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INTERNATIONAL
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SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J968/1 | REV. MAY91

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Superseding J968 MAR85

(R) DIESEL INJECTION PUMP TESTING— PART 1: CALIBRATING NOZZLE AND HOLDER ASSEMBLIES

Foreword—This SAE Recommended Practice is similar to ISO 7440/1.

The calibrating nozzle and holder assemblies are intended to simulate closely the function of the nozzle and holder assemblies in the fuel injection system of a diesel engine. They are flow gauges and require careful handling and maintenance.

The manufacturer of the injection equipment and/or the manufacturer of the engine shall specify the type of calibrating nozzle and holder assembly, the appropriate single hole orifice plate size or pintle nozzle (as applicable), high pressure pipes, exact limits, etc. to be used.

1. Scope—This part of SAE J968 specifies two types of calibrating nozzle and holder assemblies intended for the testing and setting of diesel injection pumps on test benches.

It applies to:

a. A calibrating nozzle and holder assembly with a single hole orifice plate;
b. A calibrating nozzle and holder assembly with a delay pintle type nozzle.

The approximate range of the calibrating nozzle and holder assembly is up to:

a. 300 mm^3/stroke with the single hole orifice plate;
b. 150 mm^3/stroke with the delay pintle type nozzle.

Setting and maintenance requirements are specified in ISO 4008/3.

2. References

2.1 Applicable Documents—The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Dr., Warrendale, PA 15096-0001.

SAE J967—Calibration Fluid for Diesel Injection Equipment

SAE J968/2—Orifice Plate Flow Measurement

2.1.2 ISO PUBLICATIONS—Available from ANSI, 11 West 42nd St., New York, NY 10036.

ISO 2697 Road vehicles—Fuel injection nozzles—Size "S"

ISO 2699 Road vehicles—Flange-mounted injection nozzle holders size "S",—Types 2, 3, 4, 5 and 6

ISO 4008/3 Road vehicles—Fuel injection pump testing—Part 3: Application and test procedures

ISO 4010 Road vehicles—Calibrating nozzle, delay pintle type

ISO 4093 Road vehicles—Fuel injection pumps—High pressure pipes for testing

ISO 7440/1 Road vehicles—Fuel injection equipment testing—Part 1: Calibrating nozzle and holder assemblies

Printed in U.S.A.

3. Required Characteristics—The functionally critical dimensions are shown in the following diagrams:

3.1 Calibrating Nozzle and Holder Assemblies

With single hole orifice plate, Figure 1.

With delay pintle type nozzle, Figure 2.

3.2 Components

Holder body with and without vent, Figure 3.

Spring, standard, and low rate, Figure 4.

Inlet stud with edge filter, Figure 5.

Suggested edge filter flow measuring system, Figure 6.

NOTE—The outlet of the fixture (within the dotted lines) shall be at ambient pressure.

Needle valve assembly, Figure 7.

Single hole orifice plate and flow ranges, Figure 8.

Delay pintle type nozzle is specified in ISO 4010.

Distance sleeve, Figure 9.

Retaining nuts, Figures 10 and 11.

4. Designation

4.1 General Example—There are many possible combinations of nozzle, nozzle holder, nozzle retaining nut, and nozzle opening pressure. To facilitate identification of calibrating nozzle and holder assemblies, they shall be designated in code form as given by the following example:

SAE J968-53-117L

4.2 Explanation of the Designation—The designation comprises the following three elements:

a. 1st element: SAE J968

This specifies the SAE number where the calibrating nozzle and holder assemblies are defined.

b. 2nd element: ...53...

This two-digit code is specified in Tables 1 and 2 and defines the components of the calibrating nozzle and holder assembly. In this example they are:

5—(Tens-digit code): Orifice plate No. : 5

—3 (Units-digit code): Vented holder body, as specified in Figure 3 (execution 1), not provided with a spray damper (see Figures 1 and 2).

c. 3rd element: ...117L

The first three digits define the nozzle opening pressure setting in 10^5 pascals (bar). 'L' indicates the low rate spring. No letter is used for the standard rate spring.

