

# Waveguide Switches

High precision mechanical Microwave Products



*Sivers Lab AB Stockholm Sweden, Waveguide Switch Catalogue*

*Issue 1:2004*

*Technical data in this catalogue are subject to change without notice  
and become contractual only after written confirmation.*

## Data Sheet Overview

Waveguide	Acuator	Isolation	Type no	Page
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	Fail-safe	60	WS8088P/00	52
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See also Sivers Standard Flange dimensions				70

### Other Models

On account of our module design we are prepared for modifications for any special requirements please contact us or look for your local dealer at [www.siverslab.se](http://www.siverslab.se)

E-mail: [switches@siverslab.se](mailto:switches@siverslab.se) Fax: +46 8 751 00 19 Phone: +46 8 477 68 00

## Waveguide Switches

### General

This catalogue describes the design of standard manual and automatic waveguide switches. Switches are available in frequencies ranging from 2.6 to 40 GHz.

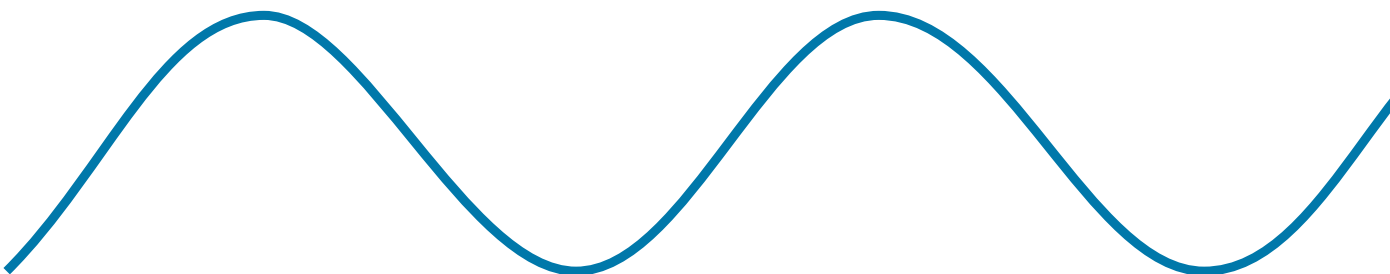
**Other models and special designs are available on request.**

Waveguide switches are widely used in microwave systems:

- In radars for redundancy transmitters
- In radars for connection to high power dummy load
- In radars for test purposes
- In satellite communications for redundancy applications
- In test systems to select various signal paths etc.

Common to all Sivers Lab mechanical waveguide switches are:

- High isolation
- Low insertion loss
- High power capability
- Long life



## General Design

The switches have a square stator with four waveguide ports. The rotor, which is fitted in the stator, has two or three channels. Electrical continuity between rotor and stator is achieved by means of quarter wave chokes. These chokes give extremely high isolation between the channels and also ensure unchanged high electrical performance throughout the lifetime of the switch.

All models have low VSWR and high power handling capacity. They withstand the full power rating of the waveguide and most models can be pressurised to 0.2 MPa (2 ATO) for high peak power applications.

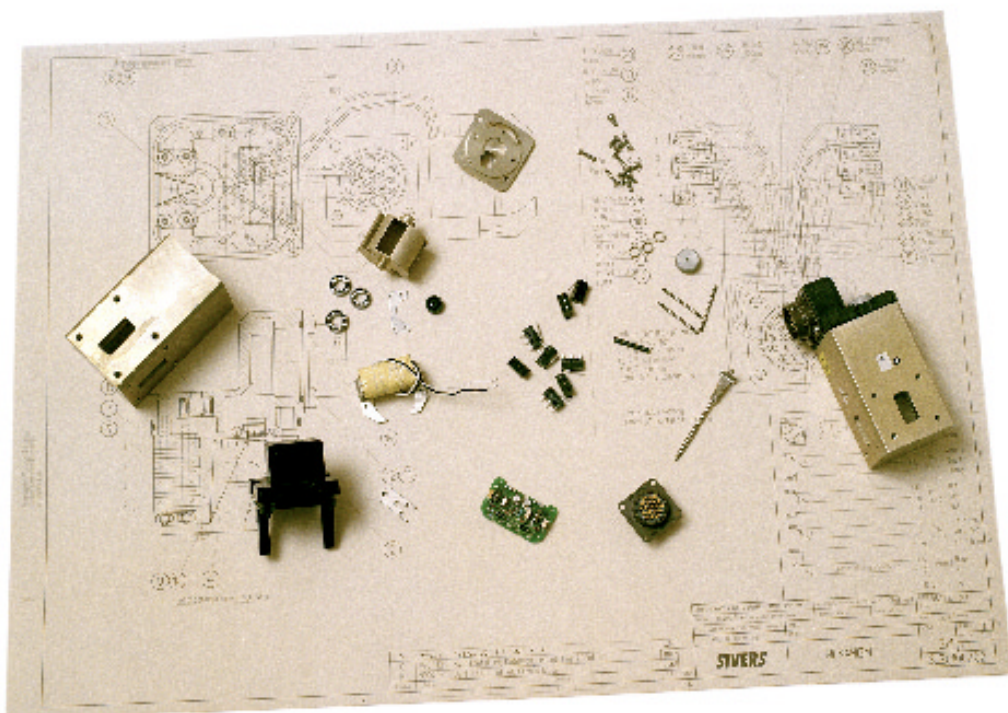
All switches have E-plane bends for small dimensions.

The switches are made of copper-free aluminium alloy, which is chromated. The rotor is supported by stainless steel ball bearings.

The flange connections are, for most models, standard flat flanges with threaded holes. Special flange drilling and/or helicoil steel inserts are available on request.

Switches are available with:

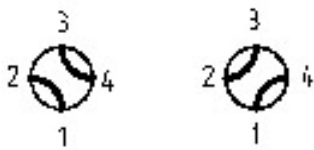
- standard rectangular waveguides
- double-ridge waveguides



## Configuration

All switches have a square stator with four ports. The rotor has two channels.

Four ports – two channels (transfer).



Position 1

Position 2

## Actuators

Manual and automatic (electromagnetic) actuators are available.

The automatic types are fail-safe or latching. The fail-safe type returns to the de-energized position when the power is disconnected and requires a small holding current in the energized position. The latching type is stable in both positions without holding current.

In applications like safety-circuits, where it is required that the switch returns to its original position, if power supply fails, a fail-safe type is the natural choice. In other applications it might be an advantage to have low power consumption and no holding current.

Several models of automatic actuators are available for switches in the frequency range 4 to 40 GHz. All standard models operate at 28 Volts and have a maximum switch current of 1 Ampere and a maximum holding current of 0.3 Ampere.

For all latching models the current is automatically switched off when the rotor is in position. In fail-safe models the current is automatically reduced to holding current when the rotor is in position.

One or several sets of position indicators are available with all models of actuators.

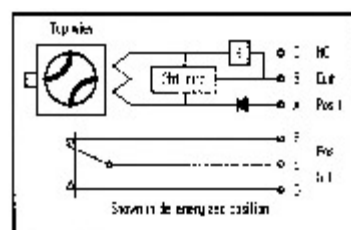
Some models can be supplied with manual override knob for manual setting of position.

## Standard Model. Type number 80--.

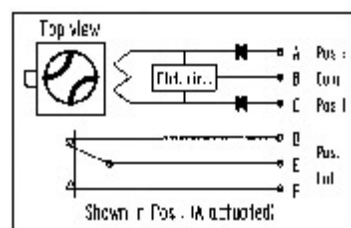
These models have the smallest dimensions. They have one set of position indicators and the electrical connection is via soldering pins or circular MIL- connector. Switch time is 100 to 250 ms (depending on frequency band). The models are in most cases specified for full temperature range.

## SatCom Model. Type number 81--.

This model can be supplied with up to four sets of position indicators. One set of indicators can be arranged to have "inhibit" function, which is a closed contact at end positions and an open contact during transition. The actuator has manual override and cannot be pressurized. Switch time is 100 to 150 ms. The electrical connection is via a circular MIL- connector.



Fail Safe Mechanism  
Holding current in one position



Latching Mechanism  
No holding current in any position

## Technical Data

VSWR	1.05 to 1.08 for rectangular waveguides and 1.20 for double ridge models.
Insertion Loss	< 0.1 dB power capacity, except for double ridge models, which have 0.2 to 0.4 dB). See datasheets for each model.
Flanges	MIL-F-3299 for rectangular waveguides and MIL-F-39000 for double ridge waveguides.
Actuator voltage	28±3 V DC as standard. Some models may have a different voltage.
Actuator current	1 A for standard models.
Switch time	100 to 1000 ms depending on model.
Position indicators	60 V/ 500 mA rating.
Connectors	Soldering pins, flying lead or circular MIL connector according to datasheet.
Pressurization	Max. 0.2 MPa (not for 81- models).
Leakage	Max. 10 cc/minute.
Material	Stator and rotor; aluminium alloy copper free.
Finish	Stator and rotor; Chromate per MIL-C-5541C.
Life	250 000 actuations minimum.
Temperature range	-40 to +85°C operating except 81- models which have 0 to 50°C.
Vibration	10 G for standard models. Up to 30 G for special models.
Duty	2 actuations/second at temperatures up to +40°C decreasing to one actuation/2 seconds at +85°C.
Reliability	All switches are actuated and the function monitored for 1 000 actuations at room temperature, highest and lowest specified temperature.

## The Company

Sivers is a long-established European microwave product manufacturer located in Sweden's largest high-tech area, Kista, in the northern part of Stockholm.

Carl von Sivers founded the company in 1951. With more than 50 years experience in microwaves, Sivers is a world-leading manufacturer of Waveguide Switches. The 2 000 sq. meters (20 000 sq. feet) facilities contain state-of-art technologies and equipment for development, engineering and production. These facilities allow the necessary activities in-house with short lead times and full quality control providing both standard and customised products

Development and production are supported by CAD/CAM systems with highly automated production equipment for low as well as large quantity production. All activities are guided by a Quality System that complies with ISO-9001:2000.

In addition to common microwave and mechanical test equipment Sivers has also equipment for high power tests, random vibration, burn-in, temperature cycling, low noise measurements etc.

### **Sivers forms a part of the Chelton Group, a division of Cobham Plc.**

Cobham Plc is a substantial British industrial group with companies in Europe and North America, employing over 8 900 people and with a turnover of 832 million GBP (2003). Cobham is internationally known as a key supplier to aeronautical and defence industries, particularly in the field of RF and microwave.

The capabilities of the group, particularly the very close co-operation with the leading slipring manufacturer Air Precision, allow Sivers to further improve its commercial technical performance and thus offer you an even better service.

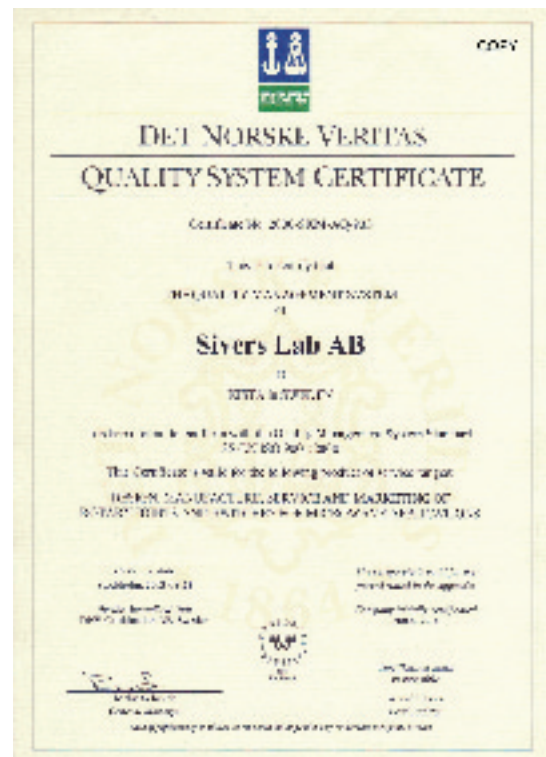
## Quality

Sivers is fully certified as per ISO-9001:2000 and quality remains one of Sivers' main priorities.

With its qualified engineers and sophisticated test equipment Sivers constantly seeks to maintain and improve the quality of products by application of ISO 9001:2000 procedures and instructions.

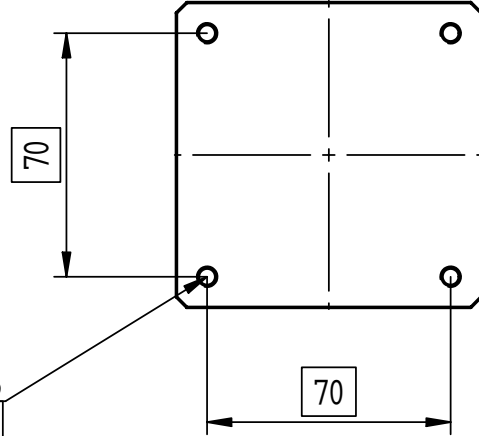
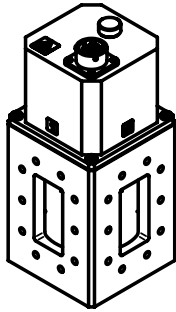
The Quality Assurance Department is completely involved in all stages of the design, development and manufacturing of our products.

Each product delivered can be accompanied by an individual test document. Our Quality Manager certifies the quality by a Certificate of Conformance.

