DaimlerChrysler Ford GM

Part Submission Warrant

Part Name: PP NW22 SW GR.STR. GES CONT. | Cust. Part Number: 1931967

Shown on Drawing No.: 19314903-Ford | Org. Part Number: 1931967

Engineering Change Level: "I" | Dated: 05.02.2013

Additional Engineering Changes: | Dated:

Safety and/or Government Regulation: ☐ Yes ☑ No | Purchase Order No.: | Weight (kg): 0,046kg/m

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 Elektrik Donanım San. ve Tic. A
Customer Name / Division

Erdem ULA
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: 408911094 / 2

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 ___/___ hours. 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: 22797 Material: PP (SRS PP 2010)

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

Organization Authorized Signature: Schlemmer GmbH Postfach 13 09 / D-85592 Poing/Germany Thomas Mergner / GQ1-Global Quality thomas.mergner@schlemmer.com Tel.: +49(0)8121/804-123 | Dated: 20.01.2017

Print Name: i.A. Thomas Mergner | Phone No.: +49 (0)8121/804-123 | Fax No.:

Title: GQ1 | E-mail: Thomas.Mergner@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

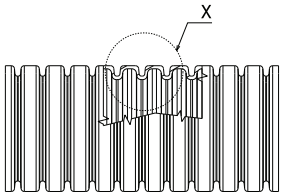
ORGANIZATION:	Schlemmer GmbH	PART NUMBER:	1931967 1931967
SUPPLIER/VENDOR CODE:	53-739-7536	PART NAME:	PP NW22 SW GR.STR. GES CON
INSPECTION FACILITY:		DESIGN RECORD CHANGE LEVEL:	"I"
		ENGINEERING CHANCE DOCUMENTS:	

ITEM	DIMENSION / SPECIFICATION	SPECIFICATION / LIMITS	TEST DATE	QTY. TESTED	ORGANIZATION MEASUREMENT RESULTS (DATA)	OK	NOT OK
1	ØA: 25,5mm	±0,4mm	20.12.16	3 pcs.	25,50 - 25,60mm	x	
2	ØI: 21,8mm	±0,4mm	20.12.16	3 pcs.	21,60 - 21,70mm	x	
3	a: 3,1mm	±0,15mm	20.12.16	3 pcs.	3,01 - 3,06mm	x	
4	b: 2,2mm	±0,15mm	20.12.16	3 pcs.	2,12 - 2,16mm	x	
5	s:	min. 0,20mm	20.12.16	3 pcs.	0,32 - 0,38mm	x	
6	Angle: 11°	±4°	20.12.16	3 pcs.	10° - 12°	x	
7	lower operating temperature:	24h: -40°C	20.12.16	3 pcs.	24h: -40°C	x	
8	continuous operating temperature	3000h: +105°C	20.12.16	3 pcs.	3000h: +105°C	x	
9	upper operating temperature	350h: +135°C	20.12.16	3 pcs.	350h: +135°C	x	
10	inflammability	FMVSS 302	20.12.16	3 pcs.	<100mm/min	x	
11	Material:	PP (SRS PP 2010)	20.12.16	3 pcs.	PP (SRS PP 2010)	x	
12	Form:	slit	20.12.16	3 pcs.	slit	x	
13	marking:	green stripes	20.12.16	3 pcs.	green stripes	x	

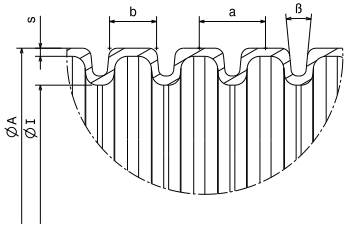
Blanket statements of conformance are unacceptable for any test results.

Schlemmer GmbH
Postfach 13 09 / 85582 Poing/Germany
Thomas Mergner / GQ1-Global Quality
thomas.mergner@schlemmer.com
Tel.: +49(0)8121/804-123

