INTERNATIONAL STANDARD | ISO 10767-1

Second edition
2015-10-01

Hydraulic fluid power — Determination of pressure ripple levels generated in systems and components —

Part 1: Method for determining source flow ripple and source impedance of pumps

Transmissions hydrauliques — Détermination des niveaux d'onde de pression engendrés dans les circuits et composants —

Partie 1: Méthode de détermination de l'onde de flux de la source et de l'impédance de la source des pompes

Reference number
ISO 10767-1:2015(E)

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 131, *Fluid power systems*, Subcommittee SC 8, *Product testing*.

This second edition cancels and replaces the first edition (ISO 10767-1:1996), which has been technically revised.

ISO 10767 consists of the following parts, under the general title *Hydraulic fluid power — Determination of pressure ripple levels generated in systems and components*:

— *Part 1: Precision method for pumps*

— *Part 2: Simplified method for pumps*

— *Part 3: Method for motors*

Introduction

The first edition of ISO 10767-1, published in 1996, was developed with a view to provide means for measurement (experimental determination) of the set of two characteristic values consisting of source flow ripple Q_S and source impedance Z_S of hydraulic pumps giving rise to pressure ripple (fluid born vibration) in the hydraulic power circuit., measurement of these two values for a given ripple source is extremely important for design and development of low noise pumps and hydraulic power systems, and for this reason, there is a valid need for such an international standard to experimental measurement of source flow ripple Qs and source impedance Z_S.

However, as discussed in the paragraph below, the so-called “secondary source method” presented in the first edition requires a very complex test system as well as signal processing technique, making its implementation highly difficult; because of this, no country except for the UK, the proposer, has yet adopted ISO 10767-1 as a national standard.

The difficulty can be explained as follows.

To determine the two characteristic values of the source flow ripple, Q_S, and source impedance, Z_S, a secondary ripple source is located in the test circuit to generate wide range ripples in the test system. Frequency characteristics of Z_S, arising from the secondary source, are first determined, followed by measurement of Q_S of the test pump on the basis of the test pump itself. This means that measurement of the harmonics of the pressure ripple is made with both the test pump and the secondary source in operation. As the result, the measurement accuracy of the harmonic component of the test pump deteriorates significantly as we come close to harmonic frequency level, where differences between the harmonic frequency of the test pump ripple and that of the secondary source become small. To deal with the problem, very complicated signal processing such as compensation is performed, but its practical effect is quite limited. In addition, the standard specifies use of a rotary valve for the secondary source of wide range (50 Hz ~ 4k Hz) ripples, but there is no provision as to the design and frequency characteristics.

These problems arise from the requirement for the secondary source, whereas the method proposed by Weddfelt[2] and Kojima[3] allows measurement of delivery ripple characteristics (Q_S) and the internal source (Z_S) on the sole basis of pressure ripple generated by the test pump. This makes the test system quite simple and allows superior accuracy to be achieved without complex processing of signals. The method according to the approaches of Weddfelt and Kojima, respectively, is the same in principle, the only difference between the two being the arrangement of the piping. The present proposal represents the method according to Kojima,[3] while annexing that of Weddfelt[2] for the purpose of reference.

