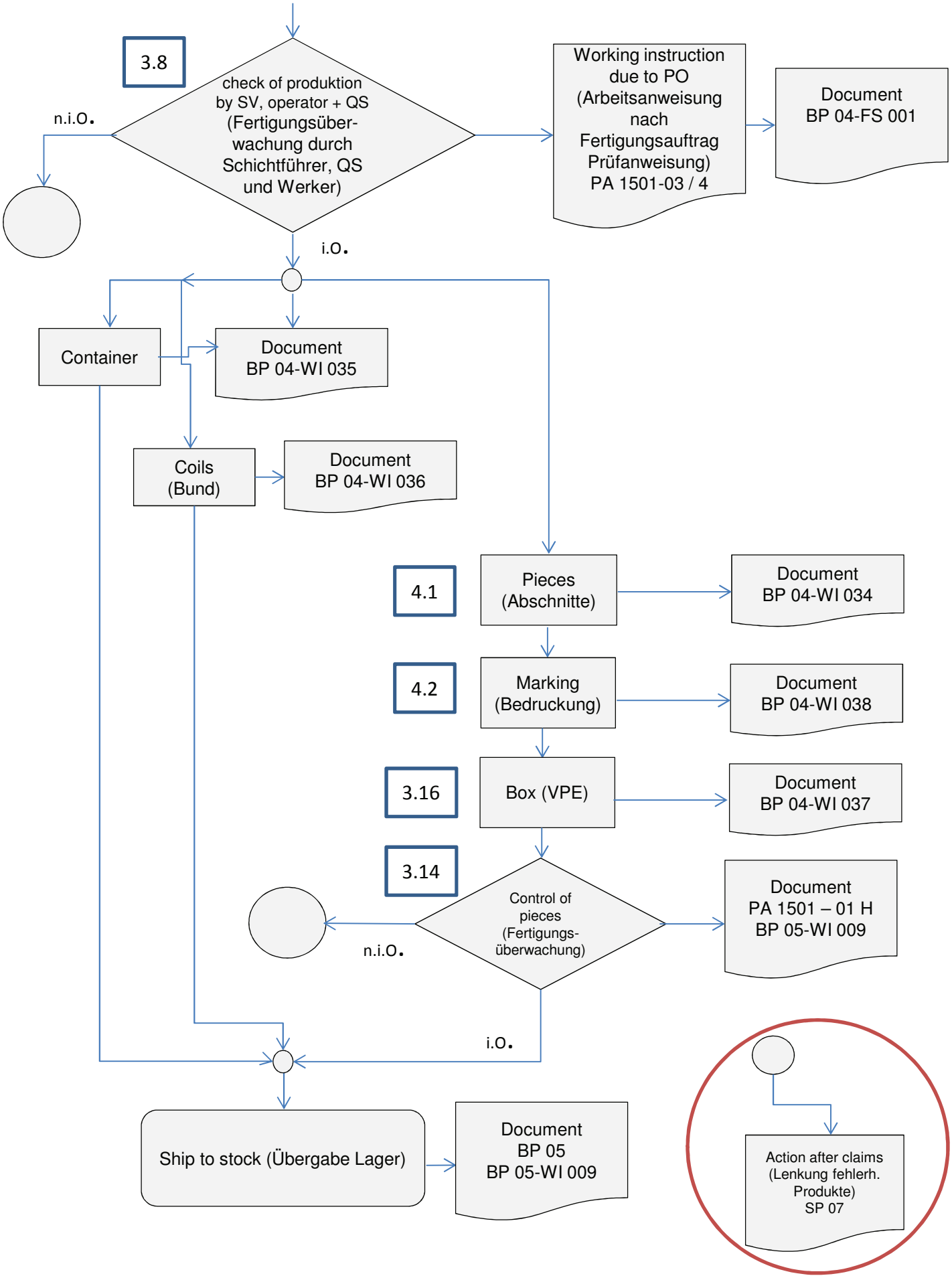
Customer Engineering Approval Date (If Req'd): Customer Quality Approval Date (If Req'd): Other Approval Date (If Req'd): (Freigabe durch Kunden [nur wenn gefordert])

Part / Process Number	Process Name / Operation Description *Arbeitsgangbeschreibung*	Machine, Tool, Device, Jig *Anlage*	Characteristics				Methods							Corrective action *Korrekturmaßnahmen*
			No.	Product	Process	Spec Char. Class	Product/Process Specification/ Tolerance	Measurement equipment *Prüfmittel*	Sample Size *Größe*	Sample Freq. *Frequenz*	Resp. *Verantwortl.*	Control Method *Methode*	Documentation	
4	final inspection (only pieces) *Abschlußüberprüfung* *(nur für Teile gültig)*		1	length *Länge*		◊	check according *Prüfung nach* PA 1501-01 e	measuring bare (multiple gauges) *Meßschiene*	sample *Muster*	every packing *jede* *Verpackung*	final control *Abschluß-* *überprüfung*	attributive check *Attributivprüfung*	none *keine*	claim to production *je nach Anfrage an die Produktion*
			2	printing *Bedruckung*		◊	check according *Prüfung nach* PA 1501-01 e	visual check *visuell*	sample *Muster*	every packing *jede* *Verpackung*	final control *Abschluß-* *überprüfung*	visual check *visuell*	none *keine*	
			3	slitting *Schlitzen*		◊	check according *Prüfung nach* PA 1501-01 e	visual check *visuell*	sample *Muster*	every packing *jede* *Verpackung*	final control *Abschluß-* *überprüfung*	visual check *visuell*	none *keine*	
			4	cut *Abschnitt*		◊	check according *Prüfung nach* PA 1501-01 e	visual check *visuell*	sample *Muster*	every packing *jede* *Verpackung*	final control *Abschluß-* *überprüfung*	visual check *visuell*	none *keine*	
			5	diameter *Durchmesser*		◊	check according *Prüfung nach* PA 1501-01 e	visual check *visuell*	sample *Muster*	every packing *jede* *Verpackung*	final control *Abschluß-* *überprüfung*	visual check *visuell*	none *keine*	
5	Requalification *Requalifizierung*		1	flammability *Flammbarkeitstest*		◊	drawing *nach Zeichnung*	burn chamber (laboratory) *Brenner* *(im QS-Labor)*	3 pcs of 3 diameter of each material *3 Teile von je 3 Durchmessern von jedem Material*	every 1 year *alle 1 Jahr*	Quality group *QS Hassf.*	attributive check *visuell*	Excel	block of stock, consultation with customer and process-development
			2	warm storaging (short term) *Wärmelagerung*		◊	drawing + specification *nach Zeichnung und Forderungen*	climate chamber (laboratory) *Temperofen* *(im QS-Labor)*	2 pcs of 3 diameter of each material *2 Teile v. je 3 Durchmessern von jedem Material*	every 1 year *alle 1 Jahr*	Quality group *QS Hassf.*	visual check *visuell*	Excel	*Ware ist bis zur letzten i.O.-Prüfung zu sperren sowie* *Kunden und eigene Entwicklungsabteilung informieren*

Process flow *(Prozeßfluß)* Corrugated standard hose *(standard Wellschlauch)*

Number *(Nr.)*	BP 02_FS_022	written *(erstellt)*	St. Hofmann	Date *(Datum)*	25.03.2014
Version	Rev.01	checked *(geprüft)*	H. Schmidt	Date *(Datum)*	25.03.2014
Date *(Datum)*	25.03.2014	approved *(freigegeben)*	S. Brotzki	Date *(Datum)*	31.03.2014




3.8
check of produktion by SV, operator + QS (Fertigungsüber-wachung durch Schichtführer, QS und Werker)
n.i.O.
i.O.
Working instruction due to PO (Arbeitsanweisung nach Fertigungsauftrag Prüfanweisung) PA 1501-03 / 4
Document BP 04-FS 001
Container
Document BP 04-WI 035
Coils (Bund)
Document BP 04-WI 036
4.1
Pieces (Abschnitte)
Document BP 04-WI 034
4.2
Marking (Bedruckung)
Document BP 04-WI 038
3.16
Box (VPE)
Document BP 04-WI 037
3.14
Control of pieces (Fertigungs-überwachung)
n.i.O.
Document PA 1501 – 01 H BP 05-WI 009
i.O.
Ship to stock (Übergabe Lager)
Document BP 05 BP 05-WI 009
Action after claims (Lenkung fehlerh. Produkte) SP 07

