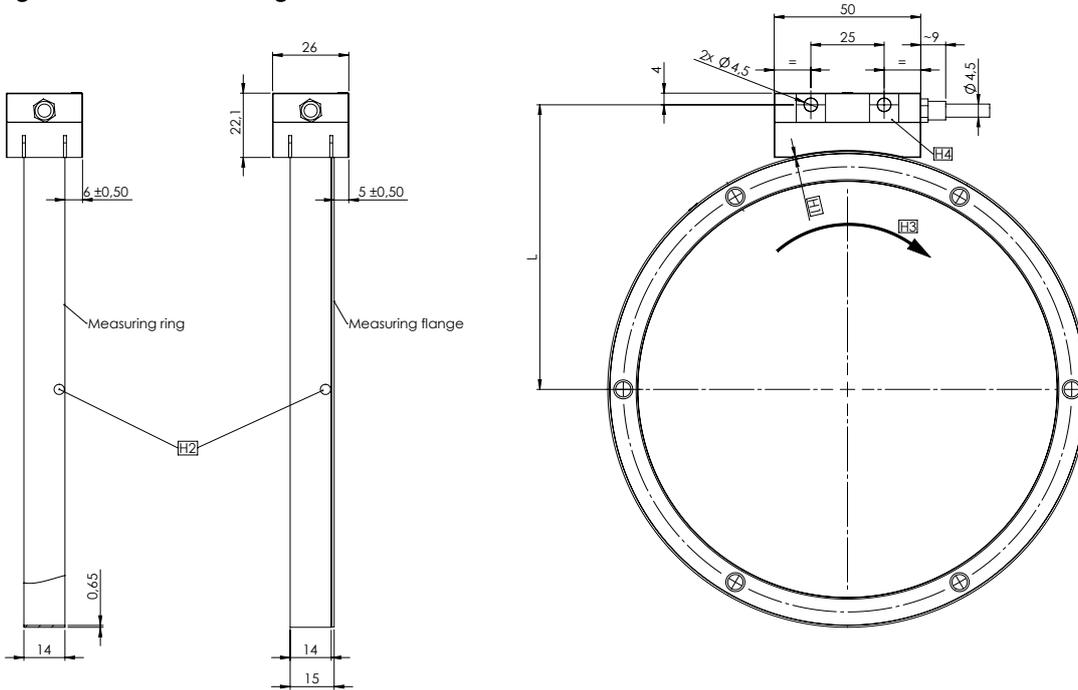


# WMKA 2010 series

- Composed of WMKA 2010 and scale tape ring on flange or measuring ring
- Grating period 1000µm
- Scanning head with integrated electronics

## Design 20 - Outside scanning

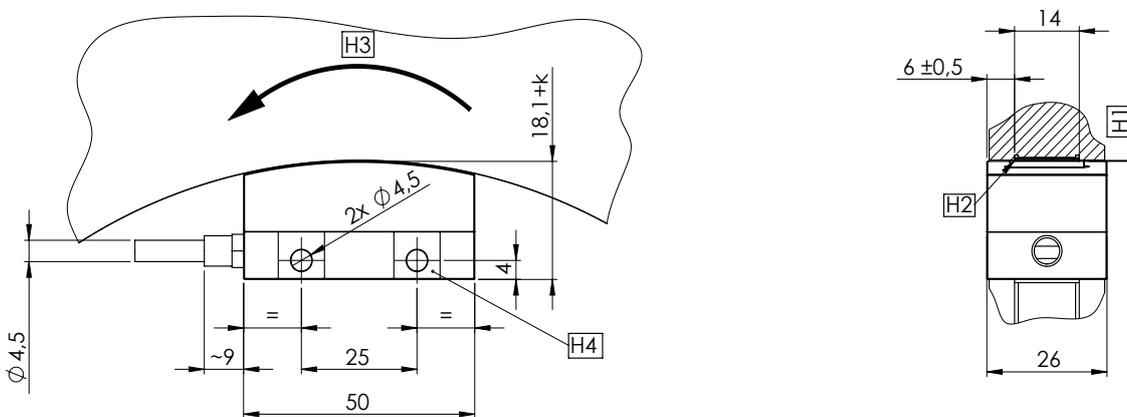


Line count	L [mm]
256	56,74
360	73,29
512	97,82
720	131,64
900	160,39
1024	180,33
1440	246,74
1800	304,25
2048	343,84

