



**Technical specification** V1-0\_3060100/20170512/W3/EN

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## Specification for Traceability system – end control fuel collector assembly line.

**Version 1.0**

EDV No.	Drawing No.	Customer	Machine No.	Tool No.
3060200	1sk-33607	BMW		
3061200	1sk-33608	BMW		
3060100	1sk-42669	BMW		
3061100	1sk-42670	BMW		
3854000	1sk-38077	PSA		

## History of revisions

Version	Date	Author	Reason of change / description
1.0	12.05.2017	Rafał Galez	First version

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## 1. General requirement.

Supplier must deliver the Traceability system which controls the flow of material through the line and to collect the parameters with which parts were produced. Collected data must be sorted and accessible. This ability must be validated due to trials. System must block machines if the processed parts flow is incorrect or parts were manufactured unsuccessfully.

The destination place to install and start up the machine, subjects of this specification is Winkelmann Powertrain Components plant in Legnica:

**Winkelmann Sp. z o.o., ul. Jaworzynska 305, 59-220 Legnica (hereinafter as Winkelmann)**

Engineer from Winkelmann IE department, responsible for this project should accept the construction of the machine before the purchasing process of components will start. Documentation should include assembly drawings with overall dimensions, the location of connections for process media with dimensions, points of loading and unloading of parts, areas access to the components that require periodic maintenance (doors, drawers, etc.). Acceptance of machine design does not relieve the supplier from the obligation to comply with all specified requirements in this document.

Documentation of the machine should contain all elements required by law and in particular, the declaration of conformity with complete list of directives for which the analysis was carried out. All documents should fulfil local regulation corresponding to the regulations of installation site.

The machine has to be CE marked (Conformité Européenne).

After placing of purchasing order, the supplier shall designate a project manager who will present within three weeks schedule of work, with at least following points:

- develop the concept of the device,
- the development of mechanical construction,
- development of automation,
- assessment of machine construction – should be planned not shorter than 1 weeks,
- lead times of purchasing components, whose realization is longer than one week,
- manufacturing of parts requiring machining,
- assembly of machine,
- manufacturing of control system
- supplier, internal tests,
- date of preliminary acceptance,
- ready for shipping,
- date of installation on site completed by final acceptance,

All documents, drawings, pictures supplied by Winkelmann for this project shall be considered as confidential and may not be transferred to third parties without the written permission of Winkelmann.

The machine must be delivered with set of fast wearing parts that will ensure the ability to work over a period of minimum 1 month.

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Machine manufacturer guarantees availability of spare parts over a period of 10 years.

Manufacturer, except nameplate cannot mount information having the promotional features (company logo etc.)

All deviations out of the specification must be marked / separately placed by the offer, otherwise spec must be taken without deviations – all deviations must be accepted by Winkelmann IE representative and the supplier.

## 2. Function (description).

System must realize following functions in defined sequence:

Functions:

- Marking of the part.
- Checking if the marking is correct.
- Secure that marking is in the right place.
- Checking if part is present.
- Securing that only designed type of parts can be processed.
- Secure that during processing marking is not damaged (marking position).
- Securing that during marking only allowed surface can be marked.
- Marking – must be readable and have min. class 2 DMC.
- Communication with machines – collecting processing parameters, canceling the process (if part must not be processed, Reading the marked marking, data analyzing).
- System must match the information about marked part and prepare whole information about parameters and flow of each part.
- Allow to install tooling and produce new specifications in the future with and without registration in the system – (high access account)

Sequence:

- Parts are placed in the machine.
- Cycle starts with pressing Start button.
- Part is marked (defined marking with witch is recognizable for the system).
- Part is placed into the processing nest (first sensor assembly and flow check – parameters and part type is defined by the tooling and automatically chosen by the machine program).
- Cycle starts with pressing Start button.
- Vision system is reading the marked part number.
- Vision system (existing) is checking the sensor type and reading its DMC content.
- Process release is made.
- Machine process the part (process parameters are reed in the machine).
- Process ends (positive IO or negative NIO – **we analyze only positive result as a flow**)
- Database is collecting result (IO, NIO), time information, sensor number, parameters during the test (screwing torque and angle, flow rates, part type) and matching it with marked part number.
- Part is placed into the processing nest (second lockage test – parameters and part type is defined by the tooling and automatically chosen by the machine program).
- Cycle starts with pressing Start button.