SIGNATURE	TITLE	DATE
i.A. Thomas Mergner	GQ1	20.01.2017



Detail X

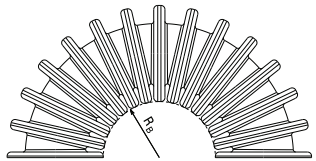


Kennzeichnung: grüner Streifen / Marking: Green Stripes							Ohne Kennzeichnung / Without Marking												
Ringware / Coil			Container [3]				Ringware / Coil			Container [3]									
EDV-Art.-Nr. ungeschlitzt Part- No. Unslit	EDV-Art.-Nr. geschlitzt Part- No. Slit	Liefer-Einheit/m Delivery-unit/m	EDV-Art.-Nr. ungeschlitzt Part- No. Unslit	Liefer-Einheit/m Delivery-unit/m	EDV-Art.-Nr. geschlitzt Part- No. Slit	Liefer-Einheit/m Delivery-unit/m	EDV-Art.-Nr. ungeschlitzt Part- No. Unslit	EDV-Art.-Nr. geschlitzt Part- No. Slit	Liefer-Einheit/m Delivery-unit/m	EDV-Art.-Nr. ungeschlitzt Part- No. Unslit	Liefer-Einheit/m Delivery-unit/m	EDV-Art.-Nr. geschlitzt Part- No. Slit	Liefer-Einheit/m Delivery-unit/m	Nenn-weite Nominal Width NW	ØA mm	ØI mm	a mm	b mm	s mm	β ±4° Grad Degree	Biege-[2] radius Bending-radius R_B [mm]	Gewicht ca. Weight Approx. g/m
1931920	1931904	100	1931922	9000	1931923	10000	1926601	1931744	100	1931604	9000	1931704	1000	4,5	7,1	5,0	2,2	1,2	0,17-0,51	30	12	9
1931924	1931906	100	1931926	5000	1931927	5000	1931806	1931746	100	1931606	5000	1931706	5000	6	9,2	6,0	2,8	1,7	min.0,17	26	10	14
1931928	1931907	50	1931930	5000	1931931	5000	1926600	1926694	50	1931607	5000	1931707	5000	7,5	9,9	6,9	2,6	1,8	0,17-0,51	11	15	12
1931932	1931933	50	1931934	3300	1931935	4000	1926602	1931748	50	1931608	3300	1931708	4000	8,5	11,6	8,5	2,3	1,4	0,17-0,51	20	18	13
1931936	1931937	50	1931938	3000	1931939	3300	-	1931750	50	1931610	3000	1931710	3000	10	12,7	10,1	2,7	1,8	0,17-0,64	20	18	14
1931940	1931941	50	1931942	2200	1931943	2200	1931812	1931752	50	1931612	2200	1931712	2200	12	15,6	12,0	3,1	2,2	min.0,17	11	20	21
1931944	1931945	50	1931946	2000	1931947	2200	1931813	1931753	50	1931613	2000	1931713	2200	13	15,8	12,9	2,7	1,8	0,17-0,51	11	22	23
1931948	1931949	50	1931950	1700	1931951	1700	1931814	1931754	50	1931614	1700	1931714	1700	14	18,3	14,5	3,2	2,3	min.0,17	11	25	28
1931952	1931953	50	1931954	1500	1931955	1500	1931816	1931756	50	1931616	1500	1931716	1500	16	18,8	15,2	2,5	1,5	min.0,17	18	25	28
1931956	1931957	50	1931958	1100	1931959	1300	1931985	1931757	50	1931617	1100	1931717	1300	17	21,0	16,8	3,2	2,2	0,17-0,51	11	30	30
1931960	1931961	50	1931962	800	1931963	1000	1931819	1931759	50	1931619	800	1931719	1000	19	24,0	19,4	3,1	2,2	0,17-0,51	11	35	38
1931964	1931965	50	1931966	700	1931967	900	1931822	1931762	50	1931622	700	1931722	900	22	25,5	21,8	3,1	2,2	min.0,20	11	37	44
1931968	1931969	50	1931970	650	1931971	700	1931823	1931763	50	1931623	650	1931723	700	23	28,0	23,7	3,1	2,2	0,20-0,77	11	42	53
1931972	1931973	25	1931974	600	1931975	600	1931826	1931766	25	1931626	600	1931726	600	26	31,3	26,4	3,1	2,2	min.0,25	11	47	64
1931976	1931979	25	1931978	450	1931984	500	1931829	1931779	25	1931629	450	1931729	500	29	33,9	29,3	3,4	2,3	min.0,25	11	60	66
1931980	1931981	25	1931982	250	1931983	300	1931837	1931764	25	1931637	250	1931737	300	37	42,0	36,7	3,9	2,8	min.0,30	12	70	98
							-	-	50	1931658	3000	1931758	3300	8,5 AHW	12,9	8,5	3,1	2,1	0,17-0,51	18	17	22
							-	-	50	1931661	2000	1931761	2200	11 AHW	15,7	11,1	3,1	2,1	0,17-0,51	18	22	26
							-	-	50	1931665	1100	1931765	1300	15 AHW	21,2	15,0	3,9	2,7	0,17-0,51	12	30	39
							-	-	50	1931669	700	1931769	900	19 AHW	25,7	19,1	4,3	2,9	0,17-0,51	12	38	50
							-	-	25	1931676	450	1931776	500	26S AHW	31,6	24,9	4,2	2,6	min.0,30	6	50	70
	1931734	25			1931834	300	1927995	1927939	25	1951174	250	1951138	300	34 AHW	39,5	34,1	4,0	2,7	0,17-0,77	12	69	73

