

Part Submission Warrant

Part Name <u>PP-BS NW 17 SW GESCHL.GRA.STR.</u>		Cust. Part Number <u>1931147</u>	
Shown on Drawing No. <u>19303900-Ford</u>		Org. Part Number <u>1931147</u>	
Engineering Change Level <u>"k"</u>		Dated <u>18.09.2013</u>	
Additional Engineering Changes _____		Dated _____	
Safety and/or Government Regulation ☐ Yes ☒ No		Purchase Order No. _____ Weight (kg) <u>0,031kg/m</u>	
Checking Aid No. _____		Checking Aid Engineering Change Level _____ Dated _____	
ORGANIZATION MANUFACTURING INFORMATION		CUSTOMER SUBMITTAL INFORMATION	
<u>Schlemmer GmbH 53-739-7536</u>		<u>Nursan Elektrik Donanım San. ve Tic. A</u>	
Organization Name & Supplier/Vendor Code		Customer Name / Division	
<u>Philipp-Reis-Straße 18</u>		<u>Erdem ULA</u>	
Street Address		Buyer / Buyer Code	
<u>Haßfurt</u>	<u>97437</u>	<u>Germany</u>	
City	Region	Postal Code	Country
		Application	
MATERIALS REPORTING:			
Has customer-required Substances of Concern information been reported?		☒ Yes ☐ No ☐ n/a	
Submitted by IMDS or other customer format:		<u>IMDS-ID: 123074017 / 3</u>	
Are polymeric parts identified with appropriate ISO marking codes?		☐ Yes ☐ No ☒ n/a	
REASON FOR SUBMISSION (Check at least one)			
☒ Initial submission		☐ Change to Optional Construction or Material	
☐ Engineering Change(s)		☐ Supplier or Material Source Change	
☐ Tooling: Transfer, Replacement, Refurbishment, or additional		☐ Change in Part Processing	
☐ Correction of Discrepancy		☐ Parts produced at Additional Location	
☐ Tooling inactive > than 1 year		☐ 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: <u>Report: 22781</u>		<u>Material: PP BS (SRS PP 2050)</u>	
Is each Customer Tool properly tagged and numbered?		☒ Yes ☐ No ☐ n/a	
Organization Authorized Signature 		Dated <u>17.01.2017</u>	
Print Name <u>i.A. Thomas Mergner</u>		Phone No. <u>+49 (0)8121804-123</u> Fax No. _____	
Title <u>GQ1</u>		E-mail <u>Thomas.Mergner@schlemmer.com</u>	
FOR CUSTOMER USE ONLY (IF APPLICABLE)			
PPAP Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other			
Customer Signature _____		Dated _____	
Print Name _____		Customer Tracking Number (optional) _____	

Production Part Approval - Dimensional Results

ORGANIZATION:	Schlemmer GmbH	PART NUMBER:	1931147	1931147
SUPPLIER/VENDOR CODE:	53-739-7536	PART NAME:	PP-BS NW 17 SW GESCHL.GRA.9	
INSPECTION FACILITY:		DESIGN RECORD CHANGE LEVEL:	"k"	
		ENGINEERING CHANCE DOCUMENTS:		

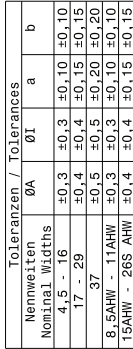
[illegible]

Blanket statements of conformance are unacceptable for any test results.



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

<u>SIGNATURE</u>	<u>TITLE</u>	<u>DATE</u>
i.A. Thomas Mergner	GQ1	17.01.2017



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

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

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

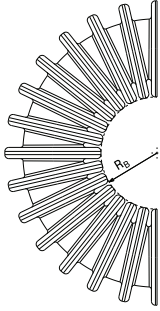
1% der Gesamtlänge + Teilung a (Mitte Wellenberg zu Mitte Wellenberg)
Endsumme auf ganze Zahl aufrunden = + Toleranz.
(Schnitt am Wellenberg)

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.

2) Die angegebenen minimalen Biegegradienten beziehen sich auf das ungeschlitzte Wellrohr.
The listed minimal bending radii refer to the unslit tube

kleinster Biegeradius des geschlitzten Wellrohres:
3 x Ø1 bei Füllgrad 50 bis 75%
Minimum bending radius of the slit tube 3 x Ø1 provided tube is not filled by more than 50% to 75%

[illegible]

Daten und Werte

Artikel-Bez.:	WR PP-BS sw. NW 17	
Artikel-Nr.:	1931147	
Form:	geschlitz	
Merkmal:	Außendurchmesser	
Vorgang:	Extrusion	
Prüfer:	M.Schneider	
Prüfzeitraum:	20.12.16 bis	20.12.16

Nennwert:	21,000
+Toleranz:	0,400
-Toleranz:	0,400

Berechnung

$$\bar{x} = \frac{\sum x}{n}$$

$$\hat{\mu} = \bar{x} = \frac{1}{k} \sum_{i=1}^k \bar{x}_i$$

$$R = x_{\max} - x_{\min}$$

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$\hat{\sigma} = \sqrt{\left(\frac{1}{k} \sum_{i=1}^k S_i\right)^2} = \sqrt{\bar{S}^2}$$

