Process control standardization

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Fogra Forschungsgesellschaft Druck e.V.
www.fogra.org

What is Fogra?

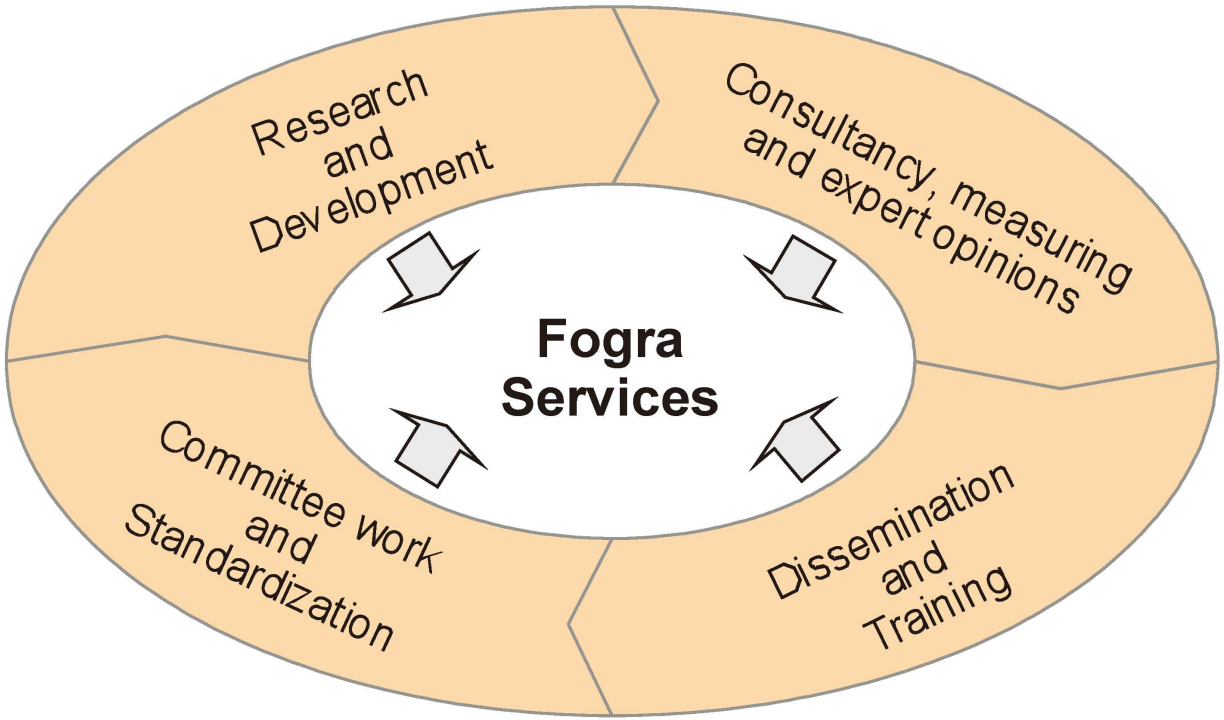
- **Registered association**
- **Founded in 1951**
- **Own institute in Munich (Germany)**
- **More than 700 members**
  - Membership structure
    - All kinds of printing companies
    - Prepress enterprises (agencies, publishing houses ...)
    - Suppliers (presses, paper, ink ...)
    - Bookbinders and finishing companies
    - ID card manufacturers
  - 35% outside of Germany
  - Fogra is bound to neutrality by their members

