# NGE TO / TENDER

TRANSNET freight rail

Elijah Manana

GMR-14323 Tender No:

Vendor No: 11001386

BOARD LIST BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT 2000

011 584 1143 Telephone:

Fax Number:

Purchaser :

Please quote reference:

K64/6000603562

Deliver to:

TFR Head Office Supply Chain Services 2000 Johannesburg

:26.06.2014 Closin Val: dit ate :08.05.2014 RFQ No :6000603562 End or Validity :28.08.2014

Currency: ZAR

RFQ/TENDER: CRAC/GMR

SUPPLY OF STRAIN GALGE MATERIALS AT TRANSNET- GEORGE GOCH DEPOT FOR A PERIOD OF THREE MOUTAS

ISSUED: 20 JUNE 2014

26 JUNE 2014 CLOSING DAT

CLOSING (THE: 10:AM

ENQUIRIES: NELSON TAPALA 078 097 9360 OR 011 026 3601

BIDDER/S ARE HEREBY INVITED TO QUOTE AND SUBMIT QUOTATION/S AT INYANDA HOUSE 1, 21 WELLINGTON ROAD, PARKTOWN-JOHANNESBURG, NOT LATER THAN THURSDAY 26 JUNE 2014 AT 10:00 AM.

RETURN OF QUOTATION/S PLEASE FAX: 011 774 9129 OR 774 9186 OR E-MAIL TO: thuli.mathebula@transnet.net. HAND / POST / COURIER: TENDER BOX IS OPEN FOR SEVEN DAYS PER WEEK FOR THE RFQ/TENDERS AND QUOTATIONS SUBMISSION.

QUOTATION/S MUST BE SUBMITTED PUNCTUALLY AT 10:00 ON THE CLOSING DATE AND LATE QUOTATIONS WILL

1.1 QUOTATION/S MUST BE SUBMITTED PUNCTUALLY AT 10:00 ON THE CLOSING DATE AND LATE QUOTATIONS WILL NOT BE CONSIDERED

1.2 IF DELIVE	RED BY HAND:			
DATE:	SIGNATURE	OF TENDERER(S):		***************************************
	CONTACT PERSON:	TEL	L <b>N</b> o:	

#### CHANGE TO / TENDER RFO

Tender No:

GMR-14323

Page

Date

23.05.2014

. . a

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

> TRANSNET FREIGHT RAIL, SUPPLY CHAIN SERVICES GROUND FLOOR INYANDA HOUSE 1 21 WELLINGTON ROAD PARKTOWN 2193

#### 2. CONDITIONS:

- 2.2 ANY PURCHASE ORDER PLACED AS A RESULT OF YOUR QUOTATION WILL BLISD USET TO THE STANDARD TERMS AND CONDITIONS OF CONTRACT, FORM US7(LATEST), GENERAL TENDER CONDITIONS MENTIONED HEREIN.
- 2.3 TENDERERS MAY OFFER AN EARLIER VALIDITY DATE, BUT THEIR CLIOTATION MAY, IN THAT EVENT, BE DISREGARDED FOR THIS REASON.
- 2.4 TENDERERS ARE REQUIRED TO OFFER ONLY FIRM PRICES. PA CES SUBJECT TO REVIEW IN TERMS OF CLAUSE 32 OF FORM US7 WILL ONLY BE CONSIDERED SHOULD THE DECLYERY SERIOD REQUIRED EXCEED 6 MONTHS.
- 2.5 BEST DELIVERY TIME MUST BE OFFERED.
- 2.6 DISCOUNT (TRADE DISCOUNT), VALUE ADDED TA (VAT) NUCH BE SHOWN SEPARATELY.
- 2.7 TRANSNET RESERVES THE RIGHT TO NEGO TATE PROS AND COMMERCIAL ASPECTS AFTER THE CLOSING DATE OF THE QUOTATION.
- 2.8 DIRECT DELIVERY INTIMATES DELIVERY BEING EFFECTED INTO THE WAREHOUSE OR THE ACTUAL POINT OF SUPPLY AND SHOULD THEREFORE INCLUDED BY TRANSPORTATION MODE DEEMED NECESSARY IN EXECUTING THIS METHOD OF DELIVERY BASIS IN ORDER TO MEET THE EQUIRED DELIVERY DATE.

#### **EVALUATION CRITERIA:**

STAGE 1: ADMINISTRATIVE RESPONDIVENESS - MANDATORY (Failer to comply will lead to Disqualification)

1. DELIVERY PERIOD PROSE MME

STAGE 2: PHASE SULST INTIVE RESPONSIVENESS - MANADATORY, FAILURE TO COMPLY WITH RESPONSIVE RESPONSIVENESS - MANADATORY, FAILURE TO

- 1. APPROVAL TROM MANUFACTURER (HBM and Vshay measurements)
- 2 MATRIAL AFETY DATA SHEETS TO BE SUPPLIED WITH GOODS

STAGE 2: PHASE 2

PRE-QUALIFICATION / FUNCTIONALITY - MINIMUM THRESHOLD 90% MUST BE MET FOR BIDDER TO PROGRESS TO STAGE 3

1 COMPLIANCE TO SCOPE OF WORK FOR THE PROJECT

STAGE 3

COMMERCIAL / PREFERENCE 80/20

- . COMPETITIVE PRICING
- . PROVIDE B-BBEE CERTICATE AND SCORECARD

DATE:	SIGNATURE OF	TENDERER(S):	
	OIOWATOIAL OF	TENDERER(3)	***************************************

# CHANGE TO / TENDER RFQ

Tender No: GMR-14323 Date : 23.05.2014

Page

3

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

TAX CLEARANCE CERTIFICATES: The Regulations in terms of the	Public
_	gement as published in Government GazetteNo.25767 dated 5 December
• • • • • • • • • • • • • • • • • • • •	nstitution to which these regulations apply must reject any bid from a
	enue that the supplier either has no outstanding tax obligations or has
	ill be disqualified if a valid tax clearance certificate or written proof from the
	s to meet outstanding tax obligations is not submitted with the tender.
COMPANY DETAILS: NAME OF COMPANY:	CONTACT PERSON:
COMPANY DETAILS: NAME OF COMPANY:	REG. No. BROAD
PASE BLACK ECONOMIC EMPOWERMENT (PRREE) Transport ful	y endorses and supports the Government's Broad-based Black Economic
	th African Business Enterprises have an equal obligation to reddress the
	enterprises who share the same values. Transnet will endeavour to do
	east a leve 5. The shat urges Tenderers (large enterprises and QSE's-
see below) to have themselves accredited by any one of the various	
	ry 2017) and Masse names appear on the present ABVA (Association of
	ABLA website (www.abva.co.za) Although no agencies have, as yet,
	will, a the interim, accept rating certificates of tenderers who have
	such agency based on the Following: 1. Large Enterprises (i.e. annual
	BBBEE scorecard. 2. Qualifying Small Enterprises-(QSE)(i.e anual
turnover>R5M but <r35m "rating="" any="" based="" elements="" four="" of<="" on="" td=""><td></td></r35m>	
	cemptedfrom being rated/verified: "Automatic rating of Level 4 BBBEE
irrespective of race of ownership, i.e.100% BBBEE recognition	, II
"Black ownership>50% or Black Women ownership>30% automatical	ally
qualifies as level 3 BBBEE, i.e. 110% BBBEL ecounition.	
"EME's should provide certified documentary proof anual turnover	
(i.e. audited financials) plus proof of plack owns hip if Black	
ownership>50% or Black Womer own, ship 30% from the EME's A	uditor/
Accounting Officer.	
4. In addition to the above Tend rers, no wish to enter into a Joint	
Venture or subcontract portion of the contract to BBBEE compani	es,
must state in their tender, the percentage of the total contract value	
that will be allocated to sub aBBEE companies should they be succ	
in being awarded by business. A rating certificate in respect of such	
BBBEE JV part ers and /or sub-contractor/s, as well as a breakdowr	
the distribution of the aforementioned percentage must also be furnis	hed
In view of the high emphasis which Transnet places on Broad-based	
Black Economic Empowerment, Transnet will allow certain preference	e
points for BBBEE in the evaluation of all responses. Depending upon	the
value of the ensuing business award	
(i.e.below or in excess of R2m), the 80/20 or 90/10 point preference	
systems will be utillized where BBBEE will count out of 20 or 10	
respectively in the evaluation process.	
EACH RESPONDENT IS REQUIRED TO FURNISH PROOF OF TH	E ABOVE TO TRANSNET
FAILURE TO DO SO WILL RESULT IN A SCORE OF ZERO BEING	ALLOCATED FOR BBBE
Turnover: Kindly incicate your company's annual turnover for the pas	t
year R	

DATE:	SIGNATURE OF TENDERER(S):	
27 t t t=,	SIGNOTOTIC OF TEMPERATION.	

#### CHANGE TO / TENDER RFO

Tender No: GMR-14323 Page Date : 23.05.2014 4

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

"If anual turnover<R5m, please attach certified confirmation from your Auditor/Accounting Officer

"If anual turnover>R5m please attach original or certified copy of accreditation certificate and detailed scorecard by an ABVA accreditation agency (registered as a "Full Member")

#### PAYMENT TERMS

The following payment terms will apply as from 1 October 2008. "All suppliers will be paid 30 days from receipt of month and statement. i.e. payment term F055

#### CONDITIONS:

This quotation is subject to the provisions of the Standard Terms and Conditions of Contrac, Form US7, (Latest) and the General Tender Conditions, Form CSS5 (Latest) and any other standard or special conditions mentioned and/or embodied in the quotation request.

#### SCHEDULE OF REQUIREMENTS

TENDERERS SHOULD INSERT THEIR PRICE/S UPDER THE APPROPRIATE HEADING HEREUNDER;

IN THIS REGARD THE TENDERER'S ATTENTION IS DIRECTED TO PARAGRAPH 16 OF FORM CSS5 (LATEST).

NB. TENDERERS OFFERING GOODS FROM IMPORTED SUPPLIES MUST SUBMIT THEIR PRICES ON THE DELIVERY BASIS APPEARING UNDER COLUMN (C) OF THIS SCHEDULE OF REQUIREMENTS.

TRANSNET INSISTS ON HONEST, AND INTEGRITY BEYOND REPRAOCH AT ALL TIMES AND WILL NOT TOLET ATE TANK FORM OF IMPROPER INFLUENCING, BRIBERY, CORRUPTION, FRATID, OR ANY OTHER UNETHICAL CONDUCT ON THE PART OF BIDDERS /TRANSNET EM. LOYES, if, in the opion of transnet, s chief operating OFFICER, A TEND DEP/CONTRACTOR/SUPPLIER HAS OR CAUSED TO BE PROMISED, OFFER OK GIVEN TO ANY TRANSNET EMPLOYEE, ANY BRIBE, COMMISSION, GIFT LOAN, DVAY TAGE OR OTHER CONSIDERATION, TRANSNET SHALL BE ENTITLED TO REVORE THE VENDER/CONTRACT BY FOLLOWING ITS INTERNAL POLICIES THAT GOVERN THE ECLUSION PROCESS. IN SUCH AN EVENT TRANSNET WILL BE ENTITLED TO PLACE ANY TENDERER/CONTRACTOR/SUPPLIER WHO HAS CONTRAVENED THE PROVISIONS OF TRANSNET'S BUSINESS ETHICS ON ITS LIST OF EXCLUDED TENDERERS. THIS LIST WILL ALSO BE DISTRIBUTED TO ALL OTHER STATE OWNED ENTERPRISES AND GOVERNMENT DEPARTMENTS.