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1930029		Gage Name: Meßschieber digtal		Appraiser A: Ferderer J.	
Part Name: PP-BS NW 29 Ringware		Gage Number: 171274051		Appraiser B: Zobel F.	
Characteristic: Außen dm.	Specification: -0,4 0,4	Gage Type: Handmessmittel 150mm		Appraiser C: Würfel V.	
Characteristic Classification: 33,9	Einheit: mm	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 07.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	33,80	33,75	33,88	33,86	33,77	33,81	33,84	33,94	33,82	33,85	33,832
2	2	33,81	33,76	33,87	33,86	33,77	33,80	33,84	33,94	33,82	33,85	33,832
3	3	33,80	33,75	33,89	33,87	33,76	33,80	33,84	33,94	33,83	33,84	33,832
4	AVERAGE	33,803	33,753	33,880	33,863	33,767	33,803	33,840	33,940	33,823	33,847	x_a= 33,8320
5	R	0,010	0,010	0,020	0,010	0,010	0,010	0,000	0,000	0,010	0,010	r_a= 0,009
6. B	1	33,81	33,75	33,88	33,86	33,77	33,81	33,85	33,94	33,83	33,85	33,835
7	2	33,81	33,76	33,88	33,87	33,77	33,80	33,84	33,95	33,82	33,86	33,836
8	3	33,80	33,75	33,89	33,86	33,77	33,80	33,84	33,94	33,83	33,85	33,833
9	AVERAGE	33,807	33,753	33,883	33,863	33,770	33,803	33,843	33,943	33,827	33,853	x_b= 33,8347
10	R	0,010	0,010	0,010	0,010	0,000	0,010	0,010	0,010	0,010	0,010	r_b= 0,009
11. C	1	33,80	33,75	33,88	33,86	33,77	33,81	33,84	33,94	33,82	33,85	33,832
12	2	33,81	33,76	33,88	33,86	33,77	33,80	33,85	33,94	33,82	33,85	33,834
13	3	33,80	33,75	33,89	33,86	33,76	33,80	33,84	33,94	33,83	33,84	33,831
14	AVERAGE	33,803	33,753	33,883	33,860	33,767	33,803	33,843	33,940	33,823	33,847	x_c= 33,8323
15	R	0,010	0,010	0,010	0,000	0,010	0,010	0,010	0,000	0,010	0,010	r_c= 0,008
16. PART AVE		33,804	33,753	33,882	33,862	33,768	33,803	33,842	33,941	33,824	33,849	X= 33,8330 R_p= 0,188
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,0087
18	(Max x - Min x) =											x_{DIFF}= 0,0027
19	R x D_4* =											UCL_R= 0,0224

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
1930029	Meßschieber digtal		Ferderer J.	
Part Name	**Gage Number**		**Appraiser B**	
PP-BS NW 29 Ringware	171274051		Zobel F.	
Characteristic	**Gage Type**		**Appraiser C**	
Außen dm.	Handmessmittel 150mm		Würfel V.	
Characteristic Classification	**Trials**	**Parts**	**Appraisers**	**Date Performed**
33,9	3	10	3	07.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,0087 x 0,5908
= 0,00512

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0027 x 0,5231)^2 - (0,0051 ^2/(10 x 3))}^1/2
= 0,00104

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0051^2 + 0,0010^2)}^1/2
= 0,00522

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = R_P x K_3
= 0,1878 x 0,3146
= 0,05907

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0052^2 + 0,0591^2)}^1/2
= 0,05931

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,00512/0,05931)
= 8,63

% AV = 100 (AV/TV)
= 100(0,00104/0,05931)
= 1,75

% R&R = 100 (R&R/TV)
= 100(0,00522/0,05931)
= **8,81**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,05907/0,05931)
= 99,61

ndc = 1.41 (PV/GRR)
= 1.41(0,05907/0,00522)
= 15,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), Vierte Ausgabe.

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name	Appraiser A
1930029	Profilprojektor	Gräf H.
Part Name	**Gage Number**	**Appraiser B**
PP-BS NW 29 Ringware	031059	Schneider M.
Characteristic / **Specification**	**Gage Type**	**Appraiser C**
Breite Welle / -0,15 0,15	optisch ST 300	Pfaff M.

Characteristic Classification	Einheit	Trials	Parts	Appraisers	Date Performed
2,3	mm	3	10	3	08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	2,19	2,16	2,24	2,30	2,27	2,32	2,26	2,23	2,17	2,19	2,233
2	2	2,19	2,16	2,24	2,29	2,27	2,31	2,26	2,23	2,18	2,20	2,233
3	3	2,19	2,17	2,24	2,30	2,27	2,32	2,26	2,23	2,18	2,19	2,235
4	AVERAGE	2,190	2,163	2,240	2,297	2,270	2,317	2,260	2,230	2,177	2,193	x_a= 2,2337
5	R	0,000	0,010	0,000	0,010	0,000	0,010	0,000	0,000	0,010	0,010	r_a= 0,005
6. B	1	2,20	2,16	2,24	2,30	2,27	2,32	2,26	2,23	2,17	2,19	2,234
7	2	2,19	2,17	2,25	2,29	2,27	2,31	2,26	2,23	2,17	2,19	2,233
8	3	2,20	2,17	2,24	2,30	2,27	2,32	2,25	2,23	2,18	2,19	2,235
9	AVERAGE	2,197	2,167	2,243	2,297	2,270	2,317	2,257	2,230	2,173	2,190	x_b= 2,2340
10	R	0,010	0,010	0,010	0,010	0,000	0,010	0,010	0,000	0,010	0,000	r_b= 0,007
11. C	1	2,20	2,16	2,25	2,30	2,27	2,32	2,25	2,24	2,18	2,20	2,237
12	2	2,19	2,17	2,25	2,29	2,28	2,32	2,26	2,23	2,17	2,20	2,236
13	3	2,20	2,17	2,24	2,30	2,27	2,32	2,26	2,23	2,18	2,19	2,236
14	AVERAGE	2,197	2,167	2,247	2,297	2,273	2,320	2,257	2,233	2,177	2,197	x_c= 2,2363
15	R	0,010	0,010	0,010	0,010	0,010	0,000	0,010	0,010	0,010	0,010	r_c= 0,009
16. PART AVE		2,194	2,166	2,243	2,297	2,271	2,318	2,258	2,231	2,176	2,193	X= 2,2347 R_p= 0,152
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,0070
18	(Max x - Min x) =											x_{DIFF}= 0,0027
19	R x D_4* =											UCL_R= 0,0181

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
1930029	Profilprojektor		Gräf H.	
Part Name	**Gage Number**		**Appraiser B**	
PP-BS NW 29 Ringware	031059		Schneider M.	
Characteristic	**Gage Type**		**Appraiser C**	
Breite Welle	optisch ST 300		Pfaff M.	
Characteristic Classification	**Trials**	**Parts**	**Appraisers**	**Date Performed**
2,3	3	10	3	08.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,0070 x 0,5908
= 0,00414

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0027 x 0,5231)^2 - (0,0041 ^2/(10 x 3))}^1/2
= 0,00117

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0041^2 + 0,0012^2)}^1/2
= 0,00430

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = R_P x K_3
= 0,1522 x 0,3146
= 0,04789

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0043^2 + 0,0479^2)}^1/2
= 0,04808

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,00414/0,04808)
= 8,60

% AV = 100 (AV/TV)
= 100(0,00117/0,04808)
= 2,44

% R&R = 100 (R&R/TV)
= 100(0,00430/0,04808)
= **8,94**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,04789/0,04808)
= 99,60

ndc = 1.41 (PV/GRR)
= 1.41(0,04789/0,00430)
= 15,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), Vierte Ausgabe.

