Specification for HTPA82x62L10.5/0.95M(UDP)

Rev.1: 2015.01.20 Fg

The HTPA82x62L_/_M(UDP) is a fully calibrated, low cost thermopile array module, with fully digital UDP interface. The module delivers an electrical offset and ambient temperature compensated output stream, which can be already used for image processing, pattern recognition and presence detection purposes. Object temperatures can be easily obtained by this data stream.

Order Code Example

HTPA32x31 | | L10 / 0.8 | F8-14 | Hi | M | (SPI) | [Si]

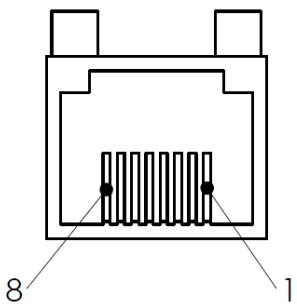
Type:	
HTPA32x31	Please contact support for all available HTPA and module combinations.
Output:	
d	HTPA sensor with digital output
Not declared	HTPA sensor with analogous output
Optics:	
L	Focal length: In example L10 = 10.0 mm focal length
/	F-Number: In example /0.8
	For optics see also "HTPA standard optics"
Filter:	
F	Filter characteristics. In example F8-14 (µm, Bandpass)
Not declared	Broad band ARC
Sensitivity:	
Hi	Increased sensitivity
Not declared	Standard sensitivity
Version:	
A	Application set: comes with GUI, housing, power supply. Always UDP Interface.
C	Calibrated sensor (only digital). Carries calibration constants on internal EEPROM
M	Module: HTPA sensor soldered to PCB, calibrated stream
S	HTPA sensor only. Raw voltage output, not calibrated
Interface:	
SPI	SPI device; Three variants: HTPA82x62: 16bit ADC all other analogous HTPAs: 14bit ADC Digital HTPA: 12bit ADC
LC	SPI,Only Analogous HTPA, 12bit ADC low speed, external processing required
UDP	Ethernet, CAT5 cable connection
PoE	Power over Ethernet, CAT5 connection, UDP protocol
Lens Material:	
Si	Silicon
Not declared	Germanium

For modules, M(UART) and M(LC) are not recommended anymore. M(SPI) and M(UDP) offer a wider input voltage range, better ADC resolution and a wider measurement range.

Pinout

Pin Assignment HTPA32x31M(UDP)

Pin	Name	Description	Type
1	TPOut+	Differential Signal Output	Digital Output
2	VDD	Positive supply voltage	Power
3	TPOut-	Differential Signal Output	Digital Output
4	TPIn+	Differential Signal Input	Digital Input
5		not connected	
6	TPIn-	Differential Signal Input	Digital Input
7		not connected	
8	VSS	Ground reference	Power



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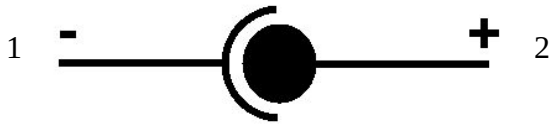
Ethernet-Interface:

Protocol Specifications:

Protocol type: UDP
All communication on Port: 30444

Power connection at Ethernet device:



1	VSS	(-)	GND
2	VDD	(+)	Supply (+3.3V DC)

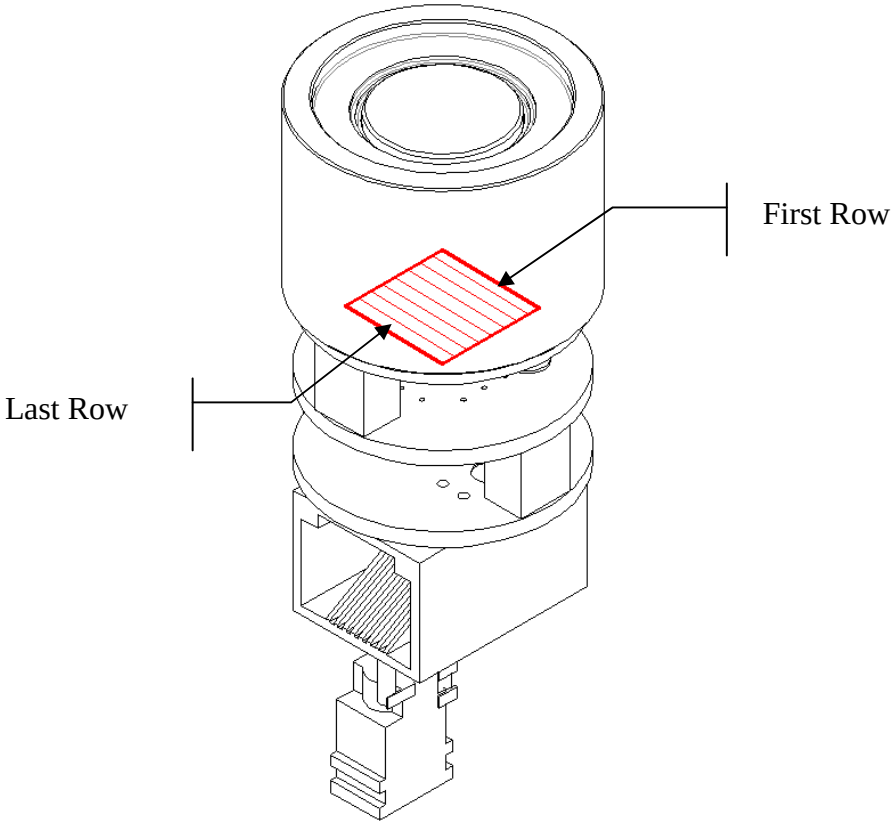
Power Supply: **3.3** VDC +/- 5%, 300mA
Connector: PJ1-021-SMT

Absolute Maximum Ratings:

Value	MIN	NOM	MAX	Unit	Remarks
VDD in respect to VSS	-0.3	3	4	V	
VDD in streaming mode	2.9	3	3.3	V	False VDD values affect compensation
Voltage on digital pin with respect to VSS	-0.3		VDD+0.3	V	
Storage temperature	-20		70	°C	
ADC reference voltages	VSS		4.096	V	
ADC resolution		16		bit	16 dig/mV
Max. current sunk/sourced on any pin		20		mA	
Operating temperature	-20		60	°C	non-condensing
Current consumption		260		mA	In streaming

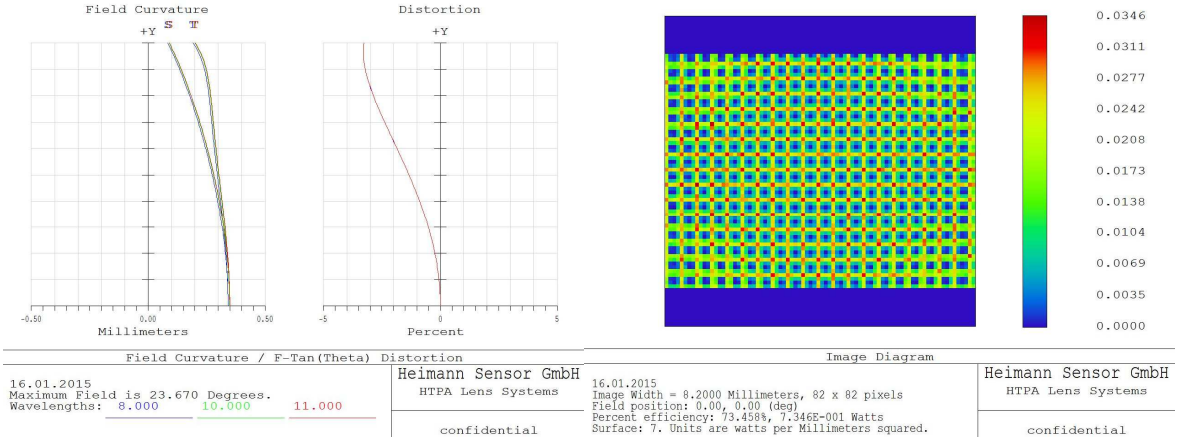
Devices enters Idle mode after bound and (see Control Message 4) and first received control command. Idle mode is entered after execution of last command. Device will wake up at next received packet.