The preferred opening pressures are shown below:

With orifice plate and standard rate spring: 207 + 3 bar

With 0.5 mm orifice plate and low rate spring: 117 + 3 bar

With delay pintle type nozzle, either: 172 + 3 bar

or: 147 + 3 bar

or: 125 + 3 bar

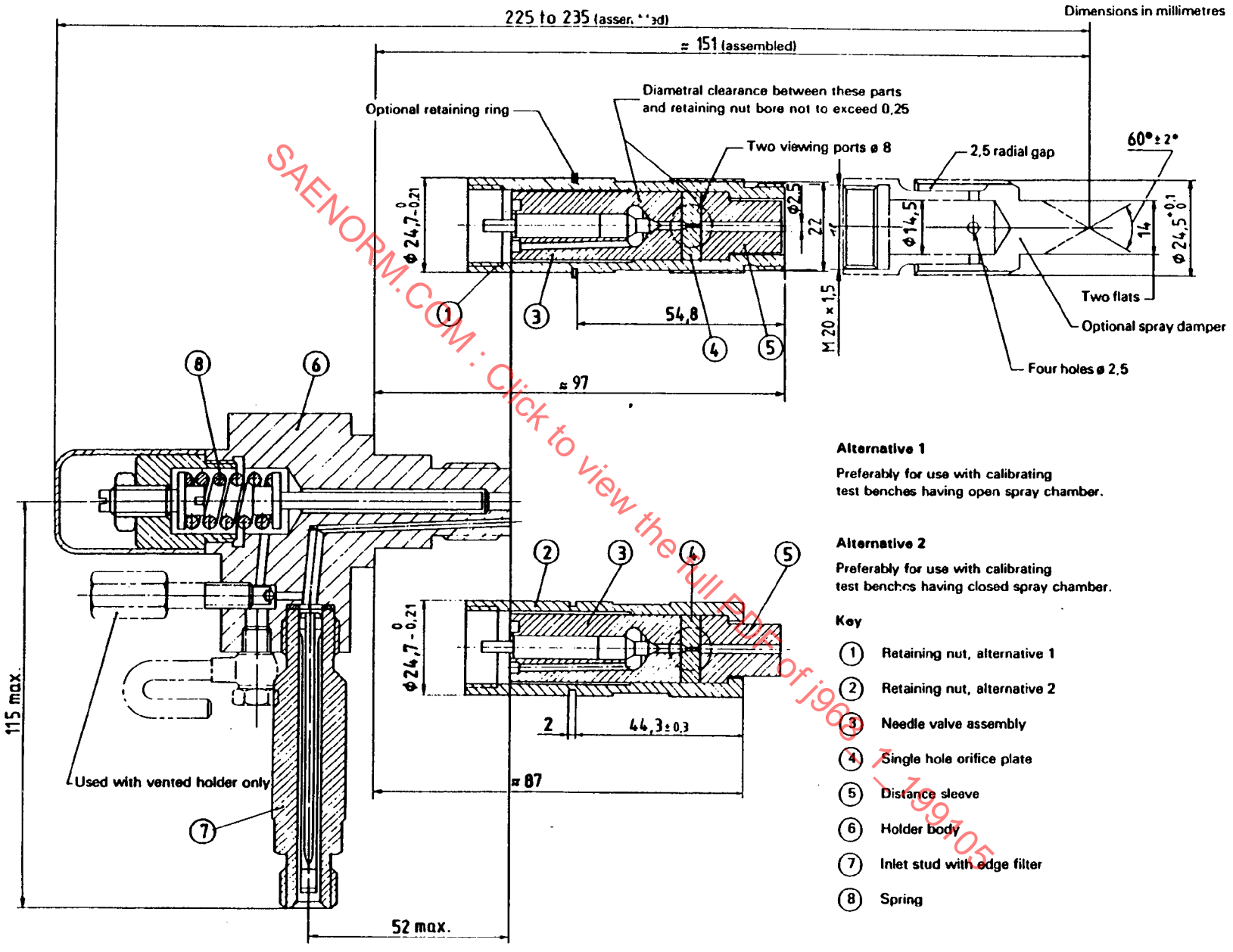


FIGURE 1—CALIBRATING NOZZLE AND HOLDER ASSEMBLY WITH SINGLE HOLE ORIFICE PLATE

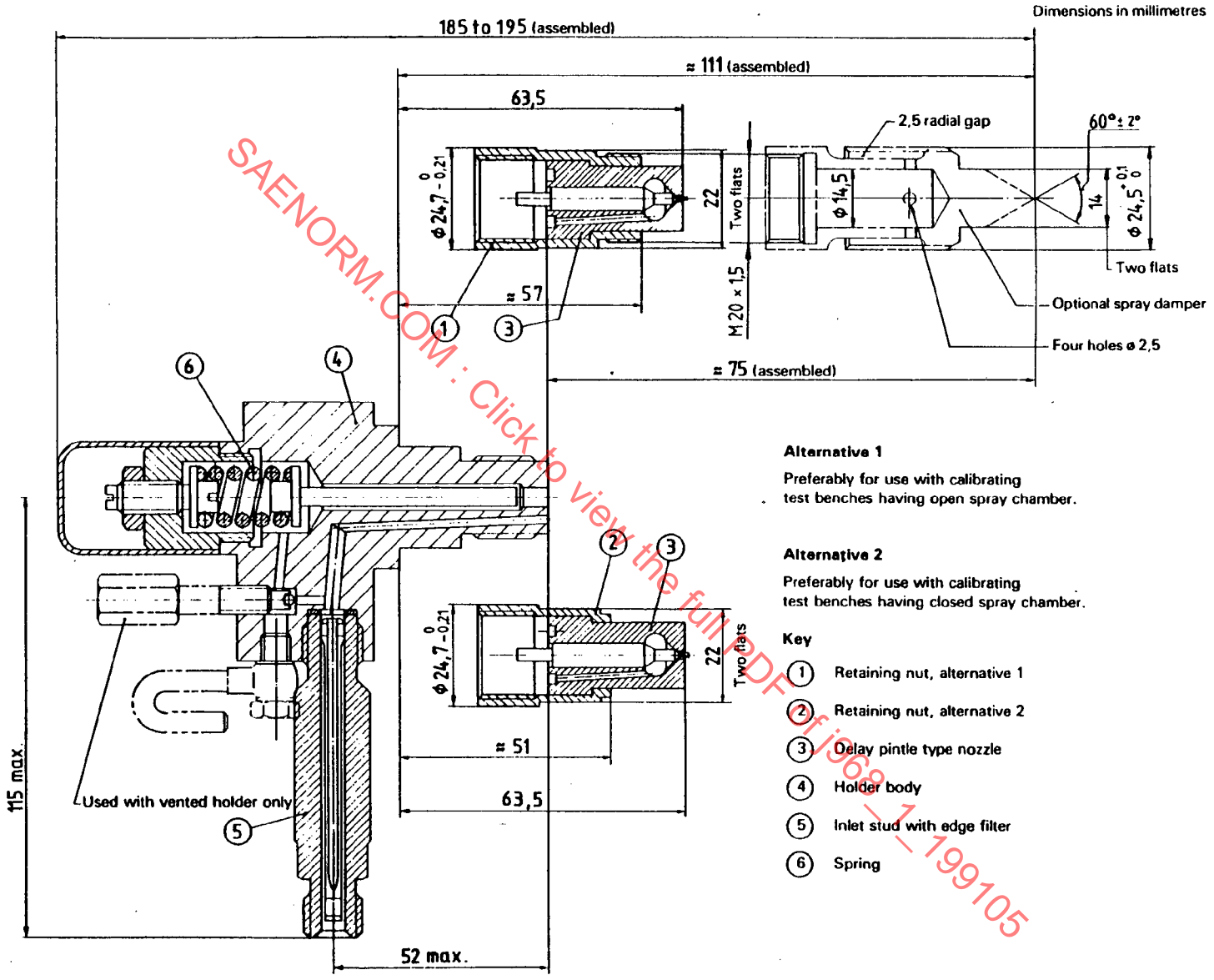
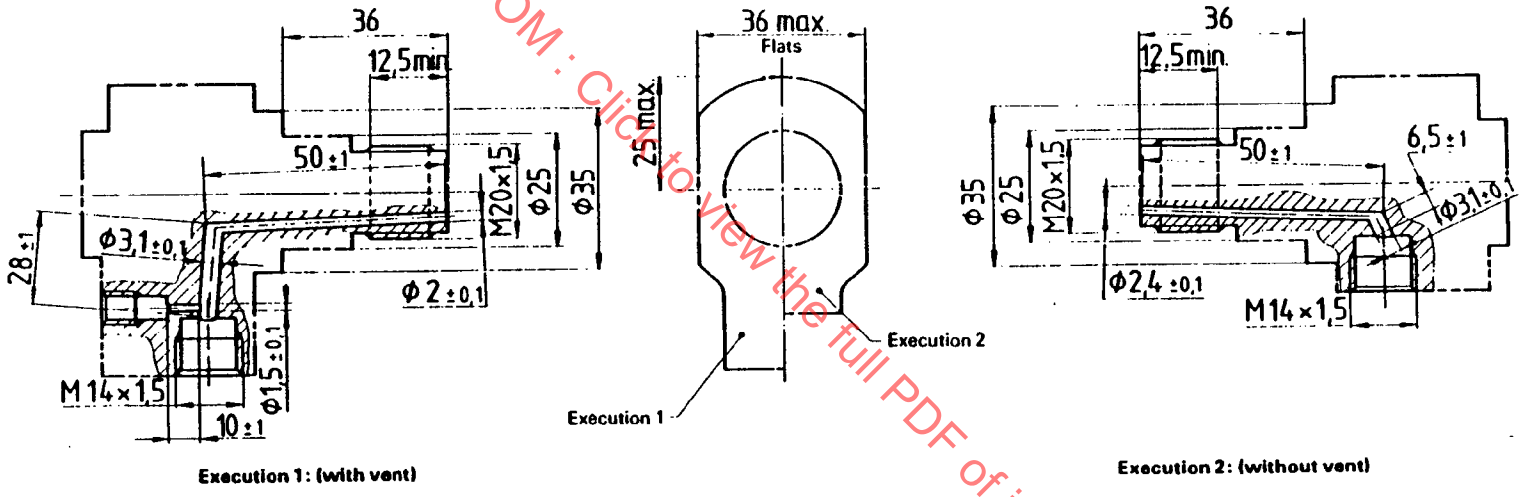


