



**INSTYTUT ENERGETYKI**  
*INSTITUTE OF POWER ENGINEERING*  
**LABORATORIUM WIELKOPRĄDOWE**  
*HIGH CURRENT LABORATORY*

01-330 Warszawa, Poland  
ul. Mory 8  
tel.: +48 797 905 315  
e-mail: ewp@ien.com.pl  
www.ien.com.pl/ewp



AB 323



## **TEST REPORT**

### **No. EWP/25/E/2020**

**TEST OBJECT:** Outdoor disconnector type SGF 123nc100

**MANUFACTURER:** HAPAM Poland Sp. z o.o.  
22/24 ks. bp. W. Tymienieckiego Str.  
90-349 Łódź, Poland

**TESTS ORDERED BY:** HAPAM Poland Sp. z o.o.  
22/24 ks. bp. W. Tymienieckiego Str.  
90-349 Łódź, Poland  
Order dated 07.07.2020

**TYPE OF TESTS:** Type test: temperature-rise test

**TESTS PROCEDURE:** IEC 62271-102:2018,  
IEC 62271-1:2017.

**OBJECT DELIVERED:** 14.07.2020

**DATE OF TESTS:** 16.07.2020 – 17.07.2020

**TESTS RESULTS:** **Positive for test current 2000 A**

**THE TESTS WERE  
WITNESSED BY:** –

**Authorised by**  
**TEST ENGINEER**  
Jacek Tymochowicz M. Sc. Eng

**Approved by**  
**HEAD OF LABORATORY**  
Maciej Owsiański M. Sc. Eng.

Warsaw, 26.08.2020



### Contents

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Report contains 23 numbered pages with

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| 1. Description of the test object |  |
|-----------------------------------|--|
| Test object                       | Outdoor disconnector   |
| Manufacturer                      | HAPAM Poland Sp. z o.o.<br>22/24 ks. bp. W. Tymienieckiego Str.<br>90-349 Łódź, Poland |
| Type                              | SGF 123nc100   |

The test object was prepared for the test by the Orderer's representatives.

| 2. Technical data declared by the Manufacturer |          |
|--|----------|
| Rated voltage                                  | 123 kV   |
| Rated current                                  | 2000 A   |
| Rated short circuit current                    | 40 kA 3s |

| 3. Technical documentation of the test object                |  |
|--|--|
| <b>Technical documentation delivered by the Manufacturer</b> |  |
| 1  | Declaration of the Producer, Object research: Current path of the disconnector type SGF123nc100, Hapam Poland Sp. z o.o., 2020.08.26, appendix 1 |
| 2  | Drawing No. 2GKL 334411, Tor prądowy odłącznika SGF 123nc100 2000A, Hapam Disconnectors, drawn 2020.07.07, appendix 2                            |
| 3  | Drawing No. 2GKL 334417, Odłącznik typu SGF 123nc100, Hapam Disconnectors, drawn 30.06.2020, appendix 3  |
| 4  | Drawing No. 2GKS200007R0202, SGF 123nc_2000 125kV. Tor prądowy FS spawany, Hapam Disconnectors, drawn 2020.06.19, appendix 4                     |
| 5  | Drawing No. 2GKS200009R0202, SGF 123nc_2000 125kV. Tor prądowy spawany KS, Hapam Disconnectors, drawn 2020.06.19, appendix 5                     |
| 6  | Drawing No. 2GKS400053P0007, SGF Element stykowy, Hapam Poland Sp. z o.o., drawn 2006.04.06, changed 2008.11.25, appendix 6                      |
| 7  | Drawing No. 2GKS400053P0008, SGF Element stykowy, Hapam Poland Sp. z o.o., drawn 2006.04.06, changed 2008.11.25, appendix 7                      |
| 8  | Drawing No. GPDT 042111, Odłącznik Palec, ABB ZWAR S.A. Zakład Odłączników W.N., drawn 21.11.99r, changed 79.04.20, appendix 8                   |
| 9  | Drawing No. GPDT052183R0025, SGF nc_2000 Pokrywa przyłącza kpl., Hapam Disconnectors, drawn 2020.06.30, appendix 9                               |

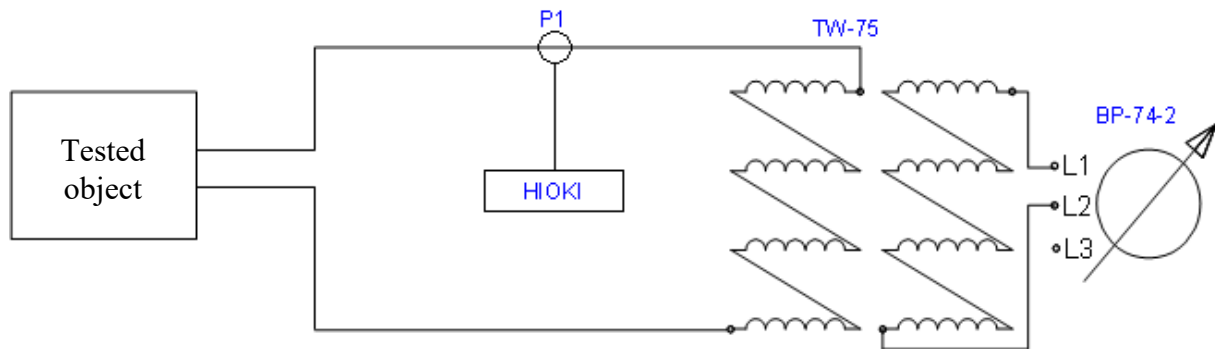


|    |  |
|----|--|
| 10 | Drawing No. GPDT060002R1202, SGF 123nc_2000_125kV. Tor prądowy KS kpl., Hapam Disconnectors, drawn 2020.06.19, appendix 10 |
| 11 | Drawing No. GPDT060002R1212, SGF 123nc_2000. Tor prądowy FS kpl., Hapam Disconnectors, drawn 2020.06.19, appendix 11       |
| 12 | Drawing No. GPDT061028P0001, Palec stykowy., Hapam Poland Sp. z o.o., drawn 2008.11.25, changed 05.12.2008, appendix 12    |

The laboratory made the identification of test object basing on the documentation given above.

| 4. Scope of the tests |   |   |   |                   |
|-----------------------|---|---|---|-------------------|
| No.                   | Kind of the test  | Standard  |   | Place of the test |
| 1.                    | Measurement of the main circuit resistance, before and after the temperature-rise test                  | IEC 62271-102:2018,<br>IEC 62271-1:2017, sub-cl. 7.4. | A | EWP               |
| 2.                    | Temperature-rise test of the main circuit with the current 2000 A                                       | IEC 62271-102:2018,<br>IEC 62271-1:2017, sub-cl. 7.5. | A | EWP               |
| A                     | The test method accredited by Polish Centre for Accreditation.<br>Accreditation Certificate No. AB 323. |   |   |                   |
| EWP                   | The test was performed in the High Current Laboratory of the Institute of Power Engineering.            |   |   |                   |

|     |   |                                   |
|-----|---|-----------------------------------|
| 5.  | Tests and their results                   | According to standard             |
| 5.1 | Temperature-rise test of the main circuit | IEC 62271-102:2018<br>sub-cl. 7.5 |



|         |  |
|---------|--|
| BP-74-2 | Regulator type BP-74-2 (inventory No. 1512)                |
| TW-75   | High-current transformer type TW-75 (inventory No. 1515)   |
| P1      | Rogowski coil (inventory No. 1360)                         |
| HIOKI   | Digital recorder type HIOKI PW3360-20 (inventory No. 1360) |

Figure 1. The supply and measurement circuits

The tested disconnector was supplied from the high-current transformer type TW75 using bus-bars 2 x Al 100x10 mm.