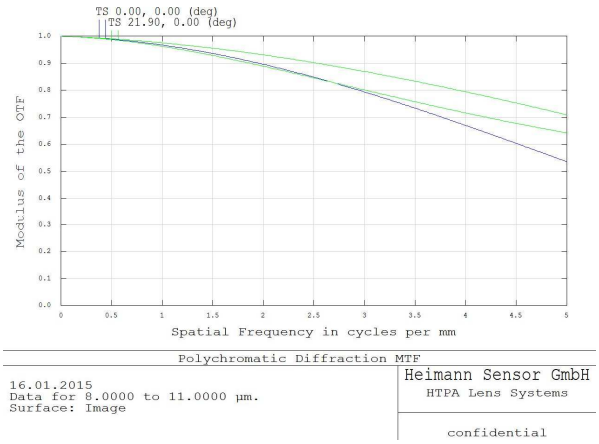
HTPA82x62L10.5/0.95M(UDP) Optical Orientation of Pixels:



Optical specifications:

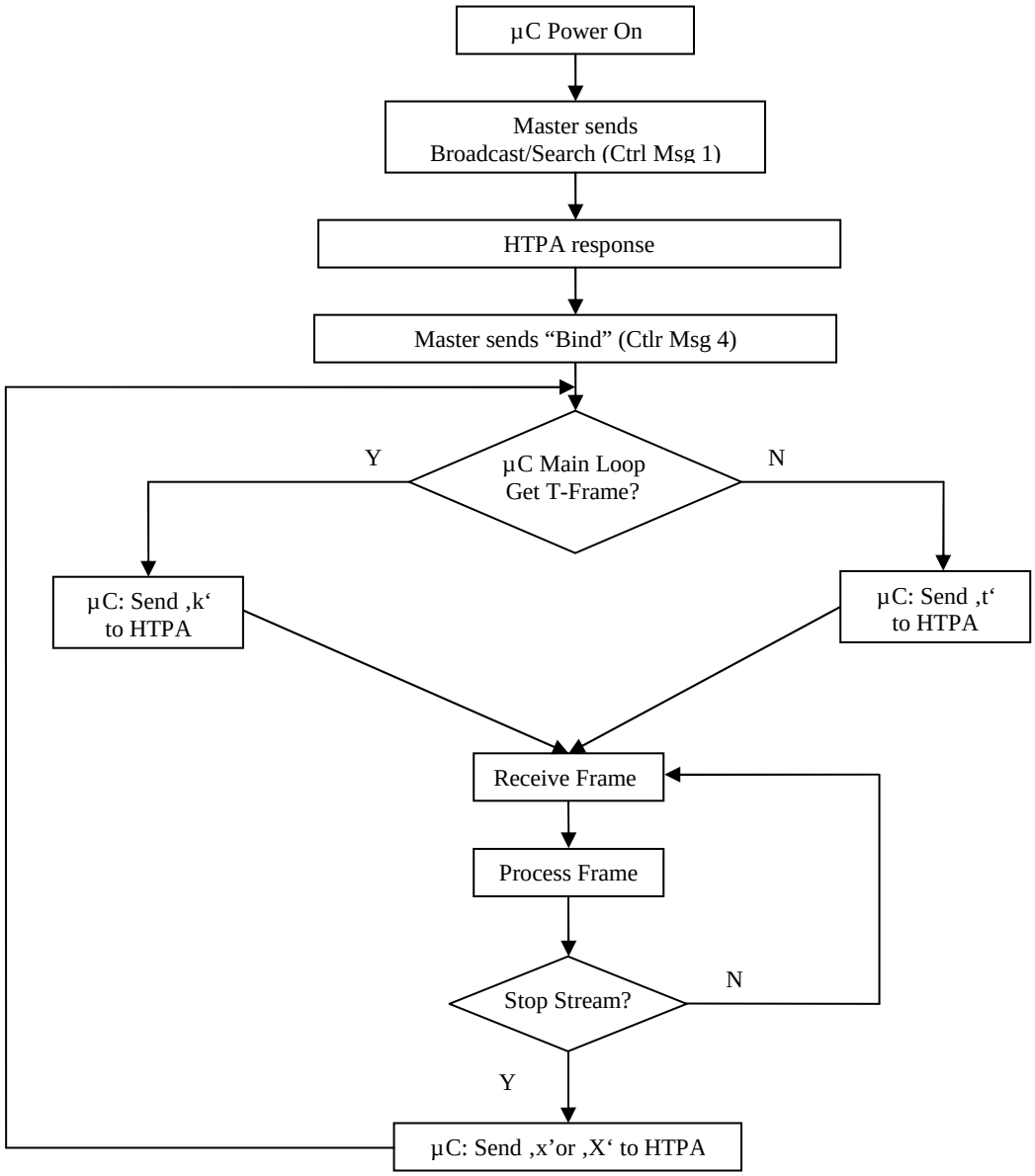
NETD	230 mK (measured at 9 Hz and 20°C object temperature)
Array format	82 (h) x 62(v) active pixels
Pixel pitch	100µm
Framerate	9 Hz
Temperature compensation	Automatic, compensates ambient temperature drift
Non-uniformity correction	Shutterless, not needed
HFOV	43.8°
VFOV	33.6°
Diagonal FOV	53.1°