TRANSNET INVITES ITS VALUED SUPPLIERS TO REPORT ANY ALLEGATIONS OF FRAUD, CORRUPTION OR OTHER UNETHICAL ACTIVITIES TO TRANSNET TIP-OFFS ANONYMOUS, AT ANY OF THE FOLLOWING ADDRESSES/ CONTACT NUMBERS:

TOLL-FREE ANONYMOUS HOTLINE-0800 003 056 EMAIL-transnet@tip-offs.com

DATE:	SIGNATURE OF TENDERER(S):	

# CHANGE TO / TENDER

**Tender No:** GMR-14323 **Page Date** : 23.05.2014 5

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

FAX NUMBER-0800 007 788 FREEPOST DBN 298, UMHLANGA ROCKS, 4320

ADDITIONAL INFORMATION REQUIRED:(WHERE APPLICABLE)	
3.1 THE FOLLOWING ADDITIONAL INFORMATION IS REQUIRED:	
(A) DISCOUNT:	
(B) SETTLEMENT DISCOUNT:	_
(C) PRICE/S FIRM:	
(D) PRICE/S FIRM UNTIL:THEREAFTER SUBJECT TO REVIEW.	
(E) PRICE/S NOT FIRM:	
(F) SABS MARK;	,
(G) SABS PERMIT NO:	•
(H) BRAND/MAKE/TYPE:	
(I) FULL NAME AND ADDRESS OF MANUFACTURER:	
(J) FULL NAME AND ADDRESS OF INSPECTION POINT	
**************************************	
(K) COUNTRY OF ORIGIN:	
(L) YEAR 2000 CONTRACT COMPLIANCE	
Vendor/proposers shall indicate their year 2000 con pliance with:	
A. Technology Products	
B. Equipment, products, a imponents or parts	
C. Products and Strvicts	
Non- compliance with either (A) or (B) shall result in your bid/	

Year 2000 Compliance means that (A) the information Technology, (B) Equipment/Products/Components/Parts (Collectively Products) supplied.

(C) Products and Services contracted, will accurately process date and time data from into and between the 20th and 21th centuries. The year 1999 and 2000 and for all leap year. Process date and time includes, but is not limited to, data calculation, logistical functions, program branching, format conversion, edits and validations and the use of dates in comparasons, sorting sequencing, merging, retrieving, searching and indexing. Furthermore year 2000 compliance when (A) used in combination with other information technology, (B) used in combination with other products, (C) used in combination with their(Vendor) other date required interfaces, shall accurately process date and time data (A) if the other

DATE:	SIGNATURE OF TENDERER(S):	
-------	---------------------------	--

# CHANGE TO / TENDER

**Tender No:** GMR-14323 **Page Date** : 23.05.2014 6

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

technology, (B) If the other products, (C) either passed to or received from their other customers/suppliers, properly exchange date and time data with it/ them.

Comply:\_\_\_\_\_\_ Does not Comply:\_\_\_\_\_ Not Con

# 

\* APPLICABLE DATE OF EXCHANGE RATE:

\* BENEFICIARY'S NAME AND VULLY DORESS:

\* BENEFICIARY'S DANKERS AND FULL ADDRESS:

\* APPLICABLE ACCOUNT NUMBER:

(O) DELIVERY DATE:

DATE: ...... SIGNATURE OF TENDERER(S): .....

# CHANGE TO / TENDER

Tender No: GMR-14323

Date : 23.05.2014

Page

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

REVILLING CORY ONLY

DATE:	SIGNATURE OF TENDERER(S):	

Tender No: GMR-14323 Date : 23.05.2014

Page

8

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

DATE: .....

TENDERERS MUST FURNISH THEIR ACTUAL DELIVERY AND MANUFACTURING PERIOD HEREUNDER NOTWITHSTANDING THE DELIVERY DATES SPECIFIED BY TRANSNET.

	UIRED TO OBTA	AIN RAW MATE	O IN REGARD TO TH :RIAL(DAYS) :(DAYS)	IE ABOVE:		
3. PERIOD TO T	RANSPORT MA	TERIAL TO DE	STINATION(DAY)		4	
MATERIAL NO.	1.(PERIOD)	2. (PERIOD)	3. (PERIOD)			
Item		Material	Description			 
00010	1 :	Strain Gauge ma	aterials		RActivity	
Delivery Date: 2	5.03.2015					
FULL DETAILS	OF DESCRIPTION	ON				
00020	50	RMS1			_	
Delivery Date: 3	0.08.2014				Activity	
FULL DETAILS	OF DESCRIPTION	ON				

SIGNATURE OF TENDERER(S): .....

Tender No: GMR-14323
Date: 23.05.2014

Page

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

ltem	Qty	Material Description	
00030	10	X 60 A Powder	R
Delivery Date	e: 30.08.2014		Activity
ULL DETAIL	S OF DESCRIP	TION	
0040	10	1.5/120LY11LY11 - STRAIN GA	UGI (10X10c) R
elivery Date	e: 30.08.2014		Activity
ULL DETAIL	_S OF DESCRIP	TION	
0050	10	3/120LY11 - STI AIN G/UGE (1	0X100)
elivery Date	e: 30.08.2014	N	Activity
ULL DETAIL	S OF DESCRIP	TION	
)60	10	XY41-3/120 (10X100)	R
elivery Date	e: 20.01.201		Activity
ULL DE AIL	S OF DESCRIPT	ΓΙΟΝ	
0070	10	1-XY41-6/120 (10X100)	R
elivery Date	e: 30.08.2014		Activity
ILL DETAIL	.S OF DESCRIPT	<b>FION</b>	
0080	10	1-XY91-6/120 (10X100)	5
elivery Date	: 30.08.2014		R Activity
	S OF DESCRIP		

DATE: ..... SIGNATURE OF TENDERER(S): .....

Page

Tender No: GMR-14323
Date: 23.05.2014

10

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

Item	Qty	Material	Description	
0090	5	1-XY91-3/120 (10	0X100)	R
elivery Dat	e: 30.08.2014			Activity
TULL DETAI	LS OF DESCRI	PTION		
0100	5	K-LY41-10/120 (	10X100)	R
elivery Dat	e: 30.08.2014			Activity
FULL DETAI	LS OF DESCRI	PTION	~())	
0110	5	K-LY41-3/120-3-	1M-vired(10x100)	R
Delivery Date	e: 30.08.2014		7	Activity
ULL DETAI	LS OF DESCRI	PTION		
0120	5	K-LY 1-6/120-3-	1M-wired(10x100)	R
Delivery Date	e: 20.0 \20 \			Activity
FULL DE A	LS OF RESCRI	PTION		
00130	5	1-va61k2.5/350_	E (10X100)	R
elivery Date	e: 30.08.2014			Activity
ULL DETAI	LS OF DESCRI	PTION		
00140	5	1-XY91-6/120 wii	red (10X100)	R
Delivery Date	e: 30.08.2014			Activity
		PTION		

SIGNATURE OF TENDERER(S): ..... DATE: .....

Tender No: GMR-14323 Date: 23.05.2014

Page 11

BOARD LIST TRANSNET FREIGHT RAIL PROCUREMENT DEPARTMENT

**FULL DETAILS OF DESCRIPTION** 

Item	Qty	Material Description	
00150	10	Flux Pens (5pcs) (5x100)	R
Delivery Da	nte: 30.08.2014		Activity

JOTAL AMOUNT

JATE: SIGNATURE OF TENDERER(S):	DATE:	SIGNATURE OF TENDERER(S):	,
---------------------------------	-------	---------------------------	---



# Section 4 VENDOR APPLICATION FORM

Respondents are to furnish the following documentation and complete the Vendor Application Form below:

- Original cancelled cheque OR letter from the Respondent's bank verifying banking details [with bank stamp]
- 2. **Certified** copy of Identity Document(s) of Shareholders/Directors/Members [where applicable]
- 3. Certified copy of Certificate of Incorporation, CM29 / CM9 change]
- 4. **Certified** copy of Share Certificates [CK1/CK2 if CC]
- 5. A letter on the company's letterhead confirm physical and postal addresses
- 6. Original valid SARS Tax Clearance Certificate
- 7. Certified copy of VAT Registration Certified
- 8. **Certified copy** of valid Company (tegin tration Certificate [if applicable]
- 9. A signed letter from your auditor or accountant confirming most recent annual turnover figures

#### Vendor Application Form

Compan, trad	ng name					
Company register	red name					
Company Registratio	n Number	or ID Numb	er if a Sole f	Proprietor		
Form of entity [√]	CC	Trust	Pty Ltd	Limited	Partnershi P	Sole Proprietor
VAT number [if re	gistered]					
Company telephone	e number					
Company fax	x number					
Company emai	il address					
Company website	e address					
Bank name			Br	anch & Bran	ch code	
Account holder			Ва	ank account	number	





Postal address				Code
Physical Address				Code
Contact person				
Designation				
Telephone				
Email				
Annual turnover ran	ge [last financial year]	< R5 m	R5 - 35 m	> R35 m
Does	your company provide	Products	Selvice.	Both
	Area of delivery	National	Provincial	Local
	Is your company a public	c or private entity	Public	Private
Does your compar	ny have a Tax Directive or	IRP30 Cert Ticate	Yes	No
Main prod	uct or services [e.g. Station	onery Consulting]		
Complete B-BBEE O	wnership Details:	O,		
% Black ownership	% Back on	women vnership	% Dis	sabled Black ownership
Does your o	ompany hat a a B-bBEE ce	ertificate Yes		No
What is y	our 8-b) dE status [Level	1 to 9 / Unknown		
How many pe	ers inner does the firm emp	ploy Permanent	P	art time
If you are an eastin	ng Vendor with Transnet p	olease complete th	e following:	
	tact person			
	act number			
Transnet Operat				
Duly authorised to sig	gn for and on behalf of Co	mpany / Organisa	ition:	
		Kathanahanananan	···I	
Name		Designation		
Signature		Date		



# TECHNOLOGY MANAGEMENT TRACK TECHNOLOGY.

#### SPECIFICATION

# STRAIN GAUGE MATERIALS

Author

Chief Engines on Te Vician

- Welson Tapala

Date:

12 May 2014

Circulation Security of Tex

Transnet Freight Rail

Transmer and Relevant Third Parties'

Urwestricted

② This document as a whole is protected by copyright. The information herein is the sole property of Transnet Ltd. It may not be used, disclosed or reproduced in part or in whole in any manner whatsoever, except with the written permission of and in a manner permitted by the proprietors.