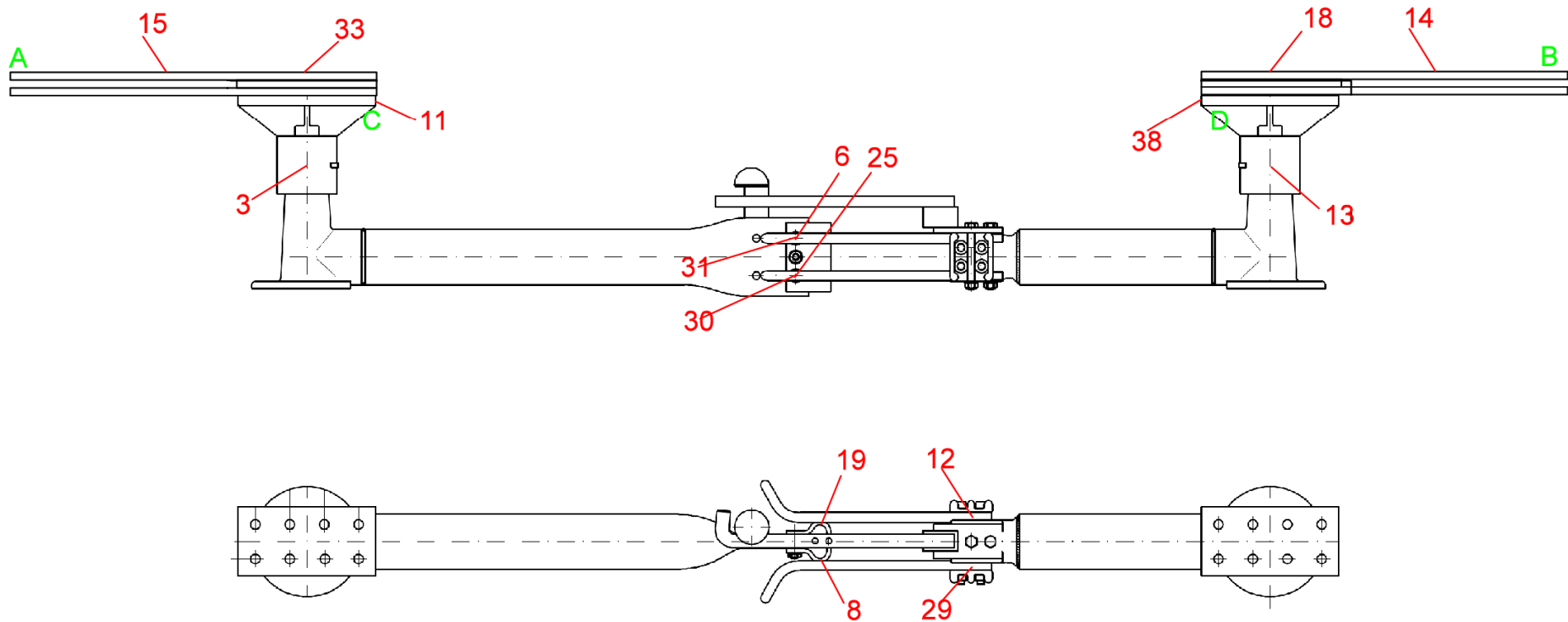


Figure 2. Arrangement of the thermocouples during temperature-rise test: 14, 15 – 1 m from terminal, 11, 18, 33, 38 – terminals, 12, 29 – bolted connections, 6, 8, 19, 25, 30, 31 – contacts, 3, 13 head. A, B, C, D – the measuring points of resistance



| 5.2 Results of the temperature-rise test of the disconnecter SGF 123nc100   |                                    |
|---|------------------------------------|
| No. of phases   | 1                                  |
| Duration of the test  | 4 h                                |
| <b>Test current</b>   |                                    |
|   | The measured value                 |
| Applied current   | 2000 A                             |
| Ambient temperature   | 21,45°C                            |
| Temperature of the measured points  | Thermocouples type K (NiCr – NiAl) |
| <b>Note:</b> The ambient temperature was measured using thermocouples immersed into tank filled with oil. These thermocouples were placed in the distance of 1 meter from the tested object at the height of 1 meter above the floor. |                                    |



**Results of the temperature-rise tests**

Table 1. Abstract of the protocol of the temperature-rise test of the disconnector type with the test current of 2000 A at steady state.

| Place                    | No. of the thermo-couple | $\vartheta$ [°C] | $\vartheta_{\text{dop}}$ [°C] | $\Delta\vartheta$ [K] | $\Delta\vartheta_{\text{dop}}$ [K] |
|--------------------------|--------------------------|------------------|-------------------------------|-----------------------|------------------------------------|
| Terminals (bare)         | 11                       | 65,97            | 100                           | 44,51                 | 60                                 |
|                          | 18                       | 64,84            | 100                           | 43,38                 | 60                                 |
|                          | 33                       | 66,66            | 100                           | 45,20                 | 60                                 |
|                          | 38                       | 64,88            | 100                           | 43,42                 | 60                                 |
| 1 m from terminals       | 14                       | 57,93            | –                             | 36,47                 | –                                  |
|                          | 15                       | 62,21            | –                             | 40,75                 | –                                  |
| Contacts (silver-coated) | 6                        | 82,63            | 115                           | 61,17                 | 75                                 |
|                          | 8                        | 86,22            | 115                           | 64,76                 | 75                                 |
|                          | 19                       | 81,74            | 115                           | 60,28                 | 75                                 |
|                          | 25                       | 82,94            | 115                           | 61,49                 | 75                                 |
|                          | 30                       | 81,15            | 115                           | 59,69                 | 75                                 |
|                          | 31                       | 80,06            | 115                           | 58,60                 | 75                                 |
| Bolted connection        | 12                       | 76,43            | 115                           | 54,97                 | 75                                 |
|                          | 29                       | 73,94            | 115                           | 52,49                 | 75                                 |
| Head                     | 3                        | 68,14            | –                             | 46,69                 | –                                  |
|                          | 13                       | 66,50            | –                             | 45,05                 | –                                  |
| Av ambient temperature   | –                        | 21,45            | –                             | –                     | –                                  |

$\vartheta$  - temperature,  $\vartheta_{\text{dop}}$  - temperature limit,  
 $\Delta\vartheta$  - temperature-rise,  $\Delta\vartheta_{\text{dop}}$  - temperature-rise limit.

