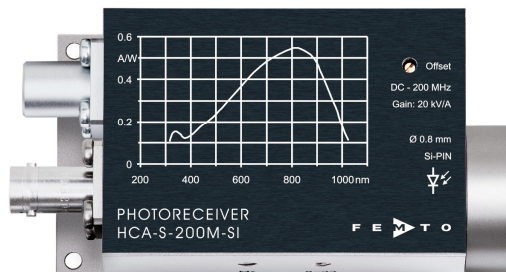


# 200 MHz Photoreceiver with Si-PIN Photodiode



The picture shows model HCA-S-200M-SI-FST

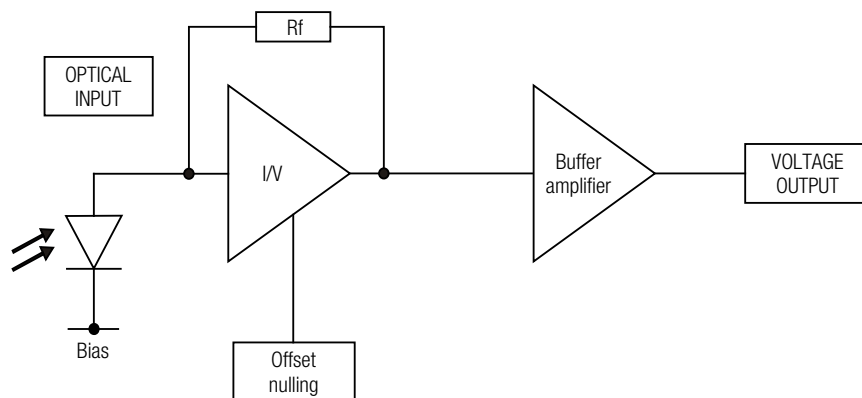
## Features

- **Si-PIN photodiode, 0.8 mm active diameter**
- **Bandwidth DC – 200 MHz**
- **Amplifier transimpedance gain  $2.0 \times 10^4$  V/A**
- **Max. conversion gain  $1.1 \times 10^4$  V/W @ 800 nm**
- **Spectral range 320 – 1000 nm**
- **Free-space input 1.035"-40 threaded, easily convertible to fiber optic input (FC and FSMA) with optionally available screw-on adapters**
- **Fiber optic input also available as permanently mounted FC-input**
- **UNC 8-32 and M4 tapped holes for mounting on standard posts with metric and imperial thread**

## Applications

- **Spectroscopy**
- **Fast pulse and transient measurements**
- **Optical triggering**
- **Optical front-end for oscilloscopes, A/D converters and HF lock-in amplifiers**

## Block Diagram



BS01-HCA-S\_R02

## Intended Use

The HCA-S-200M-SI photoreceiver consists of an Si photodiode and a subsequent low-noise fixed gain transimpedance amplifier. It is designed for fast conversion of small optical signals into equivalent output voltages. Operation is mostly self-explanatory. If in doubt, consult this document or contact [support@femto.de](mailto:support@femto.de).

For safe operation, please refer to the damage thresholds specified in the "Absolute Maximum Ratings", "Temperature Range" and "Power Supply" sections of this document.

The operating environment must be free of smoke, dust, grease, oil, condensing moisture, and other contaminants that could affect the operation or performance.

## 200 MHz Photoreceiver with Si-PIN Photodiode

### Available Versions

#### HCA-S-200M-SI-FST



1.035"-40 threaded flange with internally threaded coupler ring (outer diameter 30 mm) for free space applications. Compatible with many optical standard accessories and for use with various types of fiber connector adapters.

Optionally available:

Fiber adapters PRA-FC, PRA-FCA and PRA-FSMA. With the relative large 0.8 mm dia. photodiode installed in the HCA-S-200M-SI input coupling is not critical. However, standard SM 9/125 fibers (PC or APC) with low numerical aperture (NA) are recommended for ensuring near 100% coupling efficiency.

#### HCA-S-200M-SI-FC



Fix/permanent FC fiber connector for high coupling efficiency and excellent conversion gain accuracy.