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Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1930029		Gage Name: Profilprojektor		Appraiser A: Gräf H.	
Part Name: PP-BS NW 29 Ringware		Gage Number: 031059		Appraiser B: Schneider M.	
Characteristic: FL-Winkel	Specification: -4 4	Gage Type: optisch ST 300		Appraiser C: Pfaff M.	
Characteristic Classification: 11,0	Einheit: grad	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	10,00	12,50	11,30	11,50	12,00	12,00	11,50	11,00	13,00	13,00	11,780
2	2	10,00	12,50	11,00	12,00	12,00	12,00	11,50	11,00	13,20	13,00	11,820
3	3	10,00	12,30	11,00	11,50	12,00	11,80	11,50	11,00	13,20	13,00	11,730
4	AVERAGE	10,000	12,433	11,100	11,667	12,000	11,933	11,500	11,000	13,133	13,000	x_a= 11,7767
5	R	0,000	0,200	0,300	0,500	0,000	0,200	0,000	0,000	0,200	0,000	r_a= 0,140
6. B	1	10,00	12,30	11,00	11,50	12,00	11,80	11,50	11,00	13,20	13,00	11,730
7	2	10,00	12,50	11,30	11,50	12,00	12,00	11,50	11,00	13,00	13,20	11,800
8	3	10,00	12,50	11,00	11,50	12,00	12,00	11,50	11,00	13,00	13,00	11,750
9	AVERAGE	10,000	12,433	11,100	11,500	12,000	11,933	11,500	11,000	13,067	13,067	x_b= 11,7600
10	R	0,000	0,200	0,300	0,000	0,000	0,200	0,000	0,000	0,200	0,200	r_b= 0,110
11. C	1	10,00	12,50	11,00	12,00	12,00	12,00	11,50	11,00	13,20	13,00	11,820
12	2	10,00	12,30	11,30	11,50	12,30	12,00	11,50	11,00	13,00	13,00	11,790
13	3	10,00	12,50	11,30	11,50	12,00	12,00	11,50	11,00	13,00	13,20	11,800
14	AVERAGE	10,000	12,433	11,200	11,667	12,100	12,000	11,500	11,000	13,067	13,067	x_c= 11,8033
15	R	0,000	0,200	0,300	0,500	0,300	0,000	0,000	0,000	0,200	0,200	r_c= 0,170
16. PART AVE		10,000	12,433	11,133	11,611	12,033	11,956	11,500	11,000	13,089	13,044	X= 11,7800 / R_p= 3,089
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,1400
18	(Max x - Min x) =											x_{DIFF}= 0,0433
19	R x D_4* =	APPRAISER	A	C								UCL_R= 0,3612

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1930029	Gage Name: Profilprojektor		Appraiser A: Gräf H.	
Part Name: PP-BS NW 29 Ringware	Gage Number: 031059		Appraiser B: Schneider M.	
Characteristic: FL-Winkel	Gage Type: optisch ST 300		Appraiser C: Pfaff M.	
Characteristic Classification: 11	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 08.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,1400 x 0,5908
= 0,08271

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0433 x 0,5231)^2 - (0,0827 ^2/(10 x 3))}^1/2
= 0,01691

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0827^2 + 0,0169^2)}^1/2
= 0,08442

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = $R_P \times K_3$
= 3,0889 x 0,3146
= 0,97176

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0844^2 + 0,9718^2)}^1/2
= 0,97542

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,08271/0,97542)
= 8,48

% AV = 100 (AV/TV)
= 100(0,01691/0,97542)
= 1,73

% R&R = 100 (R&R/TV)
= 100(0,08442/0,97542)
= **8,65**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,97176/0,97542)
= 99,62

ndc = 1.41 (PV/GRR)
= 1.41(0,97176/0,08442)
= 16,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number		Gage Name		Appraiser A	
1930029		Waage digital		Ferderer J.	
Part Name		**Gage Number**		**Appraiser B**	
PP-BS NW 29 Ringware		80604645		Zobel F.	
Characteristic	**Specification**	**Gage Type**		**Appraiser C**	
Gewicht: g/m	-2 2	Sartorius, Auflösung 0,1g		Würfel V.	
Characteristic Classification	**Einheit**	**Trials**	**Parts**	**Appraisers**	**Date Performed**
66,0	mm	3	10	3	08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	66,30	66,00	65,20	65,40	66,50	66,20	65,20	65,80	67,30	67,00	66,090
2	2	66,30	65,90	65,20	65,30	66,50	66,10	65,20	65,80	67,30	67,00	66,060
3	3	66,30	66,00	65,20	65,40	66,50	66,10	65,20	65,80	67,30	66,90	66,070
4	AVERAGE	66,300	65,967	65,200	65,367	66,500	66,133	65,200	65,800	67,300	66,967	x_a= 66,0733
5	R	0,000	0,100	0,000	0,100	0,000	0,100	0,000	0,000	0,000	0,100	r_a= 0,040
6. B	1	66,30	66,00	65,20	65,40	66,50	66,10	65,20	65,80	67,30	67,00	66,080
7	2	66,30	65,90	65,20	65,30	66,50	66,20	65,20	65,80	67,30	67,00	66,070
8	3	66,30	66,00	65,20	65,40	66,50	66,10	65,20	65,70	67,30	67,00	66,070
9	AVERAGE	66,300	65,967	65,200	65,367	66,500	66,133	65,200	65,767	67,300	67,000	x_b= 66,0733
10	R	0,000	0,100	0,000	0,100	0,000	0,100	0,000	0,100	0,000	0,000	r_b= 0,040
11. C	1	66,30	66,00	65,20	65,40	66,50	66,20	65,20	65,80	67,30	67,00	66,090
12	2	66,30	65,90	65,20	65,30	66,50	66,20	65,20	65,80	67,30	67,00	66,070
13	3	66,30	66,00	65,20	65,40	66,50	66,10	65,20	65,80	67,30	66,90	66,070
14	AVERAGE	66,300	65,967	65,200	65,367	66,500	66,167	65,200	65,800	67,300	66,967	x_c= 66,0767
15	R	0,000	0,100	0,000	0,100	0,000	0,100	0,000	0,000	0,000	0,100	r_c= 0,040
16. PART AVE		66,300	65,967	65,200	65,367	66,500	66,144	65,200	65,789	67,300	66,978	X= 66,0744 R_p= 2,100
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,0400
18	(Max x - Min x) =											x_{DIFF}= 0,0033
19	R x D_4* =											UCL_R= 0,1032

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
1930029	Waage digital		Ferderer J.	
Part Name	**Gage Number**		**Appraiser B**	
PP-BS NW 29 Ringware	80604645		Zobel F.	
Characteristic	**Gage Type**		**Appraiser C**	
Gewicht: g/m	Sartorius, Auflösung 0,1g		Würfel V.	
Characteristic Classification	**Trials**	**Parts**	**Appraisers**	**Date Performed**
66	3	10	3	08.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,0400 x 0,5908
= 0,02363

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0033 x 0,5231)^2 - (0,0236 ^2/(10 x 3))}^1/2
= 0,00000

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0236^2 + 0,0000^2)}^1/2
= 0,02363

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = $R_P \times K_3$
= 2,1000 x 0,3146
= 0,66066

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0236^2 + 0,6607^2)}^1/2
= 0,66108

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,02363/0,66108)
= 3,57

% AV = 100 (AV/TV)
= 100(0,00000/0,66108)
= 0,00

% R&R = 100 (R&R/TV)
= 100(0,02363/0,66108)
= **3,57**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,66066/0,66108)
= 99,94

ndc = 1.41 (PV/GRR)
= 1.41(0,66066/0,02363)
= 39,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), Vierte Ausgabe.

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name	Appraiser A
1930029	Meßschieber digtal	Ferderer J.
Part Name	**Gage Number**	**Appraiser B**
PP-BS NW 29 Ringware	171274051	Zobel F.
Characteristic / **Specification**	**Gage Type**	**Appraiser C**
Innen dm. / -0,4 0,4	Handmessmittel 150mm	Würfel V.