[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%

[3] Kontrollabschnitte möglich / control cuts possible



Toleranzen/Tolerances				
Nennweiten Nominal width	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
8,5 AHW -11 AHW	±0,3	±0,3	±0,10	±0,10
15 AHW - 26S AHW	±0,4	±0,4	±0,15	±0,15
34 AHW	±0,5	±0,5	±0,20	±0,20

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	+105
obere Gebrauchs-temperatur, kurzzeitig Upper operating temperature		350 h	°C	+135
Brennbarkeit Inflammability	FMVSS 302 [1]			<100mm/min
max. Füllgrad/ Filling grade			%	80

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

Kennzeichnung:

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

Marking:

Non-ending axial green stripes, alternating print with an ink jet
S.R.S >PP< NW xx(AHW) YY
Indication between brakets only for appropriate types
Distance between beginning and end of print: 450±50mm
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 + division 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.

Index		
i	Art. Nr. NW29 mit grünem Streifen geändert	05.02.13 Chu
k	Art.Nr.1931734 und 1931834 zugefügt	29.01.13 Chu
j	Updated drawing	01.10.12 Chu
i	NW34AHW zugefügt/ Updated drawing	28.09.12 Chu

Toleranzen/TOLERANCES: -
Oberflächengüte/SURFACE FINISH
Farbe/COLOR: schwarz/black
Werkstoff/MATERIAL: SRS PP 2010 PP
Gewicht/WEIGHT: / g
Masstab/SCALE: /
ISO PROJEKTION METHODE 1
DIMENSIONS IN MILLIMETERS
Erstellt mit/PRODUCED ON: CATIA 5 R10

	Name	Datum
Gezeichnet/DRAWING BY	Chu	03.12.2003
Geprüft/APPROVED	Schmidt	03.12.2003

Ersatz fuer/REPLACES DRAWING
Vom/DATED: -
Ersatz durch/REPLACED BY
Vom/DATED: -

SCHLEMMER GMBH
Gruberstrasse 48
D-85586 POING

Benennung/DESIGNATION: Wellschlauch PP / Corrugated Tube PP
Zeichnungs-Nr./DRAWING NO.: 19314903-FORD
Format: A1
Blatt/PAGE: 01
von/OF: 01

DIN 34

Prozessfähigkeit (Langzeit)

Daten und Werte

Artikel-Bez.:	WR PP-ST sw. NW 22
Artikel-Nr.:	1931967
Form:	geschlitzt
Merkmal:	Außendurchmesser
Vorgang:	Extrusion
Prüfer:	M.Schneider
Prüfzeitraum:	20.12.16 bis 20.12.16

Nennwert:	**25,500**
+Toleranz:	**0,400**
-Toleranz:	**0,400**

Berechnung

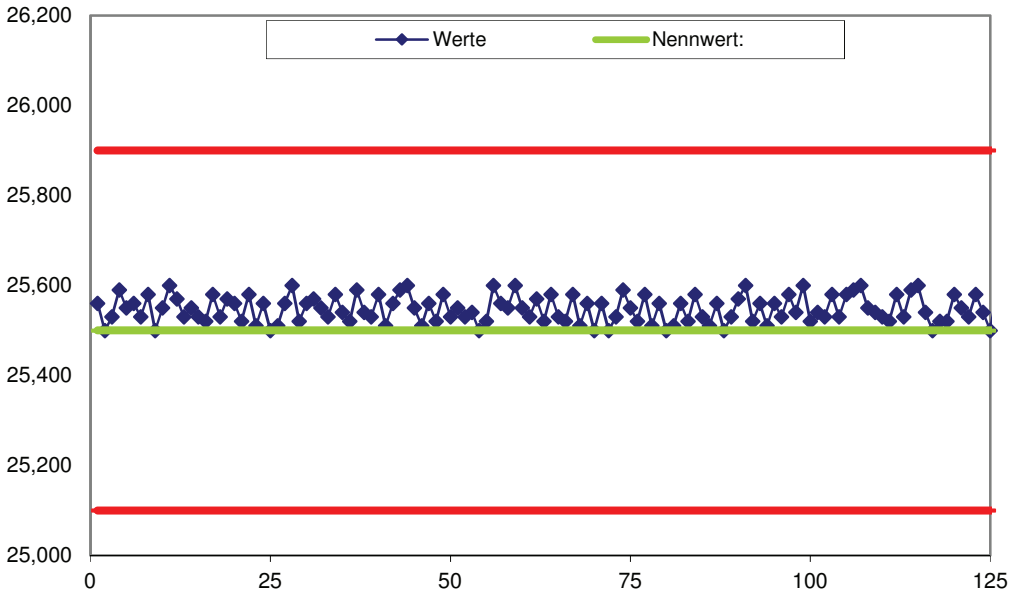
$$\bar{x} = \frac{\sum x}{n} \qquad \hat{\mu} = \bar{\bar{x}} = \frac{1}{k}\sum_{i=1}^{k} \bar{x}_i \qquad R = x\,\max . - x\,\min .$$