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- Vision system is reading the marked part number.
- Database is checking if the part was processed as IO in previous steps.
- Communicates a release signal.
- Process release is made.
- Machine process the part (process parameters are read in the machine).
- Process ends (positive IO or negative NIO – **we analyze only positive result as a flow**)
- Database is collecting result (IO, NIO), time information, parameters during the test (leakage rate) and matching it with marked part number.
- Part is placed into the processing nest (third Customer number laser marking – parameters and part type is defined by the tooling and automatically chosen by the machine program).
- Cycle starts with pressing Start button.
- Vision system is reading the marked part number.
- Database is checking if the part was processed as IO in previous steps.
- Communicates a release signal.
- Process release is made.
- Machine process the part (process parameters are read in the machine).
- Process ends (positive IO or negative NIO – **we analyze only positive result as a flow**)
- Database is collecting result (IO, NIO), time information, parameters during the test (customer part number, DMC class – by every verified feature) and matching it with marked part number.

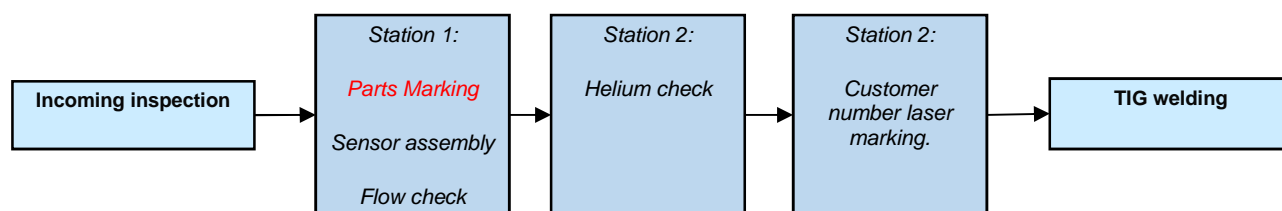
If process is not positive:

- Database is collecting data, and matching them with marked part number.
- Sets status of part as NIO
- Prevents to process the NIO part or part which was not processed in previous steps – no release signal.

During all activities of the machine all positions must be taken into consideration, during programming, to set correct reports or fault information on the machine screen, no situation with undefined position is allowed.

Component on entry of the machine is fuel rail coming from gauge control.

Material flow shows diagram below:



All trials to prove machine ability to produce ordered performance, must be done and proved before purchase. Supplier must deliver proofs or samples to test the solution.

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Parts must be marked with counter, counter must have min. 8 digits.

This marking / counter is a control value during flow of the process.

Marking position must be defined by system supplier.

Marking must not affect the part features.

Database must be easy searchable with all collected data features.

## Station 1

Tooling:

Two sets – each with two nests, each nest for other construction / specification.

Specifications:

EDV No.	Drawing No.	Customer	Machine No.	Tool No.
3060200	1sk-33607	BMW		
3061200	1sk-33608	BMW		
3060100	1sk-42669	BMW		
3061100	1sk-42670	BMW		

Marking station have to be installed.

Marked number vision system must be installed.