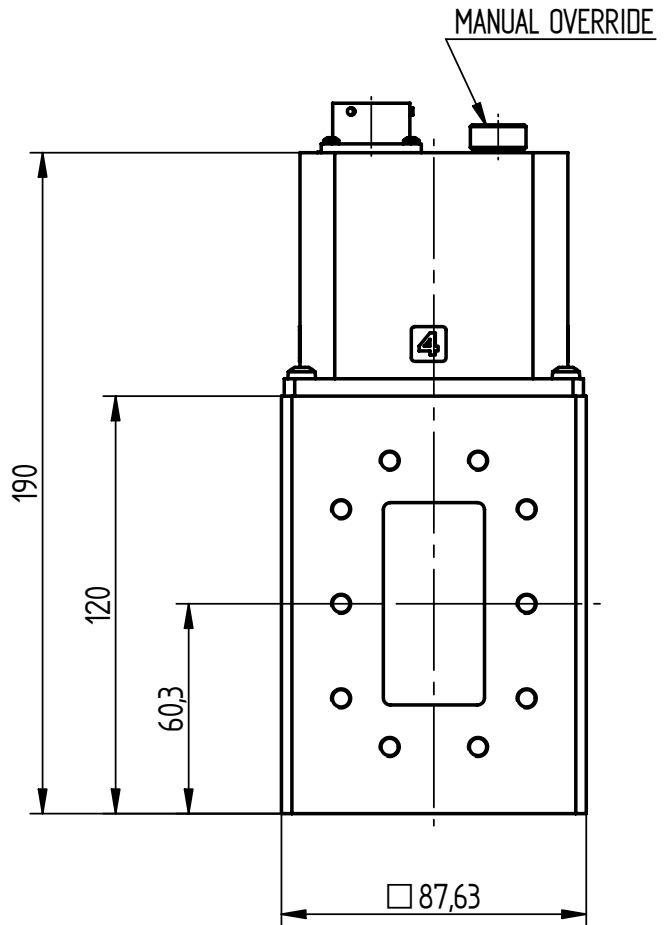
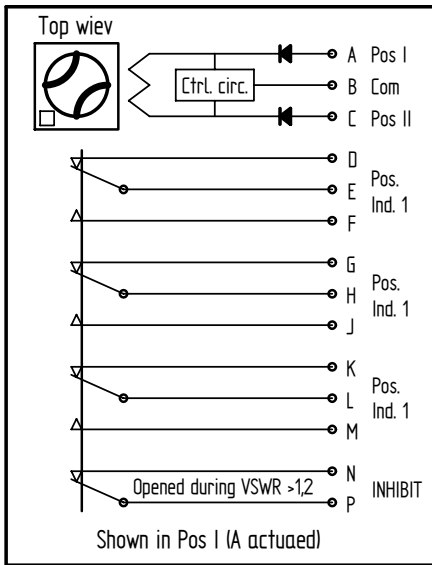


# Specifications

1	2	3	4	5		
Issue	Modification			Date	Sign.	Chkd.
B	Paragraphs added			2003-1014	HNg	HW



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c ⚠ ⚙ Europ. proj.	Ref.	020410	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	
Dimensions in mm			Appvd.		Sign.	
<b>SIVERS</b>	Title		Designed	Sheet 2(2)		
	WAVEGUIDE SWITCH WR229 / A-band Latching		Scale	1:2	Issue B	
			Doc. no.	WS8286A/01		

Reference HNg	Approved <i>HW</i>	Origin date 2002-04-10	Issue date 2003-11-05	Issue B	Page 2 (2)	Document <b>WS 8286A/01</b>
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**RF DATA**

Frequency range	3.3 – 4.9 GHz
VSWR	1.05
Insertion loss	0.1 dB
Isolation	80 dB
Peak power	500 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/52C-012 Modified with M6, thread depth min 8

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A
Switching time	200 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 1 s at +85°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Position indicator current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	2 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g



Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2003-11-13	2003-11-13	A	2 (2)	<b>WS 8286S/00</b>

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**RF DATA**

Frequency range	2.6 – 3.95 GHz
VSWR	1.05
Insertion loss	0.1 dB
Isolation	80 dB
Peak power	1 MW at 0.1 MPa abs., +25°C
Average power	8 kW
Flange interface	MIL-DTL-3922/52C-032 Modified with M6, thread depth min 8

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	200 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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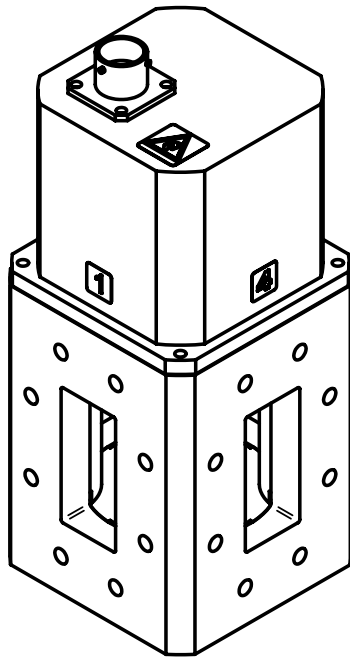
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finish	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	2.5 kg Max
Life	250 000 actuations

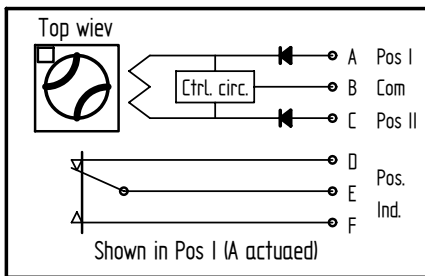
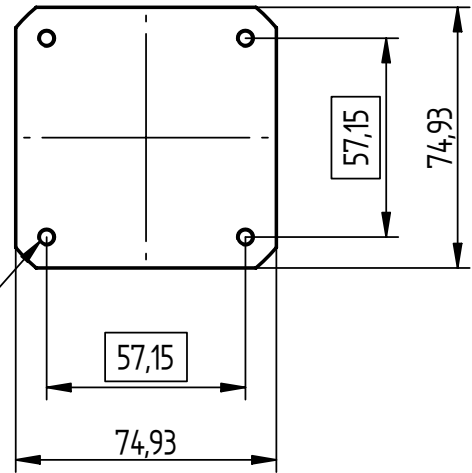
**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

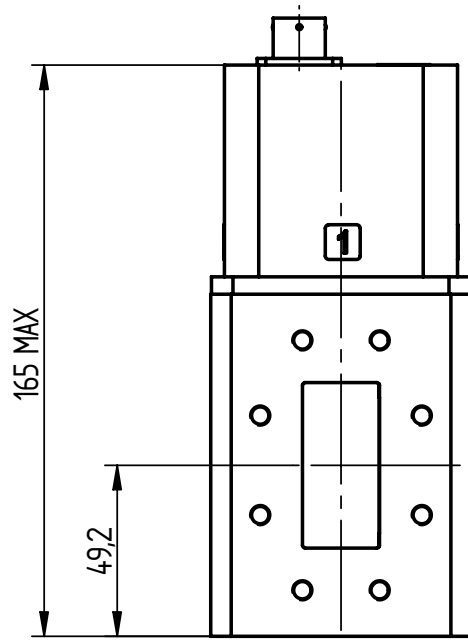
1	2	3	4	5		
Issue	Modification			Date	Sign.	Chkd.
B	ECO			2003-1014	HNg	HW



4x M5  
Depth min 8  
⊕ ∅ 0,2



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c ⊕ ∅ Europ. proj.	Ref.	030630	Sign.	SKm
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title		Designed	Sheet 1(1)		
	WAVEGUIDE SWITCH WR187/R48/WG12 Latching		Scale	1:1,5	Issue B	
			Doc. no.	WS8286G/00		

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Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	<i>HW</i>	2003-06-30	2003-11-04	B	2 (2)	<b>WS 8286G/00</b>

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**RF DATA**

Frequency range	3.95 – 5.85 GHz
VSWR	1.05
Insertion loss	0.1 dB
Isolation	80 dB
Peak power	500 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/52C-014 Modified with M6, thread depth min 8

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	500 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	1.5 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2003-01-08	2003-11-03	B	2 (2)	<b>WS 8086H/00</b>

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**RF DATA**

Frequency range	7.05 – 10.0 GHz
VSWR	1.10
Insertion loss	0.1 dB
Isolation	80 dB
Peak power	350 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/53D-004 Modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	300 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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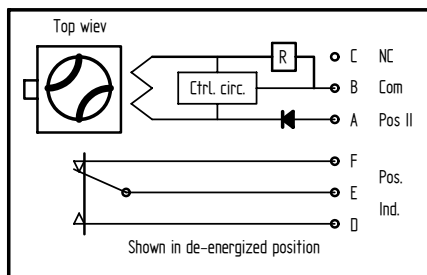
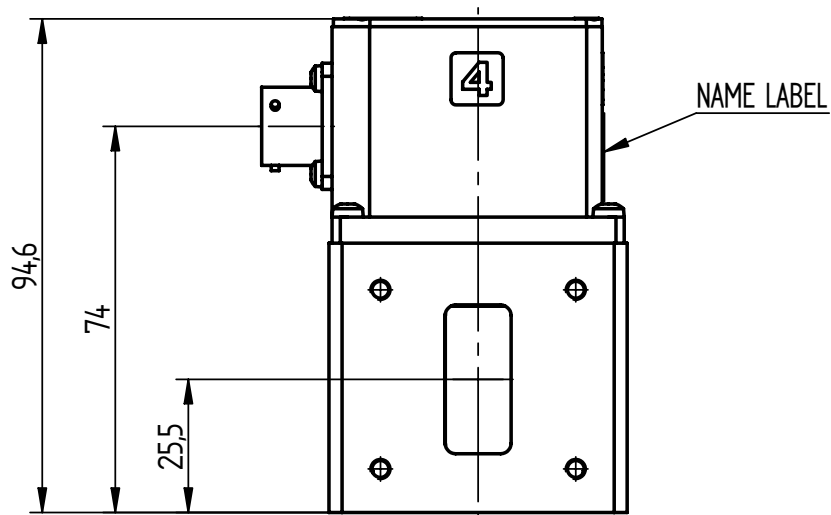
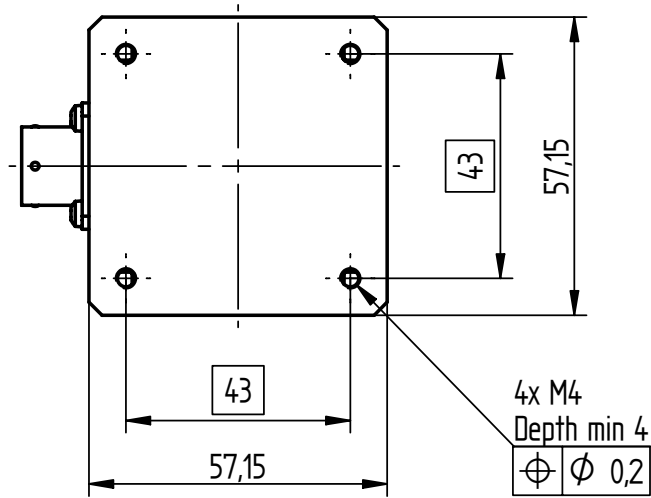
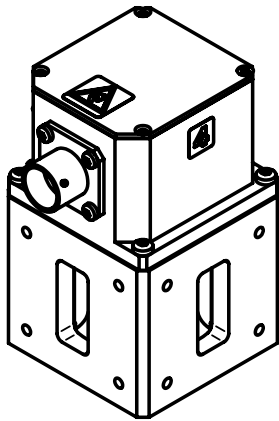
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.