FIGURE 2—CALIBRATING NOZZLE AND HOLDER ASSEMBLY WITH DELAY PINTLE TYPE NOZZLE

Dimensions in millimetres

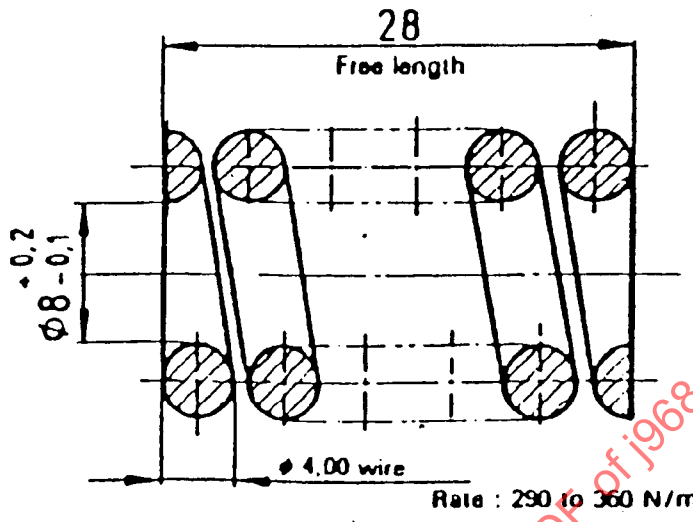


Execution 1: (with vent)

Execution 2: (without vent)

