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COUNTDOWN TIMERS AT INTERSECTIONS WITH TRAFFIC LIGHTS – EVALUATION OF THE REGULATION JOURNAL OF LAWS OF 31.5.2017 ITEM 1062

WYŚWIETLACZE CZASU NADAWANIA SYGNAŁU NA SKRZYŻOWANIACH Z SYGNALIZACJĄ ŚWIETLNA – OCENA ROZPORZĄDZENIA DZ. U. Z 31.5.2017 R. POZ. 1062

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Summary

At the beginning, the article briefly presents the history of countdown timers at intersections with traffic lights and their occurrence in Poland and abroad. Subsequently, the content of the Regulation of the Minister of Infrastructure and Construction of 24th of May 2017 amending the regulation on special technical conditions for signs, traffic signals and road safety devices and conditions for their placement on roads (Journal of Laws of 31st May 2017 item 1062) was assessed. On one hand, it was noticed that the character of this legal regulation was too general, on the other hand, it was sometimes too restrictive. The restrictions were discussed. It was noticed that some of the provisions may be understood differently due to errors occurring in the formulation of the regulation. The assessment

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carried out revealed also logical flaws and ambiguities in the discussed regulation. It was noticed that some solutions concerning installation of countdown timers were not related to the situation at intersections with traffic lights in many Polish cities before implementation of the regulation.

Keywords: regulation of law, evaluation, traffic lights, countdown timer

Streszczenie

Na początku w artykule przedstawiono pokrótce historię wyświetlaczy czasu nadawania sygnału na skrzyżowaniu z sygnalizacją świetlną oraz ich występowanie w Polsce, jak i za granicą. Następnie poddano ocenie treść przepisu rozporządzenia Ministra Infrastruktury i Budownictwa z dnia 24 maja 2017 r. zmieniającego rozporządzenie w sprawie szczegółowych warunków technicznych dla znaków i sygnałów drogowych oraz urządzeń bezpieczeństwa ruchu drogowego i warunków ich umieszczania na drogach (Dz. U. z 31.5.2017 r. poz. 1062). Z jednej strony zauważono, miejscami zbyt ogólny charakter normy prawnej, natomiast z drugiej czasami zbyt restrykcyjny. Poddano krytyce wprowadzone ograniczenia. Odnotowano, że niektóre zapisy mogą być różnie rozumiane ze względu na występujące błędy powstałe przy formułowaniu przepisów. Przeprowadzona ocena pozwoliła ujawnić również wady logiczne oraz niejednoznaczności występujące w omawianym rozporządzeniu. Zauważono, że pewne narzucone rozwiązania dotyczące montowania wyświetlaczy czasu nie zostały odniesione do istniejącego stanu rzeczy na skrzyżowaniach ze sygnalizacją świetlną w wielu miastach Polski jeszcze przed wprowadzeniem w przepisów życie.

Słowa kluczowe: rozporządzenie prawa, ocena, sygnalizacja świetlna, wyświetlacz czasu

1. Introduction

Traffic lights belong to the road infrastructure designed to improve traffic on roads as well as broadly understood traffic safety. What's more, there were created some special devices some time ago, among others countdown timers, which have been installed at intersections for a while. These are auxiliary devices used to provide visual information on the time remaining to change the phase of the transmitted light signal. However, the legal provision assessed in this article [23] defines them as information devices working together with traffic lights.

At the turn of the last few years, the issue of countdown timers in Poland aroused many emotions both among drivers as well as traffic engineers dealing with this problem. The first ones were installed already in 2007 and after that year, their number has been growing successively. Both the group of supporters and opponents of these devices grew as the number of installed ones was getting higher. Moreover, there is a lack of comprehensive reliable scientific studies in Polish conditions, which could confirm the legitimacy of opinions of any of the parties involved in this dispute.

The problem consists in the lack of advance information for a driver on a change of the transmitted signal. A driver may be surprised by a sudden change, for example, when the signal changes to green. Providing information that precedes the appearance of a yellow signal transmitted together with a red-light signal, whose transmission time in Poland

is 1s, is a very important issue in road traffic, especially in congestion conditions. It is believed that these devices help drivers to decide earlier on the type of maneuver in the access area to the intersection, which reduces the number of sudden braking or acceleration, which may cause collisions.