Characteristic Classification	Einheit	Trials	Parts	Appraisers	Date Performed
29,3	mm	3	10	3	07.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE	
1. A	1	29,18	29,22	29,32	29,41	29,45	29,29	29,28	29,22	29,26	29,26		29,289
2	2	29,19	29,23	29,31	29,40	29,44	29,28	29,28	29,21	29,24	29,25		29,283
3	3	29,19	29,22	29,32	29,40	29,44	29,28	29,28	29,22	29,24	29,26		29,285
4	AVERAGE	29,187	29,223	29,317	29,403	29,443	29,283	29,280	29,217	29,247	29,257	x_a=	29,2857
5	R	0,010	0,010	0,010	0,010	0,010	0,010	0,000	0,010	0,020	0,010	r_a=	0,010
6. B	1	29,18	29,22	29,32	29,41	29,45	29,29	29,28	29,22	29,26	29,26		29,289
7	2	29,19	29,23	29,31	29,41	29,43	29,27	29,27	29,21	29,24	29,24		29,280
8	3	29,19	29,22	29,32	29,40	29,44	29,28	29,28	29,22	29,24	29,26		29,285
9	AVERAGE	29,187	29,223	29,317	29,407	29,440	29,280	29,277	29,217	29,247	29,253	x_b=	29,2847
10	R	0,010	0,010	0,010	0,010	0,020	0,020	0,010	0,010	0,020	0,020	r_b=	0,014
11. C	1	29,18	29,22	29,30	29,41	29,45	29,29	29,26	29,22	29,26	29,26		29,285
12	2	29,17	29,21	29,31	29,41	29,44	29,28	29,28	29,23	29,25	29,25		29,283
13	3	29,19	29,22	29,32	29,40	29,44	29,28	29,28	29,22	29,24	29,24		29,283
14	AVERAGE	29,180	29,217	29,310	29,407	29,443	29,283	29,273	29,223	29,250	29,250	x_c=	29,2837
15	R	0,020	0,010	0,020	0,010	0,010	0,010	0,020	0,010	0,020	0,020	r_c=	0,015
16. PART AVE		29,184	29,221	29,314	29,406	29,442	29,282	29,277	29,219	29,248	29,253	X= / R_p=	29,2847 / 0,258
17	(r_a + r_b + r_c) / (# OF APPRAISERS) =											R=	0,0130
18	(Max x - Min x) =											x_{DIFF}=	0,0020
19	R x D_4* =											UCL_R=	0,0335

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
1930029	Meßschieber digtal		Ferderer J.	
Part Name	**Gage Number**		**Appraiser B**	
PP-BS NW 29 Ringware	171274051		Zobel F.	
Characteristic	**Gage Type**		**Appraiser C**	
Innen dm.	Handmessmittel 150mm		Würfel V.	
Characteristic Classification	**Trials**	**Parts**	**Appraisers**	**Date Performed**
29,3	3	10	3	07.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,0130 x 0,5908
= 0,00768

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0020 x 0,5231)^2 - (0,0077 ^2/(10 x 3))}^1/2
= 0,00000

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0077^2 + 0,0000^2)}^1/2
= 0,00768

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = $R_P \times K_3$
= 0,2578 x 0,3146
= 0,08110

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0077^2 + 0,0811^2)}^1/2
= 0,08146

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,00768/0,08146)
= 9,43

% AV = 100 (AV/TV)
= 100(0,00000/0,08146)
= 0,00

% R&R = 100 (R&R/TV)
= 100(0,00768/0,08146)
= **9,43**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,08110/0,08146)
= 99,55

ndc = 1.41 (PV/GRR)
= 1.41(0,08110/0,00768)
= 14,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name	Appraiser A
1930029	Profilprojektor	Gräf H.
Part Name	**Gage Number**	**Appraiser B**
PP-BS NW 29 Ringware	031059	Schneider M.
Characteristic / **Specification**	**Gage Type**	**Appraiser C**
Teilung / -0,15 0,15	optisch ST 300	Pfaff M.

Characteristic Classification	Einheit	Trials	Parts	Appraisers	Date Performed
3,4	mm	3	10	3	08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	3,36	3,40	3,45	3,42	3,48	3,50	3,51	3,44	3,47	3,37	3,440
2	2	3,35	3,41	3,45	3,42	3,47	3,49	3,51	3,44	3,47	3,38	3,439
3	3	3,35	3,40	3,45	3,42	3,48	3,50	3,51	3,45	3,46	3,37	3,439
4	AVERAGE	3,353	3,403	3,450	3,420	3,477	3,497	3,510	3,443	3,467	3,373	x_a= 3,4393
5	R	0,010	0,010	0,000	0,000	0,010	0,010	0,000	0,010	0,010	0,010	r_a= 0,007
6. B	1	3,36	3,40	3,45	3,42	3,48	3,50	3,52	3,45	3,46	3,37	3,441
7	2	3,35	3,41	3,44	3,42	3,47	3,49	3,52	3,44	3,47	3,38	3,439
8	3	3,35	3,40	3,45	3,42	3,48	3,50	3,52	3,44	3,47	3,37	3,440
9	AVERAGE	3,353	3,403	3,447	3,420	3,477	3,497	3,520	3,443	3,467	3,373	x_b= 3,4400
10	R	0,010	0,010	0,010	0,000	0,010	0,010	0,000	0,010	0,010	0,010	r_b= 0,008
11. C	1	3,36	3,40	3,45	3,43	3,48	3,50	3,52	3,44	3,46	3,38	3,442
12	2	3,36	3,41	3,44	3,42	3,48	3,49	3,52	3,44	3,46	3,38	3,440
13	3	3,36	3,40	3,45	3,42	3,48	3,50	3,52	3,45	3,47	3,37	3,442
14	AVERAGE	3,360	3,403	3,447	3,423	3,480	3,497	3,520	3,443	3,463	3,377	x_c= 3,4413
15	R	0,000	0,010	0,010	0,010	0,000	0,010	0,000	0,010	0,010	0,010	r_c= 0,007
16. PART AVE		3,356	3,403	3,448	3,421	3,478	3,497	3,517	3,443	3,466	3,374	X= 3,4402 / R_p= 0,161
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,0073
18	(Max x - Min x) =											x_{DIFF}= 0,0020
19	R x D_4* =											UCL_R= 0,0189

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1930029	Gage Name: Profilprojektor		Appraiser A: Gräf H.	
Part Name: PP-BS NW 29 Ringware	Gage Number: 031059		Appraiser B: Schneider M.	
Characteristic: Teilung	Gage Type: optisch ST 300		Appraiser C: Pfaff M.	
Characteristic Classification: 3,4	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 08.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,0073 x 0,5908
= 0,00433

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0020 x 0,5231)^2 - (0,0043 ^2/(10 x 3))}^1/2
= 0,00068

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0043^2 + 0,0007^2)}^1/2
= 0,00439

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = R_P x K_3
= 0,1611 x 0,3146
= 0,05069

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0044^2 + 0,0507^2)}^1/2
= 0,05087

