OMRON

Human Vision Components (HVC-P2)
B5T-007001-010 model
B5T-007001-020 model

Instruction Sheet

Thank you for purchasing the **Human Vision Components** (hereafter referred to as the “Product”).
Please confirm that you have received the correct product.
This Instruction Sheet provides specifications, handling methods, and safety precautions. Read and understand this Instruction Sheet before you use the Product.

For detailed interface specifications for the Product, refer to the Command Specifications document (provided separately).
Make sure to confirm and agree to the “Terms of Use and Disclaimer” section before using the Product. Beginning of use shall be deemed as confirmation and agreement.
Information concerning the following items included with the Product:
- Datasheet
- Command Specifications document
- USB drivers
- Evaluation software
- Sample codes
- Other development related documentation

can be downloaded from the website below:
https://www.components.omron.com/mobile/hvc_p2
Keep this Instruction Sheet in a safe location.

Please refer to the Japanese version if you use the Product in Japan.
This instruction sheet applies to usage outside of Japan.

OMRON Corporation

SG-B5T-093C

The contents and specifications, etc., may change without notice.

●Term Definitions
- The “Product” indicates the BT5-007001-010 and B5T-007001-020 models. It consists of the “Device” and the “SDK”. In this instruction sheet, the word “Product” refers to the whole or a part of them.
- The “Device” indicates the hardware component that consist of the main board, the camera board and the flexible flat cable (FFC).
- The “SDK” consists of the demonstration software, the command specifications and other documentations concerning the “Device” or the “SDK.”

Safety Precautions

Make sure to read these precautions for a safe use of the Product.
- The contents included is to ensure proper use of the Product and prevent harm and/or property damage to the user or other people.
- Warnings and cautions are defined as follows.

● Definition of Warning and Caution

⚠ Warning	Denotes a potentially hazardous situation which, if not avoided, may result in minor, moderate or serious injury, or death. It may also result in serious damage.
⚠ Caution	Denotes a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or damage.

“Damage” indicates property damage to a building, production line, household goods, other products, livestock, pets, etc.

●Examples of indications

⊘	Indicates **forbidden** actions.
❗	Indicates **required** actions.

⚠ Warning

Regarding use:

Do not use the Product for safety of life or crime prevention purposes.	⊘ Forbidden
Do not use the Device on automobiles or other vehicles, including bikes as it may result in accidents.	

The following will result in fire, electric shock, injury or damage if ignored.

Do not touch the Device or any connected cable during a lightning storm.	⊘ Forbidden
Do not use the Device if it is cracked or damaged.	
Do not insert foreign objects in the connector or in the holes on the various parts of the Device.	
Do not use the Device in bathrooms or any other place where it may get in contact with water.	
Do not touch the Device or any connected cable with wet hands.	
Do not install the Device in a location subjected to animal or human body fluids.	
Do not disassemble, repair, or modify the Device.	
Turn the power off and stop using theProduct if you notice any anomaly, including foul odor, distortion or discoloration to the Device during use.	❗ Required
Install the cables in a way that would not put strong force on them, including making sure they are not crushed in a door.	

The following will result in accident or injury if ignored.

Install the Device and the cables out of reach of infants.	❗ Required
Store the Device out of reach of infants when not using it. Contact emergency services at once if small parts are ingested.	
Do not touch sharp parts or the exposed interior of the Device that was damaged.	

⚠ Caution

Regarding the use or handling of the Product:

Make sure to follow the warnings and cautions indicated in this document when using the Product.	❗ Required

The following will result in accident, injury or damage if ignored.

Do not install the Device in an unstable location, where it could fall down, or where it can be subject to vibrations.	❗ Required
Install the cables in a safe way, out of the way of hands or feet.	

The following will result in burns or damage due to heating if ignored.