Communication and Timings:

Proposed flow chart of communication. (Master is referred as µC, Slave as HTPA module)



Communication:

Communication via Terminal / UDP	
Sent Char	**Result/Received message**
'h'	pushes binary EEDATA out
'K'	send continous binary temperature datastream [K*10] ***For a detailed Description of the serial order see Table2.***
'I'	Get Ambient Temperature (Calculates the Ambient Temperature from the **last measured** Frame)
'M'	Shows current and calibration settings. Device prints the following stream: **"HTPA series responsed! I am Arraytype 9"** **"HTPA82x62M(UDP) v.X.XX written by B.Forg; Heimann Sensor GmbH; YYYY-MM-DD"** Version information. **"I am running on XXXX.X kHz"** Actual MCLK-setting in kHz **"Amplification is X" Actual set amplification.** Possible strings for X: "073.50", "097.50", "098.00" or "130.00" **"MAC-ID: X IP: Y DevID: Z\r\n"** (Only Ethernet devices show a MAC-ID, DevID is shown in any case) X= MAC-ID of the device, i.e. "00.97.FF.00.10.08"; Y=current IP of the device, Z=user setable ID, range 00000…65535 **"PIXCvsTA *X* , THvsTA *X* IGNORE_ELOFF *X* FC *X* EXP *Y* TC *X* OPC *X* A16 *X* "** Possible strings: *X* ="true" or "false", *Z* is the string of a 2 decimal places value, i. e. "3.47" **"THOM *A* , THOD *B* TABLENUMBER *C* \r\n"** Possible strings for *A-C:* 2 digit decimals, i.e. "08" Remarks: These are used for internal calculations
'N'	Send continous compensated voltage data. ***For a detailed Description of the serial order see Table2.***
't'	Continuous binary voltage data of the ADC is transmitted. ***For a detailed Description of the serial order see Table2.***
'x'	Stops Stream without prompt.
'X'	Stops Stream by sending “STOP!\r\n”

Table 1: Control Characters

Please be aware, that the source and destination port has to be 30444. Only one byte must be transmitted (excluding header).

