

Tab.: Measurement programmes in wells and groundwater monitoring wells (based on Baumann, 2016)

Investigation target	Task	material of the tubing	
		electrically conductive (e.g. steel, copper)	electrically non-conductive (e.g. plastic, OBO, ceramics, eternit, GRP)
Complex evaluations	<u>Acceptance of new wells</u> : General condition, well screen position, dirt particles, foreign bodies, annular space seals, annular space backfilling, leak tightness of pipe connections, inflow profiling/water yield of well screen section(s)	TV, CAL, GG.D or RGG.D, NN, GR or SGL, packer test	CAL, GG.D or RGG.D, NN, GR or SGL, FEL
	<u>Well status evaluation</u> : General condition, silt accumulations, foreign bodies, well completion, well screen position, corrosion of casing, annular space seals, annular space backfilling, leak tightness of pipe connections, inflow profiling/water yield of well screen section(s)	TV, CAL, GG.D or RGG.D, NN, GR or SGL, EMDS, packer test	TV, CAL, GG.D or RGG.D, NN, GR or SGL, FEL
Casing	foreign bodies, pipe deposits	TV	TV
	Corrosion/wall thickness of extension pipes	EMDS* ¹ CAL TV GG.D* ¹²	
	Well screen position	TV EMDS* ⁴ CAL* ¹⁴	FEL CAL* ¹⁴
	Leak tightness of pipe connections	packer test	FEL packer test* ⁵
	Installation depth of water strings or telescopic pipes of surface or anchor casings	EMDS	EMDS
	Locating of lost pipes in annular space	EMDS	EMDS IL
	Casing Inclination and inclination direction of casing string	BDL* ²	BDL
	Determination of screen slot sizes	TV	TV
	Casing diameter and casing string deformations	TV CAL	TV CAL FEL

Casing inflow/leaks	Inflow profile	FLOW TFL *3	FLOW TFL *3
	Permeability of area around well screen	PFLOW	PFLOW
	Short circuits at rest inside casing	TFL SAL/TEMP	TFL SAL/TEMP
	Locating of humic substance infiltrations	SAC436*10 TV SAMP	SAC436*10 TV SAMP
	Locating of complex organic compound infiltrations	SAK254*10 SAMP	SAK254*10 SAMP
	Locating of entry of turbid substances (e. g. sand)	FMT*10 SAMP	FMT*10 SAMP
	Water inflows of different chemical composition	MIL *10 SAMP	MIL *10 SAMP
Annular space	Position and homogeneity of unmarked annular space seals	SGL NN GG.D*7	SGL NN GG.D*7
	Position and homogeneity of gamma-irradiated annular space seals	SGL NN*9 GG.D*7	SGL NN*9 GG.D*7
	Position and homogeneity of magnetically marked annular space seals *11	SGL NN*9 GG.D*7	SGL MAL NN*9 GG.D*7
	Existence and condition of gravel or glass bead layer (e. g. colmation)	PFLOW SGL GG.D*7 NN	PFLOW SGL GG.D*7 NN IL
	Hydraulic efficiency of annular space seals	GDT	GDT
	Annular space backfilling, bridging	SGL GG.D*7 NN	SGL GG.D*7 NN
	Localisation of sand inputs	TV*8 FMT*8	TV*8 FMT*8
	Optical grain size analysis of existing gravel layer	TV	TV
Rock	Determination of freshwater/saltwater boundaries in rock*13		IL SAL/TEMP
	Preparation and/or review of geological soil profile log	SGL GG.D*6*7 NN*6	SGL GG.D*6*7 NN IL

Remarks/ boundary conditions*15:

*1	EMDS even with heavy incrustation / deposits / ochreisation, corrosion mostly from the outside to the inside, therefore TV can only be used to a limited extent, CAL for calibration of EMDS, not in stainless steel pipes
*2	in steel pipes only inclination, no direction of inclination, alternatively use of a gyroscope
*3	TFL at very low inflow rates (below the response threshold of flowmeter probes)
*4	EMDS can also be used if the filter is not visually visible (incrustation, coatings)
*5	Packer test, if indications of hydraulic leaks are found with the screening procedures FEL; not possible with obo and ceramic lining (risk of damage!)
*6	In steel pipes only possible to a limited extent and also only with very thin annular spaces
*7	in the diameter range 100 to 130 mm better RGG.D
*8	Under delivery conditions, where the delivery rate should be in the range of normal operating conditions
*9	Above the water level, a neutron-neutron measurement should be used for a clear assessment
*10	Measurements should be taken from the water level in order to also be able to localise extraneous water inputs in the area of the top pipes
*11	Magnetic clays are unsuitable for steel casing
*12	brings additional information
*13	With known borehole development and geological stratigraphy; preferred use in groundwater monitoring wells for monitoring the fresh-salt water boundary
*14	The exact position of the pipe connections is often indicated by a slight change in the internal diameter in the area of the filter pipes
*15	It is not possible to go into all the boundary conditions here. In case of doubt, a specialist company should be consulted.