Do not wrap the Device in a blanket or sheets, etc. when it is powered on.	⊘ Forbidden
Do not use or store the Device next to fire, heating equipment, in direct sunlight, in cars or in any other location subject to high temperature.	
The Device may produce heat. Do not touch it when transmitting or shortly after powering it off.	❗ Required

Precautions for Safe Use

Check the Product for physical damage upon opening its package. It is recommended to wear gloves when opening the package.
Follow the indications listed below for a safe use of the Product.
(1) Installation Environment
- There is potential internal deterioration and damage of internal parts of the Device. Do not use the Product in conditions exceeding the ratings for temperature and humidity.
- Do not use the Product in an environment where condensation occurs.
- Do not use the Product in an environment subjected to water, oil or chemicals spills.
- Do not use the Product in an environment subjected to corrosive, combustible or explosive gas.
- Do not use the Product in an environment where dust, salt or iron powder are present.

(2) Power Supply and Wiring
- Make sure there is no faulty wiring of I/O terminals, etc. as this may result in fire.
- Do not connect the DC power supply terminal to AC power.
- Do not connect the Product to DC voltage above the rated capacity.
- Do not reverse-connect the DC power supply.
- Make sure to turn the Device off before removing cables.
- Do not connect the UART connector (CN5) to asynchronous method non-compliant devices.
- Make sure to check the Device and the connector pins for distortion or physical damagebefore connecting or removing cables.
- Connect a commercially available MicroUSB cable(TypeB) to the USB connector (CN3). Make sure the cable is not damaged and do not modify it.

(3) Others
- Do not disassemble, repair or otherwise remodel the Device.
- Treat the Product as industrial waste when disposing of it.
- Use the M2 screws on the fixing holes on the Device when fixing it. Make sure not to bend or break the board when fastening the screws. Apply torque appropriately for the screws used.
- Do not apply stress on the Device, e.g. twists, deflections or impacts, as it may result in causing defects or degradation.
- Do not apply stress on the connector or display implementation parts when installing the Device, as it may result in causing defects or degradation.

Precautions for Correct Use

Observe the following precautions to prevent failure to operate and malfunctions, and to prevent adversely affecting the performance and function of the Product.
- Store the Device at a temperature between -30 and +70°C and a humidity level below 90%.
- Do not touch the board mounted parts with bare hands. Discharge any static electricity from the user before use.
- Take proper measures against static electricity by using an antistatic wrist strap, etc. before handling the Product.
- Make sure to properly ground the connector’s earth terminal in order to prevent malfunction due to noise.
- Do not use the Product in places where the surrounding temperature goes above the rating range.
- Do not use the Product in a location where it would be subjected to direct sunlight.
- Do not use the Product in a location subject to excessive inductive or power supply noise, such as in strong magnetic or electric fields.
- Do not use the Product in a location where it would be subjected to strong UV light.
- Do not use the Product in a location where it would be subjected to radiation.
- Sufficiently evaluate the electrical characteristics of any connection to the Device.
- Make sure to properly align the connectors when connecting them.
- Avoid desorption of power supplied connectors as it will result in accidents.
- Refer to the B5T-007001 Command Specifications document separately provided by OMRON for details on the interface specifications.
- Never use benzene, paint thinner, or any other volatile cleaning solution, detergent, bleach or chemical washcloth for cleaning the Device.
- Take in consideration heat dissipation from the Device when installing it in order to improve its long term reliability.
- Install the Device sufficiently far away from any other surrounding charged parts.
- Install the Device making sure not to obstruct the camera detection range.
- Use transparent materials to cover and protect the front of the lens should it be in contact with hands or objects.
- Remove the lens protective seal before use (B5T-007001-010).
- Remove the lens protective cover before use (B5T-007001-020).
- Do not touch the camera module.
- The Product performs detection on images. As such, note that it may sometimes detect objects other than living bodies, such as photographs or posters.
- Note that since the Product uses a camera for detection, successful detection may not be possible due to light orientation, brightness or exposure issues.
- Make sure to reset the Product before using it again following a power interruption or failure.
- Restart or reset the Device if data is received improperly.
- Cutting or losing power to the Device while saving the Album on the flash ROM may destroy the Album data saved on it. As such, make sure to take a backup of the Album data on the Host device. Refer to the B5T-007001 Command Specifications document for details.
- Do not use the USB and UART connection method simultaneously.
- Do not remove the FFC connection between the main board and the camera board, and do not alter the configuration of the combination.
- When using the USB connector, note that the bus power may not be properly powering the Device depending on the computer USB port used. In such case, use a device like a self-powered hub with an AC adaptor.

