



July 2024

ePTO public survey

Summary and Q&A



CONTEXT

In November 2023, ACEA launched a public survey on the draft specification for an ePTO interface with a view to receive input from stakeholders to support its development.

More than 70 completed surveys exceeded our expectations. The responses came from all stakeholders in the field of ePTO as trailer manufacturers, connector suppliers, body builders and ePTO customers/users. ACEA would like to take this opportunity to thank all participants for their active participation in this survey. This strong participation shows us that we are on the right track with our activity on the specifications for ePTO.

In this paper, we provide a summary of the results of this public survey. We have sorted these results into four categories: "Application", "Standard Features", "Standards & Guidelines", and "Questions and Answers".

At the end of the paper, we also provide a list of PROs and CONs on the frequently asked question regarding why we did not provide for AC support in our specification.

In the next few months, we will review our draft specifications based on the fruitful responses which we have received from the survey with a view to develop the first final specifications by the end of the year.

SUMMARY

APPLICATION

Context

This section contains the main applications for ePTO provided by respondents. It provides an overview of the most reported and planned applications.

Please note that we did not focus on fixed body works applications as this is already covered by SAE activities for a standard.

ELEMENTS RAISED BY RESPONDENTS

- E-axle: Improving brake performance through recuperation
- Trailer as range extender (onboard HV batteries, bi-directional energy transfer or other power supply at the trailer)
- Trailer battery charging
- Communal services e.g., green care
- Pumping system for liquid gas
- Pumping systems for concrete
- Hydraulic pumps (crane, tipper, mixer, aerial work platform ..)

- Fridge container
- Special application fire department
- Road tanker
- Aerial work platform
- Fixed body works – not covered by our specification (covered by SAE specification)
- Most of the HV consumers are part of the IT net trailer/semitrailer

STANDARD FEATURES

Context

This section provides a summary of the most reported features for applications for ePTO which respondents wished to see supported. This shows that the draft specifications already meet the most reported and needed support for features (e.g., power classes).

Elements raised by respondents

- Usable both stationary and while driving
- Compatibility
 - All power classes up to 100 kW, special apps up to 350 kW
- High inrush current peaks are expected
 - Up to 230 A for up to 3s
- Easy to use
- Flexible and fast CAN signalling interface
- Pricing and availability
- ECE R100 aspect
 - see “technical supplement”
- Wire cross section 35 – 50 mm²
- 3 phase 400VAC: standard plug is existing (CEE or Harting)
 - see Pro_Cons_AC_HV
- HV shielded connectors are needed because of EMC requirements
 - Separated shielding for HV and LV (signalling)
- Use case description
 - High cycle usage (e.g. refrigerator)
- Mating cycles
 - 5000 are acceptable in general. Future applications might need more mating cycles

- Lifetime shall be at least 10 years
- The monitoring of mating cycles is confirmed
- HVIL should be provided to the trailer
- IMD at truck recommended
 - Dependent upon the concept (galvanic separation) more than one IMD on system basis may be necessary
- Emergency stop in cabin (additional pins at LV interface can be used)
- ISO 11992 + signals in the draft specification signalling seem to be sufficient
- Signals for state of charge (already in specification), estimated remaining distance shall be provided
- Integrated RFID technology could be an alternative to the power class detection (proposed resistor)

STANDARDS AND GUIDELINES

Context

This section summarises the answers received concerning standards and guidelines that respondents indicated to be relevant for ePTO and applications.

Elements raised by respondents

For mobile working machines, Low Voltage and Machine Directive must be fulfilled as well.

- EMC
- EN12609, EN280, EN 61800-5
- ISO 6469, ISO 16750, ISO 26262, ISO 7637, ISO 17409, ISO 21498, ISO 19642
- IEC 61140, IEC 60364
- MBN 20123, MBN 11123
- ECE R100

QUESTION AND ANSWERS

CONTEXT

This section provides a response to the most relevant questions asked by respondents to the survey. We selected the questions we believe to be the most relevant and interesting for the majority of stakeholders, and not only relevant for a special application.

SELECTED QUESTIONS

Q: Would it also be possible to have a separable plug connection on the trailer side?

A: The normal application with ECUs and consumers in general is to have a header connector at truck side and a plug with cable at trailer side. If you like to do it the other way round just go for an extension line which covers all your needs as i.e. the proposal in the technical supplement does.

Q: Can the multi-core HV cable e.g. be divided into two single-core cables?

A: Yes. It's a matter of the interface plug housing to cable. Sealing and EMC might be an issue and think about EPB line and low voltage lines (HVIL).

Q: Based on the Legal aspects, it would be possible to do a homologation for the bodybuilding part with the truck and have it fully integrated. Is it possible to add this an option the proposal?

A: To our knowledge the truck w/o the body is homologated on system level. With the multistage permission an integrated body works will be subsequently homologated on system level together with the truck. The latter one either as a delta review or as a complete review depending on the process of the technical service.

=> No topic of the HV interface requirements

Q: I'm curious if there is also a design concept for the high-voltage (HV) cable (not the connector) that connects the truck to the trailer (durability and safe operation). And if guidelines are there on how the cable is/should be suspended between truck and trailer.