# WMKA 2110 series

- Composed of WMKA 2110 and scale tape ring
- Grating period 1000µm
- Scanning head with integrated electronics

## Design 20 - Inside scanning



Line count	L [mm]
1024	142,53
1440	209,28
1800	266,84
2048	306,44

Tolerance principle in accordance with SO8015  
 General tolerances in accordance with ISO 2768-fH  
 All dimensions in mm



H1 = Air gap 0,15 ± 0,10mm, set with spacer foil  
 H2 = Reference track marking  
 H3 = Direction of shaft rotation for positive counting  
 H4 = weight plane (both sides))

## Technical data

Scanning head										WMKA 2010 / WMKA 2110									
Interface	EnDat 2.2		Fanuc $\alpha$		Mitsubishi (full duplex)		Mitsubishi (duplex)		BiSS/C		SSI + 1Vss								
Designation	EnDat 22		Fanuc02		MitA1-2		MitA1-4		BiSS		SSI - 1V pp								
Clock frequency	$\leq 16$ MHz		-		5Mbps		5Mbps		$\leq 2,5$ MHz		$\leq 1$ MHz								
Interpolation factor digital	Performance Standard: 10bit or 12bit Performance High Accuracy: 14bit										Performance Standard: 10bit or 12bit								
Cable length on the encoder	0,5m to 6m																		
Electrical connection	Cable with M12 coupling, 8pin male										Cable with M23 coupling								
Voltage supply	DC 3,6V to 14V																		
Power consumption	$\leq 1,5$ W at 5V																		
Typical current consumption	300mA at 5V																		
Shock	$< 2000\text{m/s}^2$ for 6m/s																		
Vibration	$< 200\text{m/s}^2$ 55Hz - 2000Hz																		
Operating temperature	$-10^\circ\text{C}$ to $85^\circ\text{C}$																		
Storage temperature	$-20^\circ\text{C}$ to $85^\circ\text{C}$																		
Protection	IP67																		
Weight	40g																		
Line count	256 <sup>2)</sup>		360 <sup>2)</sup>		512 <sup>2)</sup>		720 <sup>2)</sup>		900 <sup>2)</sup>		1024		1440		1800		2048		
Max. Position/Rotation <sup>3)</sup>	22bit			23bit				24bit				25bit							
Position error per grating period <sup>1)</sup>																			
Standard	$\pm 11,0''$		$\pm 7,5''$		$\pm 5,5''$		$\pm 4,0''$		$\pm 3,0''$		$\pm 3,0''$		$\pm 2,0''$		$\pm 2,0''$		$\pm 1,5''$		
High Accuracy	$\pm 3,0''$		$\pm 2,0''$		$\pm 1,5''$		$\pm 1,0''$		$\pm 1,0''$		$\pm 1,0''$		$\pm 0,5''$		$\pm 0,5''$		$\pm 0,5''$		
Electrical max. speed [min <sup>-1</sup> ]	$\leq 4680$		$\leq 3330$		$\leq 2340$		$\leq 1660$		$\leq 1330$		$\leq 1170$		$\leq 830$		$\leq 660$		$\leq 580$		

<sup>1)</sup> The position error per grating period and the accuracy of the grating result together in the encoder specific error; additional deviations caused by mounting and bearing are not considered in this error.

<sup>2)</sup> not for inside scanning

<sup>3)</sup> for all pure serial interfaces

# Ordering code

- WMKA - Scanning head for absolute angle encoder
- Grating period 1000µm

WMKA 2 10 . -20 - , - - - - -

**Scanning**

0 = Outside scanning  
1 = Inside scanning

**Performance**

S = Standard  
HA = High Accuracy

**Interface**

01 = EnDat 2.2  
02 = Fanuc Serial Interface - α Interface  
15 = SSI, with additional incremental signals 1Vpp  
16 = BiSS/C  
21 = Mitsubishi High Speed Serial Interface (full duplex)  
22 = Mitsubishi High Speed Serial Interface (duplex)