#### 1. Introduction

These documents provide specification for materials to be replenished by Strain Section at George Goch. These materials are used for strain gauge applications during field testing and laboratory experimental analysis

### 2. Objectives

- Provide Specification that will assist on procuring materials

### 3. List of Material and Quantities

List	Quantity/literal	Quantity/Pack
3.1 RMS1	50	50
3.2 X60 A Powder	10	10
3.3 X60 B Liquid		20
3.4 1.5/120LY11 - Strain Gauges (10/Pack x100)	100	10
3.5 3/120LY11 - Strain Gauges (10/ Pack x 100	100	10
3.6 6/120LY11 - Strain Gauges (10/ Pack x100)	100	10
3.7 1-XY41-3/120 (10/ Pack x100)	100	10
3.8 1-XY41-6/120 (10/ Pack x100)	100	10
3.9 1-XY91-6/120 (10/ Pack x100)	100	10
3.10 1-XY91-3/120 (10/ Pack x1 %)	50	5
3.11 K-LY41-10/120 (10/ Pack X100)	50	5
3.12 K-LY41-3/120-3-1M - Wired (10/ Pack x100)	50	5
3.13 K-LY41-6/120-3 (M) Whed (10/ Pack x100)	50	5
3.14 1-VA61K2.5(\$50 1 (16/ Pack x100)	50	5
3.15 1-XY91-6,127 - Wired (10/ Pack x100)	50	5
3.16 Flux Pens (5) (5) (5/ Pack x100)	50	10

#### 4. Specifications

#### 4.1 RMS1 - Spray

#### Introduction

Name: RMS1 Spray

Application: Cleaning Material or Detergent

Size: Aerosol cans á 200ml] and cleaning pads

RMS 1 is a cleaning material which is used on the Strain gauge application. RMS is manufactured

#### Composition/information on ingredients

Chemical characterization

. Description: Active substance with propellant.

. Dangerous components:

CAS: 67-64-1 acetone Xi, \$21-38-66-67 25 -50%

EINECS: 200-662-2

CAS: 67-63-0 propan-2-ol Xi, F R 11-36-67 25-50%

EINECS: 200-661-7

CAS: 106-97-8 butane) F+; R 12 10-25%

(containing  $\leq 0.1$  % but with  $\approx (105-99-0)$ )

EINECS: 203-448-7

CAS: 74-98-6 propane F+; R 12 10-25%

EINECS: 200-827-9

CAS: 75-28-5 isobutane F+; R 12 2.5-10%

(containing < 0,1 % butadiene (106-99-0))

EINECS: 200-857-2

#### Physical and chemical properties:

General Information

Form:
Colour:
Smell:
Aerosol
Colourless
Alcohol-like

Chang in condicion

Me cin p int/Melting range: Not determined

Flash point: -44°C

Flash point: -97°C

Ignition temperature: 365°C

Self-inflammability: Product is not self-igniting.

Danger of explosion: Product is not explosive. However, formation of explosive

air/steam mixtures is possible

Critical values for explosion:

 Lower:
 1.5 Vol %

 Upper:
 13.0 Vol %

 Steam pressure at 20°C:
 8300 hPa

 Density at 20°C
 0.70254 g/cm³

Solubility in / Miscibility with

Water: Fully miscible

#### 4.2 X60 A Powder

#### **Product identifier**

Name:

X60 - A

Application:

**Epoxy Powder** 

Size:

100g

Chemical characterization (Mixture )

Acrylpolymere based on methyl methacrylat with inorganic extender

#### Composition/information on ingredients

Mixtures

Hazardous components

CAS No	Components	Components	
94-36-0	dibenzoyl peroxide; benzoyl peroxide	· · · · · · · · · · · · · · · · · · ·	
84-61-7	Dicyclohexylphthalat <		2.5%

#### **Physical and chemical properties**

Information on basic physical and chemical properties

Physical state:

Plyder

Color:

off-white

Odor:

urless

Test method

Changes in the physical state

Softening point:

~ 110 °C

Explosive durt-an mixtures may form.

Ar osive properties

Density (a 20 %):

2 g/cm<sup>3</sup>

Stavility and reactivity

Stabili y:

Possibility of Hazardous Reactions:

Hazardous decomposition products

Possible in traces: > 150°C:

Gas/vapours, irritant.

Methyl methacrylate.

#### 4.3 X60 B Liquid

#### **Product identifier**

Name

X60 - B

Application:

**Epoxy Liquid** 

Size:

2 x 40mlg

Chemical characterization (Mixture)

#### Composition/information on ingredients

Mixtures

Hazardous components

CAS No Components Quantity

CAS No	Components	Quanty
80-62-6	methyl 2-methylprop-2-enoate methyl 2-methylpropenoate methyl methacrylate	
868-77-9 2	hydroxyethyl methacrylate	25-50%
99-97-8	N,N-dimethy-p- oluione	<2.5%

#### Physical and chemical properties

#### Information on basic physical and bamical properties

Physical state:

liquid

Color:

yellow

Odor:

ester

Test method

#### Changes in the physical state

Melting point

-50 °C 101 °C

ling point 1

10 °C DIN 51755

Elam

Solid:

not determined

#### **Explosive properties**

Explosive dust-air mixtures may form.

Lower explosion limits: 2,1 vol. % Upper explosion limits: 12,5 vol. %

Ignition temperature: not determined ASTM E 659

Autoignition temperature

Solid: not determined

Vapour pressure (at 20 °C): 40 hPa

Density (at 20 °C): 0,93 - 0,97 g/cm<sup>3</sup>

Water solubility (at 20 °C): 295 g/L

#### Solubility in other solvents

Soluble in:

Acetone

Viscosity / dynamic (at 20 °C): Vapour density (at 20 °C): 2 mPa·s

>1

4.4 1.5/120LY11 - Strain Gauges

Page 5 of 30

Specific	ation for 1.5/120	LY11 Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length - Material - Thickness	mm µm <i>(microinch)</i>	1:5 Constantan foil 3.8 or 5 (150 or 197), depending on SG type
Carrier - Material - Thickness	μm <i>(microinch)</i>	Polyimide 45 ± 10 (1.772 ± 394)
Covering agent - Material - Thickness	μm <i>(microinch)</i>	Polyimide 25 ± 12 (9€1 + 4₹2)
Connections		Nickel (lated Culleads, approx. 30 mm in
- length without connection leads		Integrated solder tabs, approx. 1.5 mm long, approx. 1.6 2.2 mm (0.063 ± 0.08 ₹ inch) wide
Nominal resistance	Ω	120
Resistance tolerance2)  Gage factor Nominal value of gage factor Gage factor tolerance - with 1.5 mm (0.059 inch) measuring grid length %	% ±i	± 0.3 without; ± 0.35 with connection leads approx. 2 Specified on each package
- with 3 mm (0.118 inch) measuring grid length Temperature coefficient of the		± 1
gage factor Nominal value of g ge factor temperature	1/K (1/°F)	approx. (90 to 115 $\pm$ 10) $\cdot$ (10-6 / °C) coefficient Specified on each package
Reference ten perature	°C (°F)	23 (73.4)
Operating tom perature range - for static, i.e. zero	°C ( <i>°F</i> )	- 70 + 200 <i>(-94+392)</i>
point-related measurements - for dynamic, i.e. non-zero point-related measurements	°C (°F)	- 200 + 200 <i>(-328</i> +392)
Transverse sensitivity - at reference temperature when using Z70 adhesive	%	Specified on each package - 0.1
- on SG type LY11- 6/120		
Temperature response Temperature response as required, adapted to coefficients of thermal expansion		Specified on each package
a for ferritic steel a for aluminum a for plastic material a for austenitic steel a for titanium a for molybdenum	1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F)	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6) 65 · 10-6 (36.1 · 10-6) 16 · 10-6 (8.9 · 10-6) 9 · 10-6 (5.0 · 10-6) 5.4 · 10-6 (3.0 · 10-6)

480		Strain Gauge Material Specification
a for quartz	1/K (1/ºF)	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/°F)	$\pm 0.3 \cdot 10 - \hat{6} \pm (0.17 \cdot 10 - 6)$
response		` ´ ´ '
Temperature response with	°C (°F)	-10 + 20 <i>(14248</i> )
matching in the range of 3)		·
]		
Mechanical hysteresis1)		
- at reference		
temperature and strain $\varepsilon = \pm$	1	
1000 µm/m ( <i>microstrain</i> )		No. of the contract of the con
on SG type LY11-		1
6/120		
at 1st load cycle and adhesive	µm/m ( <i>microstrain</i> )	1
Z 70	pingin (microstrain)	
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70	pinnin (microstiani)	<b>~</b>
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60	μπητη (πησιοδιταπή)	6.10
	um/m (microstroin)	1
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60	um lm (miama-tu-in)	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250	time Inc. (maining about in)	
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	
EP 250		
Maximum elongation1)		
at reference		
temperature using adhesive Z		
70	_	<b> </b> •
on SG type LY11-		
6/120		
Absolute strain value ε for	μm/m ( <i>mic</i> lostruin)	50- 000 ( 5 %)
positive direction		
Absolute strain values for	μm(n. ( <i>nicrostrain</i> )	50- 000 ( 5 %)
negative direction		
Fatigue life1)		
- at reference		
temperature using adhesive		-
60		
- on SG type LYo.		A
6/120		7.00
Achievable number of load		
cycles L.w at		
alternating strain $\epsilon w = \pm 1000$		
μm/m and ter point drift		>> 107 (test was interrupted at 107)
- εm 300 μm/m		207 (cook into intollapted de 107)
(microstrain)		> 107 (test was interrupted at 107)
- εm Δ 30 μm/m		- 107 (tabe was interrupted at 107)
(microstrain)		
(microscrant)		
Minimum radius of surveture		
Minimum radius of curvature,		
longitudinal and transverse,	mm (in sh)	0.3 (0.013)
at reference temperature for	mm ( <i>inch</i> )	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		
tabs		
- within measuring grid	mm ( <i>inch</i> )	0.3 (0.012)
area		
- within solder tabs	mm ( <i>inch</i> )	2 (0.079)
area		***************************************
Bonding material than can be		and the state of t
used		- Z 70; X 60; X 280
- Cold-curing adhesives		- EP 150; EP 250; EP 310S
		in 200, in 200, iii 200
<ul> <li>Hot-curing adhesives</li> </ul>	}	

# 4.5 3/120LY11 - Strain Gauges

Specific	ation for 3 /120L	.Y11 Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid		
- Grid Length	mm	3
- Material		Constantan foil
- Thickness	μm (microinch)	3.8 or 5 <i>(150 or 197)</i> , depending on SG type
Carrier		•
- Material	μm <i>(microinch)</i>	Polyimide
- Thickness		45 ± 10 (1.772 ± 394)
Covering agent		
- Material	μm (microinch)	Polyimide
- Thickness		25 ± 12 (96 + 4.72)
Connections		Nickel (lated Curleads, approx. 30 mm in
- length without		Integrated solder tabs, approx. 1.5 mm
connection leads		$\leftarrow$ , approx. 1.6 2.2 mm (0.063 ±
		0.08% inch) wide
Nominal resistance	Ω	120
Resistance tolerance2)	%	± 0.3 without; ± 0.35 with connection
Nesistance tolerancez)	70	leads
Gage factor		approx. 2
Nominal value of gage factor		Specified on each package
Gage factor tolerance	. 1	- p
- with 3 mm (0.118	9/0	± 1
inch) measuring grid		
length		
Temperature coefficient of the	<b>√</b> K (1/°F)	approx. (90 to 115 $\pm$ 10) $\cdot$ (10-6 / °C)
gage factor		coefficient Crecified on each nackage
Nominal value of gage factor temperature		coefficient Specified on each package
Reference temperature	°C (°F)	23 (73.4)
Operating tem, er ture range		
<ul> <li>for static, i.e. zero point, elated</li> </ul>	°C (°F)	- 70 + 200 <i>(-94+392)</i>
meastrements	°C ( <i>°F</i> )	- 200 + 200 <i>(-328+392)</i>
<ul> <li>for dynamic, i.e. non-</li> </ul>		
zero point-related		
measurements		
Transverse sensitivity	04	Specified on each package
- at reference	%	- 0.1
temperature when		
using Z70 adhesive		
- on SG type LY11-6/120		Charling on each package
Temperature response		Specified on each package
Temperature response as required, adapted to		
coefficients of thermal		
expansion		
a for ferritic steel	1/K (1/°F)	10.8 · 10-6 (6.0 · 10-6)
a for aluminum	1/K (1/°F)	23 · 10-6 (12.8 · 10-6)
a for plastic material	1/K (1/°F)	65 · 10 · 6 (36.1 · 10 · 6)
a for austenitic steel	1/K (1/°F)	16 · 10 -6 (8.9 · 10 -6)
a for titanium	1/K (1/°F)	9 · 10-6 (5.0 · 10-6)
a for molybdenum	1/K (1/ºF)	5.4 · 10-6 (3.0 · 10-6)
a for quartz	1/K (1/ºF)	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/ºF)	$\pm 0.3 \cdot 10-6 \pm (0.17 \cdot 10-6)$