Serial order of data in stream:

Compensated Voltage Mode	
Dataset	Value
0	offset corrected Voltage of Pixel0 in digits
1	offset corrected Voltage of Pixel1 in digits
2	offset corrected Voltage of Pixel2 in digits
3	offset corrected Voltage of Pixel3 in digits
…	…
5375	offset corrected Voltage of Pixel5375 in digits
5376	PTAT in digits
5377	VDD in digits
5378	Tamb in dK

Raw Voltage Mode	
Dataset	Value
0	absolute Voltage of Pixel0 in digits
1	absolute Voltage of Pixel1 in digits
2	absolute Voltage of Pixel2 in digits
3	absolute Voltage of Pixel3 in digits
…	…
5375	absolute Voltage of Pixel5375 in digits
5376	PTAT in digits
5377	VDD in digits
5378	Tamb in dK

Temperature Mode	
Dataset	Value
0	Object temp. of Pixel0 in deciKelvin
1	Object temp. of Pixel1 in deciKelvin
2	Object temp. of Pixel2 in deciKelvin
3	Object temp. of Pixel3 in deciKelvin
…	…
5375	Object temp. of Pixel5375 in deciKelvin
5376	PTAT in digits
5377	VDD in digits
5378	Tamb in dK

Table 2: Serial order of data in stream

Each dataset consists of a 16 bit value. If a frame consists out of more than one packet, packets are appended.

Pixel Map:

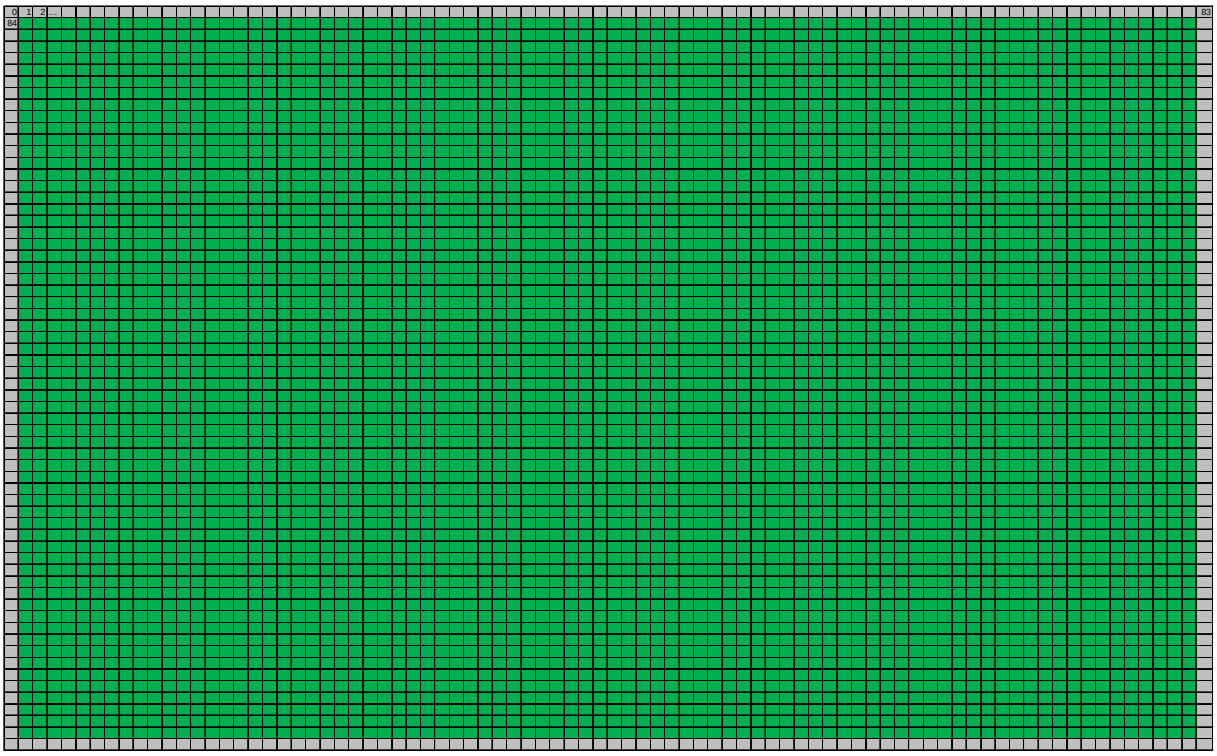


Table 3: Pixelmap

→Active Pixel
→Insensitive Pixel

Readings of insensitive Pixel can be ignored, but are transmitted.

