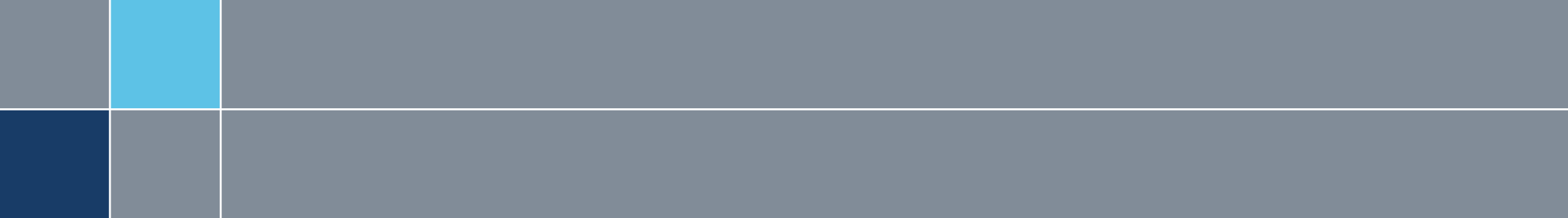# Flow Cytometry Validated Panels

PRECISION
for medicine

At Precision, we routinely run complex flow cytometry assays, such as those containing tetramers or requiring accurate detection of low-frequency populations. We utilize techniques such as enrichment with magnetic beads, FACS (cell sorting), and both standard and spectral cytometers. Assays can be validated to CLIA and used for patient selection. Standard validation provides assurance that an assay performs as required in a given application.

For flow cytometry, a technique that often involves detecting multiple targets simultaneously, it is essential to have confidence that antibody reagents are behaving reliably.

In addition to experience and expertise in developing custom assays, Precision has many panels that are ready to employ "off-the-shelf," or they may be customized if needed. Review Precision's Validated Flow Cytometry Panels for your upcoming clinical trials.
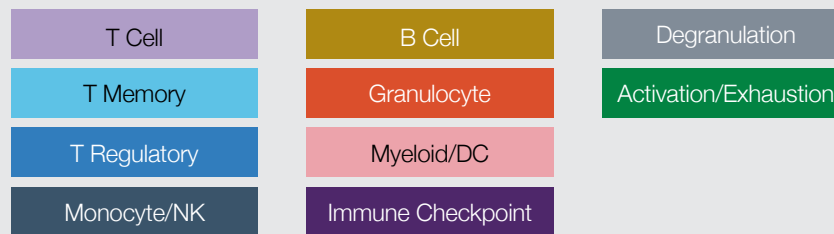
Table 1. Cell Populations and Corresponding Markers

Population Name	Corresponding Markers
Lymphocyte	CD45
T Cell	CD3 / CD4 / CD8
T Memory	CCR7 / CD45RO / CD45RA / CD62L
T Regulatory	CD25 / CD127 / FoxP3
TCR	TCRvβ / TCRγδ / Vd2 / Vg9 / TCR Vα24-Jα18
Monocyte	CD14 / CD16
NK Cell	CD56 / CD16 / NKG2A / CD337 (NKp30) / NKG2D / NKGp46 / CD158a,h
B Cell	CD19 / CD20 / CD27 / IgD / IgM / IgG
Granulocytes	CD66b / CD15
Myeloid Cell	CD33 / CD11c / CD11b / CD1c / CD66b / CD123 / CD141 / CD303
Intracellular Cytokines	IFN-γ/ IL-2 / IL-22 / IL-4 / IL-17A / mb IL-15
Degranulation Markers	CD107a / Granzyme B
Activation Markers	Ki67 / CD69 / CD86 / CD38 / PD-1 / Lag3 / Tim3
Immune Checkpoint	PD-1 / PD-L1
Exhaustion Markers	Lag3 / Tim3 / TIGIT / CTLA-4 / PD-1
Disease State Markers	CLA / EPCAM
Phosphorylation	p-ZAP70 / p-HS1 / p-PLCG2 / p-ERK 1/2 / pSTAT1