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## Station 2

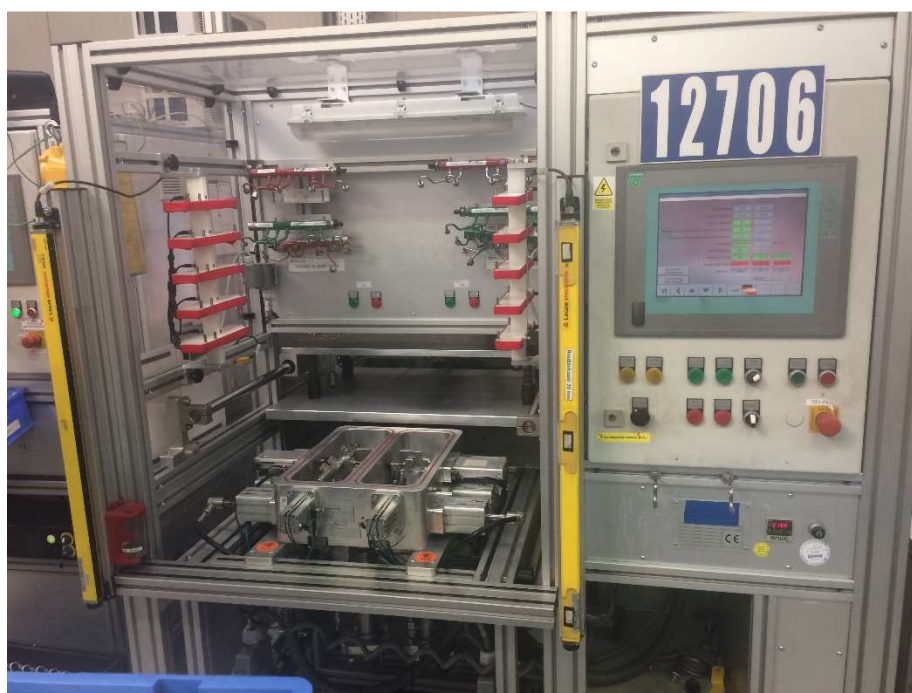
Tooling:

Two sets – each with two nests, each nest for other construction / specification.

Specifications:

EDV No.	Drawing No.	Customer	Machine No.	Tool No.
3060200	1sk-33607	BMW		
3061200	1sk-33608	BMW		
3060100	1sk-42669	BMW		
3061100	1sk-42670	BMW		

Marked number vision system must be installed.



## Station 3

Tooling:

Two sets – each with two nests, each nest for other construction / specification.

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One set with one nest (PSA) – have to work out of the database system.

Specifications:

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3061100	1sk-42670	BMW		
3854000	1sk-38077	PSA		

Marked number vision system must be installed.



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## 2.1. Product.

The final component in this process is fuel rail, it's component of fuel system for an internal combustion engine. Rail are working combined with: fuel pump - fuel rail - injector. High-pressure fuel is supplied to the fuel rail which through the injectors is delivered to the combustion chamber in precisely controlled time and amount of fuel.

Critical point of this component is a connection of steel element of fuel rail and all connecting surfaces.

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## 2.2. Tasks and procedure.

Tooling and Machine have to meet all following requirement:

- After modification machine must work in manner to guarantee ability for changeover between tooling (if applicable).
- Design of machine and program have to prevent situation which can cause sending of NiO parts to the customer in normal automatic mode of machine (in case of machine failure, incorrect media parameters, etc.),
- during project acceptance all points disputable points will be resolved in favour of the customer,
- all components of pneumatic, electrical circuits should be described (labelled) for quick and easy identification of single component on diagrams / drawings, and also on spare parts list, all documents must have the same marking system on which they can be compared, identified and proved.
- Modification must be executed in manner of "Algemeines Lastenheft"
- program must not start the cycle when the part is not in the tooling, also incorrect placing of the part must be recognized by the machine.
- Valves connection cannot influence each other, if one is jammed open.
- System must be analysed for the failure scenarios and be secured against improper test.
- 

### MAINTENANCE:

- should be equipped with Ethernet interface use for remote access in case of machine breakdown,
- Planned maintenance operations for operators, performed during production shift, can't be longer than 10 minutes per shift.

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- should allow to work in manual mode (for maintenance purpose), but activation have to be protected by password on HMI panel and mechanical switch / key,
- manual mode should be protected against damage caused by improper use,
- Program must archive a history of all users logging in and an activity history.