Test results:

The temperature-rises of the thermocouples did not exceed the limits given in table 14 of the IEC 62271-1:2017 standard for test current of 2000 A.

**Positive**



|   |  |   |
|---|--|---|
| <b>5.3</b>  | <b>Measurement of the main circuit resistance before and after the temperature-rise test</b> | <b>IEC 62271-102:2018<br/>sub-cl. 7.4</b> |
| <p>The resistances of the main circuit of the tested disconnector were measured by the technical method.<br/>The measurement points of resistance are given on Figure No. 2.<br/>The measurement results of the main circuit disconnector resistances before and after the temperature-rise tests are given in table 2.</p> |  |   |
| Measurement equipment   | Resistance meter IBECO Power AB type RMO60-TT, inventory No. 1354.                           |   |

Table 2. The measurement results of the main circuit disconnector resistances before and after the temperature-rise test (20°C).

| Between points | R [ $\mu\Omega$ ]            |                             | Change [%] |
|----------------|------------------------------|-----------------------------|------------|
|                | Before temperature-rise test | After temperature-rise test |            |
| A-B            | 117,3                        | 106,4                       | -9,29      |
| C-D            | 73,3                         | 73,2                        | -0,14      |

|               |  |
|---------------|--|
| Test results: | The measured resistances after the temperature-rise tests of the SGF 123nc100 disconnector did not increased more than 20% |
|---------------|--|

## 6. Summary

Tested object meets requirements of IEC 62271-102:2018, IEC 62271-1:2017 standards for:

| No. | Kind of test   | Standard                                 | Test result     |
|-----|--|--|-----------------|
| 1.  | Measurement of the main circuit resistance, before and after the temperature-rise test | IEC 62271-102:2018,<br>IEC 62271-1:2017. | <b>Positive</b> |
| 2.  | Temperature-rise test of the main circuit for the current 2000 A                       | IEC 62271-102:2018,<br>IEC 62271-1:2017. | <b>Positive</b> |

## 7. Photographic documentation

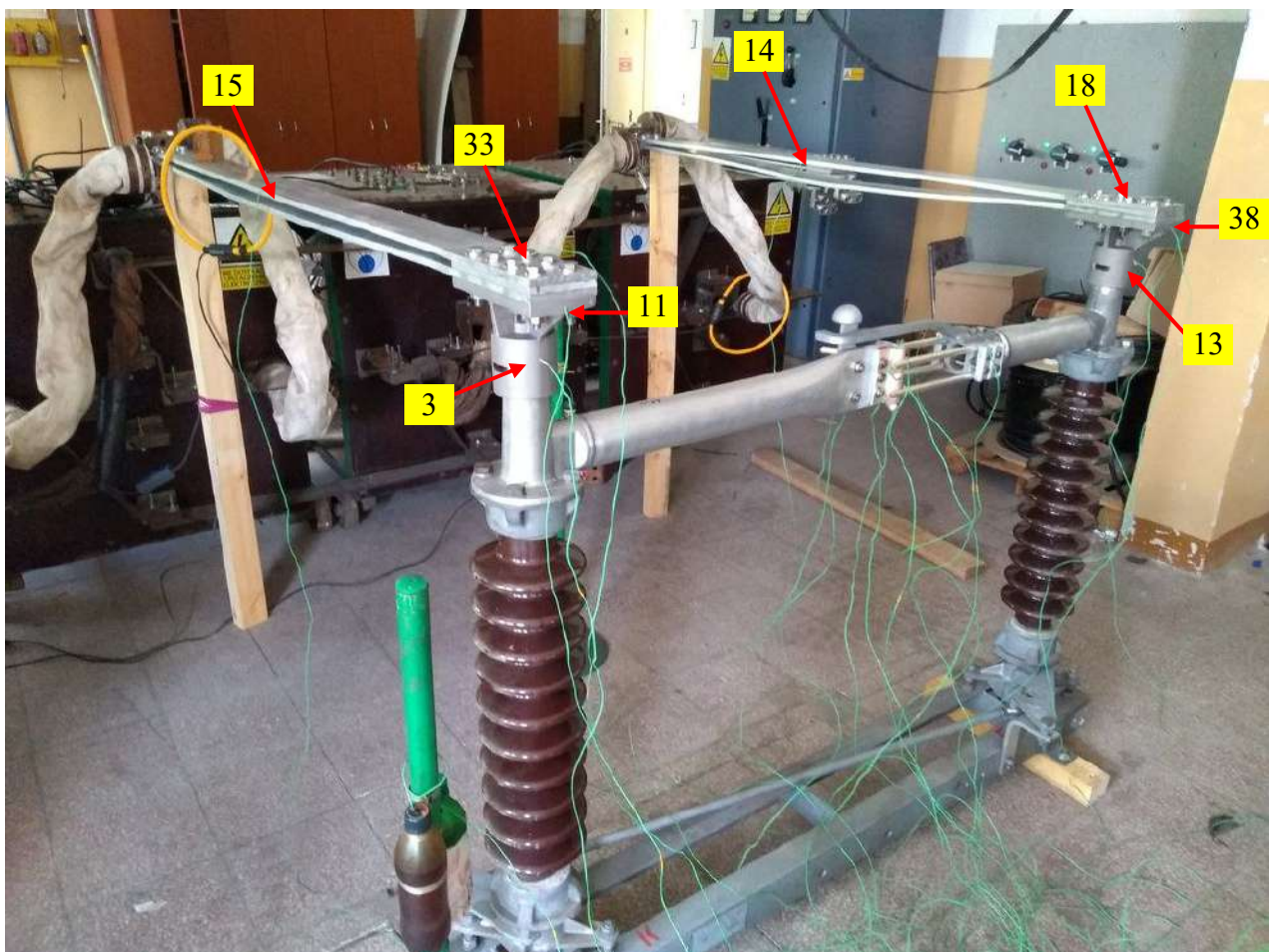


Figure 3. Disconnector type SGF 123nc100 during temperature-rise test arrangement of the thermocouples)