**Interpolationsfaktor digital**

10 = 10 Bit  
12 = 12 Bit  
14 = 14 Bit<sup>3)</sup>

**Functional safety**

.. = No  
FA = Analog signal (1Vpp) can be used for safety related equipment

**Line count**

256<sup>1)</sup>  
360<sup>1)</sup>  
512<sup>1)</sup>  
720<sup>1)</sup>  
900<sup>1)</sup>  
1024  
1440  
1800  
2048

**Multiplication 1Vpp (only for SSI)**

01	1-fold	x
25	25-fold	x
32	32-fold	x
NN	Without Incremental signals	

**Pin configuration**

C4 = 1SS08  
IS = 03S17, 01

**Electrical connection**

01 = free cable end  
1SS08 = M12 8pin coupling male  
03S17 = M23 17polig Kupplung Stift

**Cable length**

0,50 = 0,50 m  
1,00 = 1,00 m  
1,50 = 1,50 m  
2,00 = 2,00 m  
2,50 = 2,50 m  
3,00 = 3,00 m  
4,00 = 4,00 m  
5,00 = 5,00 m  
6,00 = 6,00 m

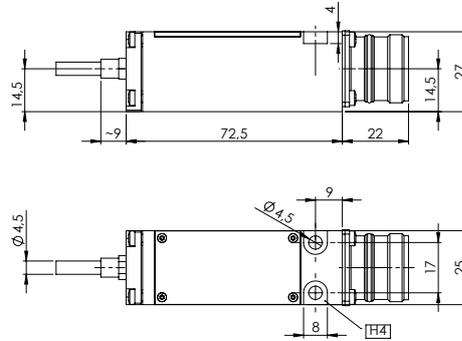
<sup>1)</sup> Not for inside scanning  
<sup>2)</sup> Option „FA“ only for SSI and 1Vss Interface with the Multiplication „01.“  
<sup>3)</sup> Not for SSI-Interface.

# External electronics

- General information
- Dimensions

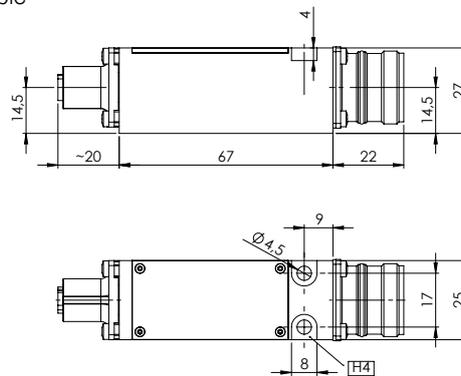
## Design 10

- Miniaturized scanning head
- with external electronics on the cable
- Output: Flange socket M23



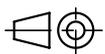
## Design 12

- Miniaturized scanning head
- with external electronics, pluggable on cable via M12 connector
- Output: Flange socket M23



Tolerance principle in accordance with ISO 8015  
 General tolerances in accordance with ISO 2768-fH  
 All dimensions in mm

H4= Mounting surface



# Interfaces

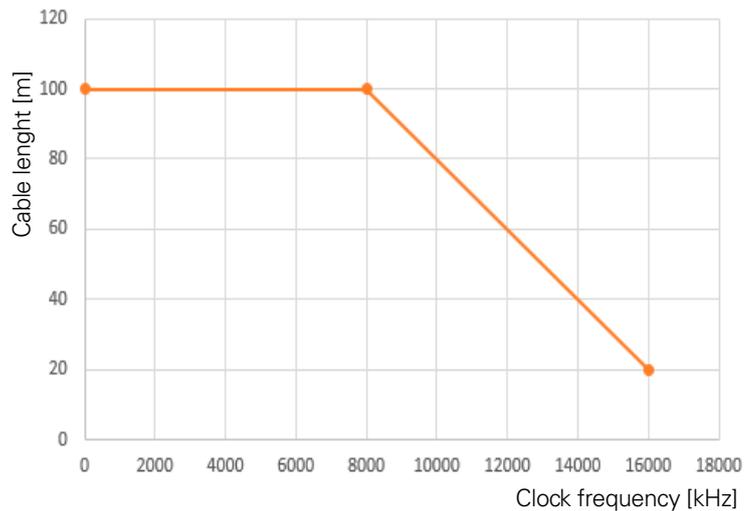
## Position values

The EnDat-Interface is a digital, bi-directional Interface for measuring systems. With this interface you can read out position values and in the measuring system saved informations. This value can also be updated or new values can be saved. Due to the serial data transfer four signal wires are enough. The data DATA gets transferred synchronously to the form the subsequent electronics given clock frequency CLOCK. The selection from the mode of transmission (position values, parameter, diagnostics,...) is done with mode-commands which are sent from the subsequent electronics to the measuring system.