Activities of Fogra

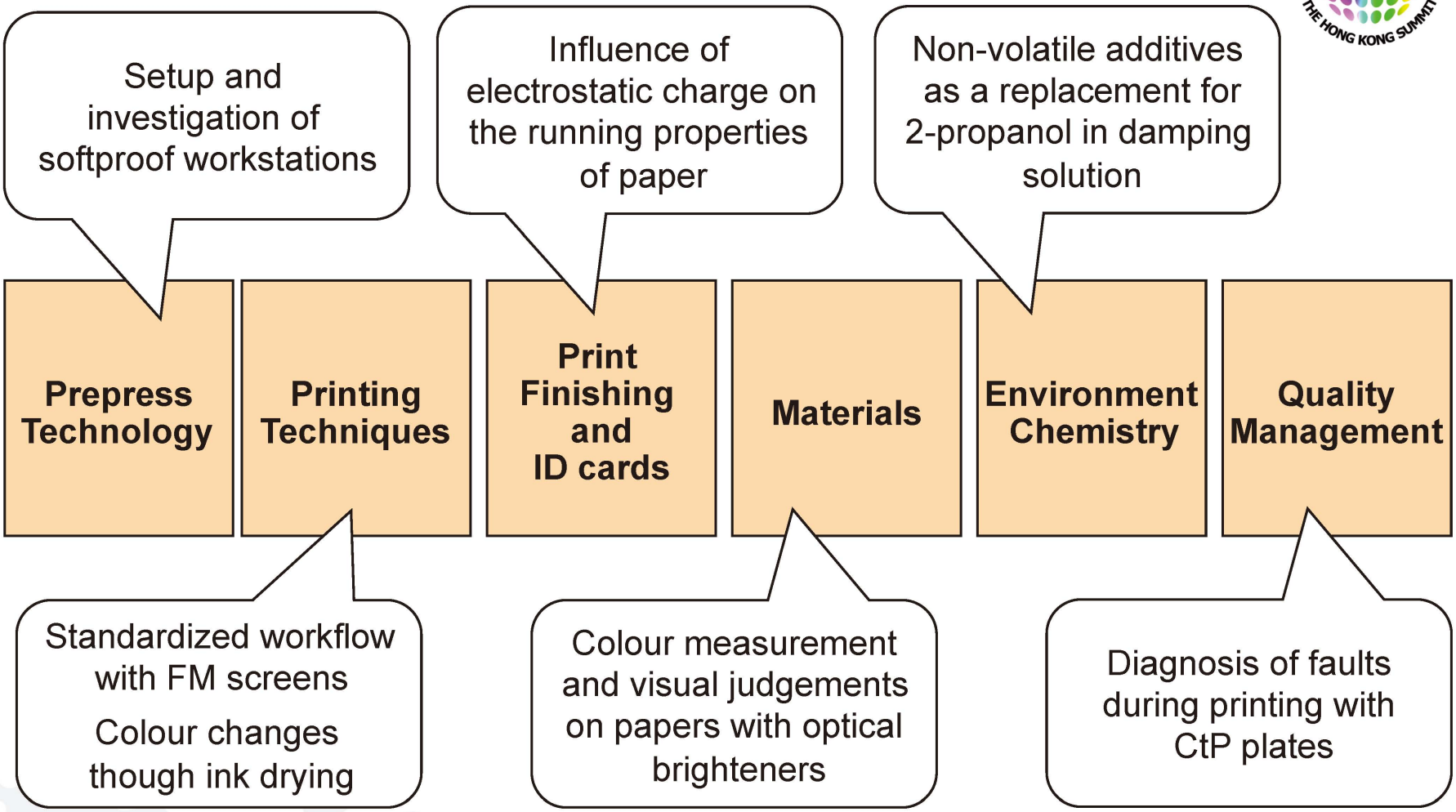
Mission

- Promoting print engineering and its future-oriented technologies
- Enabling printing industry to utilise the results

Fields of activity



Departments and actual research projects



Standardization in offset printing

- **Development by Fogra and the German Printers Association (bvdm)**
  - Relevant quality factors were identified in the 1970s
  - First version of “Process Standard Offset” in 1981
  - Gradual implementation in practice
  - Transfer to other printing technologies (newspaper, screen, …)
- **Mid 1980s**
  - Formation of international working groups led by Fogra
  - Development of ISO 2846 and ISO 12647 series according to concept of PSO
- **Later (up to now)**
  - Several revisions of PSO and ISO standards
  - Adjustments to reflect current status of printing industry
  - Many revisions base on Fogra research projects

Process Standard Offset (PSO)

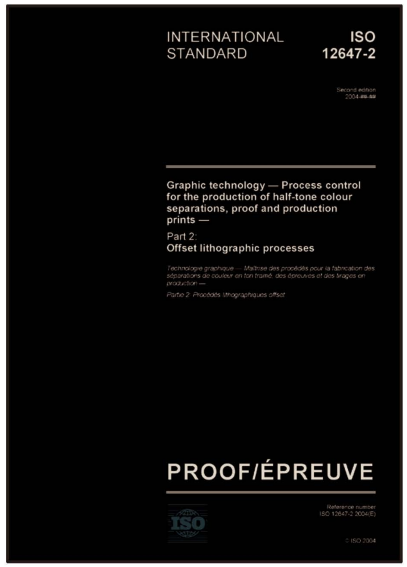
- **Industrially orientated and standardized procedure for the creation of print products**
  - Guaranty of quality over different production steps (from data creation to finished print product)
  - Aim values and tolerances for printing and proofing
  - Description of methods and useful aids
    - Supervising, guiding and proving the production process
    - Adequate testing devices
    - Control strategies and problem shooting for daily practice
- **Versions**
  - Actual version (German only): 2001/2003
  - Revised version (English also): Beginning of 2012
- **Publication available at Fogra and bvdm**

PSO versus ISO 12647

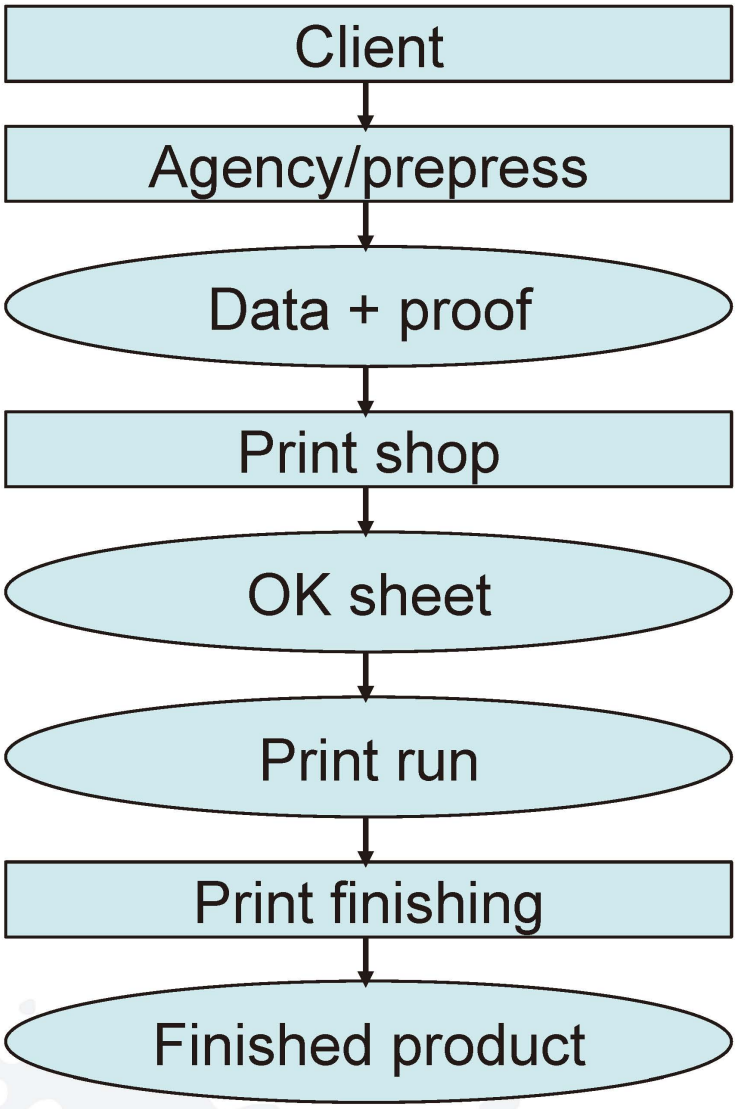
- **PSO is in full conformance with ISO 12647 series**