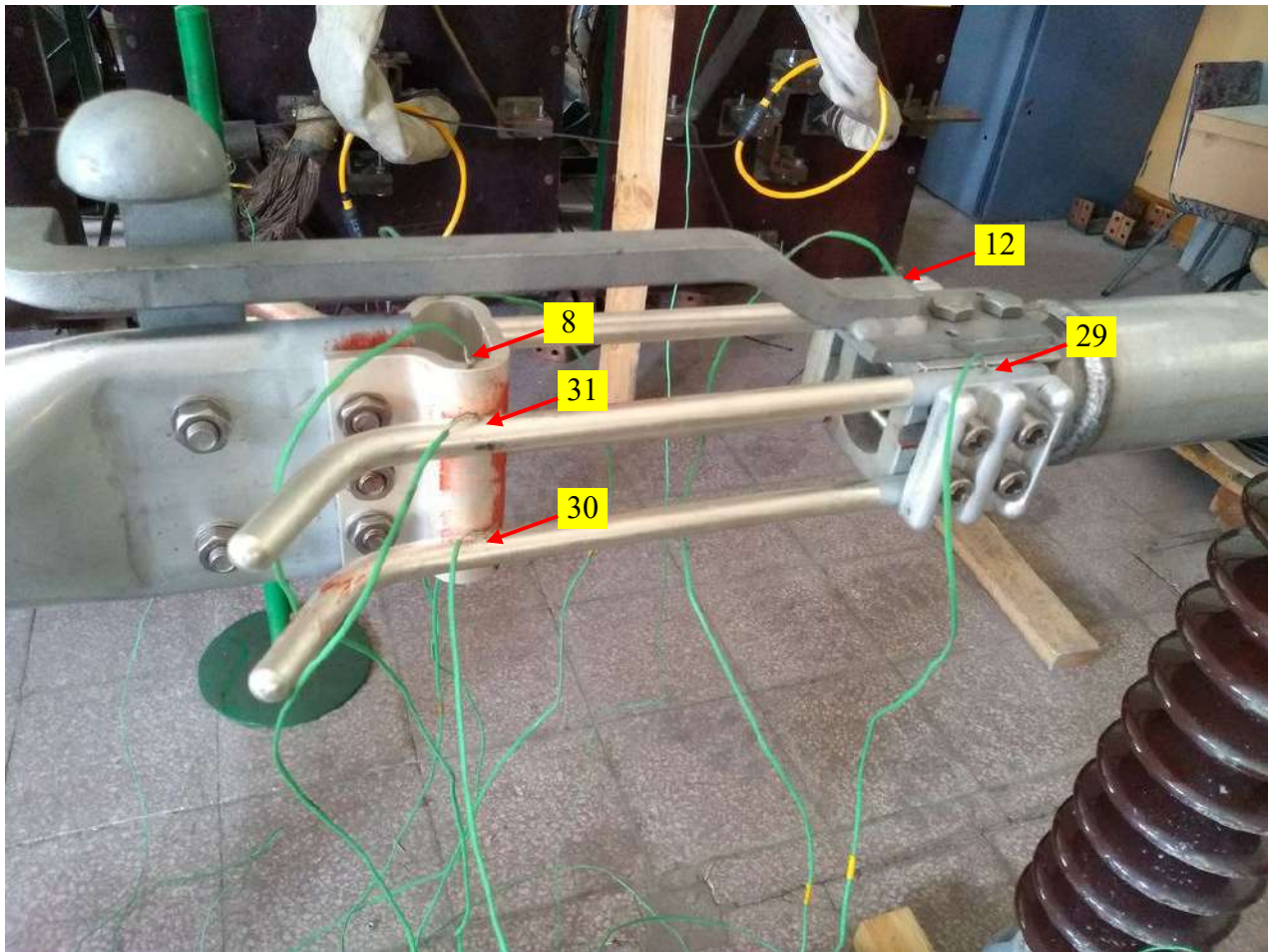


Figure 4. Disconnector type SGF 123nc100 during temperature-rise test arrangement of the thermocouples)

#### 8. Records made during tests

Not applicable



APPENDIX 1

**DECLARATION OF THE PRODUCER.**

**Object research: Current path of the disconnecter type SGF123nc100.**

Rated voltage: 123 kV  
Rated current : 2000 A  
Rated short circuit current: 40 kA 3s

Was produced by:

**HAPAM Poland Sp. z o.o.**

According to the technical documents:

**Dimension drawing of the disconnector:** 2GKL334417  
**Dimension drawing of the current path:** 2GKL334411

**Current path KS:** GPDT060002R1202

|  |                 |
|--|-----------------|
| - Rotary head with terminal (1 pc)       | GPDT052183R0025 |
| - Welded current path                    | 2GKS200009R0202 |
| - Finger in current head Cu-Ag10 (6 pcs) | GPDT042111P0001 |
| - Contact Cu-Ag20 (1 pc)                 | 2GKS400053P0007 |
| - Contact Cu-Ag20 (1 pc)                 | 2GKS400053P0008 |

**Current path FS:** GPDT060002R1212

|  |                 |
|--|-----------------|
| - Rotary head with terminal (1 pc)       | GPDT052183R0025 |
| - Welded current path                    | 2GKS200007R0202 |
| - Finger in current head Cu-Ag10 (6 pcs) | GPDT042111P0001 |
| - Contact finger CuCrZr-Ag10 (4 pcs)     | GPDT061028P0001 |

Confirmation date of the technical documents : 07.07.2020r.

Representative of the producer : M.Głowacki

Date:

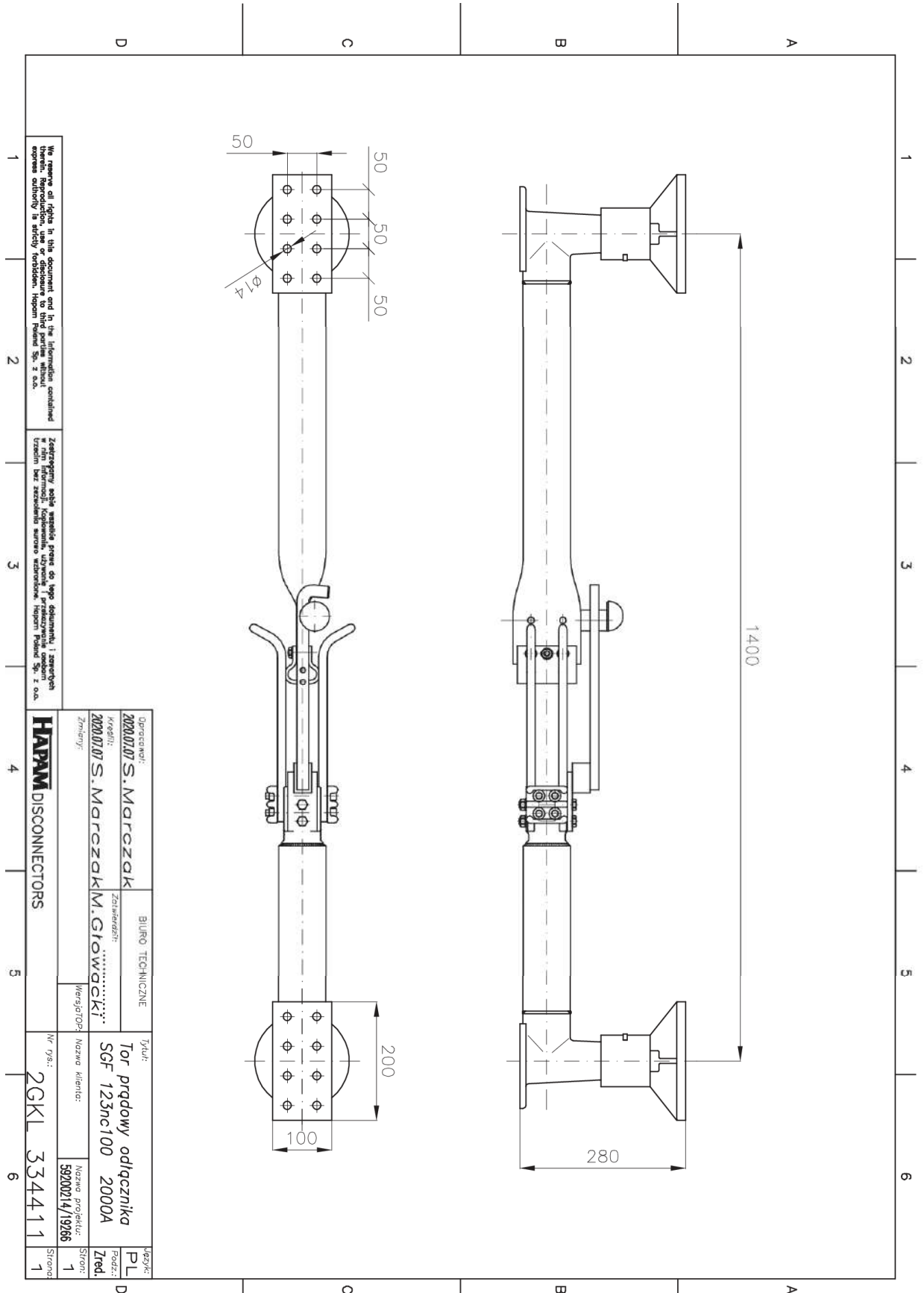
Michał Głowacki

26.08.2020r.

HAPAM Poland Sp. z o.o.  
Kierownik Biura Technicznego  
  
Michał Głowacki



APPENDIX 2



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Załącznik do protokołu pomiarów do typu obrotowej i zasrępcznej urządzeń bez zaciągania sworznia sztabowego. Instytut Energii Śp. z o.o.

|  |  |                  |  |                             |  |             |  |
|--|--|------------------|--|-----------------------------|--|-------------|--|
| Dprawa: 2020.07.07 S. Marczak          |  | BIURO TECHNICZNE |  | Typ: Tor prądowy odłącznika |  | Język: PL   |  |
| Kod: 2020.07.07 S. Marczak M. Glowacki |  | Załącznik        |  | SGF 123nc100 2000A          |  | Państwo: PL |  |
| Zmiana:                                |  | Miejscowość:     |  | Nazwa klienta:              |  | Zródło: 1   |  |
| Nazwa klienta:                         |  | Nazwa projektu:  |  | Nr rys.: 2GKL 33441 1       |  | Strona: 1   |  |
| Nazwa projektu:                        |  | Miejscowość:     |  | Nazwa klienta:              |  | Strona: 1   |  |