Interestingly, the unclear legal regulations acted to the disadvantage of the use of countdown timers in Poland until 2017, since they did not specify whether their use was legal or not. It was only in the mid-2017 that a regulation was introduced which clearly allowed for their use albeit to a limited extent as described in the further part of this article.

The aim of this article is to assess the Regulation of the Minister of Infrastructure and Construction of 24th May 2017 amending the regulation on special technical conditions for signs, traffic signals and road safety devices and conditions for their placement on roads [23] in terms of the provisions contained therein and a comparison with real conditions prevailing on Polish roads.

2. Countdown timers in Poland and other countries

There are two divisions distinguished in the design solutions of countdown timers in Poland and abroad: according to the way of installation and the method of presentation of the displayed value. While the functionality of countdown timers may be determined by the range of displayed values and colors of displayed signals. There are two types of countdown timers at intersections: for drivers and for pedestrians. It is among countdown timers that there can be distinguished green light, red light and all light phases countdown timers displaying remaining time continuously for all phases. Until the introduction of the act [23] the most common countdown timers in Poland were devices in a form of a signaling chamber mounted next to a signaling device. Sometimes, solutions were applied, which used an additional chamber in the signaling device or numbers were displayed inside a chamber with another signal. Bicolor displays were installed, although, in some cases single-color displays were also used [1].

There are some solutions used abroad, where the information about the time to change a signal is given not by numbers, as in Poland, but there are, for example, lines consisting of light points for counting signals (Fig. 1). In such a case, only the elapsing time is displayed and not numbers showing the time [1].



Fig. 1. An example of a solution to display the time remaining to a signal change [14]

Green light and red light countdown timers are used, among others, in Asian countries such as: Iran, India, Indonesia, China, Thailand, Malaysia, Philippines, Cambodia and Vietnam (only for pedestrians) [16]. As an example, traffic lights with countdown timers in Thailand, Malaysia, Iran and Turkey (Fig. 3 and Fig. 4) were presented. In European countries, countdown timers are less popular than in Asian countries, but they are used, among others, in Croatia, Greece, Slovakia or Belgium. As an example, traffic lights with countdown timers in Croatia were presented (Fig. 2).



Fig. 2. Traffic lights with countdown timers in Croatia [7]



Fig. 3. Traffic lights with countdown timers in Thailand [13] and in Iran (Tehran) [12]



Fig. 4. Traffic lights with with countdown timers in Turkey and Malaysia [2]

3. History of countdown timers

The history of countdown timers in Poland is pretty interesting, since they had been applied for almost 10 years before their use was regulated by the law. It was in Opole, where they were installed as in one of the first cities in Poland in 2007 and 2008. Since that moment they have begun to appear in other Polish towns. Currently, they are, among others, in Wrocław, Szczecin, Poznań, Zielona Góra and Toruń. There have been both many supporters and opponents of the use of traffic lights with countdown timers since that moment. Since that time, there have also appeared many names for such devices such as counters and time counters.

The first official definition of countdown timers and conditions for their use appeared in the Regulation of the Minister of Infrastructure and Construction of 24th of May 2017 [23], which came into force in Poland on the 1st of July 2017. It should be noticed here that the conditions and requirements for their use were unclear and differently interpreted until that time. On the basis of the existing legal regulations until that time, it was not possible to state unambiguously whether their installation at intersections was legal. For example, there was an idea to install countdown timers for tram drivers at tram routes as part of the renovation in Warsaw in 2013. However, the Ministry of Infrastructure considered it impossible to use such devices in the light of the law in force at that time [19]. Despite this interpretation, local governments remained uncertain about the legal situation. Therefore, an interpellation was made with a question referring to the possibility of installing countdown timers, for which a negative response was received. According to the Ministry of Infrastructure and Construction, the relevant provisions of the regulations in force at that time: Of Ministers of Infrastructure and Internal Affairs and Administration of the 31st of July 2002 on road signs and signals [25] and the Minister of Infrastructure of 3rd of July 2003 on detailed technical conditions for road signs and signals as well as road traffic safety devices and conditions for their placement on roads [24] did not allow for the use of such devices with traffic lights on roads [11]. Despite this interpretation, countdown timers have not been removed from Polish roads. In view of the Ministry's unambiguous response, it was astonishing that a draft of the regulation analyzed in the article was published in September 2016, in which the use of countdown timers was permitted.