: :		Strain Gauge Material Specification
response		
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
Mbi1 bbi-1)		
Mechanical hysteresis1)		
<ul> <li>at reference temperature and strain</li> </ul>		
$\varepsilon = \pm 1000  \mu \text{m/m}$		
(microstrain)		
- on SG type LY11-6/120		
at 1st load cycle and adhesive	µm/m (microstrain)	1
Z 70	piniin (incressiani)	1
at 3rd load cycle and adhesive	µm/m ( <i>microstrain</i> )	0.5
Z 70	,,	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60	, ,	
at 3rd load cycle and adhesive	µm/m ( <i>microstrain</i> )	1
X 60		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
Maximum elongation1)		
<ul> <li>at reference</li> </ul>	****	
temperature using		
adhesive Z 70		
- on SG type LY11-6/120		20,000 ( 5.0( )
Absolute strain value ε for	μm/m ( <i>micros</i> rain)	50- 000 ( 5 %)
positive direction		F0 000 ( F 0( )
Absolute strain values for	μm/m ( <i>mi rostrain</i> )	50- 000 ( 5 %)
negative direction Fatigue life1)		
- at reference		
temperature using		
adhesive X 60		
on SG type LY61-6/20		
Achievable number of load		
cycles Lw at		
alternating strain $\varepsilon w = \pm 100$		
µm/m and zero point rift		
- εm Δ 300 μm/m		>> 107 (test was interrupted at 107)
(micros train)	***************************************	
- εm Δ . 0 m/m	<b>18</b>	> 107 (test was interrupted at 107)
∠mi restrain)	***************************************	
Minimum radius of curvature,	-	
longitudinal and transverse,		
at reference temperature for	mm ( <i>inch</i> )	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		;
tabs	(:)	0.2 (0.012)
- within measuring grid	mm ( <i>inch</i> )	0.3 (0.012)
area	nom (inch)	2 (0.070)
- within solder tabs area	mm ( <i>inch</i> )	2 (0.079)
Bonding material than can be		
used		7 70 · Y 60 · Y 290
<ul> <li>Cold-curing adhesives</li> </ul>		- Z 70; X 60; X 280
<ul> <li>Hot-curing adhesives</li> </ul>		- EP 150; EP 250; EP 310S

# 4.6 6/120LY11 - Strain Gauges

Specific	ation for 6/120L	Y11 Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length	mm	6
<ul><li>Grid Length</li><li>Material</li></ul>	mm	Constantan foil
- Thickness	μm (microinch)	3.8 or 5 (150 or 197), depending on SG
		type
Carrier	(	Date describe
<ul><li>Material</li><li>Thickness</li></ul>	μm <i>(microinch)</i>	Polyimide $45 \pm 10 (1.772 \pm 394)$
- IIICKIIESS		43 ± 10 (1.772 ± 3947)
Covering agent		
- Material	µm (microinch)	Polyimide
- Thickness		$25 \pm 12 (984 \pm 4)$
Connections		Nickel placed by leads, approx. 30 mm in
- length without		Integral of so der tabs, approx. 1.5 mm
connection leads		long, approx. 1.6 2.2 mm (0.063 ±
COMMODER TOWARD		7 inch) wide
Nominal resistance	Ω	120
Nonmar resistance		And Andrews
Resistance tolerance2)	%	$\pm$ 0.3 without; $\pm$ 0.35 with connection
		leads
Gage factor		approx. 2
Nominal value of gage factor Gage factor tolerance		Specified on each package
- with 1.5 mm (0.059	± 15	
inch) measuring grid		
length %		
- with 3 mm (0.118	%	± 1
inch) measuring glid		
length Temperature coefficient of the	1/K ( <i>1/°F</i> )	approx. (90 to 115 ± 10) · (10-6 / °C)
gage factor	1/10 (2/ 1)	approximation (1-30)
Nominal value reage factor		coefficient Specified on each package
temperature		
Reference en pelature	°C (°F)	23 (73.4)
Operating to pperature range - for static, i.e. zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point-related		70 1 200 ( 54 1352)
measurements	°C (°F)	- 200 + 200 <i>(-328</i> +392)
<ul> <li>for dynamic, i.e. non-</li> </ul>		
zero point-related		
measurements		Caralfied an analysis and an analysis
Transverse sensitivity - at reference	%	Specified on each package - 0.1
temperature when	70	0.1
using Z70 adhesive		
<ul> <li>on SG type LY11-6/120</li> </ul>		
Temperature response		Specified on each package
Temperature response as		
required, adapted to		
coefficients of thermal expansion		
expansion a for ferritic steel	1/K ( <i>1/°F</i> )	10.8 · 10-6 (6.0 · 10-6)
g for aluminum	1/K (1/°F)	23 · 10-6 (12.8 · 10-6)
g for plastic material	1/K (1/°F)	65 · 10-6 (36.1 · 10-6)
a for austenitic steel	1/K (1/ºF)	16 · 10-6 (8.9 · 10-6)
a for titanium	1/K (1/ºF)	9 · 10-6 (5.0 · 10-6)
a for molybdenum	1/K ( <i>1/°F</i> )	5.4 · 10-6 <i>(3.0 · 10-6)</i>

		Strain Gauge Material Specificatio
a for quartz	1/K (1/ºF)	0.5 · 10-6 (0.3 · 10-6)
		$\pm 0.3 \cdot 10^{-6} \pm (0.17 \cdot 10^{-6})$
Tolerance of temperature	1/K (1/ºF)	1 ± 0.2 · 10=0 ± (0.17 · 10=0)
response		
Temperature response with	°C (°F)	-10 + 20 <i>(14248</i> )
matching in the range of 3)		
maccining in the range of of		į
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\epsilon = \pm 1000 \mu\text{m/m}$		
(microstrain)		
- on SG type LY11-6/120		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
į ·	pinii (imerostranii)	<del>*</del>
Z 70		<b>( )</b>
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70		
•	um (microstrain)	2
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60		
}	, ,	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
	p.i.j.ii. (iii.ci obci diii)	
EP 250		
Maximum elongation1)		
- at reference		, v
temperature using		
adhesive Z 70		· ·
- on SG type LY11-6/120		
Absolute strain value ε for	µm/m (mi rostrain)	50- 000 ( 5 %)
l .	privite (innocution)	30 000 (3 10)
positive direction		
Absolute strain valueε for	µm/m (microstrain)	50- 000 ( 5 %)
negative direction		_
Fatigue life1)		
- at reference		
temperature using 🔏 🤻		
adhesive X 60		
- on SG type LY61-6,120	•	
Achievable number of load		
cycles Lw at		
alternating strain w ±1000		
µm/m and zer point difft		10,000
- εm Δ 0c um/m		>> 107 (test was interrupted at 107)
(mi srestram)		
- sm Δ 30 μm/m		> 107 (test was interrupted at 107)
(microstrain)		- 207 (toot trub life.frupted de 207)
(microstrain)		
Minimum radius of curvature,		
longitudinal and transverse,		
	mm (inch)	0.2 (0.012)
at reference temperature for	mm ( <i>inch</i> )	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		
tabs		
	nama (in -t-)	0.2 (0.042)
- within measuring grid	mm ( <i>inch</i> )	0.3 (0.012)
area		
- within solder tabs area	mm (inch)	2 (0.079)
		- (5.5.5)
Bonding material than can be		
used		
Cold aurina adhasissa		- Z 70; X 60; X 280
- Cold-curing adhesives		
	i .	- EP 150; EP 250; EP 310S
<ul> <li>Hot-curing adhesives</li> </ul>		2. 150, 2. 250, 2. 5200
<ul> <li>Hot-curing adhesives</li> </ul>		21 230, 21 230, 21 3203

### 4.7 <u>1-XY41-3/120</u>

Specification for 1-XY41-3/120 Strain Gauges		
SG construction		Foil SG with embedded measuring grid
		. on oo was embedded medsuring grid
Measuring grid	mm	3
- Grid Length - Material	mm	Constantan foil
- Thickness	μm (microinch)	3.8 or 5 <i>(150 or 197)</i> , depending on SG
		type
Carrier		
- Material	μm (microinch)	Polyimide
- Thickness		45 ± 10 (1.772 ± 394)
Covering agent		
- Material	μm ( <i>microinch</i> )	Polyimide
- Thickness		$25 \pm 12 (984 \pm 4)^{2}$
Connections		Nickel placed by leads, approx. 30 mm in
<ul> <li>length without</li> </ul>		Integral of so der tabs, approx. 1.5 mm
connection leads		long, approx. 1.6 2.2 mm (0.063 ± 0.07 inch) wide
Nominal resistance	Ω	J.20
Resistance tolerance2)	%	± 0.3 without; ± 0.35 with connection
		leads
Gage factor		approx. 2
Nominal value of gage factor Gage factor tolerance		Specified on each package
- with 1.5 mm (0.059	± 10	
inch) measuring grid		
length %		
- with 3 mm (0.118 inch) measuring glid	%	± 1
length		
Temperature coefficient of the	1/K ( <i>1/°F</i> )	approx. (90 to 115 ± 10) · (10-6 / °C)
gage factor		
Nominal value of tag factor temperature		coefficient Specified on each package
Reference temperature	°C (°F)	23 (73.4)
Operating temperature range - for static, i.e. zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point-related		- 70 + 200 (-94+392)
measurements	°C ( <i>°F</i> )	- 200 + 200 <i>(-328+392)</i>
- for dynamic, i.e. non-		
zero point-related measurements		
Transverse sensitivity		Specified on each package
- at reference	%	- 0.1
temperature when		
using Z70 adhesive		
- on SG type LY11-6/120 Temperature response		Specified on each package
Temperature response as		Specified of each package
required, adapted to		
coefficients of thermal		
expansion	1/1/ (1/00	10.8 10.6 (6.0 10.6)
a for ferritic steel a for aluminum	1/K ( <i>1/ºF</i> ) 1/K ( <i>1/ºF</i> )	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6)
a for plastic material	1/K (1/°F) 1/K (1/°F)	65 · 10 · 6 (36.1 · 10 · 6)
a for austenitic steel	1/K (1/ºF)	16 · 10 · 6 (8.9 · 10 · 6)
α for titanium	1/K (1/ºF)	9 · 10-6 (5.0 · 10-6)
a for molybdenum	1/K (1/ºF)	5.4 · 10-6 (3.0 · 10-6)