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

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

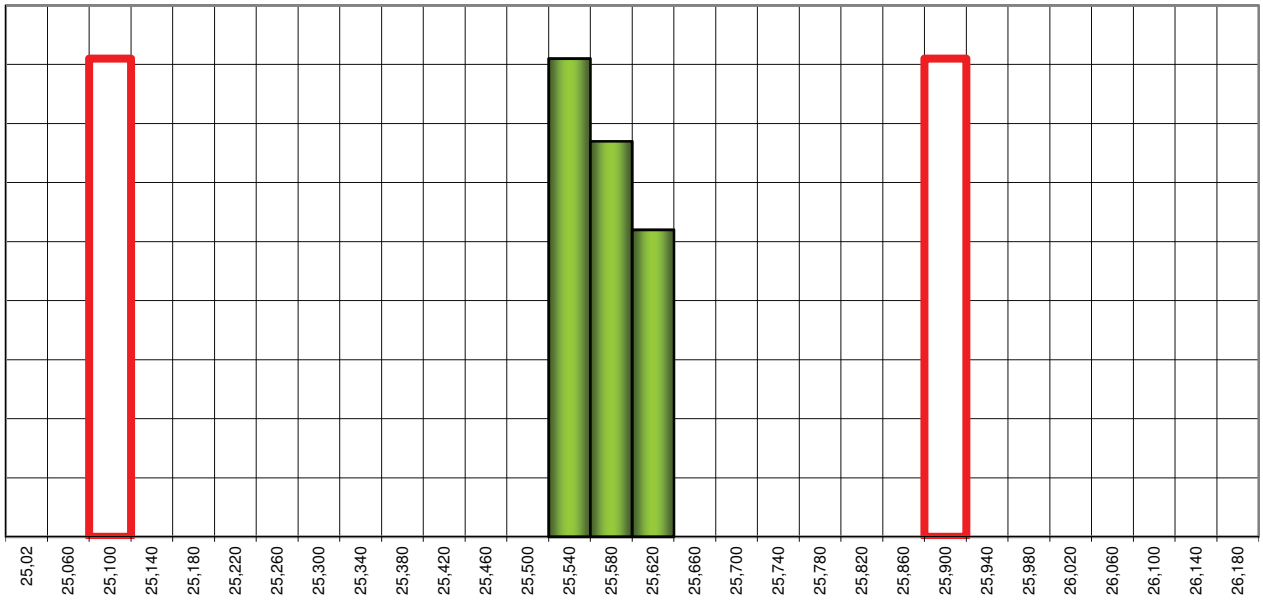
$$C_{pk} = \min .(C_{po}, C_{pu}) \qquad C_{pk} \geq 1{,}33$$

Grundgesamtheit	
Stichprobe 'k	40 à 5
n	200
$\hat{\mu}$	25,549
max.	25,600
min.	25,500
R	0,100
1x $\hat{\sigma}$	0,027
6x $\hat{\sigma}$	0,164
OGW	25,900
UGW	25,100



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

Prozessfähigkeit	
C_{po}	4,277
C_{pu}	5,458
C_{pk}	**4,277**



Prozessfähigkeit (Langzeit)

Daten und Werte

Artikel-Bez.:	WR PP-ST sw. NW 22
Artikel-Nr.:	1931967
Form:	geschlitzt
Merkmal:	Innendurchmesser
Vorgang:	Extrusion
Prüfer:	M.Schneider
Prüfzeitraum:	20.12.16 bis 20.12.16