General Panel

Panel Description	Sample Matrix	Colors																		
T/B/NK/Activation/Exhaustion	PBMC	18	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	FoxP3	CD16	CD56	PD-1	CD19	Granzyme B	Ki67	Tim3	CTLA-4	CD28	ICOS
T/B/NK/Monocyte	PBMC	17	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	CD14	CD16	CD56	NKG2D, NKp46	CD19	Ki67	CD38	CXCR3	
Treg-T-B-NK-Monocyte+BD TruCount Tube	Whole Blood	17	Viability	CD45	CD3	CD4	CD8	CD45RA	CD25	CD127	FoxP3	CD14	CD16	CD56	CD19	CD15	PD-1	HLA-DR	CCR8	
T/T Memory/Activation/Exhaustion	PBMC	17	Viability	CD45	CD3	CD4	CD8	CD45RA	CD62L	CD127	CD27	PD-1	Ki67	LAG3	Tim3	CTLA-4	CD28	CD95	CD137	
T/T Memory/T Regulatory/Activation/NK Cell	PBMC	16	Viability	CD3	CD4	CD8	CCR7	CD45RO	CD25	CD127	FoxP3	CD56	Granzyme B	Ki67	TIGIT	CD28	CD95	aBiotin-PE/PD-1		
T/T Memory/T Regulatory/Activation/NK Cell	PBMC	16	Viability	CD3	CD4	CD8	CCR7	CD45RO	CD25	CD127	FoxP3	CD56	Granzyme B	PD-1	Ki67	TIGIT	CD28	CD95		
T Cell/T Memory/Exhaustion	PBMC	16	Viability	CD3	CD4	CD8	CCR7	CD45RO	PD-1	Tim3	HLA-DR	CD28	CXCR3	CD95	ICOS	CXCR5	EOMES	T-bet		
T/T Memory/NK Cell/Activation	PBMC	15	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	CD16	CD56	CD38	HLA-DR	CD28	CD154	aBiotin-PE/PD-1			
T/T Regulatory/T Activation/NK	PBMC	15	Viability	CD45	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	CD16	CD56	PD-1	Ki67	Tim3			
T Cell Panel	PBMC	15	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	CD16	CD56	PD-1	CD38	HLA-DR	CD28	CD154			
T/T Follicular/T Helper/Exhaustion	PBMC	15	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	PD-1	HLA-DR	CXCR3	CCR6	CD154	ICOS	CXCR5			
T/B/NK/Monocyte/Activation	Whole Blood/Cyto-Chex Tube	15	CD45	CD3	CD25	CD14	CD16	CD56	CD19	CD27	IgD	CD66b	CD86	CD38	CD80	HLA-DR	CD54			
T/T Regulatory/NK/Activation	PBMC	14	Viability	CD45	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	CD56	PD-1	Ki67	CD69	HLA-DR			
Extended B Cell/Activation	PBMC	14	Viability	CD3	CD19	CD20	CD27	IgD	IgM	CD86	CD38	HLA-DR	CD40	CXCR4	CD138	CD24				
T/T Regulatory/T Memory/Activation/Exhaustion	PBMC	14	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	CD86	CTLA-4	CD39	CXCR4	LAP				

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

T Cell	B Cell	Degranulation
T Memory	Granulocyte	Activation/Exhaustion
T Regulatory	Myeloid/DC	
Monocyte/NK	Immune Checkpoint	