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

$$C_{pk} = \min.(C_{po}, C_{pu})$$

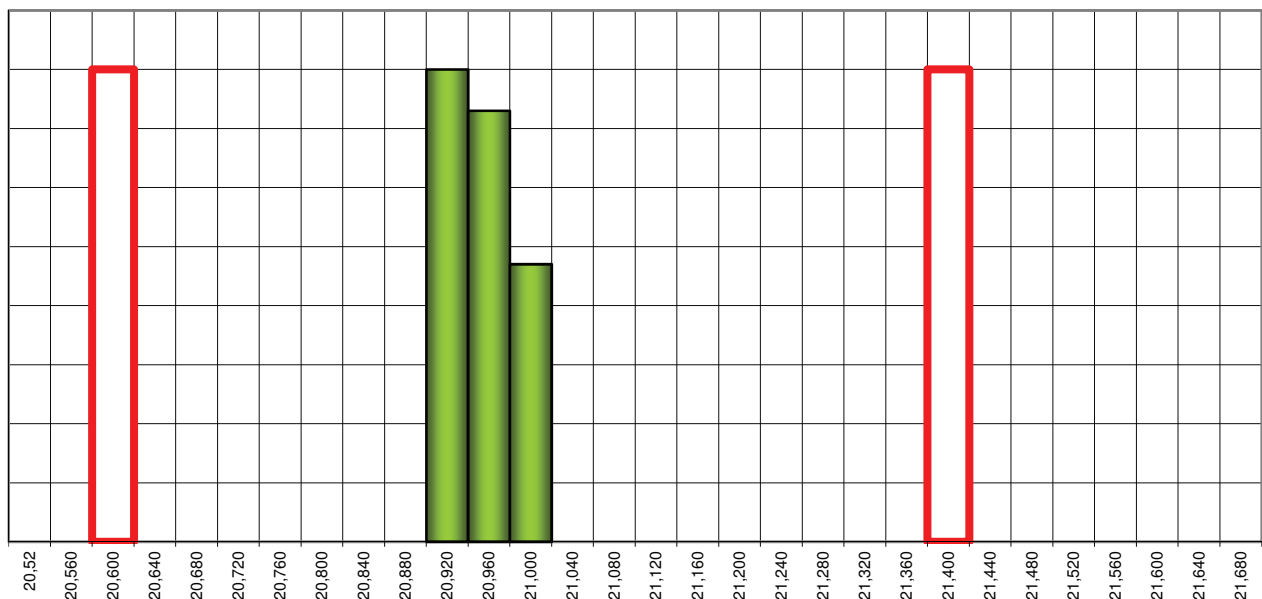
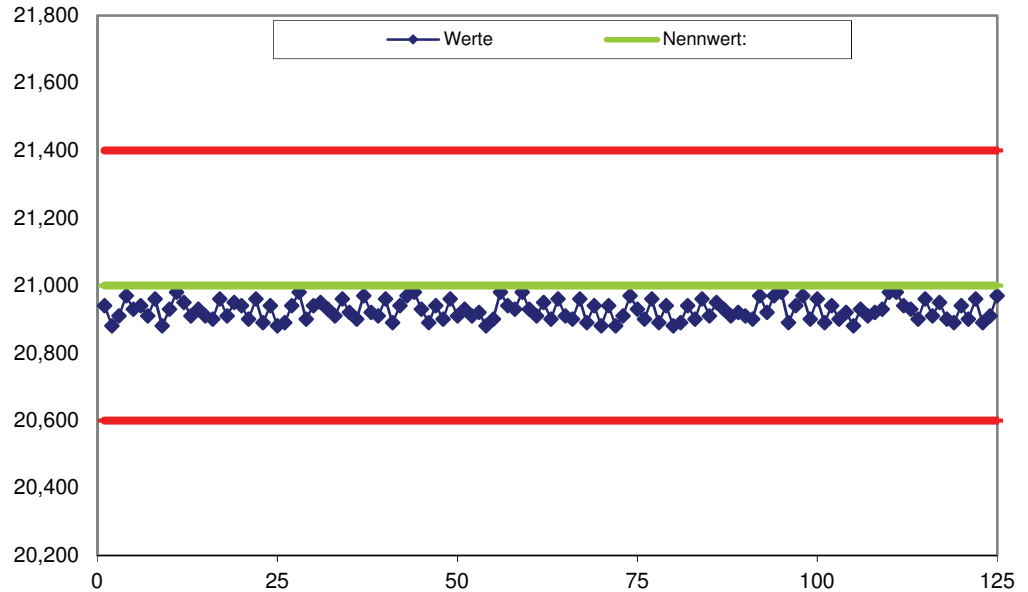
$$C_{po} = \frac{OGW - \hat{\mu}}{3\hat{\sigma}}$$

$$C_{pk} \geq 1,33$$

Grundgesamtheit		
Stichprobe 'k'	40	à 5
n	200	
$\hat{\mu}$	20,928	
max.	20,980	
min.	20,880	
R	0,100	
$1 \times \hat{\sigma}$	0,026	
$6 \times \hat{\sigma}$	0,159	
OGW	21,400	
UGW	20,600	

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

Prozessfähigkeit	
C _{po}	5,940
C _{pu}	4,134
C _{pk}	4,134



Daten und Werte

Artikel-Bez.:	WR PP-BS sw. NW 17	
Artikel-Nr.:	1931147	
Form:	geschlitz	
Merkmal:	Innendurchmesser	
Vorgang:	Extrusion	
Prüfer:	M.Schneider	
Prüfzeitraum:	20.12.16 bis	20.12.16

Nennwert:	16,800
+Toleranz:	0,400
-Toleranz:	0,400

Berechnung

$$\bar{x} = \frac{\sum x}{n}$$

$$\hat{\mu} = \bar{x} = \frac{1}{k} \sum_{i=1}^k \bar{x}_i$$

$$R = x_{\max} - x_{\min}$$

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

$$\hat{\sigma} = \sqrt{\left(\frac{1}{k} \sum_{i=1}^k S_i\right)^2} = \sqrt{\bar{S}^2}$$