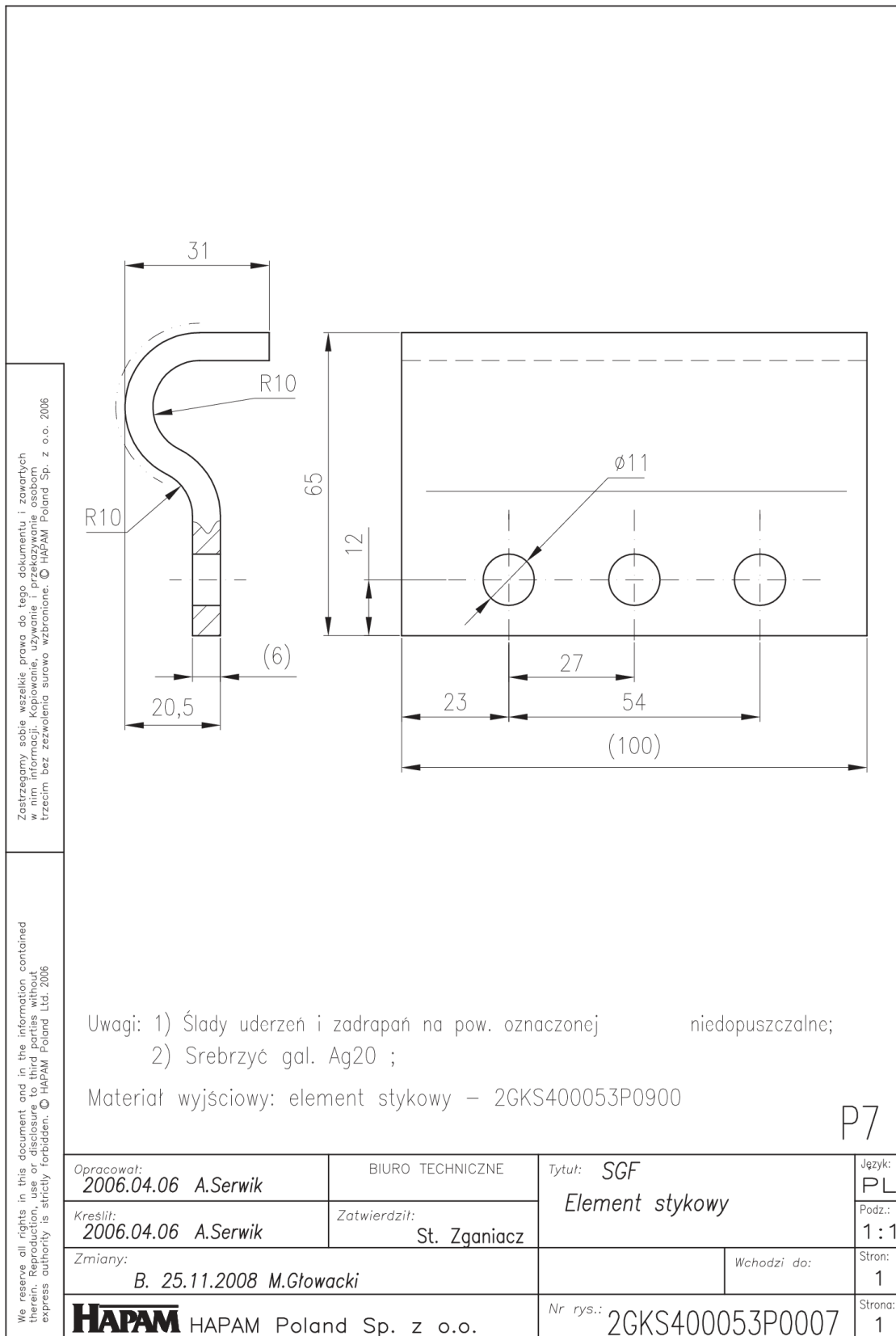
Strona: 1



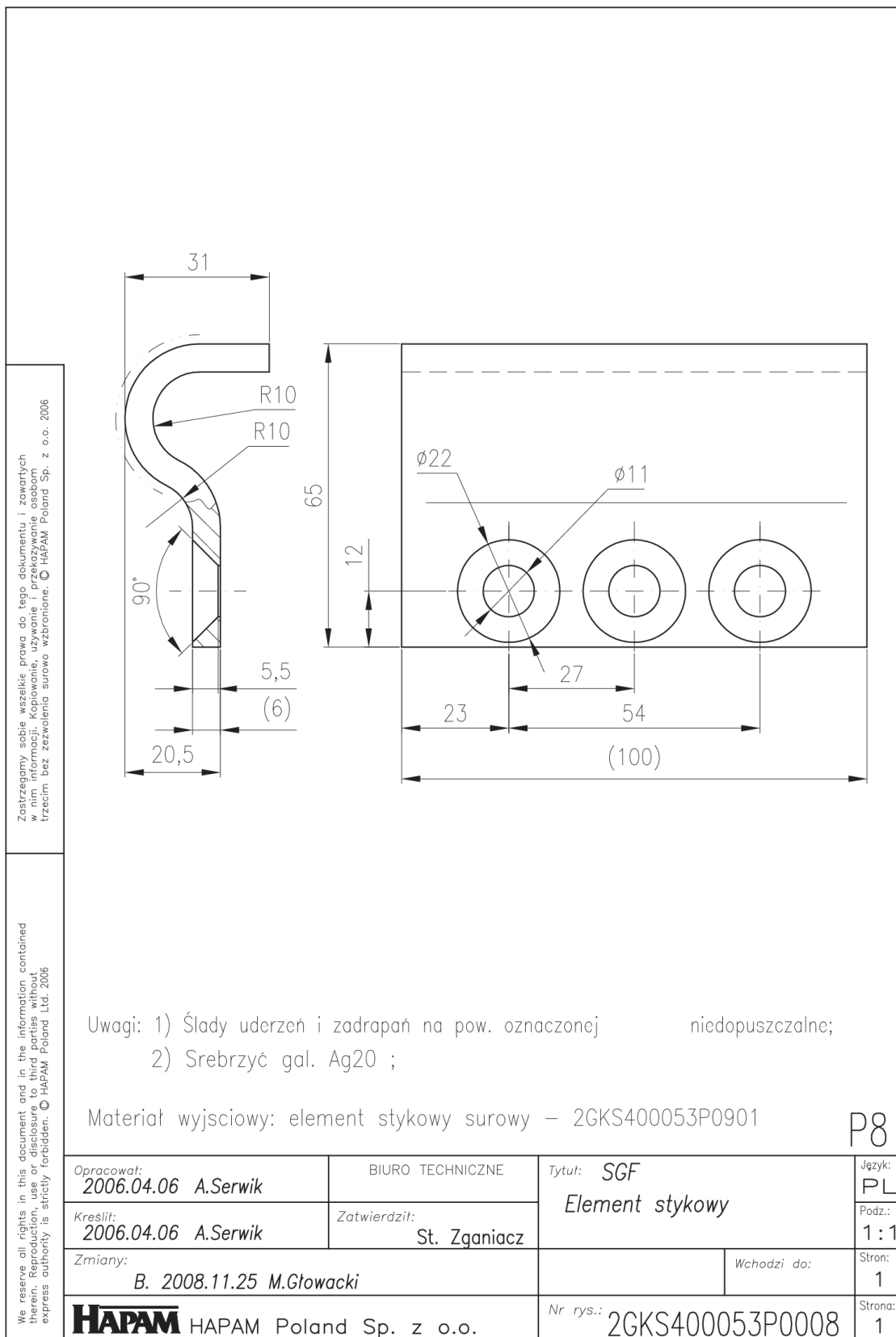




APPENDIX 6

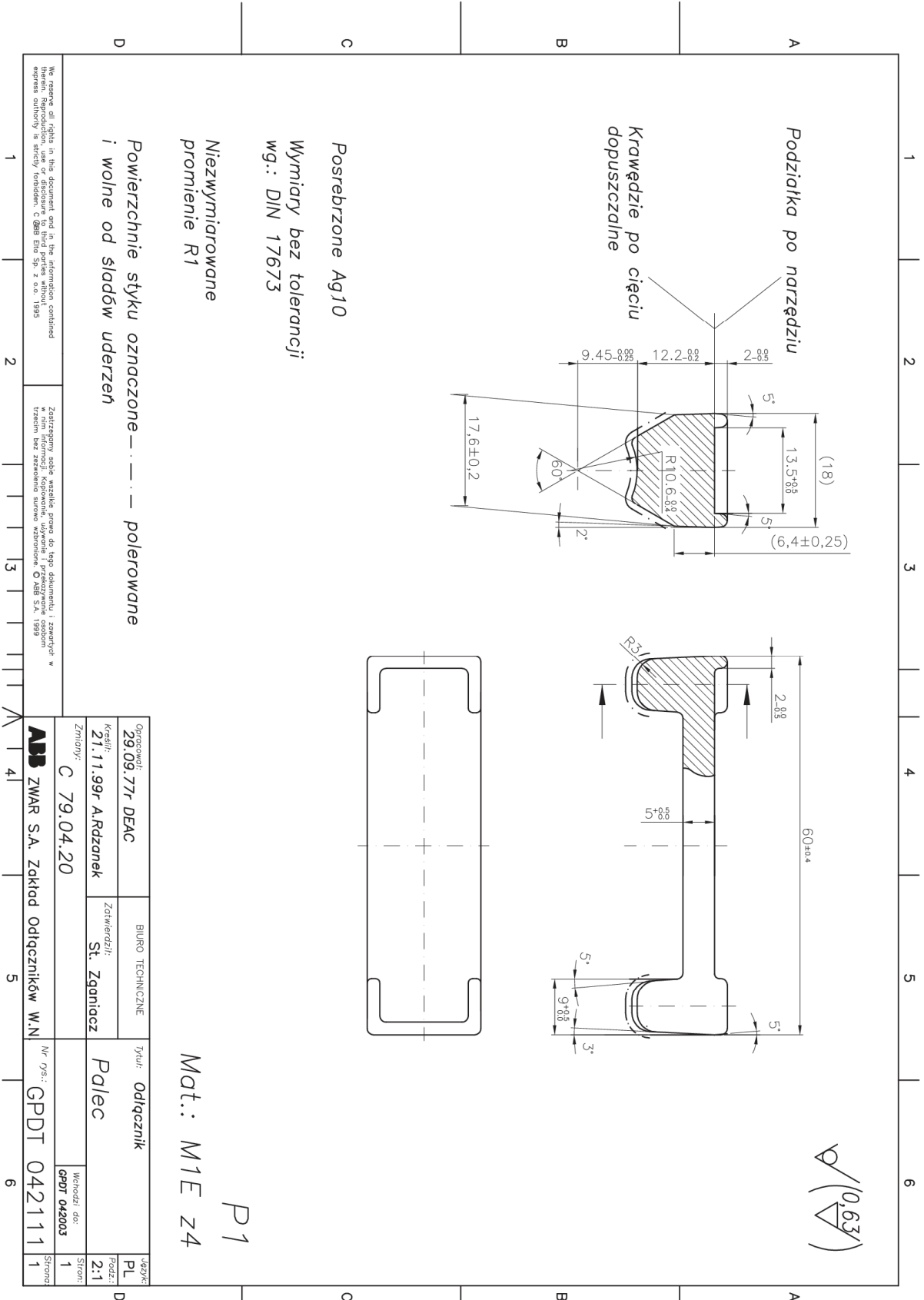


APPENDIX 7





APPENDIX 8

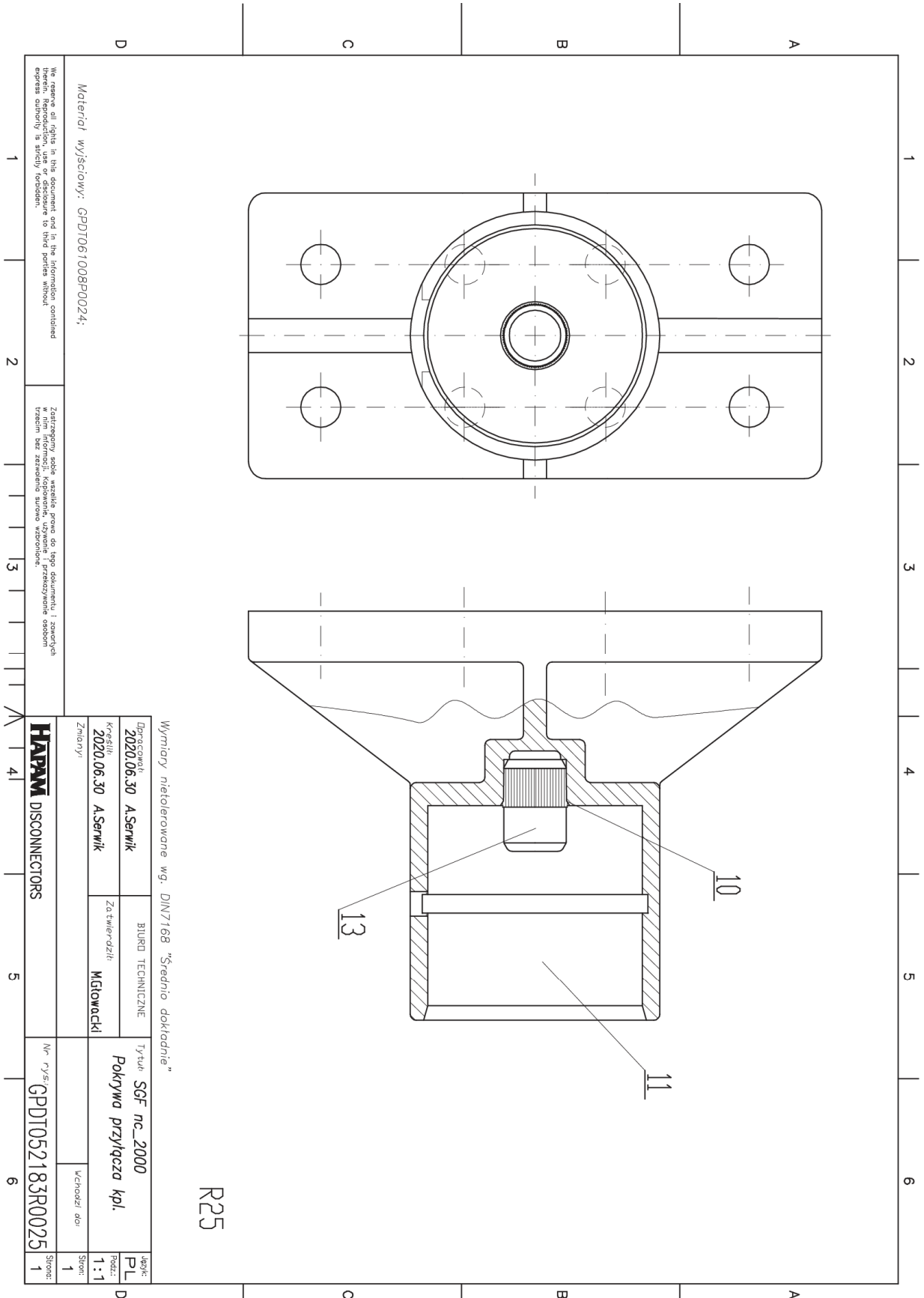