**CAUTION!**  
ESD SENSITIVE

Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c • ◯ ◯ Europ. proj.	Ref. 2003-1112	Sign. HNg
Tolerancing principle	ISO 8015		Chkd.	Sign. HW
Dimensions in mm			Appvd.	Sign. HW
<b>SIVERS</b>	Title WAVEGUIDE SWITCH WR112/R84/WG15 Fail-safe		Designed	Sheet 1 (2)
			Scale 1:1,5	Issue A
			Doc. no. WS8087H/00	

Reference HNg	Approved <i>HW</i>	Origin date 2003-11-12	Issue date 2003-11-12	Issue A	Page 2 (2)	Document <b>WS 8087H/00</b>
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**RF DATA**

Frequency range	7.05 – 10.0 GHz
VSWR	1.10
Insertion loss	0.1 dB
Isolation	80 dB
Peak power	350 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/53D-004 Modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Auto switch on to holding current after 200 ms
Holding current	300 mA
Switching time	300 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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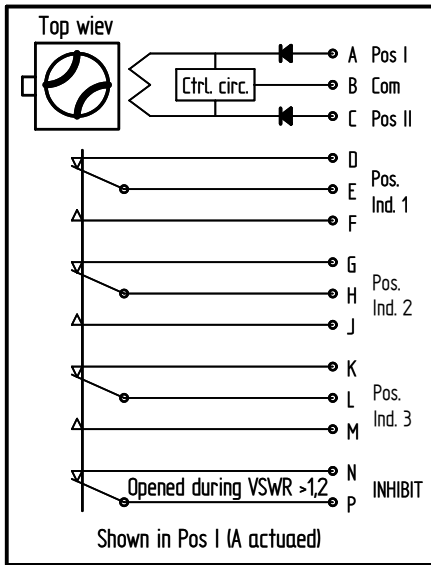
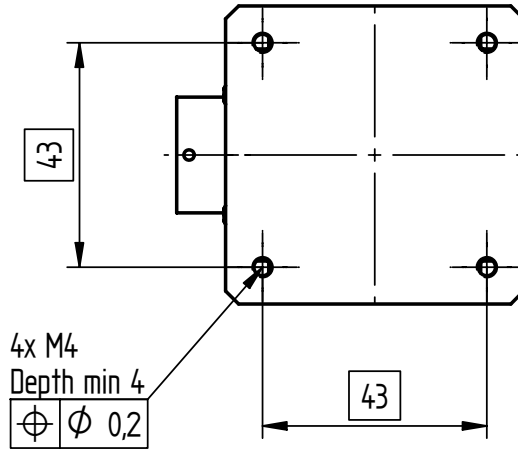
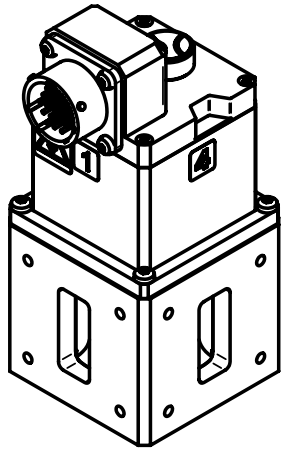
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0,5 kg Max
Life	250 000 actuations

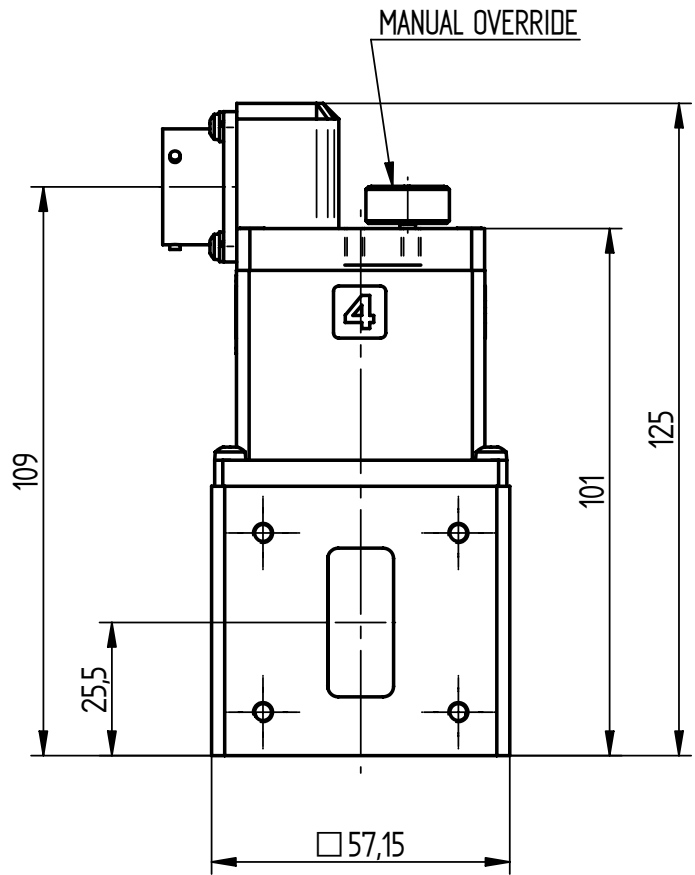
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

1	2	3	4	5		
Issue	Modification			Date	Sign.	Chkd.
B	ECO			2003-1016	HNg	HW



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c -  - Europ. proj.	Ref.	020430	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title		Designed	Sheet 1 (2)		
	WAVEGUIDE SWITCH WR112R84/WG15 Latching		Scale	1:15	Issue B	
			Doc. no.	WS8186H/00		

Reference HNg	Approved <i>HW</i>	Origin date 2002-04-30	Issue date 2003-11-05	Issue B	Page 2 (2)	Document <b>WS 8186H/00</b>
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**RF DATA**

Frequency range	7.05 – 10.0 GHz
VSWR	1.10
Insertion loss	0.1 dB
Isolation	80 dB
Peak power	350 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/53D-004 Modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	250 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1,2

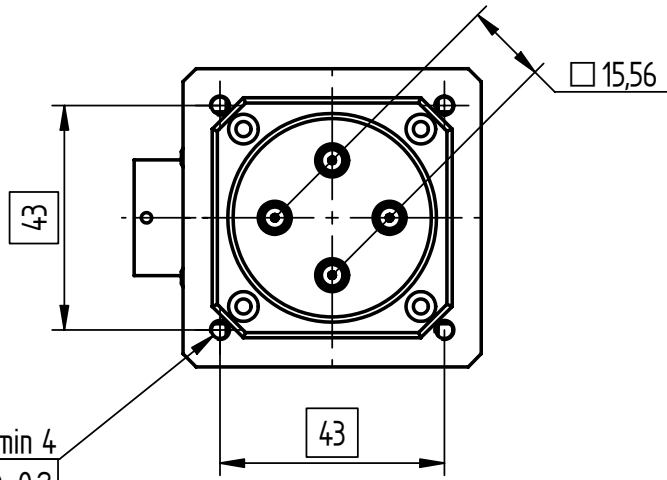
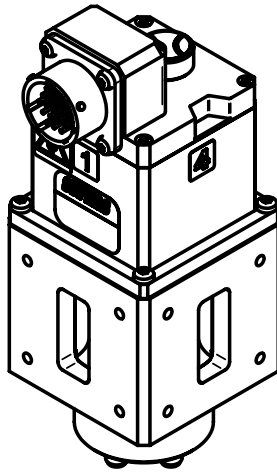
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.7 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

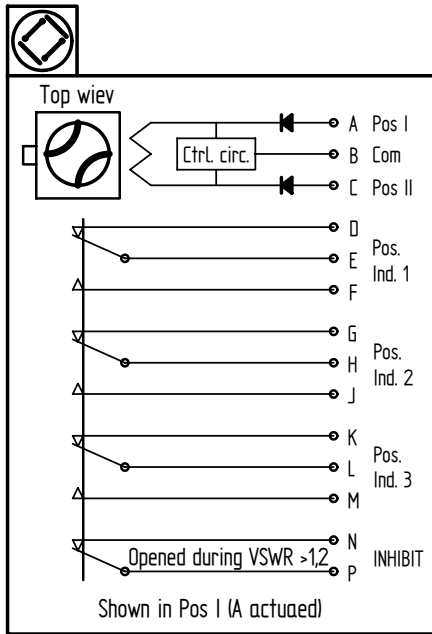
Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

1	2	3	4	5		
Issue	Modification			Date	Sign.	Chkd.
B	ECO			2003-1016	HNq	HW

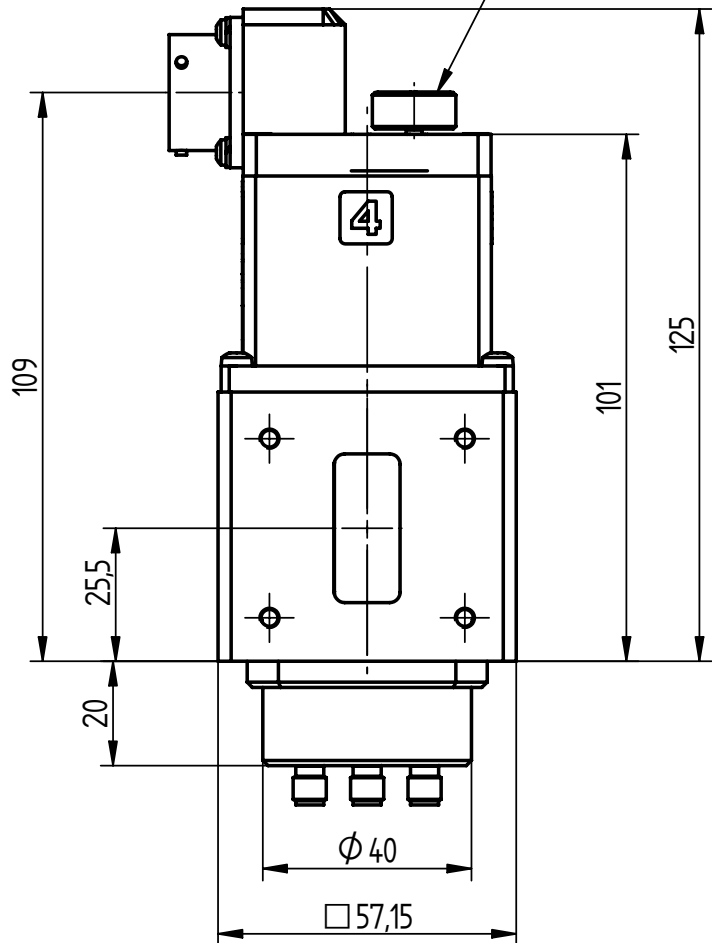


4x M4  
Depth min 4  
 $\pm 0,2$

MANUAL OVERRIDE



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c Europ. proj.	Ref.	030917	Sign.	MTr
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title		Designed	Sheet 1 (2)		
	WAVEGUIDE SWITCH WR112/R84/WG15 Latching with COAX DPDT		Scale	1:1,5	Issue	B
			Doc. no.	WS8186H/70		

Reference HNg	Approved <i>HW</i>	Origin date 2003-09-17	Issue date 2003-11-05	Issue B	Page 2 (2)	Document <b>WS 8186H/70</b>
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**RF DATA****Waveguide**

Frequency range	7.05 – 10.0 GHz
VSWR	1.1
Insertion loss	0.1 dB
Isolation	75 dB
Peak power	350 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/53D-004 Modified with 10 – 32 UNC-2B, thread depth min 8

**Coax**

Frequency range	7.05 – 10.0 GHz
VSWR	1.3
Insertion loss	0.5 dB
Isolation	60 dB
Peak power	5 kW
Average power	15 W max
Coax connector	SMA-female

Isolation, waveguide-coax	120 dB
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**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	250 ms
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

**MECHANICAL DATA**

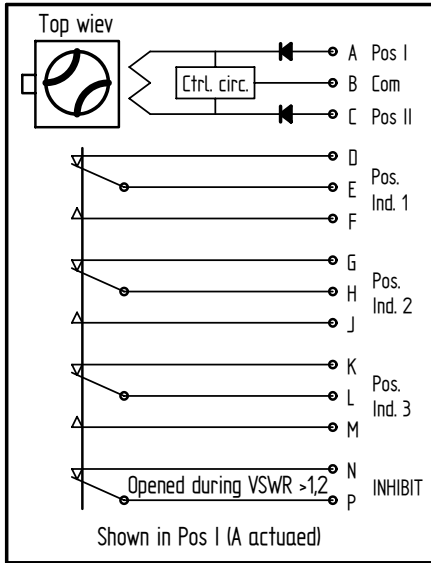
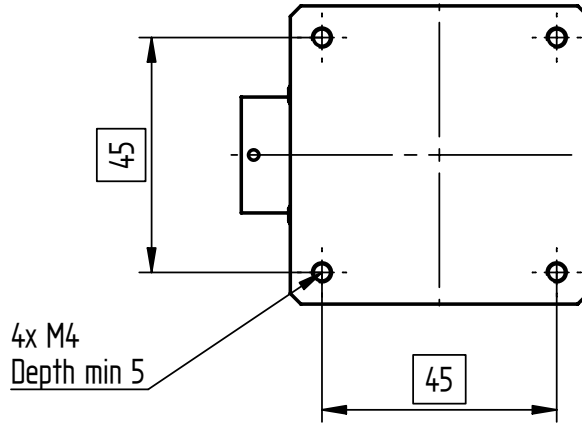
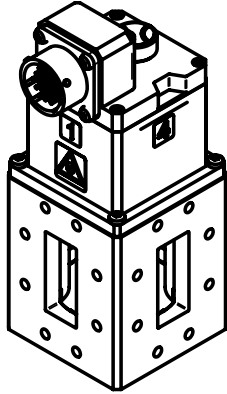
Material	Aluminium alloy; Cu-free
Finishing	Chromate per MIL-C-5541
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.7 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

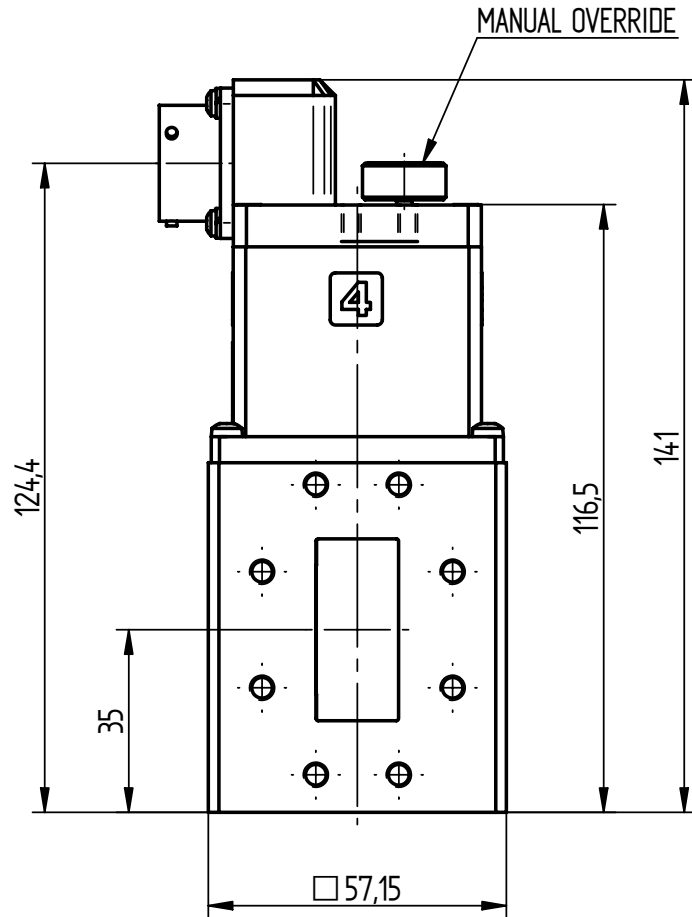
Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