General Panel

Panel Description	Sample Matrix	Colors														
T/T Regulatory/T Memory/Activation/Exhaustion	PBMC	14	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	PD-1	CD38	HLA-DR	CD28	CD154
T/T Regulatory/T Memory/Activation/Exhaustion	PBMC	13	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	CD86	CTLA-4	CD39	LAP	
T/B/NK/Monocyte/Activation	Whole Blood/ BMA	12	Viability	CD45	CD3	CD4	CD8	CD14	CD16	CD56	CD19	CD20	CD38	CD138		
B/B Memory/B-Extended Panel	Whole Blood	10	Viability	CD45	CD3	CD19	CD20	CD27	IgD	CD38	CD138	CD24				
T/B/NK/Monocyte/BTK/Aiolos	Whole Blood/ CytoChex BCT Tube	10	CD45	CD3	CD4	CD8	CD14	CD16	CD56	CD19	Aiolos	BTK				
T Cell/T Memory/CLA	PBMC	9	Viability	CD4	CD8	CCR7	CD45RA	CD25	CD14	CD69	CLA					
T/B/NK	PBMC	9	Viability	CD45	CD3	CD4	CD8	CD45RO	CD56	CD19	CD37					
T/Activation/Degranulation	PBMC	9	Viability	CD3	CD4	CD8	CD25	CD127	CD107a	Granzyme B	CD69					
T/Activation/Degranulation	PBMC	9	Viability	CD3	CD4	CD8	CD25	CD127	Granzyme B	CD69	CD38					
T/T Regulatory/Monocyte/Activation	Whole Blood	9	CD3	CD4	CD8	CD25	CD127	CD14	CD16	Ki67	ICOS					
T/Activation/Degranulation	Whole Blood	9	Viability	CD45	CD4	CD8	CD25	CD127	Granzyme B	CD69	CD38					
T/B/NK/Monocyte	Whole Blood	8	Viability	CD45	CD3	CD14	CD16	CD56	CD19	CD38						
T Regulatory	Whole Blood	7	Viability	CD45	CD3	CD4	CD25	CD127	FoxP3							
T Cell/Activation	PBMC	7	Viability	CD45	CD3	CD4	CD8	PD-1	Ki67							
T/B	PBMC	4	Viability	CD45	CD3	CD19										

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

T Cell	B Cell	Degranulation
T Memory	Granulocyte	Activation/Exhaustion
T Regulatory	Myeloid/DC	
Monocyte/NK	Immune Checkpoint	

Myeloid | Dendritic Cell

Panel Description	Sample Matrix	Colors																	
T/T Memory/B/NK/Myeloid/Activation	PBMC	18	Viability	CD3	CD8	CCR7	CD45RA	CD14	CD16	CD56	CD33	CD11b	BDCA2 (CD303)	PD-1	Ki67	CD86	HLA-DR	CD28	CD19/CD4	ICOS (CD278)
T/B/NK/DC/Monocyte	PBMC	18	Viability	CD45	CD3	CD4	CD8	CD25	CD127	CD14	CD16	CD56	CD20	CD11c	CD123	PD-1	CD86	CD38	HLA-DR	CD40
T/T Memory/Activation/ Monocyte/Myeloid	PBMC	17	Viability	CD45	CD3	CD4	CCR7	CD45RA	CD127	CD14	CD15	CD33	CD11c	CD11b	PD-L1	CD86	HLA-DR	KLRG1	Ln^{neg}	
B Cell/DC/Myeloid	PBMC	17	Viability	CD45	CD3	CD14	CD19	CD27	IgD	IgG	CD11c	CD123	PD-1	CD86	CD38	CD154	CD40	CD24	ICOS-L (CD275)	
T/B/NK/Myeloid	PBMC	17	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	CD14	CD56	CD20	CD27	CD11c	CD123	CXCR3	CCR6	CCR4	
T/B/NK/Myeloid	PBMC	16	Viability	CD3	CD4	CD8	FoxP3	CD16	CD56	CD19	CD11c	CD141	PD-1	PD-L1	CD69	CD86	HLA-DR	CD45		
T/B/NK/DC/Monocyte	PBMC	16	Viability	CD3	CD8	CCR7	CD45RO	CD14	CD16	CD56	CD19	CD11c	CD123	CD141	PD-L1	Ki67	CD86	PD-1 (CD279)		
NK/Monocyte/Myeloid	PBMC	14	Viability	CD14	CD16	CD56	CD337 (NKp30)	CD158a,h	CD15	CD33	CD11c	CD11b	HLA-DR	CD158b1/b2,j	CD57	Ln^{neg}				
B/NK/DC/Activation	PBMC	14	Viability	CD3	CD14	CD16	CD56	CD19	CD27	CD11c	CD123	CD86	CD38	HLA-DR	CD40	CXCR4				
B/NK/DC/Monocyte	PBMC	13	Viability	CD3	CD14	CD16	CD56	CD19	CD27	IgD	CD1c	CD123	CD141	CD38	HLA-DR					
B/NK/DC/Monocyte	PBMC	12	CD3	CD14	CD16	CD56	CD19	CD11c	CD123	CD86	CD38	HLA-DR	CD40	CXCR4						
MDSC	PBMC	7	Viability	CD14	CD15	CD33	CD11b	HLA-DR	Ln^{neg}											