### Related Models

#### HCA-S-200M-IN-FST

InGaAs-PIN, Ø 0.3 mm, 900 - 1700 nm  
free space input, 1.035"-40 threaded flange

#### HCA-S-200M-IN-FC

InGaAs-PIN, integrated ball lens, 900 - 1700 nm  
FC fiber connector (fix/permanent)

### Available Accessories

#### PRA-FC PRA-FCA PRA-FSMA



Fiber-adapter with external  
1.035"-40 thread

#### PRA-PAP



Alternative mounting option:  
Post adapter plate, easy to mount  
on FEMTO photoreceiver series OE,  
FWPR, PWPR, HCA-S and LCA-S

#### PS-15-25-L

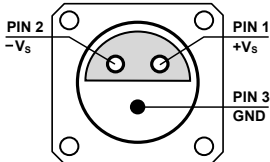
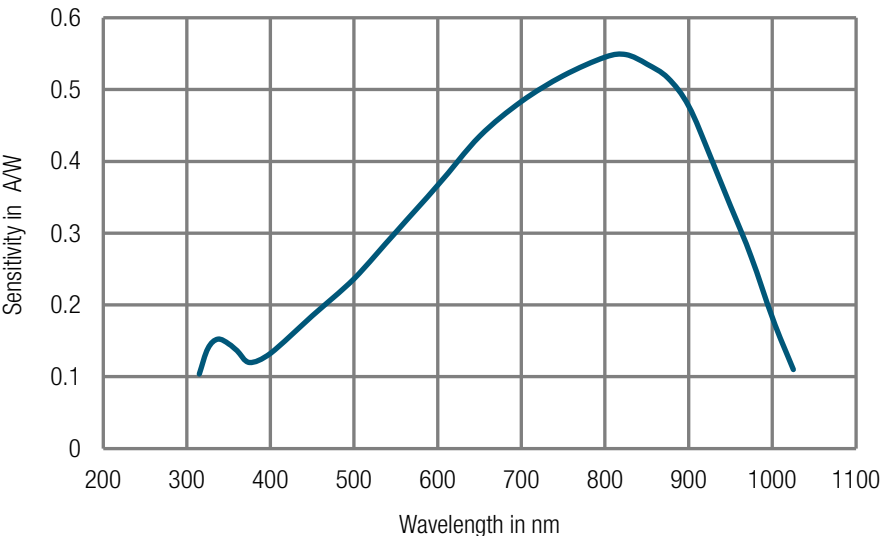


Power Supply  
Input: 100 – 240 VAC  
Output: ±15 VDC

## 200 MHz Photoreceiver with Si-PIN Photodiode

Specifications	Test conditions	$V_S = \pm 15\text{ V}$ , $T_A = 25\text{ }^\circ\text{C}$ , output load impedance $50\text{ }\Omega$ , warm-up 20 minutes (min. 10 minutes recommended)
Gain	Transimpedance gain Gain accuracy Conversion gain	$2.0 \times 10^4\text{ V/A}$ (@ output load $50\text{ }\Omega$ ) $\pm 1\text{ }\%$ (electrical) $1.1 \times 10^4\text{ V/W typ.}$ (@ $800\text{ nm}$ , output load $50\text{ }\Omega$ )
Frequency Response	Lower cut-off frequency Upper cut-off frequency ( $-3\text{ dB}$ ) Gain flatness	DC $200\text{ MHz } (\pm 10\text{ }\%)$ $\pm 1\text{ dB}$
Time Response	Rise/fall time ( $10\text{ }\% - 90\text{ }\%$ )	$1.8\text{ ns}$
Input	Noise equivalent power (NEP) Optical saturation power Input offset compensation range	$9.4\text{ pW}/\sqrt{\text{Hz}}$ (@ $800\text{ nm}$ , $10\text{ MHz}$ ) $110\text{ }\mu\text{W}$ (for linear amplification, @ $800\text{ nm}$ ) $\pm 100\text{ }\mu\text{A}$ , adjustable by offset potentiometer
Detector	Detector Active area Spectral range Max. sensitivity	Si-PIN photodiode $\varnothing 0.8\text{ mm}$ $320 - 1000\text{ nm}$ $0.55\text{ A/W typ.}$ (@ $800\text{ nm}$ )
Output	Output voltage range  Max. output voltage range Output impedance Output noise	$\pm 1.2\text{ V}$ (@ $50\text{ }\Omega$ output load) for linear operation and low harmonic distortion $\pm 1.7\text{ V}$ (@ $50\text{ }\Omega$ load) $50\text{ }\Omega$ (terminate with $50\text{ }\Omega$ load) $3\text{ mV RMS}$ ( $20\text{ mV peak-peak}$ ) typ. (@ $50\text{ }\Omega$ load, no signal on detector, measurement bandwidth $500\text{ MHz}$ )
Optical Input Connector	Material FST flange Material FST coupler ring Material FC receptacle	$1.4305\text{ stainless steel, nickel-plated}$ $1.4305\text{ stainless steel, glass bead blasted}$ $\text{nickel silver}$
Power Supply	Supply voltage Supply current	$\pm 15\text{ V } (\pm 14.5\text{ V} \dots \pm 16.5\text{ V})$ $\pm 50\text{ mA}$ (depends on operating conditions, recommended power supply capability min. $\pm 150\text{ mA}$ )
Case	Weight  Material	$209\text{ g } (0.46\text{ lbs})$ HCA-S-200M-SI-FST incl. coupler ring $188\text{ g } (0.41\text{ lbs})$ HCA-S-200M-SI-FC $\text{AlMg4.5Mn, nickel-plated}$
Temperature Range	Storage temperature Operating temperature	$-30\text{ }^\circ\text{C} \dots +85\text{ }^\circ\text{C}$ $0\text{ }^\circ\text{C} \dots +60\text{ }^\circ\text{C}$
Absolute Maximum Ratings	Optical input power (CW) Power supply voltage	$20\text{ mW}$ $\pm 20\text{ V}$