#### DOCUMENTATION:

- according to "Allgemeines Lastenheft" complete documentation should be delivered on CD/DVD,
- should contain troubleshooting of most popular failures, described way of resolving it,
- Troubleshooting for test process, which help to understand egg. what kind failure of part cause NiO results of test,
- procedure how to perform the full test of the part in manual mode,
- start-up procedure, with parameters,
- shut down procedure,
- list of alarms (text which are displayed on HMI) and description which helps to understand cause of failure,
- screenshots of complete HMI, with description of every function: button, value or operating status,
- procedure for changeover, including set-up of process/machine parameters,
- risk assessment,
- in case machine will be equipped in tanks for which factor PV > 300 supplier should add:
  - o technical description of tank,
  - o Declaration of Conformity,
  - o user manual for the tank,
  - o Technical drawing of the tank (dimensions, wall thickness, etc.)
  - o pneumatic/hydraulic diagram,
  - o drawing with localization in the machine, where is located,
  - o type of pump,

#### SAFETY:

- preventing possibility to enter into a danger zone by using of electromagnetic locked doors, which are released by appropriate option on the HMI, and only during OFF mode of the machine
- in case of interrupt light curtain, machine can start only after acknowledge this fault by operator of the machine,
- After switch off, machine have to reach zero energy status, egg. no pressure inside pneumatic actuators, furthermore all moving parts should be locked to avoid any movements caused by gravity,
- if machine will require access for any elements of the machine at a level above 1,8m machine should be equipped in ladder, handrail or any other elements which ensure safe work,
- Machine must be equipped with emergency stops in each working area. After release of lock (back to the state before stopping) the machine cannot start automatically, restart is possible only after approval (acknowledge) made by the operator,

#### WORKING CONDITIONS:

- temperature 10 – 50°C

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- Humidity 20 - 90 %
- Atmospheric pressure 950 – 1050 hPa

Otherwise must machine be air-conditioned.

## OTHERS

- warranty - 24 months,
- ergonomic of working area should meet position 112 according to OWAS methodology,
- maximal accepted noise level is 74dBA, for more detail see "Allgemeines Lastenheft",
- In case of break down supplier must start the activities to solve the problem after problem identification by the machine in 48 hours otherwise will pay penalty amount for delay.
- supplier describe maximal working time (in hours) for fast wearing parts,
- supplier describe maximal working time (in hours) for main machine's sub-components,
- supplier will be obligate to store fast wearing parts in own storage during warranty period – during negotiations,
- all machine's fixing and service inspection during warranty period are free of charge, including travelling and accommodation costs - see attached document with marked responsibility of supplier and user,
- Machine must fulfill LOTO (lock out – tag out) manner, and must be properly equipped.
- All media and described according to Placard manner.
- 

## 2.3. Interfaces.

- Basic language of HMI should be Polish (active after start-up), with possibility to change for German. Polish language are valid also for alarm texts,
- counting all iO and NiO parts and display this information on HMI,
- System should be equipped in data base with historical parameter: measured value for every cycle, total cycle time and summary of the working shift: number of NiO, iO parts and number of retested parts (for each shift). Should be possible to make backup copy of all information.
- HMI panel should have visualization of operating status of electro-pneumatic valves, sponsors, pumps, process values, status of testing chamber (close/open), etc.
- on main panel of HMI should be button which activate Dummy mode, in this mode parts have to pass through standard testing procedure except marking (even if parts is OK) and if test result is negative (NiO part) system will not require to insert the part into the NiO box. Part, tested during this cycle, are not added to main counter with iO and NiO parts. Dummy mode have to be switched off automatically after one cycle and system should store information about time when last dummy mode was activated,
- HMI panel on main page should display step of the process which are executing, test results (iO or NiO) and measured value, parameters of the test and all errors (if are active),
- result of the test should be indicated by green (iO test) or red (NiO test) lamp/light in area of the tool, where operator put the part,
- Counter (time or number of cycles) for fast wearing parts where are defined max time when should be change. When system will reach specified limit, display information on HMI that

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maintenance are needed. Actions which can be performed by operators can be reset by operator, but actions for which intervention of maintenance is needed, can be reset only using a password for maintenance/service,

- HMI should have service page which shows runtimes for all main component which required periodical maintenance,
- HMI should display total number of cycles, total working time of machine and main cycle time,
- HMI should have list of historical alarms, at least 50 position,
- HMI should have graph with historical values of main parameters (defined during pre-acceptance),
- access for HMI should be granted on four different levels protected by individual passwords:
  - o operator – preview of process parameter and test results, reset of parts counter, reset of faults, all functions to start the machine
  - o supervisor – access for NiO box, access for faults history, forcing reference test program,
  - o Maintenance – access to hand function.
  - o engineer/Administrator – access for all functions and user administration.