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Issue	Modification	Date	Sign.	Chkd.
C	Tapped holes changed to 10-32 UNF-2B, Isolation 75dB was 50dB.	010301	CEL	HW
D	ECO	2003-1016	HNg	HW



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c -  Europ. proj.	Ref.	001012	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.	001018	Sign.	AK
Dimensions in mm			Appvd.	001018	Sign.	HW
<b>SIVERS</b>	Title	WAVEGUIDE SWITCH WR137/R70/WG14 Latching	Designed		Sheet	1 (2)
			Scale	1:1,5	Issue	D
			Doc. no.	WS8186J/00		

Reference HNg	Approved HW	Origin date 2000-01-12	Issue date 2003-11-05	Issue D	Page 2 (2)	Document <b>WS 8186J/00</b>
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**RF DATA**

Frequency range	5.85 – 8.2 GHz
VSWR	1.1
Insertion loss	0.1 dB
Isolation	75 dB
Peak power	350 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/52C-040 Modified with 10-32 UNF, thread depth min 8

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	250 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

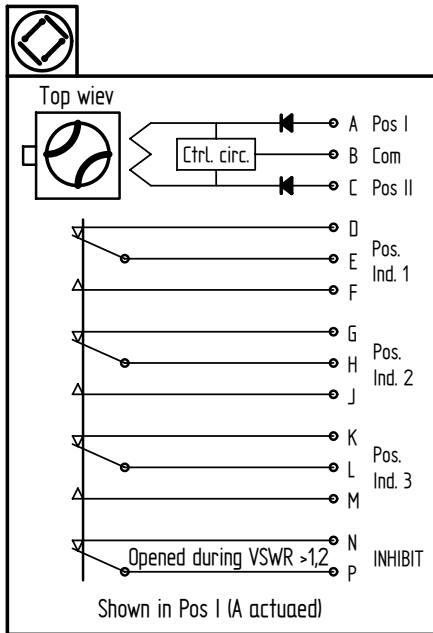
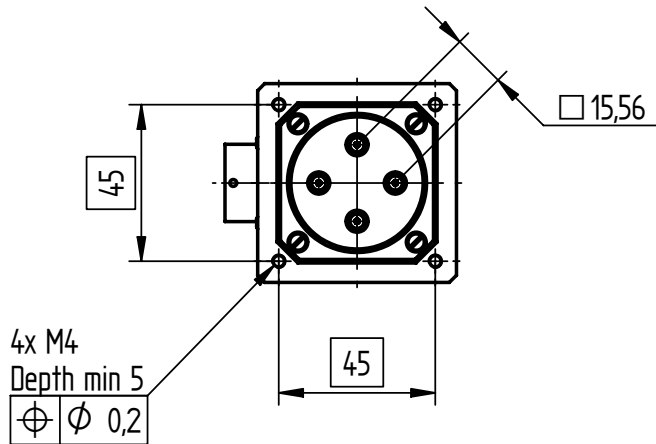
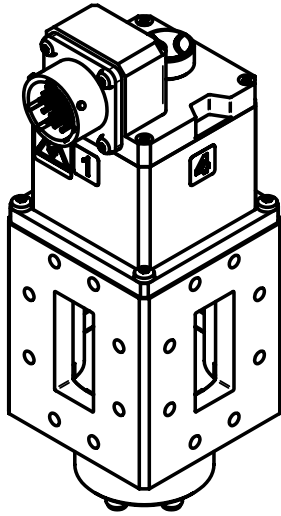
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.7 kg Max
Life	250 000 actuations

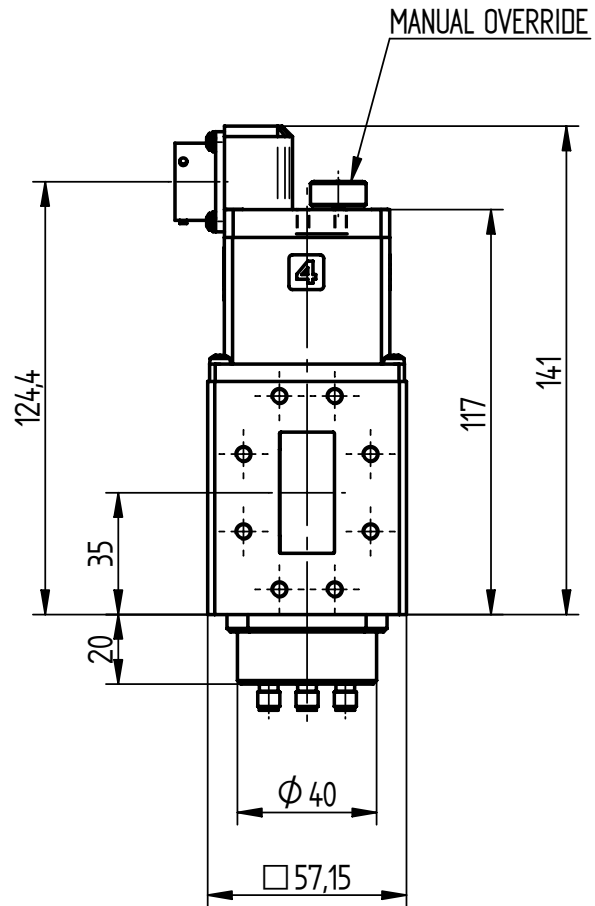
**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
C	Flange for attaching coax twisted 45°	030710	MTR	HW
D	ECO	2003-1016	HNg	HW



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\nabla$ $\phi$ Europ. proj.	Ref.	021114	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title		Designed	Sheet 1 (2)		
	WAVEGUIDE SWITCH WR137/R70/WG14 Latching with COAX DPDT		Scale	1:1,5	Issue	D
			Doc. no.	WS8186J/70		

Reference HNg	Approved <i>HW</i>	Origin date 2002-11-14	Issue date 2003-11-05	Issue D	Page 2 (2)	Document <b>WS 8186J/70</b>
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**RF DATA****Waveguide**

Frequency range	5.85 – 8.2 GHz
VSWR	1.1
Insertion loss	0.1 dB
Isolation	75 dB
Peak power	350 kW at 0.1 MPa abs., +25°C
Average power	4 kW
Flange interface	MIL-DTL-3922/52C-040 Modified with 10 – 32 UNF-2B, thread depth min 8

**Coax**

Frequency range	5.85 – 8.2 GHz
VSWR	1.3
Insertion loss	0.5 dB
Isolation	60 dB
Peak power	5 kW
Average power	15 W max
Coax connector	SMA-female

Isolation, waveguide-coax	120 dB
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**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	250 ms
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

**MECHANICAL DATA**

Material	Aluminium alloy; Cu-free
Finishing	Chromate per MIL-C-5541
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.7 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

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Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2002-08-06	2003-11-03	B	2 (2)	<b>WS 8086X/00</b>

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**RF DATA**

Frequency range	8.2 – 12.4 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	90 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	3 kW
Flange interface	MIL-DTL-3922/53D-016 modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A
Switching time	300 ms, Self cut off
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0,1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference HNg	Approved <i>HW</i>	Origin date 2002-08-06	Issue date 2003-11-03	Issue B	Page 2 (2)	Document <b>WS 8087X/00</b>
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**RF DATA**

Frequency range	8.2 – 12.4 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	90 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	3 kW
Flange interface	MIL-DTL-3922/53D-016 Modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Auto switch on to holding current after 200 ms
Holding current	300 mA
Switching time	300 ms, Self cut off
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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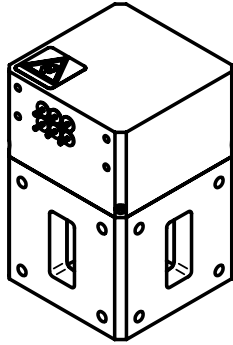
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

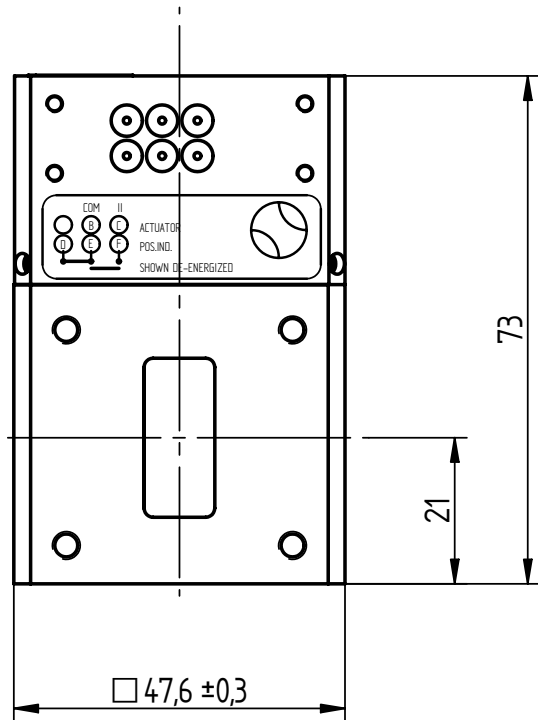
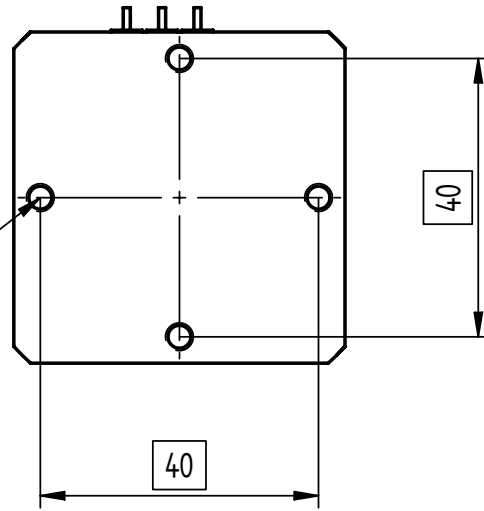
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

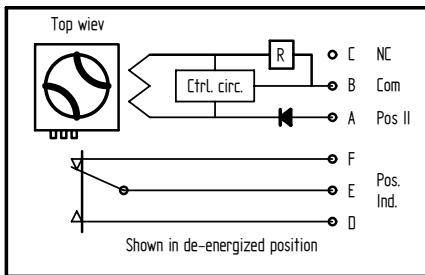
Issue	Modification	Date	Sign.	Chkd.
B	ECO	2004-04-26	HNg	HW



4x M4  
Depth min 5  
 $\begin{matrix} \oplus & \ominus \\ \oplus & \ominus \end{matrix} \quad \phi \quad 0,2$



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\begin{matrix} \triangleleft & \oplus \\ \triangleleft & \oplus \end{matrix}$ Europ. proj.	Ref. 03-11-19	Sign. HNg
Tolerancing principle	ISO 8015		Chkd.	Sign.
Dimensions in mm			Appvd.	Sign.
	Title <b>WAVEGUIDE SWITCH</b> WR90/R100/WG16 Fail-safe	Designed	Sheet 1(2)	F Issue C Doc. no. WS8088X/00
		Scale 1:1	Issue	
		Doc. no. WS8088X/00		

Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	1997-09-12	2004-04-26	C	2 (2)	<b>WS 8088X/00</b>

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**RF DATA**

Frequency range	8.2 – 12.4 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	3 kW
Flange interface	MIL-DTL-3922/53D-016 Modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Holding current	0.3 A
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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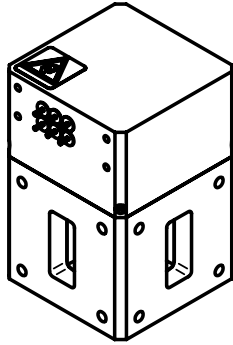
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.35 kg Max
Life	250 000 actuations

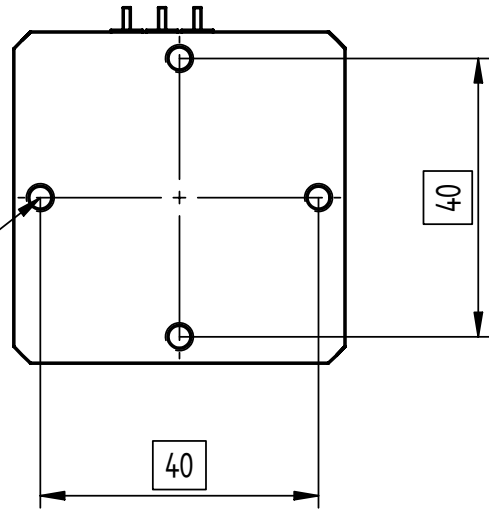
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
D	ECO	2004-0426	HNg	HW