The clock frequency is variable - depending on the cable length (max. 100m). With propagation electronics, either clock frequencies up to 16MHz are possible or cable length up to 100m. For EnDat encoders the maximum clock frequency is stored in the encoder memory. Propagation-delay compensation is provided for EnDat22.

Transmission frequencies up to 16MHz in combination with large cable length place high technological demands in the cable. Greater cable lengths can be realized with an adapter cable no longer than 6m and an extension cable. As a rule, the entire transmission path must be designed for the respective clock frequency.

Order code	Instruction set	Incremental signals
EnDat22	EnDat 2.2	Without



### Pin configuration

Electrical connection: 1SS08 8-pin coupling M12								
Power supply				Absolute position values				
	8	2	5	1	3	4	7	6
	<b>U<sub>P</sub></b>	<b>Sensor U<sub>P</sub></b>	<b>0V</b>	<b>Sensor 0V</b>	<b>DATA+</b>	<b>DATA-</b>	<b>CLOCK+</b>	<b>CLOCK-</b>
	brown/green	blue	white/green	white	grey	pink	violet	yellow

**Cable Shield** is connected with the housing; **U<sub>P</sub>** = Power supply voltage  
**Sensor:** The sensor wire is connected internally with the corresponding power supply.  
 Non-used pins or wires must not be assigned!

# Interfaces

## Pin layouts Fanuc, Mitsubishi and BiSS/C<sup>®</sup>

### Fanuc

AMO measuring systems with Fanuc Interface are for connection to a Fanuc-Control.

#### Fanuc Serial Interface - $\alpha$ interface

Order code: Fanuc02  
normal and high speed,  
two-pair transmission.

### BiSS/C

AMO measuring systems with BiSS/C<sup>®</sup> Interface are for connection to controls which have the ViSS/C Interface implemented.

#### BiSS/C bidirectional protocol

Order code: BiSS  
The Standard Encoder Profile - 32bit will be in use.

### Mitsubishi

AMO measuring systems with Mitsubishi Interface are for connection to aM itsubishi-Control.

#### Mitsubishi high speed interface

Order code: MitA1-2 (full duplex) -> one pair transmission  
Order code: MitA1-4 (duplex) -> two pair transmission

### Pin configuration

Electrical connection: 1SS08 8-pin coupling M12								
Power supply				Absolute position values				
	8	2	5	1	3	4	7	6
	<b>Up</b>	<b>Sensor</b> Up	<b>0V</b>	<b>Sensor</b> 0V	<b>DATA+</b>	<b>DATA-</b>	<b>CLOCK+</b>	<b>CLOCK-</b>
	brown/green	blue	white/green	white	grey	pink	violet	yellow

**Cable Shield** is connected with the housing; **Up** = Power supply voltage

**Sensor:** The sensor wire is connected internally with the corresponding power supply.  
Non-used pins or wires must not be assigned!

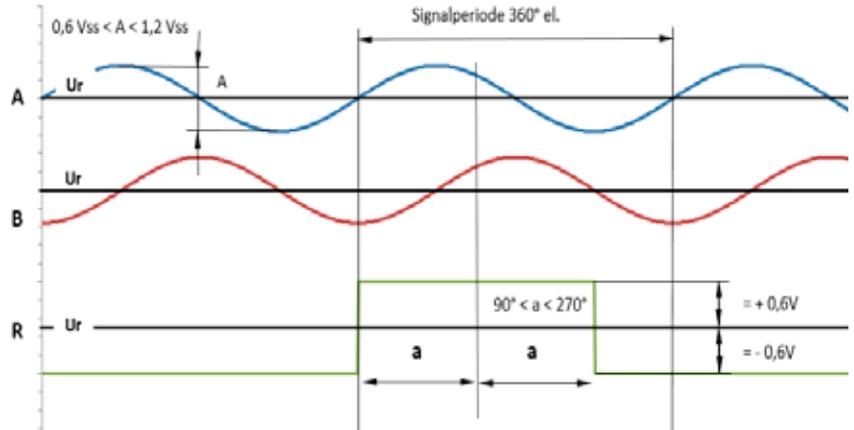
# Interface

Incremental signals  $\sim 1 V_{pp}$

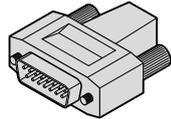
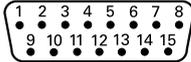
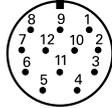
AMO-Measuring systems with  $\sim 1 V_{pp}$ -Interface are outputting signals which can be highly interpolated.