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

$$C_{pk} = \min(C_{po}, C_{pu})$$

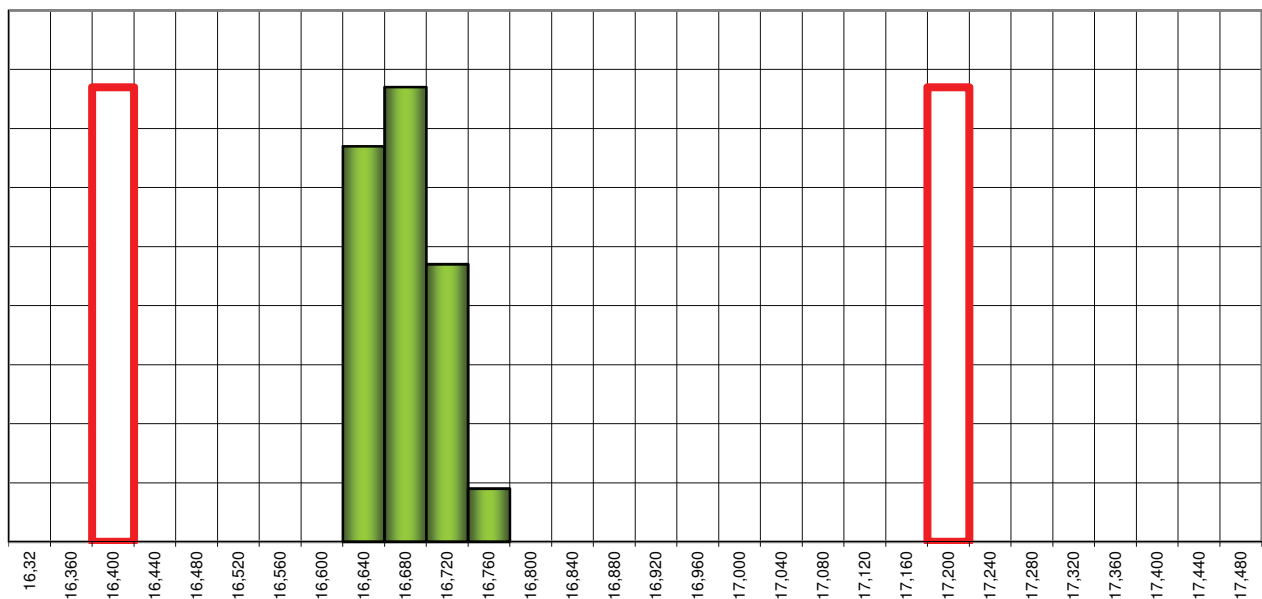
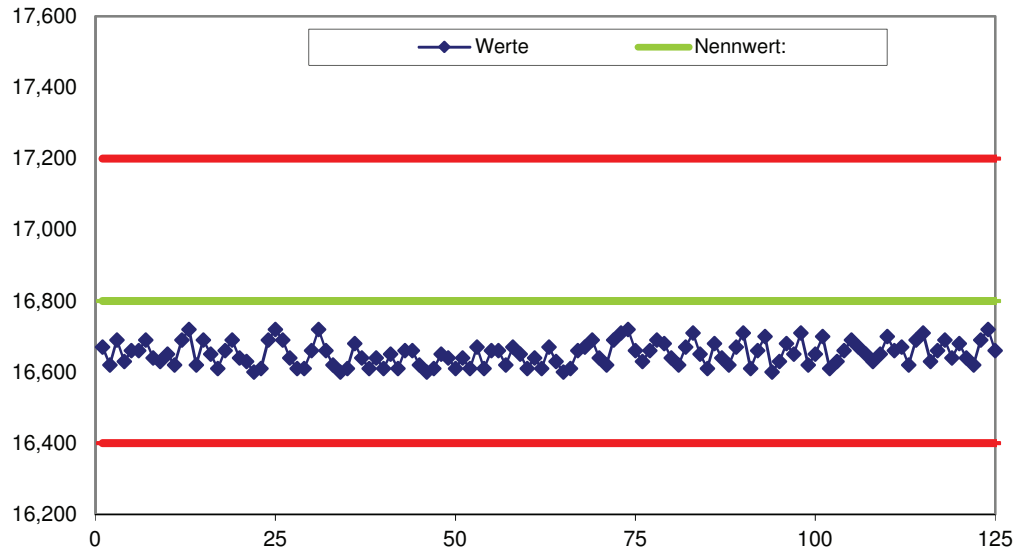
$$C_{po} = \frac{OGW - \hat{\mu}}{3\hat{\sigma}}$$

$$C_{pk} \geq 1,33$$

Grundgesamtheit		
Stichprobe 'k'	40	à 5
n	200	
$\hat{\mu}$	16,654	
max.	16,720	
min.	16,600	
R	0,120	
$1x \hat{\sigma}$	0,031	
$6x \hat{\sigma}$	0,189	
OGW	17,200	
UGW	16,400	

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

Prozessfähigkeit	
C _{po}	5,785
C _{pu}	2,691
C _{pk}	2,691



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

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.

3. Hazards identification

The most important hazards are:

Health hazard

Lung toxin

Skin hazard

Eye hazard

Ingestion

Specific hazards

When / if inhaled, fines may cause mechanical irritation of the respiratory tract.

Material is unlikely to cause irritation, but if contact with molten material occurs, treat as for thermal bum

Fines can cause mechanical irritation.

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.

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.

5. Fire-fighting measures

Extinguishing media: CO₂, water, water-foam, ABC fire extinguishing powder.

Specific hazards

Solid: Treat the material as a solid that can burn. Moulded parts or solid granules burn 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 stoichiometric mixtures.

Combustion 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.

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 humidity 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/m³ for total dust,
- 5 mg/m³ 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)
powder	Form:	Granulate /
	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/m³.

	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.

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)

12. Ecological information

mobility:	None.
Persistence / degradability:	Very low UV degradability.
Bioaccumulation:	None.
Ecotoxicity:	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 thereof – 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.

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.

15. Regulatory information

Labelling:	No labelling required under EC-Directive 88/379/EEC.
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EEC classification:	No dangerous preparation.
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Note: Additional national legislation may be in force relevant to this matter.

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 2050 (PP-BS)

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
Brennbarkeit ¹⁾ / flammability					
Brennbarkeit (in Anlehnung) / flammability (sim.)	---	FMVSS 302	Typ	selbstverlöschend self-extinguishing	
Brennbarkeit UL94 (in Anlehnung) / flammability acc. UL94 (sim.)	---	UL94	class	HB	
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	

¹⁾ produktbezogen / product related

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 derived from this document.

	Messmittelfähigkeit	
		Seite 1 von 2

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET VARIABLE DATA RESULTS

Part Number 1930029		Gage Name Meßschieber digital		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										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a = 33,8320$
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	$\bar{x}_b = 33,8347$
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	$\bar{x}_c = 33,8323$
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	$\bar{X} = 33,8330$ $R_p = 0,188$
17 $(r_a + r_b + r_c) /$	$(\# \text{ OF APPRAISERS}) =$										$R = 0,0087$
18 $(\text{Max } X - \text{Min } X) =$											$X_{DIFF} = 0,0027$
19 $R \times D_4^* =$											$UCL_R = 0,0224$

* $D_4 = 3.27$ for 2 trials and 2.58 for 3 trials. UCL_R 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 gilt auch für Container und Stückware.