  ⇨ Working according to PSO means working according to ISO 12647 (not vice verca!)

- **What is the difference?**
  - PSO covers the whole production chain with several ISO standards included
    - Printing processes (ISO 12647-1, ISO 12647-2 ...)
    - Characterization and proof (ISO 12642, ISO 12647-7 ...)
    - Measurement and viewing (ISO 3664, ISO 13655 ...)
    - Data exchange (ISO 15930-6, ISO 15930-7 ...)
    - Printing inks (ISO 2846-1, ISO 2846-2 ...)
  - Amendments/changes where missing/allowed
    - Paper types for heatset printing
    - Tolerance for tone value increases in highlights
    - FM and hybrid screens
    - Solid tone colours of secondaries
  - Easy to understand/intended for daily practice



Workflow for print production



Contract proof
- Simulation of print results
- Central tool in standardized workflow
- Receipt for client
- Master for OK sheet

Reference for print run

Constant print production with respect to OK sheet

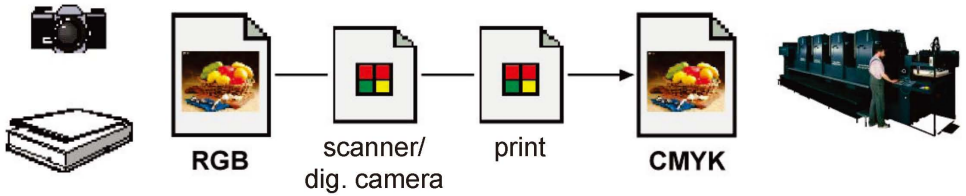
Proof-to-print match

Description of colours

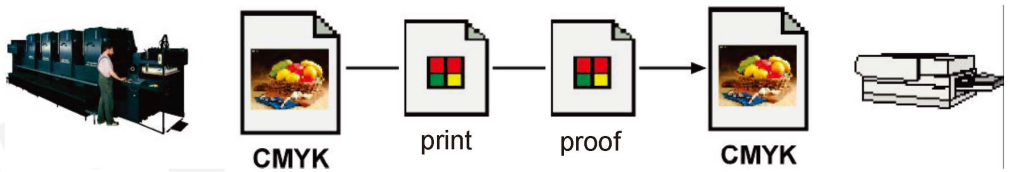
- **Input devices (scanner or digital camera)**
  - No standardized colour filters
  - Device-dependent RGB
- **Digital proofing**
  - No standardized colorants and substrates
  - Device-dependent CMYK
- **Offset printing (platemaking to print)**
  - Influence of materials
    - Colour definition for printing inks (ISO 2846-1)
    - CMYK varies with substrates
  - Clear number of printing conditions with different colour characteristics

Colour management

- **Individual characterization of input devices and digital proofing systems**
- **Generic output profiles for standardized printing conditions**
  - Freely available
    - Characterization data: www.fogra.org (Standardization)
    - ICC profiles: www.eci.org (Downloads)
  - Application of ICC profiles
    - Data preparation for production print



    - Contract proofing

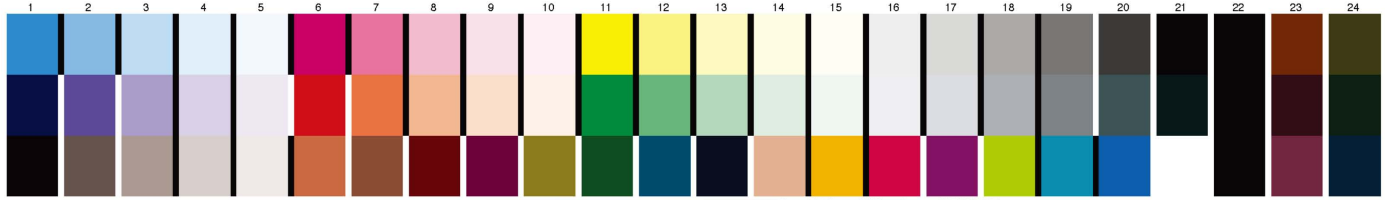


Characterization data and ICC profiles

Printing condition	Chardata	ICC profile
PT1/2 (sheet)	FOGRA39	ISO Coated v2 (ECI)
PT1/2 (web)	FOGRA39	ISO Coated v2 300 % (ECI)
PT3	FOGRA28	ISO Web Coated
PT4	FOGRA47	PSO Uncoated ISO12647 (ECI)
PT5	FOGRA30	ISO Uncoated Yellowish
SC	FOGRA40	SC paper (ECI)
MFC	FOGRA41	PSO MFC paper (ECI)
SNP	FOGRA42	PSO SNP paper (ECI)
LWC improved	FOGRA45	PSO LWC Improved (ECI)
LWC standard	FOGRA46	PSO LWC Standard (ECI)
FM (PT1/2, sheet)	FOGRA43	PSO Coated NPscreen ISO 12647 (ECI)
FM (PT1/2, web)	FOGRA43	PSO Coated 300% NPscreen ISO 12647 (ECI)
FM (PT4)	FOGRA44	PSO Uncoated NPscreen ISO 12647 (ECI)

