

D.T3.5.1 JOINT REPORT ON CALIBRATION OF TRT DEVICES

Annex A: Technical specification of the TRT
devices of the project partners in
comparison

Version 1
06 2019

 **Geologische Bundesanstalt**

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GENERAL INFORMATION			
Device name	TRT#1	TRT#2	TRT#3
manufacturer	UIT Dresden	Wärmepumpen & Elektrotechnik Frank Reimelt	UBeG GmbH & Co. KG
year of manufacture	2009	2008	2015
mobility of the device	Built on pallet, fixed on trailer, detachable	mobile box	transportable box (mounted on caterpillar)
size of the device	1.5 m x 0.5 m x 1.5 m	0.85 m x 0.75 m x 0.65 m	1.0 m x 0.8 m x 0.6 m
size of casing (L x W x H)	2 m x 1.5 m x 2.5 m	dto.	dto.
device lockable	yes	yes	yes
possible BHE types	1xU, 2xU, Concentric	1xU, 2xU, Concentric	1xU, 2xU, Concentric

TECHNICAL INFORMATION			
specifications heater / cooler			
heat injection	yes	yes	yes
heat extraction	no (prepared to connect a heat pump)	no	no
type of heater / cooler	Schniewindt, CSN flow heater 97-AS	?	Conti-Electron, screw-in heater CEL 631-636
power connection	3-phase, 400 V, 50 Hz	3-phase, 400 V, 50 Hz	
maximum power	10 kW	12 kW	9 kW
regulation of heater	currently with electronic contactor, infinity variable but pulsed in part load (modification planned to fixed heat steps)	3 heat steps; first step variable	step less with PLC
specifications circulation pump			
type of circulating pump	centrifugal pump Stübbe Typ SHB 20-100	glandless circulation pump Wilco TOP-S 25/7,5	Wilco Stratos 25/1-8
power	550 W	90 / 125 / 195 W	9 - 125 W
total dynamic head	15 m	7.5 m	8 m
maximum flow rate	5 m³/h	8 m³/h	~ 8m³/h (theoretic) / ~ 2m³/h (reality)

regulation of pump	frequency controlled, feedback loop with flow sensor	Speed-stage switching (3 steps)	yes
specifications temperature sensor			
type temperature sensor	E&H Easytemp TMR-31, PT 100, class A	PT1000, class B	Pt500 – EN 60 751
signal transmission	4-20 mA	2 conductors	4-20 mA
number of sensors	7	3	2
response time	< 1 s	2 s	2 s
total deviation of electronics and sensor (from datasheet)	$0.25 \text{ K} + 0.002 \times T $	$\pm 0.5 \text{ K}$	$E_c \pm (0.5 + \Delta \theta_{\min} / \Delta \theta) \%$
paired temperature sensors	yes	-	yes
last calibration date of sensors / maximum relative deviation between sensors	06.08.2013 / 0.02 K		23.01.2015 / 0.021 K
temperature range		-50 ... 150 °C	0 ... 180 °C
position of sensors	directly at BHE, in- and outlet before and after heater	in- and outlet before and after heater	before and after heater
specifications flow meter			
type of flowmeter	Siemens Sitrans F M MAG 5000 + MAGFLOW 5100 W	Sika, VTH 25 MS -180	Kamstrup Ultraflow 54
type of sensor	magnetic flow meter (MAG)	turbine flow sensor with Hall-effect detection	ultrasound sensor
signal transmission	4-20 mA & digital output	pulse output	
accuracy (from data sheet)	0.4 % \pm 1 mm/s	$\pm 5 \%$	
last calibration date / maximum deviation to reference	24.09.2010 / 0.13 %		
flow regulation of double u-tubes	mechanical flow meters	mechanical valves	mechanical valves

specifications control system type of control system uninterrupted power supply - UPS	Siemens SPS - Simatic S7 only for control circuit	no central control unit no UPS	Schneider SR2B121B no
datalogger type of datalogger central / decentral datalogger resolution minimum sampling interval max. value storage	UIT LogTrans16-GPRS 1 common datalogger for all sensors 16 bit 10 s 2048 MB / 2,000,000 records	Greisinger EASYlog 40 KH Greisinger EASYlog 40IMP-T 3 datalogger for temperature 1 datalogger for flow meter - 2 s 48'000 records	Kamstrup Multical 801 1 datalogger for all sensors -
additional information general power connection hydraulic extension tank remote data transmission remote control measurement devices for temperature profile	electricity, 3-phase, 16 A 50 liter GPRS to HTTP/FTP server no Geowatt NIMO-T HT temperature cable lot (max. 200 m)	electricity, 3-phase, 16 A - no, but alert via SMS no vanESSEN Mirco Diver	electricity, 3-phase, 16 A yes no