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

Legend:
- T Cell
- T Memory
- T Regulatory
- Monocyte/NK
- B Cell
- Granulocyte
- Myeloid/DC
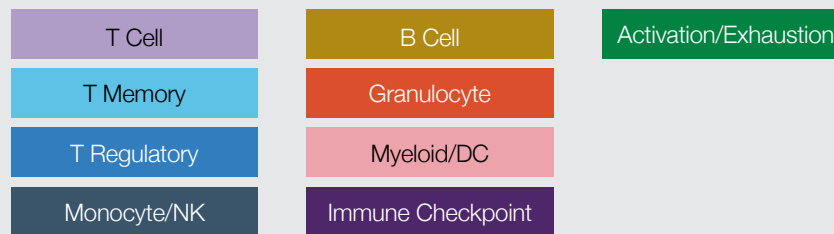- Immune Checkpoint
- Degranulation
- Activation/Exhaustion

Intracellular Cytokine

Panel Description	Sample Matrix	Colors																		
T/T Memory/Th1/Th2/Th17	PBMC	17	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	IFNγ	IL-22	IL-4	IL-17A	CXCR3	CCR6	CD161	CCR10	CD294
T/T Activation/Exhaustion/ T Regulatory/NK	PBMC	16	Viability	CD45	CD3	CD4	CD8	CD25	FoxP3	CD16	CD56	PD-1	Ki67	LAG3	TIGIT	TCRγδ	IFNγ	CD137 (4-1BB)	
T/T Regulatory/T Memory/ Th1/Th2	PBMC	14	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	IFNγ	IL-2	IL-4	CXCR3	CCR6			
T/T Regulatory/ T Memory/Th17/Th17.1	PBMC	14	Viability	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD127	FoxP3	IFNγ	IL-17A	CXCR3	CCR6	CD161			
T/B/NK/Monocyte/PD-L1	PBMC	11	Viability	CD3	CD4	CD14	CD16	CD56	CD19	PD-L1	TCRγδ	TCR Vα24-Jα18	IL-15						
T Cell/INFγ	PBMC	5	Viability	CD3	CD4	CD8	IFNγ												

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

T Cell	B Cell	Activation/Exhaustion
T Memory	Granulocyte	
T Regulatory	Myeloid/DC	
Monocyte/NK	Immune Checkpoint	

T Cell Receptor

Panel Description	Sample Matrix	Colors															
T/T Memory/B/NK/Activation	Whole Blood	15	CD45	CD3	CD4	CD8	CCR7	CD45RA	CD25	CD56	CD19	PD-1	CD69	Vd2	Vg9	HLA-DR	CD274 (PD-L1)
T/B/NK/Activation	Whole Blood	13	CD45	CD3	CD4	CD8	CD25	CD14	CD56	CD19	PD-L1	CD69	CD86	Vd2	Vg9		
T/B/NK/Activation	PBMC	10	Viability	CD45	CD3	CD4	CD8	CD25	CD14	CD56	CD20	TCRvβ				