Contract proofing

- **Ugra/Fogra Media Wedge**



Ugra/Fogra-Medienkeil-CMYK-TIFF V3.0a Proof

- **Colour difference to reference/charactarization data**

ΔE^*_{ab} paper white	Mean ΔE^*_{ab} all patches	Maximum ΔE^*_{ab} all patches	Maximum ΔE^*_{ab} primaries	Maximum ΔH^* primaries	Mean ΔH^* composed grey
3.0	3.0	6.0	5.0	2.5	1.5

- **Viewing conditions**
  - Proofs and prints are subject to metamerism effects
  - Colour matching under standard light D50

Production printing

- **Printing substrates differ by**
  - Grammage (opacity)
  - Colour and gloss
  - Coating
- **Features are responsible for fundamental parameters for rendition of colours**
  - Achievable colour gamut
  - Characteristic print curve (tone value increases)
  - Colour of the blank spots on paper
- **Classification of paper types**
  - Allocation of individual aim values for every paper type

Classification of paper types

- **Paper types according to ISO 12647-2**
  - PT 1: Gloss-coated
  - PT 2: Matte-coated
  - PT 3: LWC, web (slightly yellowish)
  - PT 4: Uncoated, white
  - PT 5: Uncoated, yellowish
- **Extensions for heat-set web printing (PSO)**
  - SC: Supercalandered
  - MFC: Machine finished coated
  - LWC: Standard (no PT 3!) and improved
  - SNP: Standard newsprint (on heat-set machines!)

Paper colour and gloss

- **Example:**
  ISO paper types on black backing

Paper type	L*	a*	b*	Gloss
1	93	0	-3	65 %
2	92	0	-3	38 %
3	87	-1	3	55 %
4	92	0	-3	6 %
5	88	0	6	6 %
Tolerance	± 3	± 2	± 2	± 5 %

Aim values for solid tone colours

- **Example:**
  ISO paper types on black backing

Paper type	1	2	3	4	5
	L*/a*/b*	L*/a*/b*	L*/a*/b*	L*/a*/b*	L*/a*/b*
Black	16/0/0	16/0/0	20/0/0	31/1/1	31/1/2
Cyan	54/-36/-49	54/-36/-49	55/-36/-44	58/-25/-43	59/-27/-36
Magenta	46/72/-5	46/72/-5	46/70/-3	54/58/-2	52/57/2
Yellow	87/-6/90	87/-6/90	84/-5/88	86/-4/75	86/-3/77
Red	46/67/47	46/67/47	45/62/39	52/53/25	51/55/34
Green	49/-63/26	49/-63/26	47/-60/25	53/-42/13	49/-44/16
Blue	24/21/-45	24/21/-45	24/18/-41	37/8/-30	33/12/-29

- **Usage of printing inks according to ISO 2846-1**
  - Colour description on reference paper
  - To be checked by ink manufacturers

Tolerances for solid tone colours

- **Deviation tolerance**
  - Maximum difference between OK print and aim values
  - Due to different characteristics of materials
- **Variation tolerance**
  - Maximum difference between production copies and OK print
  - Valid for at least 68 % of print run