Nennwert:	**21,700**
+Toleranz:	**0,400**
-Toleranz:	**0,400**

Berechnung

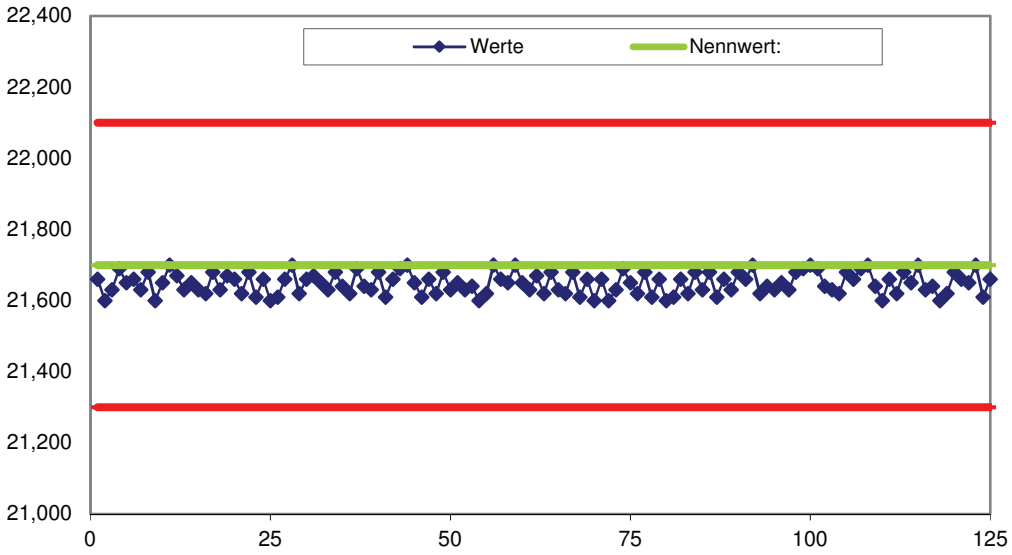
$$\bar{x} = \frac{\sum x}{n} \qquad \hat{\mu} = \bar{\bar{x}} = \frac{1}{k}\sum_{i=1}^{k} \bar{x}_i \qquad R = x\,\max . - x\,\min .$$

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

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

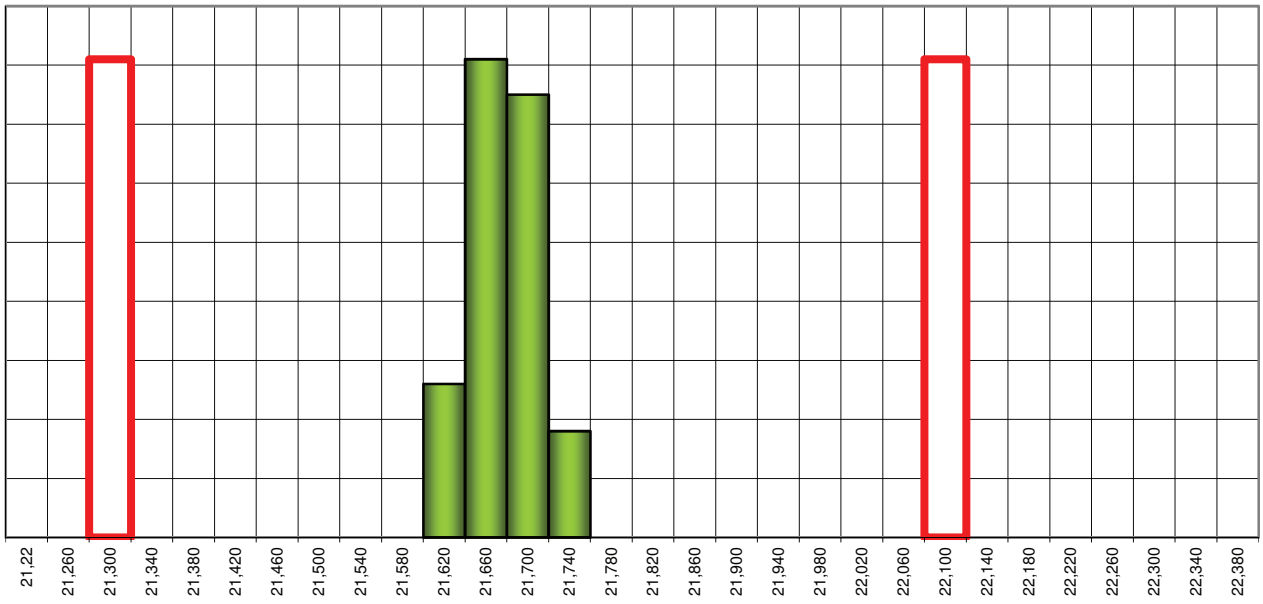
$$C_{pk} = \min .(C_{po}, C_{pu}) \qquad C_{pk} \geq 1{,}33$$

Grundgesamtheit	
Stichprobe 'k	40 à 5
n	200
$\hat{\mu}$	21,650
max.	21,700
min.	21,600
R	0,100
1x $\hat{\sigma}$	0,027
6x $\hat{\sigma}$	0,162
OGW	22,100
UGW	21,300



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

Prozessfähigkeit	
C_{po}	5,544
C_{pu}	4,319
C_{pk}	**4,319**



Safety Data Sheet

(according to directive 91/155/EEC)

Schlemmer Product Name

S.R.S. PP 2010

1. Chemical product and company identification

S.R.S. PP 2010

---

2. Composition / information on ingredients

This chemical product is a composition.
Chemical name: polypropylene.
Generic name: polyolefines.
CAS-number : 9003-07-0 and 9010-79-1.
Ingredients contributing to the hazard: none.