Messmittelfähigkeit



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GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET VARIABLE DATA RESULTS

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

Measurement Unit Analysis					% Tolerance (Tol)	
Repeatability - Equipment Variation (EV)					% EV = 100 (EV/TV) = 100(0,00512/0,05931) = 8,63	
EV	=	R x K ₁	Trials	K1		
	=	0,0087 x 0,5908	2	0,8862		
	=	0,00512	3	0,5908		
Reproducibility - Appraiser Variation (AV)					% AV = 100 (AV/TV) = 100(0,00104/0,05931) = 1,75	
AV = {(X _{DIFF} x K ₂) ² - (EV ² /nr)} ^{1/2}						
= {(0,0027 x 0,5231) ² - (0,0051 ² /(10 x 3))} ^{1/2}						
= 0,00104			Appraisers	2		
n = parts		r = trials	K ₂	0,7071	0,5231	
Repeatability & Reproducibility (GRR)					% R&R = 100 (R&R/TV) = 100(0,00522/0,05931) = 8,81 Gage system O.K	
GRR = {(EV ² + AV ²) ^{1/2}						
= {(0,0051 ² + 0,0010 ²) ^{1/2}			Parts	K ₃		
= 0,00522			2	0,7071		
Part Variation (PV)			3	0,5231	% PV = 100 (PV/TV) = 100(0,05907/0,05931) = 99,61	
			4	0,4467		
			5	0,4030		
			6	0,3742		
PV	=	R _P x K ₃	7	0,3534		
	=	0,1878 x 0,3146	8	0,3375		
	=	0,05907	9	0,3249		
Total Variation (TV)			10	0,3146	ndc = 1.41 (PV/GRR) = 1.41(0,05907/0,00522) = 15,000	
TV = {(GRR ² + PV ²) ^{1/2}						
= {(0,0052 ² + 0,0591 ²) ^{1/2}						
= 0,05931						

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

	Messmittelfähigkeit	
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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	Specification -0,15 0,15	Gage Type optisch ST 300		Appraiser C Pfaff M.	
Characteristic Classification 2,3	Einheit mm	Trials 3	Parts 10	Appraisers 3	Date Performed 08.05.15

APPRAISER/ TRIAL #	PART										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a = 2,2337$
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	$\bar{x}_b = 2,2340$
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	$\bar{x}_c = 2,2363$
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	$\bar{X} = 2,2347$ $R_p = 0,152$
17 $(r_a + r_b + r_c) /$ (# OF APPRAISERS) =											$R = 0,0070$
18 (Max X - Min X) =											$X_{DIFF} = 0,0027$
19 $R \times D_4^* =$											$UCL_R = 0,0181$

* $D_4 = 3.27$ 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.

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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				% Tolerance (Tol)	
Repeatability - Equipment Variation (EV)				% EV = 100 (EV/TV) = 100(0,00414/0,04808) = 8,60	
EV	=	R x K ₁			
	=	0,0070 x 0,5908			
	=	0,00414			
			Trials	K ₁	
			2	0,8862	
			3	0,5908	
Reproducibility - Appraiser Variation (AV)				% AV = 100 (AV/TV) = 100(0,00117/0,04808) = 2,44	
AV	=	{(X _{DIFF} x 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)				% R&R = 100 (R&R/TV) = 100(0,00430/0,04808) = 8,94 Gage system O.K	
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 = 100 (PV/TV) = 100(0,04789/0,04808) = 99,60	
PV	=	R _p x K ₃			
	=	0,1522 x 0,3146			
	=	0,04789			
Total Variation (TV)				ndc = 1.41 (PV/GRR) = 1.41(0,04789/0,00430) = 15,000	
TV	=	{(GRR ² + PV ²) ^{1/2}			
	=	{(0,0043 ² + 0,0479 ²) ^{1/2}			
	=	0,04808			

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

Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 2 v. 2
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	Messmittelfähigkeit	
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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										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a = 11,7767$
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	$\bar{x}_b = 11,7600$
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	$\bar{x}_c = 11,8033$
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	$\bar{X} = 11,7800$ $R_p = 3,089$
17 $(r_a + r_b + r_c) /$	$(\# \text{ OF APPRAISERS}) =$										$R = 0,1400$
18 $(\text{Max } X - \text{Min } X) =$											$X_{DIFF} = 0,0433$
19 $R \times D_4^* =$	APPRAISER A C										$UCL_R = 0,3612$

* $D_4 = 3.27$ for 2 trials and 2.58 for 3 trials. UCL_R 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 gilt auch für Container und Stückware.

	Messmittelfähigkeit	 Schlemmer
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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				% Tolerance (Tol)	
Repeatability - Equipment Variation (EV)				% EV = 100 (EV/TV) = 100(0,08271/0,97542) = 8,48	
EV	=	$R \times K_1$			
	=	0,1400 x 0,5908			
	=	0,08271			
			Trials	K1	
			2	0,8862	
			3	0,5908	
Reproducibility - Appraiser Variation (AV)				% AV = 100 (AV/TV) = 100(0,01691/0,97542) = 1,73	
AV	=	$\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$			
	=	$\{(0,0433 \times 0,5231)^2 - (0,0827^2/(10 \times 3))\}^{1/2}$			
	=	0,01691			
n = parts	r = trials	Appraisers	2	3	
		K ₂	0,7071	0,5231	
Repeatability & Reproducibility (GRR)				% R&R = 100 (R&R/TV) = 100(0,08442/0,97542) = 8,65 Gage system O.K	
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 = 100 (PV/TV) = 100(0,97176/0,97542) = 99,62	
PV	=	$R_p \times K_3$			
	=	3,0889 x 0,3146			
	=	0,97176			
Total Variation (TV)				ndc = 1.41 (PV/GRR) = 1.41(0,97176/0,08442) = 16,000	
TV	=	$\{(GRR^2 + PV^2)\}^{1/2}$			
	=	$\{(0,0844^2 + 0,9718^2)\}^{1/2}$			
	=	0,97542			

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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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	Specification -2 2	Gage Type Sartorius, Auflösung 0,1g		Appraiser C Würfel V.	
Characteristic Classification 66,0	Einheit mm	Trials 3	Parts 10	Appraisers 3	Date Performed 08.05.15

APPRAISER/ TRIAL #	PART										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a = 66,0733$
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	$\bar{x}_b = 66,0733$
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	$\bar{x}_c = 66,0767$
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	$\bar{X} = 66,0744$ $R_p = 2,100$
17 $(r_a + r_b + r_c) /$	$(\# \text{ OF APPRAISERS}) =$										$R = 0,0400$
18 $(\text{Max } X - \text{Min } X) =$											$X_{DIFF} = 0,0033$
19 $R \times D_4^* =$											$UCL_R = 0,1032$

* $D_4 = 3.27$ for 2 trials and 2.58 for 3 trials. UCL_R 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 gilt auch für Container und Stückware.