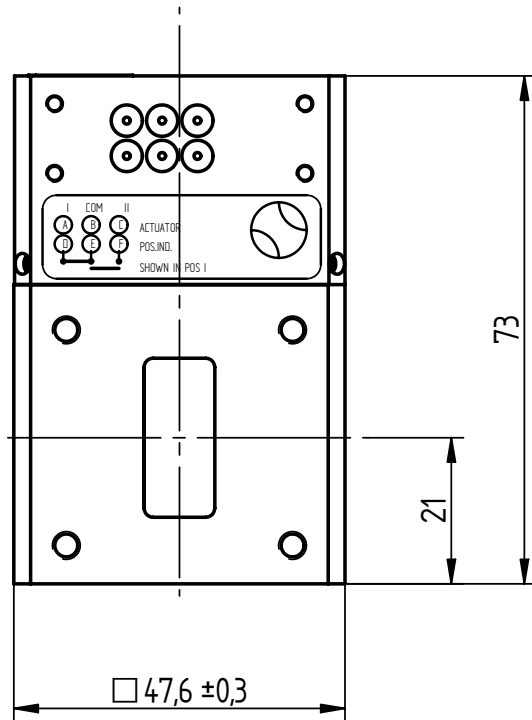
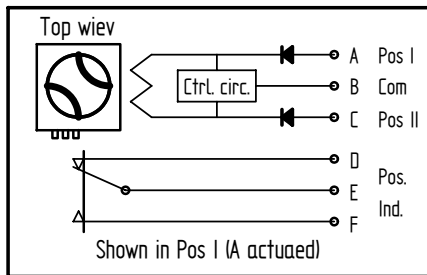


4x M4  
Depth min 5  
 $\begin{matrix} \oplus & \ominus \\ \oplus & \ominus \end{matrix} \quad \phi \quad 0,2$



**CAUTION!**  
Never connect supply voltages to pins A and C simultaneously. Severe damage will result.

**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\begin{matrix} \triangleleft & \oplus \\ \triangleleft & \oplus \end{matrix}$ Europ. proj.	Ref. 03-11-19	Sign. HNg
Tolerancing principle	ISO 8015		Chkd.	Sign.
Dimensions in mm			Appvd.	Sign.
	Title <b>WAVEGUIDE SWITCH</b> WR90/R100/WG16 Latching	Designed	Sheet 1(2)	
		Scale 1:1	Issue D	
		Doc. no. WS8089X/00		

Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	1997-09-12	2004-04-26	D	2 (2)	<b>WS 8089X/00</b>

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**RF DATA**

Frequency range	8.2 – 12.4 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	3 kW
Flange interface	MIL-DTL-3922/53D-016 Modified with M4, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure Max
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.35 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2002-11-19	2003-11-05	B	2 (2)	<b>WS 8189X/00</b>

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### RF DATA

Frequency range	8.2 – 12.4 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	3 kW
Flange interface	MIL-DTL-3922/53D-016 Modified with M4, thread depth min 5

### ACTUATOR DATA

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	100 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

### POSITION INDICATOR

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

### MECHANICAL DATA

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.45 kg Max
Life	250 000 actuations

### ENVIRONMENTAL DATA

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference HNg	Approved <i>HW</i>	Origin date 2002-08-28	Issue date 2003-11-04	Issue B	Page 2 (2)	Document <b>WS 8086M/00</b>
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**RF DATA**

Frequency range	10 - 15 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	90 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/70B-005 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	300 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 1 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2003-11-12	2003-11-12	B	2 (2)	<b>WS 8087M/00</b>

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**RF DATA**

Frequency range	10 - 15 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	90 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/70B-005 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Auto switch on to holding current after 200 ms
Holding current	300 mA
Switching time	300 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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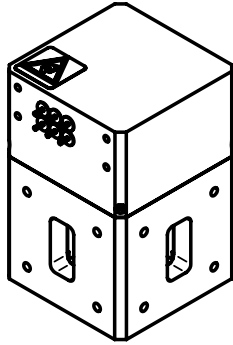
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

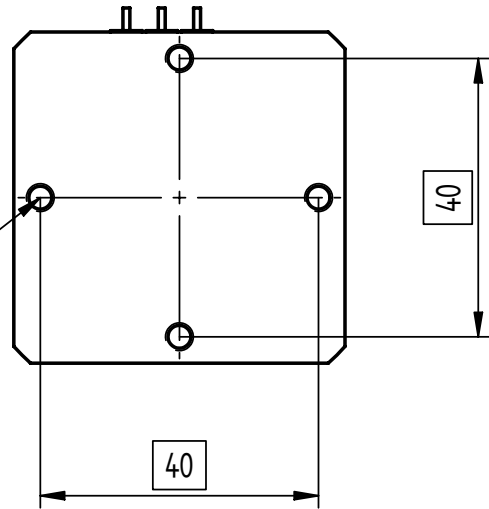
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
C	ECO	2004-0426	HNg	HW

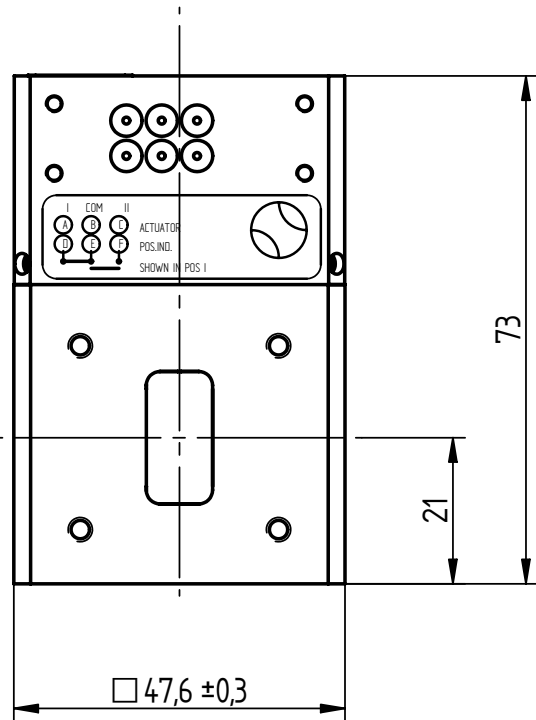
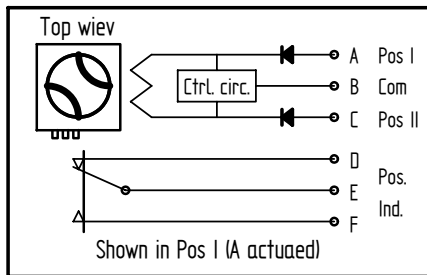


4x M4  
Depth min 5  
 $\begin{matrix} \oplus & \ominus \\ \oplus & \ominus \end{matrix} \quad \phi \quad 0,2$



**CAUTION!**  
Never connect supply voltages to pins A and C simultaneously. Severe damage will result.

**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\begin{matrix} \triangleleft & \oplus \\ \triangleleft & \oplus \end{matrix}$ Europ. proj.	Ref. 03-11-19	Sign. HNg
Tolerancing principle	ISO 8015		Chkd.	Sign.
Dimensions in mm			Appvd.	Sign.
	Title <b>WAVEGUIDE SWITCH</b> WR75/R120/WG17 Latching	Designed	Sheet 1(2)	
		Scale 1:1	Issue C	
		Doc. no. WS8089M/00		

Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	1996-02-12	2004-04-26	C	2 (2)	<b>WS 8089M/00</b>

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**RF DATA**

Frequency range	10 – 15 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	200 kW at 0.1 MPa abs., +25°C
Average power	3 kW
Flange interface	MIL-DTL-3922/70B-005 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.35 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference HNg	Approved <i>HW</i>	Origin date 1999-06-17	Issue date 2003-11-17	Issue F	Page 2 (2)	Document <b>WS 8189M/00</b>
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**RF DATA**

Frequency range	10 – 15 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	70 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/70B-005 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	100 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

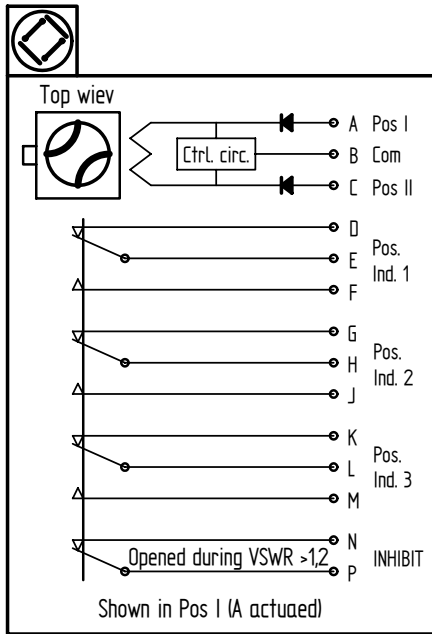
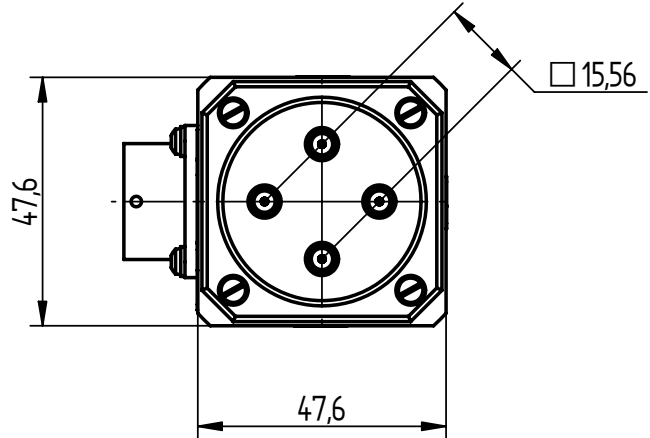
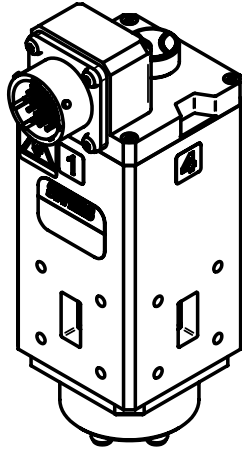
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.45 kg Max
Life	250 000 actuations

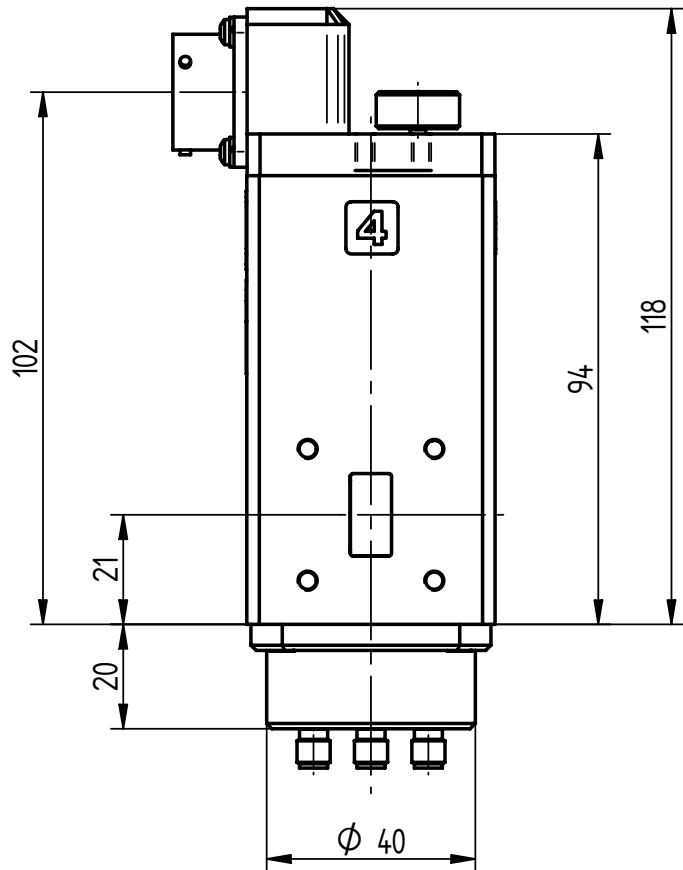
**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
B	Coax connectors twisted 45°	030710	MTR	HW
C	ECO	2003-1015	HNg	HW



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c -  Europ. proj.	Ref.	030317	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title		Designed	Sheet 1 (2)		
	WAVEGUIDE SWITCH WR75/R120/WG17 Latching with COAX DPDT		Scale	1:1,5	Issue	C
			Doc. no.	WS8189M/70		

Reference HNg	Approved <i>HW</i>	Origin date 2003-03-17	Issue date 2003-11-05	Issue C	Page 2 (2)	Document <b>WS 8189M/70</b>
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**RF DATA****Waveguide**

Frequency range	10 – 15 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	70 dB
Peak power	250 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/70B-005 Modified with 6 – 32 UNC-2B, thread depth min 6

**Coax**

Frequency range	10 – 15 GHz
VSWR	1.5
Insertion loss	0.5 dB
Isolation	50 dB
Peak power	5 kW
Average power	15 W max
Coax connector	SMA-female

Isolation, waveguide-coax	120 dB
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**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	100 ms
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Tree sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