FIGURE 3—HOLDER BODY

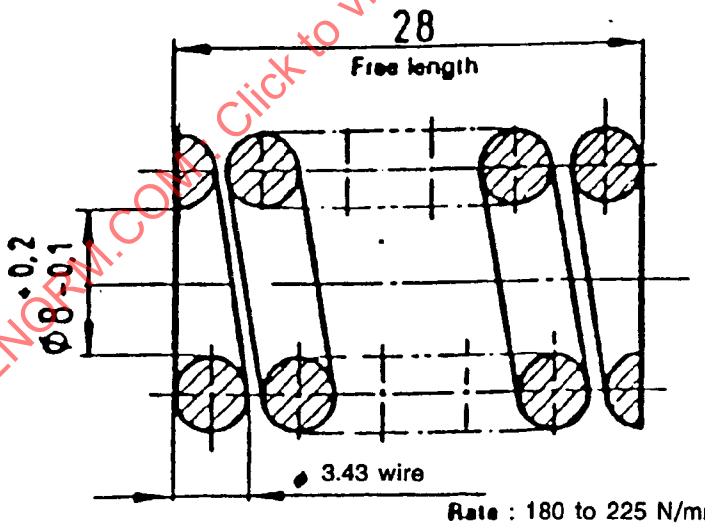
Dimensions in millimetres



Rate : 290 to 360 N/mm

STANDARD SPRING

Dimensions in millimetres

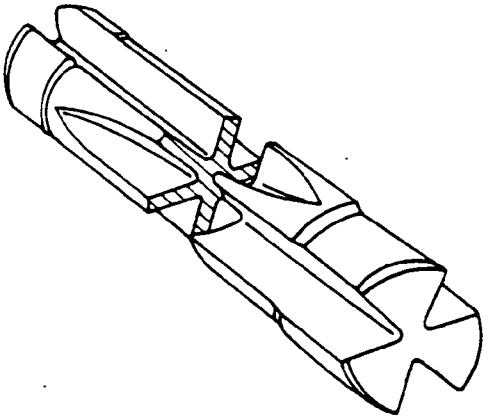


Rate : 180 to 225 N/mm

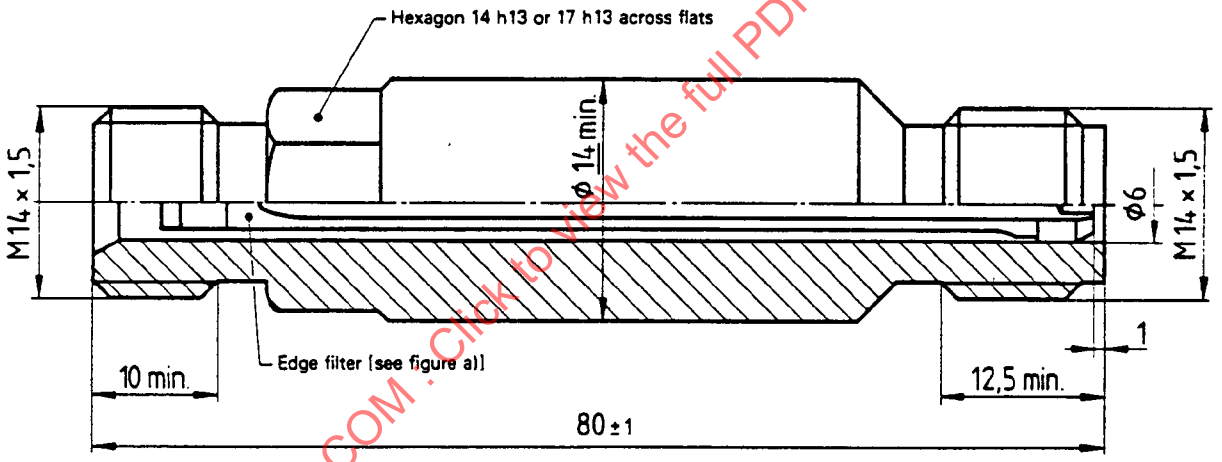
LOW RATE SPRING

FIGURE 4—SPRINGS

Dimensions in millimetres



a) Edge filter with flutes (schematic)



b) Inlet stud with edge filter

Characteristic	Value
Filter clearance (radial)	0,02 mm to 0,033 mm
Filter clearance area	7,3 mm^2 min.
Flow area for three flutes [see figure a)]	7,5 mm^2 min.
Internal volume	1 450 mm^3 ± 40 mm^3
Filter flow at 0,3 MPa (3 bar) pressure [1]	4 750 cm^3/min to 6 500 cm^3/min
Minimum flow of assembled holder body with inlet stud and edge filter at 0,3 MPa (3 bar) pressure [1]	2 000 cm^3/min

1) These tests shall be made using calibration fluid as specified in ISO 4113 at 40 °C ± 1 °C and the tolerance of the supply pressure shall be ± 0,03 MPa (0,3 bar).