Login and passwords same like access level for specific structure of HMI will be define during pre-acceptance. All above levels and password, should be granted to client,

- window for changing passwords, access levels - should be granted on Admin level,
- machine should be equipped in single media connections which should be positioned on the top of machine, back corner of the machine,

#### Media connection

- compressed air : 6 (+/-1) bar
- electric current: 230/400V

## 2.4. Control system.

- System shall be designed and manufactured in accordance with the Machinery Directive. All components of the purchase should have the CE certificate,
- should be equipped with lights indicating the status of the machine, as beacon or similar system, according to EN 60204-1:2006,
- system have to be equipped in Auto Test sequence, if Auto Test using the reference value/pattern, shows differences between read and expected value, system should contain element for calibration (correction factor),
- PLC can't be emulated by HMI of machine, have to be hardware,
- voltage of control systems should be 24VDC, all exceptions should be agreed and accepted by Winkelmann on development phase,
- all control cabinets should be built in a way that the internal temperature does not exceed 50°C in full range of ambient temperature, must guarantee stable work in range of working temperatures.
- all electrical components (boxes, cabinets, cabling) should be protected according to IP 54 standard,
- every alarm (machine fault and NiO part) should be signaled on the panel, by light and sound signal,

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- PLC and HMI software have to allow access, editing and modification by Winkelmann maintenance department in case if any modification will be needed, access for software cannot be protected or limited,
- PLC program should be written in LAD (*Ladder Diagram*) language, can be use Graph, STL are not allowed,
- all project for PLC and HMI should be supply on CD/DVD with comments for important part of software to allow good understanding how control system are working – must be accessible (no password or other protection side supplier is allowed) – access must be guaranteed after warranty period (example: data stored on hard drive locked in the envelope) – during negotiations,
- in case if internal communication are needed, manufacturer implement Profinet communication,
- electrical cabinet have to assume space for future expansion, should have at least 20% of free area (not used) and minimum 8 digital input and 8 digital output should be free,
- inspection door for electrical cabinet should be open on beck side of machine, if necessary on one side,
- Additional switch for Dummy procedure (without laser marking)
- Parameters for the part spec must be automatically chosen after placing the part in the fixture.
- Source program with descriptions must be delivered and hand on at WPL representative at final acceptance.

## 2.5. Purchasing components.

List of purchasing components are listed in attached “Allgemeines Lastenheft” but in case of contradiction, priority have parts listed below:

- spectrometer - Inficon LDS 3000,
- PLC controller – Siemens S7-300 (allowed also S7-1200, S7-1500),
- camera for DMC system – Keyence,
- pumps – Leybold,
- high pressure valves – co-ax,
- vacuum valves – Inficon, VAT,
- equipment (buttons, switches, etc.) - Moeller,
- inductive sensors – Balluff (PNP type),
- pneumatic components - Festo, SMC,
- pressure sensors – Balluff, WIKA,
- flow meter – Bronkhorst, Vögtlin
- pressure control valves – Bronkhorst, Vögtlin
- sensor for pneumatic actuators (position check) – Festo, Balluff,
- HMI panel – Siemens (min 12inch),
- aluminum profiles – MK
- compressed air treatment unit – Festo
- safety light curtains – Leuze (Balluff), SICK, Keyence,
- safety gate monitors – PILZ,
- e-stop relay – PILZ,
- motors / gearmotors – SEW, NORD,
- servomechanism – Siemens, Festo, SEW,

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- Inverters – SEW, Simens,
- 24VDC power supply – Balluff, Siemens,