■ Product Outline

HVC (Human Vision Components) is a human-sensing component that recognizes people. It is an integrated module that is built into other devices and provides both the following ten types of image sensing and a camera module:
Human Body Detection, Face Detection, Hand Detection, Face Direction Estimation, Gaze Estimation, Blink Estimation, Age Estimation, Gender Estimation, Expression Estimation and Face Recognition

Commands are received from a host via a UART serial communications path or USB (CDC class) and responses are returned.

■ Models

Name	Type	Model
Human Vision Components (HVC-P2)	Horizontal angle of view 50°	B5T-007001-010
Human Vision Components (HVC-P2)	Horizontal angle of view 90°	B5T-007001-020

■ Ratings

Item	Rated values (standards)
Supply voltage	DC 5V±10%
Consumption current	Max.0.25A
Operating temperature	0 to +50°C (no condensation or freezing)
Operating humidity	Below 90% RH (no condensation or freezing)
Storage temperature	-30 to +70°C (no condensation or freezing)
Storage humidity	Below 90%RH (no condensation or freezing)

■ Specifications & Functions

・Image input specifications

Item	Specifications	
	B5T-007001-010 model	B5T-007001-020 model
Detection resolution	1600×1200 pixels	1600×1200 pixels
Horizontal detection range (angle of view)	54±3°	94±5°
Vertical detection range (angle of view)	41±3°	76±5°
Optical axis inclination	±4°	±7°
Rotation alignment	±2°	±2°

・Image output specifications

Item	Specifications
Output image	No output / 160×120 pixels / 320×240 pixels (choose one)
Image format	RAW (8-bit、Y data)

・Host communication specifications

UART

Item	Specifications
Feature	Receives the command controlling the module from the host and sends back the detection result info
System	Full duplex bidirectional system
Protocol	Non-procedural
Sync	Asynchronous method
Data format	Start: 1 bit, Data: 8 bit, Stop: 1 bit, no parity
Transmission code	NRZ method, Logic low: 0V & logic high: 3.3V
Transmission rate	9600 (Default value)/38400/115200/230400/460800/921600 bps, can be changed through commands

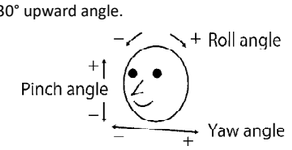
USB

Item	Specifications
Feature	Receives the command controlling the module from the host and sends back the detection result info
System	USB 2.0 (CDC class used)
Protocol	Non-procedural
Data format	Start: 1 bit, Data: 8 bit, Stop: 1 bit, no parity
Supported OS	Windows 7 32bit (refer to website for other versions) https://www.components.omron.com/mobile/hvc_p2

・Angle range [*1]

Function	Pitch angle (up-down)	Yaw angle (left-right)	Roll angle
Human body detection	Up 15° [*2] Down -30° [*2]	360° [*3]	+/-10°
Hand detection	+/-20°	+/-30°	
Face detection	+/-30°	+/-90°	
Face direction estimation	Face direction +/-20°	Face direction +/-30°	+/-45°
Age estimation			
Gender estimation			
Blink estimation			
Expression estimation			
Face recognition			
Gaze estimation	Gaze angle +/-20° [*4] (up to face direction +/-10°)	Gaze angle +/-30° [*4] (up to face direction +/-20°)	

[*1] The detection and estimation accuracy will fall when outside the specified angle range. Note that being within range indicated above does not always guarantee successful detection.
[*2] “Up direction 15°” indicates that the camera is looking up to the target from a 15° downward angle and “Down direction -30°” indicates that the camera is looking down to the target from a 30° upward angle.
[*3] This indicates all the directions to the left and right of the human body.
[*4] This is the angle when facing the camera,regardless of the face direction angle.