FIGURE 5—CHARACTERISTIC DIMENSIONS AND VALUES OF INLET STUD WITH EDGE FILTER

Dimensions in millimetres

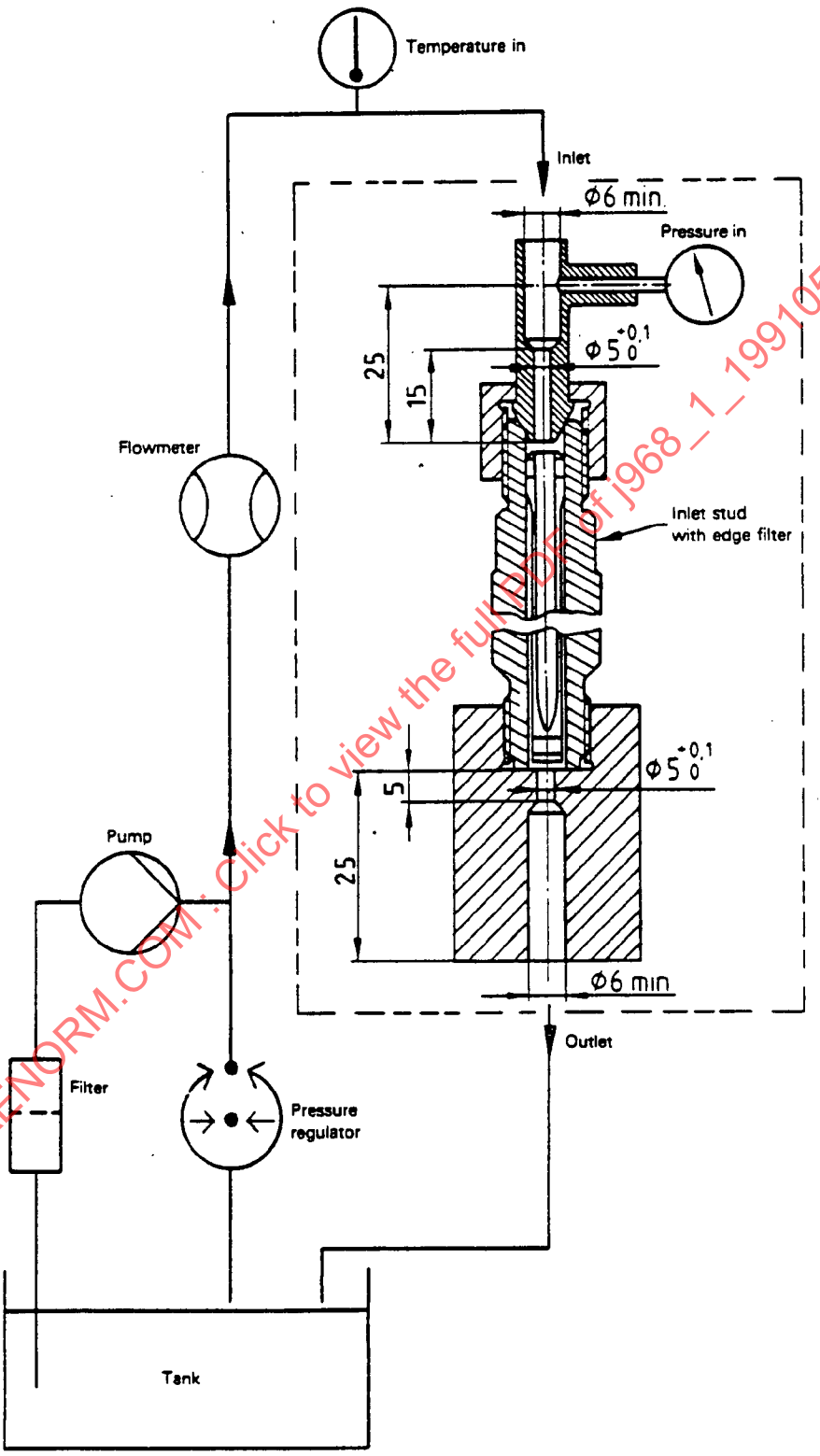


FIGURE 6—INLET STUD FLOW MEASURING SYSTEM

Dimensions in millimetres

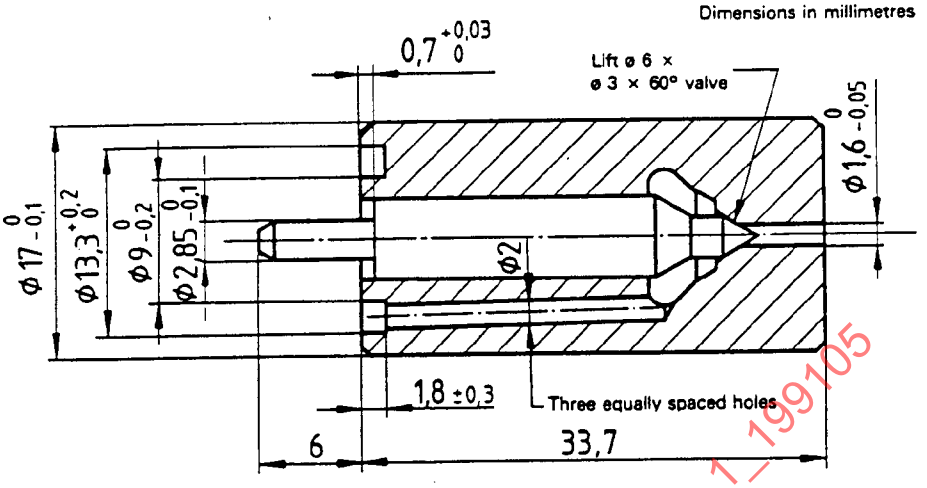
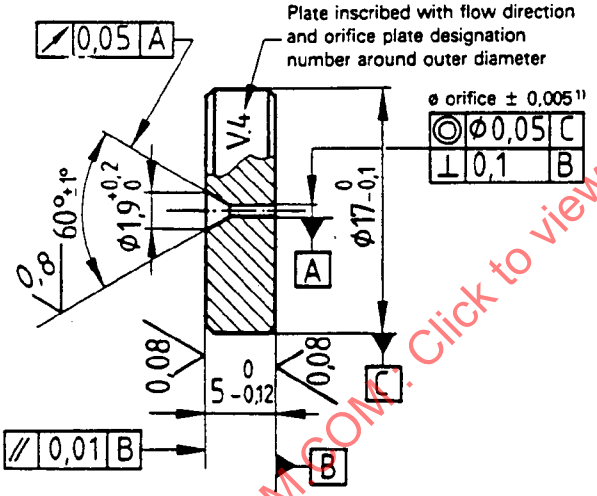