Packets (UDP, only Ethernet device):

Packet details for HTPA82x62		
Packet No.	Packet size	Packet contains
1	1451	Packet index 1 (8bit), data of Pixel0-Pixel725
2	1451	Packet index 2 (8bit), data of Pixel726-Pixel1450
3	1451	Packet index 3 (8bit), data of Pixel1451-Pixel2175
4	1451	Packet index 4 (8bit), data of Pixel2176-Pixel2900
5	1451	Packet index 5 (8bit), data of Pixel2901-Pixel3625
6	1451	Packet index 6 (8bit), data of Pixel3626-Pixel4350
7	1451	Packet index 7 (8bit), data of Pixel4351-Pixel5075
8	609	Packet index 8 (8bit), data of Pixel5076 to end of frame

Each dataset (except of packet index) consists out of a 16 bit value. For serial order of the datasets refer to section “serial order in Frame”.

Control Messages:

In the set of control messages, expressions in angled braces have to be substituted by following strings:

[IP]	insert IP in ASCII format, i.e.: *"192.168.240.122"*
[MACID]	insert MAC ID in ASCII format and hexadecimal, i.e.: *"00.1A.22.33.44.55"*
[AT]	insert index of array types in ASCII format

Array type	**Index**
HTPA 8x8	*"0"*
HTPA 16x16	*"1"*
HTPA 32x31	*"3"*
HTPA 64x62	*"5"*
HTPA 82x62	*"9"*

[MCLK]	insert Frequency of MCLK in ASCII format and kHz, i.e.: *"1050.1"*
[AMP]	insert value of amplification in ASCII format, i.e.: *"097.50"*
[MSK]	insert subnet mask in ASCII format, i.e.: *"255.255.255.000"*
[DEVID]	insert 5 digit device ID in ASCII format, i.e. *"00197"* Range: 00000… 65535

Set of control messages:

Message1: "Calling HTPA series devices" (only Ethernet device)
Conditions: Can be sent as Broadcast, or if device already known as normal packet.
Answer: "HTPA series responsed! I am Arraytype **[AT]**"
Firmware version, date and author information.
"I am running on **[MCLK]** kHz"
"Amplification is **[AMP]**\r\n"
"MAC-ID: **[MACID]** IP: **[IP]**\r\n"
A second packet with calibration depending information is send.

Message2: "x Release HTPA series device" (only Ethernet device)
Result: Device disables hardware IP filter. All packets except ARP's, DHCP requests, Broadcasts, Message1, Message3 and Message4 are discarded.
Answer: "HW-Filter released\r\n"

Message3: "HTPA device IP change request to **[IP]**.**[MSK]**." (only Ethernet device)
Result: The device changes the IP and the subnet mask to the given value and writes it to EEPROM. The IP becomes the default IP, therefore the device will use it at the next reset, if no DHCP is found.
Answer: "Device changed IP to **[IP]**. and Subnet to **[MSK]**.\r\n"

Message4: "Bind HTPA series device" (only Ethernet device)
Result: Device enables hardware IP filter. Only packets from sender IP, ARP's, DHCP requests and Broadcasts are accepted. Device accepts now the control characters listed in **Table 1.**
Answer: "HW Filter is **[IP]** MAC **[MACID]**\n\r""
Insert in the above string the IP and MAC-ID of the Sender from Message4.

Control Messages [continued]:

Message5:	"Set EEPROM data"
Conditions:	Only possible if Message 4 already successful sent. **ATTENTION!** Calibration data is overwritten!!!
Result:	Writes the next received packets into EEPROM, if packet size is equal to 1024 bytes. Device writes to EEPROM, until EEPROM is completely filled. EEPROM size depends on Device type: HTPA8x8, HTPA16x16 and HTPA32x31: 16384 byte; HTPA64x62: 65536 byte. HTPA82x62: 143360 byte.
Answer:	"Write was successful.\n\r"

Message6:	"Set DeviceID to **[DEVID]**"
Result:	The given Device ID **[DEVID]** is written to EEPROM. This ID is shown on receive of 'M'. The Device ID can be used for customer specific purposes.
Answer:	"DeviceID changed to **[DEVID]**\r\n"

