The extensions in Table 2 denotes situations which difficulties to connect elements/groups within an automation systems/ machine. Table 13 would be a new application if the persons in the plant are connected wireless. They shall not be in the proximity of a machine during dangerous actions.

Table 2 List of wireless applications and communication requirements for equipment control

Controlling, operating and commanding of production equipment and auxiliary equipment

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Wireless application | | Communication requirements | | | |
| Purpose | Corresponding Information | Transmit Data Size (bytes) | Communication Rate | Delivery Time Tolerance | Node density |
| 1 | control of liquid injection | water volume | 64 | once per 1 min. | 100 ms. | 1 |
| 2 | operation of conveyor control switch | PLC | 16 | 5 per day | 100 ms. | 5 |
| 3 | AGV control | Go signal, positioning | 100 | once per 1 min. | 100 ms. | 1 to 10 |
|  | **Bottle filling** | **fill valves** | **400** | **once per ms** | **500 µs** | **2** |
|  | **Warehouse** | **stacker crane positioning** | **10** | **once per 2 to 5 ms** | **1 ms** | **1 to 20** |







































Table 13 List of wireless applications and communication requirements for Human safety

Ensuring the safety of worker

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Wireless application | | Communication requirements | | | |
| Purpose | Corresponding Information | Transmit Data Size (bytes) | Communication Rate | Delivery Time Tolerance | Node density |
| 34 | detecting dangerous operation | image | 6K | 10 per s. (10fps) | 1 s. | 1 |
| 35 | Collecting bio info for managing worker safety | vitals information  (wearable) | 100 | once per 10 s. | 1 s. | 9 |
| 36 | vitals information  (fixed, relay) | 200 | once per 1 min. | 5 s. | 20 |
| 37 | gait | about 100K | ~10 per s (1fps~10fps) | 1 min. | 10 to 20 |
| 38 | detect entry to forbidden area | body temperature, infrared | 2 | when event occurs | 1 s. | 1 |
|  | **detect entry in the proximity of a machine** | **position of human (via connected wireless unit)** | **10 - 30** | **100 to 1000 per s** | **2 to 20 ms** | **1 to 50** |