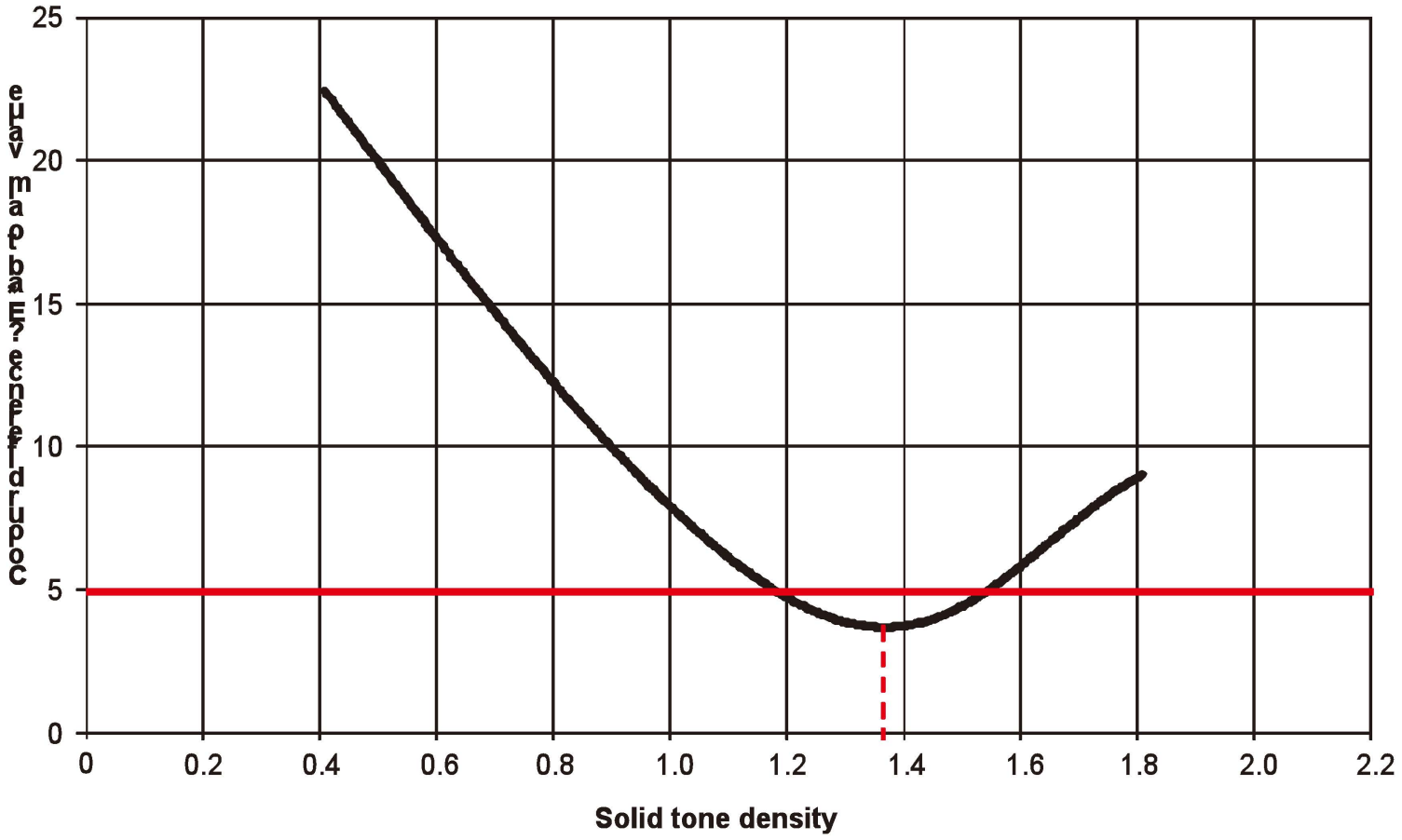
	K	C	M	Y
Deviation	5	5	5	5
Variation	4 (± 8% density)	4 (± 8% density)	4 (± 8% density)	5 (± 8% density)

- **No tolerances for secondaries**
  - Aim vlaues informative only
  - Might be changed in future versions of PSO and ISO

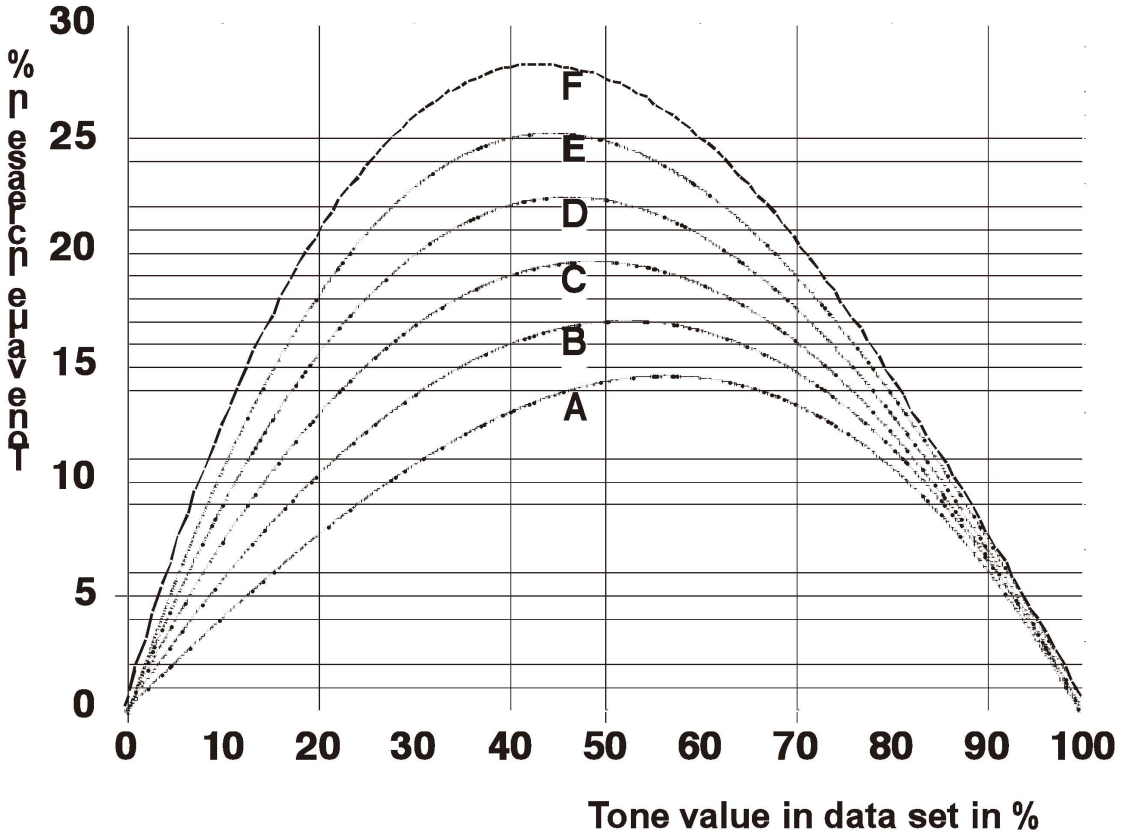
Adjusting the solid tone inking

- **Metrological control of solid tone patches in print control strip**
  - Colour measurements
    - Programmable aim values
    - Colour difference within deviation tolerance
  - Individual aim densities
    - Not generally accepted
    - Only for present combination of inks and papers
- **Contract proof as master**
  - Visual colour matching
  - Fine adjustments within tolerances