200 MHz Photoreceiver  
with Si-PIN Photodiode

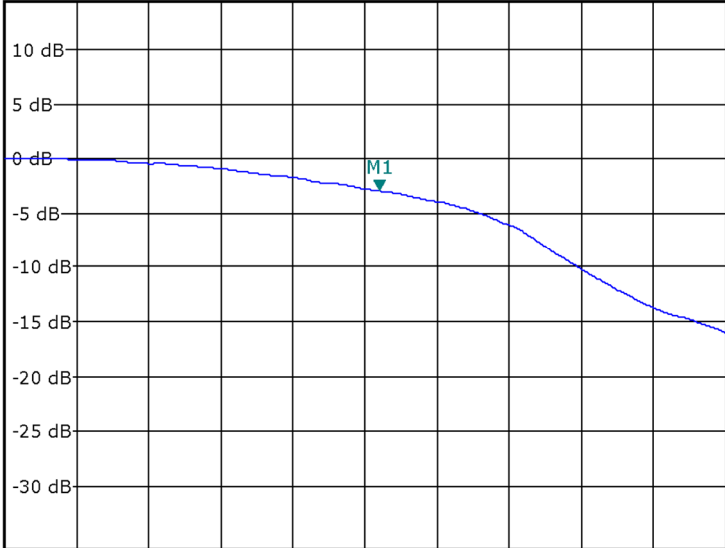
Connectors	<div>Input<div>HCA-S-200M-SI-FST1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories</div><div>HCA-S-200M-SI-FCFC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible)</div></div> <div>Output<div>BNC jack (female)</div></div> <div>Power supply<div>LEMO® series 1S, 3-pin fixed socket (mating plug type: FFA.1S.303.CLAC52)</div><div><div>Pin 1: +15 V Pin 2: -15 V Pin 3: GND</div></div></div>																								
Scope of Delivery	HCA-S-200M-SI, internally threaded coupler ring (FST version only), LEMO® 3-pin connector, datasheet, transport package																								
Ordering Information	<div>HCA-S-200M-SI-FST1.035"-40 threaded flange for free space applications and for use with various types of optical standard accessories.</div> <div>HCA-S-200M-SI-FCFC fiber optic connector (fix/permanent, FC/PC and FC/APC compatible).</div>																								
Spectral Response	<div><table border="1"><caption>Spectral Response Data (Approximate)</caption><thead><tr><th>Wavelength (nm)</th><th>Sensitivity (A/W)</th></tr></thead><tbody><tr><td>320</td><td>0.10</td></tr><tr><td>350</td><td>0.15</td></tr><tr><td>400</td><td>0.12</td></tr><tr><td>500</td><td>0.22</td></tr><tr><td>600</td><td>0.38</td></tr><tr><td>700</td><td>0.48</td></tr><tr><td>800</td><td>0.55</td></tr><tr><td>820</td><td>0.56</td></tr><tr><td>900</td><td>0.48</td></tr><tr><td>1000</td><td>0.25</td></tr><tr><td>1020</td><td>0.10</td></tr></tbody></table></div> <div>DB-Sens-HCA-S-200M-SI_R01</div>	Wavelength (nm)	Sensitivity (A/W)	320	0.10	350	0.15	400	0.12	500	0.22	600	0.38	700	0.48	800	0.55	820	0.56	900	0.48	1000	0.25	1020	0.10
Wavelength (nm)	Sensitivity (A/W)																								
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200 MHz Photoreceiver  
with Si-PIN Photodiode