Tetramer

Panel Description	Sample Matrix	Colors																
T/T Memory/HLA-DQ.2 Tetramer	PBMC	16	Viability	CD3	CD4	CD45RA	CD62L	CD25	CD127	PD-1	CD38	CTLA-4	CD39	*Custom Tetramer 1/2	Alpha 4 (CD49d)	B7	Ln^neg	Alpha E
T Cell Activation	PBMC	13	Viability	CD3	CD4	CD45RO		CD25	CD127	PD-1	HLA-DR	*Custom Tetramer 1/2	CXCR5	CD15s	CD73	Ln^neg		
T Cell/T Effector/T Regulatory	PBMC	12	Viability	CD3	CD4	CCR7	CD45RO	CD25	CD127	CD69	CXCR3	CCR6	*Custom Tetramer 1/2	Ln^neg			
T/T Memory/HLA-DQ.2 Tetramer	PBMC	12	Viability	CD3	CD4	CCR7	CD45RA	CD62L	CD38	CD39	*Custom Tetramer 1/2	Alpha 4 (CD49d)	B7	Ln^neg			

*Panel customized for sponsor use. Specific tetramer or CAR antibody may need to be supplied by sponsor. Panel available without custom marker.

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

T Cell	B Cell	Activation/Exhaustion
T Memory	Granulocyte	
T Regulatory	Myeloid/DC	
Monocyte/NK	Immune Checkpoint	

Phospho-Flow

Panel Description	Sample Matrix	Colors							
p-ERK T-cell Phospho-Flow	Whole Blood	7	CD3	CD4	CD14	CD66b	CD15	p-ERK 1/2	Total ERK
p-PLCG2, p-HSA1, pZAP70 T-cell Phospho-Flow	Whole Blood	6	CD45	CD4	CD8	p-ZAP70	p-HS1	p-PLCG2	
pStat1 Phospho-Flow	Whole Blood	2	CD3	pSTAT1 Y701					

Granulocyte

Panel Description	Sample Matrix	Colors					
T/B/Monocyte/Granulocyte Sorting	Whole Blood	6	Viability	CD3	CD14	CD19	CD15	CD66b

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

T Cell	B Cell	Activation/Exhaustion
T Memory	Granulocyte	
T Regulatory	Myeloid/DC	
Monocyte/NK	Immune Checkpoint	

CAR T

Panel Description	Sample Matrix	Colors																	
T/T Memory/CAR T + BD TruCount Tues	PBMC	17	Viability	CD3	CD4	CD8	CCR7	CD45RO	CD45RA	CD62L	CD25	CD127	CD27	CXCR3	CCR6	CD95	b2M	HLA-DR, DP, DQ	Custom CAR T*
T/Exhaustion/NK/CAR T + BD TruCount Tubes	PBMC	17	Viability	CD3	CD4	CD8	CD16	CD56	NKG2A	CD107a	PD-1	CD69	CD38	LAG3	Tim3	b2M	CD158b		Custom CAR T*

*Panel customized for sponsor use. Specific tetramer or CAR antibody may need to be supplied by sponsor. Panel available without custom marker.

Tumor-Infiltrating Lymphocyte (TIL)

Panel Description	Sample Matrix	Colors													
Treg/T/NK Tumor-Infiltrating Lymphocyte (TIL)	Tumor (TILs)	13	Viability	CD45	CD3	CD4	CD8	CD25	FoxP3	CD16	CD56	Granzyme B	Ki67	EpCAM-1	CCR8

For ease of navigation, we've color-coded markers in each panel to correspond to the cell type measured to quickly evaluate whether a validated panel contains a desired cell type marker.

T Cell	B Cell	Degranulation
T Memory	Granulocyte	Activation/Exhaustion
T Regulatory	Myeloid/DC	
Monocyte/NK	Immune Checkpoint	
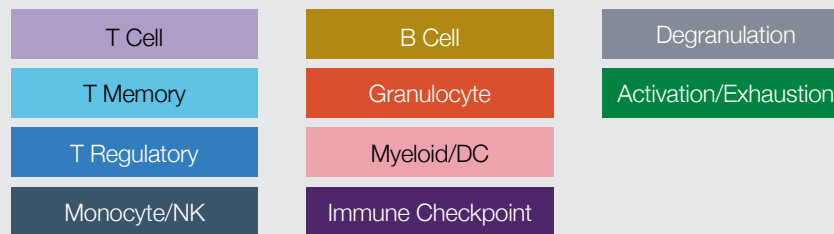
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DNA