---

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 – 920 kg/m^3
Bulk density:	550 – 630 kg/m^3
Melting point / range:	155 - 170°C
Softening point / range:	140 – 148°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
Flash point:	> 320°C
Auto ignition temperature:	> 350°C

Dust explosive properties:

Lower explosion limit (LEL):	mandatory to remain < 10g/m^3 air (fines < 125 µm)
Minimum ignition temperature:	428°C
Dust explosion class:	St 1 (fines)

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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.

Technisches Datenblatt
Technical Data Sheet

Schlemmer - Material Identification
S.R.S. PP 2010 (PP-St)

Eigenschaften / Properties	Prüfbedingungen / Test Conditions		Einheit / Unit	Wert / Value
Mechanisch / mechanical				
Zug-E-Modul / tensile modulus	1 mm/min	ISO 527-1/-2	MPa	1250
Streckspannung / tensile stress at yield	50mm/min	ISO 527-1/-2	MPa	23
Streckdehnung / tensile strain at yield	50mm/min	ISO 527-1/-2	%	5
Charpy-Kerbschlagzähigkeit / charpy notched impact strength	23 °C	ISO 179/1eA	kJ/m^2	80
	0 °C	ISO 179/1eA	kJ/m^2	60
	-20 °C	ISO 179/1eA	kJ/m^2	10
Shore Härte / shore hardness	---	ISO 868	D	63
Thermisch / thermal				
Formbeständigkeitstemperatur / temperature of heat deflection				
Meth. A	1,8 MPa	ISO 75	°C	55
Meth. B	0,45 MPa	ISO 75	°C	85
Vicat-Erweichungstemperatur / vicat softening temperature				
at 10N	120 °C/h	ISO 306	°C	148
at 50N	120 °C/h	ISO 306	°C	68
Allgemein / general				
Schmelze Massefließrate (MFR) / melt flow rate	230 °C / 2,16kg	ISO 1133	dg/min	1,2
Dichte / density	---	ISO 1183	g/cm^3	0,91

Die angegebenen Werte beziehen sich auf das Basispolymer der jeweiligen Mischungszusammenstellung. Die Angaben sind als Richtwerte anzusehen und nicht als garantierte Mindestwerte, da die Eigenschaften durch Werkzeuggestaltung und Verarbeitungsbedingungen erheblich beeinflußt werden können. Eine Verbindlichkeit kann hieraus nicht hergeleitet werden.

The stated values refer to the base polymer out of the mix composition. The information is meant as approximate values and does not state the minimal values, as the properties are extensively affected by the tool design and processing conditions. An obligation cannot be derivered from this document.

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= / R_p=	2,2347 / 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: 1930029	Gage Name: Profilprojektor		Appraiser A: Gräf H.	
Part Name: PP-BS NW 29 Ringware	Gage Number: 031059		Appraiser B: Schneider M.	
Characteristic: Breite Welle	Gage Type: optisch ST 300		Appraiser C: Pfaff M.	
Characteristic Classification: 2,3	Trials: 3	Parts: 10	Appraisers: 3	Date Performed: 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.

Schlemmer

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

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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		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**	
Wanddicke	0,3 0,6	Handmessmittel 150mm		Würfel V.	
Characteristic Classification	**Einheit**	**Trials**	**Parts**	**Appraisers**	**Date Performed**
0,3	mm	3	10	3	08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE	
1. A	1	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= R_p=	0,4799 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 x 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	Gage Name	Appraiser A
1968230	Meßschiene 1m	Ferderer J.
Part Name	**Gage Number**	**Appraiser B**
PP-BS NW 29 ges. Stücke	10011	Zobel F.
Characteristic / **Specification**	**Gage Type**	**Appraiser C**
Länge / 0 7	Stahllineal 1000mm	Würfel V.

Characteristic Classification	Einheit	Trials	Parts	Appraisers	Date Performed
40,0	mm	3	10	3	08.05.15

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE	
1. A	1	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= / R_p=	44,3167 / 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	Gage Name		Appraiser A	
1968230	Meßschiene 1m		Ferderer J.	
Part Name	**Gage Number**		**Appraiser B**	
PP-BS NW 29 ges. Stücke	10011		Zobel F.	
Characteristic	**Gage Type**		**Appraiser C**	
Länge	Stahllineal 1000mm		Würfel V.	
Characteristic Classification	**Trials**	**Parts**	**Appraisers**	**Date Performed**
40	3	10	3	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.