Colouring sequence



Aim values for tone value increases (characteristic print curve)

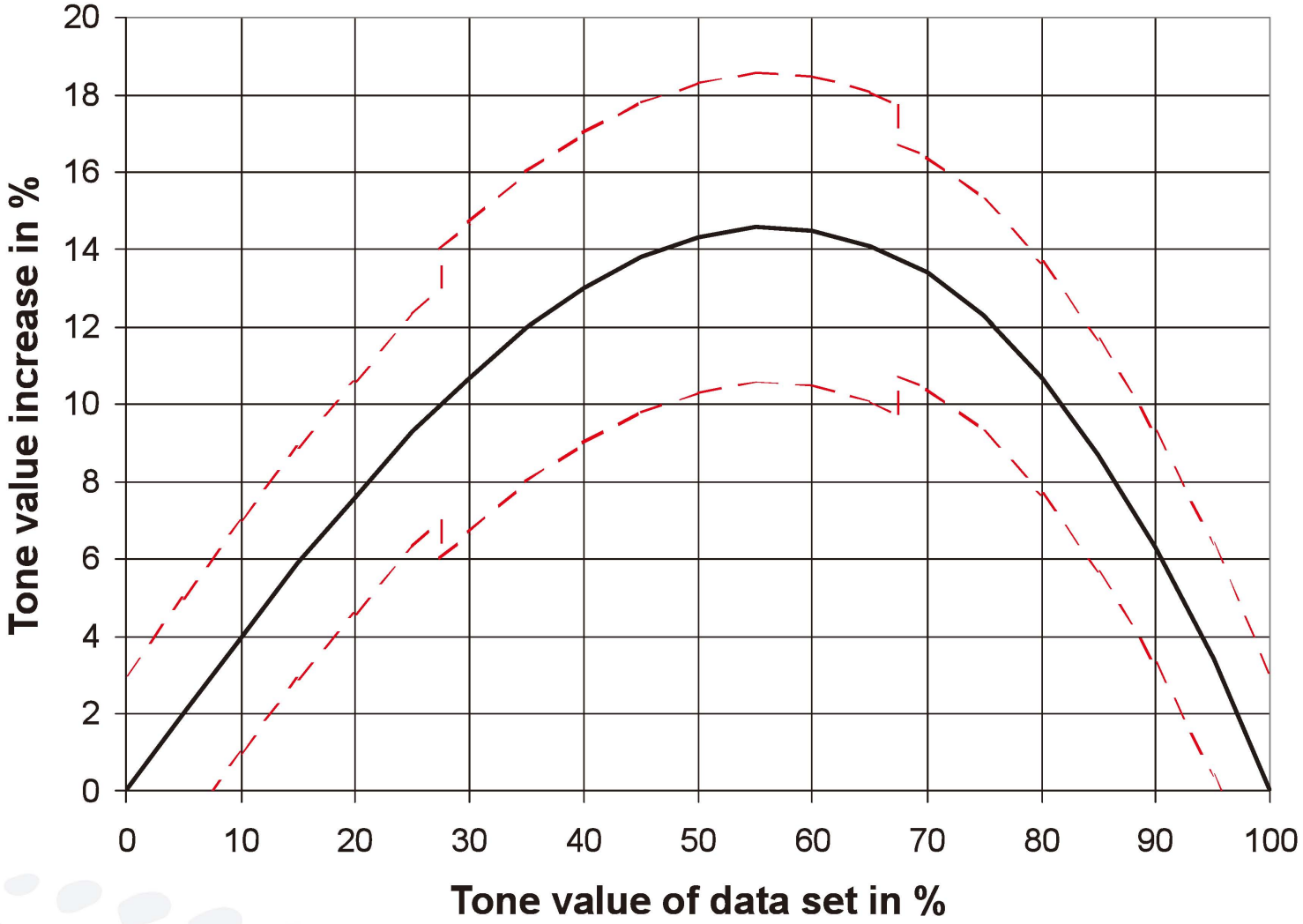


Paper	CMY	K
1/2	A	B
3	B	C
4/5	C	D
SC	B	C
MFC	B	C
LWC	B	C
SNP	C	D

Tolerances for tone value increases

- **Deviation tolerance**
  - Highlights: ± 3 %
  - Mid-tone: ± 4 %
  - Shadows: ± 3%
- **Variation tolerance**
  - Mid-tone: ± 4 %
  - Shadows: ± 3 %
- **Spread of tone value increases**
  - Difference between chromatic colours CMY in mid-tones
    - Max. 5 % in OK print
    - Max. 5 % in print run (reference OK sheet)
  - Greater deviations cause colour cast

Tolerance range OK print



Achieving the desired tonal transfer

- **RIP can convert tone values in data sets with the aid of correction tables**
- **Adding or taking away of sinlge pixels**
- **Linearization of plates**