The sine shaped incremental signals A and B are electrically 90° phase shifted and have a signal strength from 1Vpp. The showed sequence of the outputet signals - B after A - is valid for the in the connection drawing stated movement direction.

The reference mark signal R has a clear as-ignment to the incremental signals.



## Pin configuration

<b>Electrical connection: 16S15</b> <b>15-pin Sub-D-connector</b>   														
<b>Electrical connection: 03S12</b> <b>12-pin coupling M23</b>   					<b>Electrical connection: 02S12</b> <b>12-pin connector M23</b>   									
	Power supply				Incremental signals						Other signals			
	4	12	2	10	1	9	3	11	14	7	5/15	8	6	
	12	2	10	11	5	6	8	1	3	4	/	7	9	
	<b>U<sub>P</sub></b>	<b>Sensor U<sub>P</sub></b>	<b>0V</b>	<b>Sensor 0V</b>	<b>A+</b>	<b>A-</b>	<b>B+</b>	<b>B-</b>	<b>R+</b>	<b>R-</b>	<b>frei</b>	<b>Diag+</b>	<b>Diag-</b>	
	brown/ green	blue	white/ green	white	brown	green	grey	pink	red	black	/	violet	yellow	

**Cable Shield** is connected with the housing; **U<sub>P</sub>** = Power supply voltage

**Sensor:** The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

DIAG-wires must not be assigned.

DIAG-signals are for checking the encoder with AMO-STU-60.

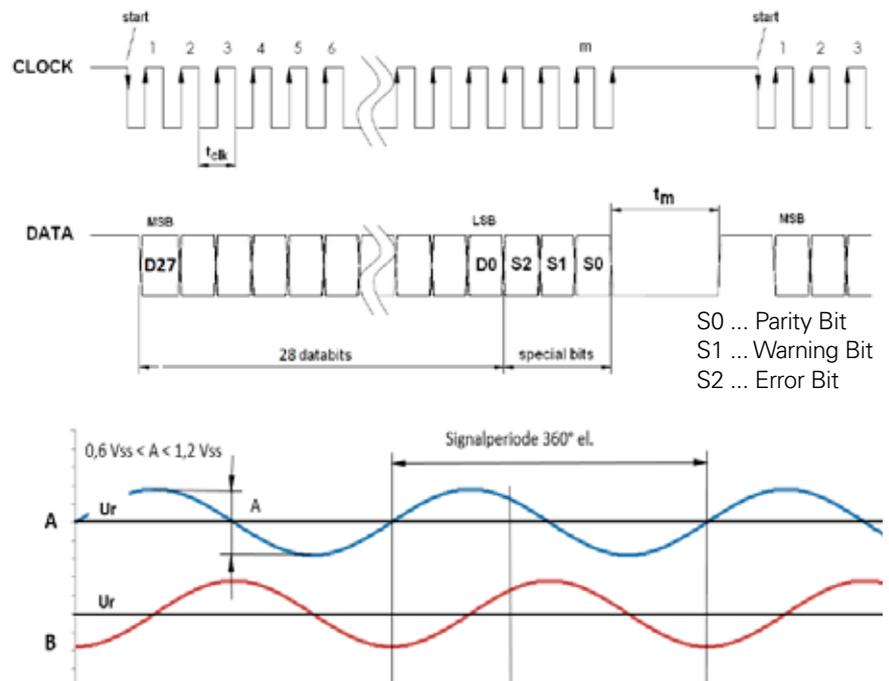
# Interfaces

## SSI + $\sim 1V_{pp}$

SSI Interface is an unidirectional Interface which can output position values. The Data DAATA gets transferred synchronously to the from the subsequent electronic given Clock frequency CLOCK. Additionally three special bits (Error, Warning and Parity) will be transferred

AMO-Measuring systems with  $\sim 1V_{pp}$ -Interface are outputting signals which can be highly interpolated.