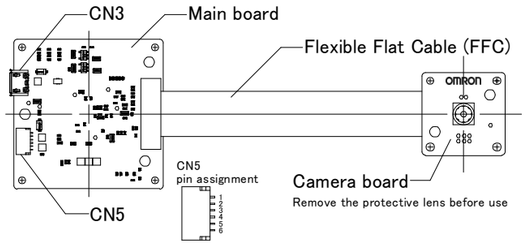
・Image Sensing Functions

Function	Output	Details
Human Body Detection, Face Detection, Hand Detection	・Number of detected objects ・Position (center coordinates) ・Size ・Degree of confidence	・Maximum of 35 per object type ・Coordinates on the screen from the top-left corner of the screen (in pixels) ・Pixel size on the input image ・Confidence in the detection result (0 to 1000), a higher value indicates a higher confidence
Face Direction Estimation	・Yaw angle ・Pitch angle ・Roll angle ・Degree of confidence	・Positive to the right (in degrees) ・Positive upwards (in degrees) ・Positive clockwise (in degrees) ・Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gaze Estimation	・Yaw angle ・Pitch angle	・Positive to the right (in degrees) ・Positive upwards (in degrees)
Blink Estimation	・Blink degree	・Output for both eyes (1 to 1000) A higher value indicates the eye is closer to being fully shut
Age Estimation	・Age ・Degree of confidence	・0 to 75 (75 includes higher ages) ・Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Gender Estimation	・Gender ・Degree of confidence	・Male or female ・Confidence in the estimation result (0 to 1000), a higher value indicates a higher confidence
Expression Estimation	・Score for 5 expressions ・Expression degree (positive or negative)	・0 to 100 The score will be output for each expression (“neutral”, “happiness”, “surprise”, “anger” and “sadness”). The score indicates the likeliness of a face displaying the estimated expression, where a higher score indicates a higher likeliness of being that expression. ・+100 to -100 A degree closer to +100 indicates a high degree of “happiness” while a degree closer to -100 indicates a high degree of “surprise”, “anger” or “sadness”.
Face Recognition	・Individual identification/verification result ・Score	・ Identify whether the face image that was taken matches the registered user in the Album. As a result of identification, the ID for the user with the highest degree of matching is output. If the degree of matching with all users is less than the threshold, "Not registered" is output (1:n recognition = identification,). ・ It is possible to change to the mode that verify that whether the face image matches a specific user in all registered users (1:1 recognition = verification) by a command. ・ Maximum number of User ID: 100 / Maximum number of data per User ID : 10 （Default value）This numbers can be changed to 500 User IDs x 2 data or 1000 User IDs x 1 data by commands） ・ The image data that is taken with other than this product can not be registered. ・ Matching degree is 0 to 1000.The closer the degree is 1000 ,the closer the User ID is to the detected person. ・ Identification(1:n):The output is the result of user with the highest matching degree. ・ Verification:(1:1):The output is the result of matching degree of specified ID's user. ・The threshold value is can be set by command

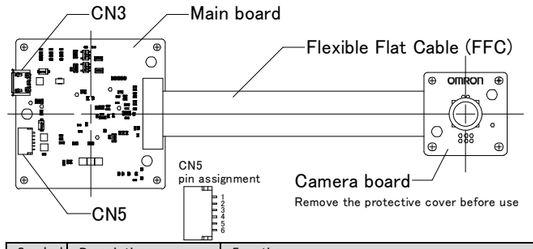
Degrees of confidence are grain size 1. Angles are for when facing the camera.

