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96129E Digital Laser Sensor LV-N10 Series User's Manual: Before using the product, carefully read this manual and keep it in a safe place for future reference. This document outlines the basic operations and hardware functions of the LV-N10 Series. The manual stresses importance in reading safety precautions, warning users not to use the product as a human body protector or explosion-proof device. The correct usage is for object detection only, and it must be powered with DC voltage, avoiding AC power which may cause damage or explosion. Regarding the laser transmission, when set on external input, it can be stopped by turning the external input ON (2 ms or longer), and will resume within 20 ms once turned OFF. The manual is divided into sections for easy navigation: 1. **Before Using**: Outlines package contents, part names, and functions. 2. **Installation and Connection**: Provides procedures for installing sensor amplifiers and cables with operating precautions. 3. **Basic Operation**: Explains basic instructions for operating and setting the sensor amplifiers. 4. **Settings for Advanced Functions**: Describes settings for advanced functions of the LV-N10 Series. The table of contents highlights safety precautions, general precautions on laser products, regulations, and standards, as well as manual organization. Further sections detail preset display mode, two-point calibration, maximum sensitivity calibration, full auto calibration, positioning calibration, detection modes, output timers, and settings save/recall features. Before Using the LV-N10 Series, check the package contents to ensure all necessary equipment and accessories are included. The package should contain: * Transmitter (T) and Receiver (R) * Operation indicator (red) * Mounting bracket set * Transmitter F J F and Receiver Adjustment screwdriver N N * Plate nut x 1 and M3 x 15 screw x 2 * Adjustment trimmer Verify the contents against the part names listed: * Sensor Amplifier * Display/control unit * Hold lock lever * Hook * Expansion connector * Dust cover * M8 connector (LV-N10) * Connection cable (LV-N11) Note that the expansion cover is installed on the main unit when shipped from the factory, and not all units may have it installed. Additionally, some parts may be unavailable for certain models. Before using your LV-N10 Series sensor amplifier, ensure you understand the part names and functions: * MEMO 1 Before Using **Step (2)-1 Installation Procedure** * Ensure power is turned off before wiring. * Insulate unused input or output cables. Operating Manual Settings Quick Reference Guide: **Setting Zero Shift**: Set current received light intensity to zero (section 3-5). **Loading Recipe Function**: Load recommended settings (section 3-17). **Initialization**: Initialize settings (section 3-19). **Output Switching**: Configure output ON timing based on received light intensity (section 3-2). **Sensitivity Adjustment**: Adjust sensor amplifier's setting value by calibration methods: 1. **Preset Function**: Enable/disable preset function using the [PRESET] button. 2. **Work-Preset Function**: Calibrate two random set points to "100.0" and ".0" with the received light intensity at ".0". 3. **Maximum Sensitivity Preset Function**: Calibrate reference state to ".0" and a slightly higher state as "100.0". Other Calibration Methods Percentage calibration establishes a setting value based on a percentage of the current received light intensity. When combined with external calibration input, this method enables highly accurate detection of transparent workpieces and small items. Refer to "Sensitivity Setting" for details. Zero Shift Function adjusts the display to show a received light intensity of 0 (zero). This function is primarily used with reflective sensor heads. It helps distinguish between changes in received light intensity. Note that zero shift cannot be used with the preset function. Loading Recommended Settings Recipe Function preregisters recommended settings (recipes) for each sensor head and application. To load a recipe, press and hold [SET] and [PRESET] buttons simultaneously, then select the desired recipe. Recipe List * Fall: detects falling workpieces * Percentage calibration (SEIP): sets a percentage of the current received light intensity * Zero-Shift (OSET): displays a received light intensity of 0 * MEGA: enables highly accurate detection * AREA: detects changes in received light intensity * DATUM: resets to factory default settings Initialization and Locking in MEGA Mode initialization reset the sensor amplifier to factory default settings. To initialize, press [SET] and [PRESET] buttons simultaneously for 3 seconds or more. Locking in MEGA Mode (1-Output Type Only) is available