**MECHANICAL DATA**

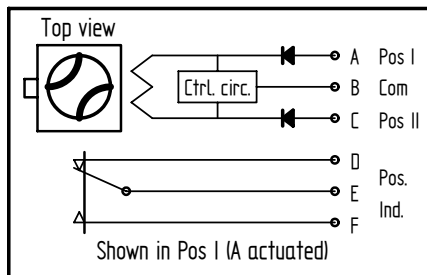
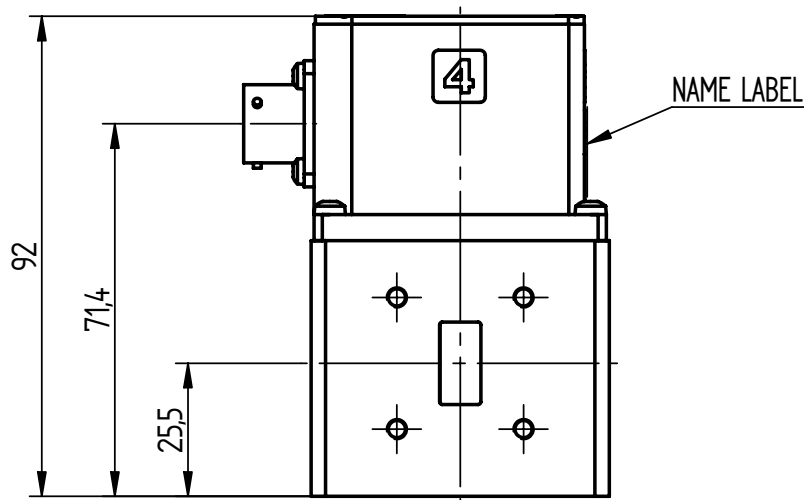
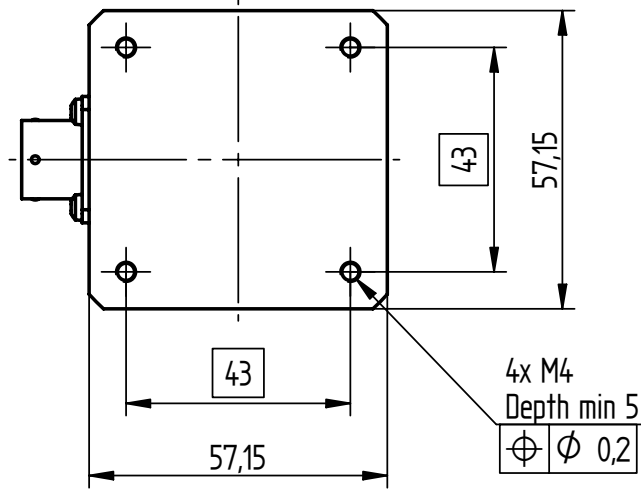
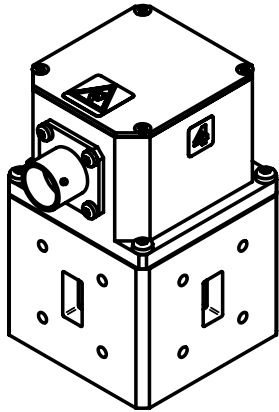
Material	Aluminium alloy; Cu-free
Finishing	Chromate per MIL-C-5541
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.6 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

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Issue	Modification	Date	Sign.	Chkd.
B	ECO	2003-1016	HNg	HW
C	ECO	2004-0205	HNg	HW



**CAUTION!**  
ESD SENSITIVE

Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c -  - Europ. proj.	Ref.	020107	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	
Dimensions in mm			Appvd.	5/2-04	Sign.	HW
<b>SIVERS</b>	Title	WAVEGUIDE SWITCH WR62/R140/WG18 Latching	Designed		Sheet	1 (2)
			Scale	1:1,5	Issue	C
			Doc. no.	WS8086P/00		

Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2002-01-07	2004-02-05	C	2 (2)	WS 8086P/00

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**RF DATA**

Frequency range	12.4 – 18.0 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	90 dB
Peak power	125 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Waveguide size	WR62 / R140 / WG18
Hole dimensions according to	MIL-DTL-3922/53D-018 (6-32 UNC-2B) thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	300 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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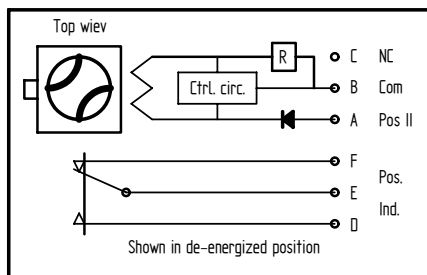
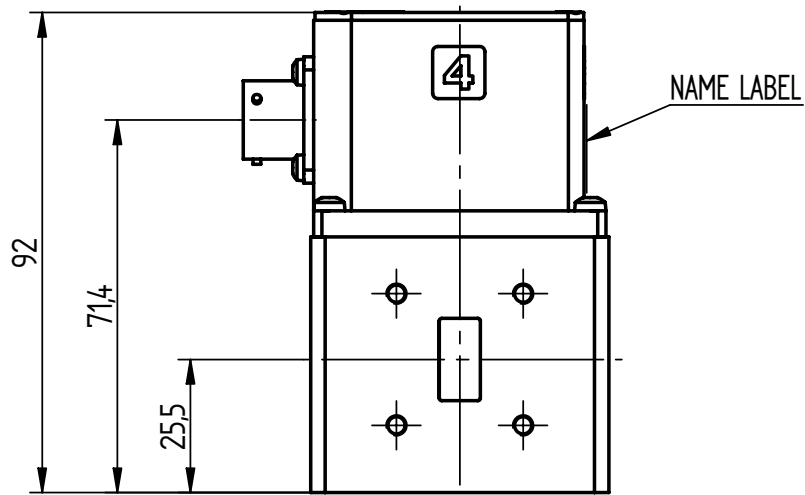
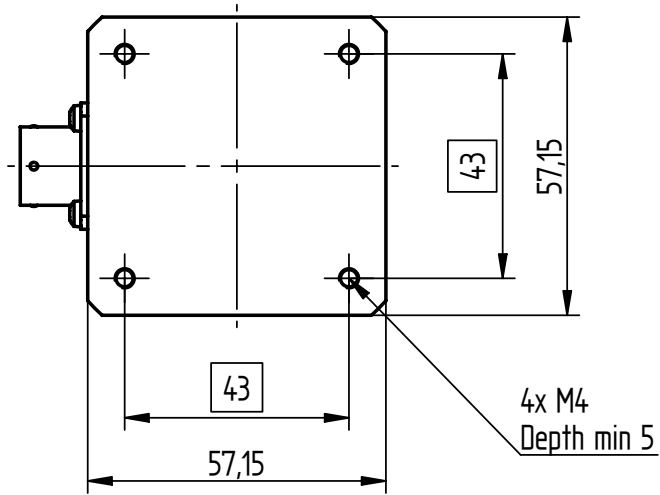
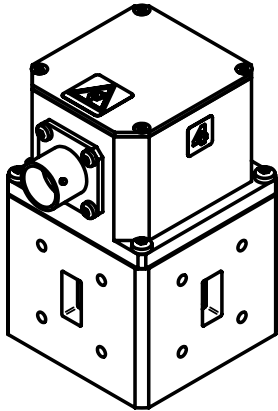
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0,5 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

1	2	3	4	5		
Issue	Modification			Date	Sign.	Chkd.
B	ECO			2003-1016	HNg	HW



**CAUTION!**  
ESD SENSITIVE

Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c • ◯ ◯ Europ. proj.	Ref.	030214	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title	WAVEGUIDE SWITCH WR62/R140/WG18 Fail-safe	Designed		Sheet	1 (2)
			Scale	1:1,5	Issue	B
			Doc. no.	WS8087P/00		

A

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D

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F

Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	2003-02-14	2003-11-04	B	2 (2)	<b>WS 8087P/00</b>

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**RF DATA**

Frequency range	12.4 – 18.0 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	90 dB
Peak power	125 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/53D-005 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Auto switch on to holding current after 200 ms
Holding current	300 mA
Switching time	300 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	MS 3112E 10-6P
Mating connector	MS 3116F 10-6S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
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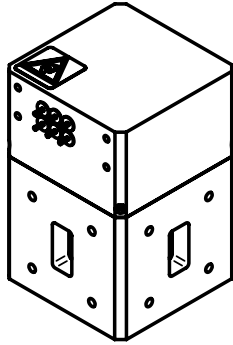
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

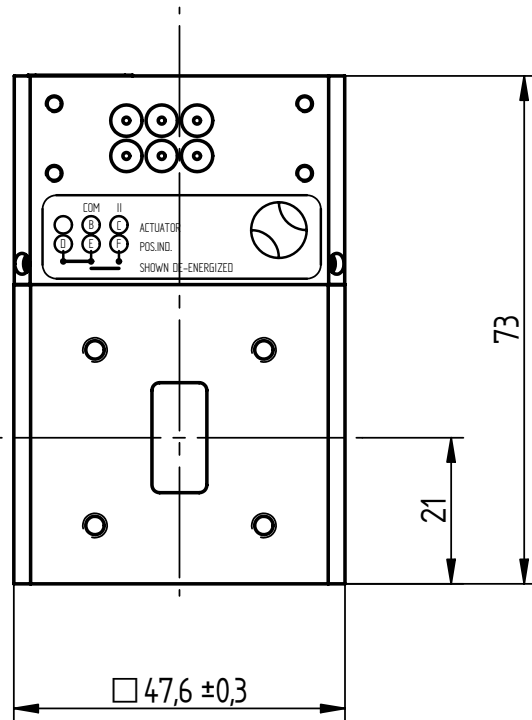
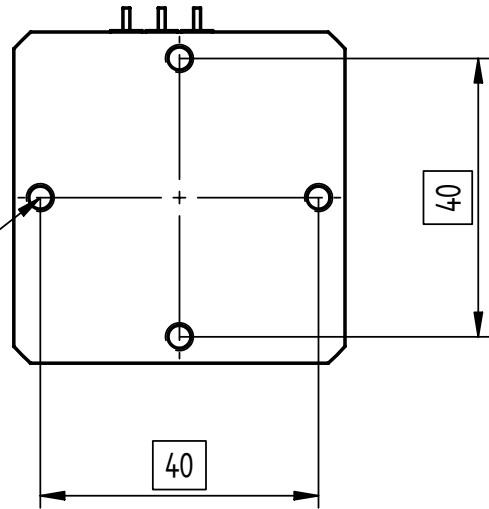
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

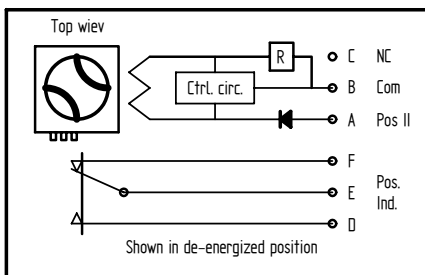
1	2	3	4	5		
Issue	Modification			Date	Sign.	Chkd.
C	ECO			2004-04-26	HNq	HW



4x M4  
Depth min 5  
 $\begin{matrix} \oplus & \oplus \\ \phi & \phi \end{matrix} 0,2$



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\begin{matrix} \triangle & \oplus \\ \cdot & \oplus \end{matrix}$ Europ. proj.	Ref. 03-11-19	Sign. HNq
Tolerancing principle	ISO 8015		Chkd.	Sign.
Dimensions in mm			Appvd.	Sign.
	Title <b>WAVEGUIDE SWITCH</b> WR62/R140/WG18 Fail-safe		Designed	Sheet 1(2)
			Scale 1:1	Issue C
			Doc. no. WS8088P/00	

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Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	<i>HW</i>	1997-12-17	2004-04-26	C	2 (2)	<b>WS 8088P/00</b>

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**RF DATA**

Frequency range	12.4 – 18.0 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	125 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/53D-018 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1A, Self cut off
Holding current	0.3 A
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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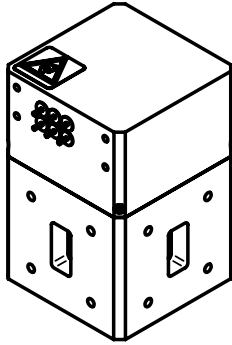
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure Max
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.35 kg Max
Life	250 000 actuations

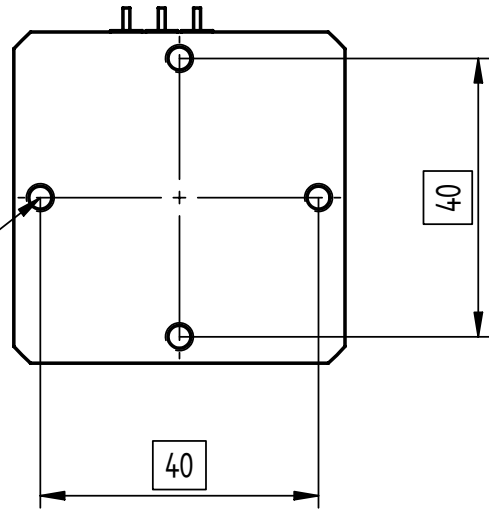
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
C	ECO	2004-0426	HNg	HW