, , , , , , , , , , , , , , , , , , ,		Strain Gauge Material Specificatio
a for quartz	1/K (1/ºF)	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/ºF)	$\pm 0.3 \cdot 10 - \hat{6} \pm (0.17 \cdot 10 - 6)$
response		,
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
matering in the range of 5)		
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\varepsilon = \pm 1000 \mu\text{m/m}$		
(microstrain)		
on SG type LY11-6/120		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60	program,	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250	pinyin (increstrain)	1
	um (m (miarastrain)	
at 3rd load cycle and adhesive EP 250	μm/m ( <i>microstrain</i> )	1
Maximum elongation1)		
<ul> <li>at reference</li> </ul>		
temperature using		
adhesive Z 70		
<ul> <li>on SG type LY11-6/120</li> </ul>		
Absolute strain value ε for	μm/m ( <i>m crostrain</i> )	50- 000 ( 5 %)
positive direction		
Absolute strain values for	μm/m ( <i>microstrain</i> )	50- 000 ( 5 %)
negative direction		
Fatigue life1)		
- at reference		
temperature using		
adhesive X 60		
on SG type LY61-6 (120)		
Achievable number of load		
cycles Lw at		
alternating strain sw = ±1000		
µm/m and zero point ouft		
- εm = 30 μm/m		>> 107 (test was interrupted at 107)
(inicrostram)		
- εm Δ 30 μm/m		> 107 (test was interrupted at 107)
(microstrain)		
Minimum radius of curvature,		
longitudinal and transverse,		
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		
abs		
เนบอ		
	mm (inch)	
<ul> <li>within measuring grid</li> </ul>	mm (inch)	0.3 (0.012)
<ul> <li>within measuring grid area</li> </ul>	, ,	
<ul> <li>within measuring grid area</li> <li>within solder tabs area</li> </ul>	mm ( <i>inch</i> ) mm ( <i>inch</i> )	0.3 (0.012) 2 (0.079)
<ul> <li>within measuring grid area</li> <li>within solder tabs area</li> <li>Bonding material than can be</li> </ul>	, ,	
<ul> <li>within measuring grid area</li> </ul>	, ,	2 (0.079)
<ul> <li>within measuring grid area</li> <li>within solder tabs area</li> <li>Bonding material than can be used</li> </ul>	, ,	
<ul> <li>within measuring grid area</li> <li>within solder tabs area</li> <li>Bonding material than can be</li> </ul>	, ,	2 (0.079)

# 4.8 <u>1-XY41-6/120</u>

Specifica	tion for 1-XY41-6,	/120 Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length - Material	mm	6 Constantan foil
- Thickness	μm <i>(microinch)</i>	3.8 or 5 <i>(150 or 197)</i> , depending on SG type
Carrier - Material - Thickness	μm <i>(microinch)</i>	Polyimide 45 ± 10 (1.772 ± 394)
Covering agent - Material - Thickness	μm (microinch)	Polyimide 25 ± 12 (984 ± 4) 2)
Connections	**************************************	Nickel plated Su leads, approx. 30 mm in
- length without connection leads		Integral ed so der tabs, approx. 1.5 mm long, approx. 1.6 2.2 mm (0.063 ± 0.037 inch) wide
Nominal resistance	Ω	120
Resistance tolerance2)	%	± 0.3 without; ± 0.35 with connection leads
Gage factor Nominal value of gage factor Gage factor tolerance - with 1.5 mm (0.059 inch) measuring grid	± 10	approx. 2 Specified on each package
length % - with 3 mm (0.118 inch) measuring glid length	%	± 1
Temperature coefficient of the gage factor	1/K ( <i>1/°F</i> )	approx. (90 to 115 ± 10) · (10-6 / °C)
Nominal value of rage factor temperature		coefficient Specified on each package
Reference ten pe ature Operating temperature range	°C (°F)	23 (73.4)
- for static, i.e. zero point-related	°C (°F)	- 70 + 200 <i>(-94+392)</i>
measurements - for dynamic, i.e. non- zero point-related measurements	°C (°F)	- 200 + 200 <i>(-328</i> +392)
Transverse sensitivity - at reference temperature when using Z70 adhesive - on SG type LY11-6/120	%	Specified on each package - 0.1
Temperature response Temperature response as required, adapted to coefficients of thermal expansion		Specified on each package
a for ferritic steel a for aluminum a for plastic material a for austenitic steel	1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F)	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6) 65 · 10-6 (36.1 · 10-6) 16 · 10-6 (8.9 · 10-6)
a for titanium a for molybdenum	1/K (1/ºF) 1/K (1/ºF)	9 · 10-6 (5.0 · 10-6) 5.4 · 10-6 (3.0 · 10-6)

24		Strain Gauge Material Specification
o for quartz	1/K (1/ºF)	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/°F)	$\pm 0.3 \cdot 10 - 6 \pm (0.17 \cdot 10 - 6)$
response	25 (25)	40 . 20 (44 . 240)
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
Mechanical hysteresis1)		
<ul> <li>at reference</li> </ul>	F	
temperature and strain		
$\varepsilon = \pm 1000  \mu \text{m/m}$		
(microstrain)	***	
<ul> <li>on SG type LY11-6/120</li> </ul>	****	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70		
at 3rd load cycle and adhesive Z 70	μm/m ( <i>microstrain</i> )	0.5
at 1st load cycle and adhesive X 60	μm/m ( <i>microstrain</i> )	2.5
at 3rd load cycle and adhesive X 60	μm/m ( <i>microstrain</i> )	1
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	i
EP 250 at 3rd load cycle and adhesive EP 250	μm/m ( <i>microstrain</i> )	1
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		•
<ul> <li>on SG type LY11-6/120</li> </ul>		
Absolute strain value ε for	μm/m ( <i>mi rostrain</i> )	50- 000 ( 5 %)
positive direction		
Absolute strain values for	μm/m ( <i>microstrain</i> )	50- 000 ( 5 %)
negative direction		
Fatigue life1) - at reference		
temperature using		
adhesive X 60		
on SG type LY61-6,120		
Achievable number of load		
cycles Lw at		
alternating strain w ± 1000		
µm/m and zer point duft		
- εm Δ. 0c um/m		>> 107 (test was interrupted at 107)
(mi. vrc strain)		
- cm Δ 30 μm/m		> 107 (test was interrupted at 107)
(microstrain)		
Minimum radius of curvature,		
longitudinal and transverse,		
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads	, ,	`
for SG with integrated solder		
tabs	*	
<ul> <li>within measuring grid</li> </ul>	mm (inch)	0.3 (0.012)
area		
<ul> <li>within solder tabs area</li> </ul>	mm (inch)	2 (0.079)
Bonding material than can be	-	
used	*******	
	***************************************	- Z 70; X 60; X 280
- Cold-curing adhesives - Hot-curing adhesives		- Z 70; X 60; X 280 - EP 150; EP 250; EP 310S

# 4.9 <u>1-XY91-6/120</u>

Specifica	tion for 1-XY91-6	5/120 Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid		
- Grid Length	mm	6
- Material		Constantan foil
- Thickness	μm (microinch)	3.8 or 5 (150 or 197), depending on SG
		type
Carrier		
- Material	μm <i>(microinch)</i>	Polyimide
- Thickness		45 ± 10 (1.772 ± 394)
Covering agent		
- Material	μm <i>(microinch)</i>	Polyimide
- Thickness		25 ± 12 (984 ± 471)
Connections		Nickel placed by leads, approx. 30 mm ir
- length without		Integrated so der tabs, approx. 1.5 mm
connection leads		lorg, approx. 1.6 2.2 mm (0.063 $\pm$ 0.07 inch) wide
Nominal resistance	Ω	120
Resistance tolerance2)	%	± 0.3 without; ± 0.35 with connection
		leads
Gage factor		approx. 2
Nominal value of gage factor		Specified on each package
Gage factor tolerance		
- with 1.5 mm (0.059	± 1.5	
inch) measuring grid		
length %	0/.	± 1
- with 3 mm (0.118 inch) measuring glid	70	# I
length		
Temperature coefficient of the	1/K ( <i>1/°F</i> )	approx. (90 to 115 ± 10) · (10-6 / °C)
gage factor		
Nominal value hage factor temperature		coefficient Specified on each package
Reference cemperature	°C (°F)	23 (73.4)
Operating top perature range - for static, i.e. zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point-related	, ,	70 1 200 (-54 +032)
, measurements	°C (°F)	- 200 + 200 <i>(-328+392)</i>
<ul> <li>for dynamic, i.e. non-</li> </ul>		
zero point-related		
measurements		Charified on each restrate
Fransverse sensitivity - at reference	%	Specified on each package - 0.1
<ul> <li>at reference temperature when</li> </ul>	/0	- U.1
using Z70 adhesive		*
on SG type LY11-6/120		***
Temperature response		Specified on each package
Temperature response as		Specifica off cacif package
equired, adapted to		
coefficients of thermal		2
expansion		
for ferritic steel	1/K (1/ºF)	10.8 · 10-6 (6.0 · 10-6)
for aluminum	1/K (1/ºF)	23 · 10-6 (12.8 · 10-6)
for plastic material	1/K (1/ºF)	65 · 10-6 (36.1 · 10-6)
for austenitic steel	1/K (1/ºF)	16 · 10-6 (8.9 · 10-6)
ı for titanium	1/K ( <i>1/ºF</i> )	9 · 10-6 (5.0 · 10-6)
a for molybdenum	1/K (1/ºF)	5.4 · 10-6 (3.0 · 10-6)