## 2.6. Test run description.

Acceptance will be divided in three parts:

Phase 1 – design approval:

- design meet the basic functions of the machine
- verify that all ergonomics requirements are meet
- assembly drawings + bill of materials,
- list of purchasing components,

Phase 2 – pre-acceptance:

- verification of safety systems,
- verification Poka -Yoke,
- access levels for HMI panel
- run of in automatic mode,
- process capability analysis,
- verification of machine documentation,
- verification of reference parts (patterns),

Phase 3 – final acceptance:

- machine documentation are complete,
- verification of productivity,
- device calibration according to patterns,
- CE certificate of the machine,
- list of spare parts,
- manuals for machine: changeover, maintenance, Safety & Health,

Full list for acceptance procedure are in attached document.

## 3. Tact time / production information

Must not impact cycle time on the machines.

Cycle time contain full sequence of work: machine cycle time manual operation and additional operation if needed.

Cycle time should be understood as time interval which begin when automatic cycle of machine is started (through full machine cycle) until new cycle time are started.

Cycle time = full machine cycle time + removing tested part + place new part for test + start of the new machine cycle.

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- Machine should be design to work 3 shift/day, 5 days/week, 48 week per year.

## 4. Delivery date / delivery condition

- Tooling / machine or/and modification must be delivered to Legnica plant till KW 26 **2017**
- If it is not possible, we accept delivery on KW 26, without documentation, but machine must work in automatic mode (allowed to be addjusted), all work must end till KW 29
- all requirement of supplier according to unloading and installation process on Winkelmann site: tool, machine, forklifts, have to be define by supplier at least 1 month before shipment,
- in case if WINKELMANN are responsible for unloading machine, after loading on supplier site, manufacturer of the machine have to send instruction for machine handling. Documents should be send immediately after loading,
- in case if transport are Winkelmann responsible, supplier should submit accurate data related to dimensions of Cargo and Cargo weight, define how to secure cargo for transport,
- due to the design of loading and unloading area at WINKELMANN, truck must have access to load from both sides - trailer should be adapted to loading in this way (onboard - curtain),
- truck should have adequate safeguards to protect the goods during transport (the right amount of clamping belt and locking blocks and others equipment to protect cargo),
- After shipping of the machine, supplier should prepare shipping protocol which describe status of the machine (egg. using a pictures) and protecting method of cargo. If supplier does not fulfill this requirement, any damage or missing machine parts/elements are supplier responsible and all cost are cover by supplier,

## 5. Acceptance condition.

Acceptances may begin if supplier will declaring that the operation control system has been verified and all security systems are fully functional, and trials on this machine are safe.

During the pre-acceptance supplier provides a person to operate on the device in order to verify the machine performance.

Winkelmann Company will supply components / parts for test if needed.

Process capabilities should meet requested level.

All test and measuring devices must fulfil Cpk, Cgk, Cmk higher than 1,67 for all processes or must be certified by supplier or authorized calibration laboratory.

All measuring devices must fulfill MSA requirements.

1 shift automatic run or minimum 500 pcs.

During acceptance, continuous (no brake down, no set-up) production run is required. During this run must be done with stable cycle time.

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Checklist used during all phases of manufacturing of the machine are one of the attachments for this document.

Stable tact time, measured during run.

Validation of produced parts to act as an braze blocker - no failure is allowed.

## 6. Contact persons.

- Mariusz Gajdzis – Project management WPL
- Rafał Galez - Industrial Engineering WPL
- Michał Zasiadły, Anna Chrenowska – Technical purchasing (TEK) WPC/WPL

## 7. Attachments.

- Alleghenies Lastenheft – German Language,
- drawing of complete part 1sk-42669
- drawing of complete part 1sk-42670
- drawing of complete part 1sk-33607
- drawing of complete part 1sk-33608
- check list for acceptance,
- OWAS,
- MSA
- Oznaczenie mediów.
- Placard pusty
- Specyfikacja sprzętu LOTO.
- Sensor drawings.

## 8. Action plan

N/A

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