	Messmittelfähigkeit	 Schlemmer
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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				% Tolerance (Tol)																					
Repeatability - Equipment Variation (EV)				% EV = 100 (EV/TV) = 100(0,02363/0,66108) = 3,57																					
EV = R x K ₁ = 0,0400 x 0,5908 = 0,02363		<table border="1"> <tr> <th>Trials</th> <th>K1</th> </tr> <tr> <td>2</td> <td>0,8862</td> </tr> <tr> <td>3</td> <td>0,5908</td> </tr> </table>				Trials	K1	2	0,8862	3	0,5908														
Trials	K1																								
2	0,8862																								
3	0,5908																								
Reproducibility - Appraiser Variation (AV)				% AV = 100 (AV/TV) = 100(0,00000/0,66108) = 0,00																					
AV = {(X _{DIFF} x K ₂) ² - (EV ² /nr)} ^{1/2} = {(0,0033 x 0,5231) ² - (0,0236 ² /(10 x 3))} ^{1/2} = 0,00000		<table border="1"> <tr> <th>Appraisers</th> <th>2</th> <th>3</th> </tr> <tr> <td>K₂</td> <td>0,7071</td> <td>0,5231</td> </tr> </table>				Appraisers	2	3	K ₂	0,7071	0,5231														
Appraisers	2	3																							
K ₂	0,7071	0,5231																							
n = parts r = trials																									
Repeatability & Reproducibility (GRR)				% R&R = 100 (R&R/TV) = 100(0,02363/0,66108) = 3,57 Gage system O.K																					
GRR = {(EV ² + AV ²)} ^{1/2} = {(0,0236 ² + 0,0000 ²)} ^{1/2} = 0,02363		<table border="1"> <tr> <th>Parts</th> <th>K₃</th> </tr> <tr> <td>2</td> <td>0,7071</td> </tr> <tr> <td>3</td> <td>0,5231</td> </tr> <tr> <td>4</td> <td>0,4467</td> </tr> <tr> <td>5</td> <td>0,4030</td> </tr> <tr> <td>6</td> <td>0,3742</td> </tr> <tr> <td>7</td> <td>0,3534</td> </tr> <tr> <td>8</td> <td>0,3375</td> </tr> <tr> <td>9</td> <td>0,3249</td> </tr> <tr> <td>10</td> <td>0,3146</td> </tr> </table>				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
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 = 100 (PV/TV) = 100(0,66066/0,66108) = 99,94																							
PV = R _p x K ₃ = 2,1000 x 0,3146 = 0,66066																									
Total Variation (TV)		ndc = 1.41 (PV/GRR) = 1.41(0,66066/0,02363) = 39,000																							
TV = {(GRR ² + PV ²)} ^{1/2} = {(0,0236 ² + 0,6607 ²)} ^{1/2} = 0,66108																									

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), Vierte Ausgabe.						
Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 2 v. 2

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GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET									
VARIABLE DATA RESULTS									

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

APPRAISER/ TRIAL #	PART										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a =$ 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	$\bar{x}_b =$ 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	$\bar{x}_c =$ 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	$\bar{X} =$ 29,2847 $R_p =$ 0,258
17 $(r_a + r_b + r_c) /$	$(\# \text{ OF APPRAISERS}) =$										$R =$ 0,0130
18 $(\text{Max } X - \text{Min } X) =$											$X_{DIFF} =$ 0,0020
19 $R \times D_4^* =$											$UCL_R =$ 0,0335

* $D_4 = 3.27$ for 2 trials and 2.58 for 3 trials. UCL_R 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 gilt auch für Container und Stückware.

Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 1 v. 2
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	Messmittelfähigkeit	 Schlemmer
		Seite 2 von 2

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET VARIABLE DATA RESULTS				
Part Number 1930029	Gage Name Meßschieber digital		Appraiser A Ferderer J.	
Part Name PP-BS NW 29 Ringware	Gage Number 171274051		Appraiser B Zobel F.	
Characteristic Innen dm.	Gage Type Handmessmittel 150mm		Appraiser C Würfel V.	
Characteristic Classification 29,3	Trials 3	Parts 10	Appraisers 3	Date Performed 07.05.15

Measurement Unit Analysis			% Tolerance (Tol)			
Repeatability - Equipment Variation (EV)			% EV = 100 (EV/TV) = 100(0,00768/0,08146) = 9,43			
EV	= R x K ₁	Trials			K1	
	= 0,0130 x 0,5908	2			0,8862	
	= 0,00768	3			0,5908	
Reproducibility - Appraiser Variation (AV)			% AV = 100 (AV/TV) = 100(0,00000/0,08146) = 0,00			
AV	= {(X _{DIFF} x K ₂) ² - (EV ² /nr)} ^{1/2}	Appraisers			2	3
	= {(0,0020 x 0,5231) ² - (0,0077 ² /(10 x 3))} ^{1/2}					
	= 0,00000	K ₂			0,7071	0,5231
n = parts	r = trials					
Repeatability & Reproducibility (GRR)			% R&R = 100 (R&R/TV) = 100(0,00768/0,08146) = 9,43 Gage system O.K			
GRR	= {(EV ² + AV ²) ^{1/2}	Parts			K ₃	
	= {(0,0077 ² + 0,0000 ²) ^{1/2}	2			0,7071	
	= 0,00768	3			0,5231	
Part Variation (PV)			% PV = 100 (PV/TV) = 100(0,08110/0,08146) = 99,55			
PV	= R _p x K ₃	4			0,4467	
	= 0,2578 x 0,3146	5			0,4030	
	= 0,08110	6			0,3742	
Total Variation (TV)			ndc = 1.41 (PV/GRR) = 1.41(0,08110/0,00768) = 14,000			
TV	= {(GRR ² + PV ²) ^{1/2}	7			0,3534	
	= {(0,0077 ² + 0,0811 ²) ^{1/2}	8			0,3375	
	= 0,08146	9			0,3249	
		10	0,3146			

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.						
Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 2 v. 2

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	Specification -0,15 0,15	Gage Type optisch ST 300
Appraiser C Pfaff M.	Characteristic Classification 3,4	Einheit mm
Trials 3	Parts 10	Appraisers 3
Date Performed 08.05.15		

APPRAISER/ TRIAL #	PART										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a =$ 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	$\bar{x}_b =$ 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	$\bar{x}_c =$ 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	$\bar{X} =$ 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 $R \times D_4^* =$											$UCL_R =$ 0,0189