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,00433/0,05087)
= 8,52

% AV = 100 (AV/TV)
= 100(0,00068/0,05087)
= 1,35

% R&R = 100 (R&R/TV)
= 100(0,00439/0,05087)
= **8,62**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,05069/0,05087)
= 99,63

ndc = 1.41 (PV/GRR)
= 1.41(0,05069/0,00439)
= 16,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1930029		Gage Name: Meßschieber digtal		Appraiser A: Ferderer J.	
Part Name: PP-BS NW 29 Ringware		Gage Number: 171274051		Appraiser B: Zobel F.	
Characteristic: Wanddicke	Specification: 0,3 0,6	Gage Type: Handmessmittel 150mm		Appraiser C: Würfel V.	
Characteristic Classification: 0,3	Einheit: mm	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	0,43	0,45	0,47	0,41	0,51	0,53	0,42	0,48	0,55	0,54	0,479
2	2	0,42	0,45	0,47	0,42	0,50	0,53	0,43	0,47	0,55	0,55	0,479
3	3	0,43	0,45	0,47	0,41	0,50	0,53	0,42	0,47	0,55	0,55	0,478
4	AVERAGE	0,427	0,450	0,470	0,413	0,503	0,530	0,423	0,473	0,550	0,547	x_a= 0,4787
5	R	0,010	0,000	0,000	0,010	0,010	0,000	0,010	0,010	0,000	0,010	r_a= 0,006
6. B	1	0,44	0,45	0,47	0,41	0,51	0,53	0,42	0,48	0,55	0,55	0,481
7	2	0,43	0,46	0,47	0,40	0,51	0,53	0,43	0,47	0,56	0,54	0,480
8	3	0,43	0,45	0,47	0,40	0,50	0,53	0,42	0,47	0,55	0,55	0,477
9	AVERAGE	0,433	0,453	0,470	0,403	0,507	0,530	0,423	0,473	0,553	0,547	x_b= 0,4793
10	R	0,010	0,010	0,000	0,010	0,010	0,000	0,010	0,010	0,010	0,010	r_b= 0,008
11. C	1	0,43	0,46	0,47	0,41	0,51	0,53	0,42	0,48	0,56	0,55	0,482
12	2	0,42	0,45	0,47	0,42	0,52	0,53	0,43	0,48	0,55	0,55	0,482
13	3	0,43	0,46	0,47	0,41	0,52	0,53	0,42	0,48	0,55	0,54	0,481
14	AVERAGE	0,427	0,457	0,470	0,413	0,517	0,530	0,423	0,480	0,553	0,547	x_c= 0,4817
15	R	0,010	0,010	0,000	0,010	0,010	0,000	0,010	0,000	0,010	0,010	r_c= 0,007
16. PART AVE		0,429	0,453	0,470	0,410	0,509	0,530	0,423	0,476	0,552	0,547	X= 0,4799 R_p= 0,142
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,0070
18	(Max x - Min x) =											x_{DIFF}= 0,0030
19	R x D_4* =											UCL_R= 0,0181

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number	Gage Name		Appraiser A	
1930029	Meßschieber digtal		Ferderer J.	
Part Name	**Gage Number**		**Appraiser B**	
PP-BS NW 29 Ringware	171274051		Zobel F.	
Characteristic	**Gage Type**		**Appraiser C**	
Wanddicke	Handmessmittel 150mm		Würfel V.	
Characteristic Classification	**Trials**	**Parts**	**Appraisers**	**Date Performed**
0,3	3	10	3	08.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,0070 x 0,5908
= 0,00414

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0030 x 0,5231)^2 - (0,0041 ^2/(10 x 3))}^1/2
= 0,00138

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0041^2 + 0,0014^2)}^1/2
= 0,00436

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = $R_P \times K_3$
= 0,1422 x 0,3146
= 0,04474

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0044^2 + 0,0447^2)}^1/2
= 0,04495

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,00414/0,04495)
= 9,20

% AV = 100 (AV/TV)
= 100(0,00138/0,04495)
= 3,06

% R&R = 100 (R&R/TV)
= 100(0,00436/0,04495)
= **9,70**

Gage system O.K

% PV = 100 (PV/TV)
= 100(0,04474/0,04495)
= 99,53

ndc = 1.41 (PV/GRR)
= 1.41(0,04474/0,00436)
= 14,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.

Schlemmer

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1968230		Gage Name: Meßschiene 1m		Appraiser A: Ferderer J.	
Part Name: PP-BS NW 29 ges. Stücke		Gage Number: 10011		Appraiser B: Zobel F.	
Characteristic: Länge	Specification: 0 7	Gage Type: Stahllineal 1000mm		Appraiser C: Würfel V.	
Characteristic Classification: 40,0	Einheit: mm	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	43,00	45,00	44,00	45,00	46,00	45,00	46,00	44,00	42,00	43,00	44,300
2	2	43,00	44,50	44,00	45,00	46,00	45,00	46,00	44,50	42,00	43,00	44,300
3	3	43,00	45,00	44,00	45,50	46,00	45,00	46,00	44,00	42,00	43,00	44,350
4	AVERAGE	43,000	44,833	44,000	45,167	46,000	45,000	46,000	44,167	42,000	43,000	x_a= 44,3167
5	R	0,000	0,500	0,000	0,500	0,000	0,000	0,000	0,500	0,000	0,000	r_a= 0,150
6. B	1	43,00	45,00	44,50	45,00	46,00	45,00	46,00	44,00	42,00	43,00	44,350
7	2	43,00	44,50	44,00	45,00	46,00	45,00	46,00	44,50	42,00	43,00	44,300
8	3	43,00	45,00	44,00	45,00	46,00	45,00	46,00	44,00	42,00	43,00	44,300
9	AVERAGE	43,000	44,833	44,167	45,000	46,000	45,000	46,000	44,167	42,000	43,000	x_b= 44,3167
10	R	0,000	0,500	0,500	0,000	0,000	0,000	0,000	0,500	0,000	0,000	r_b= 0,150
11. C	1	43,00	45,00	44,00	45,00	46,00	45,00	46,00	44,00	42,00	43,00	44,300
12	2	43,00	44,50	44,00	45,50	46,00	45,00	46,00	44,00	42,00	43,50	44,350
13	3	43,00	45,00	44,00	45,00	46,00	45,00	46,00	44,00	42,00	43,00	44,300
14	AVERAGE	43,000	44,833	44,000	45,167	46,000	45,000	46,000	44,000	42,000	43,167	x_c= 44,3167
15	R	0,000	0,500	0,000	0,500	0,000	0,000	0,000	0,000	0,000	0,500	r_c= 0,150
16. PART AVE		43,000	44,833	44,056	45,111	46,000	45,000	46,000	44,111	42,000	43,056	X= 44,3167 R_p= 4,000
17	$(r_a + r_b + r_c)$ / (# OF APPRAISERS) =											R= 0,1500
18	(Max x - Min x) =											x_{DIFF}= 0,0000
19	R x D_4* =				APPRAISER	A		B		C		UCL_R= 0,3870

* D4 =3.27 for 2 trials and 2.58 for 3 trials. UCLR represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes: diese Untersuchung glit auch für Container und Stückware.

Messmittelfähigkeit

Schlemmer

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS

Part Number: 1968230	Gage Name: Meßschiene 1m		Appraiser A: Ferderer J.	
Part Name: PP-BS NW 29 ges. Stücke	Gage Number: 10011		Appraiser B: Zobel F.	
Characteristic: Länge	Gage Type: Stahllineal 1000mm		Appraiser C: Würfel V.	
Characteristic Classification: 40	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 08.05.15

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = R x K_1
= 0,1500 x 0,5908
= 0,08862

Trials	K1
2	0,8862
3	0,5908

Reproducibility - Appraiser Variation (AV)

AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0,0000 x 0,5231)^2 - (0,0886 ^2/(10 x 3))}^1/2
= 0,00000

n = parts r = trials

Appraisers	2	3
K_2	0,7071	0,5231

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0,0886^2 + 0,0000^2)}^1/2
= 0,08862

Parts	K_3
2	0,7071
3	0,5231
4	0,4467
5	0,4030
6	0,3742
7	0,3534
8	0,3375
9	0,3249
10	0,3146

Part Variation (PV)

PV = $R_P \times K_3$
= 4,0000 x 0,3146
= 1,25840

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0,0886^2 + 1,2584^2)}^1/2
= 1,26152

% Tolerance (Tol)

% EV = 100 (EV/TV)
= 100(0,08862/1,26152)
= 7,02

% AV = 100 (AV/TV)
= 100(0,00000/1,26152)
= 0,00

% R&R = 100 (R&R/TV)
= 100(0,08862/1,26152)
= **7,02**

Gage system O.K

% PV = 100 (PV/TV)
= 100(1,25840/1,26152)
= 99,75

ndc = 1.41 (PV/GRR)
= 1.41(1,25840/0,08862)
= 20,000

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.