FIGURE 7—NEEDLE VALVE ASSEMBLY

Dimensions in millimetres,
surface roughness in micrometres



1) Tolerance of orifice hole is only a guide for manufacturing. Its purpose is to assist in meeting the final static flow limits specified in the table when flow-tested under the test conditions described in ISO 7440-2.

Orifice plate number		4	5	6	7	8
Orifice diameter, mm		0,4	0,5	0,6	0,7	0,8
Flow, cm^3/min	min.	964	1 528	2 190	3 024	3 948
	max.	1 014	1 606	2 302	3 180	4 150

FIGURE 8—SINGLE HOLE ORIFICE PLATE

Dimensions in millimetres

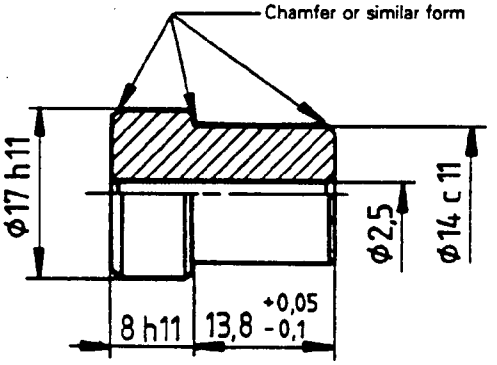
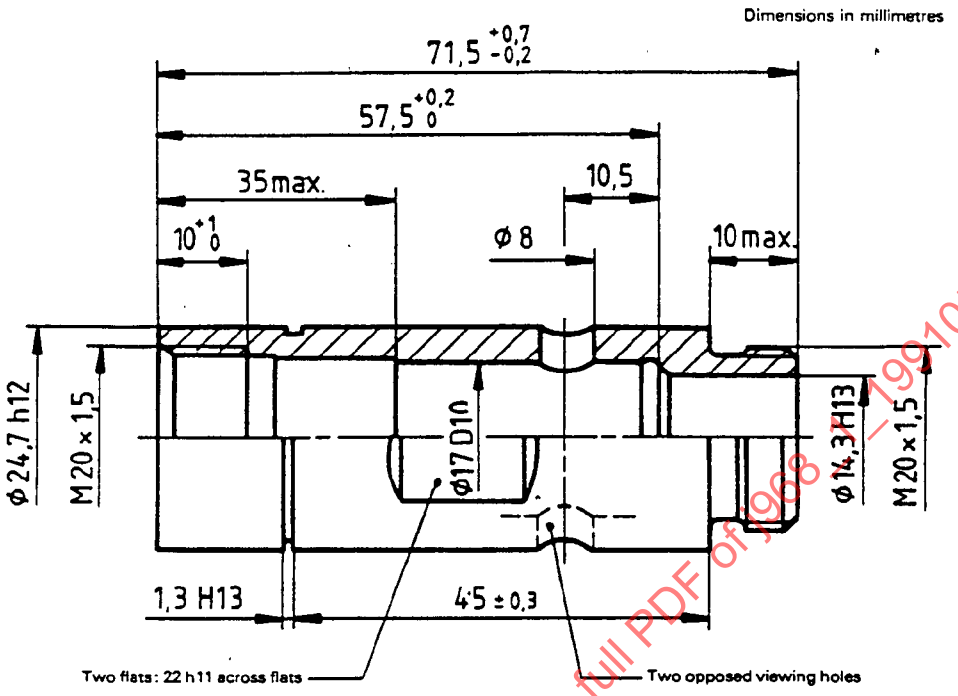
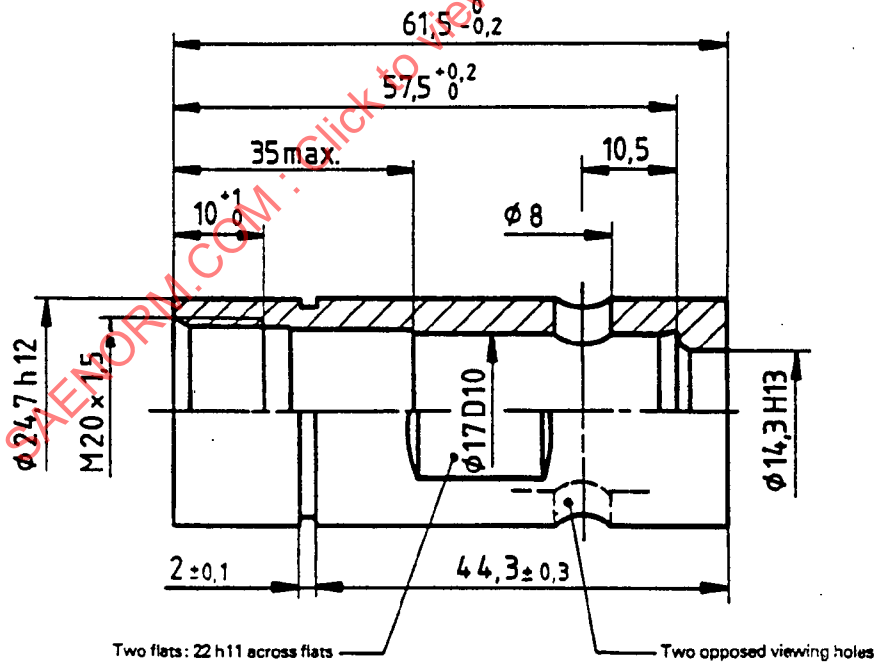


