INDOFARMA	**Catatan Hasil Kalibrasi Internal** *Internal Calibration Record* **Pipet Berskala** / *Graduated Pippet*	*No.* : F-PM-01-53 *Rev.* : 00 *Date* : 3 September 2014

Merek : *Brand*	**Bidang/Lokasi** : *Department/Location*
Type/Kelas : *Type/Class*	**Suhu ruang** : *Room temperature*
No.Seri : *Serial no.*	**Kelembaban** : *Humidity*
Kode kalibrasi : *Calibration code*	**No. Protap** : *SOP No.*
Kapasitas / Resolusi : ml / ml *Capacity / Subdivision (Resolution)*	**Petugas** : *Operator*
Syarat (kelas A) : ml *Requirement (Class A)*	**Tanggal kalibrasi** : *Calibration date*

Kalibrator yang digunakan *Calibrator used*	**Kode Kalibrasi** *Calibration Code*	**Tanggal kalibrasi Kalibrator** *Cal. date of Calibrator*
1. Neraca Analitik *2. Termometer*		

Catatan/Note :

T_{Air} = 24.0 °C
ρ_{Udara} = 0.0012 g/ml
ρ_{Air} = 0.99729 g/ml
$\gamma_{borosilikat}$ = 1.E-05 /°C
$U_{Sert\ Termometer}$ = 0.7 °C
$\rho_{air\ 20°C}$ = 998.202 kg/m³
$\gamma_{soda\ lime}$ = 2.5.E-05 /°C
$\Delta\rho/\Delta T$ = -0,00026 g/ml°C
ρAT = 8 g/ml
LOP_{Neraca} = 0.0026 gram
Δ Suhu = 24.0 °C

A. Data

1. $V_{nominal}$ = ml

Ulangan *Rep.*	W_{kosong} *W_{Empty}* (g)	$W_{isi(air)}$ *W_{Water}* (g)	ΔR *ΔR* (g)
1			
2			
3			
4			
5			
ΔR rata-rata/average		g	
SD (σ_{n-1})		g	
Isi / Volume, $V_{T20\,°C}$		ml	

2. $V_{nominal}$ = ml

Ulangan *Rep.*	W_{kosong} *W_{Empty}* (g)	$W_{isi(air)}$ *W_{Water}* (g)	ΔR *ΔR* (g)
1			
2			
3			
4			
5			
ΔR rata-rata/average		g	
SD (σ_{n-1})		g	
Isi / Volume, $V_{T20\,°C}$		ml	

3. $V_{nominal}$ = ml

Ulangan *Rep.*	W_{kosong} *W_{Empty}* (g)	$W_{isi(air)}$ *W_{Water}* (g)	ΔR *ΔR* (g)
1			
2			
3			
4			
5			
ΔR rata-rata/average		g	
SD (σ_{n-1})		g	
Isi / Volume, $V_{T20\,°C}$		ml	

4. $V_{nominal}$ = ml

Ulangan *Rep.*	W_{kosong} *W_{Empty}* (g)	$W_{isi(air)}$ *W_{Water}* (g)	ΔR *ΔR* (g)
1			
2			
3			
4			
5			
ΔR rata-rata/average		g	
SD (σ_{n-1})		g	
Isi / Volume, $V_{T20\,°C}$		ml	

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5. $V_{nominal}$ = ml

Ulangan *Rep.*	W_{kosong} W_{Empty} (g)	$W_{Isi(air)}$ W_{Water} (g)	ΔR ΔR (g)
1			
2			
3			
4			
5			
ΔR rata-rata/average		g	
SD (σ_{n-1})		g	
Isi / Volume, $V_{T20\,°C}$		ml	