■ Parts & Functions

B5T-007001-010

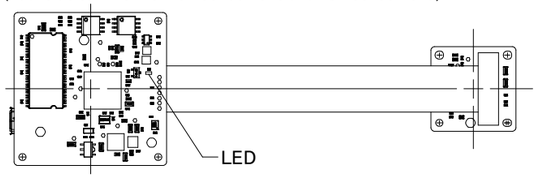


B5T-007001-020



Symbol	Description	Function
CN3	USB connector (MicroUSB Type B)	USB communication, power supply
CN5	UART connector	UART communicationl, power supply, reset input

Limit the coupling of CN3 and CN5 to less than 10 times.
(Back side common for B5T-007001-020 and B5T-007001-020)



Symbol	Description	Function
LED	LED display light	Lit when power is ON Off when proceeding commands from Host

■ Connector Pin Assignment

・CN5: Provides power and the UART communication interface.
Board-side connector: SM06B-SRSS-G-TB (made by J.S.T. Connectors, recommended for use)
Housing: SHR-06V-S-B or SHR-06V-S (made by J.S.T. Connectors)
Contact: SSH-003GA-P0.2 (made by J.S.T. Connectors)

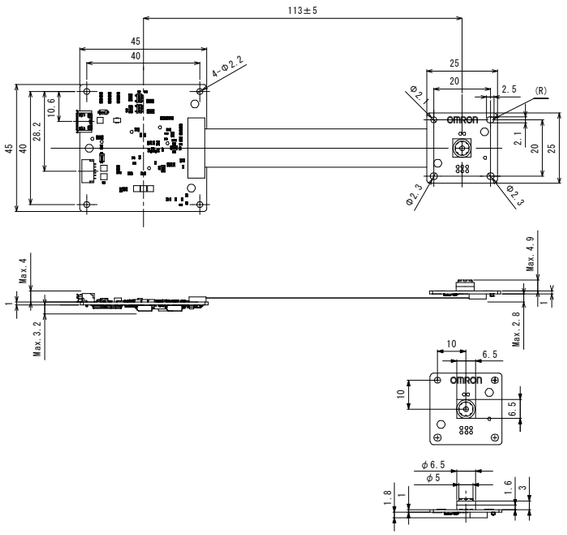
Pin number	Signal	I/O	Description
1	Vcc	—	Power supply DC5.0V±10%
2	UART RX	Input	UART [receive] (Device ← Host) Logic 0: 0V Logic 1: 3.3V
3	UART TX	Output	UART [send] (Host ← Device) Logic 0: 0V Logic 1: 3.3V
4	GND	—	Ground
5	RESET	Input	Reset signal (Device ← Host) Logic 0: 0V Logic 1: 3.3V Reset is active on logic 0
6	RESERVED	—	Do not connect to this

Do not make the RX terminal floating when applying power to the Device.

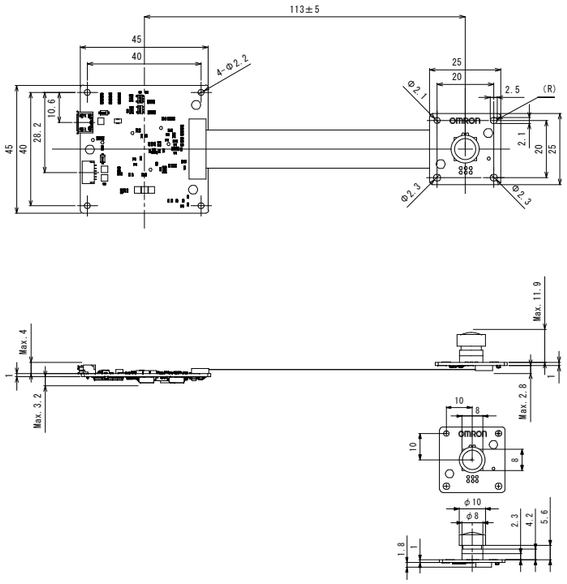
■ External Dimensions

(Units: mm / unspecified dimension tolerance: tolerance class IT16)