4. Evaluation of the regulation

The full name of the evaluated regulation is: Regulation of the Minister of Infrastructure and Construction of the 24th of May 2017 amending the regulation on special technical conditions for signs, traffic signals and road safety devices and conditions for their placement on roads. As already mentioned above, it came into force on the 1st of July 2017 (Journal of Laws of 31st of May 2017 item 1062) [23]. It consists of 3 pages: The definition of traffic was extended therein, including countdown timers, which were defined as information devices. As a result, these devices are treated in the same way as traffic lights. The first official definition of countdown timers was formulated. It is very important that the amendment does not require from traffic management authorities to use countdown timers. Thus, a General Director of National Roads and Highways, a voivodeship marshal, a starost or a president of a town with poviats rights may legally install countdown timers and decide on their installation.

It is in the first sentence, point 3.3.3.2 that there is a provision that countdown timers shall be used with fixed-time signaling devices. The questions arise: why was the option of their installation reduced that significantly? What were the important arguments for the limitations? It can be assumed that since the legislator introduced devices which could be used, so their usefulness had been confirmed and therefore the imposed limitations seem not to be justified at this moment. It is possible that current technical limitations are the reason of this provision. However, the technology develops very fast and it may be possible to install countdown timers with any type of signaling devices without major obstacles soon.

In the next sentence of the act, it is written that the surface of countdown timers should be square but there is no definition of the surface of the device. It is not specified whether this requirement should be applied to the whole device including its housing, or to the display element on which the numbers are visible. It is in the Fig. 5 that a pedestrian countdown timer used in Germany is shown whose surface seen with "naked eye" is rectangular. Then the Fig. 5 b) and c) present a device used in Poland with a visible difference in the display area before and after installation. Unfortunately, it was not properly defined in the provision how the "surface of a countdown timer" should be understood.

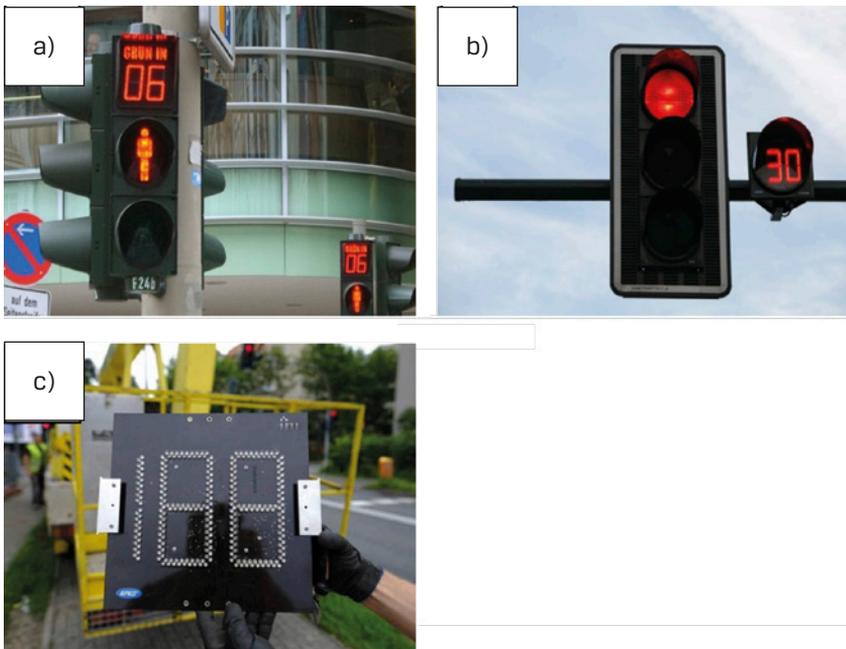


Fig. 5. Countdown timers: a) for pedestrians – Germany[8], b) for drivers – Poland [9], c) surface before installation [10].

While considering the above-mentioned provision in combination with the provision regarding the shape of the recommended speed displays, an ambiguity was noted. The regulation specifies that the recommended speed displays should have a shape of a two- or three-chamber signaling device with a 300 mm diameter lens. These devices currently found on Polish roads have a rectangular and square shape, while countdown timers installed before and interestingly after the entry into force of the Act are round. Therefore, while considering the reality prevailing on the roads, there is a doubt whether the provision regarding the shape of individual devices has not been formulated the other way around.