A: This is not the focus of the ACEA specification. In fact, this is an issue but, it is an issue dependent on the application. The ACEA proposal is not intended to give a solution for all applications but to show a way how an interface may work.

Q: Proposed connector is too heavy for our application. We need a light version

A: As always this is a matter of robustness and cost. The proposal is not to exceed 10 kg. If during development (yet to come) the unit will end at 2 kg this is generally acceptable. Please keep in mind that additional weight will be introduced by the cable.

Q: Power prediction for the trailer helpful (consumption, recuperation for the truck)?

A: Yes, might be helpful but not mandatory (should be added to the specification for signalling)

AC HV INTERFACE: PROS & CONS

Context

Finally, we received very many responses questioning why the draft specifications do not provide AC support. While some explanation is provided in the draft supplement, we believe it is important to provide additional Pros and Cons. Based on these, we elected not to provide AC support in the draft specifications.

We want to point out that AC support is still possible (as it already exists), despite the fact that it is not provided for in the draft specifications. We believe it to be an OEM-specific feature, which is already defined in other specifications.

Overview

Weight

Additional AC supply from truck to trailer will increase truck weight and thus reduce payload of the truck even if a trailer is not used.

Since the AC HV consumer(s) at the trailer is (are) not always the same the AC supply of the truck has to be designed for the maximum power class of the possible trailers. This means also maximum weight of the AC converter at truck side.

Brushless DC motors at consumer side on the trailer offer very dynamic speed and power, high efficiency over the entire speed range and the e-motor and inverter can be kept very small due to high control frequencies.

Hence, a DC power supply at the truck side with galvanic separation can be kept very small at comparable power classes due to higher control frequencies.

Frequency

When talking about AC supply, we are always referring to 50/60 Hz e-motors. This means that the consumers at the trailer will be operated with bulky 50/60 Hz e-motors. If you need a variation of speed, you need a frequency converter with its inherent limitation of minimum and maximum speed and poor overall efficiency of the converter/e-motor combination.

A better solution is to implement an DC inverter/e-motor at the trailer tailored to its needs (power class). Here you will end up in maximum efficiency (maximum range) and minimum reduction of payload.

Dual power supply AC and DC

This means you will have to introduce both at a truck: Galvanic Separation of a DC power supply and galvanic separation of AC power supply.

If a common PE/EB is used, then only one (AC or DC) can be use at a time => Interlock necessary (Contactor box) at truck side

Either you use a connector with a pinout similar to CCS (very bulky for 100 kW each) or you use two outlets. The latter is a possibility for body builders using an emPTO and a DC ePTO.

A major benefit of truck supply of AC 50/60Hz is of course that all trailers with 50/60 Hz consumers can be operated also by eTrucks. In respect to efficiency and range it is the worst solution.

Questions	Answers	
Q1 Does your company plan to create applications that use HV power supply of the truck to trailers/semitrailers?	Yes	76%
	No	24%
Q2 Would a standardized pluggable HV interface be an advantage for your company?	Yes	88%
	No	12%
Q3 Are the proposed voltage and power classes acceptable?	Yes	75%
	No	25%
Q4 Would you anticipate using all three power ranges or could some be omitted?	Yes	53%
	No	47%
Q6 Do you anticipate loads with high peak currents (load dump, inrush)?	Yes	68%
	No	32%
Q7 Do you need shielded HV current conductors?	Yes	78%
	No	22%
Q8 Do you need the support of AC?	Yes	49%
	No	51%
Q10 Are the mating cycles of 5000 acceptable?	Yes	90%
	No	10%
Q12 Is an actuating force of the HV connector of 100N acceptable?	Yes	80%
	No	20%
Q13 Is the lever actuator acceptable or do you desire an alternative?	Yes	93%
	No	7%
Q14 Do you need additional signal pins at LV connector?	Yes	26%
	No	74%
Q15 Is the high-speed CAN interface acceptable?	Yes	91%
	No	9%
Q16 Do you need additional signal pins at HV connector?	Yes	19%
	No	81%
Q17 Do you need additional signal parameter for the operation/use of an ePTO (which is not already covered by ISO 11992 and the draft specification signalling)?	Yes	17%
	No	83%
Q18 Do you plan on having your own power source?	Yes	48%
	No	52%
Q19 Do you plan your own IMD (Insulation Monitoring Device at trailer/semitrailer?	Yes	33%
	No	67%
Q20 Are all your HV consumers part of the IT net trailer/semitrailer?	Yes	68%
	No	32%



ABOUT THE EU AUTOMOBILE INDUSTRY

- 13.0 million Europeans work in the auto industry (directly and indirectly), accounting for 7% of all EU jobs
- 11.5% of EU manufacturing jobs – some 3.4 million – are in the automotive sector
- Motor vehicles are responsible for €374.6 billion of tax revenue for governments across key European markets
- The automobile industry generates a trade surplus of €101.9 billion for the European Union
- The turnover generated by the auto industry represents over 7% of the EU's GDP
- Investing €59.1 billion in R&D per year, automotive is Europe's largest private contributor to innovation, accounting for 31% of the EU total

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