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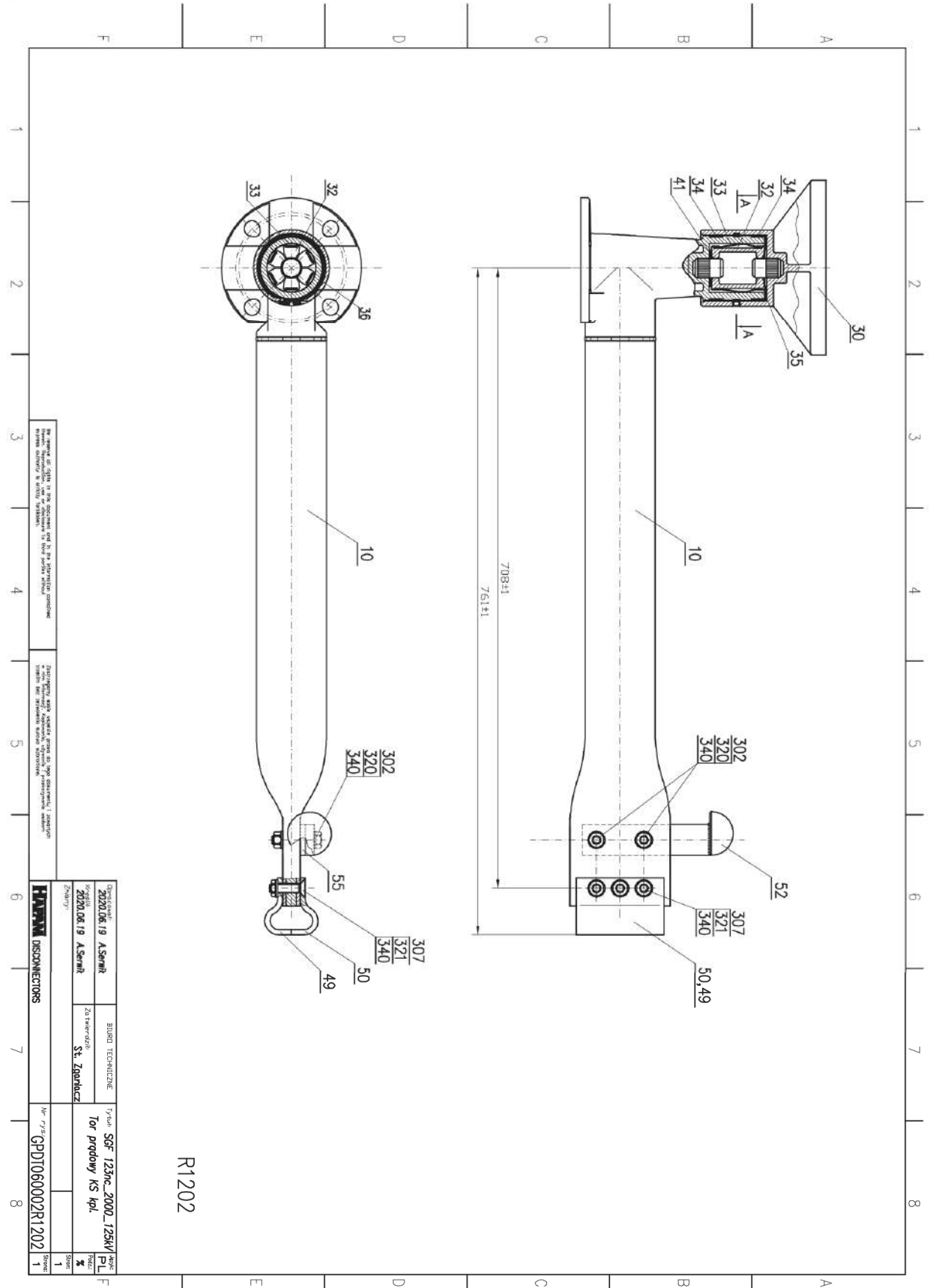
Zastrzeżenie: sędzi wszelkie prawa do tego dokumentu i zawartej w nim informacji. Kopolowanie, udzielenie i przekazywanie osobom trzecim bez zezwolenia biurowo wzbronione. © IABB S.A. 1999