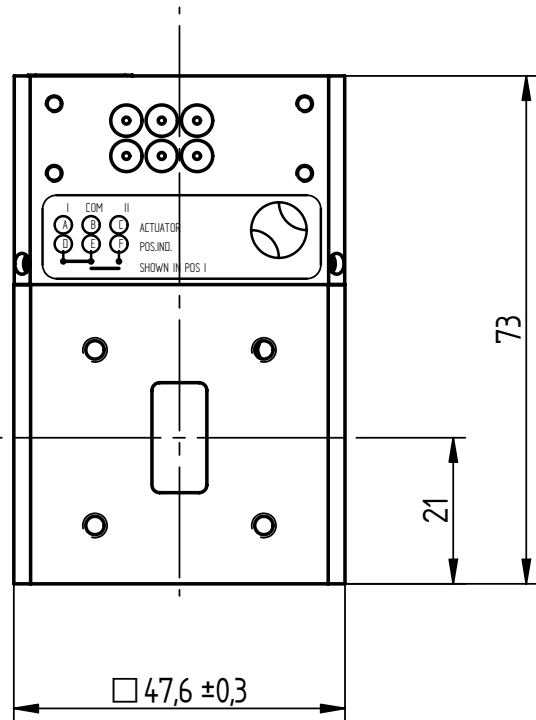
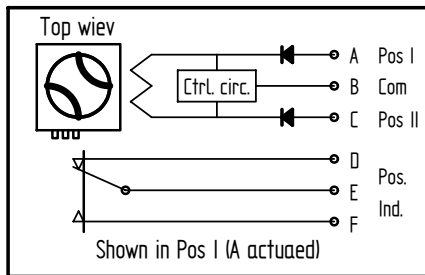


4x M4  
Depth min 5  
 $\begin{matrix} \oplus & \oplus \\ \phi & \phi \end{matrix} 0,2$



**CAUTION!**  
Never connect supply voltages to pins A and C simultaneously. Severe damage will result.

**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\begin{matrix} \triangleleft & \oplus \\ \phi & \phi \end{matrix}$ Europ. proj.	Ref. 03-11-19	Sign. HNg
Tolerancing principle	ISO 8015		Chkd.	Sign.
Dimensions in mm			Appvd.	Sign.
	Title <b>WAVEGUIDE SWITCH</b> WR62/R140/WG18 Latching	Designed	Sheet 1(2)	
		Scale 1:1	Issue C	
		Doc. no. WS8089P/00		

Reference HNg	Approved <i>HW</i>	Origin date 1997-12-16	Issue date 2004-04-26	Issue C	Page 2 (2)	Document <b>WS 8089P/00</b>
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**RF DATA**

Frequency range	12.4 – 18.0 GHz
VSWR	1.08
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	125 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/53D-018 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure Max
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.35 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide



Reference HNg	Approved <i>HW</i>	Origin date 1997-10-16	Issue date 2004-04-26	Issue F	Page 2 (2)	Document <b>WS 8189P/00</b>
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**RF DATA**

Frequency range	12.4 – 18.0 GHz
VSWR	1.05
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	125 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/53D-018 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	100 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

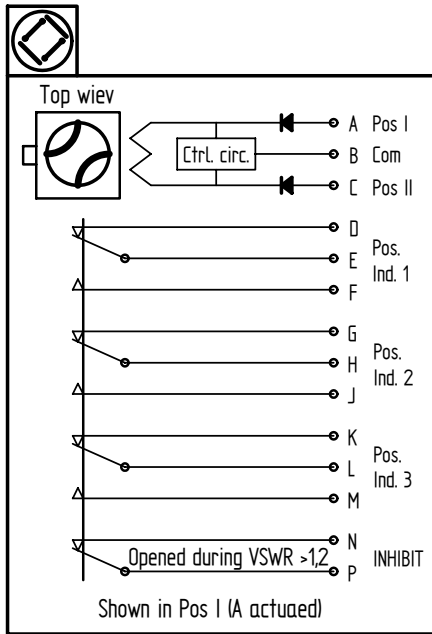
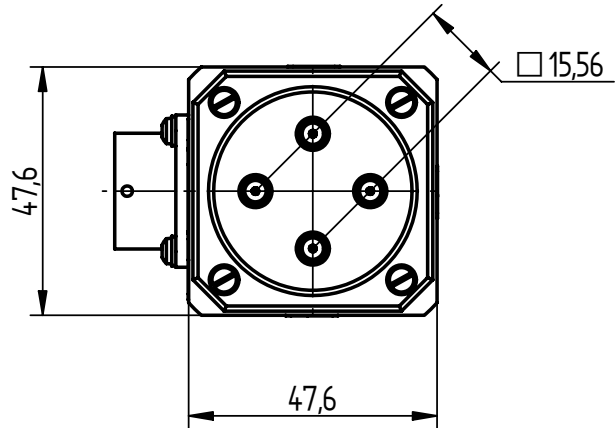
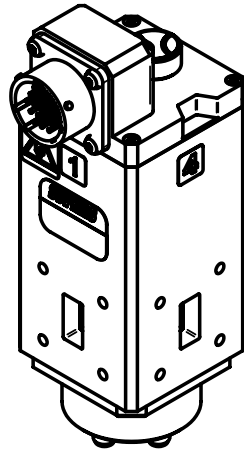
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.45 kg Max
Life	250 000 actuations

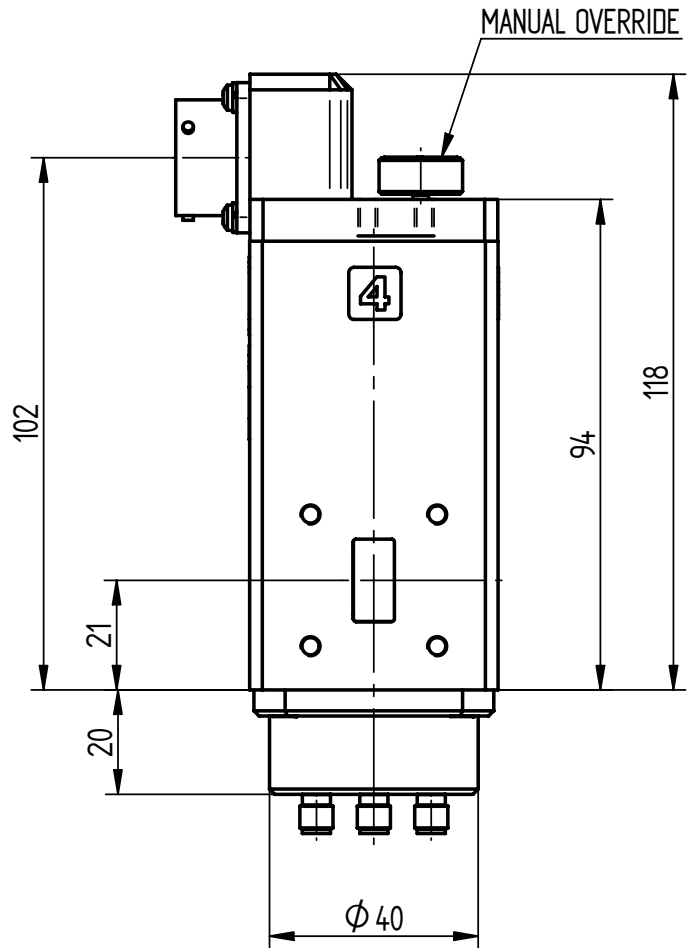
**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
C	Coax connectors twisted 45°	030710	MTr	HW
D	Paragraphs added	2003-1015	HNg	HW



**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c -  Europ. proj.	Ref.	021129	Sign.	CEL
Tolerancing principle	ISO 8015		Chkd.		Sign.	HW
Dimensions in mm			Appvd.		Sign.	HW
<b>SIVERS</b>	Title		Designed	Sheet 1 (2)		
	WAVEGUIDE SWITCH WR62/R140/WG18 Latching with COAX DPDT		Scale	1:2	Issue	D
			Doc. no.	WS8189P/70		

Reference HNg	Approved <i>HW</i>	Origin date 2002-11-29	Issue date 2003-11-05	Issue D	Page 2 (2)	Document <b>WS 8189P/70</b>
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**RF DATA****Waveguide**

Frequency range	12.4 – 18.0 GHz
VSWR	1.05
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	125 kW at 0.1 MPa abs., +25°C
Average power	2 kW
Flange interface	MIL-DTL-3922/53D-018 Modified with 6 – 32 UNF-2B, thread depth min 6

**Coax**

Frequency range	12.4 – 18.0 GHz
VSWR	1.5
Insertion loss	0.5 dB
Isolation	40 dB
Peak power	5 kW
Average power	15 W max
Coax connector	SMA-female

Isolation, waveguide-coax	120 dB
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**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	100 ms
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

**MECHANICAL DATA**

Material	Aluminium alloy; Cu-free
Finishing	Chromate per MIL-C-5541
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.6 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

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Reference HNg	Approved <i>HW</i>	Origin date 2002-03-05	Issue date 2003-11-05	Issue C	Page 2 (2)	Document <b>WS 8189K/00</b>
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**RF DATA**

Frequency range	18.0 – 26.5 GHz
VSWR	1.10
Insertion loss	0.1 dB
Isolation	70 dB
Peak power	30 kW at 0.1 MPa abs., +25°C
Average power	500 W
Flange interface	MIL-F-3922/70B-028 Modified with 4-40 UNC-2B, thread depth min 7.5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	100 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112E 14-19P
Mating connector	MS 3116F 14-19S or eq.

**POSITION INDICATOR**

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

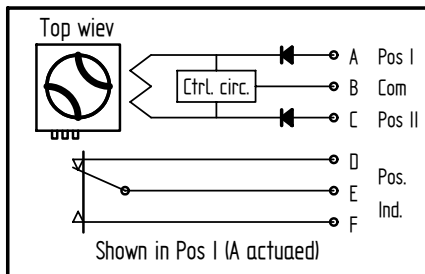
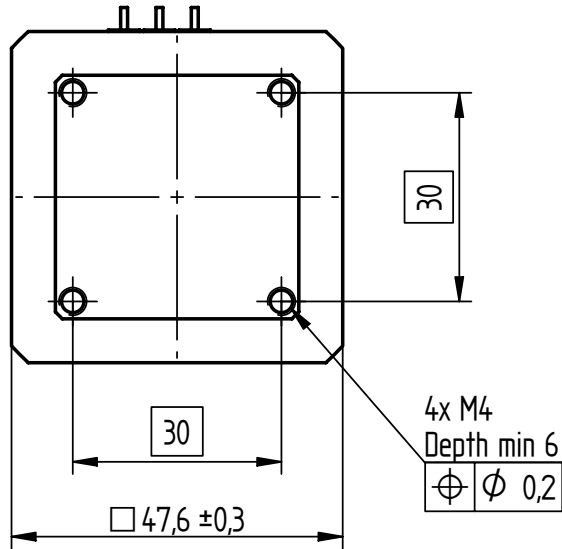
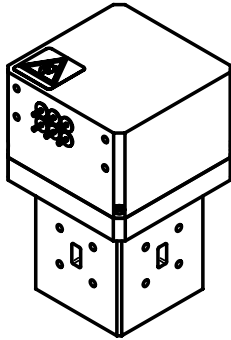
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpr. Max
Air leakage	10 cm <sup>3</sup> /min (0.1 MPa overpr.) Max
Weight	0.5 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

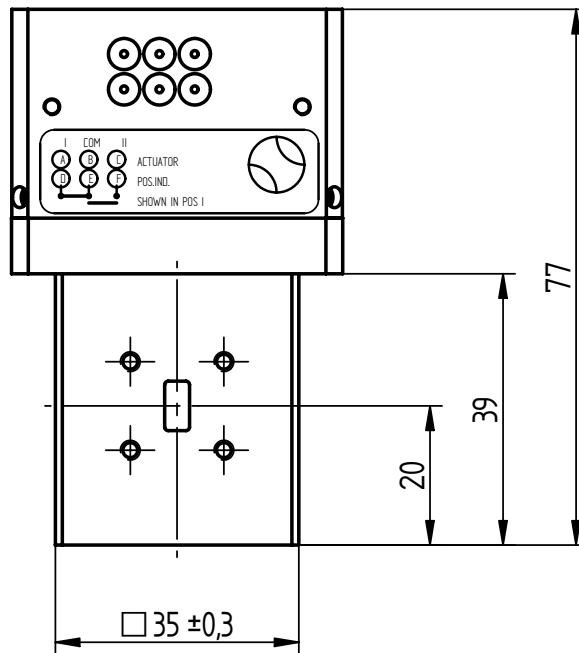
Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
B	ECO	2003-1016	HNg	HW



**CAUTION!**  
Never connect supply voltages to pins A and C simultaneously. Severe damage will result.

**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c Europ. proj.	Ref. 02-11-28	Sign. CEL
Tolerancing principle	ISO 8015		Chkd.	Sign. HW
Dimensions in mm			Appvd.	Sign. HW
<b>SIVERS</b>	Title		Designed	Sheet 1(2)
	WAVEGUIDE SWITCH WR28/R320/WG22 Latching		Scale 1:1	Issue B
			Doc. no. WS8089Q/00	

Reference HNg	Approved <i>HW</i>	Origin date 2002-11-28	Issue date 2003-11-04	Issue B	Page 2 (2)	Document <b>WS 8089Q/00</b>
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**RF DATA**

Frequency range	26.5 – 40.0 GHz
VSWR	1.1
Insertion loss	0.1 dB
Isolation	60 dB
Peak power	20 kW at 0.1 MPa abs., +25°C
Average power	0.5 kW
Flange interface	MIL-F-3922/54C-003 Modified with 4-40 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 V DC
Operating current	1 A, Self cut off
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Voltage / Current	60 V Max, 50 mA Max Resistive load
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**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finish	Chromate per MIL-C-5541 and black painted
Air pressure	N/A
Air leakage	N/A
Weight	0.35 kg Max
Life	250 000 actuations

**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100% RH if dry air in waveguide



Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	<i>HW</i>	1996-02-12	2004-04-26	B	2 (2)	<b>WS 8189D58/00</b>

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### RF DATA

Frequency range	5.8 – 16.0 GHz
VSWR	1.2
Insertion loss	0.4 dB
Isolation	50 dB
Peak power	30 kW at 0.1 MPa abs., +25°C
Average power	750 W
Flange interface	WRD 580 Modified with 6-32 UNC-2B, thread depth min 5

### ACTUATOR DATA

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	100 ms
Duty (min time between successive operations)	500 ms -20°C to +40°C linearly increasing to 2 s at +70°C
Connector	MS 3112 E14-19P
Mating connector	MS 3116F 14-19S or eq.