B5T-007001-010 model

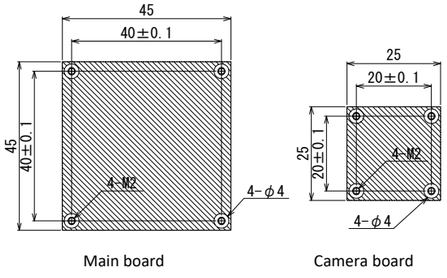


B5T-007001-020 model

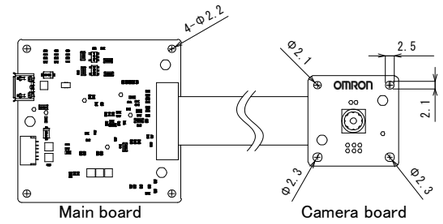


■ Mounting Method

The mounting method is the same for bot B5T-007001-010 and B5T-007001-020 models.



Do not install metallic parts for mounting on the shaded areas.



1. This figure is for a frontal mounting direction (0°) of the module. Settings need to be changed through commands when mounting the Device at a clockwise rotation angle of 90°, 180° or 270° from the front.
2. Fix each board with the M2 screws in the four board corner holes. Make sure not to bend or break the board when fastening the screws. Apply torque appropriately for the screws used.
3. Make sure to fix the board so that it is not warped, bent or any under unreasonable stress.
4. Make sure that the board is sufficiently distanced from any electrically-conductive part.
5. Take proper measures against static electricity.

Terms of Use and Disclaimer

Omron will see any use of the Product as an indication that you agree and will comply with the contents of these Terms of Use.

(1) Definitions:
In addition to the definition in “Term Definitions” section above, the terms in this section have the following meaning.
1) Software: (i) Omron’s **OKAO** Software, as embedded in the Device, and (ii) Software included in the SDK.
2) Usage conditions: Usage conditions, rating, performance, operating environment, handling instructions, cautions, prohibited use, etc. of Omron products described in this document and other documents provided by Omron..
3) Customer Device, etc.: Parts/components, electronic substrates, devices, equipment or systems, etc. manufactured by customers.
4) Customer application: Application of Omron products by customers which include embedding and/or using Omron products in Customer Device, etc.
5) Fitness: (a)Fitness, (b)performance, (c) non-infringement of third-party intellectual property, (d) compliance with laws and regulations and (e)conformity to various standards.

(2) Caution on Descriptions
Attention is required to the following points on descriptions in specifications.:
1) Rated values and performance values are the product of tests performed for separate single conditions, including but not limited to temperature and humidity. It is not intended to warrant rated values and performance values for multiple combined conditions.
2) Reference data are provided for reference only. Omron does NOT warrant that Omron products work properly at all time in the range of reference data.
3) Application examples (including those published on Omron’s website and exhibitions) are provided for reference only. Omron does NOT warrant the Fitness of Omron products under such application.
4) Omron may discontinue the production of Omron products or change the specifications of them for the purpose of improving such products or other reasons entirely at its own discretion.
5) Technical information provided by Omron is confidential information of Omron. Please refrain from disclosing to third parties.

(3) Precautions and conditions of use
The Customer accepts the following precautions and conditions when the Customer introduces or uses the Product in a Customer Application:
1) The Customer shall use the Product in compliance with the instructions noted in the instruction sheet, including but not limited to, ratings and performance.
2) The Product is composed of (i) hardware and (ii) the Software. The Software is an inseparable part of the Product and the use and application of this Software is strictly limited to the use and application of the Product as a whole, to be used in a Customer Application. It is strictly forbidden to extract, copy, amend or reproduce the Software and/or to otherwise infringe Omron's intellectual property rights on the Product and/or the Software, and doing or attempting to do so may be punishable by law.
3) Please confirm fitness of Omron products in your application and use your own judgment to determine the appropriateness of using them in such application. Omron shall not warrant fitness of Omron products in customer application.
4) "This product" is intended to be embedded in other devices, "This product" alone does not obtain various standards certification in each country.
5) "This product" is not intended for crime prevention and does not guarantee safety. Omron shall not be liable for any incidents that differ from the customer's intentions or assumptions as a result of the use of the Product.
6) The Product has a face detection feature. As such, the Customer shall take proper care of privacy, portrait right, copyright or any other rights of people.
7) Please confirm that Omron products are properly wired and installed for their intended use in your overall system.
8) When using Omron products, please make sure to (i) maintain a margin of

safety between the published rated and performance values, (ii) design to minimize risks to customer application in case of failure of Omron products, such as introducing redundancy, (iii) introduce system-wide safety measures to notify risks to users of Customer Device, etc., and (iv) conduct regular maintenance on Omron products and customer application.