Then the legislator specifies the accuracy of the signal transmission at the place where functional conditions for using both countdown timers and recommended speed displays are given, although it concerns the resolution, and uses incorrect terms. The unclear provision is as follows: "*Displays should be capable of transmitting signals with an accuracy greater or equal to 5 km/h*" [23]. Probably "resolution of 5 km/h", although it is possible that it is about accuracy - the ambiguity of the provision causes doubts. While in functional conditions for countdown timers, it was stated that "*it should enable displaying the time remaining until the end of signal transmission in digits...*" [23]. It's probably about the number here.

Serious limitations of countdown timers' use were imposed in the section on the technical conditions for placing signaling devices. In order to install a countdown timer for green light at a signaling device, a solution limiting the possibility of exceeding permitted speed by drivers has to be applied before the signaling device with the countdown timer. The legislator does not give examples of actions that should be taken in order to meet the requirements of this provision. Thus, it is presumably sufficient to place a corresponding speed limit sign. However, such action would only be a kind of bypassing a deeper problem, which is behavior of drivers while a signal is changed from green to yellow.

In one of the few studies [26], carried out in Polish conditions, where the study periods with countdown timers turned on and off were compared. Research showed that the installation of countdown timers significantly reduced the number of red light violation [26]. While other study carried out abroad showed an increase in the number of red light violation when countdown timers were turned on [18], [21]. On the other hand in Bangkok [20] 24-hour observations were carried out at the intersection with the green light countdown timer turned on and off. Results showed a significant effect of countdown timer on the reduction of the start-up lost time 1-1,92 s per cycle, which is 17-32% of the time saved. Another research conducted in Singapore [22] indicated that the number of red light violation was significantly reduced (about 65%) 1.5 months after the installation of the green countdown timer. However, in the long-term (after 7.5 months) the number of the red light violation returned almost to the before installation level. In the same research suggested that green countdown timer are effective for low traffic volumes without congestion, and not effective at all under high traffic volumes in the longer term [22]. Thus, it can be seen that the presented research results are not consistent.

The next provision of the regulation contained in the technical conditions was clearly formulated and there are no doubts, where countdown timers should be mounted (Fig. 6 b). Installation above a signaling device requires an additional fixing, which may be more difficult or more expensive from a technical point of view than the example solution showed in the picture (Fig. 6 and). It is worth noting that the countdown timers on Polish roads mounted before the introduction of the Act were most often placed next to the signaling devices on the right or left (Fig. 6 a).

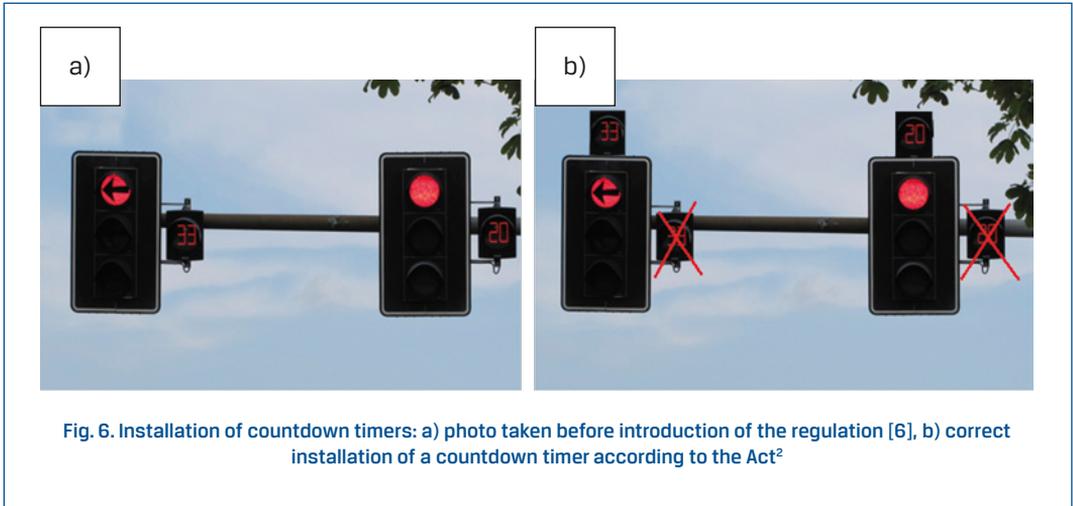


Fig. 6. Installation of countdown timers: a) photo taken before introduction of the regulation [6], b) correct installation of a countdown timer according to the Act²