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) Measure report *Messbericht*	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*		
			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. Materialetikett*	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 *Störung beheben, Ursache ermitteln und Maßnahmen einleiten keine Freigabe der Maschine*
					automatic control of parameter (not for all) parameter) *automatische Kontrolle der Parameter (nicht aller)*	◊	data sheet *Datenblatt*	check of electronic parameter *Überprüfung aller elektron. Parameter*	all parameter 100%	every 4 hours *alle 4 Stunden* continuous *immer*	operator *Werker* equipment *Maschine*	acoustically or visual interlock if out of Spec automatic *b. Abweichungen von den gesetzten Parametern ertönt oder erscheint ein Alarm*	progress chart none *Linienfreigabe* FB 1402-01	
						◊	data sheet *Datenblatt*							

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 instpection *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)

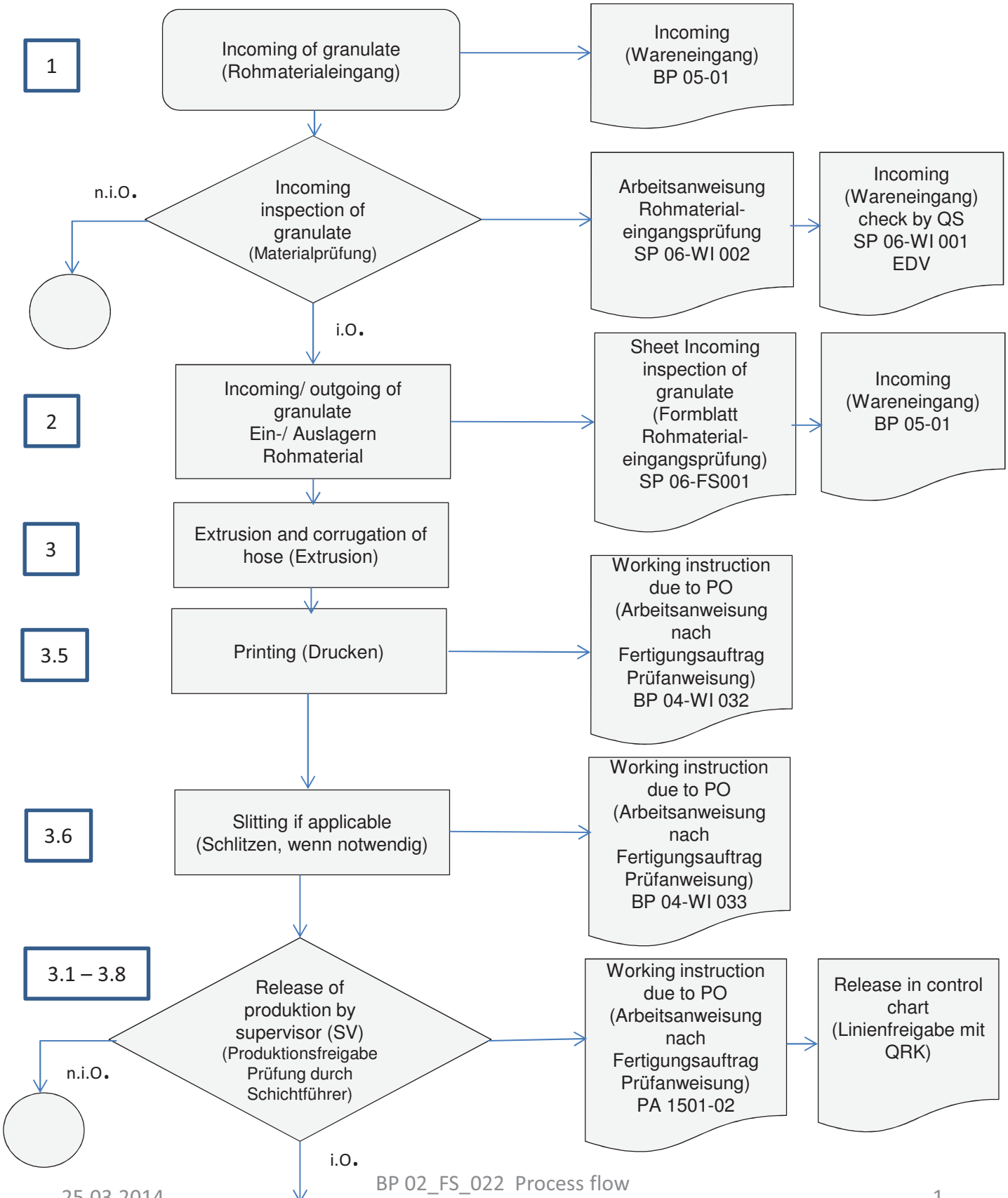
Drawing (Rev.): (Zeichnung / Index) Schlemmer drawing all standard *(für alle Standard)*	Part-Number (Supplier) all	Part Name / Description (Produktname und Bezeichnung:) corrugated standard hose with continuous geometry *Standard Wellschlauch*	Core Team: (APQP) L. Cenadi (P), D. Kolbe (QS), J. Rührseitz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