* $D_4 = 3.27$ for 2 trials and 2.58 for 3 trials. UCL_R 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
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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				% Tolerance (Tol)																					
Repeatability - Equipment Variation (EV)				% EV = 100 (EV/TV) = 100(0,00433/0,05087) = 8,52																					
EV = R x K ₁ = 0,0073 x 0,5908 = 0,00433		<table border="1"> <tr> <th>Trials</th> <th>K1</th> </tr> <tr> <td>2</td> <td>0,8862</td> </tr> <tr> <td>3</td> <td>0,5908</td> </tr> </table>				Trials	K1	2	0,8862	3	0,5908														
Trials	K1																								
2	0,8862																								
3	0,5908																								
Reproducibility - Appraiser Variation (AV)				% AV = 100 (AV/TV) = 100(0,00068/0,05087) = 1,35																					
AV = {(X _{DIFF} x K ₂) ² - (EV ² /nr)} ^{1/2} = {(0,0020 x 0,5231) ² - (0,0043 ² /(10 x 3))} ^{1/2} = 0,00068		<table border="1"> <tr> <th>Appraisers</th> <th>2</th> <th>3</th> </tr> <tr> <td>K₂</td> <td>0,7071</td> <td>0,5231</td> </tr> </table>				Appraisers	2	3	K ₂	0,7071	0,5231														
Appraisers	2	3																							
K ₂	0,7071	0,5231																							
n = parts r = trials																									
Repeatability & Reproducibility (GRR)				% R&R = 100 (R&R/TV) = 100(0,00439/0,05087) = 8,62 Gage system O.K																					
GRR = {(EV ² + AV ²) ^{1/2} = {(0,0043 ² + 0,0007 ²) ^{1/2} = 0,00439		<table border="1"> <tr> <th>Parts</th> <th>K₃</th> </tr> <tr> <td>2</td> <td>0,7071</td> </tr> <tr> <td>3</td> <td>0,5231</td> </tr> <tr> <td>4</td> <td>0,4467</td> </tr> <tr> <td>5</td> <td>0,4030</td> </tr> <tr> <td>6</td> <td>0,3742</td> </tr> <tr> <td>7</td> <td>0,3534</td> </tr> <tr> <td>8</td> <td>0,3375</td> </tr> <tr> <td>9</td> <td>0,3249</td> </tr> <tr> <td>10</td> <td>0,3146</td> </tr> </table>				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
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 = 100 (PV/TV) = 100(0,05069/0,05087) = 99,63																							
PV = R _p x K ₃ = 0,1611 x 0,3146 = 0,05069																									
Total Variation (TV)		ndc = 1.41 (PV/GRR) = 1.41(0,05069/0,00439) = 16,000																							
TV = {(GRR ² + PV ²) ^{1/2} = {(0,0044 ² + 0,0507 ²) ^{1/2} = 0,05087																									

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.						
Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 2 v. 2

	Messmittelfähigkeit	
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GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET VARIABLE DATA RESULTS

Part Number 1930029		Gage Name Meßschieber digital		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										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a =$ 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	$\bar{x}_b =$ 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	$\bar{x}_c =$ 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	$\bar{X} =$ 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 $R \times D_4^* =$											$UCL_R =$ 0,0181

* $D_4 = 3.27$ for 2 trials and 2.58 for 3 trials. UCL_R 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 gilt auch für Container und Stückware.

	Messmittelfähigkeit	 Schlemmer
		Seite 2 von 2

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET VARIABLE DATA RESULTS				
Part Number 1930029	Gage Name Meßschieber digital		Appraiser A Ferderer J.	
Part Name PP-BS NW 29 Ringware	Gage Number 171274051		Appraiser B Zobel F.	
Characteristic Wanddicke	Gage Type Handmessmittel 150mm		Appraiser C Würfel V.	
Characteristic Classification 0,3	Trials 3	Parts 10	Appraisers 3	Date Performed 08.05.15

Measurement Unit Analysis				% Tolerance (Tol)																					
Repeatability - Equipment Variation (EV)				% EV = 100 (EV/TV) = 100(0,00414/0,04495) = 9,20																					
EV = R x K ₁ = 0,0070 x 0,5908 = 0,00414		<table border="1"> <tr> <th>Trials</th> <th>K1</th> </tr> <tr> <td>2</td> <td>0,8862</td> </tr> <tr> <td>3</td> <td>0,5908</td> </tr> </table>				Trials	K1	2	0,8862	3	0,5908														
Trials	K1																								
2	0,8862																								
3	0,5908																								
Reproducibility - Appraiser Variation (AV)				% AV = 100 (AV/TV) = 100(0,00138/0,04495) = 3,06																					
AV = {(X _{DIFF} x K ₂) ² - (EV ² /nr)} ^{1/2} = {(0,0030 x 0,5231) ² - (0,0041 ² /(10 x 3))} ^{1/2} = 0,00138		<table border="1"> <tr> <th>Appraisers</th> <th>2</th> <th>3</th> </tr> <tr> <td>K₂</td> <td>0,7071</td> <td>0,5231</td> </tr> </table>				Appraisers	2	3	K ₂	0,7071	0,5231														
Appraisers	2	3																							
K ₂	0,7071	0,5231																							
n = parts r = trials																									
Repeatability & Reproducibility (GRR)				% R&R = 100 (R&R/TV) = 100(0,00436/0,04495) = 9,70 Gage system O.K																					
GRR = {(EV ² + AV ²) ^{1/2} = {(0,0041 ² + 0,0014 ²) ^{1/2} = 0,00436		<table border="1"> <tr> <th>Parts</th> <th>K₃</th> </tr> <tr> <td>2</td> <td>0,7071</td> </tr> <tr> <td>3</td> <td>0,5231</td> </tr> <tr> <td>4</td> <td>0,4467</td> </tr> <tr> <td>5</td> <td>0,4030</td> </tr> <tr> <td>6</td> <td>0,3742</td> </tr> <tr> <td>7</td> <td>0,3534</td> </tr> <tr> <td>8</td> <td>0,3375</td> </tr> <tr> <td>9</td> <td>0,3249</td> </tr> <tr> <td>10</td> <td>0,3146</td> </tr> </table>				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
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 = 100 (PV/TV) = 100(0,04474/0,04495) = 99,53																							
PV = R _p x K ₃ = 0,1422 x 0,3146 = 0,04474																									
Total Variation (TV)		ndc = 1.41 (PV/GRR) = 1.41(0,04474/0,00436) = 14,000																							
TV = {(GRR ² + PV ²) ^{1/2} = {(0,0044 ² + 0,0447 ²) ^{1/2} = 0,04495																									

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.						
Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 2 v. 2

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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	Trial 3	Parts 10	Appraisers 3	Date Performed 08.05.15

APPRAISER/ TRIAL #	PART										AVERAGE
	1	2	3	4	5	6	7	8	9	10	
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	$\bar{x}_a = 44,3167$
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	$\bar{x}_b = 44,3167$
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	$\bar{x}_c = 44,3167$
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	$\bar{X} = 44,3167$ $R_p = 4,000$
17 $(r_a + r_b + r_c) /$ (# OF APPRAISERS) =											$R = 0,1500$
18 (Max X - Min X) =											$X_{DIFF} = 0,0000$
19 $R \times D_4^* =$	APPRAISER A B C										$UCL_R = 0,3870$

* $D_4 = 3.27$ 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 gilt auch für Container und Stückware.