The above sharp wording of the regulation has an exception in the case of: "A signaling device equipped with a contrast screen for drivers of vehicles, it is allowed to install the display chamber on the right side of the signaling device, keeping the distance from 0.6 m to 0.9 m between the vertical symmetry axes of the signaling device and the display chamber" [23]. While formulating this exception, the legislator did not specify a point of reference to determine the right side that results in doubt as to which side of the signaling device is the right side. Countdown timers installed on Polish roads before the introduction of the law are an unresolved example of this dilemma (Fig. 7).

² Own study based on [6].

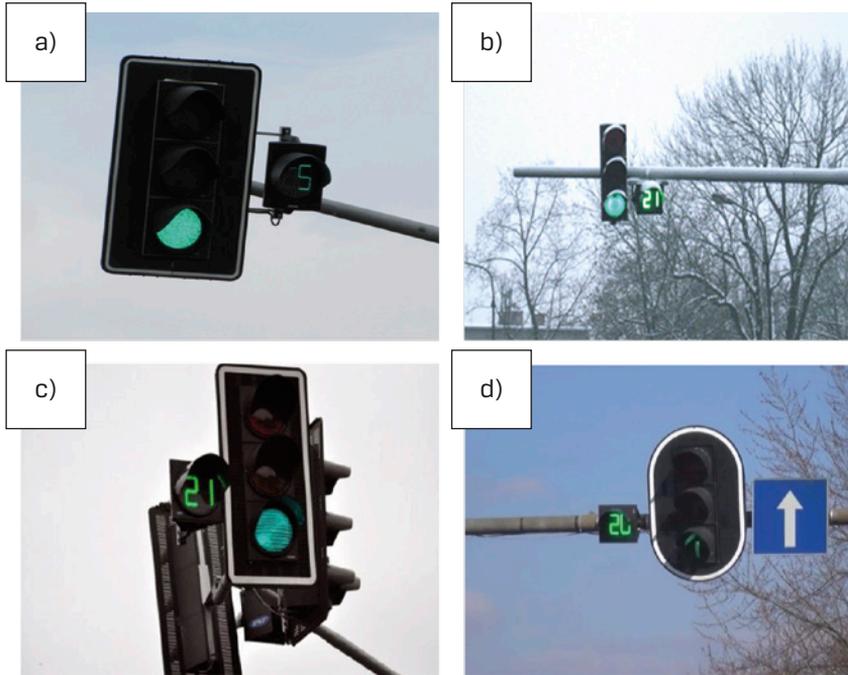


Fig. 7. Countdown timers in various Polish towns: a) Szczecin [15], b) Opole [3], c) Płock [4], d) Zielona Góra [17]

A further provision in the regulation clearly limits the location of countdown timers. If there are more than one group of signaling devices at an inlet to an intersection, then a countdown timer should be installed only above a signaling device. Such a limitation seems to be too restrictive. It is enough to take a look at solutions used in many Polish towns (before the introduction of the regulation), where countdown timers were placed in breach of the regulation being in force now and they did not raise doubts to which signaling group they belonged (Fig. 8). Although the rules for placement of countdown timers were determined there are no provisions on the number of countdown timers depending on the number of signaling devices. For example, a special case is the solution from Poznań (Fig. 8 b) where one countdown timer for two signal groups for the same direction is used. It should be added that such location of devices at intersections is not uncommon.