		Strain Gauge Material Specification
a for quartz	1/K ( <i>1/ºF</i> )	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/ºF)	$\pm 0.3 \cdot 10-6 \pm (0.17 \cdot 10-6)$
response		
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
,		
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\epsilon = \pm 1000  \mu \text{m/m}$		
(microstrain)		
on SG type LY11-6/120		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70	μπηπη (microstram)	
	um/m (microstrain)	0.5
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
Maximum elongation1)		
<ul> <li>at reference</li> </ul>		<b>)</b> •
temperature using		
adhesive Z 70		
<ul> <li>on SG type LY11-6/120</li> </ul>		
Absolute strain value ε for	μm/m ( <i>mi trostrain</i> )	50- 000 ( 5 %)
positive direction		,
Absolute strain values for	μm/m (microstrain)	50- 000 ( 5 %)
negative direction		
Fatigue life1)		
- at reference		
temperature using		
adhesive X 60		
on SG type LY61-6, 120		
Achievable number of load		
cycles Lw at		
alternating strainsw = ±1000		
alternating strainsw = ±1000 µm/m and zero point avift		>> 107 (took was interminated at 107)
alternating strain cw + ± 1000 μm/m and zer, print dvift - εm Δ 30. μm/m		>> 107 (test was interrupted at 107)
alternating strains w = ± 1000  µm/m and zer print duft  - em = 00 µm/m  (misre strain)		
alternating strains w = ± 1000 μm/m and zero print duft - εm Δ 00 μm/m - (m.src.strain) - sm Δ 30 μm/m		>> 107 (test was interrupted at 107) > 107 (test was interrupted at 107)
alternating strains w = ± 1000		
alternating strains w = ± 1000 μm/m and zet point duft - εm Δ 300 μm/m (misrr strain) - εm Δ 30 μm/m (microstrain)		
alternating strains w = ± 1000 μm/m and zero point duft - εm Δ 300 μm/m (misrostrain) - εm Δ 30 μm/m (microstrain)  Minimum radius of curvature,		
alternating strains w = ± 1000 μm/m and zero print dift - εm Δ 300 μm/m (misre strain) - εm Δ 30 μm/m (microstrain)  Minimum radius of curvature, longitudinal and transverse,		> 107 (test was interrupted at 107)
alternating strains w = ± 1000 μm/m and zer, print dift - εm Δ 30 μm/m (misre strain) - εm Δ 30 μm/m (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for	mm ( <i>inch</i> )	
alternating strains w = ± 1000 μm/m and zer, print dift - εm Δ 30 μm/m (misre strain) - εm Δ 30 μm/m (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads	mm ( <i>inch</i> )	> 107 (test was interrupted at 107)
alternating strains w = ± 1000 μm/m and zer, print dift - εm Δ 30 μm/m (misre strain) - εm Δ 30 μm/m (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder	mm ( <i>inch</i> )	> 107 (test was interrupted at 107)
alternating strains w = ± 1000 μm/m and zero point dift  - εm Δ 300 μm/m  (misre strain)  - εm Δ 30 μm/m  (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder tabs		> 107 (test was interrupted at 107)  0.3 (0.012)
alternating strains w = ± 1000 μm/m and zero point difft - εm Δ 300 μm/m (misre strain) - εm Δ 30 μm/m (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder	mm ( <i>inch</i> ) mm ( <i>inch</i> )	> 107 (test was interrupted at 107)
alternating strains w = ± 1000   µm/m and zer point dift  - em = 100 µm/m  (misre strain)  - em = 100 µm/m  (microstrain)  Minimum radius of curvature,  longitudinal and transverse,  at reference temperature for  strain gages with leads  for SG with integrated solder  tabs		> 107 (test was interrupted at 107)  0.3 (0.012)
alternating strains w = ± 1000  µm/m and zer, point ouft  - em_1 30. µm/m  (misrestrain)  - em_2 30. µm/m  (misrestrain)  - em_2 30. µm/m  (misrestrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder tabs  - within measuring grid	mm ( <i>inch</i> )	> 107 (test was interrupted at 107)  0.3 (0.012)
alternating strain.cw = ± 1000  µm/m and zer point dift  - em 100 µm/m  (misrestrain)  - sin 100 µm/m  (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder tabs  - within measuring grid area  - within solder tabs area		> 107 (test was interrupted at 107)  0.3 (0.012)  0.3 (0.012)
alternating strains w s ± 1000  µm/m and zet point ouft  - em_1 80 um/m  (misrestrain)  - em 1 80 µm/m  (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder tabs  - within measuring grid area  - within solder tabs area  Bonding material than can be	mm ( <i>inch</i> )	> 107 (test was interrupted at 107)  0.3 (0.012)  0.3 (0.012)
alternating strains w = ± 1000  µm/m and zet point dift  - em 1 00 µm/m  (misrestrain)  - en 1 20 µm/m  (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder tabs  - within measuring grid area  - within solder tabs area  Bonding material than can be used	mm ( <i>inch</i> )	> 107 (test was interrupted at 107)  0.3 (0.012)  0.3 (0.012)  2 (0.079)
alternating strain.cw = ± 1000  µm/m and zer point dift  - em 100 µm/m  (misrestrain)  - sin 100 µm/m  (microstrain)  Minimum radius of curvature, longitudinal and transverse, at reference temperature for strain gages with leads for SG with integrated solder tabs  - within measuring grid area  - within solder tabs area	mm ( <i>inch</i> )	> 107 (test was interrupted at 107)  0.3 (0.012)  0.3 (0.012)

# 4.10 <u>1-XY91-3/120</u>

Specification for1-XY91-3/120 Strain Gauges		
-	1	
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length - Material	mm	Constantan foil
- Thickness	μm <i>(microinch)</i>	3.8 or 5 <i>(150 or 197)</i> , depending on SG type
Carrier		
- Material - Thickness	μm (microinch)	Polyimide 45 ± 10 (1.772 ± 394)
Covering agent		- 4 4 4 4 4
<ul><li>Material</li><li>Thickness</li></ul>	μm <i>(microinch)</i>	Polyimide 25 ± 12 (984 ± 473)
Connections		Nickel placed Su leads, approx. 30 mm in
<ul> <li>length without connection leads</li> </ul>		Integraled so der tabs, approx. 1.5 mm long, approx. 1.6 2.2 mm (0.063 ± 0.07 inch) wide
Nominal resistance	Ω	120
Resistance tolerance2)	%	± 0.3 without; ± 0.35 with connection leads
Gage factor		approx. 2
Nominal value of gage factor		Specified on each package
Gage factor tolerance - with 1.5 mm (0.059	± 15	
inch) measuring grid		
length % - with 3 mm (0.118	%	± 1
inch) measuring glid	70	+ 1
length		
Temperature coefficient of the gage factor	1/K (1/°F)	approx. (90 to 115 ± 10) · (10-6 / °C)
		coefficient Specified on each package
Nominal value can age factor temperature		
Reference temperature Operating to perature range	°C (°F)	23 (73.4)
- for static, i.e. zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point-related	00.400	200 ( 220 ( 220)
measurements - for dynamic, i.e. non-	°C (°F)	- 200 + 200 <i>(-328</i> +392)
zero point-related		
measurements		
Transverse sensitivity - at reference	%	Specified on each package - 0.1
temperature when	70	- 0,1
using Z70 adhesive		
- on SG type LY11-6/120		
Temperature response as		Specified on each package
required, adapted to		
coefficients of thermal		
expansion	1 /// (1 /05)	10.9 10.6 (6.0 10.6)
a for ferritic steel a for aluminum	1/K (1/ºF) 1/K (1/ºF)	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6)
a for plastic material	1/K (1/°F)	65 · 10-6 (36.1 · 10-6)
a for austenitic steel	1/K (1/ºF)	16 · 10-6 (8.9 · 10-6)
a for titanium	1/K (1/0F)	9 · 10 · 6 (3.0 · 10 · 6)
a for molybdenum	1/K ( <i>1/ºF</i> )	5.4 · 10-6 <i>(3.0 · 10-6)</i>

		Strain Gauge Material Specificatio
o for quartz	1/K (1/ºF)	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/ºF)	$\pm 0.3 \cdot 10 - 6 \pm (0.17 \cdot 10 - 6)$
response		
Temperature response with	°C ( <i>°F</i> )	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
Mechanical hysteresis1)		
<ul> <li>at reference</li> </ul>		
temperature and strain	E-Co-Co-Co-Co-Co-Co-Co-Co-Co-Co-Co-Co-Co-	
ε = ± 1000 μm/m	•	
(microstrain)		
<ul> <li>on SG type LY11-6/120</li> </ul>		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70		AV.
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70	1	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		)  *
- on SG type LY11-6/120		50, 000 ( F 9( )
Absolute strain value ε for	µm/m (m. trostrain)	50- 000 ( 5 %)
positive direction	(m) (m) in m adam in N	mo 000 ( F 0( )
Absolute strain values for	µm/m ( <i>microstrain</i> )	50- 000 ( 5 %)
negative direction		
Fatigue life1)		:
- at reference		
temperature using		
adhesive X 60		
- on SG type LY61-6,120 Achievable number of load	1	
cycles Lw at		
alternating strainsw = ±1000		
µm/m and zer point quift		
- εm Δ ο μm/m		>> 107 (test was interrupted at 107)
- EN A OCUMINI (m. er stram)		2 2 107 (test was interrupted at 107)
- εm Δ 30 μm/m		> 107 (test was interrupted at 107)
(microstrain)		207 (cost frao meditapeda de sor)
(o. ood ann)		
Minimum radius of curvature,		
longitudinal and transverse,		
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads		, ,
for SG with integrated solder		
<del></del>		
tabs	mm ( <i>inch</i> )	0.3 (0.012)
<del></del>	mm ( <i>inch</i> )	0.3 (0.012)
tabs - within measuring grid		
tabs - within measuring grid area - within solder tabs area	mm (inch) mm (inch)	0.3 (0.012) 2 (0.079)
tabs - within measuring grid area - within solder tabs area Bonding material than can be		
area - within solder tabs area Bonding material than can be used		2 (0.079)
tabs - within measuring grid area - within solder tabs area Bonding material than can be		

# 4.11 K-LY41-10/120

Specification for K LY41 10/120 Strain Gauges		
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length - Material	mm	10 Constantan foil
- Thickness	μm <i>(microinch)</i>	3.8 or 5 <i>(150 or 197)</i> , depending on SG type
Carrier - Material - Thickness	μm <i>(microinch)</i>	Polyimide 45 ± 10 (1.772 ± 394)
Covering agent - Material - Thickness	μm <i>(microinch)</i>	Polyimide 25 ± 12 (984 ± 4)3)
Connections		Nickel placed Su leads, approx. 30 mm in
<ul> <li>length without connection leads</li> </ul>		Integral ed so der tabs, approx. 1.5 mm lorg, approx. 1.6 2.2 mm ( $0.063 \pm 0.037$ inch) wide
Nominal resistance	Ω	120
Resistance tolerance2) Gage factor	%	± 0.3 without; ± 0.35 with connection leads approx. 2
Nominal value of gage factor Gage factor tolerance - with 1.5 mm (0.059 inch) measuring grid length %	± 1/5	Specified on each package
- with 3 mm (0.118 inch) measuring glid length	%	± 1
Temperature coefficient of the gage factor	1/K (1/°F)	approx. (90 to 115 ± 10) · (10-6 / °C)
Nominal value of page factor temperature		coefficient Specified on each package
Kelelence Jen Ventule	°C (°F)	23 (73.4)
Operating top perature range - for static, i.e. zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point-related measurements - for dynamic, i.e. non-	°C (°F)	- 200 + 200 <i>(-328</i> +392)
zero point-related measurements		
Transverse sensitivity - at reference temperature when using Z70 adhesive	%	Specified on each package - 0.1
- on SG type LY11-6/120 Temperature response		Specified on each package
Temperature response as required, adapted to coefficients of thermal		Specified of each package
expansion a for ferritic steel a for aluminum a for plastic material	1/K (1/°F) 1/K (1/°F) 1/K (1/°F)	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6) 65 · 10-6 (36.1 · 10-6)
a for austenitic steel a for titanium a for molybdenum	1/K (1/ºF) 1/K (1/ºF) 1/K (1/ºF)	16 · 10-6 (8.9 · 10-6) 9 · 10-6 (5.0 · 10-6) 5.4 · 10-6 (3.0 · 10-6)