Typical Performance  
Characteristics

Frequency response

Offs -34.1 dB      RBW 3 MHz  
Att 5 dB      \* VBW 10 kHz      M1[1]      -2.95 dB  
Ref -53.1 dBm      SWT 65ms      217.920000000 MHz

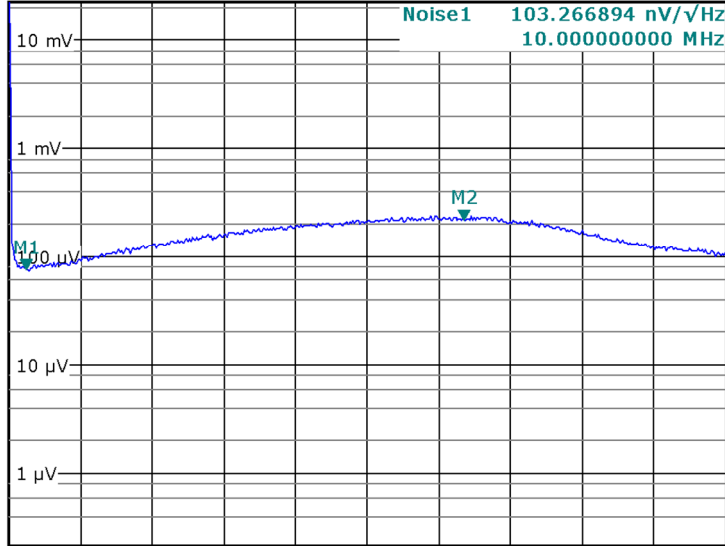


Start 20.0 MHz      Stop 400.0 MHz

PD-HCA-S-200M-Si-bw\_R01

Noise spectrum

\* RBW 1 MHz  
Att 0 dB      \* VBW 1 kHz      Noise2      292.328379 nV/√Hz  
Ref 22.4 mV      SWT 800ms      254.400000000 MHz



Start 0.0 Hz      Stop 400.0 MHz

PD-HCA-S-200M-Si-noise-R01

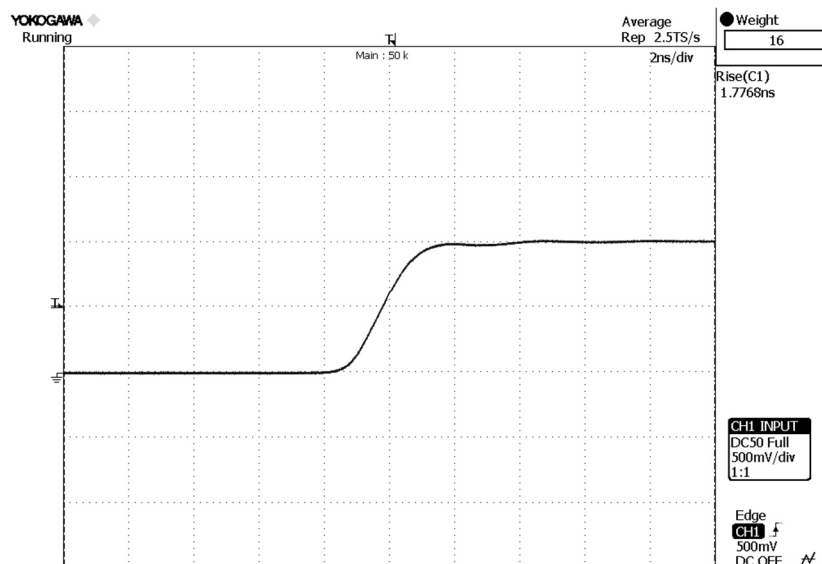
Note: spectral noise data is measured at the amplifier output with no signal on the photodiode.  
To determine the spectral input noise divide the measured output noise by the amplifier conversion gain. Conversion gain (V/W) = amplifier gain (V/A) × photo sensitivity (A/W).