|                                       |                              |                         |                             |
|---------------------------------------|------------------------------|-------------------------|-----------------------------|
| Organizacja:<br>29.09.77r DEAC        | BIURO TECHNICZNE             | Tytuł:<br>Odczynnik     | Język:<br>PL                |
| Kraj:<br>21.11.99r A.Rdzanek          | Zatwierdził:<br>St. Zgoniacz | Pałec                   | Skala:<br>2:1               |
| Zmiany:<br>C 79.04.20                 |                              |                         | Wskazani do:<br>GPDI 042003 |
| ABB ZWAR S.A. Zakład Odczynników W.N. |                              | Nr rys.:<br>GPDI 042111 | Strona:<br>1                |

APPENDIX 9



APPENDIX 10



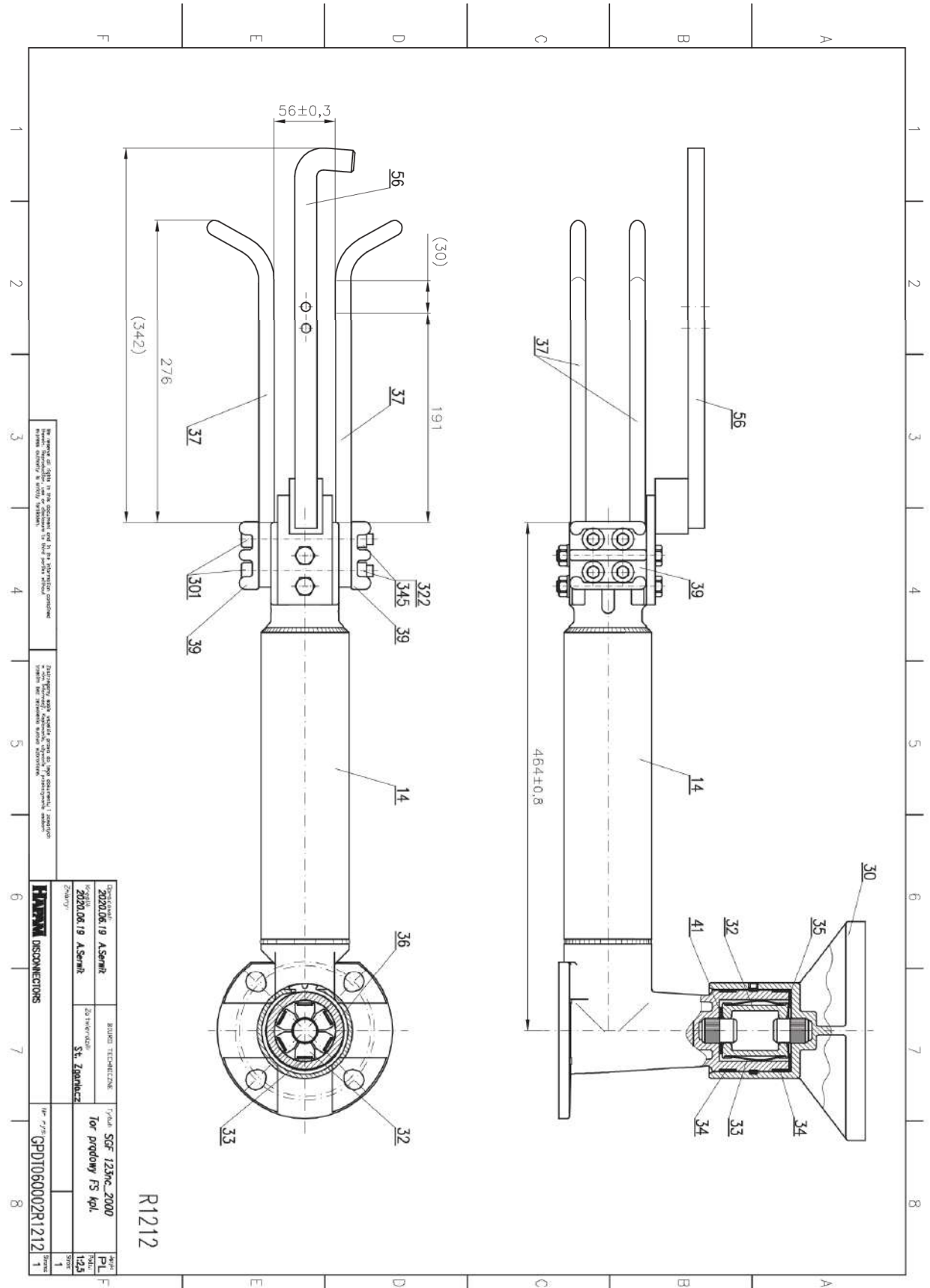
R1202

Na zobrazení je zobrazena část z celku, který je součástí celku. Všechny rozměry a údaje jsou uvedeny v technické dokumentaci.

Зображення є частиною зображення цілого, яке є частиною цілого. Всі розміри та дані наведені в технічній документації.

|  |   |  |   |                               |
|--|---|--|---|-------------------------------|
| DOKUMENT<br>2020.06.19<br>2020.06.19<br>Zpracoval: | A.S.Ševčík<br>A.S.Ševčík<br>S.Š. Zaprudnicz | BURO<br>TECHNICKÉ<br>ZS. VÝROBY<br>S.Š. Zaprudnicz | Typ: SOF 125nC_2000_125kV<br>Tor prądowy KS kpl.<br>GPD1060002R1202 | Kód: P<br>Verze: 1<br>Stav: 1 |
|--|---|--|---|-------------------------------|

APPENDIX 11



|                                |  |                           |  |                                 |  |
|--------------------------------|--|---------------------------|--|---------------------------------|--|
| Dokument<br>2020.DK.19 A.Semir |  | ROBNO TEHNIČNE            |  | Projekt<br>SGF 125kV-2000       |  |
| 2020.08.19 A.Semir             |  | Za izvedbo<br>S. Žigončič |  | Tor prodor/ FS kpl.             |  |
| Zborni                         |  | DISCONNECTORS             |  | Ime projekta<br>GPD1060002R1212 |  |
|                                |  |                           |  | Šifra<br>1                      |  |
|                                |  |                           |  | Stranica<br>1                   |  |

R1212

APPENDIX 12