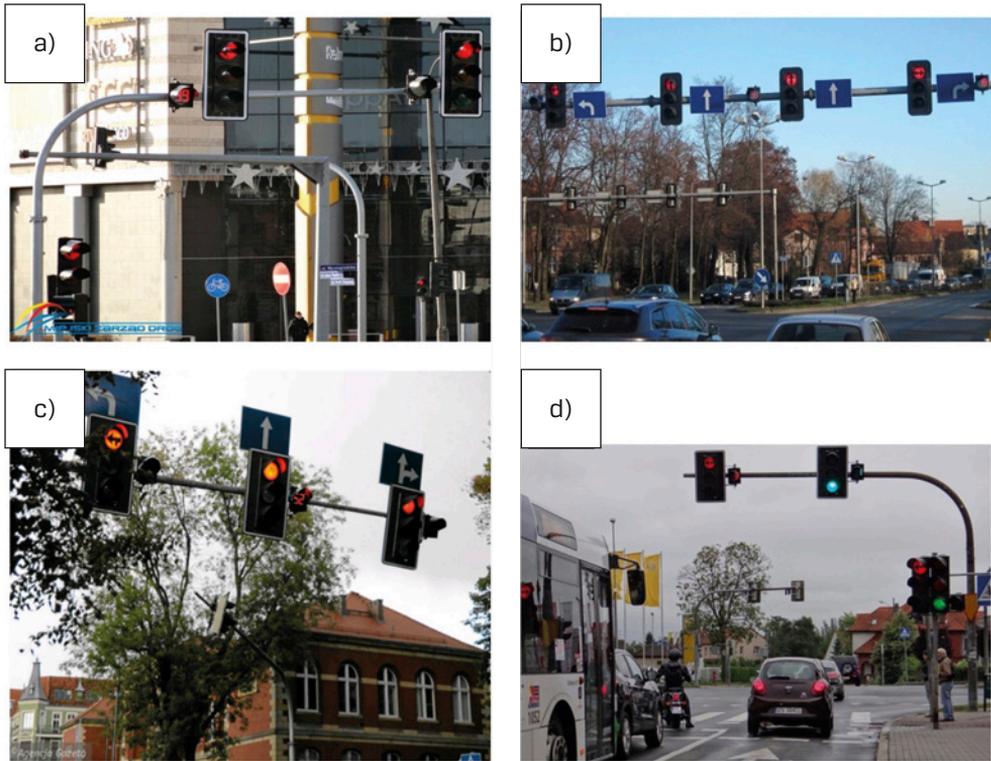


Fig. 8. Installation of countdown timers at intersections where there are more than one signaling group: a) Płock [4], b) Poznań [5], c) and d) Szczecin [15]

The regulation does not state, how the existing countdown timers should be adapted to the new regulation. Taking into account the actual state (Fig. 6 and, Fig. 7, Fig. 8, Fig. 8) and the application of these devices in many Polish cities even before the introduction of the regulation, it is an important issue that has been silenced by the legislator.

It should also be noticed that there is a lack of detailed technical conditions (for example regarding the exact dimensions of the devices or displayed numbers) in the discussed regulation. The formal requirements are very important and their lack in the regulations may cause undesirable problems in the design of traffic lights. In this regard, the regulation is too general. The regulation did not respond to many technical dilemmas, which were discussed more broadly in the article [1]. Moreover, the authors [1] have noticed that it is not possible to find detailed provisions on operation of countdown timers in regulations of the EU member states.

5. Conclusions

It is in the article that the provisions of the regulation Journal of Laws of 31st of May 2017 item 1062) [23] were discussed. It is among questionable limitations that the use of countdown timers only for fixed-time traffic lights and the need to use solutions reducing the possibility of exceeding the permitted speed before signaling devices with countdown timers were mentioned. It was also noticed that the necessity of mounting countdown timers only above signaling devices at intersection with more than one signaling group, it did not have to be obligatory. Additionally, it has not been correlated with the reality prevailing on Polish roads. What's more, the issue of adapting existing countdown timers to the new rule was silenced. The logical flaws were also presented. The first logical flaw concerning the side on which a countdown timer should be placed in the case of a signaling device equipped with a contrast screen. The second logical flaw – if countdown timers are good since their use is allowed, it seems to be not logical to limit their use only for fixed-time signaling devices. A formal mistake was also noticed where digits were confused with numbers. Several ambiguities were noticed in provisions, among them, the provision concerning the surface and shape of countdown timers as well as recommended speed displays. Moreover, the regulation does not define what is understood under the notion of the surface of a countdown timer.

The full text of the article is available in Polish online on the website <http://archiwummotoryzacji.pl>.

Tekst artykułu w polskiej wersji językowej dostępny jest na stronie <http://archiwummotoryzacji.pl>.

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