B. Perhitungan Ketidakpastian

Calculation of ucertainty

1. Perhitungan ketidakpastian volume nominal = ml

Uncertainty calculation of nominal volume

No. *No.*	Sumber Ketidakpastian *Source of Uncertainty*	Satuan *Unit*	Distribusi *Distribution*	Nilai U_t U_t *value*	Pembagi *Divisor*	u_i	Coeff. Ci *Coeff.*	Coeff. Ci *Ci*	ui Ci $u_i\ C_i$	V *V*
1	*Reproducibility,* $U_{Rep.} = \sigma_{n-1}$	gram	Normal		√5	0.0000	1.003	1.003	0.00000	4
2	*LOP of Balance,* $U_{Sert.}$ = *LOP*	gram	Normal		2.0	0.0000	1.003	1.003	0.00000	∞
3	*Density of Air* (ρ_{Air}) *=10% x0,0012*	g/ml	Rectangular		√3	0.00000	1,003 ΔR	0.00.E+00	0.00000	∞
4	*Density of Water ,* $U(\rho_{H2O})=T_{sert}\ x\Delta\rho/\Delta T$	g/ml	Normal		1.0	0.00000	-1,003 ΔR	0.00.E+00	0.000000	∞
5	*Density of Weights,* $U_{Weights}=10\%x\rho_{Weights}$	g/ml	Rectangular		√3	0.00	1,88E-5ΔR	0.00E+00	0.0.E+00	∞
6	*Temp. of water,* $U_{(TH2O)} = U_{\Delta T\,room}$	ºC	Normal		√3	0.0000	1,003E-6ΔR	0.00E+00	0.000000	∞
7	*Coef. thermal, (Uγ) = 10% x γ*	/ºC	Rectangular		√3	0.E+00	-5,015 ΔR	0.00E+00	0.00000	∞
8	*Resolution,* U_{Res} *= 1/2 x Resolution*	ml	Rectangular		√3	0.0000	1.00	1.00	0.0000	∞
9	*Drift of Balance,* U_{Drift} *= 10% x LOP*	gram	Rectangular		√3	0.00E+00	1.003	1.003	0.00000	∞
Ketidakpastian baku gabungan / *Combined Uncertainty*, $u(D) = SQRT(\sum (u_i C_i)^2)$									0.00000	
Derajat kebebasan efektif / *Effective degree of freedom*, V_{eff}									#DIV/0!	
Faktor cakupan pada tingkat kepercayaan 95 % / Coverage *Factor on uncertainty 95%*, $K_{95\%}$									2	
Ketidakpastian gabungan perluasan / *Expanded Uncertainty*, $U(D) = u(D) \times K_{95\%}$, **dalam** / *in* ml									**0.000**	

2. Perhitungan ketidakpastian volume nominal = ml

Uncertainty calculation of nominal volume

No. *No.*	Sumber Ketidakpastian *Source of Uncertainty*	Satuan *Unit*	Distribusi *Distribution*	Nilai U_t U_t *value*	Pembagi *Divisor*	u_i	Coeff. Ci *Coeff.*	Coeff. Ci *Ci*	ui Ci $u_i\ C_i$	V *V*
1	*Reproducibility,* $U_{Rep.} = \sigma_{n-1}$	gram	Normal		√5	0.0000	1.003	1.003	0.00000	4
2	*LOP of Balance,* $U_{Sert.}$ = *LOP*	gram	Normal		2.0	0.0000	1.003	1.003	0.00000	∞
3	*Density of Air* (ρ_{Air}) *=10% x0,0012*	g/ml	Rectangular		√3	0.00000	1,003 ΔR	0.00.E+00	0.00000	∞
4	*Density of Water ,* $U(\rho_{H2O})=T_{sert}\ x\Delta\rho/\Delta T$	g/ml	Normal		1.0	0.00000	-1,003 ΔR	0.00.E+00	0.000000	∞
5	*Density of Weights,* $U_{Weights}=10\%x\rho_{Weights}$	g/ml	Rectangular		√3	0.00	1,88E-5ΔR	0.00E+00	0.0.E+00	∞
6	*Temp. of water,* $u_{(TH2O)} = U_{\Delta T\,room}$	ºC	Normal		√3	0.0000	1,003E-6ΔR	0.00E+00	0.000000	∞
7	*Coef. thermal, (Uγ) = 10% x γ*	/ºC	Rectangular		√3	0.E+00	-5,015 ΔR	0.00E+00	0.00000	∞
8	*Resolution,* U_{Res} *= 1/2 x Resolution*	ml	Rectangular		√3	0.0000	1.00	1.00	0.0000	∞
9	*Drift of Balance,* U_{Drift} *= 10% x LOP*	gram	Rectangular		√3	0.00E+00	1.003	1.003	0.00000	∞
Ketidakpastian baku gabungan / *Combined Uncertainty*, $u(D) = SQRT(\sum (u_i C_i)^2)$									0.00000	
Derajat kebebasan efektif / *Effective degree of freedom*, V_{eff}									#DIV/0!	
Faktor cakupan pada tingkat kepercayaan 95 % / Coverage *Factor on uncertainty 95%*, $K_{95\%}$									2	
Ketidakpastian gabungan perluasan / *Expanded Uncertainty*, $U(D) = u(D) \times K_{95\%}$, **dalam** / *in* ml									**0.000**	