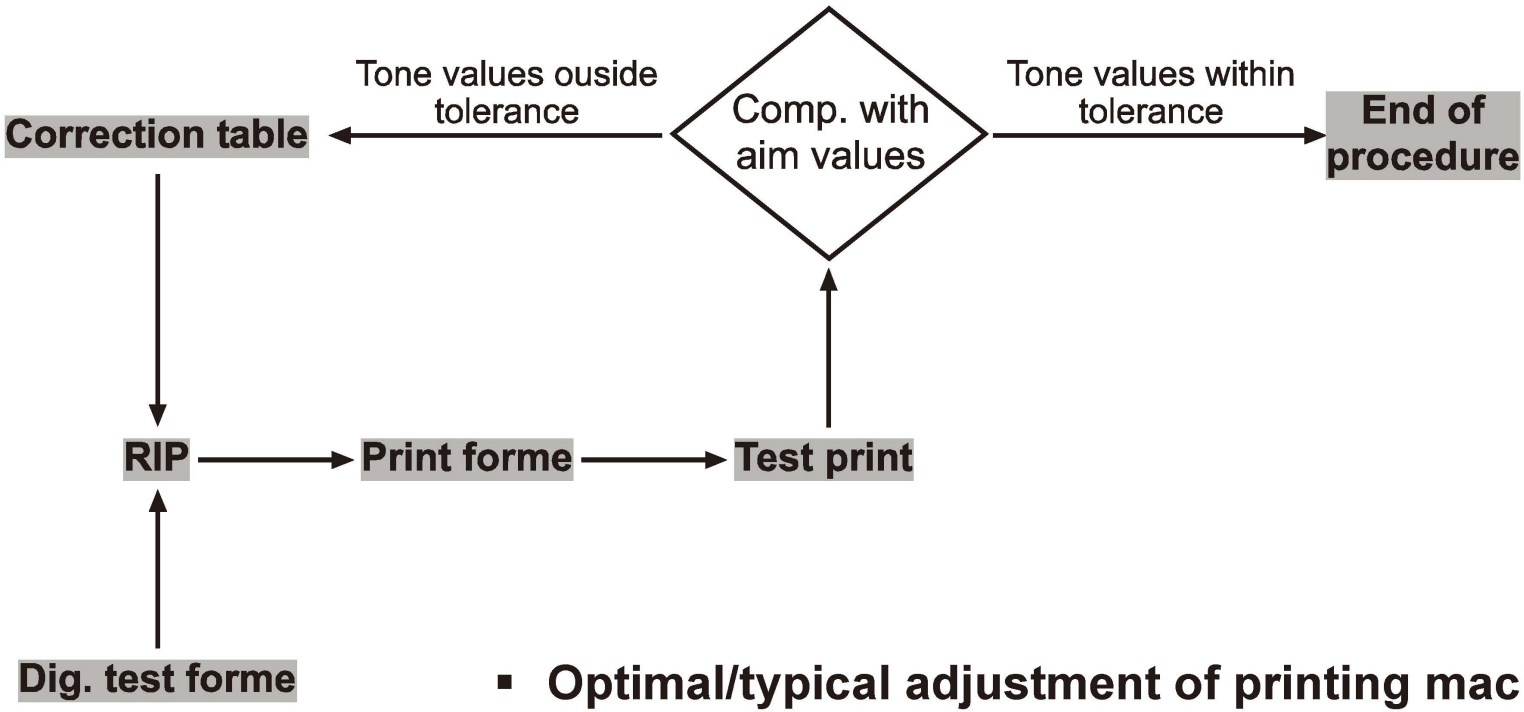
Tone value data	5	10	20	30	40	50	60	70	80	90	95
Measured on plate	4.5	9.2	18.5	27.9	36.6	45.6	56.3	67.2	78.4	89.6	94.7

- **Prozess calibration**

Tone value data	5	10	20	30	40	50	60	70	80	90	95
Measured on print	9.1	16.3	29.3	43.7	55.4	66.7	76.6	85.4	92.9	97.2	99.0
Aim values print	7.0	14.0	27.6	40.7	53.0	64.3	74.5	83.4	90.7	96.3	98.4

- **Usage of smoothing functions!**

Test print for process calibration



- **Optimal/typical adjustment of printing machine**
  - Working temperature
  - Solid tone colours/density according to standard
  - No use of completely new rubber blankets
  - ...

Controlling the print run

- **Retained samples or measuring protocol of automatic measurement devices**
- **Random examination**
  - Number of samples
    - Depends on circulation
    - The more samples, the safer the judgement
    - At least 20-30 samples
  - Random sampling
  - OK sheet necessary
- **Evaluation**
  - Separate evaluation of patches in print control strip
  - Only ink zones with enough ink taking

Intermediate summary

- **Determination of paper type to be used**
- **Usage of generic ICC profiles**
  - Correct data processing
  - Contract proof
- **Print shop must maintain aim values and tolerances with appropriate means**
  - Solid tone colours
  - Tone value increases
- **Final print result**
  - Proof-to-print match
  - Looks like expected

Fogra/bvdm PSO certification

- **Common certification programme of Fogra with bvdm since six years**
  - Demonstration of quality to the outside world
  - Ensurance of smooth production internally
  - Many agencies request Fogra/bvdm certificate
- **Certificate**
  - Launched by Fogra and member associations of bvdm
  - Valid for two years
- **Certified companies all over the world**
  - Altogether: Approx. 400
    - Starlite Holdings, Hong Kong
    - Xpress Print, Shenzhen
  - Germany: Approx. 300
  - Strongly increasing number outside of Germany

What is tested?