### POSITION INDICATOR

Voltage / Current	30 V Max, 100 mA Max Resistive load
Position indicator	Three sets of C-form contacts and one set of inhibit contact, opened during VSWR >1.2

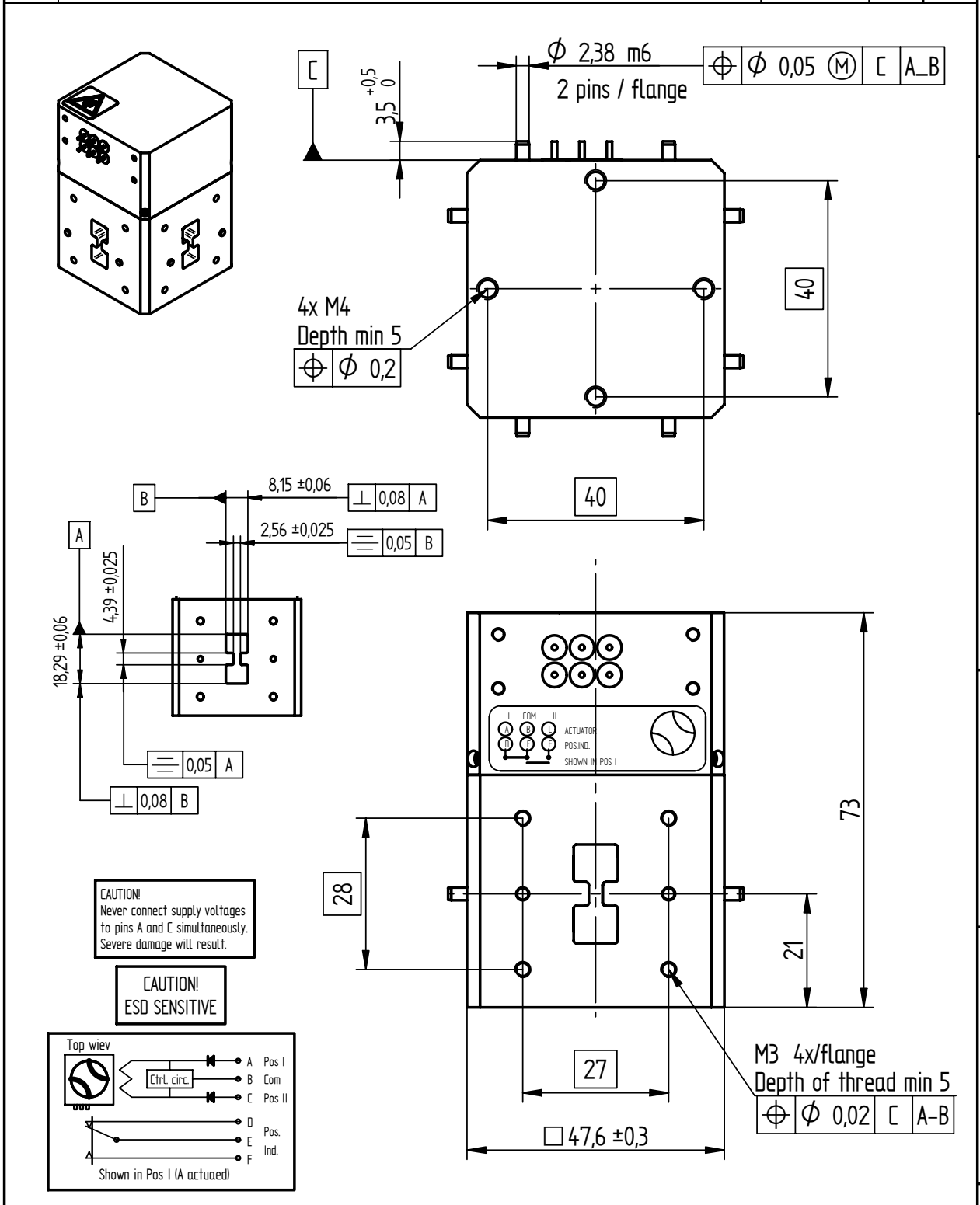
### MECHANICAL DATA

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.45 kg Max
Life	250 000 actuations

### ENVIRONMENTAL DATA

Ambient temperature	-20°C to +70°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
D	ECO	2004-04-26	HNg	HW



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c -  Europ. proj.	Ref.	04-04-23	Sign.	HNg
Tolerancing principle	ISO 8015		Chkd.		Sign.	
Dimensions in mm			Appvd.		Sign.	HW
	Title	WAVEGUIDE SWITCH WRD 650 D28 Latching	Designed		Sheet	1 (2)
			Scale	1:1	Issue	D
			Doc. no.	WS8089D6/00		

Reference HNg	Approved <i>HW</i>	Origin date 1995-02-03	Issue date 2004-04-22	Issue D	Page 2 (2)	Document <b>WS 8089D6/00</b>
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**RF DATA**

Frequency range	6.5 – 18.0 GHz
VSWR	1.2
Insertion loss	0.4 dB
Isolation	50 dB
Peak power	20 kW at 0.1 MPa abs., +25°C
Average power	500 W
Flange interface	See page 2

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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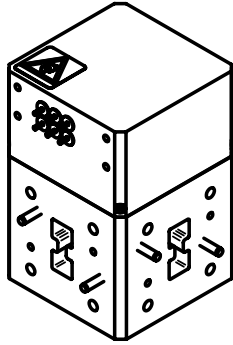
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure Max
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.) Max
Weight	0.35 kg Max
Life	250 000 actuations

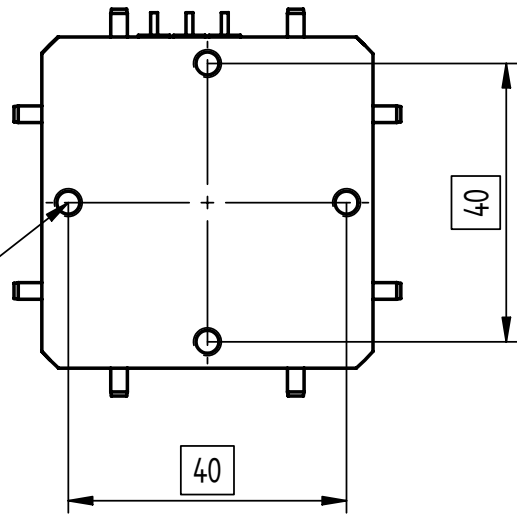
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

Issue	Modification	Date	Sign.	Chkd.
C	ECO	2004-04-26	HNg	HW

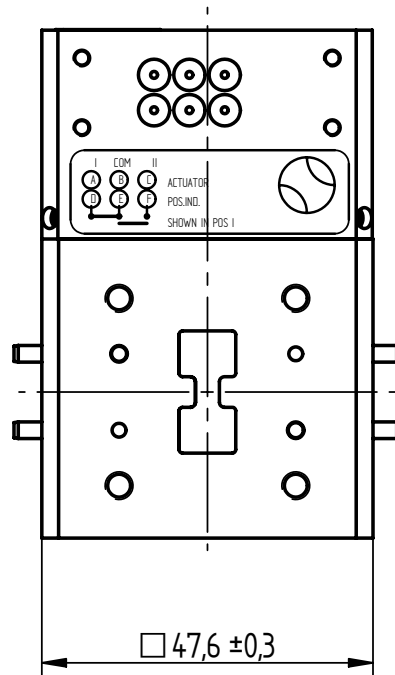
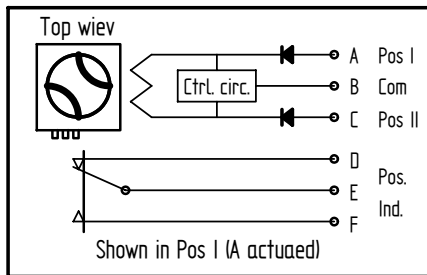


4x M4  
Depth min 5  
 $\begin{matrix} \oplus \\ \oplus \end{matrix} \quad \begin{matrix} \oplus \\ \oplus \end{matrix} \quad \begin{matrix} \oplus \\ \oplus \end{matrix} \quad \begin{matrix} \oplus \\ \oplus \end{matrix} \quad 0,2$



**CAUTION!**  
Never connect supply voltages to pins A and C simultaneously. Severe damage will result.

**CAUTION!**  
ESD SENSITIVE



Drawing principle	SS 1902	UNLESS OTHERWISE STATED THE FOLLOWING APPLIES: General tolerances, linear and angular dimensions: ISO 2768-c $\begin{matrix} \triangleleft \\ \oplus \end{matrix}$ Europ. proj.	Ref. 03-11-19	Sign. HNg
Tolerancing principle	ISO 8015		Chkd.	Sign.
Dimensions in mm			Appvd.	Sign.
	Title <b>WAVEGUIDE SWITCH</b> <b>WRD 750 D24 Latching</b>	Designed	Sheet 1(2)	F Issue C Doc. no. WS8089D7/00
		Scale 1:1	Issue	
		Designed Scale 1:1 Issue C Doc. no. WS8089D7/00		

Reference	Approved	Origin date	Issue date	Issue	Page	Document
HNg	HW	1998-02-09	2004-04-26	C	2 (2)	<b>WS 8089D7/00</b>

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**RF DATA**

Frequency range	7.5 – 18.0 GHz
VSWR	1.2
Insertion loss	0.4 dB
Isolation	40 dB
Peak power	30 kW at 0.1 MPa abs., +25°C
Average power	750 W
Flange interface	MIL-F-39000/3-074 Modified with 6-32 UNC-2B, thread depth min 5

**ACTUATOR DATA**

Operating voltage	28±3 VDC
Operating current	1 A, Self cut off
Switching time	150 ms
Duty (min time between successive operations)	500 ms -40°C to +40°C linearly increasing to 2 s at +85°C
Connector	Soldering pins

**POSITION INDICATOR**

Position indicator current	60 V Max, 50 mA Max Resistive load
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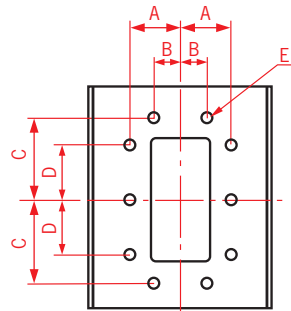
**MECHANICAL DATA**

Material	Aluminium alloy, Cu free
Finishing	Chromate per MIL-C-5541 and black painted
Air pressure	0.1 MPa overpressure Max
Air leakage	10 cm <sup>3</sup> /min. (0.1 MPa overpr.)
Weight	0.35 kg Max
Life	250 000 actuations

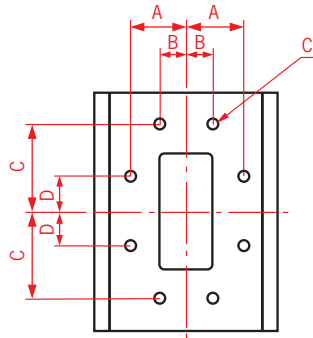
**ENVIRONMENTAL DATA**

Ambient temperature	-40°C to +85°C
Vibration	5 – 18 Hz, 3 mm amplitude 18 – 2000 Hz, 15 g
Humidity	100%RH if dry air in waveguide

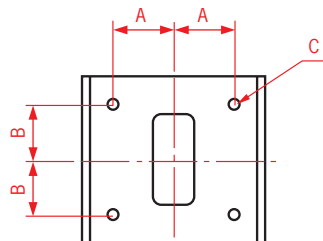
## Sivers Standard Flange Dimensions



W/G Size	A	B	C	D	E (10 x)
WR 284	29,57	14,68	48,62	32,54	M6, Depth min 8
WR 229	26,67	12,7	41,15	27,18	M6, Depth min 8



W/G Size	A	B	C	D	E (8x)
WR 187	22,22	9,52	32,33	12,7	M6, Depth min 8
WR 137	17,26	7,95	27,79	11,12	10-32 UNF-2B, Depth min 8



W/G Size	A	B	C (4x)
WR 112	18,72	17,17	M4, depth min 5 or 10-32 UNC-2B, depth min 8
WR 90	16,26	15,49	M4, depth min 5
WR 75	14,25	13,21	6-32 UNC-2B, depth min 5
WR 62	12,14	12,62	6-32 UNC-2B, depth min 5
WR 42	8,51	8,13	4-40 UNC-2B, depth min 5
WR 28	6,73	6,35	4-40 UNC-2B, depth min 5



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