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3. Perhitungan ketidakpastian volume nominal = ml

Uncertainty calculation of nominal volume

No. / *No.*	Sumber Ketidakpastian / *Source of Uncertainty*	Satuan / *Unit*	Distribusi / *Distribution*	Nilai U_t / *U_t value*	Pembagi / *Divisor*	u_i	Coeff. Ci		ui Ci / $u_i\ C_i$	V / *V*
							Coeff.	*Ci*		
1	*Reproducibility, $U_{Rep.} = \sigma_{n-1}$*	gram	Normal		√5	0.0000	1.003	1.003	0.00000	4
2	*LOP of Balance, $U_{Sert.}$ = LOP*	gram	Normal		2.0	0.0000	1.003	1.003	0.00000	∞
3	*Density of Air (ρ_{Air}) =10% x0,0012*	g/ml	Rectangular		√3	0.00000	1,003 ΔR	0.00.E+00	0.00000	∞
4	*Density of Water , $U(\rho_{H2O})=T_{sert}\ x\Delta\rho/\Delta T$*	g/ml	Normal		1.0	0.00000	-1,003 ΔR	0.00.E+00	0.000000	∞
5	*Density of Weights, $U_{Weights}$ =10%x$\rho_{Weights}$*	g/ml	Rectangular		√3	0.00	1,88E-5ΔR	0.00E+00	0.0.E+00	∞
6	*Temp. of water, $u_{(TH2O)} = U_{\Delta T\ room}$*	°C	Normal		√3	0.0000	1,003E-6ΔR	0.00E+00	0.000000	∞
7	*Coef. thermal, (Uγ) = 10% x γ*	/°C	Rectangular		√3	0.E+00	-5,015 ΔR	0.00E+00	0.00000	∞
8	*Resolution, U_{Res} = 1/2 x Resolution*	ml	Rectangular		√3	0.0000	1.00	1.00	0.0000	∞
9	*Drift of Balance, U_{Drift} = 10% x LOP*	gram	Rectangular		√3	0.00E+00	1.003	1.003	0.00000	∞
Ketidakpastian baku gabungan / *Combined Uncertainty*, **u (D) = SQRT ($\sum (u_i C_i)^2$)**									0.00000	
Derajat kebebasan efektif / *Effective degree of freedom*, **V_{eff}**									#DIV/0!	
Faktor cakupan pada tingkat kepercayaan 95 % / Coverage *Factor on uncertainty 95%*, **$K_{95\%}$**									2	
Ketidakpastian gabungan perluasan / *Expanded Uncertainty*, **U (D) = u (D) x $K_{95\%}$, dalam** / *in* **ml**									**0.000**	

4. Perhitungan ketidakpastian volume nominal = ml

Uncertainty calculation of nominal volume

No. / *No.*	Sumber Ketidakpastian / *Source of Uncertainty*	Satuan / *Unit*	Distribusi / *Distribution*	Nilai U_t / *U_t value*	Pembagi / *Divisor*	u_i	Coeff. Ci		ui Ci / $u_i\ C_i$	V / *V*
							Coeff.	*Ci*		
1	*Reproducibility, $U_{Rep.} = \sigma_{n-1}$*	gram	Normal		√5	0.0000	1.003	1.003	0.00000	4
2	*LOP of Balance, $U_{Sert.}$ = LOP*	gram	Normal		2.0	0.0000	1.003	1.003	0.00000	∞
3	*Density of Air (ρ_{Air}) =10% x0,0012*	g/ml	Rectangular		√3	0.00000	1,003 ΔR	0.00.E+00	0.00000	∞
4	*Density of Water , $U(\rho_{H2O})=T_{sert}\ x\Delta\rho/\Delta T$*	g/ml	Normal		1.0	0.00000	-1,003 ΔR	0.00.E+00	0.000000	∞
5	*Density of Weights, $U_{Weights}$ =10%x$\rho_{Weights}$*	g/ml	Rectangular		√3	0.00	1,88E-5ΔR	0.00E+00	0.0.E+00	∞
6	*Temp. of water, $u_{(TH2O)} = U_{\Delta T\ room}$*	°C	Normal		√3	0.0000	1,003E-6ΔR	0.00E+00	0.000000	∞
7	*Coef. thermal, (Uγ) = 10% x γ*	/°C	Rectangular		√3	0.E+00	-5,015 ΔR	0.00E+00	0.00000	∞
8	*Resolution, U_{Res} = 1/2 x Resolution*	ml	Rectangular		√3	0.0000	1.00	1.00	0.0000	∞
9	*Drift of Balance, U_{Drift} = 10% x LOP*	gram	Rectangular		√3	0.00E+00	1.003	1.003	0.00000	∞
Ketidakpastian baku gabungan / *Combined Uncertainty*, **u (D) = SQRT ($\sum (u_i C_i)^2$)**									0.00000	
Derajat kebebasan efektif / *Effective degree of freedom*, **V_{eff}**									#DIV/0!	
Faktor cakupan pada tingkat kepercayaan 95 % / Coverage *Factor on uncertainty 95%*, **$K_{95\%}$**									2	
Ketidakpastian gabungan perluasan / *Expanded Uncertainty*, **U (D) = u (D) x $K_{95\%}$, dalam** / *in* **ml**									**0.000**	