	Messmittelfähigkeit	 Schlemmer
		Seite 2 von 2

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				% Tolerance (Tol)																					
Repeatability - Equipment Variation (EV)				% EV = 100 (EV/TV) = 100(0,08862/1,26152) = 7,02																					
EV = R x K ₁ = 0,1500 x 0,5908 = 0,08862		<table border="1"> <tr> <th>Trials</th> <th>K1</th> </tr> <tr> <td>2</td> <td>0,8862</td> </tr> <tr> <td>3</td> <td>0,5908</td> </tr> </table>				Trials	K1	2	0,8862	3	0,5908														
Trials	K1																								
2	0,8862																								
3	0,5908																								
Reproducibility - Appraiser Variation (AV)				% AV = 100 (AV/TV) = 100(0,00000/1,26152) = 0,00																					
AV = {(X _{DIFF} x K ₂) ² - (EV ² /nr)} ^{1/2} = {(0,0000 x 0,5231) ² - (0,0886 ² /(10 x 3))} ^{1/2} = 0,00000		<table border="1"> <tr> <th>Appraisers</th> <th>2</th> <th>3</th> </tr> <tr> <td>K₂</td> <td>0,7071</td> <td>0,5231</td> </tr> </table>				Appraisers	2	3	K ₂	0,7071	0,5231														
Appraisers	2	3																							
K ₂	0,7071	0,5231																							
n = parts r = trials																									
Repeatability & Reproducibility (GRR)				% R&R = 100 (R&R/TV) = 100(0,08862/1,26152) = 7,02 Gage system O.K																					
GRR = {(EV ² + AV ²) ^{1/2} = {(0,0886 ² + 0,0000 ²) ^{1/2} = 0,08862		<table border="1"> <tr> <th>Parts</th> <th>K₃</th> </tr> <tr> <td>2</td> <td>0,7071</td> </tr> <tr> <td>3</td> <td>0,5231</td> </tr> <tr> <td>4</td> <td>0,4467</td> </tr> <tr> <td>5</td> <td>0,4030</td> </tr> <tr> <td>6</td> <td>0,3742</td> </tr> <tr> <td>7</td> <td>0,3534</td> </tr> <tr> <td>8</td> <td>0,3375</td> </tr> <tr> <td>9</td> <td>0,3249</td> </tr> <tr> <td>10</td> <td>0,3146</td> </tr> </table>				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
Parts	K ₃																								
2	0,7071																								
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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 = 100 (PV/TV) = 100(1,25840/1,26152) = 99,75																							
PV = R _p x K ₃ = 4,0000 x 0,3146 = 1,25840																									
Total Variation (TV)		ndc = 1.41 (PV/GRR) = 1.41(1,25840/0,08862) = 20,000																							
TV = {(GRR ² + PV ²) ^{1/2} = {(0,0886 ² + 1,2584 ²) ^{1/2} = 1,26152																									

Weitere Informationen zum theoretischen Ansatz und zu den in diesem Formular verwendeten Konstanten finden sich im Referenzhandbuch Measurement Systems Analysis (MSA), vierte Ausgabe.						
Formular Nr.:199	Ersteller: U. Fleischer QL	Geprüft: U.Fleischer QL	Freigabe: J. Bayer QMB	Index: 2.2	Datum: 30.04.15	Seite 2 v. 2



Control Plan (Corrugated tubes) Produktlenkungsplan

No.: KP-SRP-000-1
Part / Part Family: (Teil / Teildfamilie)
corrugated standard hose with continuous geometry
standard Welschlauch

Prototype / Pre-Launch / X-Produktion Stiefen-Holmann all standard (für alle Standards)	Key Contact / Phone Stiefen-Holmann +49 8121 804 146	Date (Orig.) 04.05.2001	Date (Rev.) 29.04.2014	Created: (Erstellt:) St. Holmann (CQ1)	Approved: (Freigegeben:) St. Brozki (CQ1)
Drawing (Rev.): (Zeichnung / Index) Schlemmer drawing all standard (für alle Standards)	Part-Number (Supplier) all	Part Name / Description (Produktname und Bezeichnung): corrugated standard hose with continuous geometry Standard Welschlauch	Core Team: L. Cenadi (P.), D. Kolbe (QS), J. Rühseitz (PL), St. Hofmann (CQ1)	Distribution: (Verteiler) Schlemmer	