for 1-output type models only. This function locks the sensor amplifier in MEGA mode, regardless of power mode selection. Disabling Key Operation Key Lock disables all key operation to prevent unauthorized use. Activating key lock requires pressing [MODE] button and (or) simultaneously for 3 seconds or more. Deactivating key lock: Press and hold [MODE] button and simultaneously for 3 seconds or more. Screen displays "unl", enabling key operation. To disable key operation, set a PIN number. Activate key lock with PIN number by pressing (or) 10 times while holding down [MODE] button. Basic Operation: Screen displays "Loc 0". Press button to set desired number (up to 4 digits). Press [MODE] button to set current received light intensity. Settings for Advanced Functions: Chapter describes settings for advanced functions of LV-N10 Series. Includes settings for basic, detection, display, and system functions. ARTICLE This document discusses various settings and modes for sensor amplifiers, particularly for detection purposes. The Detection Settings (Func) mode allows for the use of external input to control functions such as display off, preset execution, and pause or sleep mode transitions. Additionally, it touches on the analog scaling capabilities of certain models like the LV-N11MN, which enables automatic scaling of received light intensity in relation to a 5 V analog output. The Display Settings (diSP) mode allows users to customize the display content, including reversing the current value and setting value displays. It also explains how to show a sub-display for specific settings, and how excess gain can be displayed as both a percentage number and a bar graph. **Chart for Standard Setting** The chart monitors light intensity levels, updating peak values based on received light thresholds. * When current light intensity exceeds set value, samples the peak. * If light intensity falls below threshold, updates previous peak value. **Display Settings (diSP)** This function allows setting methods as described in page 4-2. It displays excess gain instead of received light intensity, similar to the "received-light intensity hold display". The saturation level can be set between 100P and 200P when preset saturation is enabled. For example, if set at 150P, actual received light intensities exceeding "100%" are corrected to "110%". **System Settings (SYS)** This section includes settings for power consumption reduction and display adjustments. **Power Save**: Enables or disables the power save function. **Display Gain**: Allows adjusting received light intensity without affecting response time. **Std (Standard)**: Displays normal light intensity levels (default). **Full (Full)**: Displays full light intensity, with increased hysteresis. **Interference Prevention and Common Key-Operations Function** This section describes settings for preventing malfunction due to "interference" between sensor amplifiers. It also lists common key operations applied equally on the main unit. **Output2 Functionality** Display OFF (OFF) and ON (ON) are four functions that control output operations. The default setting enables common key operations, while the "Limt" setting (limit setting output mode) detects reductions in received light intensity for output1. When the cumulative minimum of peak value for output1 falls below the limit setting value, output2 is turned on. **Alert Function** The "Alert" setting (alert function) turns on output2 when an error occurs. This can be triggered by correction errors in DATUM1 or DATUM 2 mode or ERH reference. **Counter Output Mode** This mode counts the number of output-1 outputs and displays a timing chart. The timer types available are off-delay, without workpiece, and with workpiece. **Settings Save/Recall** The current setting value and advanced function settings can be saved in the sensor amplifier using the "Custom Save" function. This will override previously saved settings. To execute a custom save, press and hold the [SET] and [PRESET] buttons simultaneously for 3 seconds or more. The "rSt" display will flash. **User Reset** The settings saved with the custom save function can be recalled using the "User Reset" function. This will override all previous settings. If a user reset is executed without previously executing a custom save, the factory settings will be recalled. 