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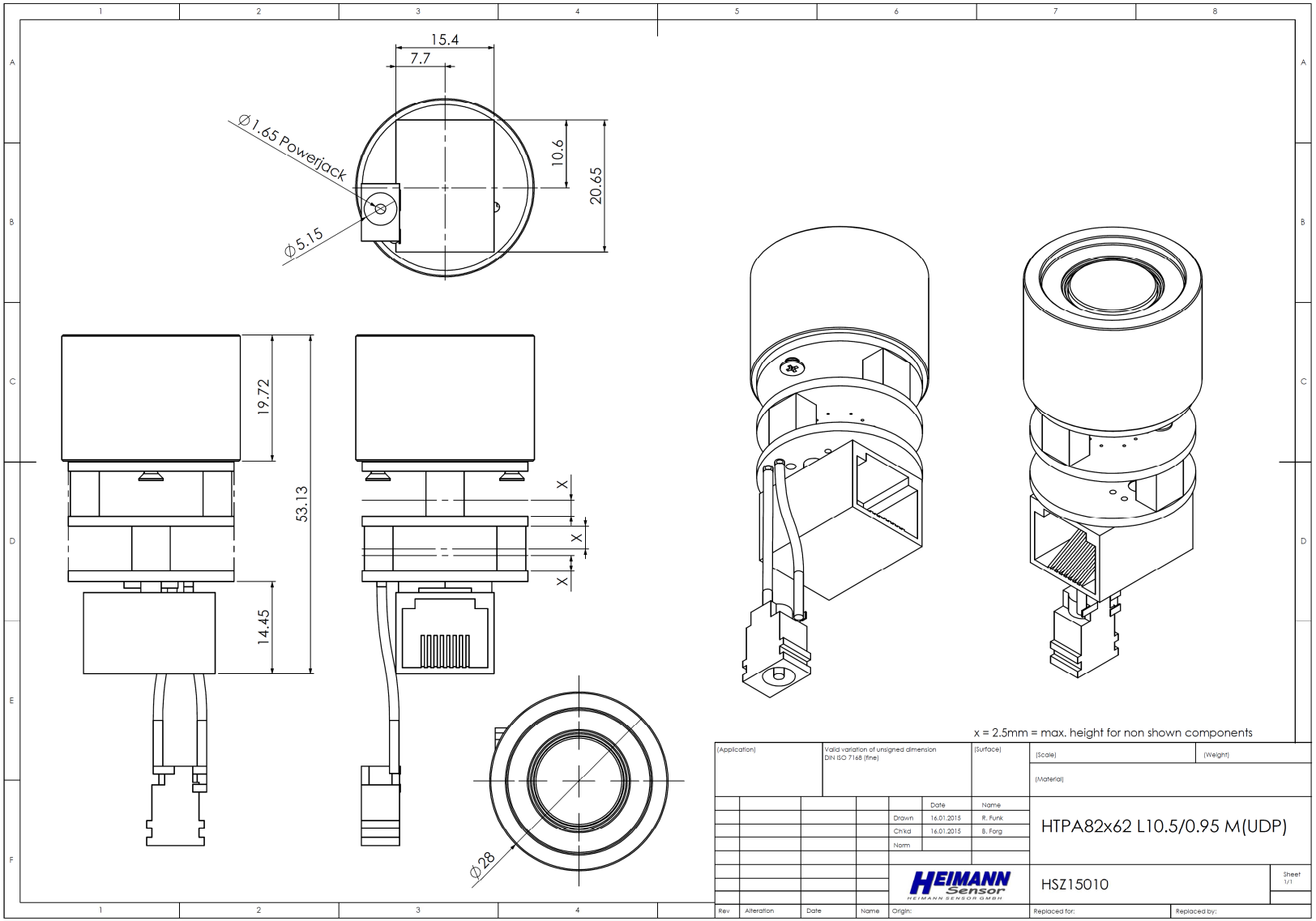
Dimensions:



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