FIGURE 9—DISTANCE SLEEVE



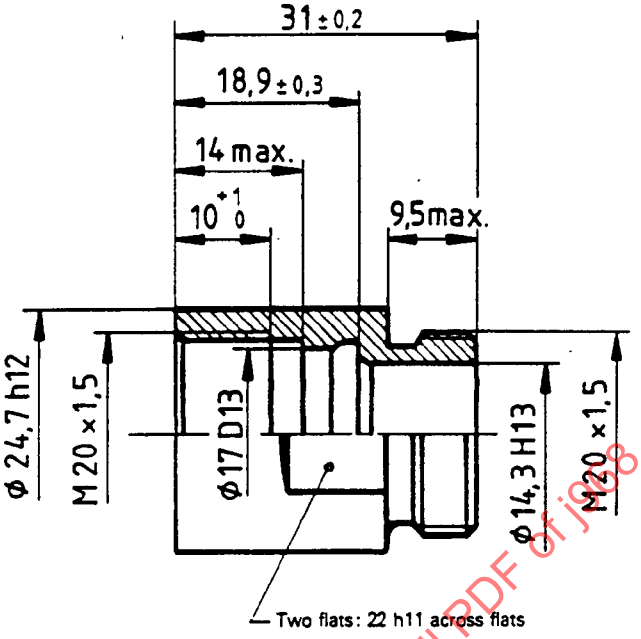
a) Alternative 1 (for use with open spray chamber)



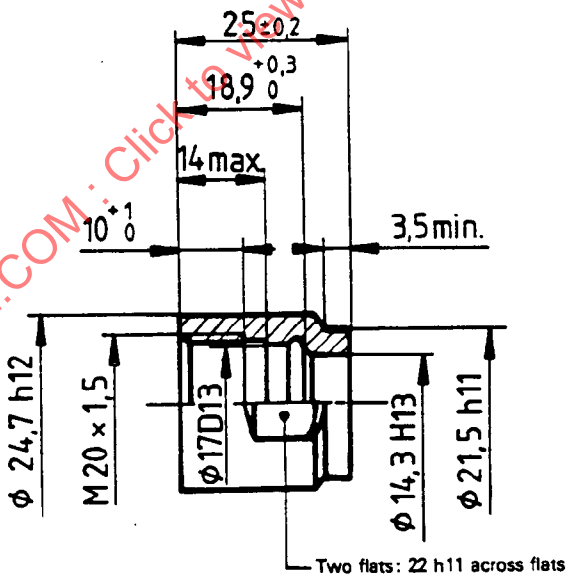
b) Alternative 2 (for use with closed spray chamber)

FIGURE 10—RETAINING NUTS (CAPNUTS) FOR CALIBRATING NOZZLE AND HOLDER ASSEMBLY WITH SINGLE HOLE ORIFICE PLATE

Dimensions in millimetres



a) Alternative 1 (for use with open spray chamber)



b) Alternative 2 (for use with closed spray chamber)[1]

FIGURE 11—RETAINING NUTS (CAPNUTS) FOR CALIBRATING NOZZLE AND HOLDER ASSEMBLY WITH DELAY PINTLE TYPE NOZZLE

[1] Retaining nut as specified in ISO 2699 (nozzle holder type 2) and in ISO 2697 (dimensions and tolerances of the nozzle capnut).