5-1 Specifications Sensor Head (1) Type Model Laser class Adjustable spot type Coaxial reflective type Super small spot type Wide area reflective type Coaxial retroreflective type LV-NH32 LV-NH35 LV-NH37 LV-NH42 LV-NH62 5 Specifications MEGA 1200 750 1200 8000 ULTRA 1000 600 1000 7000 SUPER 750 450 750 6000 TURBO 500 300 500 5000 FINE 250 150 250 3500 HIGH SPEED 200 100 200 2000 Approx. Troubleshooting Error Displays and Corrective Actions: Adjusting Raw Received Light Intensity ----- When encountering issues with raw received light intensity, try adjusting the beam axis, removing contamination, or reviewing installation environment settings. Take corrective actions to increase original received light intensity levels. Error Display Solutions: * ERC Overcurrent in control output: + Check load and return current within rated range. + Verify that output wire is not touching other wires or frames. * ERH Head cable issues: + Check sensor head connection. + Confirm whether head cable is broken or sensor head not connected. Factory Default Settings (Default Values): ----- List of Default Settings: * LV-31: Disabled rising edge detection mode; operation occurs as Std when recipe r-1 is loaded. * When loading recipes r-3/r-4 with zero-line type LV-N10, preset functions are disabled. * When using preset function, read application settings other than r-3/r-4. Recipe Function Settings: ----- When the LV-S31 is connected and recipe r-1 is loaded, the rising edge detection mode is disabled, and operation takes place as Std. If the recipe r-3/r-4 is loaded with the zero-line type LV-N10, the preset functions will be disabled. When using the preset function, read application settings other than r-3/r-4. Restrictions on Each Detection Mode: ----- The sensitivity setting is limited according to the selected detection mode. Refer to the chart below for details. MEMO 6: ----- Appendix - Digital Laser Sensor LV-N10 Series User's Manual - 6-9 Index: ----- This index provides a list of terms used in this document in alphabetical order. **Power Select Switch** **Reference Page: Operation Procedures** 1. Press the **MODE** button. 2. Switch with the ** (3-4) ** button. **Initializing (Restore to Factory Default Settings)** 1. Press and hold the ** [SET] ** button and ** [PRESET] ** button. 2. Press the ** [MODE] ** button while on the rSt screen. 3. Select init with the ** () ** button. 4. Press the ** [MODE] ** button to execute. **Displaying the Output** 2. Display screen with the 2-output type **Basic Settings (page 4-4)** * Display Settings (**diSP**) (page 4-22) * MODE Press and hold for 3 seconds or more **Warnings and Limitations** * (1) 14... ** (page 4-33) * Light intensity detection mode (page 4-37) + Limit setting output mode (*15*) (page 4-34) + Warning output mode (*) (page 4-35) + Counter output mode (*) (page 4-35) + Timer OFF (*) (page 4-37) + Off-delay timer (*) (page 4-37) + On-delay timer (*) (page 4-37) + One-shot timer (*) (page 4-37) **Revision History** * Date of printing: December, 2010 * Edition: First edition * January, 2011. Second edition **Warranties and Disclaimers** KEYENCE warrants the Products to be free of defects in materials and workmanship for a period of one (1) year from the date of shipment. If any models or samples were shown to Buyer, such models or samples were used merely to illustrate the general type and quality of the Products and not to represent that the Products would necessarily conform to said models or samples. **Copyright** (c) 2010 KEYENCE CORPORATION. All rights reserved. **Safety Precautions** General Precautions: * This product is only intended to detect objects. Do not use this product for the purpose of protecting a human body or a part of the human body. * This product is not intended for use as an explosion-proof product. Do not use this product in a hazardous location and/or potentially explosive atmosphere. * This product uses DC power. Do not apply AC power. The product may explode or burn if an AC voltage is applied. * Do not wire the amplifier line along with power lines or high-tension lines, as the sensor may malfunction or be damaged due to noise. * When using a commercially available switching regulator, ground the frame ground terminal and ground terminal. * Do not use the LV-N10 Series outdoors, or in a place where extraneous light can enter the light-receiving element directly. * Due to individual dispersion characteristics and the difference in sensor head models, the maximum sensing distance or displayed value may not be the same on all units. **Warnings** NOTICE: Safety Precautions on Laser Product * This product uses a semiconductor laser for the light source. * Use of controls or adjustments or performance or procedures other than those specified herein may result in hazardous radiation exposure. Follow the instructions mentioned in this manual. Otherwise, injury to the human body (eyes and skin) may result. **Precautions on Class 1 Laser Products** * Do not stare into the beam. * Do not disassemble this product. Laser emission from this product is not automatically stopped when it is... 1.3 Output: 310 mW 290 mW FDA (CDRH) Part 1040.10 Class 1 laser product IEC 60825-1 Class 1 laser product