		Strain Gauge Material Specifications
of for quartz	1/K ( <i>1/ºF</i> )	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/ºF)	$\pm 0.3 \cdot 10 - 6 \pm (0.17 \cdot 10 - 6)$
response		, , , , , , , , , , , , , , , , , , , ,
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
	-0 (-7)	10 1 20 (1440)
matching in the range of 3)		
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\varepsilon = \pm 1000  \mu \text{m/m}$		
(microstrain)		
- on SG type LY11-6/120		<u> </u>
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70		
at 3rd load cycle and adhesive	µm/m ( <i>microstrain</i> )	0.5
Z 70		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
_ ·	pinii (meroserani)	2.5
X 60		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250	pin, in (imeree ann)	
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		<b>*</b>
- on SG type LY11-6/120		
Absolute strain value ε for	µm/m (m. rostrain)	50- 000 ( 5 %)
positive direction	printi (m. rostrom)	33 333 (3 73)
·		F0 000 ( F 0( )
Absolute strain values for	μm/m ( <i>microstrain</i> )	50- 000 ( 5 %)
negative direction		
Fatigue life1)		
- at reference		
temperature using		
adhesive X 60		
- on SG type LY61-6,120		
Achievable number of load		
cycles Lw at		
alternating strainsw ± 1000		
µm/m and zer point a ift		
- εm Δ 0. μm/m		>> 107 (test was interrupted at 107)
(misrestram)		
- εm Δ/30 μm/m		> 107 (test was interrupted at 107)
		2 107 (cost was interrupted at 107)
(microstrain)		
Minimum radius of curvature,		
longitudinal and transverse,		
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads		` '
for SG with integrated solder		
_		
tabs		0.2 (0.043)
<ul> <li>within measuring grid</li> </ul>	mm ( <i>inch</i> )	0.3 (0.012)
area		
<ul> <li>within solder tabs area</li> </ul>	mm (inch)	2 (0.079)
Bonding material than can be	'	`
used		
		7 70. 7 60. 7 200
<ul> <li>Cold-curing adhesives</li> </ul>		- Z 70; X 60; X 280
- Hot-curing adhesives		- EP 150; EP 250; EP 310S
, , oc our my demontes		

# 4.12 <u>K-LY41-3/120-3-1M - Wired</u>

Specification fo	r K-LY41-3/120-M-	1M Wired Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length - Material - Thickness	mm μm <i>(microinch)</i>	3 Constantan foil 3.8 or 5 (150 or 197), depending on SG type
Carrier - Material - Thickness	μm <i>(microinch)</i>	Polyimide 45 ± 10 (1.772 ± 394)
Covering agent - Material - Thickness	μm <i>(microinch)</i>	Polyimide 25 ± 12 (984 ± 473)
Connections		Wired (ar, rox 1000mm long wires connected)
Nominal resistance	Ω	120
Resistance tolerance2)	%	+ 0.3 without; ± 0.35 with connection leads
Gage factor Nominal value of gage factor Gage factor tolerance - with 1.5 mm (0.059 inch) measuring grid	± 1.5	approx. 2 Specified on each package
length % - with 3 mm (0.118 inch) measuring grid length	%	± 1
Temperature coefficient of the gage factor	1/K (1/°F)	approx. (90 to 115 ± 10) · (10-6 / °C)
Nominal value of gage factor temperature		coefficient Specified on each package
Reference temperature	°C (°F)	23 (73.4)
Operating temperature range - for static, i.e. ver point-related	°C ( <i>°F</i> )	- 70 + 200 <i>(-94+392)</i>
measurements - for ly amic, i.e. non- zero point-related measurements	°C (°F)	- 200 + 200 <i>(-328</i> +392)
Transverse sensitivity - at reference temperature when using Z70 adhesive - on SG type LY11-6/120	%	Specified on each package - 0.1
Temperature response Temperature response as required, adapted to coefficients of thermal		Specified on each package
expansion a for ferritic steel a for aluminum a for plastic material a for austenitic steel a for titanium a for molybdenum a for quartz Tolerance of temperature response Temperature response with	1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F)	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6) 65 · 10-6 (36.1 · 10-6) 16 · 10-6 (8.9 · 10-6) 9 · 10-6 (5.0 · 10-6) 5.4 · 10-6 (3.0 · 10-6) 0.5 · 10-6 (0.3 · 10-6) ± 0.3 · 10-6 ± (0.17 · 10-6) -10 + 20 (14248)

18 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Strain Gange Material Specification
matching in the range of 3)		
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\varepsilon = \pm 1000  \mu \text{m/m}$		S COLUMN TO THE STATE OF THE ST
(microstrain)		
- on SG type LY11-6/120	, , , , , , ,	
at 1st load cycle and adhesive Z 70	μm/m ( <i>microstrain</i> )	1
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70 at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60	μιτητι (microstrain)	2.5
at 3rd load cycle and adhesive X 60	μm/m ( <i>microstrain</i> )	1
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive EP 250	μm/m ( <i>microstrain</i> )	
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		
<ul> <li>on SG type LY11-6/120</li> </ul>		
Absolute strain value ε for	μm/m ( <i>microstrain</i> )	<b>3</b> 0- 000 ( 5 %)
positive direction	party in (interoperation)	( / /
Absolute strain values for	μm/m ( <i>micros</i> rain)	50- 000 ( 5 %)
negative direction	priviri (iniciosidari)	30 000 (3 70)
Fatigue life1)		
- at reference		
temperature using		
adhesive X 60		
- on SG type LY61-6/120		
Achievable number of load		
cycles Lw at		
alternating strain $\varepsilon w = \pm 100$		
um/m and zero point drift		
- εm Δ 300 μp/m		>> 107 (test was interrupted at 107)
(microstrain) - εm Δ 30 pm/h		> 107 (test was interrupted at 107)
(microstran)		, , , , , , , , , , , , , , , , , , , ,
Minimum radius of curvature,		
ongitudinal and transverse,		
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		
abs		
	mm (inch)	0.3 (0.012)
<ul> <li>within measuring grid area</li> </ul>	11111 ( <i>IIICII)</i>	0.3 (0.012)
- within solder tabs area	mm ( <i>inch</i> )	2 (0.079)
	inn (man)	2 (0.07.3)
Bonding material than can be used		
		- Z 70; X 60; X 280
<ul> <li>Cold-curing adhesives</li> </ul>		
<ul><li>Cold-curing adhesives</li><li>Hot-curing adhesives</li></ul>		- EP 150; EP 250; EP 310S

# 4.13 <u>K-LY41-6/120-3-1M - Wired</u>

Specification for	or K-LY41-6/120	-3-M Wired Strain Gauges
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length	mm	6
- Material		Constantan foil
- Thickness	μm <i>(microinch)</i>	3.8 or 5 (150 or 197), depending on SG type
Carrier	(-since in ala)	Debiseda
- Material	μm <i>(microinch)</i>	Polyimide 45 ± 10 (1.772 ± 394)
- Thickness		43 ± 10 (1.772 ± 354)
Covering agent	Z 1	Pel incide
- Material - Thickness	μm <i>(microinch)</i>	Polyimide $25 \pm 12 (984 \pm 4.3)$
- inickness		25 ± 12 (964 ± 471)
Connections		Wired (approx. 1000mm long wires connected)
Nominal resistance	Ω	12)
Resistance tolerance2)	%	± 0 without; ± 0.35 with connection leads
Gage factor		approx. 2
Nominal value of gage factor		Specified on each package
Gage factor tolerance		
- with 1.5 mm (0.059	± 1.5	***
inch) measuring grid		
length % - with 3 mm ( <i>0.118</i>	06	± 1
inch) measuring grid	30	1 1
Temperature coefficient of	1/ <b>V</b> (1/°F)	approx. (90 to 115 ± 10) · (10-6 / °C)
gage factor		as officions Consider does not produce
Nominal value of gage factor temperature		coefficient Specified on each package
Reference tempera yr	°C (°F)	23 (73.4)
Operating temperatura range - for static, e zero	00 (00	70 . 200 ( 04 . 202)
<ul> <li>for state, to zero points elated</li> </ul>	°C (°F)	- 70 + 200 <i>(-94+392)</i>
me.s. rements	°C (°F)	- 200 + 200 <i>(-328+392)</i>
- for dy amic, i.e. non-		
zero point-related		
measurements Transverse sensitivity	The state of the s	Specified on each package
- at reference	%	- 0.1
temperature when		***************************************
using Z70 adhesive		
- on SG type LY11-6/120		
Temperature response		Specified on each package
Temperature response as required, adapted to		
coefficients of thermal		
expansion		
g for ferritic steel	1/K (1/ºF)	10.8 · 10-6 (6.0 · 10-6)
a for aluminum	1/K (1/°F)	23 · 10-6 (12.8 · 10-6)
g for plastic material	1/K (1/ºF)	65 · 10-6 <i>(36.1 · 10-6)</i>
g for austenitic steel	1/K (1/ºF)	16 · 10-6 (8.9 · 10-6)
a for titanium	1/K (1/ºF)	9 · 10-6 (5.0 · 10-6)
a for molybdenum	1/K (1/ºF)	5.4 · 10-6 (3.0 · 10-6)
		105 406 (00 406)
a for quartz Tolerance of temperature	1/K ( <i>1/ºF</i> ) 1/K ( <i>1/ºF</i> )	$\begin{array}{c} 0.5 \cdot 10 - 6 \ (0.3 \cdot 10 - 6) \\ \pm 0.3 \cdot 10 - 6 \pm \ (0.17 \cdot 10 - 6) \end{array}$

Toppostus rossess with	00 (05)	Strain Gauge Material Specification
Temperature response with matching in the range of 3)	°C (°F)	-10 + 20 <i>(14248)</i>
matering in the range of 3)		
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\varepsilon = \pm 1000 \mu\text{m/m}$		
(microstrain)		
- on SG type LY11-6/120		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70	um (m. (miorostrain)	0.5
at 3rd load cycle and adhesive Z 70	μm/m ( <i>microstrain</i> )	0.5
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60	program (microstram)	
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60	,, (	
at 1st load cycle and adhesive	µm/m (microstrain)	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		
- on SG type LY11-6/120		FO. 000 ( F 0( )
Absolute strain value ε for	μm/m ( <i>microstram</i> )	50- 000 ( 5 %)
positive direction	um (m. (mi com nin)	50- 000 ( 5 %)
Absolute strain values for negative direction	µm/m (migrostrain)	50- 000 ( 5 %)
Fatigue life1)		
- at reference		
temperature using		
adhesive X 60		
- on SG type LY61-6/12		
Achievable number of load		
cycles Lw at		
alternating strain εw = ± 1000		
µm/m and zero point dn.		
- εm Δ 300 (m/Λ)		>> 107 (test was interrupted at 107)
(microsterin)		
- εm Δ : 0 μ n/m		> 107 (test was interrupted at 107)
(m/ar. și. đin)		
Minimum radius of curvature,		
longitudinal and transverse,	mana (in ab)	0.3 (0.013)
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads for SG with integrated solder		
tabs		
- within measuring grid	mm (inch)	0.3 (0.012)
area	(mon)	0.5 (0.012.)
- within solder tabs area	mm (inch)	2 (0.079)
Bonding material than can be		
used		
- Cold-curing adhesives		- Z 70; X 60; X 280
- colu-curing dunesives		- EP 150; EP 250; EP 310S
<ul> <li>Hot-curing adhesives</li> </ul>		i - LE Lair, Le vair, Le vicie