The sine shaped incremental signals A and B are electrically  $90^\circ$  phase shifted and have a signal - B after A - is valid for the in the connection drawing stated movement direction.



### Pin configuration

Electrical connection: 03S17  
17-pin coupling M23

	Power supply				Increment signals				Absolut position value			
	7	1	10	4	15	16	12	13	14	17	8	9
	$U_P$	Sensor $U_P$	0V	Sensor 0V	A+	A-	B+	B-	DATA+	DATA-	CLOCK+	CLOCK-
	brown/ green	blue	white/ green	white	brown	green	grey	pink	red	black	violet	yellow

**Cable Shield** is connected with the housing;  $U_P$  = Power supply voltage

**Sensor:** The sensor wire is connected internally with the corresponding power supply. Non-used pins or wires must not be assigned!

# Interface

## Incremental signals TTL

AMO-measuring with  TTL Interface contain electronic, which form the sine-form signals - with or without- Interpolation into digital signals.

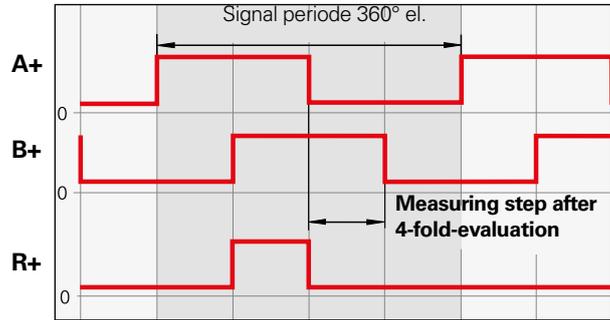
The incremental signals are outputed as rectangle pulses A+ and B + with 90° el. phase shifting.

The rectangle-mark-signal is composed from one or more reference impulses R+, which are assigned with the incremental signals:

The integrated electronic additionally creates the inverse signals A-, B- and R- for a safe transmission.

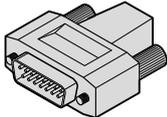
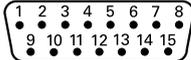
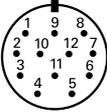
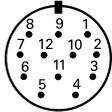
The showed sequence of the outputed signals - B after A - is valid for the in the connection drawing stated movement direction.

The measuring step results throught the distance between two flanks from the incremental signals A+ and B+ throught 1-fold, 2-fold or 4-fold evaluation.



The inverse signals A-, B- und R- are not shown.

### Pin configuration

<b>Electrical connection: 16S15</b> <b>15-pin Sub-D-connector</b>   														
<b>Electrical connection: 03S12</b> <b>12-pin coupling M23</b>   					<b>Electrical connection: 02S12</b> <b>12-pin connector M23</b>   									
	Power supply				Incremental signals						Other signals			
	4	12	2	10	1	9	3	11	14	7	5/15	8	6	
	12	2	10	11	5	6	8	1	3	4	/	7	9	
	<b>Up</b>	<b>Sensor Up</b>	<b>0V</b>	<b>Sensor 0V</b>	<b>A+</b>	<b>A-</b>	<b>B+</b>	<b>B-</b>	<b>R+</b>	<b>R-</b>	<b>Free</b>	<b>Diag+</b>	<b>Diag-</b>	
	brown/ green	blue	white/ green	white	brown	green	grey	pink	red	black	/	violet	yellow	

**Cable Shield** is connected with the housing; **Up** = Power supply voltage

**Sensor:** The sensor wire is connected internally with the corresponding power supply.

Non-used pins or wires must not be assigned!

DIAG-wires must not be assigned!

DIAG-signals are for checking the encoder with AMO-STU-60

# Cable

- Technical Data

	cable for incremental measuring systems and SSI+1Vpp	cable for measuring systems with pure serial interfaces
Jacket	PUR, high flexible, suitable for energy chains	
Diameter	4,5 +/-0,1mm	
Wires	6x2x0,09mm <sup>2</sup>	1x(4*0,09mm <sup>2</sup> ) + 4x0,14mm <sup>2</sup>
Bending radius	≥ 10mm for single bending	
	≥ 50mm for continuous bending	
Max. length	6m	
Resistance according to	UL according to Style 20963 80°C 30V	