Prozessfähigkeit (Langzeit)

Daten und Werte

Artikel-Bez.:	WR ; PP-BS sw. NW 19
Artikel-Nr.:	1931019
Form:	ungeschlitzt
Merkmal:	Innendurchmesser
Vorgang:	Extrusion
Prüfer:	M.Schneider
Prüfzeitraum:	31.07.15 bis 31.07.15

Nennwert:	**19,400**
+Toleranz:	**0,400**
-Toleranz:	**0,400**

Berechnung

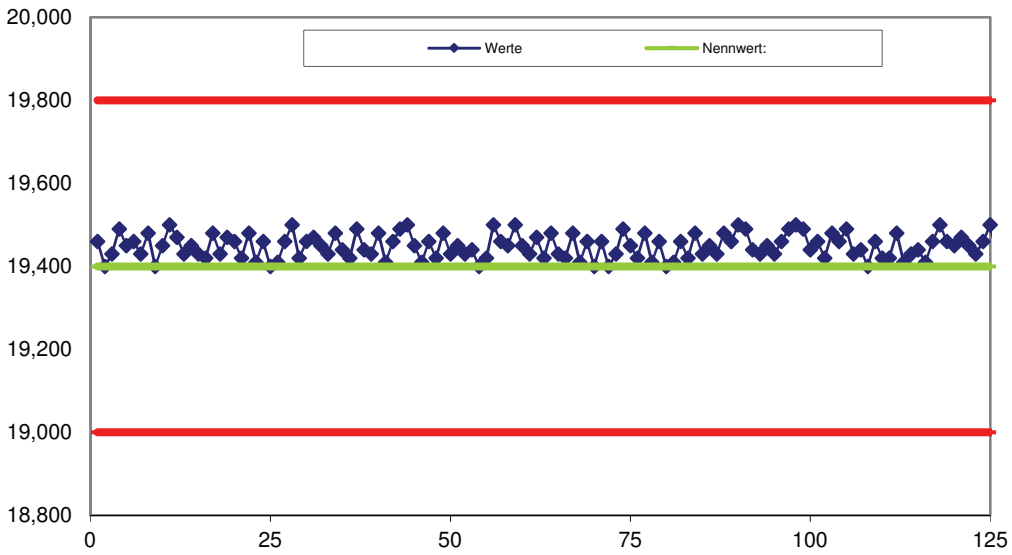
$$\bar{x} = \frac{\sum x}{n} \qquad \hat{\mu} = \bar{\bar{x}} = \frac{1}{k}\sum_{i=1}^{k} \bar{x}_i \qquad R = x\,\max . - x\,\min .$$

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} \qquad \hat{\sigma} = \sqrt{(\frac{1}{k}\sum_{i=1}^{k} S_i)^2} = \sqrt{\bar{S}^2}$$

$$C_{pu} = \frac{\hat{\mu} - UGW}{3\hat{\sigma}} \qquad C_{po} = \frac{OGW - \hat{\mu}}{3\hat{\sigma}}$$

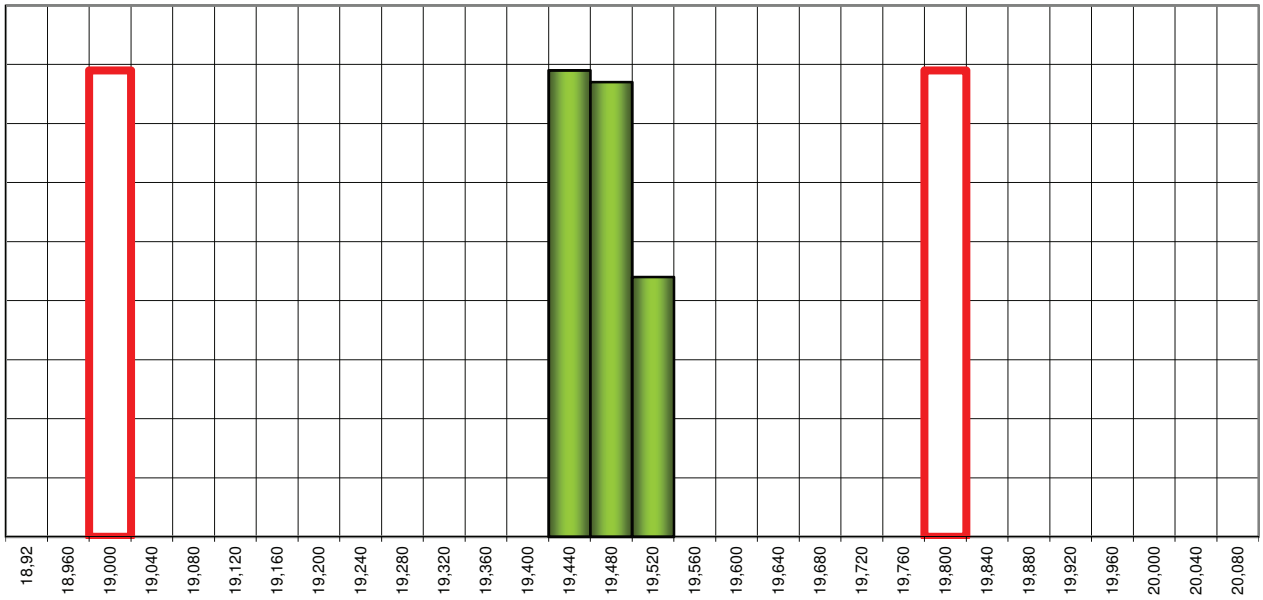
$$C_{pk} = \min .(C_{po}, C_{pu}) \qquad C_{pk} \geq 1{,}33$$

Grundgesamtheit	
Stichprobe 'k	40 à 5
n	200
$\hat{\mu}$	19,448
max.	19,500
min.	19,400
R	0,100
1x $\hat{\sigma}$	0,026
6x $\hat{\sigma}$	0,154
OGW	19,800
UGW	19,000



Fehleranteil	
P_{ob}	0,000%
P_{un}	0,000%
P	0,000%

Prozessfähigkeit	
C_{po}	4,567
C_{pu}	5,812
C_{pk}	**4,567**



Prozessfähigkeit (Langzeit)

Daten und Werte

Artikel-Bez.:	WR ; PP-BS sw. NW 19
Artikel-Nr.:	1931019
Form:	ungeschlitzt
Merkmal:	Außendurchmesser
Vorgang:	Extrusion
Prüfer:	M.Schneider
Prüfzeitraum:	11.01.16 bis 11.01.16

Nennwert:	**24,000**
+Toleranz:	**0,400**
-Toleranz:	**0,400**

Berechnung

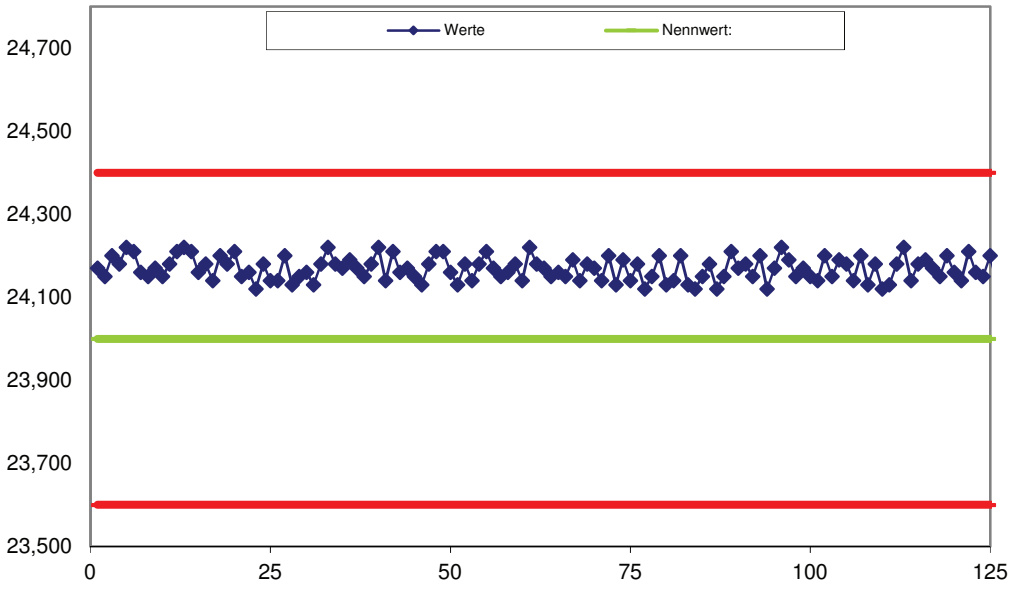
$$\bar{x} = \frac{\sum x}{n} \qquad \hat{\mu} = \bar{\bar{x}} = \frac{1}{k}\sum_{i=1}^{k} \bar{x}_i \qquad R = x\,\max . - x\,\min .$$