- **Aim values and tolerances**
  - Process Standard Offset (PSO)
  - Consistent with ISO 12647 series
- **Suitable quality controls**
- **Prepress**
  - Qualified colour management
  - Creation of contract proofs
- **Press**
  - Standardized platemaking
  - Print run with sheet-fed and/or web offset printing machines

Certification document

APPROVED QUALITY

Process Standard Offset

Process Standard ISO 12647 certified OFFSET

Testshop AG
Street 00
Code and location
COUNTRY

has successfully passed an extensive examination according to the standards of ISO 12647-2 Process Standard Offset. All test values and results range within the extent of tolerance.

Contents of examination:
- Qualified colour management
- Creation of contract proofs
- Standardized platemaking
- Print run with sheet-fed and web offset printing machines according to Process Standard Offset

The results are documented in the test report 070301/JG.

Fogra and the German Print and Media Associations confirm and certify the verified competence and quality of the certificate holder.

This certificate is valid until March 31st, 2009.

On behalf of Fogra Forschungsgesellschaft Druck and Print and Media Associations, March 2007

Dr. Eduard Neufeld
Fogra Forschungsgesellschaft Druck e.V.

Karl-Georg Nickel
Verband Druck und Medien Bayern e.V.

vdm Baden-Württemberg
vdm Bayern
vdm Berlin-Brandenburg
vdm Hessen
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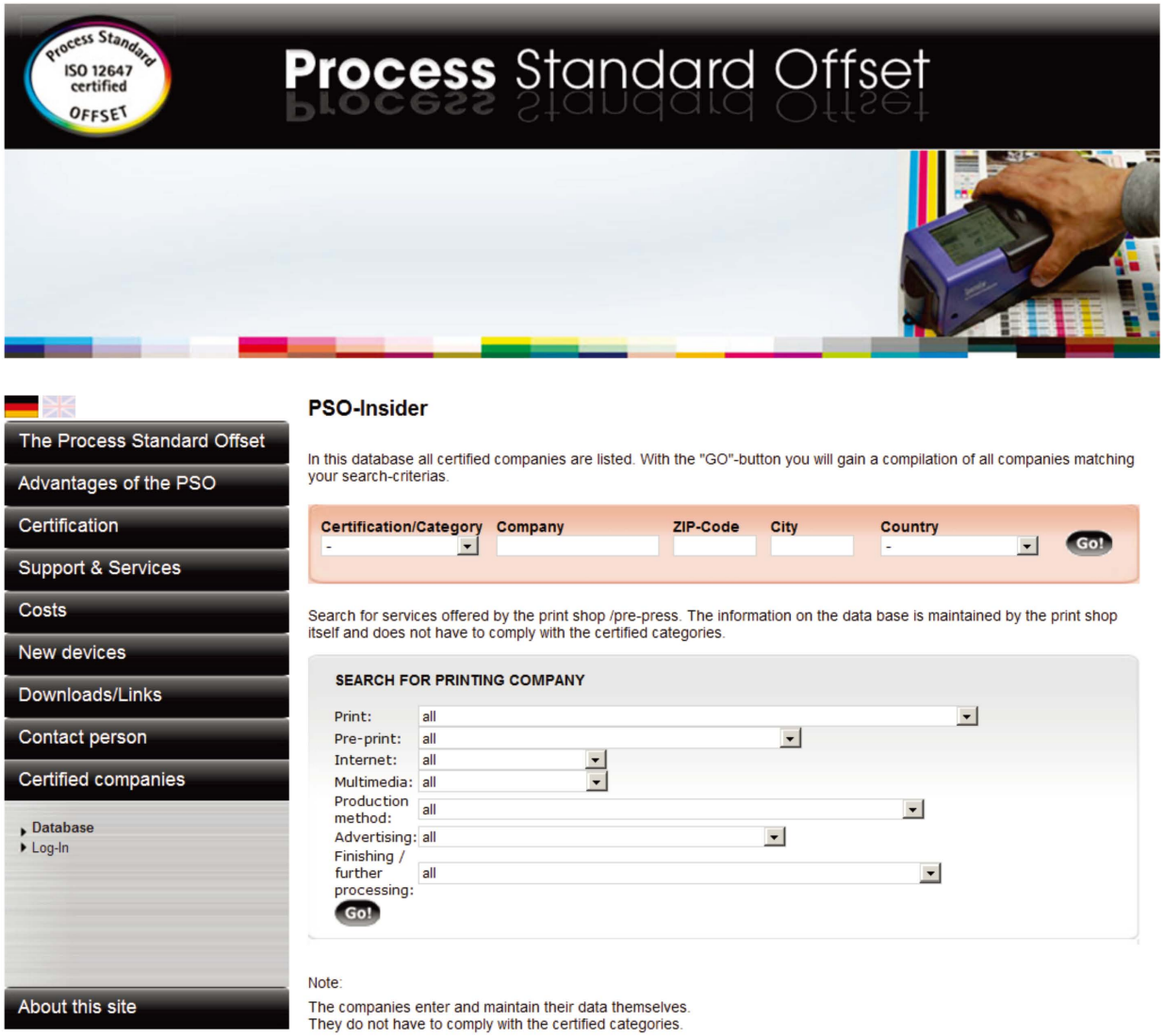
Entry at www.pso-insider.de



Digital seal of approval

Advertizing ...

Fogra PSO partner programme

- **Partners all over the world**
  - Complete list at www.fogra.org (FograCert/Qualified partners/PSO partners)
  - Actual certification partners in Hong Kong
    - Advanced Printing Technology Centre
    - Faktor Hong Kong
- **Providing onsite support for the certification according to PSO (ISO 12647)**
  - Prior consultancy
  - Leading the certification test at site
  - Certification and issuance of documents by Fogra and bvdm

Thank you!

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