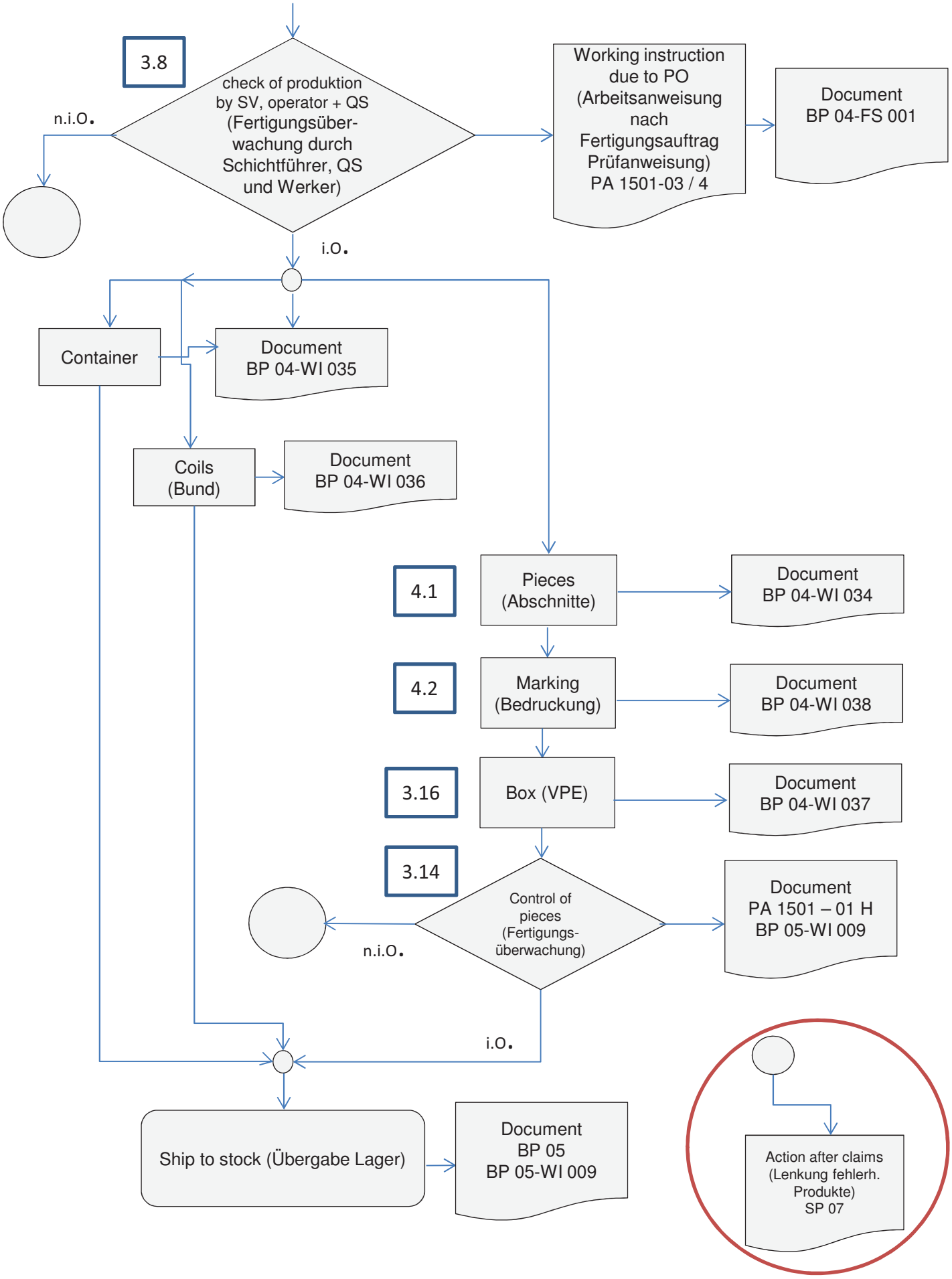
Customer Engineering Approval Date (If Req'd): Customer Quality Approval Date (If Req'd): Other Approval Date (If Req'd): (Freigabe durch Kunden [nur wenn gefordert])

Part / Process Number	Process Name / Operation Description *Arbeitsgangbeschreibung*	Machine, Tool, Device, Jig *Anlage*	Characteristics No.	Product	Process	Spec Char. Class	Methods Product/Process Specification/ Tolerance	Measurement equipment *Prüfmittel*	Sample Size *Größe*	Sample Freq. *Frequenz*	Resp. *Verantwortl.*	Control Method *Methode*	Documentation	Corrective action *Korrekturmaßnahmen*
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