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} \qquad \hat{\sigma} = \sqrt{\left(\frac{1}{k}\sum_{i=1}^{k} S_i\right)^2} = \sqrt{\bar{S}^2}$$

$$C_{pu} = \frac{\hat{\mu} - UGW}{3\hat{\sigma}} \qquad C_{po} = \frac{OGW - \hat{\mu}}{3\hat{\sigma}}$$

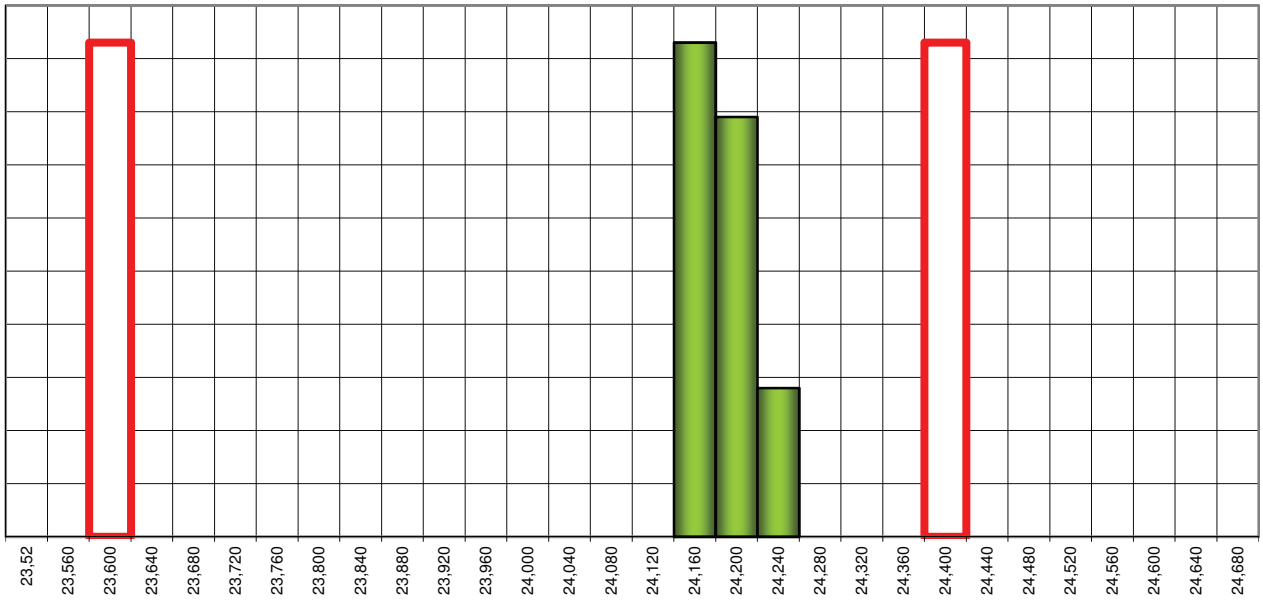
$$C_{pk} = \min .(C_{po}, C_{pu}) \qquad C_{pk} \geq 1{,}33$$

Grundgesamtheit	
Stichprobe 'k	40 à 5
n	200
$\hat{\mu}$	24,169
max.	24,220
min.	24,120
R	0,100
1x $\hat{\sigma}$	0,026
6x $\hat{\sigma}$	0,158
OGW	24,400
UGW	23,600



Fehleranteil	
P_{ob}	0,000%
P_{un}	0,000%
P	0,000%

Prozessfähigkeit	
C_{po}	2,933
C_{pu}	7,204
C_{pk}	**2,933**



CERTIFICATE OF QUALITY

Schlemmer - Materialdescription
S.R.S. PP 2050

	PROPERTY	TEST-CONDITION	TESTSPECIFICATION	UNIT	TYPICAL VALUE
mechanical	Tensile stress at yield	50 mm/min	ISO 527 -1/-2	MPa	22
	Elongation at yield		ISO 527 -1/-2	%	6
	Tensile stress at break		ISO 527 -1/-2	MPa	
	Elongation at break	50 mm/min	ISO 527 -1/-2	%	> 250
	Tensile modulus	50 mm/min	ISO 527 -1/-2	MPa	1070
	CHARPY impact strength	23°C	ISO 179 / 1eU	kJ/m^2	50
		-20°C		kJ/m^2	3
	CHARPY notched impact strength	23°C	ISO 179 / 1eA	kJ/m^2	
		-30°C		kJ/m^2	
	IZOD notched impact strength	23°C	ISO 180 / 1A	kJ/m^2	65,5
		-40°C		kJ/m^2	5,2
thermal	Melting temperature		ISO 11357	°C	164
	Heat deflection temperature		ISO 75		
	Method A	1,8 MPa		°C	48
	Method B	0,45 MPa		°C	
	Vicat softening temperature		ISO 306		
	Method A	10 N		°C	
	Method B	50 N		°C	
	Linear thermal expansion	23 - 55 °C	ISO 11359	$10^{-4}/K$	
	Flammability		FMVSS 302		Typ B
	Flammability acc. UL94	1,6 mm	IEC 60695		HB
		3,2 mm			
electrical	Comparative tracking index		IEC 60112		
	Test solution A	50 drops value			600
	Electric strength		IEC 60243-1	kV/mm	23,5
	Volume resistivity		IEC 60093	Ω cm	
	Relative permittivity	23°C, 100 Hz	IEC 60250		
		23°C, 1 MHz			
	Dissipation factor	23°C, 100 Hz	IEC 60250	10^{-4}	
		23°C, 1 MHz		10^{-4}	
general	Density	23°C	ISO 1183	g/cm^3	0,92
	Water absorption	23°C, saturation	ISO 62	%	
		23°C, 50% r. h.		%	
	Shore hardness	Method D	ISO 868		60
	Ball indentation hardness	H 961/30	ISO 2039	MPa	
		H 358/30		MPa	

The values given above are, if not particularly noted differently, determined on undyed test parts at room temperature.
The details have to be regarded as guidelines, but not as guaranteed minimum values, because characteristics can be considerable influenced through tool design and processing conditions. This statement is not of binding nature.

Updated: 12.07.2012 / Development

Safety Data Sheet

(according to directive 91/155/EEC)

Schlemmer Product Name

S.R.S. PP 2050

1. Chemical product and company identification

S.R.S. PP 2050

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2. Composition / information on ingredients

This chemical product is a composition.
Chemical name: polypropylene.
Generic name: polyolefines.
Contains no substances classified as hazardous, in concentrations which should be taken into account according to EC directives.

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3. Hazards identification

The most important hazards are:

Health hazard	**Specific hazards**
Lung toxin	When / if inhaled, fines may cause mechanical irritation of the respiratory tract.
Skin hazard	Material is unlikely to cause irritation, but if contact with molten material occurs, treat as for thermal bum
Eye hazard	Fines can cause mechanical irritation.
Ingestion	No hazard.
	The material is not classified as being a dangerous preparation according to EC Directive 88/379 and the subsequent amendments.
R(isk) phrases	n/a.

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4. First aid measures

Inhalation: When fumes of molten material have been inhaled:
- move person to fresh air.
- Rest in half upright position.
- Loosen clothing.
- Keep warm.