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

Part / Process Number	Process Name / Operation Description Anfertigungsbeschreibung	Machine, Tool, Device, Jig Anlage	Characteristics			Methods					Control Method Methode	Documentation	Corrective action Korrekturmaßnahmen	
			No.	Product	Process	Spec. Char. Class	Product/Process Specification/ Tolerance	Measurement equipment Prüfmittel	Size Größe	Sample Freq. Frequenz				Resp. Verantwort.
0	Release of tools Freigabe der Werkzeuge	mould blocks Formbacken	1	contour of corrugated tube (sharp edges within the profil range) Kontur Schlauch		Ø	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	
			2	part formed Form Teil		Ø	Dim. according dwg Maße nach freigegeb. Zeichnung und Funktionsbereitschaft Füllung / Roundness Füllung / Rundheit	caliper gauge and balance Meßschieber Meßschieber	1 turn of mould blocks 1 Ketten-umlauf	new mould blocks neues Werkzeug oder -änderung	prod. manager Prod. Manager	Dimension check Maßprüfung		
1	Incoming inspection (Granulate) Wareneingangsprüfung Granulat		1	Material Material		Ø	conformity from material with order Konformität der Werkstoffbestellung	visual check visuell		each delivery Jede Lieferung	Incoming inspection department WE	Keep test certificate Test Zertifikat aufbewahren	reject delivery, claim (7-D) Reklamationsbearbeitung starten	
2	placing at disposal Vorbereitung Material		1	Material Material		Ø	Material according to production order Material gemäß Produktionsauftrag	visual check visuell		each production order Jeder Fertigungsauftrag	shift-leader, operator Schichtführer Werker	comparison PO with material lab. Verg. Arbeitsnummer im Materiallabor	no machine release for production and start improvements keine Freigabe der Maschine für Fertigung	
3	corrugated tube extrusion Extrusion	Extrusion-line Rohranlage	1	inside diameter Innendurchmesser		Ø	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	attributive check Attributivprüfung	release in control chart ORQ Freigabe	No release to the machine for production, immediately action induce, find out root cause and induce action Keine Freigabe der Maschine für Fertigung, Sofortmaßnahmen einleiten, Ursache ermitteln und Maßnahmen einleiten
			2	outside diameter Aussendurchmesser		Ø	check according to PA 1501-02 Prüfung nach PA 1501-02	caliper gauge (multiple gauges) Meßschieber	1 meter	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 ORQ Freigabe	
			3	wall thickness area 1 / area 2 Wandsstärke zw. Bereich 1 u. 2		Ø	check according to PA 1501-02 Prüfung nach PA 1501-02	caliper gauge (multiple gauges) Meßschieber	1 meter		shift-leader, Schichtführer	attributive check Attributivprüfung	release in control chart ORQ 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 ORQ Freigabe	
			5	printing Bedruckung		Ø	check acc. each PO Prüfung n. j. Auftrag	visual check measuring bench (multiple gauges)	4 meter	printer change and change of parameter every 4 hours nach Drucker-tausch oder Parameteränd. oder alle 4 Stunden	shift-leader, Schichtführer	visual check attributive check	control chart	
			6	sifting (if necessary) Schützen (wenn gefordert)		Ø	check acc. each PO Prüfung n. j. Auftrag	visual check visuell	1 meter	start of production every 4 hours zu Produktionsbeginn	shift-leader, Schichtführer	visual check attributive check	ORQ Freigabe control chart	
			7	flamability test (if necessary) Flammbarkeits-test (wenn gefordert)		Ø	check according to PA 1501-02 Prüfung nach PA 1501-02	light (laboratory) Licht	1 piece	alle 4 Stunden	shift-leader, Schichtführer	attributive check Attributivprüfung	control chart ORQ Freigabe	
			8	part formed Ausformung	parameter	Ø	filling / roundness Füllung / Ovalität	visual check visuell	one turn of mould blocks 1 Ketten-umlauf	production start zu Produktionsbeginn	shift-leader, Schichtführer	visual check attributive check	ORQ Freigabe control chart	Repair failure, check machine parameter find root cause and induce action No release to the machine
					automatic control of parameter (not for all) automatische Kontrolle der Parameter (nicht aller)	Ø	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 erönt oder erscheint ein Alarm	progress chart none Linienfreigabe FB 1402-01 Störung beheben, Ursache ermitteln und Maßnahmen einleiten keine Freigabe der Maschine	



Control Plan (Corrugated tubes) Produktlenkungsplan

No.: KP SRP 000-1
Part / Part Family: (Teil / Teiled Familie)
corrugated standard hose with continuous geometry
standard Wellenschlauch

__ Prototype __ Pre-Launch __ X Production	Key Contact / Phone	Date (Orig.)	Date (Rev.)	(Datum und Änderungsindex)	Created: (Erstellt :)	Approved: (Freigegeben:)
__ Prototyp __ __ Vorserie	Stefien Hofmann	04.05.2001	Rev. 18	St. Hofmann (CQ1)	St. Hofmann (CQ1)	St. Brozki (CQ1)
Drawing (Rev.): (Zeichnung / Inkav)	Part-Number	Part Name / Description	Product Name und Bezeichnung:	Core Team:	Distribution: (Verteiler)	
Schlemmer drawing	all	corrugated standard hose with continuous geometry	Standard Wellenschlauch	L. Cenadi (P.), D. Kolbe (QS), J. Rühseitz (PL), St. Hofmann (CQ1)	Schlemmer	
all standard (für alle Standard)						
Customer Engineering Approval Date (If Req'd):	Customer Quality Approval Date (If Req'd):	Other Approval Date (If Req'd):				

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



Prototype ___ Pre-Launch X Production
___ Prototype ___ Vorserie Produktion

Key Contact / Phone
Stefen Hofmann
+49 8121 804 148

Part-Number
all

Part Name / Description
corrugated standard hose with continuous geometry

Customer Quality Approval Date (If Req'd):

Date (Orig.)
04.05.2001

Date (Rev.)
29.04.2014

Created: (Erstellt:)
St. Hofmann (CQ1)

Approved: (Freigegeben:)
St. Hofmann (CQ1)

Distribution: (Verteiler)
Schlemmer

Part / Part Family:
corrugated standard hose with continuous geometry

No.: KP SRP 000-1

Control Plan (Corrugated tubes) Produktlenkungsplan

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
4	final inspection (only pieces) Abschlußüberprüfung (nur für Teile gültig)		1	length Länge		Ø	check according Prüfung nach PA 1501-01 e	measuring bare (multiple gauges) Meßschiene	sample	every packing jede Verpackung	final control Abschluß- überprüfung	attributive check Attributivprüfung	none	claim to production je nach Anfrage an die Produktion
			2	printing Bedruckung		Ø	check according Prüfung nach PA 1501-01 e	visual check	sample	every packing jede Verpackung	final control Abschluß- überprüfung	visual check	none	
			3	slitting Schlitzen		Ø	check according Prüfung nach PA 1501-01 e	visual	sample	every packing jede Verpackung	final control Abschluß- überprüfung	visual check	none	
			4	cut Abschnitt		Ø	check according Prüfung nach PA 1501-01 e	visual check	sample	every packing jede Verpackung	final control Abschluß- überprüfung	visual check	none	
			5	diameter Durchmesser		Ø	check according Prüfung nach PA 1501-01 e	visual check	sample	every packing jede Verpackung	final control Abschluß- überprüfung	visual check	none	
5	Requalification Requalifizierung		1	flammability		Ø	drawing nach Zeichnung	burn chamber (laboratory) Brenner (im QS-Labor)	3 pcs of 3 diameter of each material 3 Teile von je 3 Durchmesser von jedem Material	every 1 year alle 1 Jahr	Quality group	attributive check	Excel	block of stock, consultation with customer and process-development Ware ist bis zur letzten i.O.-Prüfung zu sperrern sowie Kunden und eigene Entwicklungsabteilung informieren
			2	warm storing (short term) Wärmelagerung		Ø	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 Durchmesser von jedem Material	every 1 year alle 1 Jahr	Quality group	visual check	Excel	

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