- PCR — ddPCR, qPCR
- NGS — whole exome and targeted resequencing

RNA
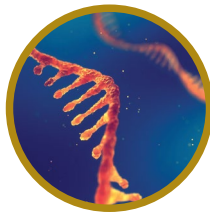
- Gene expression profiling NanoString
- CAR T and virus (ie, gene therapy) biodistribution
- rtPCR
- MicroRNA analysis

Protein
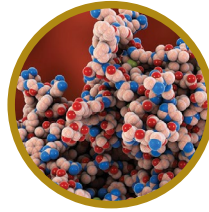
- Comprehensive large molecule bioanalysis — PK, ADA, NAb
- Multiplex cytokine profiling, receptor occupancy, tetramer staining
- Custom ligand binding assays — ELISA, MSD, Biacore
- Quantitative image analysis of protein expression (eg, phosphorylation, signaling)

Cell
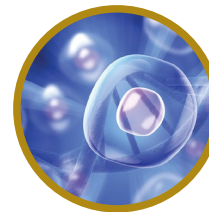
- Flow cytometry — up to 31 color panels, ICS, phosphoflow, receptor occupancy
- Functional assays — eg, T cell activation, ADCC, ELISpot
- Single-cell quantitative image analysis
- Proprietary cell separation technology for CTCs and cfDNA
- Immunophenotyping via proprietary epigenetic platform

Tissue
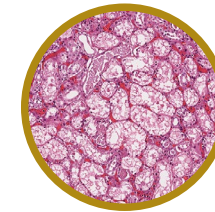
- Multiplex IHC with centralized pathology reading
- Quantitative IF — up to 9 concurrent markers
- FISH, ISH, sequencing

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What sets us apart is the way we integrate clinical trial execution with deep scientific knowledge, laboratory expertise, and advanced data sciences. This is Precision Convergence: maximizing insights into patient biology and accelerating the pace of scientific discovery and approval.
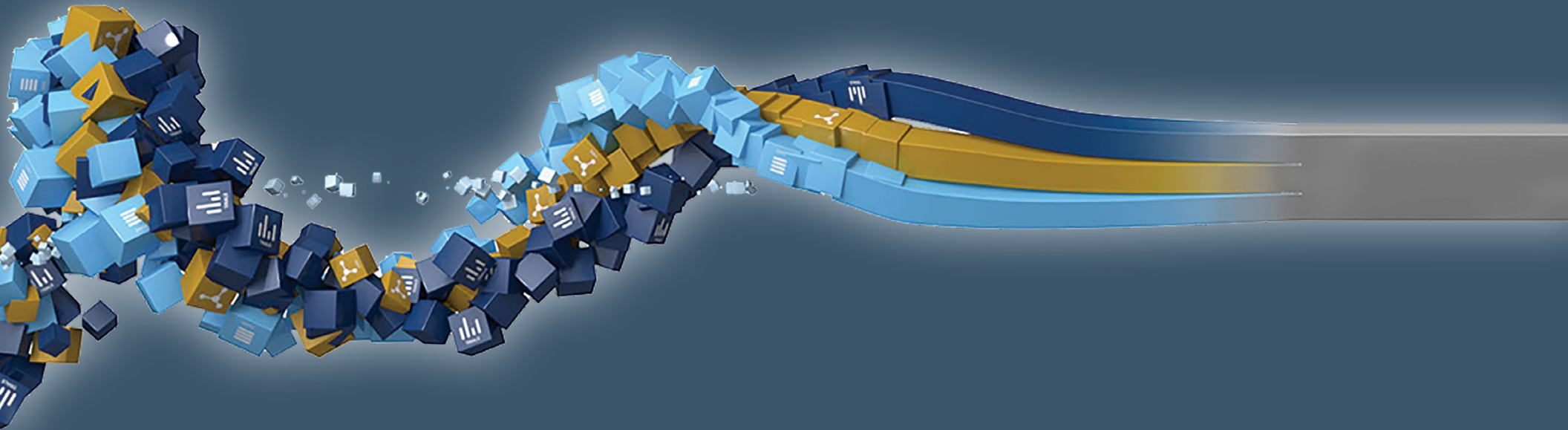
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