9) Omron shall not be responsible and/or liable for any loss, damage, or expenses directly or indirectly resulting from the infection of Omron products, any software installed thereon or any computer equipment, computer programs, networks, databases or other proprietary material connected thereto by distributed denial of service attack, computer viruses, other technologically harmful material and/or unauthorized access. It shall be the users sole responsibility to determine and use adequate measures and checkpoints to satisfy the users particular requirements for (i) antivirus protection, (ii) data input and output, (iii) maintaining a means for reconstruction of lost data, (iv) preventing Omron products and/or software installed thereon from being infected with computer viruses and (v) protecting Omron products from unauthorized access.

10) Omron products are designed and manufactured as general-purpose products for use in general industrial products. They are not intended to be used in the following applications. If you are using Omron products in the following applications, Omron shall not provide any warranty for such Omron products.
   (a) Applications with stringent safety requirements, including but not limited to nuclear power control equipment, combustion equipment, aerospace equipment, railway equipment, elevator/lift equipment, amusement park equipment, medical equipment, safety devices and other applications that could cause danger/harm to people's body and life.
   (b) Applications that require high reliability, including but not limited to supply systems for gas, water and electricity, etc., 24 hour continuous operating systems, financial settlement systems and other applications that handle rights and property.
   (c) Applications under severe condition or in severe environment, including but not limited to outdoor equipment, equipment exposed to chemical contamination, equipment exposed to electromagnetic interference and equipment exposed to vibration and shocks.
   (d) Applications under conditions and environment not described in specification.

11) In addition to the applications listed from (a) to (d) above, Omron products are not intended for use in automotive applications (including two wheel vehicles). Please do NOT use Omron products for automotive applications. Please contact Omron sales staff for products for automotive use.

(4) Warranty Terms and Conditions

The terms and conditions for warranty of Omron products are as follows:

1) Warranty period: One year after the purchase.

2) Coverage: Omron will provide either of the following two services for the malfunctioning Omron products at its own discretion:
   (a) Free repair of malfunctioning Omron products at an Omron maintenance service location.
   (b) Free replacement of the malfunctioning Omron products with the same number of replacement/alternative products

3) Exceptions: Omron will not cover Omron products under its warranty if the cause of the malfunction falls under any of the following.
   (a) Usage in a manner other than the original intended use for the Omron products.
   (b) Usage outside of the usage conditions.
   (c) Usage of the product against the conditions described in "(3) Precautions"
   (d) Modification or repair made to Omron products by other than Omron personnel.
   (e) Software program embedded or rewrite by other than Omron or usage of such software.
   (f) Cause which could not have been foreseen with the level of science and technology at the time of shipping from Omron.
   (g) Causes originating from other than Omron or Omron products (including force majeure such as but not limited to natural disasters).

(5) Limitation of Liability

The warranty set out in these Terms and Conditions is the whole and sole liability for Omron products. There are no other warranties, expressed or implied. Omron and the distributors of Omron products are not liable for any damages which may arise from or be related to Omron products.

(6) Export Controls

Customers of Omron products shall comply with all applicable laws and regulations of Japan and/or other relevant countries with regard to security export control, when exporting Omron products and/or technical documents or providing such products and/or documents to a non-resident. Omron may not provide customers with Omron products and/or technical documents if Omron determine that they fail to comply with such laws and regulations.

Regional Contact

OMRON Corporation

Electronic and Mechanical Components Company

Americas
https://components.omron.com/us-en/
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