In case of respiratory problems move person to first aid station or hospital for medical treatment.

Skin contact: Any molten material on the skin or any burns should be cooled (off) as quickly as possible by means of cold water. Cover the wound with sterile cloth and move person to first aid station or hospital for medical treatment.
Attention: Never pull off the molten material from the wound.

Eye contact: Any material entering the eye should be flushed out with copious volumes of water.

Ingestion: No danger of toxicity, the material is biologically inactive.

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5. Fire-fighting measures

Extinguishing media: CO_2, water, water-foam, ABC fire extinguishing powder.

Spezific hazards

Solid: Treat the material as a solid that can burn. Moulded parts or solid granules bum slowly with a low smoke density and flaming drips, carbon monoxide and irritating oxygen containing organic substances are released.

Product fines: A spark can ignite an explosive concentration of product fines in air.

Vapours: Hot vapours – from heated material – plus air can be extremely inflammable in the case of stochiometric mixtures.

Combusion products: In case of fire, carbon monoxide and toxic and/or irritating oxygen containing organic substances are released.

Protection of firefighters: Do not approach fire in confined space without positive pressure self contained breathing apparatus and full bunker gear i.e.: bunker coats, helmet with face shield, gloves, rubber boots.

Note: Cool fire exposed containers with water.

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6. Accidental release measures

Personal precautions
Apply ample grounding with respect to dust explosion dangers caused by released dust from granulate supply (filters).
Protect skin, eyes and / or hands.
Prevent generation of dust (to be realised from powder).
Take great care in immediately preventing further powder or dust release in view of the formation of dust clouds in air.

Environmental precautions
For disposal considerations see section 13.

Cleaning-up methods
Shovel or sweep up released material.
Suck up fines or dust with special industrial vacuum cleaner. Avoid the generation of dust clouds. Put into containers for reclaiming or disposal.

7. Handling and storage

Handling

Precautions

General precautions: For safe polymer processing the material should be completely dry.

Personal protection: For more information on personal protection when handling the material see section 8.

Hygienic precautions: Adequate washing facilities, with supplies of mild soap and hand cleansers should be available at all working stations. Solvents should never be used as hand cleansers.
Smoking, eating and drinking in working and storage areas should be prohibited.

Advice on technical measures

Ventilation: A ventilation system should be installed where:

- melt processing of the material is carried out,
- solid material is being ground or machined,
- any high temperature processing is carried out (e.g. sealing).

It is advised to install local exhaust ventilation in the vicinity of processing machines.

Prevention of dust generation: Suppression: Optimise the piping system used for pneumatic transport (surface, comers, length, velocities).
Filtering: Take extreme care of dust explosion danger and apply ample local grounding where the presence of fines plus static electricity in or near the pneumatic transport lines is very likely.
Note: When handling the granulate normally dust will not be a problem with respect to breathing.
During regrinding operations however, the use of a dust mask is advised.

Prevention of fire and explosion: See information on static discharges in section “Storage”.

Storage

Technical measures: Owing the electrostatic properties of the material and its fines a grounding installation for storage silos and pneumatic transport is obligatory. Other ways of prevention with respect to electrostatic properties are: Inerting i.e. lowering oxygen concentrations by means of nitrogen supply, control of transport speed, etc.

Storage conditions: Avoid prolonged storage in open sunlight, high temperatures and / or high humididity as this could well speed up alteration and consequently loss of quality of the material and this could lead to unforeseen dangers.
Keep polymer completely dry for good processing (in spite of increased static danger).
Stack pallets only two high when storing, in order to prevent collapsing.

Incompatible products: n/a.

8. Exposure controls / personal protection

Control parameters: Threshold Limit Value (TLV): A provisional TLV (TWA 8 hours) is advised in accordance with the TLV of non-toxic nuisance dust:
- 10 mg/m^3 for total dust,
- 5 mg/m^3 for respirable dust.

Personal protective equipment

Respiratory protection: When the threshold limit value (TLV) is accidentally exceeded see "Prevention of dust generation".

Hand protection: When handling a hot melt (e.g. during purging of a processing machine) heat resistant gloves should be worn.

Eye protection: When handling a hot melt (e.g. during purging of a processing machine) heat resistant face shields should be worn.

Skin and body protection: The use of apron, boots and / or full protective suit is not prescribed here, it is up to the decision of the processor.

---

9. Physical and chemical properties

Polymer properties:

Physical state: Solid (at + 20°C)

Form: Granulate / powder

Colour: Coloured or natural

Odour: Weak paraffinic

PH value: n/a

Relative density: 900 – 1000 kg/m^3

Bulk density: 500 – 600 kg/m^3

Melting point / range: 130 - 170°C

Viscosity: n/a

Solubility in water: insoluble

Solubility in other substances: soluble only in some aromatic hydrocarbons, chlorinated hydrocarbons and / or n-paraffines (> C14) at high temperatures

Volume conductivity: Low, danger of static charges

Safety properties:

Decomposition temperature: > 300°C

---

10. Stability and reactivity

The material is chemically stable, however under certain conditions hazardous reactions can take place.

Conditions to avoid

Material fines: Material fines – accidentally released in air – can result in an explosive concentration (see sections 7 and 8).

Electrostatic loading: For information on safety measures regarding electrostatic loading see:
"Prevention of dust generation"
"Technical measures"

Dust / powder air mixtures: Working with powders always incorporates the danger of the formation of explosive mixtures in the dust and / or powder with air, in particular at concentrations above 10g/m^3.

	One spark can ignite such a mixture, other ignition sources are: hot surfaces, open flames, radiant heat, etc. Fines / particle sizes 10 – 50 µm are extremely dangerous, sizes 300 – 500 µm less dangerous and sizes > 500 µm are not dangerous. Do not use an open fire during processing and demoulding.
Gas / vapour air mixtures:	At high temperatures (local hot spots) inerting should be possible be applied, in order to strongly reduce oxygen concentrations. Stabilisation of the polymer results in inflammable gases being formed only at higher than usual temperatures.
Processing temperatures:	Do not exceed 320°C.
Long term exposure:	Do not expose during long terms to temperatures above 80°C and / or UV light.

Materials to avoid
Strong oxidizing agents.

Hazardous decomposition products

	At processing temperatures some degree of thermal degradation will occur. Although highly dependent on temperature and environmental conditions a variety of decomposition products may be present in small amounts, ranging from simple hydrocarbons (e.g. methane, propane) to toxic and / or irritating gases (e.g. carbon monoxide, carbon dioxide, acids, ketones, aldehydes)
Changes in physical appearance:	Dust fines (and powder) can cause extremely dangerous situations compared with base material (see sections 5, 6, 7 and 9). There is no possibility of degradation to unstable products under normal circumstances. Only at extreme temperatures (above the decomposition temperature) degradation will occur.

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11. Toxicological information

Acute toxicity:	None.
Local effects:	None.
Chronic short and long time toxicity:	None.
Sensitization:	None.
Specific effects:	None.

(carcinogenicity, mutagenicity, teratogenicity, narcosis)

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12. Ecological information

mobility:	None.
Persistance / degradability:	Very low UV degradability.
Bioaccumulation:	None.
Ecotoxity:	There is no indication that this material is a risk to the environment.
Aquatic toxicity:	This material is a water insoluble non-toxic solid material.

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13. Disposal considerations

The disposal of this material – as well as the used packaging thereoff – presents no danger regarding toxicological and / or ecological considerations. It can be burnt in a controlled way or be disposed of via landfill, or it can be recycled for less critical non-food applications.
Note: Additional national or regional provisions may be in force relevant to this matter.

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14. Transport information

General precautions: Keep the material dry during transport.
Special precautions: No special precautions have to be met as the material is not classified regarding the transport of dangerous goods.

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15. Regulatory information

Labelling: No labelling required under EC-Directive 88/379/EEC.
EEC classification: No dangerous preparation.

Note: Additional national legislation may be in force relevant to this matter.

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16. Other Information

Recommended application(s)
Packaging, industrial, automotive.
This material should not be used for the production and / or application in human body implants.