Page 5 Introduction This user manual describes the basic operations and hardware functions of the LV-N10 Series. Read this manual carefully to ensure safe performance and function of the LV-N10 Series. Keep this manual in a safe place for future reference. Ensure that the end-user of this product receives this manual. Symbols The following symbols are used in this manual to alert you to matters concerning the prevention of injury and product damage. Always read these sections. Indicates cautions and limitations that must be followed during operation. Indicates additional information on proper operation. Indicates tips for better understanding or useful information. Indicates reference pages. It indicates a hazardous situation which, if not avoided, will result in death or serious injury. It indicates a hazardous situation which, if not avoided, could result in death or serious injury. Failure to follow the instructions may lead to minor or moderate injury. Failure to follow the instructions may lead to product damage as well as property damage. Point Important CAUTION DANGER NOTICE WARNING Reference Safety Precautions 2- Digital Laser Sensor LV-N10 Series User's Manual * The laser classification for FDA (CDRH) is implemented based on IEC60825-1 in accordance with the requirements of Laser Notice No.50. Laser Transmission OFF input When the laser transmission OFF input is set for external input, the laser transmission can be stopped by turning the external input ON (2 ms or longer). The transmission is stopped while the external input is ON. Once the external input is turned OFF, the laser transmission will resume within 20 ms. UL Certification This product is a UL/C-UL Listed product. (Contact KEYENCE for information on heads which support UL-certification.) * UL File No. E301717 * Category NRKH, NRKH7 * Enclosure Type 1 (Based on UL50) Be sure to consider the following requirements when using this product as a UL/C-UL Listed Product. * Use a power supply with Class 2 output defined in NFPA70 (NEC: National Electrical Code). * Power supply voltage is 10 - 30 VDC. * Power supply/External input/Control output shall be connected to a single Class 2 source only. * Use with an over current protection device which is rated 30V or more and not more than 1A. * Use this product under pollution degree 2. CE Marking Keyence Corporation has confirmed that this product complies with the essential requirements of the applicable EC Directive, based on the following specifications. Be sure to consider the following specifications when using this product in a member state of the European Union. ● EMC Directive (2004/108/EC) * Applicable standard EMI : 60947-5-2. Class AEMS : 60947-5-2 When connecting with the NU-CL1, always install in a conductive enclosure (control panel, etc.), and wrap a ferrite core (E045R401938 manufactured by Seiwa Electric Mfg. Co., Ltd.) one turn around the sensor head cable. These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of the EMC Directive. The manufacturer of the end-product is solely responsible for the compliance of the end-product. Safety Precautions for Digital Laser Sensor LV-N10 Series User's Manual The user manual states that safety precautions are essential when handling the digital laser sensor. General precautions include wearing protective eyewear, keeping loose clothing and long hair tied back, and avoiding exposure to extreme temperatures or vibrations. Precautions on Regulations and Standards are also outlined, emphasizing the importance of adhering to relevant regulations and standards when using the device. Installation and mounting procedures for the sensor amplifier and sensor head are provided, along with wiring diagrams and connection instructions. The manual also includes guidance on adjusting the sensitivity and preset functions. Additionally, the user manual covers various chapters, including before using the device, installation and connection, basic operation, and quick reference tables. Looking for troubleshooting the Digital Laser Sensor LV-N10 Series? Start here: www.lv-n10.com. Troubleshooting Instructions ----- 6-25 Troubleshooting Tips and Tricks ----- 6-26 Appendix A1 Device Installation Instructions ----- 6-27 Appendix A2 Calibration Procedures ----- 6-28 Appendix B1 List of Specifications ----- 6-29 Appendix C1 User Manual Index ----- 6-30 Technical settings menu contents: Detection modes and timing options Output display settings: timer, mode, and external input configuration Parameter saving features Analog scaling functions specific to certain models Display settings: reverse display, sub-display, and saturation control System settings: power save, gain adjustment, interference prevention, and sensitivity tuning Advanced output settings for specific models