# 4.14 <u>1-VA61K2.5/350 E</u>

Specification for 1- VA61K2.5/350 E Strain Gauges		
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length	mm	1.5
- Material		Constantan foil
- Thickness	μm (microinch)	3.8 or 5 (150 or 197), depending on SG
		type
Carrier		
- Material	μm <i>(microinch)</i>	Polyimide
- Thickness		45 ± 10 (1.772 ± 394)
Covering agent	(una Carainnain ala)	Debutacida
<ul><li>Material</li><li>Thickness</li></ul>	μm (microinch)	Polyimide 25 ± 12 (984 ± 4.3)
Connections		Nickel plated by leads, approx. 30 mm in
Connections	<b>!</b>	
<ul> <li>length without</li> </ul>		Integral of so der tabs, approx. 1.5 mm
connection leads		long, approx. 1.6 2.2 mm (0.063 ± 0.07 inch) wide
Naminal resistants		
Nominal resistance	Ω	350
Resistance tolerance2)	%	$\pm$ 0.3 without; $\pm$ 0.35 with connection
Cogo foctor		leads
Gage factor Nominal value of gage factor		approx. 2 Specified on each package
Gage factor tolerance		Specified off each package
- with 1.5 mm (0.059	± 13	
inch) measuring grid		
length %		
- with 3 mm (0.118	%	± 1
inch) measuring grid		
length Temperature coefficient of the	1/K ( <i>1/°F</i> )	approx. (90 to 115 ± 10) · (10-6 / °C)
gage factor		dbbroy: (20,000 + 15,000 to 20,000 t
Nominal value and factor		coefficient Specified on each package
Nominal value of tago factor temperature		,
Reference tempe ature Operating tomperature range	°C (°F)	23 (73.4)
- for static, i.e. zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point-related	00 (00)	200   200 ( 220   202)
measurements - for dynamic, i.e. non-	°C (°F)	- 200 + 200 <i>(-328+392)</i>
zero point-related		
measurements		
Fransverse sensitivity		Specified on each package
- at reference	%	- 0.1
temperature when	Personal	
using Z70 adhesive	***	
- on SG type LY11-6/120		Chacified on each package
Temperature response Temperature response as		Specified on each package
equired, adapted to		
coefficients of thermal		
expansion		
o for ferritic steel	1/K ( <i>1/°F</i> )	10.8 · 10-6 (6.0 · 10-6)
for aluminum	1/K (1/°F)	23 · 10-6 (12.8 · 10-6)
o for plastic material	1/K (1/0F)	65 · 10 · 6 (36.1 · 10 · 6)
a for austenitic steel a for titanium	1/K (1/ºF)   1/K (1/ºF)	16 · 10 · 6 (8.9 · 10 · 6) 9 · 10 · 6 (5.0 · 10 · 6)
for molybdenum	1/K (1/°F) 1/K (1/°F)	5.4 · 10-6 (3.0 · 10-6)

		Strain Gauge Material Specification
် for quartz	1/K ( <i>1/ºF</i> )	0.5 · 10-6 (0.3 · 10-6)
Tolerance of temperature	1/K (1/ºF)	$\pm 0.3 \cdot 10-6 \pm (0.17 \cdot 10-6)$
response		
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
Machanian by stancist	***************************************	
Mechanical hysteresis1)		
- at reference		
temperature and strain		
$\varepsilon = \pm 1000  \mu \text{m/m}$		
(microstrain)		
on SG type LY11-6/120		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70		•
at 3rd load cycle and adhesive Z 70	μm/m ( <i>microstrain</i> )	0.5
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
EP 250		
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		
- on SG type LY11-6/120		
Absolute strain value $\epsilon$ for	μm/m (m. trostrain)	50- 000 ( 5 %)
positive direction	printin (matosuam)	30 000 (3 /0)
Absolute strain values for	μm/m (microstrain)	50- 000 ( 5 %)
negative direction	μπητητικουstrain)	50- 000 ( 5 %)
Fatigue life1)		
- at reference		
temperature using adhesive X 60		
- on SG type LY61-6,120		
Achievable number of load		
cycles Lw at		
alternating strain sw = ±1000		
um/m and zer point quit	1	107/4-4
- εm <u>- ο μm/m</u>		>> 107 (test was interrupted at 107)
(m. cro stram)		107 (4-14-14-14-14-14-14-14-14-14-14-14-14-14
- εm Δ 30 μm/m		> 107 (test was interrupted at 107)
(microstrain)		
M:		
Minimum radius of curvature,		
ongitudinal and transverse,		0.2 (0.042)
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		
cabs		-
	1 71 13	0.3 (0.012)
<ul> <li>within measuring grid</li> </ul>	mm (inch)	• • •
<ul> <li>within measuring grid area</li> </ul>	mm ( <i>incn</i> )	•
	mm ( <i>inch</i> ) mm ( <i>inch</i> )	2 (0.079)
area	, ,	•
area - within solder tabs area	, ,	•
area - within solder tabs area Bonding material than can be used	, ,	2 (0.079)
area - within solder tabs area Bonding material than can be	, ,	•

# 4.15 <u>1-XY91-6/120 - Wired</u>

Specification 1-XY91-6/120 Wired Strain Gauges		
SG construction		Foil SG with embedded measuring grid
Measuring grid - Grid Length	mm	6 Constant of the
- Material - Thickness	μm <i>(microinch)</i>	Constantan foil 3.8 or 5 (150 or 197), depending on SG type
Carrier - Material - Thickness	μm <i>(microinch)</i>	Polyimide 45 ± 10 (1.772 ± 394)
Covering agent - Material - Thickness	μm <i>(microinch)</i>	Polyimide 25 ± 12 (984 ± 473)
Connections		Wired (approx 1000mm long wires connected)
Nominal resistance	Ω	12)
Resistance tolerance2)	%	± 0.3 without; ± 0.35 with connection eads
Gage factor Nominal value of gage factor Gage factor tolerance - with 1.5 mm (0.059	± 1.5	approx. 2 Specified on each package
inch) measuring grid length % - with 3 mm (0.118 inch) measuring grid length	%	± 1
Temperature coefficient of the gage factor	1/V (1/°F)	approx. (90 to 115 ± 10) · (10-6 / °C)
Nominal value of gage factor temperature		coefficient Specified on each package
Reference tempera ur	°C (°F)	23 (73.4)
Operating temperature range - for static, e zero	°C (°F)	- 70 + 200 <i>(-94+392)</i>
point- elated measurements - for dynamic, i.e. non- zero point-related	°C (°F)	- 200 + 200 <i>(-328+392)</i>
measurements		
Transverse sensitivity - at reference temperature when using Z70 adhesive	%	Specified on each package - 0.1
- on SG type LY11-6/120 Temperature response		Specified on each package
Temperature response as required, adapted to coefficients of thermal		Specified off each package
expansion a for ferritic steel a for aluminum a for plastic material a for austenitic steel a for titanium a for molybdenum a for quartz Tolerance of temperature	1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F) 1/K (1/°F)	10.8 · 10-6 (6.0 · 10-6) 23 · 10-6 (12.8 · 10-6) 65 · 10-6 (36.1 · 10-6) 16 · 10-6 (8.9 · 10-6) 9 · 10-6 (5.0 · 10-6) 5.4 · 10-6 (3.0 · 10-6) 0.5 · 10-6 (0.3 · 10-6) ± 0.3 · 10-6 ± (0.17 · 10-6)

		Strain Gauge material Specifications
Temperature response with	°C (°F)	-10 + 20 <i>(14248)</i>
matching in the range of 3)		
Mechanical hysteresis1)	]	
<ul> <li>at reference</li> </ul>	]	
temperature and strain		
$\varepsilon = \pm 1000  \mu \text{m/m}$		
(microstrain)		
- on SG type LY11-6/120		
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
Z 70	, , ,	
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	0.5
Z 70	, , , , , ,	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	2.5
X 60	pini, in (inicrostrum)	
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
X 60	philyin (microstram)	
at 1st load cycle and adhesive	μm/m ( <i>microstrain</i> )	1
	μπηπη (microstrain)	1
EP 250	um/m (microstrain)	1
at 3rd load cycle and adhesive	μm/m ( <i>microstrain</i> )	4
EP 250	<del> </del>	
Maximum elongation1)		
- at reference		
temperature using		
adhesive Z 70		
<ul> <li>on SG type LY11-6/120</li> </ul>		<u></u>
Absolute strain value ε for	μm/m ( <i>microst ain</i> ,	50- 000 ( 5 %)
positive direction		<b>Y</b>
Absolute strain values for	μm/m ( <i>migrosti</i> in)	50- 000 ( 5 %)
negative direction		
Fatigue life1)		
<ul> <li>at reference</li> </ul>		
temperature using		
adhesive X 60		
<ul> <li>on SG type LY61-6/12</li> </ul>		
Achievable number of load		
cycles Lw at		
alternating strain εw = ± 1 00	· ·	
µm/m and zero poin drine		
- εm Δ 300 μm/n		>> 107 (test was interrupted at 107)
(microstrin)		207 (2002 Hab ilitali apada at 147)
- εm Δ Σ Ω μ n/m	1	> 107 (test was interrupted at 107)
(m'are strain)		2 207 (cost mas interrupted at 107)
(increase)		
Minimum radius of curvature,		
longitudinal and transverse,	mana (in ah)	0.2 (0.012)
at reference temperature for	mm (inch)	0.3 (0.012)
strain gages with leads		
for SG with integrated solder		мочениче
tabs		0.2 (0.042)
<ul> <li>within measuring grid</li> </ul>	mm (inch)	0.3 (0.012)
area		
<ul> <li>within solder tabs area</li> </ul>	mm (inch)	2 (0.079)
Bonding material than can be		
Bonding material than can be used		
used		- Z 70; X 60; X 280
		- Z 70; X 60; X 280 - EP 150; EP 250; EP 310S

# 4.16 Flux Pens (5 pcs)

#### Introduction

Name:

FS 01

Application:

Flux

The flux pen is a valuable accessory for very fine soft soldering. It is shaped like a felt tip pen and contains a special non-corrosive flux, based on colophony, which does not spray and conforms with EN 29454; 1.1.3 (F-SW 32 of DIN 8511).

#### Composition/information on ingredients

Chemical characterization

Description:

Mixture consisting of the following components.

Dangerous components:

CAS: 67-63-0

Xi, F; R 11-36-67

50-100%

EINECS: 200-661-7

CAS: 8050-09-7 Balsamharz

Xi: R 43

10-25%

EINECS: 232-475-7

CAS: 124-04-9

adipic acid

propan-2-ol

Xi; R 36

2.5-10%

EINECS: 204-673-3

. Regulation (EC) No 648/2004 on detergents belong for contents

Lösungsmittel

≥ 30%

#### Physical and chemical properties:

General Information

Form:

naid

Colour:

Ember coloured

Smell:

Alcohol-like

Change in condition

Melting point/Melang ratio

Not determined

Boiling point/Boil

82°C 13°C

Flash point:

43500

Ignition temperature

425°C

Self-ir (an mas "//ty:

Product is not selfigniting.

Danger explosion:

Product is not explosive. However, formation of explosive

air/steam mixtures is possible.

Critica values for explosion:

Lower:

2.0 Vol %

Upper:

12.0 Vol %

Steam pressure at 20°C:

Density at 20°C

48 hPa 0.833 g/cm<sup>3</sup>

Solubility in / Miscibility with

Water:

Partly miscible