Marker	frequency	output noise	resulting input noise (NEP)
1	10 MHz	103 nV/√Hz	9.4 pW/√Hz (@ 800 nm)

## 200 MHz Photoreceiver with Si-PIN Photodiode

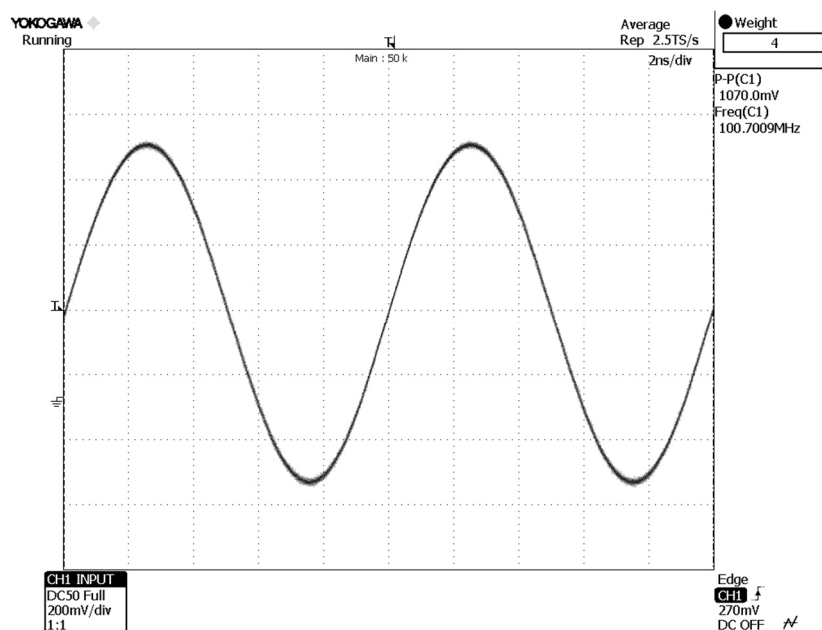
Typical Performance  
Characteristics (continued)

Pulse response to square wave input signal  
(with 16 times averaging)



PD-HCA-S-200M-SI pulse-2ns\_R01

Large signal response  
output signal for 100 MHz, 100  $\mu$ W modulated optical input signal  
(with 4 times averaging)