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5. Perhitungan ketidakpastian volume nominal = 0 ml

Uncertainty calculation of nominal volume

No. / *No.*	Sumber Ketidakpastian / *Source of Uncertainty*	Satuan / *Unit*	Distribusi / *Distribution*	Nilai U_i / U_i *value*	Pembagi / *Divisor*	u_i	Coeff. Ci		ui Ci / $u_i\ C_i$	V / *V*
							Coeff.	*Ci*		
1	*Reproducibility,* $U_{Rep.} = \sigma_{n-1}$	gram	Normal		√5	0.0000	1.003	1.003	0.00000	4
2	*LOP of Balance,* $U_{Sert.}$ = *LOP*	gram	Normal		2.0	0.0000	1.003	1.003	0.00000	∞
3	*Density of Air* (ρ_{Air}) *=10% x0,0012*	g/ml	Rectangular		√3	0.00000	1,003 ΔR	0.00.E+00	0.00000	∞
4	*Density of Water ,* $U(\rho_{H2O}) = T_{sert}\ x\Delta\rho/\Delta T$	g/ml	Normal		1.0	0.00000	-1,003 ΔR	0.00.E+00	0.000000	∞
5	*Density of Weights,* $U_{Weights} = 10\% x \rho_{Weights}$	g/ml	Rectangular		√3	0.00	1,88E-5ΔR	0.00E+00	0.0.E+00	∞
6	*Temp. of water,* $u_{(TH2O)} = U_{\Delta T\ room}$	ºC	Normal		√3	0.0000	1,003E-6ΔR	0.00E+00	0.000000	∞
7	*Coef. thermal, (Uγ) = 10% x γ*	/ºC	Rectangular		√3	0.E+00	-5,015 ΔR	0.00E+00	0.00000	∞
8	*Resolution,* U_{Res} = *1/2 x Resolution*	ml	Rectangular		√3	0.0000	1.00	1.00	0.0000	∞
9	*Drift of Balance,* U_{Drift} = *10% x LOP*	gram	Rectangular		√3	0.00E+00	1.003	1.003	0.00000	∞
Ketidakpastian baku gabungan / *Combined Uncertainty*, $u(D) = SQRT(\sum (u_i C_i)^2)$									0.00000	
Derajat kebebasan efektif / *Effective degree of freedom*, V_{eff}									#DIV/0!	
Faktor cakupan pada tingkat kepercayaan 95 % / Coverage *Factor on uncertainty 95%*, $K_{95\%}$									2	
Ketidakpastian gabungan perluasan / *Expanded Uncertainty*, $U(D) = u(D) \times K_{95\%}$, **dalam** / *in* **ml**									**0.000**	

C. Hasil Kalibrasi

Calibration Results

No.	$V_{Nominal}$ $V_{Nominal}$ (ºC)	$V_{Kalibrasi}$ $V_{Calibration}$ (ºC)	Koreksi *Correction* (ºC)	Ketidakpastian, $U_{95\%}$ *Uncertainty,* $U_{95\%}$ (ºC)
1				
2				
3				
4				
5				

Dihitung Oleh *Calculated by*	Tanggal *Date*	Diperiksa oleh *Checked by*	Tanggal *Date*	Catatan / Kesimpulan *Note / Conclusion*