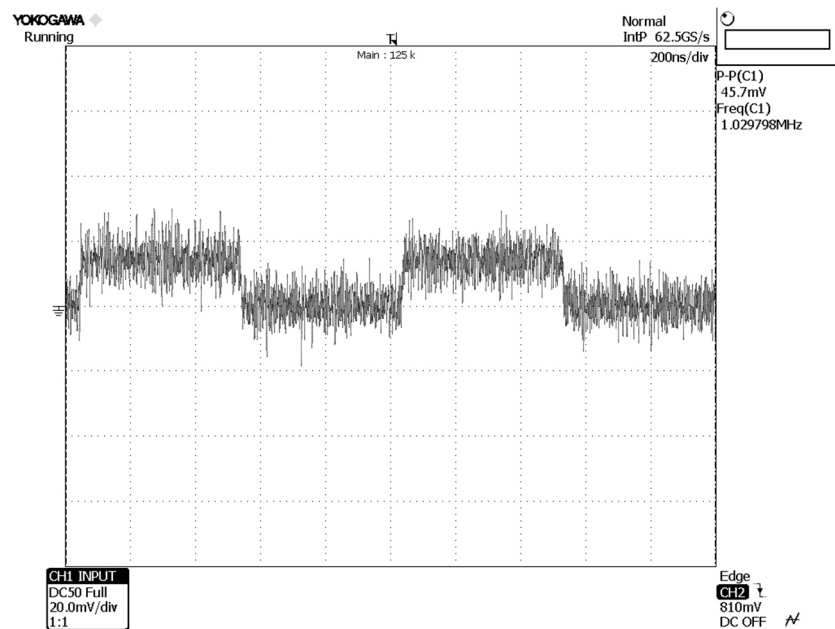


PD-HCA-S-200M-SI-large-sinus\_R01

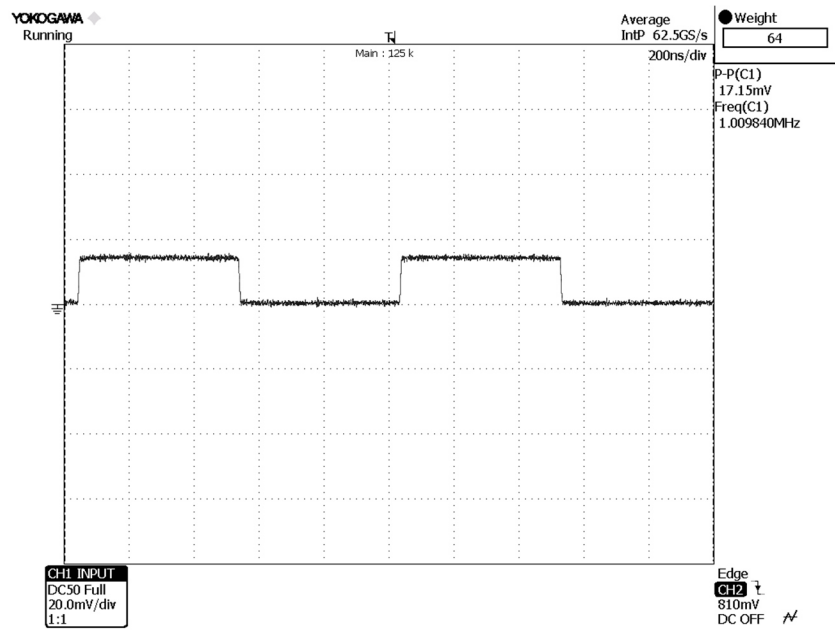
200 MHz Photoreceiver  
with Si-PIN Photodiode

Typical Performance  
Characteristics (continued)

Small signal response  
output signal for 1.5  $\mu$ W modulated optical input signal, 1 MHz square wave, without averaging



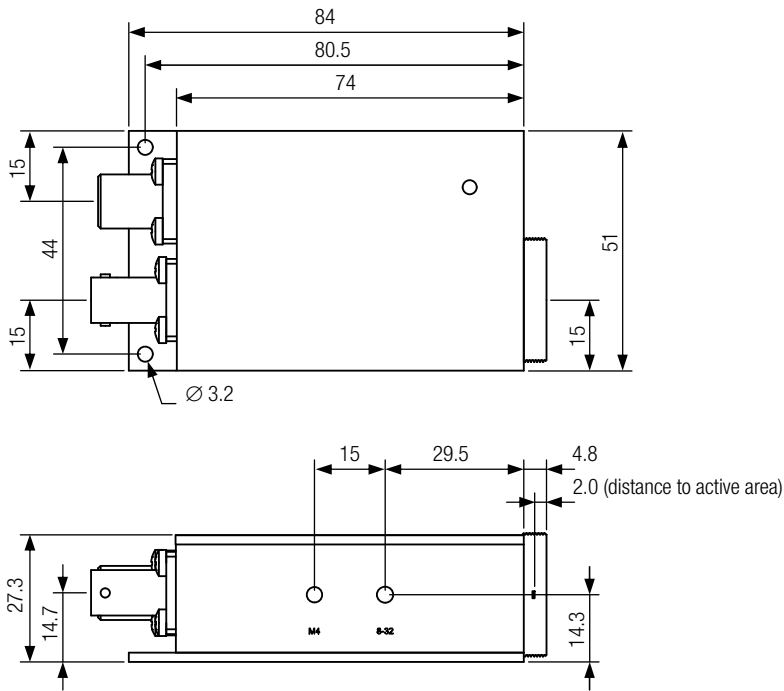
Small signal response  
output signal for 1.5  $\mu$ W modulated optical input signal, 1 MHz square wave,  
with 64 times averaging



200 MHz Photoreceiver  
with Si-PIN Photodiode

Dimensions

HCA-S-200M-SI-FST (1.035"-40 threaded free space input)



DZ-HCA-S\_FST\_R1

all dimensions in mm unless otherwise noted



## Dimensions (continued)

D7-HCA-S EC: R1

all dimensions in mm unless otherwise noted

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